Investigating Public Preferences for Tropical Biodiversity amongst Distant Beneficiaries: Developing the Application of Stated Preference Techniques

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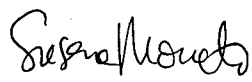
DECLARATION

This is to certify that:

1. No part of this thesis has been presented to the University for any degree.

2. Chapter 6 was undertaken as joint work with my supervisor Dr Susana Mourato and Dr Giles Atkinson. At least 75% is my own work.

3. This thesis is less than 100,000 words in length excluding Appendices and References.



Dr Susana Mourato

ABSTRACT

Despite heightened awareness of the need to find additional resources for tropical biodiversity conservation, and recognition that the global benefits may be significant, surprisingly little is known about the size and nature of these values or how best to capture them. This research aims to address this gap by undertaking one of the first in-depth investigations of UK preferences for tropical biodiversity. The research comprises two case studies.

The first case study elicits public preferences for expanding the tropical protected area network, investigating the crucial issue of how these values might best be captured by exploring individual willingness to pay under three different payment mechanisms in a sequential, randomized contingent valuation survey. It represents the first study to explore public preferences towards different ways of funding tropical conservation and is one of only a few studies to use a within-subject design to explore the reasons why respondents prefer different payment mechanisms.

The second case study uses a novel methodological approach using a split sample choice experiment to demonstrate the values held for a specific rainforest conservation programme taking into account substitutes. The use of the choice experiment technique specifically enables a more detailed analysis of willingness to pay in terms of the perceived importance of the underlying attributes of rainforest conservation. Correspondingly, the research reveals new and important information on public preferences for conservation policy responses and towards conservation priorities.

A key element of the research is to develop the application of stated preference techniques in the valuation of distant and unfamiliar public goods, in particular: by testing the effectiveness of an entreaty in reducing protests responses; by examining in depth the reasons for sensitivity to payment vehicles; by exploring framing effects and by investigating the effect of the opt-out format in modelling choices for public goods.

TABLE OF CONTENTS

Declaration 2
Abstract 3
Table of Contents 4
List of Tables 9
List of Figures 11
List of Acronyms 12
Acknowledgements 13

Chapter 1: Introduction 14
1.1 Policy Background 14
1.2 Problem Statement 18
1.2.1 Demonstration of Global Non-Use Values 19
1.2.2 Capturing Global Non-Use Values 20
1.2.3 Public Preferences, Priority-Setting and Policy Responses 21
1.2.4 Methodological Challenges in Exploring Public Preferences 21
1.3 Research Design 22
1.4 Aims and Objectives 25
1.5 Novel Contributions 27
1.5.1 Methodological Contributions: 27
1.5.2 Policy Contributions: 28
1.6 Thesis Structure 29

Chapter 2: Literature Review 33
2.1 Introduction 34
2.2 Indirect Approaches 34
2.3 Stated Preference Literature on Valuing 'Global' Biodiversity 36
2.3.1 Coverage 36
2.3.2 Methodological Issues 40
2.3.3 Policy Dimensions 45
2.4 Summary and Conclusions 51

Chapter 3: Stated Preference Techniques 53
3.1 Introduction 54
3.2 Economic Valuation 54
3.2.1 Theory of Economic Valuation 56
3.2.2 Economic Valuation Methods 59

3.3 Contingent Valuation **60**
3.3.1 The Contingent Valuation Survey Instrument 60
3.3.2 Analysis of Contingent Valuation Data 64
3.3.3 Validity and Reliability 66
3.3.4 Main Advantages and Disadvantages of CVM 68
3.4 Choice Experiments **69**
3.4.1 The Choice Experiment Survey Instrument 70
3.4.2 Analysis of Choice Experiment Data 73
3.4.3 Validity and Reliability 76
3.4.4 Main Advantages and Disadvantages of Choice Experiments 77
3.5 Comparing Choice Experiments and Contingent Valuation Method **78**

Chapter 4: Introduction to the Case Studies **79**
4.1 Introduction **80**
4.2 Expanding the Tropical Protected Area Network and Capture Mechanisms **80**
4.2.1 Policy Background 80
4.2.2 Research Design 81
4.2.3 Development of the Survey Instrument 81
4.2.4 Final Survey Instrument 86
4.2.5 Sampling and Data Collection 91
4.3 Iwokrama Rainforest and Conservation Priorities **92**
4.3.1 Introduction 92
4.3.2 Research Design 92
4.3.3 Iwokrama Rainforest 93
4.3.4 Development of the Survey Instrument 95
4.3.5 Final Survey Instrument 98
4.3.6 Sampling and Data Collection 107
4.4 Summary **107**

Chapter 5: Public Preferences for Expanding the Tropical Protected Area Network and Capture Mechanisms **108**
5.1 Policy Background **109**
5.2 Research Objectives **114**
5.3 Experimental Design **115**
5.4 Data **120**
5.5 Results and Discussion **120**
5.5.1 Survey Response Rates 120
5.5.2 Sample Characteristics 121

5.5.3 Environmental Attitudes and Behaviour 122
5.5.4 Biodiversity: Experience, Awareness and Attitudes 124
5.5.5 Attitudes towards Funding Tropical Conservation 129
5.5.6 Valuation Section 131
5.5.7 Sensitivity towards Payment Vehicles 140
5.5.8 Econometric Models of Willingness to Pay 144
5.6 Conclusion 152

Chapter 6: Exploring Public Preferences for Tropical Biodiversity: Can an Entreaty Help to Reduce Protest Zeros? 156
6.1 Introduction 157
6.2 Literature Review 157
6.3 Experimental Design 160
6.3.1 Classification of Protests 163
6.3.2 Research Hypotheses 164
6.4 Data 165
6.5 Results and Discussion 165
6.5.1 Zero Willingness to Pay Responses 166
6.5.2 Effect of Entreaty on Incidence of Protest Zeros 167
6.5.3 Effect of Entreaty on WTP Estimates 170
6.5.4 Effect of Re-classifying 'Valid' Protest Zeros 174
6.6 Conclusion 175

Chapter 7: Examining Public Preferences for Rainforest Conservation: Incorporating Substitutes in the Valuation of a Specific Rainforest 177
7.1 Policy Background 178
7.2 Research Objectives 178
7.3 Valuing a Specific Rainforest 181
7.4 Experimental Design 182
7.4.1 Research Hypotheses 183
7.4.2 Attributes 185
7.5 Data 186
7.6 Results and Discussion 188
7.6.1 Response Rates 188
7.6.2 Sample Socio-demographic Characteristics 188
7.6.3 Knowledge, Experience and Attitudes towards Rainforests 190
7.6.4 Perceptions of Rainforest Conservation Priorities 191
7.6.5 Valuation Results 195

7.7 **Conclusions** 212

Chapter 8: Investigating the Impact of the Opt-Out Format in Modelling Choices for Public Goods 216

8.1 Introduction 217

8.2 Literature Review 218

8.2.1 The Opt-out Option in Non-market Valuation 219

8.2.2 The Impact of Alternative Opt-out Formats 221

8.3 Research Hypotheses: 223

8.4 Experimental Design 226

8.5 Data 228

8.6 Results and Discussion 230

8.6.1 Perceptions of Task Complexity between Opt-out Treatments 230

8.6.2 Choice Certainty between Opt-out Treatments 231

8.6.3 Choice Shares and Individual Response Patterns 231

8.6.4 Invalid Responses: Protest Zeros and Invalid Positives 234

8.6.5 Econometric Results 235

8.6.6 Marginal Prices 242

8.6.7 Welfare Estimates 243

8.7 Conclusions 243

Chapter 9: Conclusions 246

9.1 Purpose of Thesis 247

9.2 Summary of Findings 247

9.2.1 Policy Findings 247

9.2.2 Methodological Findings 252

9.3 Implications of Findings 255

9.3.1 Policy Implications 255

9.3.2 Methodological Implications 257

9.4 Limitations and Recommendations for Future Research 258

9.4.1 Limitations of Thesis: 258

9.4.2 Future Research: 262

References 265

Appendix A.1: Focus Group Results (Case study 1) 290

Appendix A.2: Survey Instrument (Case study 1) 302

Appendix A.3: Survey Locations (Case study 1) **320**
Appendix A.4: Cognitive Interview Report (Case study 2) **321**
Appendix A.5: Survey Instrument (Case study 2) **333**
Appendix A.6: Survey Locations (Case study 2) **377**
Appendix A.7: Classification of Open-Ended Responses to term 'Biodiversity' **378**
Appendix A.8: Motivations for positive WTP (Case study 1) **379**
Appendix A.9: Classification of Open-Ended Reasons for Sensitivity to Payment Mechanisms **380**
Appendix A.10: Weighting of Sample in Chapter 5 ..... **381**

LIST OF TABLES

Chapter 2

Table 2.1: Implicit Prices for Global Biodiversity using Indirect Approaches 35
Table 2.2: Summary of Empirical Research on WTP for Global Biodiversity 37

Chapter 3

Table 3.1: CVM Elicitation Formats 63

Chapter 4

Table 4.1: Versions of Final Survey Instrument (Case Study 1) 86
Table 4.2: Questionnaire Structure 87
Table 4.3: Versions of Final Survey Instrument (Case Study 2) 98
Table 4.4: Questionnaire Structure 99
Table 4.5: Attributes and Levels 100

Chapter 5

Table 5.1. Survey Response Rates 121
Table 5.2. Socio-demographic Characteristics 121
Table 5.3: Summary of Environmental Attitudes and Behaviour 123
Table 5.4: Distribution of Responses to Biodiversity Statements 128
Table 5.5: Motivations for Zero Willingness to Pay 135
Table 5.6: Summary Statistics for Non-Parametric WTP 136
Table 5.7: Certainty for Positive Bids Only 138
Table 5.8: Non-Parametric WTP Censored for Certainty 139
Table 5.9: Definition of Interval Regression Variables 145
Table 5.10. MLE Interval Regression on WTP across Payment Vehicles 146
Table 5.11. MLE Interval Regression on *Weighted* WTP across Payment Vehicles 149
Table 5.12: Aggregate Estimates of Welfare Benefits to Adult Population of London 151

Chapter 6

Table 6.1. Socio-demographic Characteristics 166
Table 6.2: Reasons for Zero WTP 167
Table 6.3. Incidence of Protest Zeros With and Without Entreaty 168
Table 6.4: Definition Of Logit and Interval Regression Variables 168
Table 6.5: Results of Logit Regression on Probability of Protesting at 2nd Stage 169
Table 6.6. Non-Parametric Lower-Bound Mean and Median WTP 170

Table 6.7. MLE Interval Regressions on WTP 171
Table 6.8. Non-Parametric Lower-Bound Mean and Median WTP Positive Bids Only 172
Table 6.9. MLE Interval Regressions Results: (1) WTP Positives Only; (2) WTP Valids Recoded. 172
Table 6.10. Incidence of Valid Zeros With and Without Entreaty 173
Table 6.11. Incidence of Protest Zeros using Re-Classification of 'Valid' Zeros 174
Table 6.12. Non-Parametric Mean and Median WTP with Re-Classified 'Valid' Zeros 175

Chapter 7

Table 7.1: Attributes, Levels and Variables 185
Table 7.2: Sample and Population Socio-Demographic Characteristics 189
Table 7.3: Attitudinal Ranking of Programme Attributes 193
Table 7.4: Definition of Interaction Variables 197
Table 7.5: MLE Regression Results 198
Table 7.6: MLE Models for Pooled and Optimally Pooled Datasets 199
Table 7.7: MLE Regression Results on SUB Dataset without Interactions 202
Table 7.8: Marginal Prices for Attributes and Rainforest Labels 206
Table 7.9: Welfare Estimates for Iwokrama Rainforest Conservation Programmes 209
Table 7.10: Welfare Estimates For Various Rainforest Conservation Programmes 209

Chapter 8

Table 8.1: Attributes, Levels and Variables 227
Table 8.2. Socio-demographic Characteristics 230
Table 8.3: Choice Share by Opt-Out Format: 'Status Quo' Vs 'Choose Neither' 232
Table 8.4: Definition of Interaction Variables 236
Table 8.5: MLE Model Results for Conditional Logit and Nested Logit Specifications 237
Table 8.6: Marginal Prices using Nested Logit Specification 242

LIST OF FIGURES

Chapter 1

Figure 1.1: Thesis Structure 31

Chapter 3

Figure 3.1 Total Economic Value and Tropical Rainforests 55

Chapter 4

Figure 4.1: Valuation Scenario 89
Figure 4.2: Example of Donation Vehicle Payment Ladder Question 90
Figure 4.3: Valuation Scenario BASE Treatment 103
Figure 4.4: Example of 'Status Quo' and 'Choose Neither' Choice Cards in BASE treatment . 104
Figure 4.5: Valuation Scenario SUB Treatment 105
Figure 4.6: Example of Choice Card in SUB Treatment 106
Figure 4.7: Example of Certainty Scale 106

Chapter 5

Figure 5.1: Description of Funding Options 118
Figure 5.2 Responses to "What does the term 'biodiversity' mean to you, if anything?" 125
Figure 5.3: Associations with 'Biodiversity' 126
Figure 5.4: Number of related associations with term 'biodiversity' 127
Figure 5.5 Attitudes towards Cost-Sharing 131
Figure 5.6: Distribution of WTP Increased Tax 132
Figure 5.7: Distribution of WTP Higher Prices 132
Figure 5.8: Distribution of WTP Donations 133
Figure 5.9: Attitudes towards Payment Mechanisms 141
Figure 5.10: 'Most Preferred' Payment Mechanism 142
Figure 5.11: Reasons for Sensitivity towards Payment Mechanisms 143

Chapter 6

Figure 6.1: The Entreaty 163

Chapter 7

Figure 7.1: Example of 'Baseline' and 'Substitutes' Choice Cards 187
Figure 7.2: Attitudes towards Conservation Priorities and Policy Responses 192
Figure 7.3: BASE and SUB Pooled Log Likelihood Relative Scale 204

Chapter 8

Figure 8.1: Example of 'Status Quo' and 'Choose Neither' Choice Cards 229
Figure 8.2: Frequency of Choosing Opt-out amongst Respondents 233

LIST OF ACRONYMS

CBA	Cost Benefit Analysis/Appraisal
CBD	Convention on Biological Diversity
CE	Choice Experiment
CM	Choice Modelling
CVM	Contingent Valuation Method
DFN	Debt for Nature
GEF	Global Environment Facility
IIA	Independence of Irrelevant Alternatives
IICRCD	Iwokrama International Centre for Rainforest Conservation and Development
MLE	Maximum Likelihood Estimation
NGO	Non-Governmental Organisation
OLS	Ordinary Least Squares
SP	Stated Preference
WTA	Willingness to Accept
WTP	Willingness to Pay

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Chapter 1: Introduction

1.1 POLICY BACKGROUND

Despite widespread acknowledgement of the importance of biodiversity, and the establishment in 1992 of the UN Convention on Biological Diversity (CBD), global biodiversity continues to decline at an unprecedented rate (CBD 2006b;Chapin et al. 2000;GEF 1998;Koziell 2001;Millennium Ecosystem Assessment 2005;Perrings & Gadgil 2002). Currently, extinction rates are estimated to be between 100-200 times higher than background rates and are overtaking the natural rate of regeneration (CBD 2001a; OECD 2002).

The latest data available on the current status of global biodiversity suggest the situation is critical. Approximately 23% of the world's mammal species and 12% of the bird species are assessed as globally threatened (IUCN 2004a). Since 1990, over half of all tropical and sub-tropical grasslands, savannahs and shrublands, and, around 30% of desert ecosystems have been lost (Millennium Ecosystem Assessment 2005). Despite being one of the most productive ecosystems on Earth, around 10% of the world's reefs have been destroyed with a further 30% expected to be lost in the next 20 years (Pomerance 1999). In the last two decades, over 35% of the worlds mangroves have been destroyed (CBD 2006b). Tropical rainforests, which are thought to contain as much as half the world's species, are reported to have been lost at a rate of approximately 12.3 million hectares per annum between 1990 and 2000 (FAO 2000). In addition, many habitats and ecosystems have become severely fragmented, affecting their ability to provide important ecosystem goods and services, and crucially, their role in maintaining biodiversity (CBD 2006b).

Given that the loss of biodiversity is in many cases irreversible, this situation poses a serious threat to sustainable development and to human wellbeing in general (Loreau et al. 2006;Millennium Ecosystem Assessment 2005). Correspondingly, in 2002 at the World Summit on Sustainable Development (WSSD), 190 countries made a further commitment to achieve a significant reduction in the rate of biodiversity loss by 2010.

The reasons for global biodiversity loss are complex. The main proximate causes have been identified as habitat loss and fragmentation, over-harvesting, pollution, climate change, and the introduction of alien species. These are underlain by a number of causal factors such as population growth, poorly defined property rights (a common factor in environmental degradation), increasing over-consumption patterns, and a combination of economic, institutional and policy failures (see OECD 2003; Pearce & Moran 1994). Of these, one of the

key drivers is arguably the inability of existing markets (and the problem of missing markets) to fully capture the economic values derived from biodiversity. This typically occurs as a result of the public good characteristics displayed by many of its goods and services. Since many of the benefits (and costs) are non-market and thus not easily appropriable, private (local or national) land use decisions typically fail to take into account the full range of values provided by biodiversity. Correspondingly, it is frequently the case that biodiversity is undersupplied – that is, a socially optimal level of biodiversity is not provided.

The failure of economic systems to signal the true contribution to human wellbeing from the goods and services provided by biodiversity can occur at a variety of scales. Pearce and Moran (1994) distinguish between local and global failures. This thesis is particularly concerned with the latter. Indeed, the situation is particularly pertinent at the global scale since few markets exist to capture the values attached to the provision of tropical biodiversity by those in distant countries[1]. These benefits comprise mainly indirect use, option and non-use values, for example, contributions to climate regulation, the protection of genetic information and existence and bequest values. Although very few studies have been undertaken to estimate the size of these benefits, the expectation is that they may be significant in size. Consequently, demonstrating and capturing these globally held values could significantly contribute to the conservation of global biodiversity. This is the focus of the current research.

This is considered particularly important given that most of the world's remaining biodiversity occurs in the tropics in some of the economically poorest parts of the world[2]. As a result, there is an inequitable distribution in the costs and benefits of meeting global biodiversity objectives, with the onus falling largely on the countries which least can afford the costs. To developing countries like Guyana, which still have vast areas of intact natural rainforest and high levels of biodiversity, the economic pressure for conversion or logging to meet short term needs is great and the direct and indirect costs associated with conservation can be high. In such contexts, local land-users often receive only a small fraction of the benefits of biodiversity protection whilst experiencing the greatest share of the costs (Balmford & Whitten 2003;Wells 1992). In contrast, the global benefits, which as noted may be substantial, are typically experienced free of charge. For example, Norton-Griffiths and Southey (1995) show how the net effect of conservation in developing countries can lead to considerable domestic opportunity costs while the greatest benefits may be experienced externally.

This inequitable distribution in the local costs and global benefits of global biodiversity conservation has led to broad recognition that developed countries should help developing

[1] This problem has been termed *global appropriation failure* (Pearce 1995; 1996; 1999;Pearce & Moran 1994).

[2] Pimm and Raven (2000) report that approximately two-thirds of all species occur in the Tropics.

countries to meet the costs of achieving global biodiversity objectives. This is formalised under Article 20 of the CBD (and in the recommendations of WSSD), which acknowledges the responsibility of developed countries to provide *new and additional* financial and technical resources to developing countries to achieve global biodiversity objectives.

Despite such commitments it is widely acknowledged that global conservation efforts are seriously under-funded (Balmford & Whitten 2003;Bruner, Gullison, & Balmford 2004;CBD 2001a; 2003a; 2005;James, Gaston, & Balmford 2000; 2001; 1999). This is arguably a further manifestation of the undervaluing of biodiversity (CBD 2005). While few estimates of the financial costs of conserving global biodiversity are available, those that do exist suggest that current funding is well below that required for effective conservation. For example James, Gaston & Balmford (2001) estimate that a comprehensive global biodiversity conservation programme would cost approximately US $317 billion per annum compared to current expenditures of just US$6 billion per annum (Balmford et al. 2002). A key first stage in bridging the gap between local costs and global benefits is to gain a better understanding of the size and nature of global values held for tropical biodiversity conservation.

There has been much discussion on how best to meet the shortfall in funding. For example, there is widespread recognition of the need to remove perverse subsidies which are currently estimated at $1trillion (Balmford & Whitten 2003;James, Gaston, & Balmford 2001; 1999), as well as the need for more complex innovative financing mechanisms[3]. However, in terms of who should pay the costs of tropical conservation there is a general acceptance that most of the increased support will need to come from global stakeholders. Indeed, numerous studies have called for greatly increased financial support from the developed countries to redress the inequitable imbalance in the costs and benefits (Balmford & Whitten 2003;Bruner, Hanks, & Hannah 2003). The basis for such recommendations reflects increased awareness of the global benefits provided by tropical biodiversity and recognition that the geographical location of biodiversity does not match that of the financial resources (CBD 2006a).

Consequently, the achievement of the CBD's 2010 target of a significant reduction in the rate of biodiversity loss is expected to require substantial increases in the size of financial (and technical) transfers between developed and developing countries (CBD 2006a). This means developed countries will need to find ways to mobilize considerable additional funding to support implementation of the programme of work. While it is advocated that the full range of existing and emerging financial mechanisms (including markets) should be utilized to meet the need for adequate financial resources (and incentives), it is likely that a large proportion will

[3] For a full discussion of the array of potential instruments see Bayon, Lovink & Veening (2000); McNeely (1996); and Richards (1999).

continue to come from public funds. This situation raises key questions about how developed countries can generate additional funds for conservation and more generally, how the public prefer to contribute.

Alongside this, considerable efforts are being made to identify conservation priorities that will maximise the amount of biodiversity conserved. This reflects the fact that finite resources are available to support conservation and that it is clear that not everything can be saved. Thus choices have to be made regarding where conservation efforts should be focused (Ginsberg 1999). Setting priorities for the conservation and sustainable use of biodiversity is regarded as essential given the unprecedented rates of loss, the high levels of threat many resources are under and the limited funds available to deal with these problems (OECD 2003). However, there is limited consensus on how to set priorities.

Indeed, a number of strategies have emerged, which has led to criticism of duplicated effort and a general lack of clarity (Mace et al. 2000). Some of the most influential approaches are those developed by biologists and adopted by international NGOs. These emphasise the need for large-scale conservation approaches which aim to prevent as many species extinctions as possible through the identification of areas which possess high species richness and high numbers of rare and endemic species. Two of the most well-known approaches are Biodiversity Hotspots (Myers 1988) and Tropical Wilderness Areas (Mittermeier et al. 1998). The main distinction between the two approaches is their interpretation of the relevance of threat and vulnerability, the former exhibiting high levels of threat and vulnerability and the latter low levels[4]. Although arguably both wilderness areas and hotspots are required, this dichotomy illustrates the general lack of consensus which exists between priority-setting approaches.

The setting of priorities is complicated, and it is not necessarily the case that resources should be targeted first and foremost to the scarcest or most threatened biodiversity since the very demise of this biodiversity may indicate they are not amenable to policy intervention, meaning additional investment could result in wasteful allocation of limited resources (see Moran, Pearce, & Wendelaar 1997;OECD 2003). There are indeed a variety of attributes on which to base priorities, and whilst many of the established priority-setting strategies reflect mainly biological indicators, recent work has attempted to align the biological factors with more practical considerations such as cost effectiveness, and other social and political factors (see Moran, Pearce, & Wendelaar 1997;O'Connor, Marvier, & Kareiva 2003;Veech 2003). This

[4] Other approaches include IUCN Red List which specifically focuses on threatened species (IUCN 2004a); Megadiversity countries, which highlight the value of the top 17 countries for species diversity and endemism as a strategy for securing funding (Mittermeier, Robles, & Mittermeier 1997); and, WWF's Global 200 which aims to ensure that the full range of ecosystems is represented within regional conservation and development strategies, so that conservation efforts around the world contribute to a global conservation strategy, (Olson & Dinerstein 1998).

reflects a shift amongst donor bodies towards more social and economic objectives and the mainstreaming of biodiversity issues amongst poverty reduction goals (Lapham & Livermore 2003). Even so, given the lack consensus (and the dominance of expert opinion), concerns have been expressed over the transparency (and replicability) of approaches (Brooks et al. 2006).

1.2 PROBLEM STATEMENT

Despite clear scientific evidence that all aspects of biodiversity are in steep decline, biodiversity continues to be undervalued and 'given inadequate weight in both private and public decisions' (Loreau et al 2006 p. 245).

Furthermore, despite heightened awareness of the need to find additional resources for biodiversity funding, and the recognition that global values[5] may be significant, surprisingly little is known about the size and nature of these values nor how best to capture them.

Pearce (1996) characterises the problem as one of 'demonstration and capture', the first challenge being to develop an appreciation of the size of these globally held values and the second to develop capture mechanisms that can appropriate these values and turn them into real resource flows. The only way to estimate directly these non-use values is by asking the public to express their preferences.

Alongside this, there is the difficulty of deciding where conservation efforts should be focused given that not everything can be saved. Currently, there is no 'common blueprint' for conservation action, and consensus (and in some cases transparency) is lacking between priority approaches (Brooks et al. 2006; Mace et al. 2000). Moreover, these approaches are typically dominated by expert opinion; little appears to be known about what the general public prioritise, nor whether this is reflected in current approaches.

Correspondingly, this thesis focuses on four key areas: (1) demonstrating global non-use values for tropical biodiversity; (2) investigating public preferences towards capture mechanisms; (3) assessing public preferences towards priority setting and policy responses; and (4) overcoming some of the methodological challenges in measuring public preferences for tropical biodiversity amongst distant beneficiaries.

[5] For ease of reference in the remainder of the thesis these values are termed under the broad heading of global *non-use* values, although it is noted that they may also include indirect use and option values.

1.2.1 Demonstration of Global Non-Use Values

Numerous studies have highlighted the importance of establishing better estimates of the global non-use values attached to rainforests and biodiversity, in particular the values experienced by developed countries (Carson 1998;Dixon & Pagiola 2001;Rolfe, Bennett, & Louviere 2000).

Despite a vast amount of literature exploring non-use values for biodiversity, the majority have focused on local or domestic benefits and very few studies have been undertaken to investigate the values held amongst distant populations for tropical biodiversity. Although broad generalizations of the size of global non-use values have been developed by examining existing international transfers and estimating implied willingness-to-pay (WTP) from debt-for-nature swaps, such approaches have been criticized for providing underestimates (Freeman 1993). The only way of directly measuring public preferences for tropical biodiversity amongst distant beneficiaries is through the application of stated preference (SP) techniques.

In over 40 years of work in the field of environmental valuation only seven[6] stated preference studies have been undertaken to directly estimate the benefits accruing to distant populations from conserving tropical biodiversity (see Epp & Gripp 1993;Hanley, Spash, & Walker 1995;Horton et al. 2001; 2003;Kramer & Mercer 1997;Manoka 2001;Menzel 2003;Rolfe, Bennett, & Louviere 2000)[7]. Of these five have focused on the valuation of preferences for tropical rainforests mainly in a non-specific 'rainforests worldwide' context and have largely been undertaken in the US. Much less is known about how people in other developed countries, such as the UK, value tropical biodiversity. Furthermore, it is notable that no studies have estimated the benefits attached to recent proposals for expanding the tropical protected area network across a *range of habitats and ecosystems*. In addition, few estimates are available of the values held for specific rainforest conservation programmes yet such values would be useful for cost benefit appraisal (CBA) and to assess the adequacy of payments.

This research aims to address these gaps in knowledge by undertaking further research into global non-use values for tropical biodiversity from the perspective of UK residents. In particular, the research uncovers values for the expansion of the tropical protected area network and values in the context of a specific rainforest. Such estimates can be expected to be useful in: (1) demonstrating the importance of tropical biodiversity; (2) guidance for the size of international transfers; (3) informing CBA of land use decisions; and (4) helping to stimulate markets for capturing international WTP.

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[6] This refers to the number of studies that have directly explored WTP for tropical biodiversity; it excludes studies which have focused on WTP for specific species only.

[7] An additional study by Svedsater (2000) examines WTP for groups of global environmental goods, including rainforests.

1.2.2 Capturing Global Non-Use Values

In addition to understanding more about the size and nature of non-use values, there is a pressing need to identify ways of capturing these values so that they can be turned into real resource flows. Indeed, according to Dixon and Pagiola (2001),

> *'Simply measuring the benefits provided by biodiversity – no matter how accurately we may be able to do so – will not be sufficient to ensure its preservation. ... new ways are required to help increase the amounts that individuals or countries are willing to pay for protection of various national or global (or non-local) benefits'* (p. 50).

Traditionally these values have been expressed through public donor funding or philanthropic donations to international environmental NGOs. This has most often involved transfers of public money from developed countries to recipients in biodiversity rich countries of the south through donor funding, bilateral, and multilateral assistance and GEF grants. Recent attention has also been directed towards a number of market mechanisms which potentially offer a more efficient approach to the provision of global biodiversity. However, there are limits to the extent to which market approaches will be able to capture the public good characteristics of biodiversity; not least due to the difficulty of finding mechanisms which can capture such intractable values particularly at the global scale[8]. Thus, whilst competitive markets potentially offer the most efficient allocation mechanism, many of the individual components of biodiversity will not be captured in markets and in the short to medium-term future donor funding is likely to remain a key source of finance (Mountford & Keppler 1999).

In view of the urgent need to take action against biodiversity loss and the scale of the funding crisis, this is expected to require significant increases in public funding from the developed to the developing countries. This raises fundamental questions about how the public would most prefer the costs to be shared and how they would most prefer to contribute to tropical biodiversity conservation. Correspondingly, this research explores public preferences for how we can best capture the non-use values attached to biodiversity conservation amongst distant residents. In doing so it addresses a crucial policy issue which has been completely overlooked in the valuation literature to date despite numerous calls for the need to find ways of capturing these values. The main objective is to identify where future fund raising efforts would best be directed by exploring public preferences amongst UK residents for different capture

[8] To date there have been few successes in the over hyped bio-prospecting sector, while progress in the market for carbon storage has been slowed by policy debate. Certification schemes linked to sustainable and organic agriculture have begun to take off, however such schemes often attract only a small share of the total market and are typically restricted to supporting conservation within the sustainable use landscape (Hardner & Rice 2002). Payments for environmental services have had some success in Costa Rica however elsewhere markets have yet to fully mature, in many cases the crucial ingredients of strong institutional support, and clearly defined property rights are not always present (Pagiola, Bishop, & Landell-Mills 2002). Moreover, it has been suggested that opportunities for private sector investment in biodiversity may be smaller than originally expected (Pagiola, Bishop, & Landell-Mills 2002).

mechanisms for example charitable donations, increased taxes or through higher prices linked to the redirection of perverse subsidies.

1.2.3 Public Preferences, Priority-Setting and Policy Responses

Whilst it can be argued that there is no one correct way of setting priorities or prescribing responses, there is a strong case for considering public preferences in goal-setting since much of the money being directed towards conservation comes from public funds. Indeed since the allocation of funds to one area means another will be deprived and crucially, since the loss of biodiversity in many instances may be irreversible, it is important that priorities should reflect public preferences. Moreover, indecision amongst policymakers over how to identify and interpret key priority setting factors could benefit from public input.

A number of questions can be raised: How do the public prioritise conservation targets? Furthermore how do the public weight biological objectives against other priority setting factors such as social and economic objectives? And, the over-arching question – do current priority setting approaches reflect the concerns of the wider public?

This research seeks to address some of these issues through an in-depth exploration of public preferences for tropical conservation, examining the importance of the underlying attributes of rainforest conservation including biological, and socio-economic indicators, and by investigating how the public prioritise between different rainforest investment opportunities.

1.2.4 Methodological Challenges in Exploring Public Preferences

As noted, there has been very little empirical research investigating public preferences amongst distant beneficiaries towards tropical biodiversity. Correspondingly, very little work has been undertaken to tackle the methodological challenges associated with this type of valuation work. Yet, the valuation of preferences for tropical biodiversity amongst distant beneficiaries presents a much more difficult challenge than the elicitation of values for local and familiar goods. A key interest of this thesis is how to overcome some of the methodological issues that are expected to arise.

Thus, in order to arrive at the estimates described above a key element of the research will be to consider ways of minimising the potential problems that may arise. For example, sensitivity to payment mechanisms, protest responses, the incorporation of substitutes, framing effects, and exploring the effect of the opt-out format. While these issues are particularly relevant to the

current context, the lessons learned from this research may also be applied in the wider field of environmental valuation.

1.3 RESEARCH DESIGN

The research comprises two case-studies which have the shared objective of providing new information on the size of non-use values attached to tropical biodiversity and on public attitudes towards tropical conservation, and to provide novel methodological contributions to the application of stated preference techniques.

Case study 1 focuses on a broad-scale marginal change in the provision of tropical biodiversity by examining WTP for the expansion of the tropical protected area network. In contrast, case study 2 investigates preferences for marginal changes in the provision of a specific rainforest conservation programme (further details on the case studies are provided in chapter 4.). Both case studies use stated preference techniques to investigate public preferences for tropical biodiversity.

It is acknowledged that the use of stated preference techniques in economic valuation, in particular in the context of valuing distant benefits of biodiversity conservation, is not without criticism. Correspondingly, a number of potential objections could be raised towards with the current research approach:

One issue concerns the efficacy of basing public policy on uninformed public preferences instead of expert opinion. It is argued that information on public preferences should be used to inform decisions so that politically inclusive choices can be made (Christie et al. 2006). Indeed, public consultation and participatory approaches are frequently recommended as central elements in identifying conservation priorities and in the development of environmental policy (Fischer and Young, 2007). Moreover, expert opinions do not necessarily help with decision-making in the context of scarce resources since they give rise to non-monetary indicators which are difficult to incorporate into CBA (Nunes and van der Bergh 2001) and they may be subjective and lack transparency. The downside of relying solely on public views is that they may be ill-informed, for example, high values may be placed on spectacular or charismatic species at the cost of less-charismatic ones which are functionally more important for sustainability (Vatn and Bromley, 1994). Some argue that the general public cannot be expected to judge accurately complex and unfamiliar goods such as tropical biodiversity and come up with sensible decisions (Sagoff, 1988). An intermediate solution suggested by the NOAA Panel is to ensure the general public are informed by experts prior to decisions – this is in essence the approach of the current research: the information contained within the surveys and the valuation

scenarios were designed on the basis of expert input, and, it is recommended that the results are used in conjunction with expert opinion (Arrow et al 1993). However, it is acknowledged that questions may be raised regarding how the level of information and knowledge of tropical biodiversity may affect responses. This raises a number of issues.

Firstly, is it reasonable to assume that respondents have preferences for previously unknown or complex goods? A concern here is whether preferences are 'constructed' as part of the valuation process (rather than merely 'informed'). This would make them susceptible to context and elicitation effects such that the responses do not reveal 'true' preferences[9] (Spash and Hanley, 1995). Some consider that the SP technique will not work for such goods (see Nunes and van der Bergh, 2001). Bishop and Welsh (1992) argue that because a respondent has not previously had information about a resource it does not mean they do not hold preferences, it may simply be the case that there was no previous incentive to acquire information on it - this type of behaviour is evident in the market place too. Thus it is theoretically plausible that people may be concerned about the conservation of previously unfamiliar resources, like Iwokrama Rainforest, and attach value to such goods[10]. The related difficulty then is how much information should be provided to respondents? As Spash and Hanley (1995) point out uninformed preferences are likely to lead to underestimates for public policy. Yet, Hanley et al. (1995) find that WTP for international biodiversity increases significantly as the level of information provided to respondents increases. The NOAA panel recommend that respondents are given as much information as they can be reasonably expected to assimilate and that comprehension is tested (Arrow et al, 1993) - this approach is adopted in the current research; however, it remains the case that there may be both a degree of preference construction, and other information effects which are beyond the scope of this investigation.

More general criticisms of the use of SP techniques include amongst others Sagoff (1988) who argues that such studies elicit the wrong preferences since they focus solely on the wants of the individual rather than 'citizen'. While Vatn and Bromley (1994) raise concerns that hypothetical values may simply not capture all the information relevant to the particular environmental choice; they conclude that such pricing is insufficient to ensure informed and collective choices over environmental goods and services. Another concern is the occurrence of 'lexicographic preferences' where individuals may simply refuse to make trade-offs (see Spash, 2000). This may be particular pertinent in the current context, for example, it can be imagined that some people may perceive there to be a moral duty to protect the rainforests. Hanley et al (1995) argue that such responses are typically in the minority, thus the use of valuation in principle still be justified (*ibid.*). On a more practical note, it may be possible to isolate such responses

[9] This may be masked by 'coherent arbitrariness' (see Ariely et al. 2003).
[10] Bishop and Welsh (1992) conclude that 'it is theoretically possible that existence values could "exist" for obscure and previously unknown resources as well as unique natural assets" (p414).

through the use of follow-up questions – this is attempted in the current research .Other more practical concerns include the occurrence of various biases such as hypothetical bias, insensitivity to scope and protests (see Freeman, 1993; Mitchell and Carson, 1989) – elements of which the current research seeks to address.

The penultimate point concerns the overall approach of focusing on the estimation of non-use values. In the policy and valuation literature, increasing attention is being placed on the valuation of the more functional aspects of ecosystem goods and services, such as, carbon sequestration and hydrological services which can be predicted by natural science. The latter may be more appealing conceptually to policymakers since these services are more tangible (and thus seem easier to capture); are based on 'real science' and because there is greater scope for the use of revealed preference valuation methods which are often considered less controversial. However, it should be noted that the measurement and prediction of ecosystem services in biophysical terms can involve considerable uncertainty and is data intensive. Revealed methods too have advantages and disadvantages[11], and individual studies should be assessed for validity and reliability. Thus, while certainly appealing it is not necessarily the case that ecosystem service approaches automatically provide a more legitimate evidence base for conservation decisions. Perhaps the key point is that the two approaches are not mutually exclusive. Efforts should be made to demonstrate (and capture) the value of all key goods and services provided by the conservation of tropical biodiversity, including functional ecosystem services and non-use values. It is the view of this thesis, that the role of a stated preference evidence base for non-use values in future conservation decisions will increase as the number and scope of high quality empirical studies increases, and with the emergence of new capture mechanisms.

Thus, the application of stated preference techniques to value distant and complex environmental goods, such as tropical biodiversity, is not a foolproof exercise, neither is it the only way to inform policy decisions. However, the premise of this thesis is that uncovering information about public preferences can be useful in making decisions about the efficient allocation of public resources and may act as a catalyst for finding ways to capture such values. Moreover, such information may be used in conjunction with expert opinion to help design policy to secure maximum benefits for society and for nature. This thesis focuses solely on the preferences of individuals in 'donor' countries however it is notwithstanding that attention should also be given to assessing the preferences of individuals in 'recipient' or host countries, as well as the political values (Spash and Hanley 1995). This is beyond the scope of the current research. However it is acknowledged that such research is fundamentally important since

[11] Moreover, stated preference methods may also be used in valuing the final benefits of ecosystem services, for example, the contingent valuation method has been widely used to value the provision of drinking water (see Whittington, 2002)

livelihoods, locally and nationally, may be critically affected by such resource allocation decisions.

1.4 AIMS AND OBJECTIVES

The aims and objectives of this thesis are set out below.

The overall aim of this research is to learn more about the size and nature of the values attached to tropical biodiversity by distant populations, about how best to capture these values and to identify priorities for future policy responses, based on an exploration of public preferences in the UK using stated preference techniques. In doing so the research aims to develop the application of stated preferences techniques in the valuation of public goods through methodological contributions to the contingent valuation method and choice modelling approach.

The specific research objectives of this thesis are discussed below in case study order.

1.4.1 Expanding the Tropical Protected Area Network and Capture Mechanisms (Case Study 1)

This case study estimates the willingness-to-pay (WTP) of London[12] residents for an expansion the protected area across the developing countries and, crucially, explores how these values might best be captured by exploring WTP under different payment mechanisms, using the contingent valuation method. The expansion of the tropical protected area network is regarded as a crucial instrument in the achievement of the CBD's 2010 target.

Policy Objectives:

The main policy objectives are:

(1) to investigate public attitudes, knowledge and awareness of biodiversity and tropical biodiversity,

(2) to examine public attitudes towards funding tropical conservation and preferred ways of cost-sharing;

(3) to estimate willingness to pay for expanding protected area network across developing countries under three different payment mechanisms;

(4) to assess the adequacy of existing UK transfers in view of the approximate aggregate benefits.

[12] The target population would ideally be residents of the UK however due to budget constraints the sample had to be limited to London residents.

Methodological Objectives:

The key methodological objectives of case study 1 are:

(5) to investigate the effect of different payment mechanisms on: (i) the incidence of protest zeros; (ii) willingness-to-pay; and, (iii) certainty; in the context of paying for tropical biodiversity;

(6) to explore in-depth the reasons behind respondent sensitivity towards different payment mechanisms; and

(7) to test the effectiveness of an entreaty in reducing protest zeros, in particular to examine the effect on: (i) incidence of protest zeros (and in a multivariate context on the likelihood of protesting); and (ii) willingness-to-pay.

1.4.2 Iwokrama Rainforest and Conservation Priorities (Case Study 2)

This case study estimates the willingness-to-pay of London residents towards a specific rainforest conservation programme, Iwokrama Rainforest in Guyana, South America, using the choice experiment technique. Iwokrama Rainforest is a pertinent case study as it was dedicated by the Government of Guyana as a gift to the international community for finding sustainable solutions to the conservation of tropical rainforests. To counteract the potential for upward bias in estimating values for a specific rainforest, this study uses a novel methodological approach with a split sample design to incorporate the effects of substitutes.

Policy Objectives

Specifically, the key policy objectives are:

(1) to estimate the value attached to conserving Iwokrama rainforest from the perspective of UK residents;

(2) to investigate which aspects of the rainforest conservation programme the public prioritise;

(3) to explore how benefits could be maximised by examining preferences towards different management responses;

(4) to examine how the public prioritise between rainforests in different conditions and to consider its policy implications; and

(5) to review the adequacy of existing financial transfers from UK to Iwokrama rainforest.

Methodological Objectives

The key methodological objectives are:

(6) to test the effect of framing rainforest conservation choices in the context of information about baseline conditions and information about substitutes, on: (i) taste parameters; (ii) marginal prices and (iii) welfare estimates;

(7) to derive more meaningful absolute estimates of WTP using a novel methodological approach which explicitly incorporates information about substitute goods and the baseline conditions; and

(8) to investigate the impact of the format of the opt-out option in modelling choice for public goods, in particular on: (i) perceptions of choice task complexity; (ii) choice certainty; (iii) choice shares and response patterns; (iv) invalid responses; (v) factors affecting opt-out selection; and (vi) attribute salience, marginal prices and welfare estimates.

1.5 NOVEL CONTRIBUTIONS

This research makes a number of novel contributions to the existing literature on valuing public preference towards tropical biodiversity and, more generally, on the application of stated preference techniques. These are divided into methodological and policy contributions:

1.5.1 Methodological Contributions:

(1) To the best of the author's knowledge, this is the *first study* to test the effectiveness of an entreaty in reducing protest zero responses in a contingent valuation study. Previous applications of entreaties in the CVM literature have focused solely on the different problem of hypothetical bias. In view of the numerous problems associated with protest zero responses, this research makes an important and extremely useful contribution to the stated preference literature.

(2) To the best of the authors knowledge, this is the *first study* to use a within-subject design, as recommended by Jakobsson and Dragun (1996), to examine respondent sensitivity towards different payment mechanisms in the context of estimating WTP for tropical biodiversity, and is *one of only four studies* overall have used the within-subject approach to test for respondent sensitivity to payment mechanisms. The use of a within-subject design has the particular advantage of allowing for an in-depth exploration of the factors affecting sensitivity. This issue is important as sensitivity to payment mechanisms has been found elsewhere to have a significant impact on welfare estimates.

(3) This research uses a *novel methodological approach* which explicitly incorporates information about substitutes to derive absolute estimates of WTP for a specific rainforest. This is particularly important in valuing specific goods since one of the key criticisms of such studies is the potential for upward bias due to the failure to consider competing goods. The only other study to use a choice experiment approach to incorporate substitutes failed to derive absolute welfare estimates due to the absence of baseline information. This

problem is overcome in the current research through the use of a novel split-sample approach. Consequently, this is the *first study* to produce absolute estimates of WTP for a specific tropical rainforest using the choice experiment technique. And, crucially, it is the *first stated preference study* to take into consideration substitutes in deriving absolute estimates of WTP amongst distant beneficiaries for a specific biodiversity conservation programme.

(4) To the best of the authors' knowledge, this is the *first study* to investigate the effect of alternative opt-out formats ('do nothing' options) in modelling choices for pure public goods. This is an important issue since in the context of recreation and private goods, (where different formats apply) varying the opt-out format has been found to significantly influence choice behaviour. Correspondingly, this research investigates the effect of presenting the opt-out as either: (i) a fixed 'status quo' alternative; or (ii) as a fixed 'choose neither' alternative with a statement in the pre-text; both formats are used in the valuation literature.

(5) In relation to the investigation of the effect of varying the opt-out format – this is the *first study* to investigate how opt-out format affects choice certainty.

1.5.2 Policy Contributions:

(6) This is the *first study* to examine public preferences amongst distant beneficiaries for expanding the tropical protected area network, thereby measuring the value attached to the provision of a *range* of tropical habitats and ecosystems (including wetlands, savannahs, islands, mountains and rainforests)[13]. This is an important policy area since the expansion (and upgrade) of the existing protected area network is regarded as key instrument in the achievement of the CBD's 2010 goal of a significant reduction of biodiversity loss, and, will be dependent on greatly increased financial support from developed countries. Correspondingly, assessment of the size of the non-use values attached to this policy change holds great policy relevance. To the best of the authors knowledge *no previous study* has been conducted which explicitly considers this issue using the latest data available on how to prioritise the expansion of the protect area network.

(7) This is the *first study* to investigate public preferences for *different ways of funding* tropical conservation. This is a crucial issue because very little is known about how best to capture global non-use values for biodiversity. Moreover, much of the additional funds needed to

[13] Previous studies have valued rainforests or endangered species only.

meet global objectives are expected to come from the developed countries, meaning governments, NGOs and other institutions urgently need to find ways of increasing funding.

(8) This represents the *first study* to apply the choice modelling approach to explore *UK preferences* for rainforest conservation and is *one of the first* to explore UK preferences for rainforest conservation per se. In fact, there has been *only five other studies* worldwide to investigate preferences for rainforests amongst distant populations and this research addresses a much overlooked and important policy issue. The application of the choice experiment technique allows for a more in-depth investigation of pubic preferences for the underlying components of rainforest conservation. Thus, this research uncovers new and important information on nature of public preference as well as the size of non-use values.

(9) This research undertakes a *novel* approach to the framing of rainforest conservation. Correspondingly, it provides *new and valuable* information on public preferences towards *rainforests in different conditions*, and, on *public priorities for conservation*. To the best of the author's knowledge no previous work has been conducted to investigate how the public prioritise these issues, yet, policy could benefit greatly from this kind of research, in particular since there is no agreed upon approach on how to prioritise biodiversity conservation efforts. Moreover, since biodiversity loss is in many cases irreversible and, much of the funding for biodiversity conservation comes from public funds, there is a strong case for considering public opinion.

(10) Lastly, this research provides *one of the first* opportunities to examine the adequacy of international funding for tropical conservation efforts. By collecting primary data on UK public preferences it is possible to compare directly perceived benefits and actual 'payments' for a specific conservation programme. This study has great policy relevance as it is expected to provide an indication of the international demand for preserving a specific rainforest, Iwokrama Rainforest, Guyana.

1.6 THESIS STRUCTURE

The structure of the thesis is presented in Figure 1.1. It comprises three main parts. Part 1 provides an introduction to the main research, including a review of the relevant literature, an overview of stated preference methods and an introduction to the case studies. Part 2 contains the core research chapters, comprising both policy and methodological analysis, presented in case study order. These chapters include detailed discussion of the policy problems and /or methodological challenges being addressed, the experiment design used, and the results and

conclusions. Part 3 presents the overall conclusions for the thesis. A description of the individual chapters is provided below:

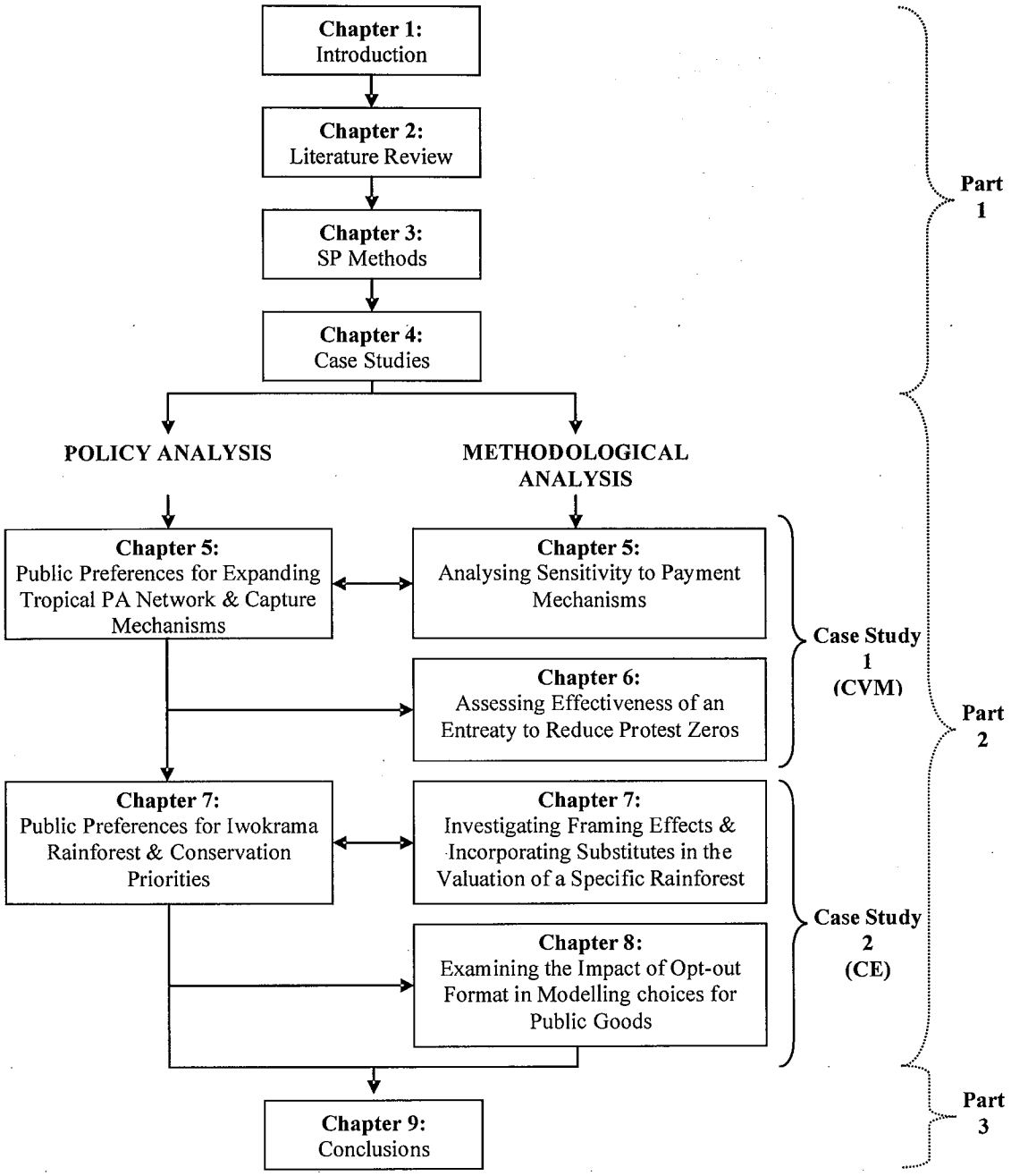
Chapter 2 sets the context for this thesis by providing a critical review of the literature on valuing public preferences for tropical biodiversity amongst distant beneficiaries. The chapter begins with a brief review of studies using indirect approaches to value these goods, and highlights some of the shortcomings of these approaches. The rest of the chapter focuses on reviewing the main policy and methodological findings from the related stated preference literature, and highlights key gaps in knowledge.

Chapter 3 describes the stated preference approach to economic valuation. The chapter begins with an overview of the concept of economic valuation. It then provides a detailed review of the contingent valuation method and choice experiment technique which are used later in the thesis, including: survey instrument design; data analysis; validity and reliability; and the main advantages and disadvantages of each technique.

Chapter 4 introduces the two case studies. Case study 1 applies the contingent valuation method to investigate the preferences of London residents towards expanding the protected area network across developing countries and towards alternative capture mechanisms. Case study 2 applies the choice experiment technique to investigate the preferences of London residents towards a specific rainforest conservation programme and toward conservation policy priorities. The chapter provides a detailed description of each case study including: a description of the policy context, the research design; the development of the survey instrument; a description of the final survey instrument; and sampling and data collection methods.

Chapter 5 undertakes the main policy analysis for case study 1 and addresses the methodological issue of respondent sensitivity to payment mechanisms. The literature review includes a thorough review of the work on estimating the financial costs of expanding the protected area network and the options for mobilizing additional international funding. The research reports on public attitudes, knowledge and awareness of tropical biodiversity and attitudes towards funding tropical conservation. It presents and discusses the resulting estimates of individual and aggregate willingness to pay for expanding the protected area network under various funding mechanisms; and undertakes an in-depth review of the reasons behind sensitivity to payment mechanisms.

Figure 1.1: Thesis Structure



Chapter 6 is the second chapter of case study 1; it addresses the important and problematic issue of protest responses in stated preference studies. The chapter describes a novel approach to dealing with the problem of protest zeros, through the use of an entreaty to "talk people out of their protest responses". The issue is particularly pertinent to the current context as Carson (1998) points out, some respondents may be distracted by real life provision issues, for example, corruption and enforcement difficulties in developing countries, which may hamper the estimation of true preferences for global public goods such as those described in this case

study. This is the first study to address this issue, and is the only stated preference study to use an entreaty to tackle protest zeros.

Chapter 7 is the first chapter in case study 2; it reports the results of a choice experiment study to estimate London residents' WTP towards conserving Iwokrama Rainforest, in Guyana, South America, and investigates how the public prioritise policy responses to rainforest conservation. It has a strong methodological component, using a novel approach with a split sample design, to incorporate information about substitutes as well as the specific baseline conditions, to establish absolute estimates of willingness to pay for a *specific* rainforest. Concurrently, it explores how framing may affect choices about rainforest provision, and provides new information about how the public prioritise rainforests in different conditions. It also investigates public attitudes, knowledge and awareness of tropical rainforests.

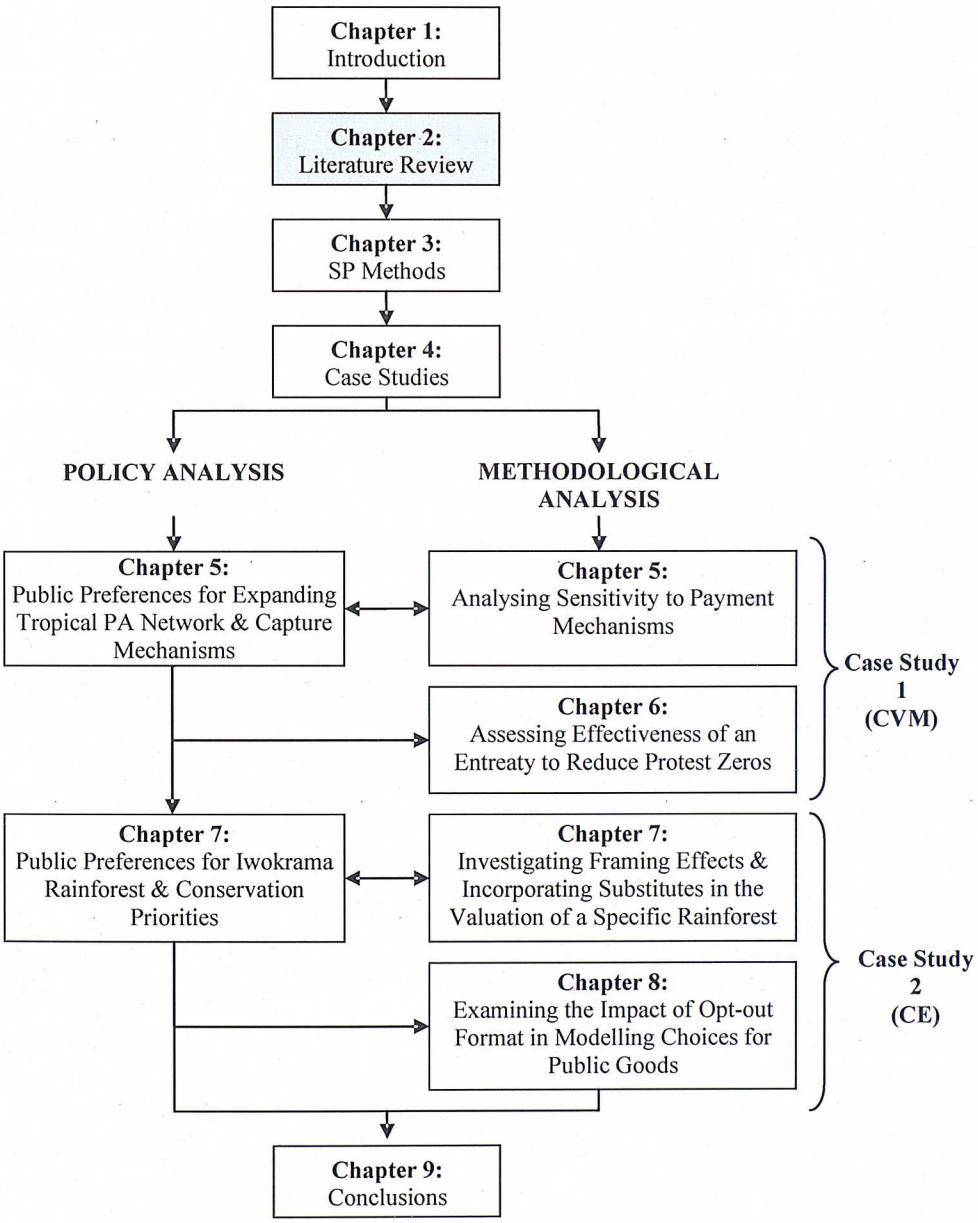
Chapter 8 is the second chapter of case study 2; it has a methodological objective, which is to investigate the effect of alternative ways of presenting the 'do nothing' (or opt-out) alternative in valuing preferences for public goods. This is an important issue since the form of the opt-out has been found to have a significant effect on respondents behaviour in the context of recreational user values and the consumption of private goods (Banzhaf, Johnson, & Mathews 2001;Kontoleon & Yabe 2003). Yet, no such work has been conducted to investigate the effect of alternate opt-out formats in the context of valuing public goods where other opt-outs are relevant.

Chapter 9 presents the main conclusions of the thesis and reviews the implications both for policy and methodology. The chapter concludes with a discussion of the main strengths and weaknesses of the thesis and recommendations for future research.

Chapter 2: Literature Review

SUMMARY

This chapter provides a critical review of the main findings to date from the stated preference literature on valuing public preferences for tropical biodiversity amongst distant beneficiaries. This chapter provides a key reference point for the remainder of the research.



2.1 INTRODUCTION

This chapter reviews the empirical work on public preferences for the conservation of tropical rainforests and global biodiversity from the perspective of distant beneficiaries (additional policy and methodological literature is reviewed in the individual chapters in Part 2 and Part 3). The objectives are: (1) to consider the coverage provided by the existing empirical research; (2) to discuss the main findings with particular attention to validity and reliability; and (3) to identify the key gaps in existing knowledge. The chapter is organised as follows: the first section provides a brief review of studies using *indirect* approaches to value global non-use values. The next section reviews in detail the empirical research using stated preference techniques and the extent of knowledge on preferences towards conservation policy, priorities and funding mechanisms. The chapter concludes with a summary of the main gaps in knowledge and explains how the proposed research builds on the existing work to address these issues.

2.2 INDIRECT APPROACHES

A number of studies have used *indirect* methods to estimate the size of global non-use values for tropical biodiversity (see, for example, Adger et al. 2002; 1995;Pearce 1995; 2007;Pearce & Moran 1994;Ruitenbeek 1992;Yaron 2002)[14]. These have typically involved deriving implicit prices for global biodiversity based on the size of existing flows through various international transactions, for example, debt-for-nature (DFN) swaps, donations by international NGOs, or funding from major donor institutions, such as the GEF. Such approaches assume that the contributions made reflect some kind of willingness-to-pay (WTP). In the case of debt-for-nature swaps, this WTP is the amount paid by the conservation body to purchase 'the secondary debt on the secondary debt market' in return for domestic investment in conservation (Pearce & Moran 1994). For example, Adger *et al* (2002; 1995) base existence values for Mexican forests on a combination of such transactions, reporting estimates of £0.02 - £8.47/ha (£2005).

An overview of the main findings from key studies using these approaches is provided in Table 2.1. In general, estimates are highly variable both within and between studies. For example, the upper bound of the per hectare estimate provided by Yaron (2002) is over double that reported by Adger *et al* (2002; 1995) and almost six times that reported by Pearce (1996).

[14] It should be noted that, unlike many of these studies, this thesis is concerned with gaining a full understanding of public preferences towards various aspects of tropical biodiversity based on one population, rather than on determining the non-use value placed on global biodiversity by the *global* population.

Table 2.1: Implicit Prices for Global Biodiversity using Indirect Approaches

	AUTHOR	GOOD	APPROACH	ESTIMATE (£2005)
Global	Ruitenbeek (1992)	Implied WTP through debt-for-nature (DFN) swaps	Based on implicit values derived from six DFN swaps or equivalent (excl. outlier Monteverde, Costa Rica)	· £0.15-£9.35 per ha
	Pearce & Moran (1994); Pearce (1996)	Implied world WTP for limited forest area covered by debt-for-nature swaps	Implicit Prices based on range of DFN swaps	· £0.01-£3.40 per ha · Aggregate: £0.9 billion per yr
		Implied WTP Forests based on GEF	Based on potential GEF fund	· £1.70 per ha · Aggregate £0.3 billion per yr
		Implied WTP based on analysis of range of debt-for-nature swaps	Implicit Prices based on range of DFN swaps (including Ruitenbeek 1992)	· £4.25/ha
Specific	Adger *et al* (1995; 2002)	Revealed Existence values for Mexican Forests	Based on tourism surveys and DFN swap & International NGO contributions	· £0.02-£8.47 per ha
	Yaron (2002)	Non-use value Mount Cameroon Project	Based on combined donor funding to MCP	· £12.94 -£21.56 per ha
Iwokrama	van Buekering & van Heeren (2003)	Global non-use value of Iwokrama rainforest	Based on average annual donation to Iwokrama by foreign organisations 1999-2001	· £0.13 per ha (extrapolated from below) · Aggregate £49,488 per yr

Notes: All currencies converted into £ using OECD average annual exchange rate (OECD 2007) for year of estimate and then inflated to £2005 using HM Treasury GDP deflators ratio (HM Treasury 2007).

Indirect approaches have been criticised on a number of bases. Flint (1992) argues that estimates based on donor expenditure to *flagship* sites, (such as Mount Cameroon), may provide only a general indication of public WTP for global biodiversity. Pearce (1999) contends that implied prices based on debt-for-nature swaps are 'open to doubt' and finds that values produced by indirect approaches are somewhere in the region of one-tenth of those produced by direct valuation methods (stated preference techniques). Indeed, the general consensus is that indirect approaches may provide underestimates. The main reason for the discrepancy lies in the acknowledgement that market transactions are unlikely to provide a complete picture of total economic value (Adger et al. 1995;Pearce & Moran 1994). Indeed, Freeman (1993) states that aggregate non-use values are likely to be much larger than the observed acquisition and advocacy expenditures of environmental organisations. Moreover, he also notes that due to free-riding, estimates based on aggregate donations would be at the lower bound of true aggregate WTP. Correspondingly, the estimate provided by Van Beukering and van Heeren (2003) of the global non-use value for Iwokrama rainforest (case-study 2 in this thesis) of £49,488 per annum (£2005) is expected to be a large underestimate of the benefits, and will form a key reference point for the valuation study described in Chapter 7.

In addition, to the studies reported above, there have also been a few attempts to ascertain non-use values for various ecosystems through meta-analysis of existing stated preference literature (see, for example, Woodward & Wui 2001). Such approaches can be useful in providing a rough indication of aggregate non-use values; however there are lots of problems associated with such exercises, for example the lack of uniformity in the changes being measured. The study by Costanza et al. (1997) received heavy criticism for scaling up estimates taken from other studies valuing small marginal changes in specific local ecosystems to obtain values for the whole planet (for a detailed review of the study's shortcomings see Bockstael et al. 2000 and Pearce 1998).

These criticisms highlight the importance of obtaining additional estimates of the non-use values attached to global biodiversity through alternative methods, for example, by directly examine public preferences.

2.3 STATED PREFERENCE LITERATURE ON VALUING 'GLOBAL' BIODIVERSITY

There have been surprisingly few studies to estimate *directly* the global non-use values held for tropical or 'global' biodiversity. Whilst there is a vast amount of literature exploring the non-use values attached to biodiversity, the majority of these have focused on goods and services provided at the local scale. Much less attention has been directed towards estimating the values held for 'global' biodiversity amongst distant beneficiaries using stated preference techniques.

2.3.1 Coverage

Indeed, only a very small number of studies have been identified which attempt to *directly* value the benefits to residents in developed countries for the conservation of tropical biodiversity. These studies have examined the values attached to: (1) specific endangered species; (2) the protection of tropical rainforests; (3) global biodiversity; and (4) bundles of global environmental goods which include biodiversity. This thesis is primarily concerned with the second and third categories, namely, preferences for global biodiversity and for tropical rainforests. However, studies in the first and fourth category are also included since they are relevant to the discussion on public preferences towards conservation policy responses and methodological issues. A summary of the literature reviewed is presented in Table 2.2.

Table 2.2: Summary of empirical research on willingness to pay for global biodiversity

	AUTHOR	GOOD	ELICITATION	WTP ESTIMATE (£2005)	MARKET
Exotic Species	Swanson & Kontoleon (2003)	WTP Black Rhino	· OE · One-off tax	· Depending on management approach mean £15.74 - £18.86	UK
	Mourato (1999)	WTP Black Rhino	· OE · One-off tax	· 25 years mean £11.18 · Infinite time mean £15.65	UK
	Kontoleon & Swanson (2002;2003)	WTP Giant Panda under various conservation programmes	· PL · Airport tax foreign visitors	Mean WTP conserved in: · Cages £2.77 · Pens £5.99 · Habitat £10.57	OECD citizens
Global Biodiversity	Hanley, Spash & Walker (1995)	WTP for International Biodiversity Fund	· OE · Annual tax	· Mean £63.12 to £82.85 per yr · Med. £40.29 to £67.16	UK
	Menzel (2003) Unpublished	Protect half endangered species which will become extinct in next 10 years	· DC · Monthly tax	· Mean £6.22 per month · Aggregate benefit to Germany £2.6 bill per yr	Germany
	Epp & Gripp (1993) Unpublished	Worlds remaining tropical rainforests	· OE · One-off donation	· Mean WTP not reported	US
	Kramer & Mercer (1997)	Saving extra 5% (110 million acres) of tropical rainforests	· DC & PC · One-off donation	· DC: mean £16.50 · PC: mean £24.35	US
	Manoka (2001)	Saving extra 5% (110 million acres) of tropical rainforests	· DC & OE · One-off donation	· DC: mean £2.42 · OE: mean £5.36 - £5.62	US
				· DC: mean £4.83 - £11.77 · OE: mean £6.66 - £7.69	PNG
Ecosystems/Rainforests (Ex-situ)	Horton *et al* (2001; 2003)	Conserving 5% (190,000 km2 or 19 mill ha) and 20% (760,000 km2 or 76 mill ha) of Brazilian Amazon	· PL · Annual tax	· 5% mean £14.72 - £20.66 per yr · 20% mean £23.50 - £27.57 per yr	UK
				· 5% mean £33.72 - £56.37 per yr · 20% mean £45.98-£69.82 per yr	Italy
	Rolfe, Bennett & Louviere (2000; 2002) (and Rolfe and Bennett 2001)	Rainforests in Australia and overseas locations, described by six attributes: area, rarity, people, special features, visits, price	· Choice experiment · One-off donation · Caveat: estimates relative only (no baselines defined)	Marginal prices: · Area £3.20 per 1000 ha · Fairly to extremely rare £25.21 · Thailand to South Am. £41.08 · Locals worse off to better off £61.08	Australia
Various Global Goods	Svedstar (2000)	Various global environmental resources including: rainforests, endangered animals; air pollution; and global warming.	· OE · Annual donation	Mean WTP: · 50,000 ha rainforest £48.70 per yr · 2 mill ha rainforest £39.87 per yr · African elephant £30.47 per yr · 5 species (incl. Elephant) £26.10 per yr	Sweden & UK

Notes: OE = open ended; DC = dichotomous choice; PC = payment card; and PL = payment ladder format. All estimates converted into £ using OECD average annual exchange rate (OECD 2007) for year of data collection and inflated to £2005 using HM Treasury GDP deflators ratio (HM Treasury 2007).

Three studies are included which investigate public preferences for globally endangered species, these focus on charismatic species such as the Giant Panda and Black Rhino (see Kontoleon & Swanson 2002; 2003;Mourato 1999;Swanson & Kontoleon 2003)[15]. Much of the motivation for the later stems from the belief that such flagship species are important to the general public who

[15] It should be noted that there are other studies to estimate willingness to pay for globally endangered species however these typically involve surveying residents within the country where the species are found or visitors – for a full review of the literature on preferences for endangered species see Loomis and White (1996).

require specific 'figureheads' with which to lodge support (Kontoleon & Swanson 2002; 2003; McNeely, 1996; Bayon *et al* 2000). Notably the willingness to pay (WTP) estimates are very similar between studies: Kontoleon and Swanson (2003) report mean WTP for the conservation of the Giant Panda in its natural habitat of £10.57-£14.80 per annum (£2005) while Mourato (1999) reports mean WTP of £11.18 per annum (£2005) for conserving the Black Rhino for a 25 year period.

Two studies have focused on the valuation of 'global biodiversity', albeit based on loosely defined goods (see Hanley, Spash, & Walker 1995;Menzel 2003). Hanley, Spash and Walker (1995) in assessing UK willingness-to-pay (WTP) towards an international biodiversity fund left the good unquantified, simply advising respondents that the amount of biodiversity provided would be dependent on the amount of money raised. Instead, the research focused on examining the effect of providing varying levels of information to respondents. The resulting welfare estimates were found to be sensitive to information effects: WTP increased significantly with the provision of more information. Although this problem is not unique to the valuation of 'global biodiversity', the authors note that this raises the difficult question of what is an appropriate level of information to be provided to respondents.

In contrast, Menzel (2003) investigates German residents' WTP for protecting 'half of the endangered species which will become extinct in the next 10 years'. The robustness of the study is unclear since few details are included about the valuation scenario, in particular, the means of provision, nor on the regression results (it is also unpublished). Notably, the author reports that the sample was not representative of the target population in particular for age, which was found to be a significant determinant of WTP. Interestingly, the estimates reported by Menzel (2003) are very similar to those reported by Hanley, Spash and Walker (1995) when taking into account the frequency of payments. That is, adjusting Menzel's monthly WTP estimate to a per annum estimate[16] produces an approximate mean WTP of £74.64 per annum (£2005), which falls well within the range reported by Hanley, Spash and Walker (1995) of £63.12 to £82.85 (£2005) per annum. This consistency is a positive outcome.

Notably, of the very few studies undertaken to investigate the value of biodiversity amongst distant populations most have focused on tropical rainforests. Even so, only five studies have been identified which explicitly examine WTP for tropical rainforests among developed country residents and this issue remains very much unexplored in the SP literature[17]. Of these studies, half have focused on preferences for non-specific goods for example protecting the 'worlds remaining rainforests' (see Epp & Gripp 1993) or an additional 5% of the worlds rainforests

[16] By multiplying the mean monthly WTP estimate by 12.
[17] In addition Svedsater (2000) estimates WTP for various global environmental goods which include tropical rainforests.

(see Kramer & Mercer, 1997; Manoka, 2001), and two have attempted more specific valuations (Horton *et al*, 2001; 2003; Rolfe *et al*, 2000). Aside from Horton *et al* (2002, 2003) which concentrated on the Brazilian Amazon, none of the 'specific' rainforest valuation studies have produced absolute estimates of WTP. Moreover, in some cases WTP estimates vary widely both within and between studies. For example, Kramer & Mercer (1997) and Manoka (2001) produce estimates of US resident's WTP which differ by an order of magnitude for the same marginal change in the world rainforests (see discussion in next section).

In addition, two further studies were identified which investigate *in situ* the preferences of developed country residents for tropical habitats (see: Muriithi and Kenyon 2002, and Flatley and Bennett 1996). Such studies are somewhat limited in their usefulness within the current context as respondents may be super-informed with respect to the good of interest (having visited the site or location). In view of this, these studies are only included where they offer particular insights into preferences for tropical biodiversity or policy responses.

A final study, Svedsater (2000), examines WTP of grouped Swedish and UK residents for various global environmental goods including endangered species and tropical rainforests. The study reports higher estimates than Kontoleon and Swanson (2002; 2003) and Swanson and Kontoleon (2003) for the conservation of endangered species. Mean WTP for conserving the African Elephant was estimated to be £30.47 per annum. In addition, estimates of mean WTP for tropical rainforests are greater than those derived by Horton *et al.* (2001; 2003) despite covering a far smaller area. However, the robustness of the estimates reported by Svedsater (2000) is questionable: there was evidence of scope and embedding effects (discussed in next section); and the sample was very small and consisted of students rather than members of the general population.

Overall, in terms of the populations covered, only four studies report WTP estimates for UK residents, one of which also examines the preferences of Italian residents; an additional study reports on the preferences for grouped UK and Swedish residents; three studies examine the preferences of US residents, one of which also investigates preferences amongst residents of Papua New Guinea; one study examines Australian preferences; another study reports on the preferences of residents in Germany; and one study examines the preferences of OECD residents.

The next section discusses the validity and reliability of these studies in greater detail and draws lessons from the wider context of the empirical work on the valuation of non-use values for global biodiversity.

2.3.2 Methodological Issues

As discussed, there have been only five empirical studies to explore (explicitly) public preferences towards rainforest conservation amongst distant populations[18]. For the most part these studies have explored the methodological issues relating to the establishment of valid and reliable estimates of global non-use values and with one exception they have all relied on the use of the contingent valuation method[19]. Prior to reviewing the main empirical findings, this review considers the work of Carson (1998) which provides an important contribution to the application of contingent valuation method (CVM) to valuing global biodiversity

Carson (1998) undertakes a theoretical review of the potential for a large-scale multi–country application of CVM to the valuation of tropical rainforests. Whilst concluding that there is indeed much potential for the use of contingent valuation in assessing global non-use values, the study highlighted a number of concerns reflecting broader criticisms of the contingent valuation method, namely that (1) it is overly sensitive to the order in which good valued; (2) it is insensitive to scope; and (3) it can overestimate true economic value. These issues are the focus of much of the subsequent empirical work on public preference for tropical rainforest. In particular, emphasis has focused on testing for scope and elicitation effects. However, Carson (1998) also highlights a number of other methodological challenges specific to the elicitation of public preferences for tropical rainforests, which have yet to be adequately addressed by the existing literature. These issues relate to the difficulty of ensuring respondents buy into the plausibility of the provision of goods at this scale. For example, Carson states that even with a 'plausible enforcement mechanism' some respondents will believe that tropical rainforests will continue to be lost due to corruption and other provision issues (ibid, p. 25). Carson also highlights the importance of, and corresponding challenge in ensuring respondents are adequately informed about other similar rainforest programmes that may be simultaneously provided, that is the availability of substitute goods. These issues are addressed later in the thesis (see Chapters 6 and 7).

The first empirical work to consider the preferences held by distant populations for the conservation of tropical rainforests is that by Epp and Gripp (1993). This study examined US residents WTP for 'the worlds' rainforests, using a test re-test approach to assess the reliability of CVM estimates. Epp and Gripp (1993) found that in a re-survey undertaken 10 months after the original that respondents' WTP was both similar in size and met six different measures of reliability. Although the authors fail to report mean WTP estimates, respondents were found to hold positive values for rainforest protection. Through its finding that respondents are able to

[18] The two studies by Muriithi and Kenyon (2002) and Flatley and Bennett (1996) actually surveyed foreigners in a local setting and Svedsater (2000) focuses on groups of global environmental goods.
[19] Rolfe, Bennett and Louveire (2000) provide the only empirical work to explore preferences for rainforest conservation using the choice modelling technique.

give stable and reliable estimates of their WTP for rainforest preservation, this work provides instrumental support for the application of CVM to valuation of global environmental goods.

In building on Carson's earlier paper, Kramer and Mercer (1997) undertake what is largely recognised as the first application of CVM to value rainforest preservation amongst global stakeholders (the study by Epp and Gripp (1993) is often overlooked since it was never published). The Kramer and Mercer (1997) survey was aimed at addressing three specific problems: (1) to assess the feasibility of using CVM to value a global environmental good; (2) to estimate US WTP for world's tropical rainforests; and (3) to determine attitudes of US residents towards issues relating to rainforest management and protection. Kramer and Mercer (1997) found that US residents were willing to pay on average £16.50-£24.35 (£2005) in a one-off payment to protect an additional 5% of the world's rainforests. The broad range reflects the different elicitation methods used; the lower figure is derived from a double-bounded dichotomous choice question and the upper-bound from the payment card method. Whilst Kramer & Mercer (1997) state that the figures are very similar no significance tests were reported. Interestingly these findings are inconsistent with those elsewhere in the valuation literature which have typically found dichotomous choice formats to produce higher estimates than open-ended or payment card methods[20] (see Boyle & Bishop 1988;Cameron & Huppert 1991;Reaves, Kramer, & Holmes 1999). This could in part be a reflection of respondent uncertainty in valuing distant and unfamiliar goods – the issue of uncertainty was not explicitly addressed in the research by Kramer & Mercer (1997).

In order to gain a better understanding of the nature of these values and to explore Carson's (1998) suggestion of a multi-country study, Manoka (2001) repeated the valuation undertaken by Kramer & Mercer (1997) in a cross-cultural comparison of WTP amongst residents of the US and Papua New Guinea (PNG). In addition, the study investigated suggestions that CVM may provide overestimates of true economic values[21]. The results indicate that almost half of the stated WTP amount consists of non-economic components of value (being related to intrinsic values, a sense of 'good causes', and non-paternalistic altruism). However, even including the non-economic components the estimates reported were much lower than those derived by Kramer & Mercer (1997), ranging from £2.42-£5.62 (£2005) for US residents and £4.83 -£11.77 (£2005) for PNG residents. Surprisingly, PNG residents were willing to pay significantly higher amounts than US residents. However, follow-up questions revealed that approximately 70% of PNG residents' WTP was attributed to the conservation of *domestic*

[20] The dichotomous choice format is often associated with the problem of yea-saying which may lead to inflated estimates of WTP.

[21] CBA and other economic assessments require estimates of true economic components of non-use values, thus non-economic components that have potential to overestimate WTP should be identified since they are not consistent with the Kaldor-Hicks notion of compensating or equivalent measures of welfare.

rather than global rainforests. Manoka (2001) also found that WTP was considerably affected by respondent uncertainty with estimates decreasing by almost 90% when uncertain responses were taken into account although it should be pointed out that uncertainty was incorporated using quite an extreme form of re-coding where responses which were less than 100% certain were considered to be zero bids[22]. Because the study provided an exact replication of the valuation scenario posed by Kramer & Mercer (1997) yet produced much lower estimates and since the values of US and PNG residents were also significantly different (in terms of motives and socio-economics), these findings raise questions over the appropriateness of transferring estimates between countries.

Horton *et al.* (2001; 2003) further investigate multicultural differences in preferences for rainforest conservation by exploring willingness-to-pay amongst UK and Italian residents for conserving part of the Brazilian Amazon. The study used a payment card method which was designed to take into account the effects of respondent uncertainty in expressing WTP. This follows on from other studies in the valuation literature which suggest that respondents can experience considerable uncertainty in the valuation of environmental goods especially where these goods may be unfamiliar[23] (Alberini, Boyle, & Welsh 2003;Loomis & Ekstrand 1998). In line with this Horton *et al* (2001; 2003) found considerable variability in the bids reported by respondents. The authors suggest this was due to respondent unfamiliarity with the good being valued, and that respondents may have been using notion of social fairness and fair-share in formulating WTP responses. Consistent with Manoka (2001), the results indicated that preferences were not transferable between countries: Italian residents had significantly higher WTP than UK residents[24]. The UK estimates are however similar in magnitude to those reported by Kramer & Mercer (1997), although the area of rainforest protected is much smaller. The authors themselves question the reliability of their estimates due to the evidence of high respondent uncertainty exhibited by widely varying bids size.

Horton *et al* (2001; 2003) also test for the occurrence of embedding effects (after Kahneman & Knetsch 1992). Carson (1998) rejects the argument that such problems are inherent in the use of CVM citing evidence of at least 30 studies which have founds estimates to vary in the

[22] Loomis and Ekstrand (1998) have found such extreme recoding to reduce the accuracy of estimates and others suggest the incorporation of uncertainty into the likelihood function.

[23] Some of the reasons given for this apparent uncertainty stem from the fact that respondents may be uncertain about the monetary value they place on unfamiliar goods due to less well defined preferences as well as a lack of experience in such valuation situations both in terms of the good, the scenario and possible substitutes and complements (Wang 1997). In the case of rainforest valuation the problem of respondent unfamiliarity can cause a number of difficulties, for example ensuring that respondents understand the trade-offs they are being asked to value; are familiar with the benefits of rainforests, understand and find plausible the payment and provision mechanisms. In addition uncertainty may be due to lack of interest in the valuation task for example failure to engage fully in the valuation task.

[24] This was partially explained by recent media coverage in Italy which may have upwardly biased the estimates as well as potential cultural differences, interviewer bias and translation problems.

expected manner according to scope and suggests that studies reporting insensitivity to scope may be overcome by careful design. Horton *et al* (2001; 2003) find evidence of internal consistency amongst UK residents in tests for part-whole effects for changes in the area of rainforest conserved, however, due to high variability in bids there were large overlaps in the confidence intervals. Moreover, there was external inconsistency between sub-samples of the Italian respondents, with greater mean WTP for the smaller scope than for the larger scope. One explanation for the apparent insensitivity and variability of bids is that respondents were not informed beforehand of the requirement to value at two different levels of scope. Indeed, Kontoleon & Swanson (2003) suggest that such effects can be 'nullified' by providing advance warning, which has been shown to produce more stable bids. Thus this discrepancy may indeed be solvable by better survey design as suggested by Carson (1998).

There is indeed mixed evidence on the occurrence of embedding and scoping effects in the valuation of global environmental goods. Kontoleon and Swanson (2002; 2003) found evidence that respondents are internally sensitive to qualitative changes in scope in relation to WTP for panda conservation. The study found that respondents' willingness to pay increased with improvements to the quality of life of pandas as provided through various conservation approaches: WTP estimates were approximately three times as much for pandas conserved in natural habitat rather than in cages. In contrast Svedstar (2000) in the valuation of four different types of global environmental good, including rainforests and endangered species, found that neither contingent valuation nor categorical rating were able to ensure respondents sensitivity to scope in external tests. Svedsater (2000) suggests that one of the reasons for the displayed insensitivity may be due to the use of 'mental accounts' (after Thaler 1990) such that stated values reflect WTP for broad environmental goods where respondents are unable to specify values for specific goods. In considering the results, three caveats should be considered, firstly respondents were asked to value four goods of which only the last, climate change, displayed any sensitivity to scope – this suggests the possible occurrence of sequencing effects yet no tests for this were reported. Secondly, the results are based on a very small sample size – only 148 respondents valued all four goods. Thirdly, the corresponding OLS regression models indicated poor fit with r squared of 0.1 and 0.07. However, Svedsater's (2000) conclusion that respondents are unable to properly define economic values may be strengthened by the fact that the study used four different measure of scope (absolute magnitudes; percentages, number of events and verbal cues), as well as two different appraisal techniques (contingent valuation and categorical rating) and may back up arguments elsewhere in literature that responses to CV questions may be arbitrary.

Given these mixed results more attention needs to be placed on understanding how to overcome problem of respondent insensitivity to scope in the valuation of rainforest preferences. An

alternative approach to tackling the problem is offered by the choice modelling technique. One of the potential advantages of this approach is the automatic inclusion of internal tests for scope sensitivity[25]. Further advantages lie in the ability of choice modelling to value multi-dimensional goods, to assess how trade-offs might occur between attributes and in coping with framing issues particularly in the incorporation of substitutes and complements.

Rolfe, Bennett and Louviere (2000) in investigating Australian preferences for rainforest preservation in Vanuatu undertake the only study to use choice modelling to explore preferences for global environmental goods. One of the strengths of the study which has not been adequately addressed in the other rainforest valuation studies is in the explicit inclusion of substitutes in the valuation process. The study required respondents to choose between different rainforest conservation programmes provided in six different locations each being described in terms of six attributes: size, rarity, impact on indigenous people, special features, potential to visit and one-off donation, the monetary attribute. The results indicate that all of the attributes were found to be statistically significant in explaining choice decisions; and high importance was attached to ensuring local people are better off, extreme rarity, and Australian rainforests. For example, the value of preserving rainforests in Australia instead of Thailand was £41.08 (£2005).

Whilst the chief aim of the study by Rolfe, Bennett, and Louviere (2000) was to explore Australian preferences for a specific rainforest, Vanuatu, because the study failed to include baseline conditions for each of the alternative rainforests their estimates are only relative. Consequently, absolute estimates for a specific rainforest were not derived. From a policy perspective, establishing estimates for specific rainforests is likely to be very valuable since it enables the incorporation of global non-use values into cost benefit analysis and thus directly into policy appraisal (Rolfe, Bennett, & Louviere 2000). One of the main difficulties in deriving values for specific rainforests lies in the amount of information that needs to be transferred to respondents so that informed decisions can be made. Kramer & Mercer (1997) found that focus group respondents felt uncomfortable with valuing rainforests at regional and country scales without more information about the possible options and that the amount of information that would be required to do so would be too overwhelming. In the case of Muriithi and Kenyon (2002) and Flatley and Bennett (1996), the problem of information transfer was minimised by the fact that the 'global' stakeholders were in fact in-situ foreigners who were asked to value a local good which was already familiar. As a consequence of the in-situ nature of the survey, the estimates derived are unlikely to be representative of the non-use values that would be experienced by people who are less familiar with the good and restricts the

[25] Although it has also been pointed out that the internal tests for scope sensitivity offered by choice experiments can be weaker than external tests since respondents are essentially forced to be sensitive to changes in scope (Hanley, Mourato, & Wright 2001).

transferability of these estimates. Thus, the non-use values derived from in-situ surveys may be of limited value in understanding the preferences held by the wider public located in distant countries who have no prior experience of the good being valued. The only other study to explicitly focus on a specific rainforest is that by Horton *et al* (2001; 2003) however, as noted, previously the estimates produced were highly uncertain and their failure to properly address the issue of substitutes on the basis of the 'uniqueness' of the Brazilian Amazon could be questioned since at the very least the Amazon is essential a regional good located across seven other countries.

Rolfe, Bennett and Louviere (2000; 2002) (see also Rolfe & Bennett 2001) also examine the effect of re-framing the original valuation amongst varying numbers of overseas and domestic rainforests and amongst alternative ecosystems such as rangelands and wetlands. The results indicate that respondents felt more comfortable when an equal number of domestic and international rainforest locations were offered; suggesting respondents were parochial in their preferences. In addition, extending the choice of substitutes by including alternative ecosystems also improved model fit, although only slightly. These results are interesting since they seem to conflict with the earlier findings of Kramer and Mercer (1997) that respondents are more comfortable valuing the 'world's rainforests' than allocating WTP to specific or regional rainforests. This disparity may reflect greater familiarity amongst Australian residents with tropical rainforest since they occur domestically. Additional empirical research is required to explore whether respondents in countries like the UK with no domestic rainforests are comfortable allocating WTP to specific rainforests, and, moreover how alternative ways of framing rainforest choices may affect preferences.

2.3.3 Policy Dimensions

As noted, exploration of public preferences towards conservation policy has received much less attention amongst the empirical work on global non-use values, yet, understanding more about such preferences could provide valuable input into the policy debate over priority-setting and on how best to fill the shortfall in conservation funding. To date the existing work has primarily focused on establishing estimates of the aggregate benefits associated with providing global biodiversity, much less is known about how the public prioritise conservation issues; about how preferences vary under alternative policy responses; and, more importantly, how the public would prefer to contribute to tropical conservation. Of the handful of studies undertaken, it would appear the general public are sensitive to such issues. This section reviews the main findings to date.

2.3.3.1 Aggregate Benefits

Studies providing aggregate estimates of global non-use benefits for biodiversity have primarily focused on: (1) the analysis of the cost and benefits of alternative land uses; (2) assessing the adequacy of existing resource transfers; and, (3) demonstrating the potential *additional* funds that could be generated for tropical conservation.

Two studies which explicitly consider the role of global non-use values in land use decisions for specific conservation programmes are Flatley and Bennett (1996) and Muriithi and Kenyon (2002). In both cases the non-use values are based on a sample of foreign tourists. Flatley and Bennett (1996) in examining Australian tourists' willingness-to-pay for Vanuatuan rainforests found that the aggregate non-use benefits for protecting two areas of rainforest exceeded the potential lease fees from logging: approximately £250,000 per annum (£2005) compared to £3,000 per annum (£2005), respectively. However, the authors did note the possibility of both strategic (an open-ended elicitation format was used) and part-whole bias. Similarly, in examining the costs and benefits of conserving Arabuko Sokoke forest, Muriithi and Kenyon (2002) found that when taking into account WTP by foreign tourists that the benefits of conservation exceeded the costs. However, the study did not however take into consideration the opportunity cost of the forest land and no calibration was applied to the aggregation of the results. In both cases, the general conclusion was that capturing the external global non-use benefits through *some kind* of international transfer mechanism could provide a strong argument for conserving these resources which otherwise may not exist. Such findings back up arguments elsewhere in the economic literature which have reviewed the imbalance between the domestic costs of conservation and the global benefits. For example Norton-Griffiths and Southey (1995) find that the opportunity costs of conservation in Kenya outweigh the current benefits flows and call for additional international transfers in order to address the otherwise inappropriate subsidy provided by Kenya to the rest of the world through its protected areas programme.

Indeed, much of the emphasis on the need for greater understanding of the size and nature of global non-use values stems from the belief that people in distant countries hold significant values for the conservation of tropical biodiversity which if captured could provide crucial additional sources of funding. For example, Kramer and Mercer (1997) suggest on the basis of their assessment of US preferences that a revolving fund of approximately £1.5 - £2.2 billion (£2005) could be generated to protect rainforests worldwide.

A closely related motivation for exploring estimates of global non-use values, is the potential to assess the adequacy of transfer payments from developed to developing countries to meet global biodiversity objectives. This was the specific aim of the study by Menzel (2003) which sought to investigate whether Germany's contributions to the GEF provided an appropriate level of

biodiversity protection in comparison with the perceived benefits. The aggregate non-use benefits to German residents were found to translate into a potential fund as high as £2.6 billion per annum (£2005) and confirmed *a priori* expectations that there exists a large shortfall in funding when compared to actual contributions[26]. However, as noted by Pearce (2007) willingness-to-pay estimates should exceed actual expenditures by consumer surplus. Menzel (2003) concludes that the commitments of donor countries are likely to be well below the benefits gained and argues for more attention to the preferences of the public in decision-making on biodiversity protection

Similarly, the general observation is that aggregate non-use benefits may often exceed programme costs. Horton *et al* (2003) found that aggregating WTP estimates across UK households produces an annual fund of approximately £680 million (£2005) which is well in excess of the estimated costs of setting in place a programme of protected areas in the Brazilian Amazon[27]. Likewise, Swanson and Kontoleon (2003) report that aggregate UK WTP for Black Rhino conservation in Namibia could create a fund in region of £136 million (£2005) which would more than cover the costs of implementing the proposed conservation programme regardless of the local revenue-generation schemes.

However, there are a number of important caveats to theses estimates. Firstly, few of the studies are based on representative samples. The Horton et al. (2003) study uses a small sample of residents in Norwich (n = 213) which was neither representative of the local nor the national population (respondents were richer and more highly educated) – yet estimates were aggregated *without adjustment* to the UK population. Secondly, in many cases the validity and reliability of the estimates is questionable. As noted in the previous section, the results reported by Horton et al. (2003) are biased by scope effects and the Menzel (2003) estimates are based on a regression model with very low explanatory power. Thirdly, some of the estimates are highly uncertain (Horton et al. 2003; Manoka, 2001). Fourthly, there are additivity issues relating to these results. For example, estimates of the aggregate benefits to the UK population for conserving just one endangered species and a small part of the Brazilian Amazon (provided by Swanson & Kontoleon (2003) and Horton *et al* (2001; 2003, respectively) already add up to well in excess of the total amount currently spent by the UK on funding biodiversity conservation (approximately £20.8 million[28]), without even considering other conservation

[26] Germany currently contributes in the region of £17 million per annum (£2005) to the GEF (Menzel, 2003).

[27] The planned programme aimed at combating historical threats (agricultural expansion and logging) as well as future threats posed by the governments Avanca Brazil programme. The one-off cost of purchasing land was estimated to be £392.3 million (£2005) plus approximately £22.8 million per year (£2005) to cover operating costs.

[28] The major components of UK funding for biodiversity consist of (1) DFID annual funding ranging from £13.8 - £27.6 million, plus (2) DEFRA funding via Darwin Initiative of approximately £7 million and DEFRA support to the FFI Flagship Species Fund of £280,000) (Lapham & Livermore 2003).

goods. Indeed caution needs to be taken in interpreting these figures especially where environmental goods are highly substitutable (Bishop & Welsh 1992).

With these caveats in mind the empirical research to date does appear to suggest that transfers from developed to developing countries could well be inadequate. If this is true, it sheds further doubt over the appropriateness of using indirect approaches which rely on existing transfers to demonstrate non-use values.

2.3.3.2 Conservation Approaches and Priority-Setting

Few of the studies on global non-use values have examined public preferences towards alternative conservation policy responses. Studies such as Kontoloen & Swanson (2002; 2003), Swanson and Kontoleon (2003), Mourato (1999) and Rolfe, Bennett & Louviere *et al* (2000) are the few to explore how willingness to pay is affected by alternative policy responses and how the public prioritise between conservation targets.

Both Kontoleon & Swanson (2002; 2003) and Swanson & Kontoleon (2003) find that distant populations are sensitive to the conservation approaches used in ensuring the protection of globally endangered species. In assessing the preferences of OECD residents for the conservation of the Giant Panda, Kontoleon and Swanson (2002; 2003) report that respondents attach significantly higher values to approaches which conserve pandas in a natural setting as opposed to cages or pens. The study concludes that conserving pandas in a natural setting may be useful as a tool to secure funding for the conservation of wider habitats.

Swanson and Kontoleon (2003) investigate ways to maximise the total economic value of conservation programmes by exploring the potential conflict between use and non-use values amongst UK residents for preservation of the Black Rhino. The aim was to find compatible policy options that would address both local and global concerns. The policy options were described in terms of the potential revenue that might be generated through the various uses of the Black Rhino, in order to support the long-term future of the conservation programme. Swanson and Kontoleon (2002; 2003) found that to maximise total economic value, the conservation programme would need to avoid policies which allow people to enjoy the harvesting of rhinos but that other commercial uses were considered acceptable. The study suggests that people in the UK do potentially support the sustainable use of wildlife.

Taking the lower bound this suggests current UK expenditure to biodiversity is in the region of approximately £20.8 million per annum (in addition the FCO contributes roughly £3 million to a single Environment Fund, which includes biodiversity projects however this is excluded (Lapham & Livermore 2003)).

In exploring the issue of sustainable use Swanson and Kontoleon (2003) provide valuable feedback for the ongoing debate in the policy field over the appropriateness of traditional policy approaches which have typically focused on 'fines and fences' compared to more recent polices which encourage sustainable use as incentives for the long-term conservation of biodiversity (see Kenward 2004). None of the existing studies on preferences for rainforest conservation have sought to address this issue. Hutton and Leader-Williams (2003) suppose that arguments against the use of wild resources may well reflect ethical objections, as well as concerns that 'sustainable use' may not in fact be sustainable[29]. The importance of this issue is underlined by the Convention of Biological Diversity which identifies the conservation and *sustainable use* of biodiversity as one of its key objectives. Moreover, attaining sustainable use of tropical rainforests is a key goal of the second case-study in this thesis. Indeed Iwokrama rainforest is in the process of implementing a programme of sustainable timber logging as well as commercial NTFP harvesting as a way of finding financial solutions to its long-term survival. The current research aims to extend that of Swanson and Kontoleon (2003) by examining preferences in the context of rainforest preferences to investigate whether UK non-use values are in conflict with the proposed plans to start sustainably using Iwokrama rainforest.

Mourato (1999) reports on a CVM survey to investigate preferences of UK residents towards the conservation of the Black Rhino under programmes of varying time horizons. Around half of the respondents were insensitive to the duration of the programme. However, those that were sensitive experienced a significant decline in benefits when the conservation programme changed from one of limitless horizon to a 25-year programme, such that mean WTP dropped from £12.60 to £9 (£2005). The study concluded that further research was needed into this important policy dimension. Indeed, Carson (1998) highlights the need to consider temporal dimensions in examining preferences for rainforest conservation yet to date no study has explored this issue. This issue is particularly pertinent to case-study 2 in this thesis. The Iwokrama Rainforest conservation programme has received significant funding from international donors for the past 15 years, (the UK being the largest supporter) yet has recently intermittently faced the prospect of closure due to a lack of funds. If, as per Mourato (1999), shorter-term programmes are found to hold significantly lower benefits, this may strengthen the case for international donors to provide funds over longer time horizons.

The most explicit investigation of how the public prioritise conservation at a global scale is undertaken by Rolfe, Bennett and Louviere (2000; 2002) which explores how Australian residents' prioritise between rainforests in different locations. Unsurprisingly, the study finds that domestic rainforest preservation is valued more highly than overseas locations, and that

[29] Although beyond the scope of this research the issue of risk would make an interesting future research topic in terms of how public perceive risk in achieving conservation objectives – i.e. how is risk traded off against potential costs and benefits of conservation.

rainforests in South America are the most preferred international location. (In addition respondents were found to prefer rainforests over wetlands and rangelands, and wetlands to rangelands.) The study provides useful information for fine-tuning approaches to priority-setting which use geographic criteria, for example, Moran, Pearce and Wendelaar (1997) which set priorities based on a country's investment potential and Mittermeier's 'mega-diversity countries' (Mittermeier, Robles, & Mittermeier 1997). However, there are other priority-setting factors used in the policy field which would also benefit from an exploration of public perceptions. For example, vulnerability is frequently used as an indicator, and is one of they key criteria used in the Hotspot and Tropical Wilderness approaches. As noted by Moran, Pearce and Wendelaar (1997) there is no clear consensus on how issues such as threat (and vulnerability) should contribute to priority setting, that is, whether high threat (or vulnerability) should indicate a reason for or against investment. Indeed, this issue provides an important avenue for the exploration of public priorities for rainforest conservation which has the potential to provide perhaps more practically valuable feedback than approaches which have explored public priorities in terms of geographic locations.

2.3.3.3 Preferences for Capture Mechanisms

Whilst there is much evidence to suggest that the general public attach significant value to the conservation of tropical biodiversity, very little is known about how best to capture these values or how public would most prefer funds to be generate for tropical conservation.

A common attitudinal question included in many of the valuation surveys is whether respondents believe that developed countries should help developing countries to meet costs of conserving rainforests/ biodiversity. The majority of respondents have typically agreed with the transfer of funds from developed to developing countries to meet tropical rainforest conservation objectives. For example, Horton *et al* (2001; 2003) reported 93% in favour and Kramer & Mercer (1997) found 67%. However there has been no further exploration of how public might prefer this to be achieved for example whether they would prefer to contribute personally through voluntary donations, taxes or market mechanisms or through governmental contributions, or global payment schemes.

On the basis of general surveys of public attitudes towards the environment Clemencon (2000) hypothesises that there may indeed be much support amongst the public for global 'green planet contributions' which could raise funds more effectively and more transparently to secure stable and additional funding for conserving global environmental goods. In terms of how this could be achieved, Panayotou (1997a; 1997b) report that a survey of industrialised countries found that respondents would prefer to give to an environmental agency over an international tax although elsewhere there is evidence to suggest public distrust in the effectiveness of

international organisations and governments to achieve outcomes (Clemencon 2000). In both cases these findings were based on purely attitudinal questions.

There have been a number of empirical studies to investigate preferences for eco-certification schemes which seek to capture WTP for biodiversity conservation (see Ozanne & Vlosky 1997;Teisl et al. 2002;Teisl 2003), however, no studies have been identified which explore how public willingness-to-pay towards tropical biodiversity might vary under different *types of funding mechanism*. Indeed, there are numerous potential mechanisms which could be adopted to help raise funds for tropical conservation, for example, the removal and redirection of perverse subsidies, surcharges on medicinal products derived from the rainforest, per capita green planet contributions, airport taxes and so on. However, to date there has been a notable absence of studies to investigate whether the general public would support such mechanisms or indeed whether efforts should in fact be directed towards more traditional approaches, for example, through increased taxes or voluntary charitable fund-raising. The current research proposes to address this important policy dimension.

2.4 SUMMARY AND CONCLUSIONS

Given the considerable scarcity of empirical research in this policy area, there is much scope to add to existing knowledge on preferences for tropical biodiversity conservation amongst distant populations. A review of the existing research highlights a number of key issues:

In general, the empirical work on preferences for rainforest conservation is characterised by a dominance of CVM approaches. Comparisons are constrained by the different goods and scopes of provision, however, there is evidence of some variability in estimates of non-use values both within and between studies (and countries), as well as conflicting results on respondents' sensitivity to scope. The only study to employ the choice modelling technique failed to derive absolute estimates of WTP. In terms of the extent of knowledge on UK preferences, the studies investigating preferences for globally endangered species have produced some consistent findings. There is also some similarity between the estimates of UK resident's WTP for rainforests provided by Horton et al (2001; 2003) and Kramer and Mercer (1997) for US residents (although the scope of change differs) but there is a wider divergence with the estimates provided by Svedsater (2000)[30].

Despite widespread acknowledgment of the need to develop a greater appreciation of global non-use values and to find ways of capturing these benefits, there is an apparent lack of studies

[30] Horton *et al* (2001; 2003) estimates of UK WTP for conservation of Amazonia are much lower than those derived by Svedsater (2000) in the valuation of rainforest amongst other global environmental goods.

investigating how the public would prefer funding for tropical conservation to be generated nor how they prioritise between different global conservation objectives.

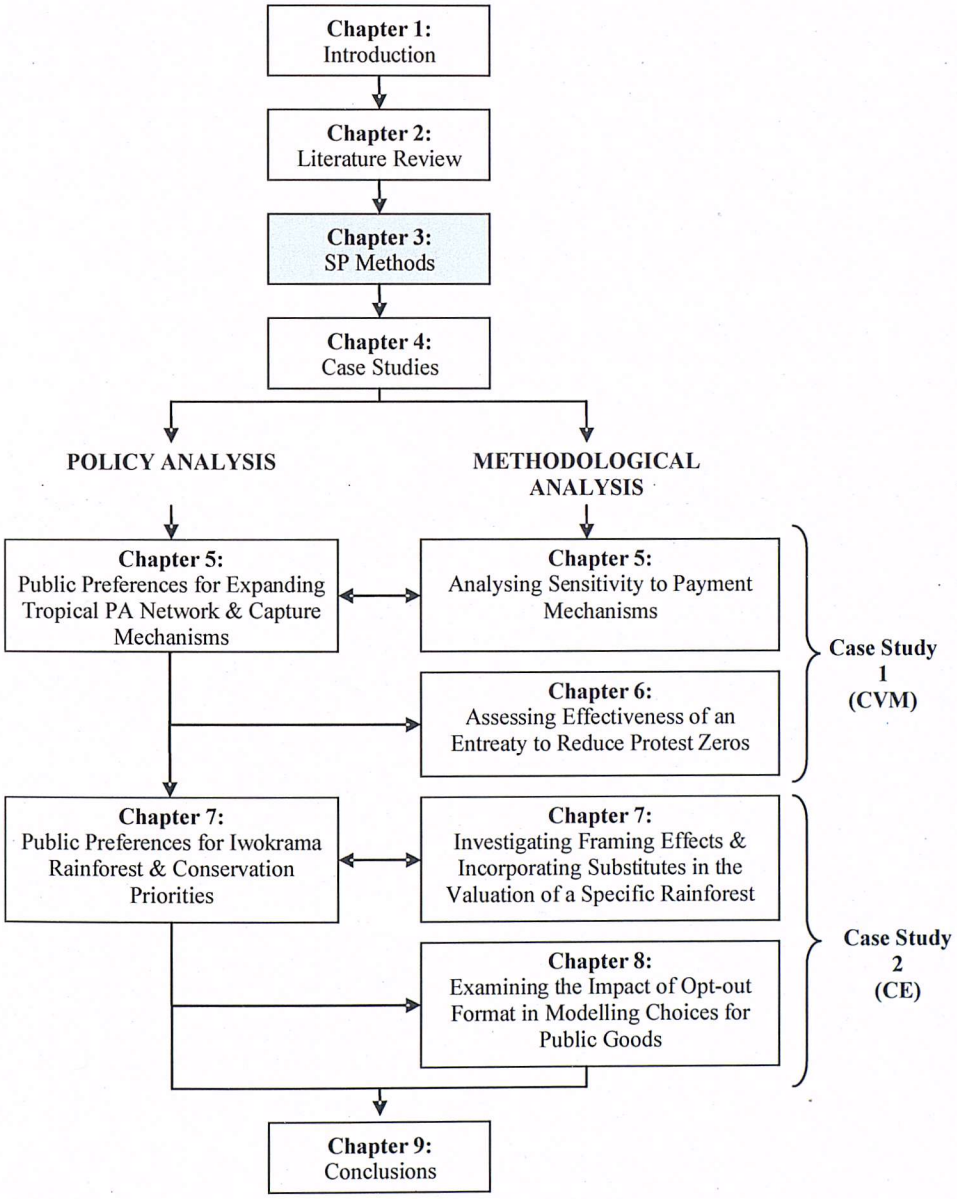
Moreover, while the studies by Kramer and Mercer (1997), Manoka (2001) and Horton et al. (2001; 2003) provide a rough indication of the size of non-use benefits associated with tropical conservation programmes, they focus solely on rainforest ecosystems. Correspondingly, it would be very useful to have additional estimates of the non-use values associated with tropical biodiversity conservation *inclusive of other ecosystem types* and, with respect to the *most up-to-date policy scenarios,* such as those proposed by Bruner, Balmford and Gullison (2005).

This thesis aims to address the current gaps in knowledge through the application of stated preference techniques to explore the preferences of UK residents towards the conservation of tropical biodiversity and rainforests. From a methodological perspective, it builds on the work by Rolfe, Bennett and Louviere (2000) by establishing absolute estimate for a specific rainforest through the use of a novel split sample choice modelling approach and by exploring alternative ways of framing rainforest choices. The research also provides a first attempt to address concerns highlighted by Carson (1998) regarding the potential problems associated with doubts amongst respondent about real-life issues concerning the provision of tropical biodiversity conservation. From a policy perspective the research aims to explore the dichotomy presented between the findings of Kramer & Mercer (1997), that people felt uncomfortable expressing WTP at a specific level and the experiences of the NGO community that charitable-givers are most willing to do so in the context of specifically targeted campaigns. In addition a key part of the research aims to uncover new information about public preferences for ways of capturing global non-use values and how they prioritise global conservation issues. Crucially, the study aims to provide estimates of the non-use values held by UK residents using the most recent data available on how to prioritise the expansion of the tropical protected area network.

Chapter 3: Stated Preference Techniques

SUMMARY

This chapter provides an overview of economic valuation and a detailed discussion of two key stated preference techniques used in this thesis: contingent valuation method (CVM) and choice experiments (CE). It includes survey instrument design; the analysis of CVM and CE responses; issues relating to validity and reliability; and the main advantages and disadvantages of each technique. The chapter concludes with a brief overview of the literature comparing the two techniques.



3.1 INTRODUCTION

Stated preference methods are a range of techniques which seek to attach a monetary value to non-market goods (or services)[31] by directly asking people what economic value they attach to those goods (Bateman et al. 2002). They offer the only way to measure non-use values for public goods, such as biodiversity, when there are no observable markets through which preferences can be revealed (Adamowicz et al. 1998).

Stated preference methods consist of two main types: (1) the contingent valuation method; and (2) choice modelling techniques, which may be further classified into: choice experiments; paired comparisons; contingent ranking; and contingent (or conjoint) rating (Bateman et al. 2002). This thesis is primarily concerned with the contingent valuation method (CVM) and choice experiments (CE).

The current chapter provides an overview of the concept of economic valuation. It then provides a detailed review of the contingent valuation method and choice experiment technique, including: survey instrument design; data analysis; validity and reliability; and the main advantages and disadvantages of each approach.

3.2 ECONOMIC VALUATION

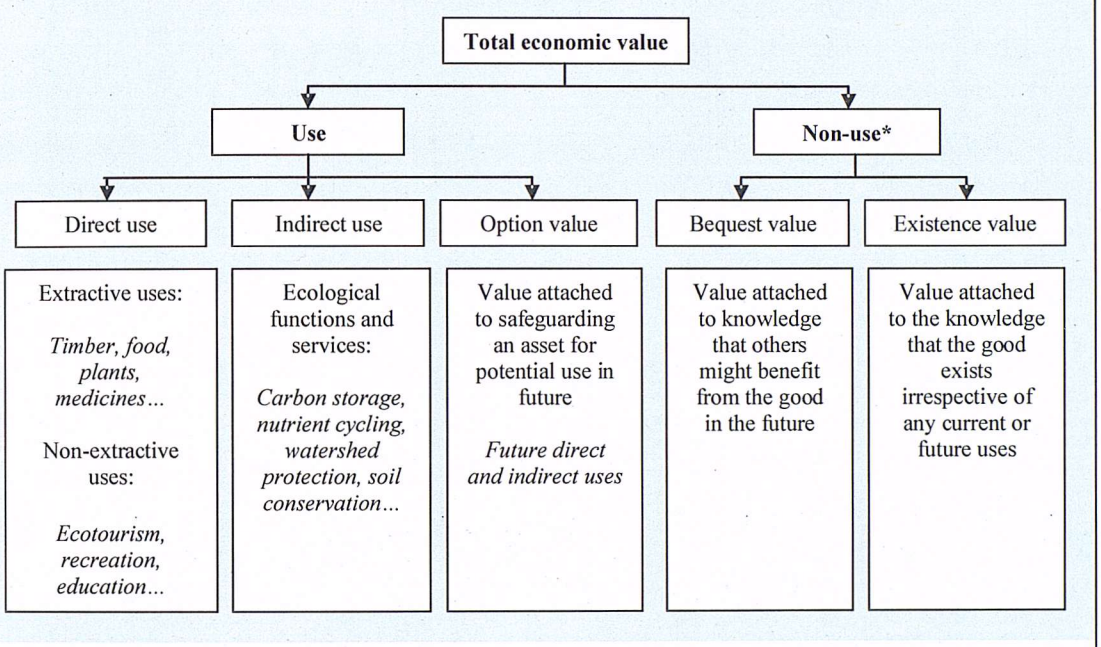
Economic value is an anthropocentric notion which refers to the contribution to human wellbeing that results from a change in the provision of a particular good or service. For goods or services that are traded in markets, economic value can be measured from changes in prices and incomes received (Mitchell & Carson 1989). However, markets do not exist for all goods; in particular, markets are frequently absent (or incomplete) for public goods. In many cases this is because such goods display the characteristics of non-rivalry and/or non-excludability. Correspondingly, the economic value for these goods cannot be inferred from changes in prices and incomes. In such instances, economic valuation can be used to assign a monetary value to the non-market good, where the monetary value has a particular and precise meaning (Bateman et al. 2002 p. 1). In doing so, the aim is to provide a measure, in monetary terms, of the positive or negative contribution to human wellbeing that results from a change in the quantity or quality (or both) of the provision of a non-market good.

A typology has been developed to describe the different types of economic value that may arise from a change in the provision of a good. Figure 3.1 provides an overview of these concepts in

[31] Hereafter, the term 'goods' should be read to include 'goods or services'.

relation to benefits that may be experienced from tropical rainforests. The two main categories are use and non-use values. Direct use values are experienced *in situ*, for example, through harvestable products, provision of clean water, and medicines. Indirect use, option and non-use values may be experienced at a variety of scales, from local to global, for example, through climate regulation, the protection of genetic information and existence and bequest values. This thesis is particularly concerned with the latter types of value since these may accrue to distant beneficiaries. The net sum of the various types of value is the *total economic value* provided by the good (Bateman et al. 2002).

Figure 3.1 Total economic value and tropical rainforests



Note: * A third type of non-use value, altruism, is sometimes referred to which describes the value attached to the knowledge that the good in question is available to others in the current generation (Bateman *et al*, 2002).

Adapted from Pearce & Moran (1994); OECD (2003).

The assignment of economic values to non-market environmental goods is motivated by a number of reasons. The foremost is to ensure that non-market goods are on a level playing field with goods that are traded in the market, that is, to avoid non-market goods being treated as having a zero price (unless of course they truly make zero contribution to human well being). Related to this, is the economic desire for efficiency in the use of resources - in terms of public policy this usually requires a comparison of the cost and benefits associated with proposed policy changes (Bateman et al. 2002;Mitchell & Carson 1989)[32]. It reflects the finite nature of

[32] A commonly accepted criterion for judging a policy (from an economic perspective) is whether or not it offers a potential Pareto-improvement (Hicks 1939;Kaldor 1939). That is, whether or not, a policy would result in at least one person being better off and no-one being worse off after those that gain

public funds and the need for informed and objective choices. Correspondingly, to assess accurately the costs and benefits associated with a policy that impacts on a non-market good, it is often necessary to obtain estimates of the value associated with changes in the goods and services provided through economic valuation. As discussed in Chapter 1, in the context of this thesis, it is suggested that obtaining a better idea of the size and nature of the non-use values held for tropical biodiversity by distant beneficiaries, will: (1) help to demonstrate the global importance of tropical biodiversity; (2) ensure decisions regarding proposals to expand protected area network are based on more accurate information on the potential benefits of provision; (3) to assess the adequacy of current transfers; and (4) help to stimulate markets to capture the values.

3.2.1 Theory of Economic Valuation

Economic value is defined in terms of an individual's *preferences* for a good or service. Correspondingly, economic valuation relies on a number of assumptions of economic theory (Freeman 1993;Hanley, Shogren, & White 1997;Mitchell & Carson 1989). Firstly, it is assumed that an individual (or any other economic agent) knows what he or she wants and makes choices accordingly - this is the concept of *rational choice*. Secondly, it is assumed that an individual is the best judge of his or her own wellbeing - this is the concept of *consumer sovereignty*. Related to this, it is assumed that an individual will always make choices that maximise his or her own utility and that choices are made with consistency (Freeman 1993;Hanley, Shogren, & White 1997;Mitchell & Carson 1989). More specifically, a set of four assumptions, referred to as the axioms of consumer theory, have been defined which set the basis for modelling individual choices (Hanley, Shogren, & White 1997;Varian 2003):

i. Completeness: an individual can always compare (and rank) any two levels of a good or service
ii. Refiexivity: each level of a good or service is at least as good as itself
iii. Transitivity: if an individual thinks A is at least as good as B and that B is at least as good as C, then it follows that A is at least as good as C.
iv. Continuity: no level of a good or service is considered to be absolutely necessary, and it is assumed that marginal trade-offs with income or other goods are possible.

The later point represents one of the key assumptions underpinning the theory of economic valuation, namely, that an individual's preferences have the property of substitutability between bundles of market and non-market goods (Freeman 1993). Correspondingly, it is assumed that

compensate those that lose - the term potential relates to the fact that the payment of compensation is hypothetical, that is, in reality it is not actually paid (Mitchell & Carson 1989).

where an increase in an environmental good is desirable, the maximum amount of other goods or services that an individual is willing to give up in order to receive the good (or conversely, the minimum an individual is willing to accept in order to give up a good) represents its economic value. Thus, using money as the unit of measure, an individual's maximum willingness to pay (or minimum willingness to accept) can be used as an indicator of their underlying preferences for an improvement (or deterioration) in an environmental good. That is, assuming the above conditions are met, willingness-to-pay and willingness-to-accept can provide a measure of the *economic value* of a good to an individual.

Hicks (1943) proposes four measures of economic value based on consumer surplus holding *utility* constant (as opposed to the Marshallian consumer surplus which holds *income* constant). They comprise compensating variation and compensating surplus which measure gains or losses relative to the initial utility level; and equivalence variation and equivalence surplus, which measure gains or loses relative to a specific alternative utility level (Mitchell & Carson 1989). Variation measures are used when the individual can vary the quantity of the particular good of interest, while surplus measures are used in situations where the individual can buy only fixed quantities (Randall & Stoll 1980). The case studies contained within this thesis concern situations where it is of interest to measure the value associated with an improvement in an environmental good in relation to the initial utility level. More specifically, they consider situations where a fixed quantity (and quality) of a public good, that is tropical biodiversity, is not currently available, and the objective is to measure the value associated with increased provision of the good. In this context, the relevant welfare measure is the Hicksian compensating surplus; this measures the amount an individual is willing to pay for an improvement which leaves him or her just as well off after the change as before (Freeman 1993).

Thus, an individual is assumed to have an indirect utility function which may be defined in terms of the maximum utility that can be derived given income Y, the prices of other goods P, other socio-economic factors S and, in relation to a particular non-market environmental good B, in the current context biodiversity (Bateman et al. 2002):

$$V(Y, P, S, B) \qquad [3.1]$$

It is assumed that a change in the provision of the particular non-market good may affect utility such that an increase in the amount (or quality) of the non-market good from B_0 to B_1 will lead to an increase in utility or wellbeing:

$$V(Y, P, S, B_0) < V(Y, P, S, B_1) \qquad [3.2]$$

On the basis that the policy change deals with a fixed increase in the provision of a *desirable* non-market good, it is assumed that since the provision of an additional amount of this good increases the utility of a respondent that they will be willing to pay something towards the provision of this good. The maximum amount they are willing to pay (*WTP)* will be the amount that ensures their level of utility is the same as it was before the policy change, this is referred to as the compensating surplus measure:

$$V(Y, P, S, B_0) = V(Y- WTP, P, S, B_1) \quad [3.3]$$

Economic theory suggests two further basic assumptions about WTP, namely that a respondent's maximum willingness to pay is bounded by income, such that it is less than income and in the case of public goods, WTP should be non-negative since where people do not like public goods they can just be ignored (Bateman et al. 2002).

Prior to moving on, it should be noted that economic valuation is not without criticism. Indeed, as a result of the manifold assumptions, it has been criticised on a number of levels. For example, it is based on the examination of individual preferences and the assumption of 'consumer sovereignty', yet the resulting estimates are applied to decisions that concern 'society' as a whole. As Freeman (1993) points out, the sum of individual WTP may not be the same as the value to society, in particular it does not (usually) take into consideration distributional impacts (although SP techniques may consider this). It has also been criticised for its anthropocentric basis or rather that it fails to consider intrinsic value, that is, that goods may have values 'in themselves' independent of the contribution to human wellbeing. It is however possible that preferences may in fact be influenced by intrinsic values, in particular, where stated preference techniques are applied to measure an individual's stated willingness-to-pay this may include the value associated with the good's 'right to exist' (Bateman et al. 2002;Pearce, Atkinson, & Mourato 2006). Perhaps the key issue here is that while intrinsic values may assist in awareness-raising, they are of little use in helping to making choices between resource allocations that involve sacrifices (OECD 2002).

Other criticisms particularly pertinent to the current valuation context include that the assumption of convexity of preferences which is required by the demand theory that underpins the stated preference technique, may not hold for complex and emotive goods. Similarly, it is possible to envisage, for example, in the case of endangered species, that loss aversion (after Tversky and Kahneman, 1990) could occur (yielding indifference curves which touch and thus divergences in welfare measures), which exemplifies a potential limitation of Hicksian consumer theory (Bateman et al.1997). Another oft-cited criticism is that an individual's stated

WTP may be based not on economic choice behaviour but rather a desire to feel good due to contributing to a public good – Kahneman and Knetsch (1992) refer to this as 'purchase of moral satisfaction'. Additionally, individuals may simply refuse to make trade-offs, for example, stating a zero value for a good even though they positively value its provision. Such behaviour reflects non-compensatory decision strategies (like the rights-based beliefs discussed above) and is incompatible with the theoretical foundations of CBA (Spash, 2000; Niemeyer and Spash, 2001)[33]. Where respondents adopt such strategies it is not possible to define the utility functions for the good of interest, which means the axiom of continuity is violated (Spash and Hanley, 1995; see, for example, Stevens et al., 1991). It can be envisaged that emotive goods may be particularly susceptible to such effects, especially where they may be complex and unfamiliar, as with tropical rainforests which possess multiple facets that may be difficult to trade-off.

In summary, the arguments for and against economic valuation are manifold and a thorough review is beyond the scope of this thesis (a more comprehensive discussion is provided in Freeman, 1993; see also Alberini and Kahn, 2006 and Bjornstad and Kahn, 1996 for criticisms regarding the neoclassical assumptions behind contingent valuation). The main point is that economic valuation is not a foolproof exercise, neither is it the only way to inform policy decisions, however, the premise of this thesis is that uncovering information about public preferences can be useful in making decisions about the efficient allocation of public resources and may act as a catalyst for finding ways to capture such values.

3.2.2 Economic Valuation Methods

Economic valuation methods comprise three main types: (1) revealed preference; (2) stated preference; and (3) benefits transfer which relies on the first two categories (Bateman et al. 2002). Revealed preference methods measure preferences for an environmental good *indirectly*, by examining behaviour in existing markets which are associated with the good of interest. In contrast, stated preference methods elicit preferences *directly* by asking people what value they hold for the good of interest. Stated preference techniques hold a key advantage over revealed preference approaches, in that they can measure all the types of value associated with a non-market good, including those unrelated to current or future use, for example, bequest or existence values. Indeed, they offer the only option for measuring preferences in the current context. The remainder of the chapter provides a review of two key stated preference techniques: containing valuation and choice experiments.

[33] This is because CBA is based on the assumption of compensating for welfare losses (Spash and Hanley, 1995).

3.3 CONTINGENT VALUATION

The contingent valuation method elicits public preferences for environmental goods and services by directly asking people how much they would be willing to pay (or accept) for a change in the quantity or quality of a given good which is traded in a hypothetical market (Mitchell & Carson 1989). As, noted, the theoretical basis for the method is derived from welfare economics and the concept of economic value based on individual utility maximisation (Hanley, Mourato, & Wright 2001). The assumption being that human wellbeing is a reflection of what individuals prefer and is thus linked to willingness to pay such that stated WTP amounts are related to respondents underlying preferences in a consistent manner. This concept is supported by attitude-behavioural models developed in the psychological literature such as Fishbein and Ajzen's (1975) theory of reasoned action, which links hypothetical willingness to pay, a behavioural intention, and actual payments. CVM has a strong background in the field of environmental valuation. The concept was first introduced by Ciriacy-Wantrup (1947) and the first application was undertaken by Davis (1963) to value the benefits attached to outdoor recreation. CVM is typically administered through a questionnaire-based survey instrument.

3.3.1 The Contingent Valuation Survey Instrument

A contingent valuation survey typically consists of three main parts: the introduction; the contingent valuation scenario; and socio-demographic section.

The introductory section presents respondents with a set of attitudinal, behavioural and knowledge questions regarding the particular good of interest. This serves as a warm-up to the valuation section and aims to uncover factors which may explain responses to the valuation questions. It may also be used to uncover policy relevant information about public attitudes towards the good in question.

The contingent valuation scenario provides respondents with information regarding the proposed policy change to be valued (including the means of provision, method of payment, timescale of payments, and extent of the market) and presents the elicitation question. This is discussed in more detail below.

The final section investigates the socio-economic and demographic profile of the respondent and is an essential part of the survey instrument. The information obtained is used to assess the representativeness of the sample, and the validity of the resulting welfare estimates, for example, whether key socio-demographic variables influence WTP in the expected way.

In designing a contingent valuation survey, the key challenge is to ensure that the scenario is comprehensible, plausible, and meaningful, such that respondents are willing and able to provide valid and reliable estimates of the values attached to the good of interest (Mitchell & Carson 1989). The remainder of this section discusses key aspects of the contingent valuation scenario: (1) the proposed policy change to be valued, (2) the hypothetical market; (3) the payment method; (4) the elicitation method; and, (5) follow-up questions.

Policy Change of Interest

The policy change of interest may be based on a hypothetical or actual scenario. The description must clearly identify the key attributes and how these will be changed by the proposed policy change (Bateman et al. 2002). This is done by describing the conditions under the status quo and comparing this with the conditions under the policy change in a comprehensible manner. In the context of valuing distant and unfamiliar public goods, such as those contained within this thesis, this may require the provision of additional background information, and visual aids such as maps. In all cases, respondents should be reminded to consider substitute goods, and information should be provided on how the policy change of interest relates to other alternative investment opportunities. Since CVM estimates have been found to be insensitive to scope it is also important that the extent of the change is made clear to respondents, especially as insensitivity is often the result of poor survey design (Mitchell & Carson 1989).

Hypothetical Market

The hypothetical (or constructed) market concerns the social context in which the policy change and payment takes places (Pearce, Atkinson, & Mourato 2006). This is not necessarily a neutral part of the scenario as respondents may have perceptions regarding the effectiveness, reliability and trustworthiness of different institutions for example governments, charities and so on. Bateman et al (2002) stress the importance of ensuring respondents believe the scenario is feasible. In the context of providing a global public good this may raise a number of issues relating to the real-life context – for example, difficulties in effectively implementing protected area programmes in developing countries (Carson 1998). These issues are considered in greater detail in Chapter 6. Additionally, Mitchell and Carson (1989) highlight the importance of ensuring an incentive-compatible mechanism is used; they consider that true preferences are revealed when respondents believe provision is dependent on payment of the stated amount. This is an importance issue since different provision conditions may encourage different types of strategic behaviour for example free-riding (under-bidding) or over-stating WTP. Another important consideration is how long the good is provided. It was noted earlier that Mourato (1999) report significantly different WTP for goods provided over different time horizons. A final consideration is the extent of the market, that is, who else will be asked to pay.

The Payment Method

As discussed in the previous section, there are four possible benefit measures and which measure to be used depends on the nature of the change and on property rights. The case-studies contained within this thesis, measure the value of an improvement in a good relative to the initial utility level, (respondents do not own individual nor collective rights to the new level); thus willingness-to-pay is the appropriate measure. In alternative situations, for example, where an individual does have property rights, willingness-to-accept could be used to measure the value of forgoing the improvement. However, in general WTP is the preferred measure since it provides a more conservative estimate (Carson, Flores, & Meade 2001)[34].

The second consideration with regard to the payment method is the choice of payment vehicle, this may be voluntary, for example, a charitable donation, or it may be coercive, for example, a tax. Voluntary vehicles may encourage free-riding while coercive vehicles typically have higher rates of protests, that is, objections towards the payment. While coercive vehicles have generally been preferred, the main recommendation is that the vehicle is seen as credible and acceptable, thus, the general rule is to use the vehicle that is most likely to be used in the real context (Pearce, Atkinson, & Mourato 2006). This is clearly a non-neutral part of the valuation scenario, and is explored in greater detail in chapter 5.

Additional considerations relate to the frequency or type of payment used as this has been found to affect stated WTP, for example, one-off or regular (annual or monthly) payments.

Finally, a key point as recommended by Arrow et al (1993) is that reminders should be included to encourage respondents to consider their budget constraints when responding to WTP questions. Respondents should be instructed to respond as if they were in a real life situation and to consider all relevant expenditure and income constraints.

Elicitation Method

Following description of the policy change and payment method, the elicitation question is presented. This directly asks respondents to indicate their WTP (or WTA) for the described policy change. There are several different types of elicitation method which are associated with various strengths and weaknesses (see Table 3.1).

[34] Estimates of willingness-to-pay and willingness-to-accept have been found to diverge. In general WTA is greater than WTP (Mitchell & Carson 1989). A number of argument have been postulated to explain the difference, for example, Hanemann (1991) finds the difference maybe dependent on the availability of close substitutes – a full discussion can be found in Mitchell and Carson (1989).

Table 3.1: CVM Elicitation Formats

Elicitation Format	Approach	Strengths/Weaknesses
Open-Ended	Simple 'How much would you be WTP/WTA?' with no cues regarding expected range of response	• Very informative & no anchoring bias • High rates of non-response, protests, zeros, & outliers
Payment Card/Ladder	A visual aid containing a large number of monetary amounts from which respondent chooses an amount (or range of amounts)	• Avoids starting point bias; few outliers • Weak range bias (& benchmark bias)
Single-Bounded (SB) DCM	'Would you pay this amount?' single bid offered, prices vary across respondents	• Provides incentive for truthful response; minimises non-response & outliers • Yea- & nay-saying; less informative; larger samples needed; higher estimates
Double-Bounded (DB) DCM	'Would you pay this amount?', two bids offered designed to capture bounds of WTP – prices vary across respondents	• As per SB DCM but more informative • Lower incentive compatibility; inconsistency in responses to first & second bids; yea saying, large samples
One and One-Half Bounded (OOHB) DCM	'Would you pay this amount?' one or two bids offered depending on response to opening question – prices vary across respondents	• As per SB DCM but more informative, less inconsistency between first & second bids • Yea & nay-saying, large samples needed

Notes: Adapted from Bateman et al. (2002) and Mitchell and Carson (1989). DCM = Dichotomous Choice Method.

In this thesis the payment ladder format is used. This format was selected since open-ended questions can lead to excess bid variability for unfamiliar goods and dichotomous choice formats, as recommended by the NOAA panel, require larger samples and have been found to suffer from anchoring effects and starting point bias (Horton et al. 2003). Furthermore, Reaves, Kramer and Holmes (1999) in a CVM study to value an endangered species found that the payment card format had the most desirable responses properties when compared with the dichotomous choice and open-ended formats, in particular, it had significantly lower protest responses. Although the payment ladder format can suffer from problems with implied value cues and range bias (Bateman et al. 2002;Mitchell & Carson 1989); this was minimised in the current application by including an open-ended 'other amount' and thorough pre-testing.

Follow-up Questions

The final element of the contingent valuation section is the inclusion of follow-up questions to de-brief respondents about their responses to the valuation questions and their perceptions of the valuation scenario. This is a very important section since it can help to identify invalid responses such as protest bids. For example, some respondents will invariably state zero

willingness because they object to some aspect of the contingent scenario even though they value the good in question. This issue of protests is an important one since it can seriously affect survey efficiency and the accuracy of resulting estimates. The problem is considered in greater detail in Chapter 6.

Pre-testing

The survey instrument should be subject to pre-testing through for example, focus groups, cognitive interviews and pilot tests. Focus groups and cognitive interviews in particular are important in the earlier stages of design to gain insights into attitudes and perceptions towards issue of interest. Cognitive interviews in particular can be useful in uncovering information regarding thought processes and in probing views on more sensitive information than would be appropriate in a group setting for example specific views on payment, the consideration of budget constraints and so on. Conversely, the pilot test is typically more useful at the later stages to fine-tune the questionnaire – to establish whether the questions are working, to pick up any numbering sequences problems, to inform on likely response rates and so on.

3.3.2 Analysis of Contingent Valuation Data

In general, the main purpose of a contingent valuation survey is to establish a measure of public WTP for a particular policy change. This is typically achieved by analysing the responses to the CVM questions parametrically using econometric regression techniques to derive estimates of mean and median WTP[35]. A corollary objective of this analysis is to determine the key factors influencing WTP; this is important in assessing the validity of the WTP responses and is useful in aggregating results.

The econometric analysis of responses to CVM questions depends on the type of data obtained, which correspondingly depends on the elicitation format. Thus, the data obtained from the survey instrument may be: (1) continuous, for example, open-ended format; (2) binary, for example, dichotomous choice formats; or (3) interval data, for example, payment ladder, double-bounded or OOHB DCM formats. In this thesis, the payment ladder format is used, thus this review is concerned with the econometric analysis of interval data[36] (see Haab and McConnell (2002) for a thorough review of econometric methods for analysis of all CVM elicitation formats).

Prior to analysis of the data, responses to follow-up questions are analysed to identify invalid responses for example, respondents that overstate their WTP and respondents that report protest

[35] Non-parametric techniques can also be applied to derive lower-bound estimates (Bateman et al. 2002)
[36] The analysis described may also be applied to interval data derived from other elicitation methods such as the double-bounded or OOHB dichotomous choice formats.

zeros. Since it is not possible to impute true values, the standard procedure is to exclude these respondents from the analysis (Bateman et al. 2002). The sample should subsequently be tested to ensure no systematic bias occurs from dropping invalid responses.

The payment ladder elicitation format typically requires respondents to tick the amount on the payment ladder which corresponds to their maximum WTP for the proposed change[37]. It is thus assumed that true WTP lies in the interval between the ticked amount and the next amount up, such that the ticked amount represents the lower bound of true WTP, t_{li}, and the upper bound is the next amount up , t_{ui}. The probability that a respondent *i* ticks t_{li} can therefore be written as:

$$\Pr(\text{ticks } t_{li}) = \Pr(t_{li} \leq \text{WTP} \leq t_{ui}) \qquad [3.4]$$

where *l* is the lower bound and *u* the upper bound of WTP. In this way, responses to the payment card format can be treated as interval data which may be analyzed parametrically using maximum likelihood estimation (MLE) procedures (Cameron & Huppert 1989;Haab & McConnell 2002)[38]. MLE is a technique which aims to find the parameter values that make the observed data most likely (Myung 2003). This is done through a series of iterations which in theory test all the possible parameter values to identify those which have the highest likelihood of explaining the observed data. In practice optimization or minimization algorithms are used as well as the log-likelihood function since these are computationally less demanding (Purcell 2000). Given then that WTP for a public good, such as those described in this thesis, should be non-negative (Bateman et al. 2002)[39] and since WTP is often skewed, a log-normal distribution can be assumed which may be written as (after Cameron & Huppert 1989):

$$\log WTP = x_i'\beta + u_i \qquad [3.5]$$

where β is the coefficient vector , x_i is the vector of independent variables (for example, income, education and so on), and u_i, the error term, is distributed normally with mean 0 and standard deviation σ. Standardizing each pair of interval thresholds for logWTP it can be stated that (Cameron & Huppert 1989):

$$\Pr(tick\ t_{l_i}) = \Phi((\log t_{u_i} - x_i'\beta)/\sigma) - \Phi((\log t_{l_i} - x_i'\beta)/\sigma) \qquad [3.6]$$

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[37] Other variants of the payment ladder format require respondents to indicate the *range* within which their willingness to pay lies (for an example see Bateman et al. (2002), p. 140).

[38] Interval data may also be analysed using ordinary least squares regression however this requires assumptions about the location of true WTP, for example, the mid-point of the interval is usually used.

[39] This is because those experiencing negative utility can simply ignore its provision (Bateman et al. 2002).

where Φ is the standard normal cumulative density function. Since the observed data is fixed this probabilistic expression is re-written in terms of the log-likelihood function which represents the likelihood of the parameters values given the observed responses, such that:

$$\log L = \sum_{i=1}^{n} \log[\Phi((\log t_{ui} - x_i'\beta)/\sigma) - \Phi((\log t_{li} - x_i'\beta)/\sigma))] \quad [3.7]$$

for n independent observations with unknown parameters β and σ, where individual i ticks payment t_{li}. Using the interval regression command in STATA, the log-likelihood function can be maximized over all observations with respect to β and σ, to identify the parameter values that have the highest likelihood of explaining the observed data. Using the model output, estimates of mean and median WTP can be calculated from the following formulas (Cameron & Huppert 1989):

$$Median\ WTP = e^{(x_i'b)} \quad [3.8]$$

$$Mean\ WTP = e^{(x_i'b)} \cdot e^{(\sigma^2/2)} \quad [3.9]$$

Where b is the coefficient vector, x_i the vector of independent variables (computed at their mean values), and σ is calculated in the model output. In general, selection of the dependent variables is based on theoretical and empirical expectations – it is desirable to include exogenous rather than endogenous variables (Bateman et al. 2002;Hanley, Shogren, & White 1997).

For comparison purposes, non-parametric estimates of the central tendency measures may also be derived directly from the raw data. For example, by averaging the mid-points of the intervals (or lower bounds if a conservative estimate is preferable) to obtain estimates of mean WTP, or using more sophisticated methods such as the Kaplan-Meier product limit estimator (see (Bateman et al. 2002).

3.3.3 Validity and Reliability

Although the CVM method is now widely applied and generally accepted as a valuation methodology for non-market environmental goods, concerns have been expressed regarding the validity and reliability of the resulting estimates. Correspondingly, it is customary to assess the validity and reliability of each CVM application (Bateman et al. 2002). There are established approaches for undertaking such analyses; an overview is provided below (for a more extensive discussion see Mitchell and Carson (1989)):

Validity concerns the degree to which the estimates measure the value of the good of interest (Bateman et al. 2002;Mitchell & Carson 1989). This is typically assessed by examining three types of validity: (i) content or face validity; (ii) criterion validity; and (iii) construct validity (Pearce & Moran 1994). Content validity involves a subjective assessment of whether the survey instrument asks the correct questions for measuring the value of the good of interest in an appropriate way. This involves an appraisal of all aspects of the survey instrument (and sampling strategies), including the valuation scenario (for example, whether the good is clearly specified) and the appropriateness of chosen welfare measures, elicitation formats and provision mechanisms. Criterion validity is a more ambitious approach which compares hypothetical WTP amounts with 'real' WTP amounts, correspondingly it provides one of the most accurate assessments of validity, however, it is applicable only in the context of quasi-public goods (Mitchell & Carson 1989). It requires the creation of simulated markets in which respondents can exchange real money which is then compared with an identical hypothetical scenario, consequently it is not an option for all CVM applications – an example of this approach is provided by Bishop and Heberlein (1979).

Construct validity is perhaps the most commonly applied approach to validity tests; it seeks to validate an estimate by comparing it with other measures that it should be related to. It comprises two types of approach: (1) convergent validity which assesses the validity of an estimate by comparing it with estimates derived from other techniques for example travel-cost method or benefits transfer or meta-analysis; and (2) expectations based theory which compares results with those expected from economic theory and other empirical results (Mitchell & Carson 1989). Expectations-based validity is perhaps easier to apply since it is generally based on an examination of the bid function to assess whether expected relationships occur, that is, whether coefficients are significant and have the correct sign. For example, it would normally be expected (if the good is normal) that the income variable would have a significant and positive association with WTP (Carson, Flores, & Meade 2001). In addition, the overall fit of the model should be assessed.

Reliability relates to the stability and reproducibility of an estimate (Carson, Flores, & Meade 2001). In the CVM context, this requires the repetition of a study at different time intervals. For example, using two different samples from the same population with the same survey instrument at different points in time; or through the test-re-test approach, where the same sample is re-interviewed with the same survey instrument at a later date (Carson, Flores, & Meade 2001)[40]. Correspondingly, it is not generally considered to be a reasonable requirement for every individual study (Bateman et al. 2002;Mitchell & Carson 1989). Indeed few such

[40] Additionally, Mitchell and Carson (1989) note that the r2 value of econometric model provides an approximate indication of the reliability of the survey.

studies have been conducted (Pearce & Moran 1994). As noted, Epp and Gripp (1993) found evidence of reliability in the use of CVM to value US preferences for tropical rainforest preservation using a test-retest approach.

Finally, the NOAA Guidelines (see Arrow *et al.* 1993) provide a set of recommendations on how to design and conduct CVM surveys in order to maximise the validity and reliability of estimates. This notes the importance of (amongst others): the careful pre-testing of a CV questionnaire; the use of conservative designs to underestimate rather than overestimate; the use of WTP rather than WTA measures; the need for accurate descriptions of the programme and policy; importance of including reminders about substitute commodities and budget constraints and using follow-ups to explore reasons for WTP responses. While some of the recommendations have since been superseded by more recent empirical findings, the guidelines remain a cornerstone for the design of CVM studies.

3.3.4 Main Advantages and Disadvantages of CVM

The main advantage of CVM (as with other SP techniques) is that it provides a direct way to estimate the non-use value attached to non-market goods and services, which is not possible through indirect methods. Indeed, CVM can be used to capture all aspects of total economic value making it is an extremely flexible technique. In comparison with other SP approaches, such as choice experiments, it may be considered to be less cognitively demanding since respondents are typically required to respond to only one or two scenarios.

The main disadvantages associated with the CVM method relate to the validity and reliability of results, indeed, much work has focused on testing the robustness of the technique. Key areas of concern relate to the presence of various biases such as hypothetical and strategic bias, insensitivity to scope, framing effects, ordering effects, and elicitation effects[41]. For example, in comparative studies it had been found that actual payments are often lower than hypothetical stated payment amounts. This has led to concern that CVM surveys may result in upwardly biased estimates due to the hypothetical nature of the task. Recent literature has tested the effectiveness of 'cheap talk' in dealing with this problem (see for example, Aadland & Caplan 2003;Cummings & Taylor 1999;List 2001) in some cases with successful results (see Chapter 6 for a review of the cheap talk literature).

Another concern is strategic bias, this occurs where a respondent states a WTP amount which differs to their true WTP in order to influence the provision of the good or the required payment

[41] For example empirical work has found that different elicitation formats can produce varying results with the NOAA endorsed dichotomous choice format providing significantly larger estimates than OE responses, (Hanley, Mourato & Wright, 2001).

amount (Mitchell & Carson 1989) . For example, free-riding may occur where a respondent believes that the provision of a good is guaranteed but the stated WTP amount is not related to actual payment, thus there is an incentive to understate the true value; alternatively, if the respondent believes it is possible to influence the provision of a good, there is an incentive to bid high (Freeman 1993). Such behaviour is closely related to the elicitation format used and can be minimized by designing a survey instrument that is incentive-compatible (Bateman et al. 2002;Carson, Flores, & Meade 2001;Pearce & Moran 1994).

Scope and embedding effects have been discussed earlier in Chapter 2, these relate to the sensitivity of respondents towards changes in the scope of the good being valued. More formally, scope effects occur where one aspect of the good changes but stated WTP does not change (or changes in the wrong direction) while 'embedding' effects occur where two or more aspects of the good change with the same insensitivity in stated WTP (Carson & Mitchell 1995). Poorly designed surveys have been blamed for many of the incidences of insensitivity to scope, for example, the use of vague descriptions of the good to be valued (Carson, Flores, & Meade 2001). As experience in the application of CVM has developed, it is hoped that state-of-the-art surveys may hold more potential in overcoming such insensitivity.

Additionally CVM has been criticised for failing to provide an appropriate context for choices, largely due to the fact that it typically focuses on a single good. Thus it may confer importance or result in respondents being super-informed with respect to the good of interest, or it may simply make decisions difficult by failing to provide a realistic choice setting (Bennett & Blamey 2001).

It should also be pointed out that CVM surveys are not cheap to conduct, thus an additional drawback is the cost associated with the implementation of the technique.

This discussion on the limitations of CVM is not exhaustive; other issues relate to sensitivity to elicitation effects, cues and anchor bias, ordering effects and so on (see Mitchell & Carson 1989 for a fuller discussion).

3.4 CHOICE EXPERIMENTS

Choice experiments were initially developed by Louviere and Hensher (1982) and Louviere and Woodworth (1983) in the context of transport and market research literature and have become increasingly popular in the context of environmental valuation. They are part of the choice modelling (or conjoint analysis) approach, which also includes contingent ranking, contingent

ranting and paired comparisons[42]. The choice experiment technique is however the only choice modelling approach which definitively meets the requirements of welfare theory (Bateman et al. 2002). The method is derived from Lancaster's (1966) characteristics of value theory which states that any good may be described by a bundle of characteristics and the levels that these may take. The technique is underpinned by the random utility framework and relies on the application of statistical design theory to construct choice questions in which respondents are required to choose their preferred option amongst a series of alternatives which are differentiated in terms of their attributes and levels. By varying the levels the attributes take across the options and by including a monetary attribute it is possible to estimate the total value of a change in a good or service as well as the value of its component attributes, and to calculate trade-offs between attributes. In order to ensure the estimates derived are consistent with welfare theory a baseline or opt-opt alternative must be included, this avoids the problem of respondents being forced to choose options.

3.4.1 The Choice Experiment Survey Instrument

The choice experiment survey instrument is very similar to that used in a CVM survey, the main difference is in the design of the valuation section, which is reviewed here. The key aspects of a CE valuation section comprise: (i) policy change (and the opt-out); (ii) the attributes and levels; (iii) experimental design; (iv) the choice sets; and (v) follow-up questions.

Policy change

As with CVM, the policy change of interest may be hypothetical or real, and in order for estimates to be welfare consistent, respondents should be provided with a clear description of the conditions under the baseline conditions and with the policy change. Notably, there are different ways of presenting the baseline information in choice experiments and elsewhere the form of the opt-out has been found to significantly affect respondent perceptions of the choice tasks (Banzhaf, Johnson, & Mathews 2001;Kontoleon & Yabe 2003); this issue is reviewed in greater detail in chapter 8. The notable difference with the CE approach is that it can simultaneously estimate WTP for a number of different policy scenarios; this is because the policy change is described in terms of its constituent attributes and associated levels.

Attributes and Levels

Correspondingly, the policy changes of interest are defined in terms of their key attributes and associated levels. Attribute selection is typically based on a thorough review of the literature,

[42] Contingent ranking involves the ranking of a series of alternatives, if one of the option is always currently feasible it may provide an estimate of value consistent with welfare theory; Contingent rating involves a respondent scoring alternative scenarios for example on a scale of 1 to 10; and paired comparisons require respondents to score pairs of scenarios on similar scales (Bateman et al. 2002).

focus groups or cognitive interviews, and consultation with policy experts. The aim is to identify the key attributes which are affected by the policy change and which are relevant to public preferences. Crucially, a monetary attribute must be included in order for the estimation of marginal prices and welfare estimates. As with the CVM, this may be coercive or voluntary, the decision depends on which is the most acceptable or credible method of paying. It is important that relevant attributes are not excluded from the choice sets since this can result in respondents making assumptions about missing information when making their choices (Bennett & Adamowicz 2001). Ideally, the number of attributes should be kept to a minimum since the required sample size increases exponentially with each additional attribute and with increases in the number of levels (Bateman et al. 2002). Moreover, the greater the number of attributes the greater the cognitive burden facing respondents. Correspondingly, the norm is to have between four and six attributes[43] which aim to reflect the main policy and respondent relevant criteria[44] (Bateman et al. 2002).

Once the attributes are defined, levels need to be assigned that encompass the ranges relevant to the policy changes of interest and relevant to public preferences (Pearce, Atkinson, & Mourato 2006). The price attribute in particular should have non-linear levels covering the full range of willingness-to-pay in order to avoid occurrence of 'fat-tails', this should be tested prior implementation of the survey; (Bateman et al 2002). Levels for other attributes may be defined quantitatively, qualitatively or pictorially and may be relative or absolute – focus groups or interviews can be used to ascertain the most appropriate format. The number of levels can vary between attributes, in addition, alternative-specific designs may be used which apply different levels to specific alternatives (see Hensher, Rose, & Greene 2005;Louviere, Hensher, & Swait 2000). Finally, it is customary to provide respondents with a reference table describing the attribute and levels used in the choice experiments.

Experimental Design

Once the attributes and levels are defined these need to be combined to produce the alternatives to be presented to respondents. Since choice experiments involve the estimation of a relationship between the probability of choosing an alternative and the attribute levels contained in the alternative, it is necessary to ensure that sufficient combinations of attribute levels are provided to be able to detect the effects of interest; this is achieved through statistical design theory. There are two main approaches. The first involves presentation of the complete factorial design, that is, *all* possible combinations of attribute levels and permits the estimation of all

[43] Although recent experience suggests that respondents are able to weight up as many as 23 attributes (pers. comm. Louviere 2004).

[44] The consequence of including irrelevant attributes is that it may reduce the likelihood of valid responses being received and could affect response rates however the consequences of excluding important attributes is also important since this can cause respondents to make assumptions about missing information and bias preference estimates (Bennett & Adamowicz, 2001).

possible effects of the attributes upon choices, including main effects and interactions. However this approach invariably results in unfeasibly large designs. The more practical alternative is to undertake a fractional factorial design which reduces the complete set of alternatives down to a more manageable number which can model the main effects of interest. These designs are potentially orthogonal[45] and can be produced by statistical software such as SPSS. The drawback is that not all interaction effects may be estimable, however, as Louviere, Hensher and Swait (2000) point out they typically account for between 70 and 90% of the variance in choice models[46]. Another strategy to reduce the number of alternatives is to 'block' the alternatives so that only a sub-sample of respondents receive each block. This involves assumptions about preferences being identical across respondents and also requires a larger sample size (Bennett & Adamowicz 2001), however, these drawbacks may be offset by avoiding potential problems associated with over-loading respondents with a large number of choice sets.

Choice Sets

Once the alternatives have been produced these need to be grouped together into choice sets for presentation to respondents. This may be done via a sequential approach which involves combining cards using a particular strategy for example through random selection and the use of fold-over designs (as recommended by Louviere, Hensher, & Swait 2000) or using a simultaneous approach which determines the levels of the attributes for all alternatives in the choice sets (Bennett & Adamowicz 2001). Once constructed, choice sets should be examined for dominant or implausible options. Implausible combinations may be dealt with by explaining to respondents that some alternatives may appear nonsensical however all combinations are in fact possible.

The other main decisions with regard to the construction of choice sets are: (i) whether a generic or labelled design should be used; (ii) the number of alternatives to include; and (iii) the number of choice sets presented to respondents. Labelled experiments can be useful in conveying additional information regarding, for example, different policy approaches or as in case-study 2, alternative substitute goods (see Chapter 7). Decisions regarding the number of alternatives and choice sets to include primarily depend on the cognitive capacity of respondents, that is, the desire to avoid over-loading respondents such that they resort to heuristics or satisficing behaviour; and, the need to include all aspects of the experimental design (again these issues are considered in greater detail in chapter 7). According to Blamey, Louviere and Bennett (2001), most applications present three alternatives (including the opt-out option).

[45] An orthogonal design is one where each of the attribute levels has zero correlation with the other attribute levels – it enable the effects of the each of the attribute levels on choice to be separated out (Bateman et al. 2002).

[46] Where interaction effects are present but unaccounted for estimates may be biased (Bateman et al 2002).

Once constructed the choice sets should be introduced to respondents with clear instructions on how to respond to the questions and reminders to frame the choice in the context of everyday decisions. It is recommended that an example choice set is included.

Follow-Up questions

Similar to the CVM instrument, this section focuses on identifying invalid responses to the choice experiments. Follow-up questions are typically used to investigate: motivations for choosing 'do something' or 'do nothing'; whether or not respondents used simplified decision strategies in making choices for example, always choosing the same (generic) option regardless of attribute levels and perceptions towards the choice tasks .

Pre-testing

As with CVM, the main survey instrument should be subjected to rigorous testing prior to implementing the main survey. Emphasis should be placed on examining perceptions (and comprehension) of the attributes and associated levels and the decision processes involved in the choice experiment tasks. This may involve focus groups, cognitive testing and pilot tests.

3.4.2 Analysis of Choice Experiment Data

The main purpose of the choice experiment technique in the context of non-market valuation is to establish estimates of WTP. Choice experiments are able to provide marginal prices for changes in the underlying attributes as well as welfare estimates for total changes. To obtain these values responses to choice experiments are analysed using econometric techniques.

The theoretical basis for deriving welfare estimates from choice experiment comes from Lancaster's characteristics theory of value (Lancaster 1966) and random utility theory (Luce 1959;McFadden 1974). The former states that any good can be described as a bundle of characteristics and the levels they take. Random Utility Theory (after Luce, 1959 and McFadden, 1974) rests on the concept that utility is a latent construct which exists in mind of consumer and is unobservable directly to the researcher (Louviere 2001). The random utility framework states that the utility of a choice comprises both a deterministic (or observable) component and an unexplainable (or unobservable) component, the error term. The inclusion of the error term reflects the fact that it can be difficult to capture all influences on utility, for example due to unobservable attributes, omitted attributes, and measurement errors (Bateman et

al. 2002)[47]. Thus the latent unobservable utility U_{ai} for choice alternative a held by individual i can be described in terms of its observable component V_{ai} and its unobservable component ε_{ai}:

$$U_{ai} = V_{ai} + \varepsilon_{ai} \quad [3.10]$$

This expression can be disaggregated further to show that utility is assumed to be a function of the attributes of the good (Z_{ai}) and in addition may also vary according to characteristics of the individual (I_s):

$$U_{ai} = V(Z_{ai}, S_{ai}) + \varepsilon(Z_{ai}, S_{ai}) \quad [3.11]$$

The aim is to design a preference elicitation procedure that will capture a significant proportion of latent utility, although a proportion will always remain unexplained (Louviere 2001). As a result of the error component, predictions cannot be made with absolute certainty and are instead based on probabilities. Thus the probability that individual i will chose option a over all options j in the choice set C can be expressed as the probability that utility for option a is greater than that for all other options j, as given by:

$$\Pr(a|C) = \Pr[(V_{ai} + \varepsilon_{ai}) > (V_{ji} + \varepsilon_{ji}) = \Pr[(V_{ai} - V_{ji}) > (\varepsilon_{ai} - \varepsilon_{ji}) \quad [3.12]$$

This equates to the probability that the difference between the observable utility for option a and for all other options j is greater than the difference in the error terms (or unobservable utility) for option a and for all other options j (Bateman et al. 2002). In order to calculate the choice probabilities, assumptions need to be made about the distribution of the error terms (since its distribution is not directly observable). The typical assumption is that error terms are additive in the utility function and are independently and identically distributed according to an extreme value distribution known as the Gumbel distribution ((Bateman et al. 2002;Kling & Thomson 1996). This means the probability of individual i choosing alternative a can be given by:

$$\Pr(a_i) = \frac{\exp(\mu V_{ai})}{\sum_{j \in C} \exp(\mu V_{ji})} \quad [3.13]$$

where μ is a scale parameter which is typically normalised to 1. This expression can be estimated using the conditional logit model (Bateman et al. 2002). Welfare estimates for a

[47] The error part can also be said to be 'unobserved individual idiosyncrasies of tastes' (Louviere, Hensher & Swait, 2000).

change from initial conditions with indirect utility (V^0) to new conditions with indirect utility (V^1) can be calculated using the equation:

$$WTP = \frac{-1}{\beta_{price}}\left[\ln\sum_{a}^{J^0}\exp(V_{ai}^0) - \ln\sum_{a}^{J^1}\exp(V_{ai}^1)\right] \quad [3.14]$$

Following on, the marginal value (or implicit price) of a change in any single attribute, can be given by:

$$WTP = \frac{-\beta_{attribute}}{\beta_{price}} \quad [3.15]$$

The conditional logit model is the preferred model for the estimation of choice experiment data (Hensher, Rose, & Greene 2005;Louviere, Hensher, & Swait 2000) primarily due to its simplicity. However, an implicit requirement of this model is the independence from irrelevant alternatives property (IIA). This assumes that each alternative is viewed as distinct and independent such that the error terms associated with each alternative are uncorrelated[48]. The Hausman-test is commonly used to test for this property. In the case of IIA violations, the main options are to increase the deterministic part of the utility expression[49] by including more choice relevant variables for example through interactions between attributes and socio-economic variables, or to use an alternative model specification which relaxes or removes the requirement of IIA (Bateman et al. 2002;Hensher, Rose, & Greene 2005).

One such model is the nested logit, this allows a relaxation of the IIA property by assuming instead a *generalised* extreme value distribution which allows the choice of alternatives to be correlated within but not between groups of alternatives (Kling & Thomson 1996). This means the unobserved influences associated with the choice of an alternative may be found to be similar within groups but uncorrelated between groups. For example, in the current context if an attribute for example visitor facilities fails to be included in the model but should be, the influence of this missing attribute is likely to be similar for the two conservation alternatives but not for the opt-out alternative – thus, the 'missing' information in the error component for conservation alternatives is likely to be more similar than the 'missing' information in the error component for the 'opt-out' (after Hensher, Rose, & Greene 2005). The nested logit enables a

[48] The IIA assumption is the behavioural equivalent of the IID assumption. It states that the ratio of probabilities of any two alternatives should be the same whether or not other alternatives are present or removed (Bateman et al. 2002).

[49] Since increasing the observable part of utility will in turn reduce the random component (Bateman et al. 2002;Hensher, Rose, & Greene 2005).

relaxation of the IID and IIA assumptions such that the variance in the error components can be correlated within groups but remains independent between groups[50].

In order to define a nesting structure the analyst is required to make assumptions about the correlation of error terms (Kling & Thomson 1996). The nested structure is often interpreted as implying sequential decisions by respondent but this is not necessarily the case since the correlated error terms may come from any unobserved influences (Kling & Thomson 1996). The nested logit is actually a set of linked MNL models (Hensher, Rose, & Greene 2005). Nesting produces conditional choices (alternatives) and marginal choices ('do nothing' or 'do something') (Hensher, Rose, & Greene 2005). In a two level nested logit model the probability of an individual choosing alternative a in class k is given by:

$$\Pr_{ak} = \Pr(a \mid k)\Pr(k) \qquad [3.16]$$

where $\Pr(k)$ is the probability of choosing the kth class of outcome and $\Pr(a \mid k)$ is the probability of an individual choosing alternative a conditional on choosing the kth class.

Using the nested logit specification, welfare estimates for a change from initial conditions with indirect utility (V^0) to new conditions with indirect utility (V^1) are given by (after Kling & Thomson 1996):

$$WTP = \frac{-1}{\beta_{price}}\left\{\ln\left[\sum_{k=1}^{K}\left(\sum_{a=1}^{J}\exp\left(V_{ak}^{0}/\lambda_k\right)\right)^{\lambda_k}\right] - \ln\left[\sum_{k=1}^{K}\left(\sum_{a=1}^{J}\exp\left(V_{ak}^{1}/\lambda_k\right)\right)^{\lambda_k}\right]\right\} \qquad [3.17]$$

where λ_k refers to the inclusive value coefficient produced in model estimation.

3.4.3 Validity and Reliability

As with the CVM, it is important to assess the validity and reliability of the estimates derived from choice experiment techniques. The same typology applies and in many cases validity is assessed in the same way. Expectation-based validity may be assessed by examining the model results to check whether parameter estimates are significant and have the correct sign; the overall fit of the model should be assessed; and depending on the regression model the IIA assumption should be tested (Bateman et al. 2002). In addition, emphasis is placed on assessing

[50] In addition, neither the multinomial probit model nor the mixed logit (random parameter) models require the IIA assumption to hold true however since both are computationally more complex in the current study the nested logit is used (Bateman et al. 2002;Hausman & McFadden 1984;Hensher, Rose, & Greene 2005).

whether choices are consistent across choice sets[51] and whether the choices made are rationale, for example, by checking whether clearly superior options are chosen. As noted earlier, it is also important to check for the presence of heuristics or simplified decision strategies, for example, through the use of follow-up questions to explore motivations for choices; in particular, in situations where the opt-out is chosen across all choice sets (this issue is re-visited in Chapter 6). The technique may also be susceptible to learning and fatigue effects which may be assessed by examining how individual choices vary across sequential choice sets.

3.4.4 Main Advantages and Disadvantages of Choice Experiments

One of the key advantages of the CE technique is that it provides a very rich data set on public preferences since respondents are required to make multiple trade-offs over a series of tasks in one application (Bennett & Blamey 2001) [52]. The technique also provides automatic tests for scope effects as recommended by the NOAA panel. Sensitivity to scope is assessed by examining the statistical significance of the parameter estimates for the attributes presented in the models; insignificance indicates insensitivity (Bennett & Blamey 2001). Since choice experiments infer an individual's preferences from choice-based decisions rather than by directly asking about willingness to pay, they also offer the advantage of de-emphasising the monetary aspect of the valuation task, since the price attribute is typically only one of several attributes which describe the good. This may help in reducing strategic behaviour (and yea-saying) (Hanley, Mourato & Wright, 2001). The technique is also considered to offer advantages in dealing with framing issues, through its ability to explicitly incorporate substitutes (and complements) into the decision process[53] (Bennett & Blamey 2001). And, it is regarded as having more potential in benefit transfer approaches given that the valuation is derived from the underlying characteristics of a good rather than a specific good (Hanley, Wright, & Adamowicz 1998). Choice experiments may also offer the advantage of being less costly than CVM since they provide more information regarding individual preferences and can value more than one policy scenario in one questionnaire. Thus choice modelling seemingly has the potential to address a number of the shortcomings associated with the CVM, however it should be noted that some of the advantages remain empirically unproven (Adamowicz, Boxall, Williams, & Louviere 1998;Bennett & Blamey 2001;Hanley, Mourato, & Wright 2001;Hanley, Wright, & Adamowicz 1998).

[51] Foster and Mourato (2002) describe a method for assessing consistency in contingent ranking experiments.
[52] CVM can be used to value multidimensional changes however it is likely to require a series of CV scenarios which would be costly to implement.
[53] It is suggested by both Boxall et al (1996) and Hanley, Wright and Adamowicz (1998) that CM is superior to CVM where substitution effects may be important.

The technique is also associated with a number of limitations. One of the primary issues relates to the greater cognitive burden placed on respondents and the associated problems of inconsistency, learning and fatigue effects which may lead to random errors and difficulty in modelling responses. In addition in estimating the aggregate value of a good the approach relies on the implicit assumption that the total value is equal to the sum of its parts raising two key concerns: (1) the problem of ensuring all relevant attributes are included and what to do about missing attributes and (2) whether the attributes are indeed additive in this way, research elsewhere has found that values of whole bundles of improvement may be valued less than the sum of component values (Hanley, Mourato, & Wright 2001;Hanley, Wright, & Adamowicz 1998). The technique is also susceptible to sensitivities relating to the study design as is the case with other stated preference techniques. The design process itself is reliant on many more technical complexities than in other techniques which if violated can seriously compromise the estimates derived (Bennett & Blamey 2001). Moreover, due to the relatively recent emergence of the technique in the field of environmental valuation, a number of issues specific to the valuation of non-market environmental goods have yet to adequately addressed, for example, how varying the presentation of the opt-out affects choice decisions in modelling preferences for public goods (as will be discussed in Chapter 8).

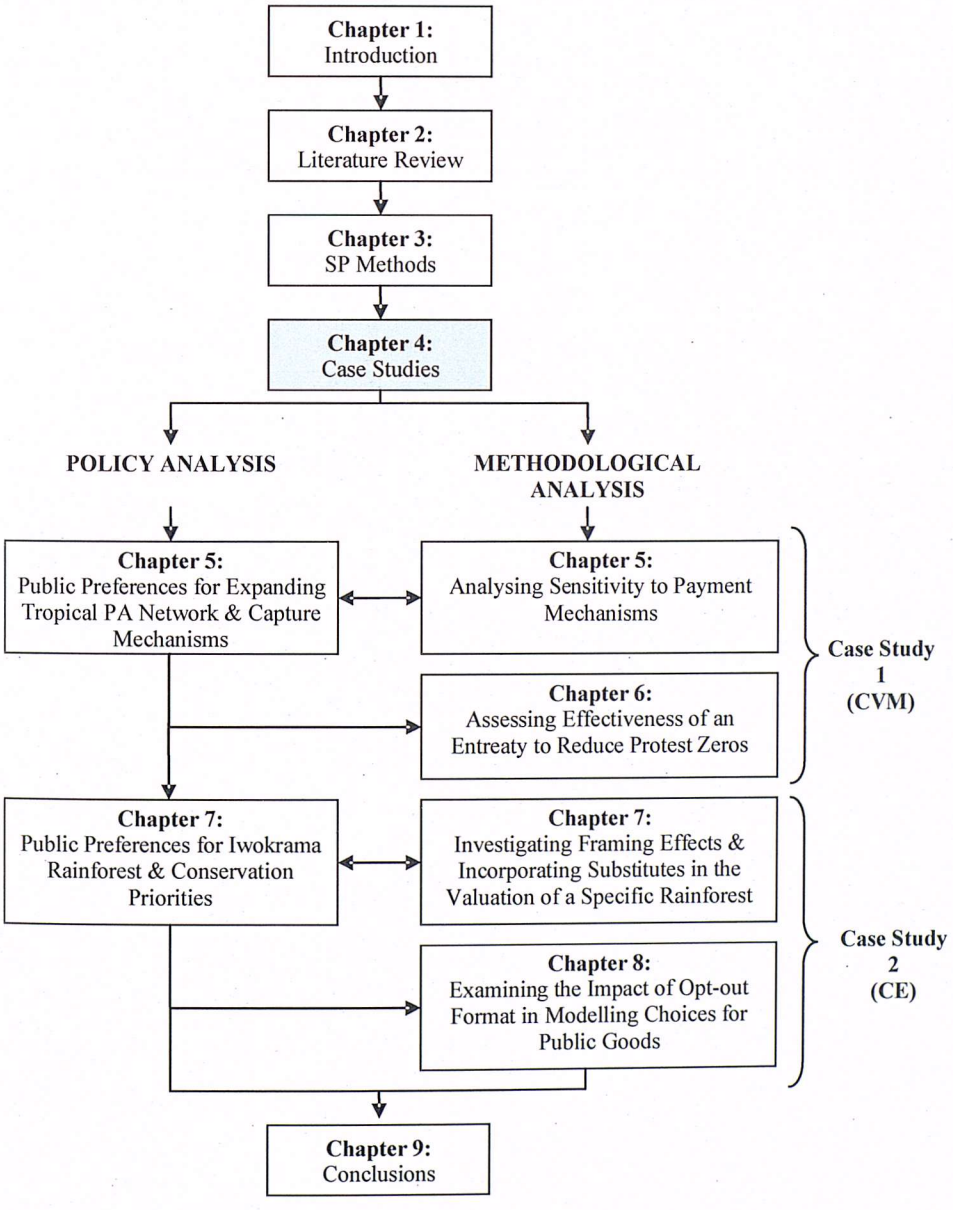
3.5 COMPARING CHOICE EXPERIMENTS AND CONTINGENT VALUATION METHOD

Despite recent interest in choice modelling as a potentially superior alternative to CVM (Hanley, Mourato, & Wright, 2001) there have been relatively few studies to compare the two techniques (Foster & Mourato, 2003) and findings have been mixed. Boxall et al (1996) reported CV estimates to be 20 times those derived from CE. In contrast, Hanley *et al* (1998) and Hanley, Wright and Adamowicz (1998) found estimates from CM to be greater than those derived from CVM, although in both cases the differences were not statistically significant. Adamowicz *et al* (1998) and Foster and Mourato (2003) found that CM estimates were smaller or larger than CV estimates depending on the model specification and on the level of inclusiveness of the good being valued, respectively. With regard to other issues both Boxall *et al* (1996) and Hanley, Wright and Adamowicz (1998) find support for the premise that CM maybe superior to CVM in terms of dealing with substitution effects. In general, it is regarded that CVM is more suited to providing estimates of the total value associated with a change in the provision of a good whereas, CM is more applicable to providing estimates of WTP for attributes of a good and the information on how attribute relates to each other (Bateman et al. 2002;Foster & Mourato 2003;Hanley, Wright, & Adamowicz 1998).

Chapter 4: Introduction to the Case Studies

SUMMARY

This chapter provides an overview of the two case-studies undertaken to investigate public preferences towards tropical biodiversity amongst distant beneficiaries. Case study 1 applies the contingent valuation method to investigate the preferences of London residents towards expanding the protected area network across developing countries and towards alternative capture mechanisms. Case study 2 applies the choice experiment technique to investigate the preferences of London residents towards a specific rainforest conservation programme and toward conservation policy priorities.



4.1 INTRODUCTION

The focus of this research is the examination of public preferences for tropical biodiversity, amongst distant beneficiaries, through the application of stated preference techniques. A key objective is to address unresolved methodological issues related to the application of the contingent valuation method and choice experiment techniques in this context. The research also seeks to inform to priority-setting and policy formulation at the local and international scale by providing new information on public priorities towards conservation.

Two case studies are used to address these issues: (1) a contingent valuation study of London residents WTP for expanding the protected area network and preferences for funding mechanisms; and (2) a choice experiment study to estimate London residents WTP towards rainforest conservation and priorities for conservation funding.

The current chapter provides a detailed description of each case study including: the research design; development of the survey instrument including focus groups, cognitive interviews and pilot-testing; a description of the final survey instrument; and sampling and data collection methods.

4.2 CASE-STUDY 1: EXPANDING TROPICAL PROTECTED AREA NETWORK AND CAPTURE MECHANISMS

4.2.1 Policy Background

At the 2002 World Summit on Sustainable Development over 190 governments committed to the goal of achieving by 2010 a significant reduction in the rate of biodiversity loss. One of the key targets in meeting this goal is the establishment of an effectively managed and ecologically representative, global system of protected areas (CBD 2003a). According to the best available data this is expected to require the creation of many new protected areas to cover the most urgent unprotected sites (Rodrigues et al. 2004a). The vast majority of these sites are located in the developing countries where large shortfalls in conservation funding already exist (Balmford et al. 2003;Balmford & Whitten 2003;Bruner, Gullison, & Balmford 2004).

Recent estimates suggest that the creation and effective management of new protected area to cover the most urgent sites across the developing countries will cost approximately $10.8 billion per year over the next 10 years (Bruner, Gullison, & Balmford 2004). Given the scale and urgency of the problem, (and the more pressing domestic agendas) it is anticipated that much of this funding will need to come from the developed countries if global biodiversity objectives are to be met. This raises the question of how much value is placed on expanding the network of

protected areas by the public in developed countries and how can these values best be captured to maximise funding? This case-study aims to address this by investigating the value attached by UK residents to expanding the existing network of protected areas across the developing countries. And, crucially, to explore how these values might best be captured by exploring willingness-to-pay (WTP) under different payment mechanisms. In doing so this research aims to provide preliminary guidance to help address the problem of how to maximise international funding for tropical conservation. It also seeks to develop the application of the CVM by exploring the use of an entreaty to reduce protest zeros and sensitivity to payment mechanisms.

4.2.2 Research Design

The research addresses the following policy related questions:

- What are London residents' current attitudes towards, knowledge and awareness of biodiversity and tropical biodiversity?
- What are London residents' attitudes towards funding tropical conservation and cost-sharing?
- How much are London residents willing to pay towards expanding the tropical protected area network across the developing countries?
- Under which funding mechanism is WTP maximised? And under which funding mechanism would respondents most prefer to contribute?

In addition, this case study also addresses a number of methodological questions related to the use of stated preference techniques:

- Are respondents sensitive to the type of payment mechanism presented? How does this affect: (i) WTP; (ii) protest responses; and (iii) certainty?
- What are the reasons for sensitivity towards payment mechanisms?
- Can an entreaty help to reduce protest responses which might arise due the scale and nature of the good being provided?

The above issues are addressed in a case study to estimate London residents WTP towards expanding the protected area network under three different payment mechanisms, using a randomised contingent valuation method.

4.2.3 Development of the Survey Instrument

The survey instrument was developed in three stages: (i) literature review and expert consultation to establish the policy change of interest; (ii) focus group to test the contingent scenario and explore public attitudes and awareness; and (iii) a pilot-test of the draft survey instrument.

4.2.3.1 Literature Review and Expert Consultation

The policy change of interest was developed through a thorough review of the literature on the current status and extent of the global protected area network and on options for mobilizing financial resources for tropical conservation (see CBD 2005). One of the chief aims was to help guide policy makers in assessing the cost and benefits of expanding the tropical protected network by providing information on the non-use benefits to distant beneficiaries. To this end, it was desirable to use a contingent scenario that (i) had already been the subject of a cost assessment and (ii) was based on the latest information available on the priority areas for expansion. Correspondingly the policy change presented to respondents was adapted from that used by Bruner, Balmford and Gullison (2004) in estimating the financial costs of expanding the protected area network across the developing countries. The calculations used in their scenario were adapted to fit the current research. A full description of the scenario is provided in section 4.2.4 and in Chapter 5.

4.2.3.2 Focus Group

A focus group is an informal group discussion conducted by a moderator amongst a small group of respondents. They are commonly used in the design stages of stated preference studies to gain insights into the issue of interest, and to test aspects of the questionnaire design (Bateman et al. 2002).

Correspondingly, the contingent valuation scenario and other aspects of the survey instrument were tested in a focus group setting. Since the earlier research conducted for case-study 2 fed into this study (and due to budget constraints), only one focus group was conducted. This consisted of five participants, one moderator and an assistant and was held at the parish offices of St Augustine's Church in Kensington on 20th October 2005. Participants were recruited on a volunteer basis, and a £20 donation was made to the Church as payment for their time. The participants consisted of three males and two females, one aged 25-35; two aged 45-60, and two aged 60+ years. The focus group lasted for one and a half hours, which is the duration recommended in the marketing literature (Malhotra 2004). The discussion was tape-recorded, and notes were also taken by the assistant. The moderator recorded brainstorming sessions on a flipchart.

Aims:

The main purpose of the focus group was to explore understanding and awareness of tropical biodiversity, attitudes towards funding conservation and to test aspects of the valuation scenario. The main discussion points consisted of:

(i) Understanding of the term 'biodiversity';

(ii) Attitudes towards and awareness of biodiversity loss, and, motivations for conserving biodiversity;

(iii) Comprehension and attitudes towards the proposed valuation scenario;

(iv) Attitudes towards developed countries helping to pay the costs of the proposed protected area programme, and default assumptions about how developed countries would fund the proposed programme;

(v) To explore the range of WTP for the proposed programme and possible protest responses;

(vi) To explore perceptions of the proposed payment vehicles and preferences for ways of contributing towards tropical conservation.

Main Findings

The main findings of the focus group are summarised below (a full report is provided in the Appendix):

- Participants were familiar with the term biodiversity and with the concept of biodiversity loss: all participants had previously heard the term biodiversity; most could provide basic definitions; and most were able to provide examples of local changes in biodiversity.
- When considered alongside other issues facing society today, participants were not overly concerned about the problem of global biodiversity loss; however, the majority believed that the conservation of biodiversity was a 'good thing'. This was motivated by the value attached to the richness of life, concerns about animal welfare and the need to avoid upsetting the balance of nature.
- Participants had mixed views on the proposed policy change. Three participants expressed positive attitudes towards the proposed programme however the other two participants expressed concerns about potential problems with corruption in developed countries, and enforcing the protected areas.
- Consistent with findings elsewhere, all participants believed that developed countries should help contribute to the conservation of tropical biodiversity. Indeed all participants agreed that if the proposed expansion were to go head it would only work if developed countries contributed.
- Participants did not feel able to state a WTP amount, although this outcome was led by one dominant participant refusing to 'play the game'. One participant felt that it would only be possible to come up with an answer when actually asked to part with money – to help overcome this issue a commencement date for payment was included in the WTP question in the final survey instrument.
- Default assumptions about how the programme would be funded included all three vehicles preliminarily selected for the valuation scenario, namely government taxes and charitable donations, and paying via higher prices for goods.

- Viewpoints differed on how the programme would best be funded and on the pros and cons of the three proposed funding options. Each of the options was considered by at least one participant to be a 'preferred' option. There was no one clearly preferred option. The tax vehicle received the most negative and positive comments compared to the other vehicles. The higher prices vehicle received the most votes as 'preferred option', and the charitable donations option received the fewest negative comments.

Overall, the main finding of the focus group was that some respondents may hold negative perceptions towards the proposed policy change. This was not unexpected as Carson (1998) points out, one of the difficulties in assessing public preferences for global scale public goods is convincing respondents that implementation programmes can realistically provide the good of interest. Interestingly, the concerns raised by the two participants in the current focus group were almost identical to those predicted by Carson (1998)[54], namely, problems with corruption and enforcement. This suggested that revisions should be made to the final survey instrument in order to address the potential problem of respondents protesting due to the real-life implementation issues. Although Carson (1998) states this 'may be an insurmountable problem for CV survey designers' (p. 22), it was hypothesised that recent developments in the use of entreaties to deal with other problems in CVM literature, (for example the use of cheap talk to deal with hypothetical bias) may hold some potential for dealing with any potential 'protest' responses in the current context. This research is discussed in greater detail in Chapter 6. It should be noted that the focus group was somewhat biased towards older participants which may have affected outcomes, for example, negative comments towards the tax payment vehicle were predominantly raised by the older participants. A more age-balanced group may have brought more heterogeneity into the discussion, for example, it's possible to envisage that views on the overall importance of biodiversity conservation and default assumptions over likely payment vehicles may differ between age groups.

4.2.3.3 Pilot Testing

A draft version of the questionnaire was field tested using respondents similar to those that were included in the final survey and under similar survey conditions (after Bateman et al. 2002). The survey was distributed in a randomly selected street within one of the six London boroughs selected for use in the main survey (see section 4.2.5). The survey was conducted using the same drop-off format intended for the main survey, with the exception that completed questionnaires were collected rather than mailed back (due to time constraints). A total of 85

[54] Carson (1998) states that 'there will be respondents who believe that even if they pay for the preservation plan, the tropical forests will still disappear as a result of corrupt politicians or simply the inability of some developing countries to enforce tropical rainforest preservation policies' (p. 25).

questionnaires were distributed, and a total of 31 questionnaires were returned, giving a response rate of 36%.

Aims

The purpose of the pilot test was to: (i) identify any problems with question wording, ordering, and, other details such as question skip patterns; (ii) to further test the valuation scenario in particular whether or not respondents would be willing to pay, reasons for zero willingness to pay, and the range of the payment ladder intervals; (iii) to test whether respondents were able to cope with the cognitive demands of the sequential contingent valuation questions; and (iv) to assess the likely survey response rate.

Main Findings

A summary of the main findings from the pilot test is provided below:

- Contrary to the focus group findings, in the pilot survey only two respondents (out of a total of thirty-one respondents) expressed an unwillingness to contribute towards the programme due to concerns about real-life implementation problems.
- Although the pilot sample was too small to test explicitly the effect of the entreaty script, the overall results suggested that the majority of respondents now bought into the valuation scenario, either as a result of improvements in the wording of the scenario, the addition of the entreaty or due to the larger sample size.
- The range of payment intervals was found to be adequate, with only one respondent ticking the highest amount on the ladder.
- Almost two-thirds of respondents experienced sensitivity in their stated willingness to pay across the vehicles, and item non-response for these questions was very low (only two respondents failed to answer all three questions). This confirmed the relevance of investigating willingness to pay under different payment vehicles and also that respondents were able to cope with the cognitive demands of answering three sequential questions.

In accordance with these findings, a few minor changes were made to the survey instrument in preparation for the main survey, these comprised:

- Slight rewording and reordering of the attitudinal and experience questions in the preliminary and final sections of the questionnaire and the clarification of instructions in the follow-up questions.
- A payment commencement date was included in the WTP question to help address issues raised in the focus group testing.
- The first sentence in the description of the higher prices vehicle was changed from 'governments agree to reduce spending on subsidies which support environmentally harmful practises in agriculture, forestry, fishing and mining sectors' to 'governments agree

to reduce spending on subsidies in agriculture, forestry, fishing and mining sectors'. It was decided to remove the emphasis on 'environmentally harmful practises' since this seemed contentious and two respondents in the pilot stated that their WTP under this vehicle was motivated solely on the basis of objecting to the government supporting 'environmentally harmful practises'.

4.2.4 Final Survey Instrument

The final survey instrument was designed to address both policy and methodological questions as outlined in section 4.2.2. A within-subject design was used to estimate WTP under three, sequential, payment mechanisms in a randomised CVM and a split-sample design used to test the effectiveness of an entreaty in reducing the likelihood of protesting[55]. Thus six versions of the final questionnaire were developed to accommodate: (1) the need to randomise the order of the three sequential valuation questions; and, (2) to test the effect of including an entreaty (see Table 4.1). With the exception of the random ordering of the three payment vehicles and the absence or inclusion of the entreaty script, the final questionnaire was identical across all six versions.

Table 4.1: Versions of Final Survey Instrument (Case Study 1)

Level 1	Level 2: Randomised Order	Version
No Entreaty	Tax, Higher Prices, Donation	1
	Donation, Tax, Higher Prices	2
	Higher Prices, Donation, Tax	3
Entreaty	Tax, Higher Prices, Donation	4
	Donation, Tax, Higher Prices	5
	Higher Prices, Donation, Tax	6

The questionnaire was designed to be self-administered, following closely the principles of The Total Design Method and The Tailored Design Method (Dillman 2000;Dillman 1978) which provide guidance on achieving high quality information and high response rates. This included: the use of booklet format; the use of simple words; avoidance of double-barrel questions; questions were worded in complete sentences; questions were vertically aligned; consistent instructions were provided for all questions and skip patterns; question and response categories were differentiated using bold print for questions and light print for responses; all questions fitted each page without running over; answer spaces were consistently placed at the right of the response category label and all response categories were mutually exclusive (Bateman et al.

[55] Sequential ordering has the advantage of ensuring that information is collected for each mechanism as opposed to a simple choose one approach which could lead to insufficient information being collected for one or more options.

2002;Dillman 2000;Dillman 1978). To help make the questionnaire interesting to respondents and to avoid them falling into patterns of answering, a variety of question formats were used including, open-ended, closed-ended, partially close-ended, ranking and rating scale questions (Bateman *et al.* 2002).

The structure of the final survey instrument followed standard CVM design as discussed in the pre-ceding chapter (see Table 4.2). It comprised six sections covering: general issues; conservation issues; valuation scenario; follow-up questions; socio-demographics; and a final section on environmental beliefs and behaviour. The questions were ordered in a logical sequence following a broadly 'funnelled approach' (Bateman et al. 2002) with the exception of the final section on environmental beliefs which was included at the end in case of respondent fatigue (after O'Garra 2005).

Table 4.2: Questionnaire Structure

Section	Content
A General Issues	Ranking of general issues and environmental issues
	Membership of environmental organisations and previous donations to environmental causes
	Experience of developing countries and protected areas
B Conservation Issues	Understanding of term 'biodiversity'
	Knowledge of tropical conservation and causes of biodiversity loss
	Information box on biodiversity and biodiversity loss
	Attitudes towards developed countries paying costs of conserving tropical biodiversity and cost-sharing
C Valuation Scenario	Description of Valuation Scenario
	Entreaty (in one treatment only)
	Payment Principle question
	Three WTP questions in randomised order, with certainty and zero WTP follow-ups
D Follow-up	Reasons for sensitivity to payment vehicles
	Perceptions towards payment vehicles
	Motivations for WTP and zero WTP
	Perceptions towards proposed protected area programme
E Socio-Demographics	Key socio-demographics indicators
F Environmental Beliefs & Behaviour	Agreement with environmental statements
	Frequency of environmental behaviour
	Attitudes towards the questionnaire

The first section covered attitudes towards general issues and environmental issues and in addition previous experience of supporting environmental causes through either membership of

environmental organisation or donations of time or money. Two different ranking questions were included which aimed at offering respondents more opportunity to think about the possible trade-offs between the good of interest and other public goods; this has been found to enhance reliability (Mitchell & Carson 1989). Two transition questions were included to lead into the next section these explored previous visits to developing countries and prior experience of protected areas in developing countries.

Section B was aimed at exploring knowledge, awareness, and attitudes towards biodiversity and tropical conservation issues. After the preliminary questions respondents were presented with an information box which provided a simple definition of the term biodiversity[56]; examples of goods and services provided by biodiversity; information on the status of global biodiversity and introduced proposed policy responses. The purpose was to ensure all respondents had a similar, minimum, level of knowledge regarding the good of interest, prior to the valuation section. The section also included preliminary questions to investigate attitudes towards funding tropical conservation.

4.2.4.1 Valuation Section

In the valuation section respondents were presented with a scenario adapted from that used in Bruner, Gullison and Balmford (2004). Their scenario was based on the latest data available on how to prioritize the expansion of the existing protected area network utilizing the results of the global gap analysis by Rodrigues *et al.* (2003; 2004a; 2004b). Thus, the scenario presented to respondents was a real one but focused solely on the *expansion* of the protected area network across the developing countries. To help convey this, a map of the urgent unprotected sites and information on estimated programme costs were included in the scenario. The full valuation scenario is presented in Figure 4.1.

Willingness to pay was assessed at two stages. Firstly, respondents were asked whether in principle they would be willing to contribute to the proposed programme. Those responding YES or DON'T KNOW went on to the second stage of the valuation scenario and those stating NO went straight to the follow-up questions. At the second stage, respondents were asked to report their maximum WTP per annum for the next 10 years for the proposed change under

[56] Biodiversity is a complex concept for which no universally agreed upon definition exists - definitions have recently been found to vary widely both between disciplines and policymakers (Ewers & Rodrigues 2006;Holt 2006). This adds to the challenge of creating a basic information platform from which respondents can respond to biodiversity valuation questions. Carson (1998) advises that if the term biodiversity is introduced that it 'will need to have its meaning conveyed to respondents in a very simple way'. In the current context the decision was taken to include a simple definition adapted from a recently published document by the CBD which defined biodiversity as the term given to 'describe the variety of life on Earth' (CBD 2000b). In addition respondents were provided with examples of the types of goods and services provided by biodiversity.

three randomly ordered payment mechanisms. The three payment mechanisms were selected to inform policy debate; they consisted of a tax increase, higher prices and a donation vehicle (full details are provided in Chapter 5).

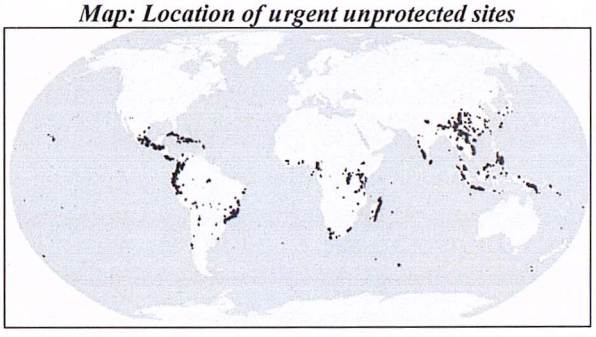
Figure 4.1: Valuation Scenario

Background:
A recent assessment of the world's protected area network has revealed that important areas in almost all regions but especially in the developing countries are outside the network. These countries contain most of the worlds remaining biodiversity and are experiencing the highest rates of loss.

The Problem:

- New protected areas are urgently needed across the developing countries to conserve the highest priority sites which are under severe threat (see map).
- These sites contain approx 1000 species, including many rare and endangered species, which are currently not protected anywhere else in the world; and,
- They include many different types of habitat and ecosystem including tropical rainforests, savannahs, wetlands, islands and mountain ecosystems.

Map: Location of urgent unprotected sites



Proposed Solution:
To conserve these sites the existing network of protected areas needs to be expanded by 30%, meaning an additional 3.5 million km2 of tropical habitats and ecosystems (an area approx 15 times the size of the UK) need to be added to the network.

Without this expansion many of these sites are likely to become severely degraded within the next 10 years, meaning the loss of many species, habitats and ecosystems.

Costs: It will cost approx $11 billion per year for the next 10 years, to create & effectively manage the new protected areas; including ensuring local communities are no worse off.

Some of these costs can be met by the developing countries however additional funding will be needed from the developed countries if the programme is to go ahead.

The elicitation format was a payment ladder: respondents were presented with a list of possible payment amounts and asked to tick the maximum they would be willing to pay. In order to reduce any potential effects the range of values displayed on the ladder were based on pre-test surveys and included an open-ended 'other amount' category. The payment amounts were selected to be non-linear. An example of the payment ladder WTP question under the donation vehicle is presented in Figure 4.2.

As discussed, respondents can experience uncertainty in the valuation of unfamiliar goods which in turn may affect welfare estimates. Thus, immediately after each payment ladder respondents that reported positive WTP amounts were asked in a follow-up question to indicate how certain they were that they would really pay the reported amount if they were asked in real-life to do so using a scale of 0% (absolutely uncertain) to 100% (absolutely certain) [57].

Figure 4.2: Example of Donation Vehicle Payment Ladder Question

What is the maximum you would be willing to donate through this scheme, per year for the next 10 years, starting from 31st March 2006, to ensure that the proposed protected area programme goes ahead? **Please consider the amounts in the following table and place a tick next to the maximum amount you would be willing to pay. Please bear in mind your income constraints and try to be as realistic as possible.**

Annual Payment	***TICK ONE ONLY***	
0		→ Go to C.4
50p		
£1		
£2		
£5		
£7		
£10		
£12		
£15		→ Go to C.3
£20		
£30		
£50		
£60		
£100		
£250		
Any other amount (pls specify):		

In a separate section, additional closed- and open-ended[58] follow-up questions were used to explore reasons for sensitivity in WTP between payment vehicles, and perceptions and attitudes towards the payment vehicles and proposed programme. In accordance with standard procedures in the design of stated preference questionnaires follow-up questions were also

[57] An alternative approach used in the CVM literature is to adapt the payment ladder to enable respondents to express the range of values over which respondents are certain/uncertain of paying.

[58] The use of an open-ended question format was particularly informative in exploring reasons for sensitivity to payment vehicles since this format enables respondents to openly express his or her viewpoint, which can provide valuable insights (Bateman et al. 2002)

included to explore motivations for positive and zero willingness to pay (Bateman et al. 2002;Mitchell & Carson 1989).

The final sections of the questionnaire investigated socio-demographics and environmental beliefs and behaviour. A copy of the final survey instrument is presented in Appendix 2.

4.2.5 Sampling and Data Collection

Whilst the ideal target population would have been the UK as a whole, due to study constraints the target population was confined to adults living in London. Correspondingly, the main survey was distributed in a drop-mail back format to randomly selected households across London. .

The sample frame population (residential units within London) was divided into distinct populations or strata based on the existing division of London into its thirty-three constituent boroughs. The boroughs were grouped into low, middle and high 'income' strata (based on indices of deprivation[59]) and two boroughs were subsequently randomly selected from each group: (i) High: Kingston-upon-Thames and Harrow; (ii) Middle: Hammersmith and Fulham and Wandsworth; and (iii) Lambeth and Hackney. A list of street names was obtained from local borough officials for each of the selected boroughs and one street was randomly selected from each to act as nodal point from which to begin the survey (see Appendix 3 for a list of survey locations).

The survey was distributed by calling at every other house on the nodal street. Following a brief introduction, households were asked to participate in the survey; those that were willing to do so were given a cover letter, a questionnaire and a stamped-addressed envelope for the survey return[60]. To increase the randomness of the design the cover letter requested that the survey be completed by the member of the household (aged 18 years or older) with the most recent birthday. Once all the houses in the first (nodal) street had been called upon in this way the same procedure was conducted in the next consecutive street until all surveys were distributed. To reduce non-response error[61], the survey was conducted at different times of the day, the main delivery times were between 6.30 pm – 9 pm Mon-Thurs and additional deliveries

[59] The Index of Multiple Deprivation is a 'measure of multiple deprivation at the small area level' (ODPM 2004). It is made up of seven domain indices relating to income deprivation, employment deprivation; health deprivation and disability; education, skills and training deprivation; barriers to housing and services; living environment deprivation and crime. Thus the index highlights important and relevant factors which may be expected to influence WTP such as income; education; employment with income and employment deprivation carrying 45% of the multiple index weighting.

[60] Respondents were asked to return the survey within one month of delivery; a return by date was printed on the front and last page of the questionnaire.

[61] Non-response may occur where it is not possible to contact parts of the sample frame or because they refuse to be interviewed or send back the questionnaire.

being made in the afternoons between 2-5pm and on weekends. In this way a total of 1836 questionnaires were distributed between 18th and 30th Jan 2006, using eight trained assistants.

In accordance with the Tailored Design Method to help improve response rates a follow-up 'thank you/reminder' postcard was sent approximately 10 days after drop-off to all households that had not yet returned a completed questionnaire (Dillman, 2000). In addition, an incentive was included which offered respondents the chance to win a £20 voucher on return of a completed survey.

4.3 CASE-STUDY 2: IWOKRAMA RAINFOREST AND CONSERVATION PRIORITIES

4.3.1 Introduction

This case study examines public preferences towards the conservation of a specific rainforest, Iwokrama Rainforest in Guyana, and how the public prioritise between alternative rainforest investment opportunities and conservation policy responses. Additionally, it addresses a number of methodological issues relevant to the estimation of the values attached to the conservation of a specific rainforest and the framing of rainforest choices. The choice experiment technique is used since this enables a more detailed examination of how the public trade-off the multiple facets of rainforests. This case-study is expected to provide useful information for shaping both local and internal conservation policy.

4.3.2 Research Design

This research addresses the following policy related questions:

- What are London residents' current attitudes towards, knowledge and awareness of tropical rainforests?
- How much are London residents willing to pay to conserve Iwokrama Rainforest?
- Which aspects of rainforest conservation programme do the public prioritise and under what conditions are benefits maximised?
- How do the public prioritise between rainforests in different conditions and how does this affect WTP for Iwokrama rainforest?

In addition, this case-study also addresses a number of methodological questions related to the use of stated preference techniques:

- How does the framing of rainforest provision affect choices?

- To test the usefulness of a split-sample approach to incorporating substitutes into the valuation of a specific rainforest to produce absolute estimates of WTP
- What is the impact of varying the form of the opt-out alternative in modelling choices for public goods?

4.3.3 Iwokrama Rainforest

The first stage of the research focused on the selection of an appropriate rainforest to feature as the main case study for the survey. Iwokrama Rainforest in Guyana[62] was considered particularly relevant since it has been given to the *international community* to act as an example of how to develop sustainable solutions to the conservation and management of tropical rainforests, by the Government of Guyana.

Iwokrama Rainforest features a number of interesting policy issues that are relevant internationally as well as locally. Firstly, it covers an extensive area of pristine frontier rainforest (371,000 hectares), has over 80% of its original vegetation intact and contains a high number of rare and endangered species. Correspondingly, it forms part of the Guyana Shield which is a Tropical Wilderness Area[63]. Tropical Wilderness Areas are recognised as priorities for international conservation efforts (see Mittermeier et al. 1998), however, as will be discussed later, there are many other priority-setting approaches, and there is much debate over how best to set priorities.

Secondly, as noted, one of the key objectives of Iwokrama's conservation programme is to establish sustainable methods of managing tropical rainforests (the sustainable use of biodiversity is also a key objective of the Convention on Biological Diversity). The rainforest is divided into a sustainable utilisation area and a complete preservation zone. The sustainable utilisation area currently allows ecotourism in part of the forest and there are plans to expand the permitted uses to allow sustainable (reduced impact) logging. A key question for local policy makers (and international policy) is whether allowing 'sustainable uses' such as ecotourism and sustainable logging would affect the non-use value attached to Iwokrama Rainforest; in particular whether the revenue generated would offset any changes in the total economic value of the forest. Studies elsewhere have found that non-use values may conflict with some uses of wildlife resources, although not all (Swanson & Kontoleon 2003). Correspondingly, the choice experiments described later in this chapter offer choices between management approaches that permit 'sustainable uses' or 'complete preservation'.

[62] Iwokrama Forest is situated in the interior of Guyana.
[63] Iwokrama rainforest is part of the Guyana Shield which is recognised as Tropical Wilderness Area by Conservation International.

An additional objective of Iwokrama is to ensure an equitable distribution in the benefits of conserving rainforests in particular with respect to the local communities in and around the forest. These communities are some of the poorest in Guyana with very limited access to basic amenities, high dependency on the surrounding natural resources and very few employment opportunities. Correspondingly, the provision of benefits through community development, training and jobs is a key aspect of the conservation programme. This mirrors a general shift in conservation policy from the earlier 'fines and fences' approaches which often resulted in the marginalisation of local communities (Wells 1992) to approaches that seek to provide community benefits through for example Integrated Conservation and Development Projects (ICDP) (Milner-Gulland & Mace 1998). Interestingly, despite increased recognition of the links between biodiversity and poverty, the key biodiversity priority-setting approaches have yet to fully incorporate social factors in their priority indicators, despite recent calls for their inclusion (see Veech 2003). It is thus interesting to explore public preferences towards the social aspects of conservation policy responses, more specifically, how much the public value the provision of benefits to local communities in and around globally important conservation areas, such as Iwokrama Rainforest.

Finally, Iwokrama Forest has received considerable donor funding, almost $15 million since its inception almost 15 years ago, from a variety of international sources, of which the UK is the main contributor[64]. However, in recent years, funding has declined, and the programme has intermittently faced the prospect of closure. This situation raises pertinent questions about how much value is attached to the rainforest conservation programme by distant beneficiaries and whether actual 'payments', in the form of international funding, are in line with perceived benefits. Moreover, it also highlights the importance of considering the temporal dimension in investigating the values attached to rainforest conservation programmes – if Iwokrama was to close after 15 years, would the cost in donor investments outweigh the non-use benefits and more importantly, would the benefits of donor funding be maximised by undertaking longer term investments?

Finally, understanding more about the size and nature of global non-use values will play an important part in enabling Iwokrama to realise the benefits it provides. Internalising these values could make an important contribution towards achieving sustainable economic development as well as meeting conservation goals.

[64] To date the programme has received approx of US$15 million in international donor funding (pers comm. Watkins 2004).

4.3.4 Development of the Survey Instrument

The survey instrument was developed over three stages: (i) literature review and consultation with local stakeholders and experts; (ii) cognitive interviews to test choice experiment; and (iii) pilot testing of the draft survey instrument.

4.3.4.1 Literature Review, Stakeholder and Expert Consultation

The valuation scenario was developed following a familiarisation trip to Iwokrama rainforest in Guyana. The purpose of the trip was to ascertain the current status of the protected area programme, and to identify the key local policy issues of interest (as discussed above). This involved consultation with key stakeholders in and around Iwokrama rainforest (local communities, the conservation programme and government development officials), and a thorough review of the policy literature. This fed into the process of attribute selection and the design of a draft survey instrument.

4.3.4.2 Cognitive Interviews

A series of cognitive interviews were held to explore public understanding, awareness and attitudes towards the conservation of tropical rainforests. Cognitive interview methods are derived from social and cognitive psychology and provide useful tools to explore the processes by which respondents answer survey questions and the factors influencing the answer they provide (Collins 2003). In the current context, the primary objective was to inform the development of the survey instrument.

A total of twelve cognitive interviews were conducted between 25th July and 13th August 2004, over three rounds. The interviews were staggered to incorporate participant feedback into the testing process. The majority of participants were recruited in and around Hyde Park, London. A £10 voucher was paid as an incentive for participation. Efforts were made to recruit participants with varying socio-demographics in order to replicate the target population as closely as possible. In total five males and seven females were interviewed, consisting of: three participants aged between 18 and 30 years; five participants aged between 30 and 45 years; two participants aged between 45 and 60 years; and two participants over 60 years. The interviews lasted for 30 minutes to one hour; longer interviews are not advisable since this can place excessive demands on participants (Willis 1999). Notes were taken during the interviews by the moderator.

Aims

Participants were asked to complete draft versions of the survey instrument. A verbal protocol[65] was used to explore (using general and specific probes) the cognitive processes behind responses and perceptions towards the survey instrument. In particular the objectives were to explore: (i) general comprehension of the questions and information provided: in particular the meaning of specific terms, the level of information provided, the intent and meaning of questions; (ii) decision processes, in particular, with respect to the choice experiment questions, including motivation and sensitivity to questions; and (iii) response mapping: that is the adequacy of the response categories.

Main Findings:

The key findings related to participants perceptions of the survey instrument; these were subsequently fed into the design process to produce the final version of the survey instrument. In addition, a number of observations were made with regard to respondents' perceptions, awareness and attitudes towards rainforest conservation, policy responses, and priorities. A brief summary is provided below:

- Over half of the respondents expressed no preference for prioritising rainforests on a geographic basis; this reflected a mix of reasons including: greater concern for the condition of the rainforest than the location; insufficient information on specific areas; and belief that all rainforests are equally important. The remainder of the participants preferred to contribute to rainforests in South America; this was motivated by greater familiarity with rainforests in this location.
- Perceptions towards the prioritisation of alternative rainforest investment opportunities differed. Positive perceptions were held for rainforests that were still intact on the basis that this may indicate they had good long term chances. Some participants viewed the conservation of rainforests that were already fragmented as pointless. Some participants expressed preferences for knowing where investments were going rather than simply investing anywhere.
- Views were mixed in terms of which aspects of rainforest programmes were most or least important. Several participants considered AREA to be very important due the role of rainforests in climate regulation, other environmental services and habitat provision. Others viewed AREA as important due to a belief that 'others' (experts, perhaps) had this view, while a couple of participants did not view it as important at all. Similarly, several participants considered rare or endangered SPECIES attribute to be extremely important

[65] The main alternative is the 'Think Aloud' approach. This was not adopted as thinking aloud is unusual process for some people, consequently it can be difficult to implement, requiring the training of subjects and may be met by resistance (Willis 1999). Moreover, the use of a verbal protocol was more appropriate to the current context as it allows more control over the interview, enabling the interviewer to focus on probing specific areas of interest.

(and this was reflected in their choices) due to a concern for species and biodiversity; one participant considered the differences in species to be too small, and another felt rare or endangered species weren't necessarily as important as species in general. The majority of respondents considered LOCAL COMMUNITIES and MANAGEMENT to be important attributes. There was a commonly shared view that local communities should benefit from conservation programmes (and not be made worse off). The majority of participants were in favour of the sustainable use of the rainforest – complete preservation was perceived by some as unrealistic. In terms of programme length (TIME attribute) some participants considered this to be less important since 15 years was sufficiently long (suggesting a lack of bequest values), while other participants considered it to be one of the most important factors in choices – notably, one participants did not understand the attribute, thus the wording was subsequently clarified.

- All participants appeared able to respond to the choice experiment in the correct manner although some participants considered there to be a lot of information. Probing revealed that one participant did not want to choose the opt-out option due to some form of social desirability or survey bias. Conversely, one participant chose the opt-out when there were too many trade-off indicating the use of a heuristic decision process.

4.3.4.3 Pilot testing

The draft survey instrument was subjected to two rounds of field testing. Both pilot tests were distributed to London residents in and around Hyde Park. The main objectives were to: (i) identify any potential problems with questions, wording and other details such as question skip patterns; (ii) test the choice experiment section and to assess the relevance of the attributes; (iii) assess the adequacy of the bid levels and range; and (iv) assess response rates.

The main purpose of the first pilot was to investigate the likely range of WTP. This was done using a payment ladder CVM question. Twenty questionnaires were handed out at random in Hyde Park using a drop-off/mail-back format. The response rate was high (44%). The range of WTP was from £1 to £60.

The second pilot survey incorporated the feedback received from the first pilot, the cognitive interviews and changes to the experimental design[66]. In addition a number of the attitudinal questions were refined. A total of 100 surveys were distributed at random in Hyde Park, again using a mail-back format and a response rate of 44% was obtained. The results indicated the need to the bid levels presented in the choice experiments. Correspondingly, the highest level was increased from £60 to £100.

[66] Following expert advice, the attribute levels were reduced to a two-level design (pers. comm. Louviere 2004).

4.3.5 Final Survey Instrument

The final survey instrument was designed to address both policy and methodological issues as outlined in section 4.3.2. A split-sample design was used to investigate the effect of: (i) framing Iwokrama rainforest against its baseline condition and in the context of substitute rainforests; and (ii) the effect of varying the form of the opt-out option. Correspondingly, three versions of the main survey instrument were developed which were identical except for certain aspects of the valuation section (see Table 4.3): (1) Iwokrama rainforest framed against its baseline conditions using a 'status quo' opt-out (BASE/SQ); (2) Iwokrama rainforest framed against its baseline conditions using a 'choose neither' opt-out (BASE/CN); and (3) Iwokrama rainforest framed in the context of substitute rainforest investment opportunities (SUB).

Table 4.3: Versions of Final Survey Instrument

Level 1		Level 2	Version
BASE	Iwokrama against baseline conditions	Status Quo opt-out (SQ)	1
		Choose Neither opt-out (CN)	2
SUB	Iwokrama against substitutes		3

As with case-study 1, the main survey instrument was designed to be self-administered in accordance with the Total Design Method and The Tailored Design Method (Dillman 2000;Dillman 1978) – for a review see section 4.2.4.

The final survey instrument was structured followed the standard design for choice experiment surveys (see Chapter 3). It comprised six sections covering: environment; tropical rainforest issues; valuation scenario and choice experiments; follow-up questions; alternative CVM valuation[67]; and a final section on socio-economic and demographic characteristics (see Table 4.4). The questions were ordered in a logical sequence following a 'funnelled approach' (Bateman et al. 2002).

[67] This was not analysed.

Table 4.4: Questionnaire Structure

Section	Content
A Environment	Ranking of general issues and environmental issues
	Visits to Tropical Rain Forests (TRF) – previous or planned
	Knowledge of TRF
B Tropical Rainforests	Rainforest Facts Box
	Familiarity with Rainforest Facts
	Attitudes towards Management and Conservation of TRF
	Attitudes towards developed countries paying costs of conserving tropical biodiversity and cost-sharing
	Attitudes towards conservation priorities – geographic and rainforest conditions
	Payment principle question
C Valuation Section	Description of Valuation Scenario
	Description of attributes and levels
	Attitudinal Ranking of attributes
	Preferred management approaches
	Choice Questions
D Follow-up	Reasons for choice decisions
	Motivations for WTP and zero WTP
	Perceptions towards Opt-out
	Perceptions of Choice Tasks
E Alternative Valuation	CVM question
	Follow-ups to CVM
F Socio-Demographics	Key socio-demographics indicators

4.3.5.1 Valuation Section

Preferences towards rainforest conservation were elicited using choice experiments, in which respondents were required to choose their preferred conservation programmes. In all split-samples, the programmes were described in terms of the same six attributes: AREA; SPECIES; MANAGEMENT APPROACH; TIME; LOCAL COMMUNITIES; and DONATION (see Table 4.5). The attributes were chosen, following a thorough review of the literature, to reflect the main policy changes of interest and to be appropriate to the perceptions of respondents:

Area and local community impacts were identified as important factors by Rolfe, Bennett and Louviere (2000) in the only other study to use a CE approach to assess public preferences for rainforest conservation.

Table 4.5: Attributes and levels

Attribute	Levels
AREA	The rainforest conservation area may cover: • 185,000 hectares [a] (an area approx 1¼ times the size of London); o • 371,000 hectares [a] (an area approx 2½ times size of London) • *0 hectares (baseline only)*
SPECIES	Depending on the level of conservation provided, there may be either • 30 rare or endangered species or • 45 rare or endangered species • *20 rare or endangered species (baseline only)*, within the conservation area.
MANAGEMENT	The conservation area may permit some commercial activities in order to raise money towards the running costs of the conservation programme. The options are: • **Complete Preservation:** meaning no commercial activities take place, no revenue is generated, no disturbance to the rainforest; or • **Sustainable Use:** meaning parts of the rainforest are used for ecotourism and sustainable logging, generating 30-40% of the programmes running costs, some disturbance in areas of the rainforest. • *No restrictions on rainforest use meaning unsustainable mining and timber logging (baseline only).*
TIME	The rainforest may be conserved for: • 15 years; or • 50 years • *0 years (baseline only).* At the end of the conservation period there is no guarantee that the rainforest will continue to be conserved.
LOCAL COMMUNITIES	The communities living in and around the rainforest may be affected in the following ways: • Community Benefits (e.g. development projects, jobs, training) or • No Community Benefits • *No Community Benefits and Worse off (baseline only).*
DONATION (one-off):	£3; £10; £14; £20; £30; £50; £65; £100; £500; *£0 (baseline only)*

Note: [a] In the base treatment respondents were advised that 185,000 ha was half of Iwokrama rainforest and 317,000 ha was the whole rainforest. *Italics* indicate levels specific to the baseline alternative only.

The number of rare or endangered species is a key indicator in many of the biodiversity priority–setting approaches discussed previously[68]; its inclusion provides an interesting opportunity to investigate whether these approaches reflect public preferences.

As discussed earlier, the MANAGEMENT attribute is particularly relevant to the local policy context, as well as international conservation policy. It should be noted that public preferences towards policies involving sustainable uses or complete preservation have not previously been investigated in the context of rainforest provision.

Carson (1998) highlights the need to consider the temporal dimensions of rainforest conservation in exploring public preferences. To date, no such studies have examined this issue[69]. To address this, a temporal attribute was included to describe the length of rainforest conservation; thereby explicitly investigating the value of Iwokrama Forest under different time horizons. This issue is particularity pertinent to the local policy situation since Iwokrama Rainforest project has intermittently faced the prospect of closure.

The price attribute was based on a one-off donation, although compulsory payment vehicles are usually preferred[70], in this case a voluntary mechanism was employed since it was both policy relevant and also provided the most realistic payment mechanism (there are currently plans to set up an Iwokrama Trust Fund mechanism in the UK and also in the US). A one-off donation was selected rather than an annual payment in order to avoid any possible interaction effects with the TIME attribute.

The attribute levels were the same in each of the split-samples, with the exception that the baseline level was omitted from the SUB treatment (instead a non-specific baseline was included in the pre-text which stated that without a conservation programme the rainforests would be expected to be severely degraded in next 15 years or less). The levels were defined in terms of absolute changes using a combination of quantitative and qualitative measures and were chosen to reflect the actual and likely conditions in Iwokrama rainforest. Since it has been reported elsewhere that respondents may have difficulty interpreting quantitative measures of area, the hectare values were also defined in terms of the relative size compared to London (a mental map). This MANAGEMENT attribute was defined to reflect the conditions in the Iwokrama case study: 'sustainable use' involved ecotourism and sustainable logging in parts of

[68] Current approaches such as the hotspot analysis use biological indicators including the number of rare or endangered species present and the level of threat (Myers et al. 2000).
[69] Elsewhere, Christie *et al.* (2004) found that respondents were unwilling to support policies that simply delay the time it takes for such species to become extinct. Similarly, Mourato (1999) found that the public prefer policies that conserve black rhinos into perpetuity rather than 25 yr protection, although around 50% of the respondents were insensitive to the programme length.
[70] For example, due to problems of free-riding associated with voluntary mechanisms (Bennett & Adamowicz 2001).

the forest to generate revenue to help meet the programme running costs, coupled with the potential negative effect of some disturbance in the rainforest. The complete preservation approach involved preserving the rainforest intact with no commercial activities permitted, and thus no contribution to the running costs of the programme[71]. The TIME attribute offered programmes of 15 years and 50 years duration (anything over 50 years was felt to add implausibility since it would be difficult to guarantee). Respondents were advised that there was no guarantee that the rainforest would be conserved beyond the end of the programme. Efforts were made to ensure the donation levels covered the expected range of WTP through pre-testing[72] (Bateman et al. 2002)

A fractional factorial design was used in SPSS (12.0) to reduce the 256 possible combinations to a subset which would enable the main effects of interest to be estimated 'as efficiently as possible' (Louviere, Hensher, & Swait 2000)[73]. A set of 16 original profiles or cards were generated and choice sets were constructed by randomly drawing pairs (or triples in the case of the SUB treatment) without replacement from two (or three) sets of the cards[74]. The choice sets were split into three blocks and respondents were randomly allocated to a block. In the second round of data collection an extra three choice cards (6 cards in the substitutes survey) were added which replicated three (or six) of the existing choice sets but with the price increased to £500 (preliminary results from the first round of data collection indicated presence of 'fat-tails'). Thus, in total, 19 (or 22) choice sets were used, these were grouped into three blocks (A, B or C), such that each respondent was required to answer five, six or seven choice sets depending on the randomly allocated block and the treatment.

In the BASE treatment, the valuation scenario (see Figure 4.3) stated that funding for the existing Iwokrama Rainforest conservation programme had run out, and if additional funds were not raised the programme would close down[75]. The proposed solution was to set up a rainforest fund in the UK to raise the money needed for a new conservation programme. In each choice set, respondents were presented with a choice between future scenarios with no

[71] The original intent was to explore preferences for different types of sustainable use, that is, ecotourism vs. more extractive uses; however this element had to be dropped in order to reduce the complexity of the questionnaire. Interestingly the initial findings suggested that extractive uses were not necessarily viewed negatively in comparison to non-extractive, indeed some respondents expressed negative attitudes towards ecotourism as a conservation tool, feeling that it was an exploitative way to generate income.

[72] If price levels are too high, the majority of respondents would choose scenarios with the lowest price level; and if too low, the majority would choose the scenarios with the highest levels (ibid.).

[73] Whilst using a main effects design requires assumptions about the insignificance of interaction effects, it has been justified on the basis that such designs can typically account for 70% to 90% of the variance in choice models (Louviere, Hensher, & Swait 2000).

[74] One of the sets consisted of the original profiles and the second set was a fold-over or mirror image of the first, this technique is recommended by Louviere, Hensher & Swait, (2000) as a way of increasing the statistical efficiency of the design.

[75] Respondents were presented with a description about Iwokrama Rainforest including a location map, information about species, area, local communities and the condition of the rainforest.

conservation programme (baseline) and two conservation programme alternatives. The baseline conditions (opt-out) were fixed across all choice sets and represented the likely future scenario if the current programme closed down. This scenario involved no restrictions on rainforest use, resulting in severe degradation of the rainforest, a decline in number of rare or endangered species and a decline in welfare of the local communities.

Figure 4.3: Valuation Scenario BASE Treatment

Iwokrama Rainforest

Iwokrama Rainforest is located in Guyana, South America. It contains at least 45 rare or endangered species and is approximately 371,000 hectares in size.

Iwokrama is considered to be highly valuable because:

- High number of plant and animal species present
- Home to a number of local Amerindian communities
- At least 80% of its original rainforest is intact
- One of the last remaining untouched pristine rainforests

The problem:

Iwokrama is currently under protection however the funding for the existing conservation programme has run out and if additional money is not raised the programme will close down.

The consequences:

If this happens scientists predict that within approx 15 years most of the forest will be used for unsustainable mining and timber logging, leading to the severe degradation of this pristine rainforest, the loss of many species including around 25 rare or endangered species, and a decline in the welfare of the local communities.

The Solution

To avoid these losses it is proposed to set up a Rainforest Fund in the UK to raise the money needed for a new conservation programme to be set up.

Respondents were advised that there were a number of different options under which the new conservation programmes could be implemented and asked to choose their preferred option in each choice set. A split-sample design was used to test the effect of presenting the opt-out as either: (i) a fixed alternative within the choice set; or (ii) a choose neither with pre-text statement (see chapter). An example of the choice cards is presented in Figure 4.4.

Figure 4.4: Example of 'status quo' and 'choose neither' choice cards in BASE treatment

Status Quo Format

Please place a tick below the ONE option you most prefer:

Attributes	Iwokrama Rainforest in 2019		
	Option A No Conservation	Option B Conservation	Option C Conservation
Size of conservation area (hectares)	No conservation Area	185,000 ha	371,000 ha
Rare species present	20 species	45 species	45 species
Management	No restrictions on rainforest use	Sustainable Uses	Sustainable Uses
Conserved Period	0 years	15years	50 years
Local communities	No Benefits Worse off	No Community Benefits	Community Benefits
Donation Required	£0	£30	£100
Please tick ONE only:	☐1	☐2	☐3

Choose Neither Format

Please place a tick below the ONE option you most prefer:

Attributes	Iwokrama Rainforest in 2019		
	Option A Conservation	Option B Conservation	Option C No Conservation
Size of conservation area (hectares)	185,000 ha	371,000 ha	I would support neither option
Rare species present	45 species	45 species	
Management	Sustainable Uses	Sustainable Uses	
Conserved Period	15 years	50 years	
Local communities	No Community Benefits	Community Benefits	
Donation Required	£30	£100	
Please tick ONE only:	☐1	☐2	☐3

In the SUB treatment, the valuation scenario (see Figure 4.5) stated that three different rainforest organisations were raising funds to support three different conservation programmes (Iwokrama rainforest, Atlantic rainforest and Any rainforest) and if additional money was not raised then none of the conservation programmes would go ahead, meaning no additional rainforest will be conserved. The proposed solution was to set up a fund in the UK to raise the money needed for the new conservation programmes.

Figure 4.5: Valuation Scenario SUB Treatment

Please imagine three rainforest organisations are raising money to fund three rainforest conservation programmes, each with a different focus, as explained below:

Organisation A: Iwokrama Forest (Pristine/Untouched rainforest)

Organisation A is focusing on Iwokrama Rainforest in Guyana, South America. This forest contains a high number of plant and animal species and is home to a number of Amerindian communities. It is in **pristine condition** with **over 80% of its original rainforest intact** and is one of the last remaining **extensive 'untouched'** rainforests.

Organisation B: Atlantic Forest (Fragmented/Little left)

Organisation B is focusing on Atlantic Rainforest in Brazil, South America. This forest contains a high number of plant and animals species and is home to a number of Amerindian communities. It is already **very fragmented** with **less than 8% of the original rainforest left** and is in danger of being completely lost.

Organisation C: Any Rainforest (Any condition)

Organisation C is focusing on rainforest loss worldwide, setting up conservation programmes in **any rainforest**, in **any location** and in **any condition**. The main reason for rainforest selection is ease of investment. If you donate to this organisation you would not know the location of the programme or the quality of the rainforest.

The problem...

All three organisations are **short of funding**, and if sufficient money is not raised then **none of the conservation programmes will go ahead**, meaning no additional rainforest will be conserved. **If this happens these rainforests are likely to become severely degraded within 15 years or less.**

Respondents were advised that there were a number of different options under which the new conservation programmes could be implemented and asked to choose their preferred alternative in each choice set. The choice sets were labelled to represent each of the three rainforest investment opportunities. An example of a choice card is presented in Figure 4.6.

Figure 4.6: Example of choice card in SUB treatment

Substitutes Format

Please tick the ONE option you most prefer below:

Attributes	Option A	Option B	Option C
	Iwokrama Forest Untouched	**Atlantic Forest** Little Left	**Any Rainforest** Any condition
Size of conservation area (hectares)	185,000 ha	185,000 ha	185,000 ha
Rare species present	45 species	30 species	45 species
Management	Sustainable Uses	Sustainable Uses	Sustainable Uses
Conserved Period	50 years	50 years	50 years
Local communities	Community Benefits	No Benefits	Community Benefits
Donation Required	£30	£10	£20

Please indicate preference: (Tick ONE)

☐ Option A
☐ Option B
☐ Option C
☐ I would not support any option

In all treatments prior to presentation of the choice sets respondents were provided with an explanation of the task and an example choice question (Bennett & Adamowicz 2001). Respondents were asked to consider each choice question separately. Respondents were reminded to consider the options in the context of their real circumstances, and to consider budget constraints and alternative expenditure possibilities (Bateman et al. 2002). Consistent with the advice of Bennett and Adamowicz (2001) it was explained that some options may seem implausible but all were in fact possible. After each choice question, respondents were asked to express how certain they felt about their choice by circling one point on a scale from 0% (absolutely uncertain) to 100% (absolutely certain). An example of the scale used is presented in Figure 4.7.

Figure 4.7: Example of certainty scale

How certain are you of your choice? Please circle ONE point on the scale below:

0% 20% 40% 60% 80% 100%

Absolutely uncertain Absolutely certain

4.3.6 Sampling and Data Collection

The target population, sampling frame and survey method were the same as those described in case-study 1 (see section 4.2.5), with the exception that three nodal streets were randomly selected per London borough and two rounds of data collection were conducted. The second round of data collection served the purpose of (i) distributing the CN version of the BASE questionnaire; and (ii) to extend the bid range in the choice experiments[76].

In the first round of data collection, two streets were selected in each of the six randomly selected London boroughs to act as nodal points for survey distribution. Correspondingly, between 18th October and 10th November 2004, a total of 1296 questionnaires were delivered to households in twelve locations across London (108 per location). In the second round of data collection, a further 1260 questionnaires were delivered to households between 7th and 17th November 2005, in six randomly selected locations in the same six London boroughs. Thus, in total, 2556 questionnaires were distributed in eighteen locations across London (see Appendix 6 for survey locations).

Approximately two weeks after the initial drop-off date a reminder postcard was sent out to those respondents who had not yet returned a completed questionnaire. In addition, an incentive was included which offered respondents the chance to win a £25 voucher on return of a completed survey.

4.4 SUMMARY

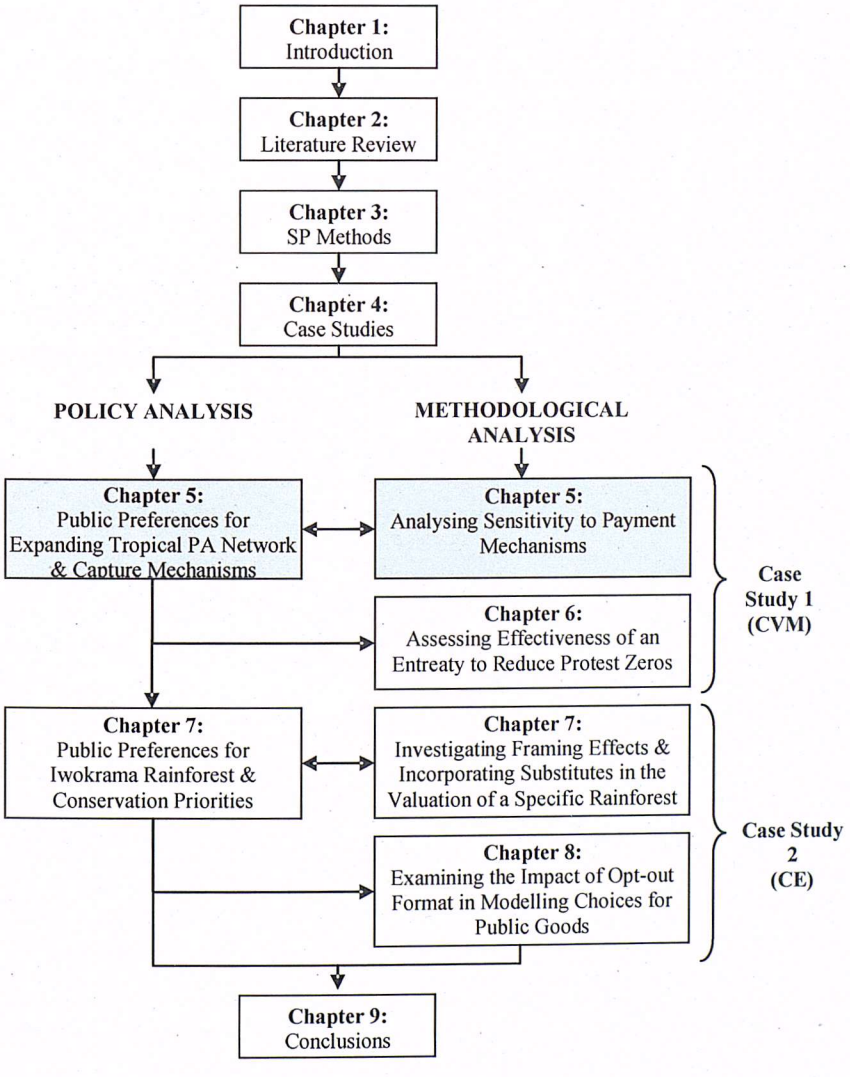
This chapter introduces the two case studies used to explore public preferences towards tropical biodiversity amongst distant beneficiaries. Case study 1 uses the contingent valuation method to explore public preferences towards expanding the tropical protected area network and funding mechanisms. Case study 1 features in Chapters 5 and 6. Case study 2 uses the choice experiment techniques to explore public preferences towards a specific rainforest conservation programme incorporating alternative investment opportunities. Case study 2 features in chapters 7 and 8.

[76] Preliminary analysis on the data collected in the first round indicated presence of 'fat-tails', correspondingly, in the second round of data collection an extra three choice cards (6 cards in the SUB survey) were added which replicated three (or six) of the existing choice sets but with the price increased to £500.

Chapter 5: Public Preferences for Expanding the Tropical Protected Area Network and Capture Mechanisms

SUMMARY

This is the first chapter in case study 1. It reports the results of a CVM study to estimate London residents' WTP towards expanding the protected area network across the developing countries, and crucially, it examines preferences for different ways of contributing to protected areas. Individual WTP for the proposed expansion was elicited using three sequential, randomly ordered, payment mechanisms chosen to reflect both existing and hypothetical funding options discussed in the policy literature. The use of a within-subject approach allows for an in-depth analysis of the reasons behind respondent sensitivity towards payment mechanisms and, is one of only a few studies using a within-subject design to explore the reasons why respondents prefer different payment mechanisms. This chapter also investigates attitudes, knowledge and awareness of tropical biodiversity and attitudes towards funding tropical conservation.



5.1 POLICY BACKGROUND

Protected areas play a pivotal role in the *in situ* conservation of biodiversity (Chape et al. 2005). The establishment of an effectively managed and ecologically representative, global system of protected areas is regarded as a crucial step in the achievement of the 2010 target of a significant reduction in the rate of biodiversity loss (CBD 2003a)[77]. However, despite significant increases, over the last 30 years, in the number of and coverage provided by protected areas[78], the current network is considered far from complete (Brooks et al. 2004;Dudley & Parish 2006). There is concern about the level of effectiveness and the extent of coverage and representativeness (CBD 2003a).

Although, there has been no comprehensive assessment of the management effectiveness of the world's protected areas to date, many are believed to be ineffectively implemented and/or managed, meaning some areas continue to be degraded despite their status as 'protected' (Hoft 2004). Indeed, according to CBD (2003b) less than 25% of forest protected areas are well-managed, many have no management at all and only 1% are regarded as long-term secure. Further problems include: the phenomena of 'paper parks'; the inappropriate demarcation of existing protected areas such that they are too small or inadequate to cover the species and ecosystems therein; and, low levels of protection, for example, less than half of reserves are classified within IUCN categories I to IV (Dudley & Parish 2006;IUCN 2004b) [79] [80]. Alongside this, significant gaps are reported to exist in the current network with many species, ecosystems, and ecosystem processes, having no protection at all or insufficient coverage for long-term survival (Burgess et al. 2004;Dudley & Parish 2006;Eken et al. 2004;IUCN 2004b;Mulongoy & Chape 2004;Rodrigues et al. 2003; 2004b; 2004a). Indeed, coverage has been found to vary greatly and is not proportionally representative: less than 2% of some bioregions and only 1% of coastal, marine and high seas are protected (Burgess et al. 2004;Mulongoy & Chape 2004). Consequently many areas containing unique biodiversity are thought to remain unprotected.

Given the scarce funds available to support biodiversity conservation, and in the absence of comprehensive data on the extent and effectiveness of the global protected area network, the Convention on Biological Diversity (CBD) in its Protected Areas Programme of Work

[77] The achievement of the 2010 target will not rest on protected areas alone, it will also require substantial efforts in greening the wider landscape, for example through sustainable use of resources, community conservation, education, and so on.

[78] The global protected area network has increased from around 3 million km2 in 1970s to covering today an estimated 18, 764, 958 km2 of the Earth's surface (Mulongoy & Chape 2004).

[79] IUCN categories are based on protected area management objectives; they range from strictly protected areas where human visitation is strictly controlled (I) to areas with high levels of human interaction and intervention (V).

[80] Further, Hoft (2004) makes the point that the level of global coverage may be distorted by the fact that some of the areas which are under protection may not be particularly valuable for biodiversity conservation.

recommends that immediate efforts should be focused on providing protection to the most irreplaceable and vulnerable sites (CBD 2001b). Rodrigues et al. (2004a), in the first attempt to identify the highest priority areas for expansion of the global protected area network, find that the most urgent unprotected sites fall overwhelmingly in the tropics, especially in the tropical and sub-tropical moist forests and islands [81]. Many of these areas overlap with those highlighted under other priority-setting approaches such as biodiversity hotspots (Myers 2003; Myers et al 2000) and the Global 200 Ecoregions (Olson & Dinerstein 1998), and the vast majority are located in the developing countries of the tropics.

This presents a significant challenge since economically these countries can least afford to fund global conservation objectives and many of their protected areas already experience severe funding deficits (Balmford & Whitten 2003;Bruner, Gullison, & Balmford 2004;James, Gaston, & Balmford 1999;Wilkie, Carpenter, & Zhang 2001). Indeed, anecdotal evidence suggests that insufficient funding has been a recurrent driver in the failings of many protected areas in these countries. While other issues such as weak political commitment also play a part, lack of financial resources represents a major problem since it means many protected areas cannot be effectively managed, for example, due to insufficient staff, equipment, enforcement measures and so on (Bruner, Gullison and Balmford 2004). Moreover, it is often the case that the money needed for the creation of new protected areas is simply not available.

Recently a number of studies have sought to estimate the financial costs of managing protected areas in the developing countries in order to highlight the extent of the funding shortage (see for example, Balmford et al. 2002;Bruner, Gullison, & Balmford 2004;James, Gaston, & Balmford 2001; 1999;Pimm et al. 2001). A number of important findings emerge from these studies. Firstly, current spending on protected areas is almost eight times greater in developed countries compared to developing countries, despite the later containing most of the world's biodiversity and the majority of the urgent unprotected sites (James, Gaston, & Balmford 2001)[82]. Secondly, in comparison with the anticipated costs of effective management it is clear that there already exists a significant shortfall in funding for protected areas in developing countries. James et al (2001; 1999) estimate that current spending is approximately $0.695 billion per annum. The costs of effectively managing these areas are estimated to be between a conservative $1.1 billion provided by Vreugdenhil (2003) (their study omits the Caribbean and focuses on base costs) and $2.3 billion per year (James et al. 1999; 2001). Unsurprisingly this shortfall becomes even greater when the estimated costs of expanding the network are factored in. In the most

[81] Their assessment was based on a global gap analysis of coverage provided for terrestrial vertebrate species, using information on species coverage, irreplaceability and seriousness of threat. Approximately 85% of the highest priority unprotected sites were located in these areas even though the Tropics account for only 39% of the worlds land area.

[82] James, Gaston, and Balmford (2001) estimate that annual expenditure on protected area management is approximately $5.27 billion in developed countries compared to $0.695 billion in developing countries.

recent study Bruner, Gullison and Balmford (2004) estimate that to upgrade and expand the terrestrial protected areas network by 30% or 3.5 million km2 in the developing countries alone will cost approximately $13 billion per year compared to current spending of $0.8 billion/yr[83]. Of this an estimated $10.8 billion per year would be required solely for expanding the network (including the costs of effectively managing the new protected areas, land purchase and compensation) to provide coverage for the highest priority areas as identified by Rodrigues *et al.* (2004a).

It is clear that substantial new and additional resources for conservation will be needed within the developing countries if the target of an ecologically representative and effectively managed system of protected areas is to be achieved. This means a concerted effort will be required to increase all sources of funding available to tropical conservation, both domestically and internationally.

Whilst domestic government budgets provide critical sources of finance for protected areas, it is often the case that commitments are very small (CBD 2005). Furthermore, significant increases in domestic government expenditure are limited by the more immediate problems faced by these countries such as health and poverty (IUCN 2004b;Mulongoy & Chape 2004). According to McNeely (1996) the domestic resources available within the developing countries are unlikely to be sufficient for financing biodiversity protection. Despite this, recent developments in the use of revenue generation mechanisms such as eco-tourism, resource user fees and most recently through payment for environmental services, offer some potential for increasing domestic funding, albeit with limits. For example, eco-tourism is not an option for all protected areas, in particular those which are inaccessible or located in countries which are simply too underdeveloped to attract tourists. Furthermore, like other markets, it is vulnerable to external factors such as changes in market demands, political instability and natural disasters. There have been encouraging results in the use of ecosystem services payments to fund forest conservation in Costa Rica, however, the success of such markets is dependent on, amongst other factors, the presence of strong institutional support, and clearly defined property rights, which are not always easy to establish (Pagiola, Bishop, & Landell-Mills 2002). Consequently, in the foreseeable future external funding is likely to remain a critical source of finance for protected areas within the developing countries. More specifically, it is anticipated that much of the additional funding that is required to expand the protected area system will need to come from developed countries.

[83] This figure is based on the $0.695 billion per year estimated by James et al. (1999; 2001) adjusted for inflation (Bruner, Gullison and Balmford 2004).

Currently, the major sources of international funding for protected areas in developing countries are: international donor assistance from multilateral institutions, in particular the GEF[84] and the World Bank[85]; bilateral and multilateral official development assistance[86] (ODA); private foundations such as the United Nations Foundation; NGOs including for example the Nature Conservancy's Parks in Peril programme and Conservation International's Critical Ecosystems Partnership Fund; and, to a lesser extent from the private sector, and emerging international markets for the goods and services provided by biodiversity (CBD 2005). Whilst significant increases in funding will be required through all sources, it is anticipated that increases in public funding will play a major role (Clemencon 2006). This in part reflects the fact that international funds for biodiversity are currently largely fed by government contributions either directly through bilateral and multilateral ODA or indirectly via contributions to the Global Environment Facility (GEF), which is the largest supporter of protected areas globally (GEF 2006). But also because similar to the domestic situation, international markets for biodiversity have yet to fully mature.

The major routes for increased public funding are through direct bilateral or multilateral overseas development assistance or indirectly through contributions to the GEF, the later playing a central role as the financial mechanism of the CBD (CBD 2005). Both present a challenge as new global commitments to poverty and international security have resulted in reductions in funding streams to conservation (Mulongoy & Chape 2004). According to Bayon (1999) there has been a steady decline in ODA for past 20 years, most countries no where near the agreed target of 0.7% of GNP. Indeed, in recent years, taking into account inflation and expanding GEF agenda, real commitments to GEF from member countries have declined (Clemencon 2006) [87]. Despite this, many consider the expansion of government contributions to offer the main solution to financing tropical conservation (James, Gaston, & Balmford 2000). This suggests considerable efforts will be required by governments to generate new resources for funding tropical conservation for example through increases in existing taxes, the introduction of green taxes or the redirection of existing public expenditure.

[84] Since 1991-2006 the GEF has invested over $1.5 billion across 1500 protected areas, covering over 300 million hectares, and has leveraged an additional $3.16 billion in co-financing (GEF 2006). In the first decade the GEF provided $1.1 billion in funding to support approximately 200 biodiversity projects including more than 1000 protected areas covering more than 226 million hectares (GEF 2003). In 2002 the GEF's third replenishment earmarked a further $400 million for sustainable protected areas systems for the period 2002-2006, equating to roughly $100 million per annum (GEF 2003).

[85] Between 1988 and 2003 the World Bank Group lent a total of $1, 834 million to protected area projects and leveraged an additional $1, 399 million in co-funding (The World Bank 2003). This supported around 233 protected area projects across 85 countries (The World Bank 2003).

[86] Total ODA activities for all biodiversity projects, not specifically protected areas (data is not available for this), for periods 1998-2000 amounted to $1.09, $1.03 and $0.87 billion respectively (CBD 2005). The United Kingdom committed on average $23.9 million per annum for period 1998-2000, representing 0.7% of its total bilateral ODA for the same period (CBD 2005).

[87] Although some countries have increased their commitments this has been offset by decreases by large donor countries such as US (Clemencon 2006).

The later in particular represents one of the most often cited solutions to the biodiversity funding crisis, more specifically, through the removal and redirection of government spending on perverse subsidies[88]. It is estimated that governments spend approximately $1 trillion per annum on subsidies that lead to the loss of biodiversity that would not occur without these subsidies (McNeely 1996). Indeed, in a recent report the CBD specifically recommends this as a key funding option for protected areas, starting with the redirection of subsidies from those sectors having the closest links with protected areas (CBD 2005 p.2). Proponents argue that the removal of perverse subsidies would achieve a number of desirable goals. Such as, a decrease in rate of biodiversity loss; help promote sustainable use of resources; make conservation more cost effective by reducing the artificially inflated benefits of unsustainable land use alternatives; reduce the global costs of conservation objectives; and crucially, free up funds that can be directed towards achieving conservation objectives (see CBD 2000a;James, Gaston, & Balmford 2001; 1999;McNeely 1996;Robin, Wolcott, & Quintela 2003). James, Gaston and Balmford (1999; 2001) argue that a global system of protected areas would cost just 2% of annual expenditure on harmful subsidies.

Alongside public donor funding, Balmford and Whitten (2003) also highlight the importance of increasing individual contributions directly through voluntary charitable donations. There are an increasing number of individuals joining NGOs and increasing number of tropical conservation NGOS. Although this is only likely to account for a small percentage of the total resources required, it does offer a much needed route for capturing international WTP for tropical biodiversity. In recent years there has been an emergence of more sophisticated fund-raising mechanisms through the use of targeted sponsorship programmes designed to confer a sense of 'ownership' to the donors, through for example 'adopt an acre' schemes. Indeed, McNeely (1996) considers that targeted fund raising could significantly increase in the future as countries continue to grow economically.

In summary, the global protected areas network urgently needs to be expanded to safeguard the highest priority areas which remain unprotected. The majority of these areas are located in the developing countries and it is anticipated that much of the additional funding that is required to fund future expansion will need to come from developed countries. However, while attention has been devoted to estimating the financial costs of expanding protected area network, much less is known about the size of non-market benefits. Despite this, the general consensus appears to be that 'funding protected area systems in developing countries would generate considerable

[88] The term perverse subsidies applies to government subsidies that encourage production or consumption patterns which are harmful to the environment (Robin, Wolcott, & Quintela 2003), for example by keeping resource prices for producers or consumers below market levels (James, Gaston and Balmford, 2001). In doing so they contribute to the decline of biodiversity.

net benefits to society' (Bruner, Gullison, & Balmford 2004 p.1124). Nevertheless more estimates are required on the size of the benefits of tropical conservation to feed in to costs benefit analyses; to assess the adequacy of existing transfers and, in addition, to help generate additional financial support. Indeed a recent note produced by the CBD Ad-Hoc Open-Ended Working Group on Protected Areas stated (2005 p.20) 'At the heart of the funding gap is the undervaluing of protected areas'. *This raises the question of how much value is placed on expanding the protected area network amongst populations in developed countries, and, crucially, how best can these values be captured to maximise funding to meet global biodiversity objectives?*

5.2 RESEARCH OBJECTIVES

As discussed in earlier chapters, there have been very few studies to estimate the willingness-to-pay (WTP) of developed countries residents for achieving global biodiversity objectives. Previous empirical work has focused mainly on estimating WTP for tropical rainforest conservation and mainly on US preferences. No empirical work has been conducted to estimate the benefits to distant beneficiaries of expanding the tropical protected area network to protect a range of additional habitats and ecosystems (including wetlands, savannahs, islands, mountains and rainforests) and species. Importantly, very little is known about how the public would most prefer to contribute towards tropical conservation.

Given that expansion of the tropical protected area network is regarded as a crucial instrument in achieving the CBD's goal of a significant reduction in rate of biodiversity loss, and, in view of the urgent need to leverage increased funding from the developed countries to support tropical conservation, this represents a significant gap in knowledge. The current chapter seeks to address this by investigating the value attached by London[89] residents to expanding the existing network of protected areas across the developing countries and, crucially, to explore how these values might best be captured by exploring willingness-to-pay under different payment mechanisms.

The main research objectives are:

(1) to investigate public attitudes, knowledge and awareness of biodiversity and tropical biodiversity,

(2) to examine public attitudes towards funding tropical conservation and preferred ways of cost-sharing;

[89] The target population would ideally be residents of the UK however due to budget constraints the sample had to be limited to London residents.

(3) to estimate willingness to pay for expanding protected area network across developing countries under three different payment mechanisms;
(4) to assess the adequacy of existing UK transfers in view of the approximate aggregate benefits.;
(5) to investigate the effect of different payment mechanisms on: (i) the incidence of protest zeros; (ii) willingness-to-pay; and, (iii) certainty; in the context of paying for tropical biodiversity; and
(6) to explore in-depth the reasons behind respondent sensitivity towards different payment mechanisms; and

This chapter makes a number of novel contributions to the existing literature. Firstly, to the best of the author's knowledge it is the *first contingent valuation study* to examine the preferences of developed country residents towards expanding the tropical protected area network at this scale, thereby measuring the value attached to the provision of *a range* of habitats and ecosystems, and species. No previous empirical study has considered this issue using the latest data available on how to prioritise the expansion of the network. Notably, this is *the first study* to explicitly examine public preferences for tropical biodiversity under different payment mechanisms, thereby helping to address the early question posed by Pearce (1995) of how best can we capture international WTP for global biodiversity. Furthermore, to the best of the authors knowledge this is the *first study* to use a within-subject design, to examine respondent sensitivity towards different payment mechanisms in the context of estimating WTP for tropical biodiversity, and is *one of only four studies* overall have used the within-subject approach to test for respondent sensitivity to payment mechanisms.

5.3 EXPERIMENTAL DESIGN

A within-subject design is used to estimate willingness to pay of London residents towards securing additional protection of tropical biodiversity, under three different payment mechanisms, in a randomised continent valuation study.

In addition to providing useful information on public attitudes towards funding tropical conservation, the decision to incorporate three different payment mechanisms was based on recognition in the CV literature that the payment mechanism is not a neutral part of the contingent valuation scenario and that it may carry value in itself (Bateman et al 2002;Mitchell & Carson 1989). Indeed empirical research indicates that the type of payment vehicle can influence whether or not respondents are willing to report their willingness to pay by affecting the propensity to protest (see for example, Bateman et al. 1993;Champ et al. 2002;Daubert & Young 1981;Jakobsson & Dragun 1996;Rollins 1997), and, crucially, the amount they are willing to pay (see for example, Bateman et al. 1993;Bergstrom, Boyle, & Yabe 2004;Daubert

& Young 1981;Jakobsson & Dragun 1996;Rowe, D'Arge R.C., & Brookshire 1980). The majority of these studies provide evidence to suggest that mean willingness-to-pay can vary significantly under different payment mechanisms. Thus it can be expected that aggregate estimates will differ significantly too. For example, Bateman et al. (1996) find that aggregate annual benefits for informal woodland recreation are £44,450 per annum via a tax increase compared to £141, 252 via a user fee vehicle. This holds significant implications for cost benefit analysis and adds weight to the argument for exploring the effect of different payment mechanisms in the current study. Indeed, Mitchell and Carson (1989) emphasise the need for studies to investigate how willingness to pay varies under different mechanisms and crucially whether there is a potential mechanism which can capture 'most (if not all) of the public's WTP for a particular good' (p304).

Further to this, from both a methodological and a policy perspective it is useful to use a *within-subject* test since this provides an opportunity to *directly* ask respondents why they are sensitive to different payment vehicles. Anecdotal evidence in the CV literature stresses the importance of credibility, acceptability and trust (Bateman et al 2002; Mitchell & Carson 1989). However much of the empirical research into the reasons behind sensitivity of payment mechanisms has been based on split-sample designs, which provide limited opportunities to explore in depth the reasons why respondents are sensitive to different payment vehicles. Indeed Jakobsson and Dragun (1996) highlight the need for studies which present the *same* respondent with a range of payment vehicles and then *explicitly* explore the reasons behind preferences and perceptions towards individual mechanisms. In addition they stress the need for such studies across a range of environmental goods. To the best of the author's knowledge, only four studies have been undertaken to explore how an individuals' preferences vary under different payment mechanisms in a within-subject design (see Bateman et al. 1996;Bennett 1984;Bonato, Nocera, & Telser 2001;Rollins 1997), none of which examine preferences in the context of conserving distant and unfamiliar public goods such as tropical biodiversity. The current research aims to address this gap by using a within-subject treatment with an open-ended follow-up question to ask respondents *directly* why they are willing to pay more towards tropical conservation under some mechanisms rather than others, and to understand more about the reasons behind sensitivity towards different payment mechanisms.

The proposed policy change was adapted from that used by Bruner, Gullison and Balmford (2004) in estimating the financial costs of upgrading and expanding the protected area network in the developing countries but focuses solely on the expansion of the protected area network[90].

[90] No attempt was made to place a value on improving effectiveness within the existing protected areas as to date no comprehensive assessment of the management effectiveness of the world's protected areas has been undertaken. This lack of data makes the definition of a meaningful scenario from which to measure

Their scenario was based on the latest data available on how to prioritise the expansion of the existing protected area network utilising the results of the global gap analysis by Rodrigues *et al.* (2004a; 2004b). Although Rodrigues *et al.* (2004a; 2004b). specifically avoided defining the area required for the expansion of the protected areas network (pers. comm. Bruner 2005), Bruner, Gullison and Balmford (2004) reworked some of their analysis to derive rough estimates of the area required to cover the highest priority unprotected sites in the developing countries[91]. For the purposes of the current study an additional assumption was made (on the basis of the work undertaken by Rodrigues et al. (2003)), that such an expansion would provide protection for approximately 1000 species which are not currently protected anywhere else in the world[92]. To this end, respondents were asked to express their willingness to pay for expanding the existing network of protected areas by 30%, meaning an additional 3.5 million km2 of protected areas would be created, to conserve the highest priority sites in the developing countries which contain approximately 1000 species, including many rare and endangered species and many different types of habitats and ecosystems.

Respondent WTP was assessed at two stages. The first stage was a payment principle question in which respondents were asked whether in principle they would be willing to contribute to the proposed policy change. Those respondents stating NO went straight to follow-up questions. Those stating YES or DON'T KNOW went on to the second stage in which they were asked to report their maximum WTP per annum for the proposed policy change for the next 10 years, under three different payment vehicles, in sequential, randomly ordered, payment ladder questions.

The three payment mechanisms were selected to inform policy debate and on the basis that those most relevant to the exploration of public preferences are those based on public funding, and those seeking to capture individual willingness to pay directly. The mechanisms represented both traditional and hypothetical funding options, specifically: (1) GEF type payment structure funded through an increase in existing taxes (tax increase); (2) government agreement to remove and redirect perverse subsidies, meaning price increases for everyday goods (higher prices); and (3) a voluntary fund supported by charitable donations (donations). Of course it is a complicated situation to model the effect of the removal of subsidies since it depends on the type of subsidy and the sector that is being subsidised. Nevertheless, in its simplest case, one

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the value attached to marginal changes in effectiveness very difficult. As a result, in the current study, the valuation focuses solely on the expansion of the existing network of protected areas.

[91] They suggest a conservative estimate of an additional 3.5 million km 2 would be needed, representing a 30% expansion of the existing network across the developing countries.

[92] This was based on the calculation by Rodrigues et al. (2003) that expanding the network to cover the most urgent unprotected sites would reduce number of absolute gaps by more than two-thirds from 1652 to 543, in other words it would provide cover for 1109 species and would increase the number of threatened species being covered from 9% to 55%. This estimate was adjusted downwards to 1000 species to accommodate that the proposed expansion would take place in developing countries only.

would reasonably expect the removal of subsidies to result in price increases at least in the short-term. Indeed there are arguably many potential barriers to the removal of subsidies, primarily since both recipients and producers depend on them (Bayon, Lovink, & Veening 2000) and because of a lack of political will, making it an interesting focus for the assessment of public preferences.

To provide respondents with a rationale for having to state WTP under three different mechanisms the preamble to the valuation questions explained that *'Developed countries, like the UK, are currently considering* ***three ways*** *of raising the additional money required to set up the protected area programme. In order to work out which option is best, reliable estimates are needed of how much people would be willing to pay towards the programme, if anything, under each funding option.'* This served the purpose of pre-warning respondents that they would be asked to answer three sequential valuation questions, following on from advice of Bateman et al. (2002) that the 'surprise element of an unexpected sequence should be avoided' (p. 325) and also Cooper, Hanemann and Signorello (2002) that if respondents are unaware of subsequent valuation questions the surprise may result in inconsistent responses[93]. A description of the payment vehicles is provided in Figure 5.1. In order to take into account any potential sequencing effects, three versions of the survey instrument were produced with the payment vehicles presented in the following random order: (1) Tax; Higher Prices; Donation; (2) Higher Prices; Donation; Tax; and (3) Donation; Tax; Higher Prices.

Figure 5.1: Description of Funding Options

Funding Option 1: International Fund supported by tax increases

The UN sets up an International Fund for governments to make voluntary contributions to the protected area programme. The UK contribution would be met by increasing the income tax rate. All of the money raised by this tax increase would go towards the protected area programme.

Funding Option 2: Reducing subsidies meaning price increases

Governments agree to reduce spending on subsidies in agriculture, forestry, fishing, & mining sectors. This would free up government funds which would go towards the costs of the protected area programme. But, since subsidies keep prices low this would mean price increases for many everyday goods, including basic food products.

Funding Option 3: Charitable Donations

An international charity, like Worldwide Fund for Nature (WWF), sets up an International Fund for ordinary members of the public to contribute by sponsoring different aspects of the programme. The fund would be voluntary meaning only those that wish to contribute would do so. All money raised by the fund would go towards the protected area programme.

[93] Furthermore, Kontoleon and Swanson (2003) advise that ordering effects may be 'nullified' by providing advance warning which has been shown to produce more stable bids.

As discussed above it was anticipated that respondents would exhibit sensitivity in responding to the contingent valuation questions across payment vehicles. Thus, the research was designed to investigate the effect of different payment vehicles on (i) the incidence of protest zeros; (ii) on willingness to pay; and (iii) the level of certainty of paying reported WTP bids. Since no previous studies have been identified which have specifically investigated the differences between tax, donations and higher prices mechanisms collectively, a number of broad hypotheses have been defined[94].

Hypothesis 1: The incidence of protest zeros will vary across the payment vehicles

In relation to the first objective it was hypothesised that the incidence of objections towards paying towards the proposed policy change would vary across the payment vehicles. The direction of the differences was not specified due to lack of previous empirical studies on higher prices vehicles but also because despite anecdotal suggestions in the CV literature that coercive vehicles such as taxes are likely to be more objectionable, empirical studies have found that the propensity to protest may be lower under tax vehicles compared to donations, in particular if the later is associated with lower credibility (see Bateman et al. 1993; 1995;Jakobsson & Dragun 1996). Protests were identified on the basis of both closed- and open-ended questions, the later were analysed using subjective coding (for a more in-depth description of protests see chapter 6).

Hypothesis 2: Mean WTP will differ across the payment vehicles
Hypothesis 2a: Mean WTP will be higher under the tax vehicle compared to the donations vehicle.

Similarly with respect to the second objective given the lack of studies comparing tax, donations and higher prices vehicles collectively a broad hypothesis was defined that willingness to pay would be expected to vary between the vehicles. However, since in general willingness to pay has been found to be higher under tax vehicles when compared with donations (see Bateman et al. 1995; Champ et al. 2002;Jakobsson & Dragun 1996), a further sub-hypothesis was also defined that stated that willingness to pay is expected to be higher under the tax vehicle compared to the donations vehicle.

Hypothesis 3: Certainty will differ across the payment vehicles

[94] The only study identified to investigate the effects of paying under higher prices compared with alternative vehicles, including a voluntary trust fund, did not report the effect on mean willingness to pay but did find that the higher prices vehicle did not work well producing a significant and wrongly signed coefficient for the bid variable (see Blamey 1998).

Since different payment vehicles may have different perceived probabilities of providing the good (Mitchell & Carson 1989), it was also hypothesised that respondent certainty regarding payment of the stated amount would vary across the payment vehicles.

Finally, respondent perceptions and attitudes towards the payment vehicles were explored in a series of closed and open-ended follow-up questions, designed to capture the reasons behind potential sensitivity towards the payment vehicles.

5.4 DATA

A full description of the survey instrument and data collection procedures is provided in Chapter 4. To recap the survey consisted of six sections covering: general issues; understanding, awareness and attitudes towards biodiversity conservation and funding tropical conservation; a valuation section; follow-up questions exploring motivation for WTP and perceptions towards payment vehicles; socio-demographic questions; and finally a section on environmental beliefs and behaviour. The survey was implemented using a drop-off and mail-back approach with a follow-up reminder sent approximately two weeks later. The survey was distributed in 6 random locations across London in January 2006.

5.5 RESULTS AND DISCUSSION

5.5.1 Survey response rates

A total of 603 complete or partially usable[95] questionnaires were returned, giving an overall sample response rate of 32.8%. Although this is low compared to other survey formats it is still within the realm of those reported by other CV mail surveys[96]. The response rates were similar across the three versions of the questionnaire, thus the ordering of the payment vehicles did not appear to influence response rates (see Table 5.1).

The survey was favourably received by most of the respondents with: 56.6% finding it 'interesting' and 23.1% considering it to be 'educational'. Only 4.5% of respondents considered the questionnaire to be 'unrealistic', whilst 7.8% found it to be 'difficult'. One of the difficulties in exploring preferences for a distant and unfamiliar good is the amount of information that needs to be transferred and although efforts were made to keep the questionnaire as brief as possible, 21.6% of respondents regarded the questionnaire as 'too long'.

[95] In addition a further 28 incomplete or unusable questionnaires were returned.
[96] Mitchell and Carson (1989) review response rates for CV mail surveys finding rates range from as low as 8% to 93%.

Table 5.1. Survey Response Rate by Version

Version	Delivered (N)	Returned (N)	Response Rate (%)
TPD	612	207	34.3%
PDT	612	197	32.7%
DTP	612	199	33.0%
Total	1836	603	32.8%

Notes: TPD, PDT and DTP refer to the presentation order of the three payment vehicles, T = Tax, P = Higher Prices, and, D = Donations.

5.5.2 Sample characteristics

The key socio-demographics of the sample are presented in Table 5.2. Almost half of the respondents are male and the average age is 44 years. The sample is highly educated with 71% of respondents attaining a degree level education or above, and is wealthy with average gross household income of £57,223 per annum.

Table 5.2. Socio-Demographic Characteristics (Full Sample)

Variable	Sample	London
Sex (% male)	43.8%	49.4%[b]
Age (mean)	44.3 yrs[a]	43.2 yrs[c]
Education: Degree level or above (%)	71.1%	24.8% [d]
Self-employed	20.6%	12.5%
Employed	68.5%	79.9%
Unemployed	4.2%	7.1%
Gross annual household income (mean)	£57,223[a]	£37,024[e]
Member of environmental organization	13.8%	-
Number of Observations	601	7,387,800

[a] Age/Income taken as mid-point of response category
[b] From ONS (2005) Resident Population using mid-2003 population estimates
[c] ONS (2005) statistics include aged 16 or above as adults hence mean age is slightly lower – when comparing average age excluding this youngest age category (i.e. comparing 20 year olds and above), there is no significant difference between the sample and the target population.
[d] London education statistics are based on population of working age (males aged 16 to 64 and females aged 16 to 59).
[e] London average annual household income calculated by multiplying average gross household weekly income (based on 2000 to 2003), £712 by 52 weeks.

In comparison with the target population of London, the sample is not representative for certain key demographic variables, and in particular for education and income. This is a common problem in mail surveys[97], which can be susceptible to non-response and sample-selection bias,

[97] Indeed Horton et al. (2001; 2003) in a study to investigate UK WTP for protecting Amazonia also reported significantly higher levels of income and education compared to the national average, (in their case average income was greater by 30%), despite using a face-to-face interview method.

mainly due to the lack of control over participation (Loomis 1987;Messonnier et al. 2000;Mitchell & Carson 1989). While in the current study this does not invalidate the sample specific findings it does mean that additional care needs to be taken in calculating aggregate welfare estimates[98]. Thus the preliminary sections report the results of the full unweighted sample but note that these results should be treated with caution since they are not necessarily representative of the target population. Later in the valuation section weighting procedures are used in accordance with the summary characteristics for the three censored samples (protestors and outliers removed), to derive representative estimates of WTP.

5.5.3 Environmental Attitudes and Behaviour

Environmental attitudes, beliefs and behaviour were elicited in a series of questions which asked respondents to rank their priorities for additional government funding and to rate a number of statements relating to their environmental behaviour. In addition, close-ended questions were included to investigate membership of environmental organisation, previous experience of donating to environmental causes and general attitudes towards proposals to conserve the environment. The purpose of these questions was to 'warm up' respondents, to encourage them to think about all aspects of the proposed valuation scenario, and to provide information to help validate the resulting welfare analysis (Bateman et al. 2002). The results are reported in Table 5.3.

The environment was ranked the number one priority for additional government funding amongst five general issues[99] by only 12% of respondents; whilst 27% and 26% considered education and crime, respectively to be the highest priorities. Similarly, only 12% of respondents considered biodiversity loss, simplified as 'loss of rare and endangered species and habitats' to be the highest priority for environment funding, and in fact, almost half the respondents (46.2%) ranked it as the least important priority. Of the four environmental problems presented, most respondents (38.9%) considered climate change to the highest priority, followed by waste management and air pollution.

[98] To do this weighting procedures can be applied to the censored data so that the sample characteristics correspond to the target population (after Anderson, Basilevsky, & Hum 1983;Bateman et al 2002; Messonnier et al 2000;Mitchell & Carson 1989).
[99] Crime, education, NHS, poverty and environment.

Table 5.3: Summary of Environmental Attitudes and Behaviour

Ranking of general issues:	**Highest**				**Lowest**
	1	**2**	**3**	**4**	**5**
Crime	26.0%	17.1%	18.5%	15.6%	22.9%
Education	27.0%	25.8%	22.7%	16.1%	8.4%
NHS	23.1%	30.4%	20.9%	15.9%	9.7%
Environment	12.3%	15.6%	21.7%	29.2%	21.2%
Poverty	13.7%	12.0%	14.5%	21.7%	38.1%
Ranking of environmental issues:	**Highest**			**Lowest**	
	1	**2**	**3**	**4**	
Air Pollution	24.2%	34.7%	25.6%	15.5%	
Climate Change	38.9%	18.4%	25.1%	17.7%	
Waste Management	25.8%	29.6%	25.1%	19.5%	
Biodiversity Loss	12.1%	17.9%	23.8%	46.2%	
Frequency of Environmental Behaviour:	**Never**	**Rarely**	**Sometimes**	**Often**	**Always**
Recycle glass, cans, paper	0.8%	2.5%	4.2%	19.2%	73.2%
Choose environmentally friendly instead of regular products	3.0%	15.5%	46.5%	30.2%	4.7%
Visit a nature reserve or protected area in the UK	11.9%	26.6%	41.2%	18.5%	1.9%
Membership Environmental Organization:		13.8%			
Donated Time or Money in last 12 mths to:					
Any Environmental cause		52.5%			
Environmental cause excl. natural disaster campaigns		26.6%			
Any Wildlife or Nature Conservation		22.9%			
Wildlife or Nature Conservation in the UK only		17.0%			
Wildlife or Nature Conservation Overseas only		11.2%			

Levels of environmental behaviour were somewhat higher than might be expected given the lower perceived importance of the environment. Almost three-quarters of respondents *always* recycled glass, paper and cans, and virtually all respondents (99.2%) engaged in some level of recycling. Similarly, a high proportion of respondents had experience of choosing environmental–friendly products over regular products in the marketplace, with over 80% doing so with some regularity. At least 60% of respondents at least sometimes visit nature reserves in the UK, and 26.6% rarely visit. Around 13.8% of respondents are currently members of environmental organisations and over half (52.5%) have donated time or money to an environmental cause in the last 12 months. The latter figure is somewhat inflated by the high proportion of respondents that had donated to natural disasters causes of which there were several[100] in the 12 months preceding the survey. Perhaps a more representative figure is the 26.6% of respondents that have donated to environmental causes *excluding* natural disasters.

[100] For example, in August 2005 Hurricane Katrina struck.

Nevertheless this still indicates a large amount of support to the environment and, crucially, that a significant amount of respondents have experience of *paying* for environmental causes.

5.5.4 Biodiversity: Experience, Awareness and Attitudes

Respondents were presented with a series of questions to investigate their knowledge, awareness, experience and attitudes towards biodiversity, and more specifically towards funding tropical conservation. As with the preceding section, the purpose of these questions was to 'warm up' respondents, and to provide information that might help explain willingness to pay. It was also the intention that responses would provide useful information for policymakers on public knowledge, perception and attitudes towards tropical conservation.

Biodiversity: Knowledge and Beliefs

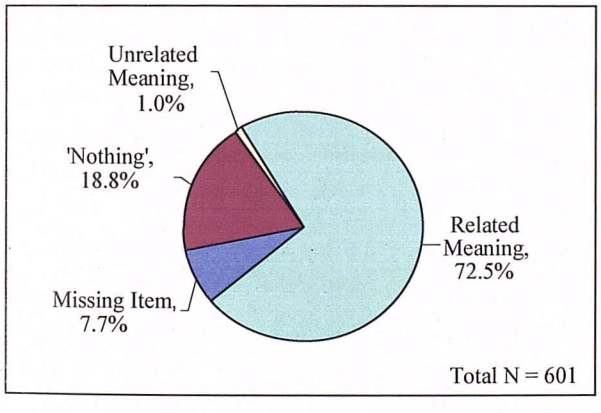
The elicitation of preferences for biodiversity has been found elsewhere to be complicated by the public's relatively low awareness and understanding of the term 'biodiversity' (Christie et al. 2006). This presents a number of challenges, firstly because the use of stated preference techniques requires respondents to make 'well-informed values judgements on the environmental good under investigation' (Christie et al. 2006, p.305); correspondingly, this may require the transfer of a lot of complex information in a meaningful format. According to Sagoff (1988), there is concern that poorly informed respondents may be unable to make sensible decisions about a goods provision and may be prone to lexicographic preferences. Indeed, Nunes and van den Bergh (2001) suggest that the valuation of biodiversity using CV can fail if the public is not informed or lacks experience with it[101].

In order to investigate understanding of the term biodiversity, respondents were presented with an open-ended question which asked: "*Before reading this questionnaire what did the term biodiversity mean to you, if anything?*". This was adapted from a similar question used by Spash and Hanley (1995). It is useful to review the findings in terms of: (a) the overall proportion of respondents with some understanding of the term (see Figure 5.2); (b) the proportion of respondents that included certain biodiversity related terms (see Figure 5.3); and lastly, (c) to explore individual knowledge levels by investigating the number of different related associations reported (see Figure 5.4) and to see if this varies according to key socio-demographic characteristics.

[101] The issue is further complicated by the lack of a unique definition of biodiversity amongst scientists and policymakers (Christie et al. 2006). However, although the public may not understand the term, they may still hold value for what it represents and, can learn through the survey.

Overall, 8% of respondents did not respond to the question (Figure 5.2). Almost one-fifth (19%) of respondents stated the term meant 'nothing' to them, common responses included 'I have never heard the term', 'not much', and 'no idea'. A further 1% of respondents provided an unrelated meaning, for example, one respondent stated 'using a number of methods to produce energy e.g. wind power and solar power'. Encouragingly, almost three-quarters (72%) of the respondents appeared to have some understanding of the term biodiversity. This is very high compared to findings elsewhere, for example, a recent UK study found that only 26% of respondents had heard the term biodiversity (DEFRA 2002), whilst Spash and Hanley (1995) found the most common occurrences of relevant terms, in a general public survey, were "don't know", "haven't a clue" and "nothing" [102]. Of course, in the current study, respondents had a significantly higher level of education than compared with the general public, which is likely to go some way in explaining high levels of awareness – this is explored in more detail later[103]. On a positive note, the results suggest that the problem of respondents being poorly informed about the good may be less evident in this valuation.

Figure 5.2 Distribution of responses to "What does the term 'biodiversity' mean to you, if anything?"



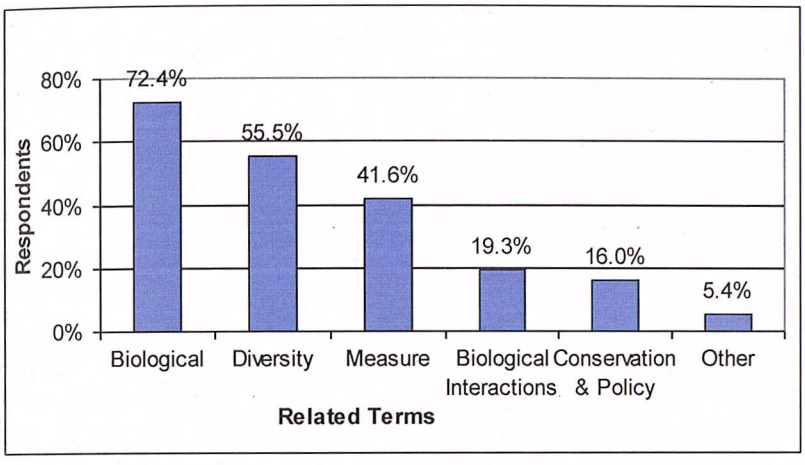
The open-ended responses were decomposed into units and then categorised into seven broader headings: biological terms, diversity terms, measure/amount, biological interactions, conservation and policy responses, threats and importance (see Appendix for full classification). It is clear from the headings alone that some of the respondents had a relatively sophisticated understanding of the term. Figure 5.3 provides an overview of the proportion of respondents (excluding missing items) associating 'biodiversity' with various related terms. Responses were coded according to the occurrences of related terms and thus are not mutually exclusive, in

[102] Similarly, in a series of focus groups consisting of members of the general public Christie et al (2006) also found evidence of low levels of understanding and awareness of the term biodiversity – over half of participants had not come across the term before, whilst some of those that had could not provide a clear definition. The authors concluded that the general public have a relatively low understanding of the term biodiversity.

[103] Additionally, respondents could have read ahead in the questionnaire (to the biodiversity information box).

other words respondents mentioning 'biological terms' may also have included terms relating to 'diversity'.

Figure 5.3: Proportion of total respondents associating 'biodiversity' with various related terms

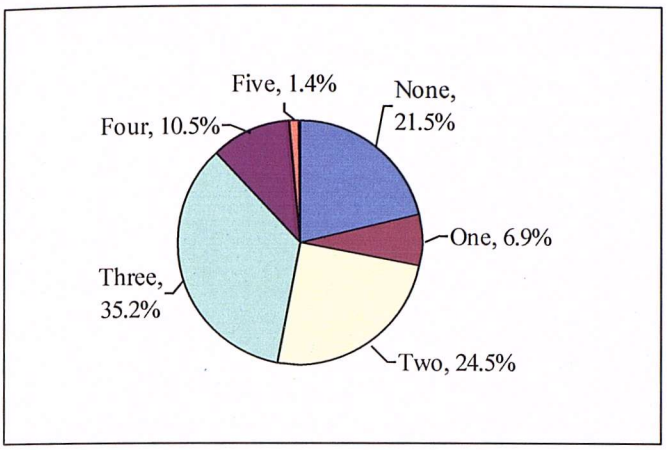


Note: Sample excludes missing items thus total number of respondents = 555.

The majority of respondents (72.4%), were able to provide a related meaning, linking the term with biological indicators such as 'flora and fauna', 'plants and animals', 'species', 'ecosystems' and 'living things'. Over half (55.5%) of the respondents included terms relating to diversity, for example mentioning the 'variety', 'range' and 'spread' of various biological indicators. Over two-fifths (41.6%) of respondents included references towards biodiversity as some form of measure including terms such as the 'number of' and 'level of' as well as terms relating to the amount of biological indicators in a given area, for example, 'in an ecosystem' or 'habitat'. An unexpectedly high proportion of respondents (19.3%) linked biodiversity with relatively sophisticated terms relating to 'interactions' and 'co-dependency' between life forms, in some cases citing examples such as the 'food chain'. In addition 16% of respondents linked the term with conservation and related policy issues. The 'other' category included a variety of different associations for example 'mono-cropping', the 'survival of the planet', and so on - although only a small proportion of respondents mentioned such terms. In terms of coverage, it is perhaps notable there were no specific mentions of 'genetic' diversity.

In order to gain a better insight into knowledge levels, a variable was created to indicate the number of different, related, associations reported by individual respondents. This was calculated by counting the number of different categories of association mentioned by each respondent (as based on the seven broad categories identified earlier). The results are presented in Figure 5.4.

Figure 5.4: Number of related associations with term 'biodiversity' as a proportion of total respondents



Note: Total N = 555. (The sample excludes missing items, thus, the discrepancy between the proportion of respondents reporting 'none' in this figure (21.5%) and 'nothing and 'unrelated' in Figure 5.2 (19.8%) relates to this exclusion).

Almost 7% of respondents made only one relevant association with the term biodiversity – for the most part this consisted of references to the various biological indicators. In contrast, almost a quarter (24.5%) of the respondents were able to provide two different types of association, and over a third (35.2%) provided three different associations. The proportion of respondents providing more than three different associations tailed off with just over 10% providing four different associations and only 1.5% providing five different related associations.

In order to explore whether knowledge of the term 'biodiversity' was related to respondents' socio-economic characteristics, a variable was created to represent levels of knowledge by grouping the number of different related associations into four categories to represent: no knowledge, basic (1 or 2 different related associations), medium (3 different related associations) and high (4 or 5 different related associations). Chi square tests of independence were then used to identify any potential associations between the various socio-demographic variables and knowledge. The results indicated a number of significant associations.

As expected, level of knowledge of 'biodiversity' was found to be significantly associated with degree-level education or above (chi square value of 57.8169 and p=0.000), with membership of environmental organisations (chi square of 12.7012 and p=0.005) and donating to environmental causes (excluding natural disaster appeals) (chi square of 44.1691 and p=0.000). The later results provide some corroboration to the earlier findings of Spash and Hanley (1995) that the number of conservation groups student respondents belonged to was positively correlated with familiarity with biodiversity definitions. In addition, in the current study,

knowledge levels were also found to be significantly associated with income group[104] (chi square value of 16.8440 and p=0.010), and to a slightly lesser extent with age group which had a negative association (chi square value of 12.3825 and p=0.054). In contrast, gender was not found to have any significant association with the level of knowledge of biodiversity. Overall these findings suggest that knowledge of the term biodiversity increases with income, education, membership of environmental organisation and donation to environmental causes but declines with age.

Attitudes and perceptions towards biodiversity were investigated using a Likert scale to assess respondents agreement with a series of statements (in part adapted from Horton et al. 2001; 2003;O'Garra 2005). The distribution of responses is presented in Table 5.4. Whilst around 10% of respondents believe that globally, there has been little loss of plant and animal species, over 81% of respondents either disagree or strongly disagree with this statement. In terms of the importance of conserving biodiversity, almost all respondents (85.7%) consider that the conservation of species and ecosystems is essential for survival, and almost two-thirds of respondents (60.6%) rejected the notion that science and technology would provide a solution to the problems associated with biodiversity loss.

Table 5.4: Distribution of responses to biodiversity statements

Statements	1	2	3	4	5
While some local plant and animal species may have been harmed by environmental degradation, over the whole Earth there has been little effect	36.0%	45.8%	7.8%	7.8%	2.8%
We must look after the worlds' species and ecosystems if we are to survive	4.2%	3.4%	6.6%	40.4%	45.3%
Science and technology will allow us to overcome any problems associated with the loss of species and ecosystems	17.1%	43.5%	22.6%	13.3%	3.6%

Note: 1 = strongly disagree, 2 = disagree; 3 = neutral; 4 = agree; and, 5 = strongly agree.

Awareness, knowledge and experience of tropical biodiversity

Awareness, knowledge and experience of tropical biodiversity were explored in a series of closed and open-ended questions. In line with previous empirical findings (see Horton et al 2001; 2003;Kramer & Mercer 1997;Manoka 2001), the vast majority of respondents, 91.3%, had 'previously read, heard, or watched TV programmes about the conservation of tropical wildlife and habitats'[105]. Similarly, virtually all of the respondents, 93.5%, had some previous

[104] Age and income variables were grouped into three categories (young, middle and old; and lower, middle and high income, respectively) to allow for chi square testing.

[105] Horton et al (2001; 2003) found that all of the UK respondents had previously heard about tropical rainforests. Manoka (2001) reported that 95% of US respondents had some previous knowledge of

knowledge of the causes of tropical biodiversity loss. On average, respondents were able to list at least 3 causes of tropical biodiversity loss; the maximum number of causes reported was 14. The causes identified varied widely, the most common were: deforestation and logging which accounted for 21% of all causes, global warming (11.3%), agriculture/farming (10.1%), pollution (8.7%), hunting and fishing (8.1%).

It was hypothesised that respondents with experience of protected areas and developing countries may hold positive preferences towards the proposed valuation scenario on the basis that this may indicate an underlying interest in tropical biodiversity and/or developing countries. And, importantly, that these respondents may perceive the proposed policy change as providing potential user benefits. (Of course it could also be the case that respondents with experience of protected areas and/or developing countries may hold negative perceptions towards the proposal depending on the quality of their experience). Approximately two-thirds of respondents (66.1%) had previously visited a developing country and just over half of all respondents (51.3%) had visited a protected area or national park or conservation project. It is perhaps unsurprising that such a high proportion of respondents had visited developing countries given the sample is relatively wealthy.

In line with Ajzen's (1991) theory of planned behaviour, experience of actually *paying* for the good in question may be a more powerful predictor of underlying values than other attitudinal data. As noted in the previous section a high proportion of respondents had some experience of donating to *general environmental* causes. Returning to these figures, in terms of biodiversity, 22.9% of respondents had donated time or money to wildlife or nature conservation in the previous 12 months (see bottom of Table 5.3). A higher proportion of respondents had donated to a UK based wildlife cause (17.0%) compared to an international wildlife or nature cause (11.2%). These results suggest that nearly a quarter of the respondents appear to attach some value towards biodiversity conservation. More importantly, these respondents appear to have some experience of expressing their underlying values for biodiversity conservation in terms of a *payment* of either money or time.

5.5.5 Attitudes towards Funding Tropical Conservation

One of the main objectives of this study is to uncover information about the public attitudes towards funding tropical conservation.

An issue commonly addressed in the previous empirical research into public preferences for tropical biodiversity is whether respondents believe that developed countries should help the

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tropical rainforests and 86% had some previous knowledge of the causes of deforestation. Whilst Kramer and Mercer (1997) also reported that 91% of US respondents had previous knowledge of rain forest and 81% had knowledge of the causes of deforestation.

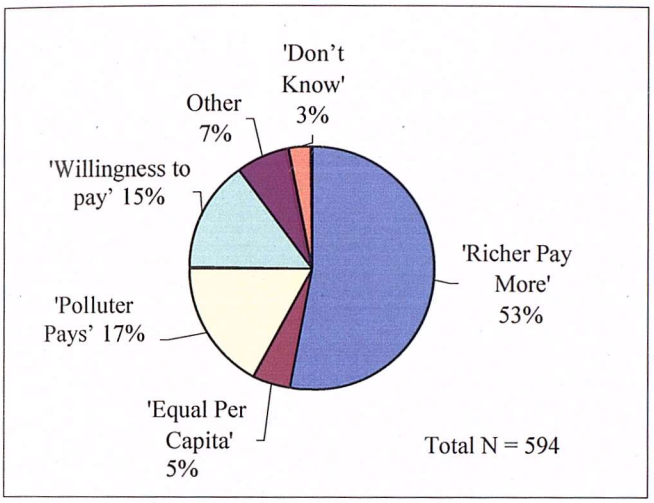
developing countries to meet the costs of conserving tropical biodiversity. In the current study the vast majority of respondents, 86%, agreed that developed countries should help pay, 7% disagreed whilst, 7% responded 'Don't know'. These findings suggest considerable support exists for the transfer of funds from developed to developing counties to meet biodiversity conservation objectives and are in line with findings from previous studies. For example, Horton *et al* (2001; 2003) found that 92% of UK respondents were in favour of developed countries helping to pay the costs for preserving tropical rainforests whilst Kramer and Mercer (1997) reported that 67% of US residents supported the transfer of funds from industrialised nations to help pay the costs of rainforest conservation. These findings add weight to the commitment made under the CBD for the developed countries to help the developing countries to meet the financial costs of providing global biodiversity as set out under Article 20.

In view of this support, it is interesting to explore how the public would prefer the costs to be shared between the developed countries. The financial mechanism currently appointed under the CBD to transfer funds from developed to developing countries is the Global Environment Facility. This has typically been replenished on a roughly four yearly basis, with three replenishments to date and a fourth replenishment currently in negotiation. Whilst the cost-sharing varies over replenishments it is ultimately, according to the GEF, shared on the basis of what a donor country is willing to pay (subject to capacity and agreement on what is an equitable distribution of financial responsibility) (GEF 2005). There are many other potential ways of sharing the costs, which are evident elsewhere in the field of sustainable development. For example, the internationally agreed target to commit 0.7% of rich countries gross national product (GNP) to ODA is based on a countries wealth, such that richer countries pay more. Another common principle is the 'polluter pays', although this is not directly applicable to the international transfer of funds for biodiversity conservation, there is an argument that it could be scaled up to apply by ensuring 'countries' with poorer environmental track records pay more towards the costs of biodiversity conservation. Other cost sharing principles include per capita based payments. Clemencon (2000) discusses the potential for a 'per capita green planet contribution' which could be used to provide more automatic funding for protecting the global environmental goods, such as biodiversity, at potentially a very low per capita cost.

To explore public preferences on cost-sharing approaches for conserving global biodiversity, all respondents were asked *"If the developed countries were to help* [pay the costs of conserving tropical biodiversity], *how do you think the costs should be shared between the developed countries?"*. The distribution of responses is presented Figure 5.5. Interestingly, only 15% of respondents chose the current method of cost-sharing adopted under the GEF (essentially 'willingness to pay'). In contrast, over half the respondents (53%) were in favour of 'richer countries pay more' cost sharing arrangement, which is more reflective of the type of

arrangement adopted in the UN ODA targets where countries commits a proportion of their GNP. Around 17% of respondents preferred a 'polluter pays' principle, 5% chose the 'per capita' payments and only 3% stated 'don't know'.

Figure 5.5 Attitudes towards Cost-Sharing: Distribution of responses to *"If the Developed countries were to help* [pay the costs of conserving tropical biodiversity] *how do you think the costs should be shared between the developed countries?"*



5.5.6 Valuation Section

5.5.6.1 Payment Principle Question

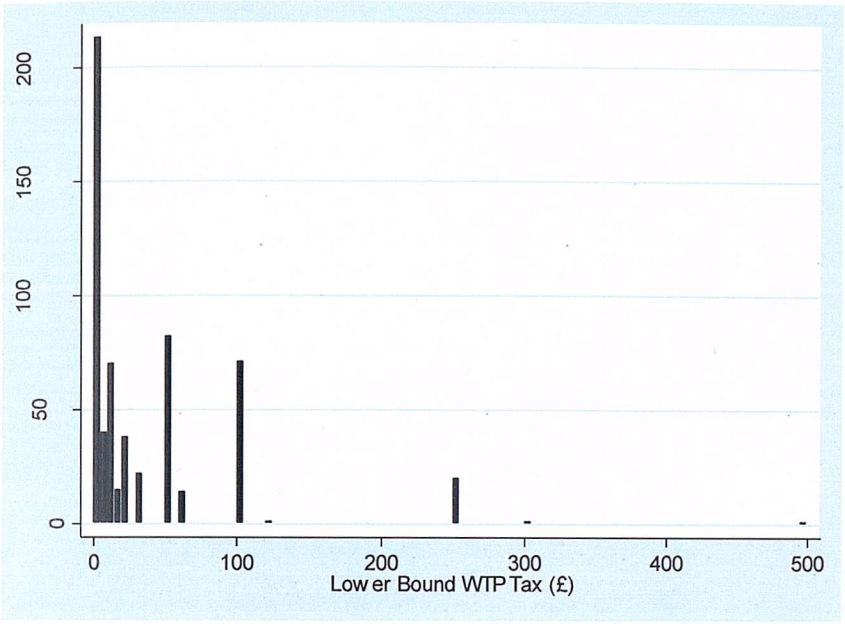
All respondents were presented with a payment principle question (PPQ) which asked *"**Do you think that, in principle, you would be willing to contribute something towards the cost of ensuring the proposed protected area programme goes ahead?** Please bear in mind there are other causes such as poverty reduction, pollution and so on, as well as other things that you may prefer to spend your money on."* This question was presented immediately after the description of the proposed policy change and prior to the three individual payment ladder questions. Almost two-thirds of respondents (65.4%) stated YES to the payment principle, around 15% stated NO and the remainder stated DON'T KNOW (19.8%). Interestingly, the proportion stating NO was similar to that reported by Horton et al. (2001; 2003) (11%) adding some validity to the results.

5.5.6.2 Distribution of Willingness to Pay across Payment Vehicles

Respondents that stated YES or DON'T KNOW to the PPQ (n=508) were asked how much they were willing to pay towards the protected area programme per year for the next 10 years under the three, randomly ordered payment mechanisms. (Respondents that stated NO to the PPQ were coded as zero WTP bids consistent with other empirical studies for example (Horton et al. 2003;Turner et al. 2004)). Response rates were similar across all mechanisms; item non-

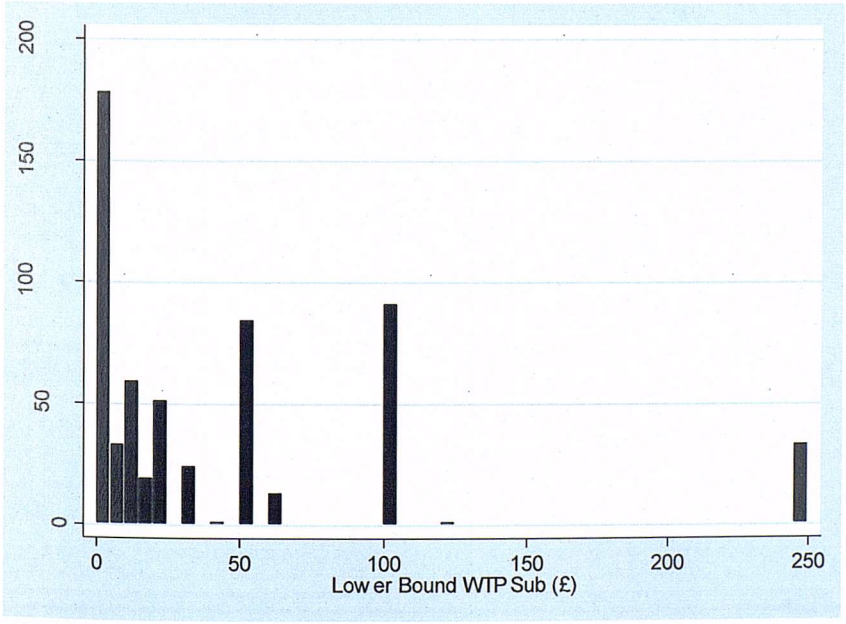
response was low, ranging from 2.2% to 2.7%. Figure 5.6, Figure 5.7 and Figure 5.8 depict the distribution of WTP under each of the payment mechanisms (full sample).

Figure 5.6: Distribution of WTP per annum in Increased Tax



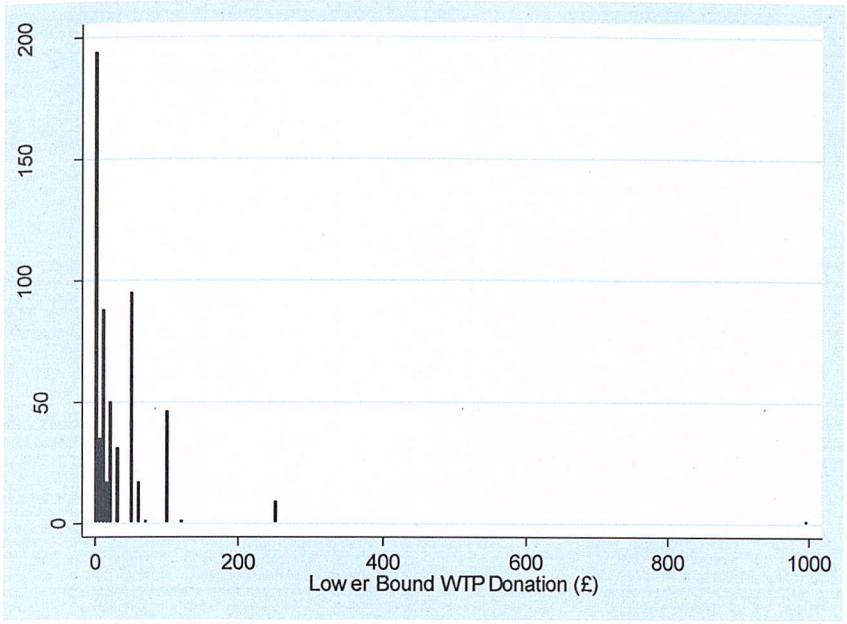
Note: Lower Bound WTP corresponds to the value ticked on the payment ladder

Figure 5.7: Distribution of WTP per annum in Higher Prices



Note: Lower Bound WTP corresponds to the value ticked on the payment ladder

Figure 5.8: Distribution of WTP per annum in Donations



Note: Lower Bound WTP corresponds to the value ticked on the payment ladder

Inspection of the WTP distributions reveals a large proportion of responses are clustered over zero for all three of the payment mechanisms, indeed roughly a quarter of respondents were unwilling to pay anything toward the proposed programme under each of the mechanisms (zero WTP bids accounted for 27.9%, 25.0% and 27.7% of total responses under the tax, higher prices and donations vehicles, respectively). Conversely, the proportion reporting positive WTP was marginally higher under the higher prices vehicle (75%) compared to the donation (72%) and tax (72%) vehicles. The shape of the distributions suggests that WTP is positively skewed for all three of the payment mechanisms. This is often the case with WTP data, and is due to the presence of a relatively small proportion of very high bids dragging the tail of the distribution out to the right. In the case of the tax vehicle one outlier was identified at £500 and under the donations vehicle one outlier of £1000. The positive skew suggests the use of logged data may be more appropriate in the econometric estimation of WTP (Cameron & Huppert 1989).

5.5.6.3 Motivations for Positive Willingness to Pay

To validate WTP bids respondents motivations for stated WTP were analysed. The results indicate that reported bids appear to reflect true economic values. The main motivations for positive WTP were consistent with those reported by Horton et al. (2001; 2003), namely: to conserve species and ecosystem richness (25.3%); for the global ecosystem services provided (22.3%); so future generations can enjoy these species/ecosystems (15.9%), and due to concern about nature and wildlife conservation (14.6%) (see Appendix 8 for table of main motivations). Only a very small percentage was motivated by knowledge that these species/ecosystems exist (1.7%), and similarly only a small proportion were concerned with the preservation of genetic

resources for the future (2.3%). A noteworthy finding was the very low proportion (1.5%) that were motivated by the possibility of visiting these places in the future, which highlights that for the majority of the respondents the main benefits related to indirect use, existence, and bequest values (non-use values).

5.5.6.4 Motivations for Zero Willingness to Pay across Payment Vehicles

The main reasons for zero willingness to pay are reported in Table 5.5, categorised into valid and protest responses.

The reasons were similar across the payment vehicles although the proportions varied suggesting some sensitivity in perceptions towards the various mechanisms. The most frequently cited reason related to budget constraints, ('I cannot afford to contribute') which accounted for 25.7%, 31.8% and 30.3% of the responses in relation to the tax, higher prices and donations vehicles, respectively. This was followed by 'I prefer to give to other causes' which unsurprisingly accounted for a higher proportion of the reasons under the voluntary vehicle (17%) compared to the tax (9.7%) and higher prices (11.3%) vehicles. Encouragingly only a small percentage of the reasons for zero responses (3.0-4.0%) were due to negative perceptions regarding the likely success of the proposed policy change.

Sensitivity towards the individual vehicles was also reflected in protest reasons and, for the most part, mirrored a priori expectations. The tax vehicle encountered a higher number of protests on the basis of objections towards compulsory payments (9.1%) and the belief that taxes are already too high (9.1%). Unlike the other two mechanisms the tax mechanism also resulted in protest zeros due to being inapplicable with 5.1% of responses citing 'I don't pay taxes'. This is one of the oft cited problems with tax vehicles, since it excludes non-taxpayers (Bateman et al. 2002). The tax vehicle was also subject to more frequent perceptions of mistrust.

In contrast, fewer respondents objected to the higher prices vehicle on the basis of it being compulsory (2.0%), indeed some of the open-ended responses reflected a perception that it enabled some choice. Similarly, it also received fewer objections compared to the tax vehicle due to existing prices being too high (4.0% compared with 9.7% considered existing taxes too high). However it did receive objections due to 'disagreement with the reduction of spending on subsidies' which accounted for 6% of reasons. This vehicle was also considered 'inequitable' by the highest proportion of respondents.

Table 5.5: Motivations for Zero Willingness to Pay towards Protected Area Programme

Reasons for Zero bids	Tax	Higher Prices	Don
Valid Reasons			
I cannot afford to contribute	25.7%	31.8%	30.3%
I prefer to give to other causes	9.7%	11.3%	17.0%
I prefer to spend my money on other things	4.6%	5.3%	4.8%
Other reasons (valid)	3.4%	4.6%	4.8%
Protest Reasons			
I don't believe the programme would work	3.4%	4.0%	3.0%
Government should pay	5.7%	6.0%	10.9%
Inappropriate vehicle	5.7%	6.0%	4.8%
Mistrust	3.4%	2.0%	1.2%
Payment vehicle inefficient/ineffective	1.1%	0.7%	6.1%
Inequitable	0.6%	4.0%	0.0%
It should be voluntary/ compulsory[a]	9.1%	2.0%	6.1%
Taxes/Prices already too high	9.7%	4.0%	0.0%
I don't pay taxes/not applicable	5.1%	0.0%	0.0%
Disagree reducing subsidies	0.0%	6.0%	0.0%
Other reasons (protest)	12.6%	12.6%	10.9%
Total	100.0%	100.0%	100.0%

Note: Total number of responses Tax=175; Sub=151; Don=165. Totals differ from number of respondents with WTP=0 due to respondents providing multiple reasons and also item non-response. [a] Responses under tax and higher prices referred to 'It should be voluntary' and under the donation vehicle 'It should be compulsory'

The donations vehicle received no protests on the basis of being 'inequitable'. However, in comparison with the other vehicles, it received more frequent objections regarding the inefficiency or effectiveness of the vehicle institutions (6.1%); and the belief that the 'government should pay' (10.9%).

5.5.6.5 Protest Rates across Payment Vehicles

Overall protest zero bids accounted for 15.0%, 11.4% and 12.0% of total WTP responses under the tax, higher prices and donations vehicles respectively. There is a lack of published data on protest rates amongst the valuation literature and in particular amongst the studies that deal with exploration of preferences of distant beneficiaries for global biodiversity. However, these rates seem reasonable given the complex nature of the good, and are much lower than the 33% reported by Jakobsson and Dragun (1996) in valuing endangered species.

In relation to Hypothesis 1 (see section 5.3), a two-way chi-squared test indicated a significant difference in the protests rates between the tax and the higher prices vehicles (chi squared 3.2365, $p = 0.072$), although no other significant associations were detected. This provides

some evidence to support the suggestion that tax vehicles are considered more objectionable (Bateman et al. 2002).

5.5.6.6 *Non-parametric Estimates of Willingness to Pay across Payment Vehicles*

The summary statistics for sample estimates of willingness to pay are presented in Table 5.6[106]. WTP estimates are calculated from the reported lower-bound of the payment interval, and with the NO responses to the payment principle question included as zero bids (consistent with procedures adopted elsewhere in CV literature for example (Horton et al. 2003;Turner et al. 2004). Also, in line with standard procedures in the valuation literature, protest zeros and outliers were removed from the final welfares estimates (Bateman et al. 2002;Mitchell & Carson 1989), resulting in an increase in mean WTP under each of the mechanisms.

Table 5.6: Summary Statistics for Non-Parametric WTP per annum towards Protected Area Programme

Summary WTP Statistic	Payment Mechanism		
	Tax	Prices	Don
Total Number of Responses	588	587	585
Total number of responses WTP=0	164	147	162
Number of responses WTP=0 (protests) (%)	88 (15.0%)	67 (11.4%)	70 (12.0%)
Total valid responses (excl protestors & outliers)	499	520	514
Total valid responses WTP=0 (%)	76 (15.2%)	80 (15.4%)	92 (17.9%)
Mean WTP	£35.03	£43.16	£29.28
Mean WTP (excl protestors & outliers[a])	£40.27	£48.72	£31.37
Median WTP (excl protestors & outliers[a])	£15.00	£20.00	£15.00
SD (excl protestors & outliers[a])	£55.93	£63.07	£41.81
Standard Error	£2.50	£2.14	£1.84

Note: [a]One outlier was identified under the tax vehicle of £500; and one outlier under the donations vehicle £1000. There were 8 missing observations under the tax vehicle; 9 under the prices vehicle, and 11 under the donations vehicle.

On average respondents were willing to pay £40.27, £48.72 and £31.37 per annum for the next 10 years towards the protected area programme under the tax, higher prices and donations vehicles respectively. It is also useful to consider median WTP values since mean values may be sensitive to high values (Malhotra 2004). Even with extreme outliers removed, median WTP of £15.00, £20.00 and £15.00 for the tax, higher prices and donations vehicles respectively, is much lower than mean WTP indicating that the WTP distribution remains skewed to the right. Further the high standard deviation values indicate that the bids are relatively scattered around the mean, with variability greatest under the higher prices mechanism followed by the tax mechanism and lowest under the donations mechanism, (standard deviations £63.07, £55.93,

[106] It should be noted that these are sample estimates only and are not representation of the target population. Estimates weighted to the population are provided in Section 0.

and £41.81, respectively). The smaller average deviation from the mean under the donations vehicle may be indicative of the high proportion of respondents (52%) with previous experience of paying for environmental goods via donations mechanisms.

In relation to hypothesis 2 and 2a, to assess whether willingness to pay is significantly different between the payment vehicles a paired Wilcoxon signed rank test was employed since unlike t-tests this does not require the data to be distributed normally (Malhotra 2004)[107]. The results indicate that WTP is significantly greater under the higher prices vehicle compared to the tax and donations at the 1% significance level and that WTP under the tax vehicle is significantly greater than the donations vehicle at the 5% significance level (p value 0.0136)[108]. These results provide considerable support for findings elsewhere that respondents exhibit sensitivity in WTP under different payment conditions (Bateman et al. 1993;Bergstrom, Boyle, & Yabe 2004;Daubert & Young 1981;Jakobsson & Dragun 1996;Rowe, D'Arge R.C., & Brookshire 1980).

To further explore the effect of the different payment vehicles on willingness to pay the data was examined in terms of the incidence of valid zeros and on positive willingness to pay bids only. Although the proportion of valid zeros was higher under the donations vehicle (17.9%) compared to tax (15.2%) and higher prices (15.4%), chi squared tests on three-way and all possible two-way cross-tabulations indicate there was no significant difference between the vehicles. Nevertheless, the lower proportion of zeros reported under the tax vehicle compared to the donations vehicles is consistent with the findings of Bateman et al. (1993; 1995). A comparison of the central tendency and distribution of WTP for positive bids only (excluding outliers) confirms that the greater willingness to pay under the higher prices vehicle compared to the tax and donations vehicles appears to be driven by respondents reporting higher positive bids under this vehicle. Mean WTP for positive bids only is £47.51, £57.58 and £38.21 under the tax, higher prices and donations vehicles, respectively. A Wilcoxon signed-rank test confirms that positive willingness to pay is significantly higher under the higher prices vehicle compared to the tax and donations at the 1% significance level and for the tax and donations is significant at the 10% level.

[107] The paired Wilcoxon signed rank test does require that the data is not independent however this can be assumed to be the case since individuals are asked to report willingness to pay under each of the three vehicles, thus reported WTP under one vehicle may influence reported WTP under another. This assumption does have the drawback of dropping observations where respondents have not reported valid bids under all vehicles nevertheless it seems the safest assumption given a within-subject design has been used.

[108] These results are further corroborated by conducting three sets of pair wise Student Ttests on the transformed log-normal WTP data which reveal that willingness to pay is significantly different between all vehicles at the 1% significance level.

Overall, the differences in WTP between the tax and donations vehicle support the earlier hypothesis (2a) and are consistent with empirical findings elsewhere (see Bateman et al. 1995; Champ et al. 2002;Jakobsson & Dragun 1996). The finding that willingness to pay is highest under the higher prices vehicle is an interesting result. It is possible that this reflects that this vehicle is the most hypothetical of three presented. Indeed Jakobsson and Dragun (1996) note that where a payment vehicle is unrealistic respondents may report untrue bids. However, it may simply be the case that respondents prefer this vehicle since it offers a compulsory mechanism (meaning everybody pays) but payments may be perceived as being more flexible and less noticeable than taxes, and, less effort than making donations.

5.5.6.7 Certainty across Payment Vehicles

There are many factors which may influence certainty and which in turn may influence a respondent's valuation. These include uncertain preferences, uncertainty about the proposed policy change, for example its quality or quantity, uncertainty about factors likely to affect the good to be valued and uncertainty about an individual socio-demographic circumstances (Wang 1997). In order to gauge preference certainty (and to investigate the effect on WTP), respondents reporting positive bids[109] were asked to indicate how certain they were that they would really pay the stated amount if asked, using a scale of 0% to 100% certain. The results are presented in Table 5.7 (non-valid responses excluded).

Table 5.7: Certainty for Positive Bids only (excludes outliers)

Certainty	Payment Mechanism		
	Tax	**Higher Prices**	**Don**
Mean	80.53%	78.47%	73.53%
Median	90.00%	80.00%	80.00%
Std Dev	22.12%	21.56%	22.86%
N	412	430	415

Note: Total N differs from total positive bids due to item non-response.

In general, certainty was found to be relatively high for all vehicles, with median certainty of 90% for tax vehicle and 80% for both donations and subsidies vehicle. This is an encouraging result given the valuation is dealing with a complex and distant good.

[109] Respondents stating zero WTP were assumed to have certain preferences, thus they were not asked to report their certainty. Indeed Loomis and Ekstrand (1998) found that NO responses have greater certainty than YES responses, with nearly half of their NO sample being very certain of their answer, whilst YES responses had significantly higher uncertainty. The assumption that respondents stating NO (to PPQ) or zero WTP would not actually pay in reality is also consistent with the approach adopted by Champ and Bishop (2001), who found that NO responses in hypothetical treatments were similar to those in actual treatments.

In relation to Hypothesis 3, (see section 5.3) the results of paired Wilcoxon signed rank tests reveals that certainty was significantly different between all the vehicles at the 1% significance level. These results suggest that individual reported certainty was significantly influenced by payment mechanism, such that respondents were most certain of their reported WTP bids under the tax vehicle, followed by subsidies and then donations vehicle. This is an interesting result since the subsidies vehicle was the most hypothetical of all the mechanisms. Indeed over half respondent considered the donations vehicle to be the 'most likely' to fund the programme (see next section) yet, respondents were least certain about their WTP responses under this vehicle. The trend of declining certainty from tax to subsidies to donations vehicle, may suggest that certainty is more influenced by the perceived coerciveness (or appropriateness) of the vehicle rather than perceived realism. Indeed, respondents may be less certain of their preferences under voluntary donation mechanisms because in reality they don't really have to pay.

To examine the effect of uncertainty on WTP uncertain bids were removed from the sample at several different truncation points. This is similar to the approach adopted by Champ and Bishop (2001) although in their study uncertain YES bids were recoded as NOs. The results are presented in Table 5.8. In general the effect of censoring WTP estimates for certainty is relatively small. The largest change occurs in censoring bids at 99% certainty although this is to be expected since the sample size is halved, consequently the reduction in WTP may in part be explained by the greater proportion of zero bids relative to total bids (since zero bids considered to have 100% certainty).

Table 5.8: Non-Parametric WTP Censored for Certainty

Mechanism		WTP	WTP Responses Truncated at Certainty:			
			≥ 70%	≥ 80%	≥ 90%	≥ 99%
Tax	Mean	£40.27	£44.51	£44.18	£44.91	£41.45
	Median	£15.00	£20.00	£20.00	£20.00	£12.00
	St Dev.	£55.93	£60.00	£60.98	£62.29	£62.40
	N	499	405	368	304	253
Prices	Mean	£48.72	£51.09	£51.77	£53.75	£47.96
	Median	£20.00	£20.00	£20.00	£30.00	£20.00
	St Dev.	£63.07	£65.97	£67.00	£69.94	£68.73
	N	520	414	362	289	233
Donations	Mean	£31.37	£30.97	£29.39	£29.14	£24.02
	Median	£15.00	£15.00	£12.00	£10.00	£1.50
	St Dev.	£41.81	£44.16	£44.37	£48.21	£46.19
	N	514	376	322	251	200

Overall, censoring for certainty results in a slight increase in mean WTP under the tax and higher prices vehicles, a small decrease under the donations vehicles, and an increase in standard deviation across all three vehicles. These results are relatively consistent with those of

Champ, Alberini and Correas (2005) who found that dropping unsure respondents in a DCM model had the effect of increasing both mean WTP and standard deviation[110].

5.5.7 Sensitivity towards Payment Vehicles

Understanding more about why respondents prefer certain payment mechanisms may help to inform policymakers on the design of appropriate capture mechanisms, and, similarly, help to guide CV researchers on the most sensitive aspects of payment vehicles which should be considered in CV design. Over half of the respondents (58%) in the full sample reported different WTP amounts across the mechanisms (includes protestors and outliers[111]).

Perceptions of the Payment Vehicles

To understand more about respondents perceptions of the payment mechanisms, respondents were asked to choose the mechanism which they perceived to rate highest for each of the following characteristics: fairest way to raise funds; most appropriate way to raise funds; most successful in raising funds; and realistically, the most likely to fund the programme. The results are presented in Figure 5.9.

The tax vehicle was considered to be the 'fairest' mechanism by the greatest proportion of respondents (44%) when compared to the subsidies (27%) and donations (27%) vehicle, possibly because of the 'everybody pays' factor but also because being based on an income tax increase it more explicitly addresses equity concerns. In terms of which mechanism was considered the 'most appropriate' way to raise funds, the difference between the higher prices vehicle and tax mechanism, which collectively received the greatest support, was much less marked. There is much support in the policy literature for redirecting perverse subsidies as a funding source for conservation and this perception appears to be shared by just over a third of respondents (34%). Almost two-fifths of respondents (38%) considered the tax to be the most appropriate mechanism and less than a quarter of respondents (24%) considered it appropriate for the protected area programme to be funded by voluntary donations.

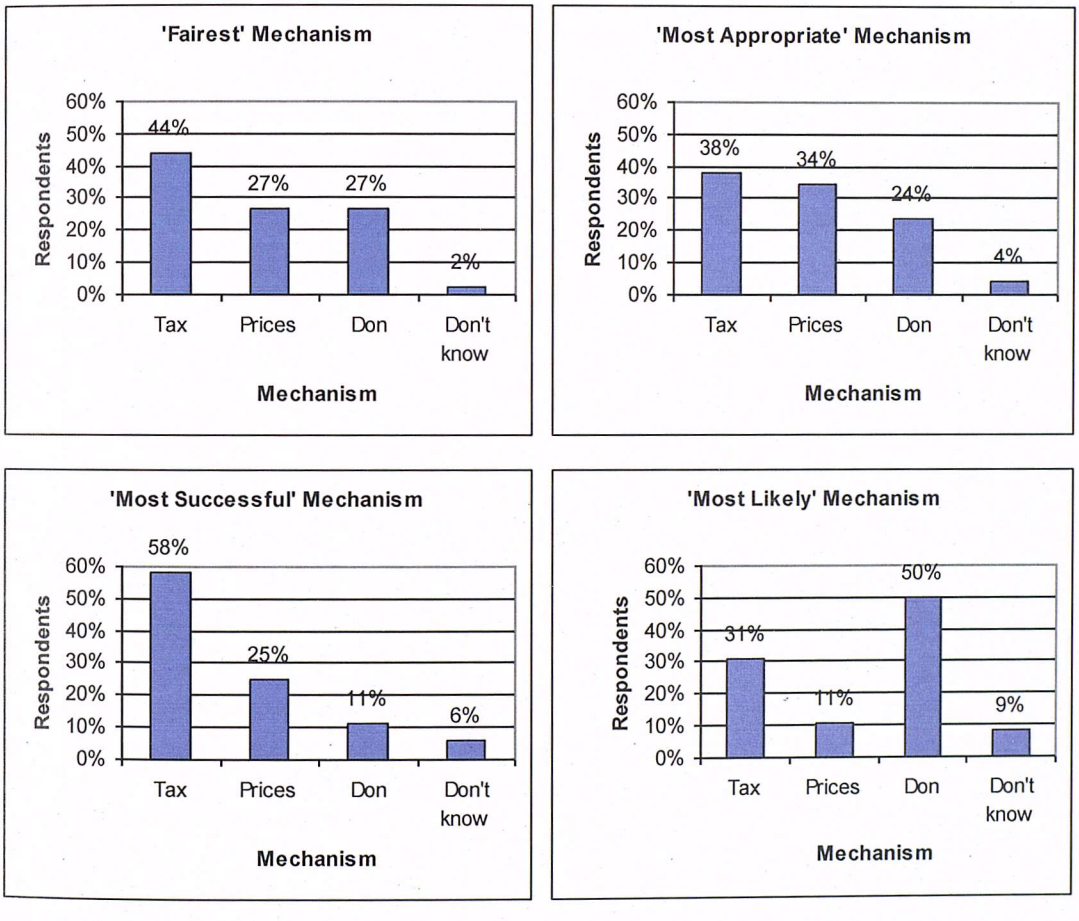
Almost two-thirds of respondents (58%) believed that the tax mechanism would be the most successful at raising funds, which is likely to reflect the compulsory nature of this vehicle and

[110] Of course if Champ and Bishop (2001) approach of re-coding uncertain positive responses as zeros had been used then the effect on WTP estimates would be much more significant. However this approach has been avoided here since extreme recoding of uncertain bids seems a drastic step which has been found elsewhere to reduce the precision of estimates and explanatory power of the regression models (Loomis & Ekstrand 1998).

[111] Protestors were included in the analysis since many of these respondents simply exhibit an extreme form of payment vehicle sensitivity, thus excluding their responses would result in the loss of important information.

its wider coverage. The higher prices vehicle was selected by only a quarter of respondents (25%) although it too would be compulsory and have similarly wider coverage. This may indicate that respondents do not consider current spending on subsidies to be high enough to ensure to generate significant funding, or as with (Blamey 1998) it may simply be that respondents may have struggled to understand the higher prices vehicles. Of course it is unsurprising that a much lower proportion of respondents considered a voluntary donation mechanism (11%) would raise the most funds.

Figure 5.9: Attitudes towards Payment Mechanisms: Responses to "Which funding option do you think is: (i) the fairest way to raise funds?; (ii) the most appropriate way to raise funds?; (iii) will be the most successful in raising funds?; and, (iv) is realistically most likely to be used to fund the programme?"



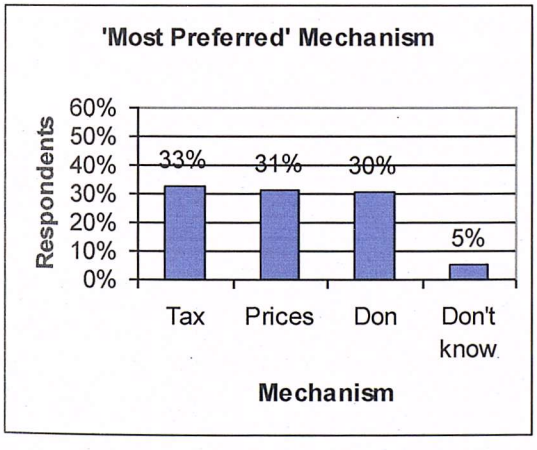
Despite only a minority considering the donation vehicle to rate highest for the other characteristics, approximately half of respondents (50%) believed it would be the most likely mechanism to fund the programme. This adds considerable support to the argument of Champ et al (1997) that in certain cases a voluntary donation may be perceived as the most plausible funding mechanism. Interestingly, the higher prices vehicle received the lowest support,

indicating that almost 89% considered it 'not' to be the 'most likely' mechanism, despite it being regarded as the 'most appropriate' by one-third of the sample.

It is clear from these attitudinal questions that perceptions vary towards the vehicles depending on the particular characteristic. Indeed, it is interesting that although 58% of respondents believe the tax vehicle will be most successful at raising funds, only 38% believe it to be the most appropriate funding mechanism.

The 'most preferred' method of contributing to the protected areas programme was fairly evenly split, with roughly a third of respondents supporting each payment mechanism (see Figure 5.10). Overall, marginally more respondent chose the tax payment mechanisms, compared to the higher prices and donations mechanisms. Interestingly, this attitudinal indicator of preferences for the various vehicles does not appear to account for the differences in WTP across the vehicles. More specifically one might expect a greater proportion to prefer the higher prices vehicle since WTP was significantly higher under this vehicle, yet this does not appear to be the case – the reasons for sensitivity are considered in greater detail in the next section.

Figure 5.10: 'Most Preferred' Payment Mechanism: Responses to "Overall, under which one of the three funding options would you most prefer to contribute to the protected area programme?"



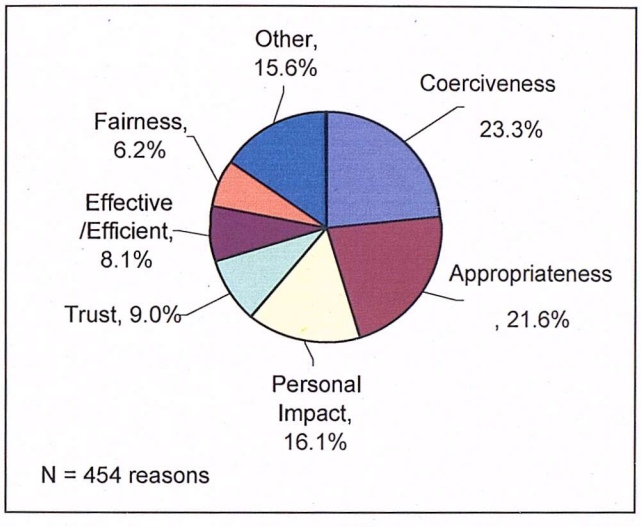
Reasons for Sensitivity towards Payment Vehicles

To understand more about the reasons for this sensitivity, respondents were asked in an open-ended question to briefly explain the reasons why they were willing to pay more under some mechanisms rather than others. To the best of the authors knowledge, this direct approach to investigating the reasons for sensitivity to payment vehicles represents a novel contribution to the existing literature and was one of the main advantages of using a within-subject design.

In total 454 reasons were provided; these were coded and classified into seven broad categories (see Appendix for classification scheme). The distribution of responses for the full sample

including protestors and outliers is presented in Figure 5.11. The results indicate that the main drivers for sensitivity towards the vehicles reflected both positive and negative attitudes towards the coerciveness, appropriateness, personal impact, trust, effectiveness and fairness of the various vehicles[112]. The 'other' category included 12 different individual associations incorporating concerns about the institutions, fund-raising potential, transparency, coverage and budget constraints, as well as 'don't know'.

Figure 5.11: Reasons for Sensitivity towards Payment Mechanisms



Notably the most frequent comments related to the coerciveness of the mechanisms (23.3%) reflecting both positive and negative attitudes towards compulsory (9.7% and 1.8%, respectively) and voluntary payment mechanisms (7.5% and 4.4% respectively). The main pros included 'everybody should pay', and 'choice' and 'flexibility'. The cons reflected similar attitudes, for example, 'lack of choice' and also that respondents perceived 'competing charitable causes' as a reason for paying less under the donations mechanism.

Consistent with advice in the CVM literature (see Bateman et al. 2002; Champ et al. 2002), the perceived appropriateness or acceptability of the various mechanisms was also an important factor, accounting for 21.6% of the total responses. Again this reflected positive and negative attitudes. Frequent comments related to the unacceptability of tax increases (4.4%) and interestingly, positive support for reducing subsidies (8.2%) in particular the 'spin-off benefits' such as 'trade' and 'level playing field' effect.

[112] Since the sample included zero bidders (and protestors) there was some overlap with the reasons reported for zero WTP. Interestingly, focusing solely on positive bidders revealed a very similar distribution in the reasons for paying more under certain vehicles compared with the full sample.

Over 16% of the reasons provided for sensitivity reflected consideration of the 'personal impact' of the various payment mechanisms. Positive attitudes were expressed towards payments that were 'less noticeable/visible' or would be 'easier to pay' or require 'less effort', all of which were deemed reasons for paying more (14.3% collectively). Similarly, a smaller proportion (1.8%) considered payments which were 'easier to forget/ignore' or involve 'more effort' as reasons for paying less; (the later were mainly in relation to the voluntary donation vehicle). This is an interesting result since it could suggest that some respondents may factor in a 'transaction charge' for mechanisms that require effort, which could partly explain the reasons for the lower mean WTP under the donations vehicle.

The trustworthiness of the vehicle, which is frequently cited as an important issue in the design of payment vehicles, in particular, in relation to taxes (see Bateman et al. 2002) accounted for a much lower proportion of total responses (9%). The majority of these reflected negative perceptions, focusing on mistrust of the various mechanisms, for example, 'I don't trust taxes'. The perceived effectiveness or efficiency of vehicles and their fairness accounted for 8% and 6% of responses respectively, again reflecting both positive attitudes (for example, 'greater chance of success') and negative attitudes (for example, 'affects the less well off'). It is perhaps noteworthy that perceived 'credibility' was not cited as a reason for paying more (or less) under the various vehicles despite frequent suggestions in the literature that this is an important aspect of the payment mechanism (see Bateman et al. 2002;Champ et al. 2002;Jakobsson & Dragun 1996). Of course this may be because all three vehicles were considered equally credible.

5.5.8 Econometric Models of Willingness to Pay

To examine the factors affecting willingness to pay towards the protected area programme the responses to the contingent valuation questions were regressed against socio-demographic attitudinal, behavioural and design variables using maximum likelihood estimation procedures. Since the payment ladder elicitation format provides interval data on reported WTP, an interval regression model (see Chapter 3 for econometrics of interval models) was fitted using STATA with robust standard errors (protestors and outliers removed)[113]. In all cases a log-normal distribution was adopted since WTP for a public good, such as this, can be assumed to be non-negative (Bateman et al. 2002)[114] and there is evidence to suggest the distribution of WTP is skewed (see section 5.5.6.2). Thus the regressions were performed on the natural logarithms of the bounds of reported WTP. The explanatory variables (and definitions) are listed in Table 5.9 and the interval regression results are reported in Table 5.10.

[113] Payment ladder responses may also be analysed using non-interval regression methods such as OLS, however this requires assumptions about where true WTP lies in the interval between the ticked value and the next value up. Further, Cameron and Huppert (1989) find that maximum likelihood interval estimation procedures are more reliable than OLS regression on interval midpoints.

[114] Since those experiencing negative utility can simply ignore its provision.

Table 5.9: Definition of Interval Regression Variables

Variable	Description
INCOME/1000	Mid-point of income interval divided by 1000
KIDS	Number of children < 16 yrs in household
DEGREE	Dummy coded 1 if degree level education or above, 0 otherwise
KNOW_CAUSES	Dummy coded 1 if respondent has some knowledge of causes of biodiversity loss, 0 otherwise
MEMBER	Dummy coded 1 if currently a member of an environmental organisation, 0 otherwise
CHOOSE ENV	Frequency of choosing environmental goods over regular products from 1 (never) to 5 (always)
ENV_NO1	Dummy coded 1 if respondents rank environment as top priority for additional government funding amongst 5 general issues
DEV_PAY	Dummy coded 1 if respondents believe developed countries should help pay the costs of conserving tropical biodiversity, 0 otherwise
ENTREATY[115]	Dummy coded 1 if respondents received Entreaty script, 0 otherwise

WTP was found to be determined by a combination of socio-demographic, attitudinal, and behavioural factors together with a design variable, entreaty (which is discussed in detail in chapter 6). Age and sex were not found to be significant determinants of WTP under any of the vehicles, and thus were excluded from the models. Notably, none of the experience indicator variables namely, prior visits to developing countries nor prior visits to protected areas within developing countries or the UK, were found to be significant determinants of WTP under any of the payment vehicles. This finding corroborates the results of the follow-up questions where a very low percentage (only 7 respondents) chose 'future visits' as their main motivation for WTP reinforcing that WTP is motivated by non-use rather than potential use values.

There is little evidence of sensitivity in the determinants of WTP between the three vehicles. In all cases, willingness to pay was found to be consistently, significantly influenced by: income, degree level education, knowledge of causes of biodiversity loss, membership of environmental organisations; frequency of choosing environmentally friendly goods over regular; the perceived importance of the environment; and belief that developed countries should help pay the costs of conserving tropical biodiversity. All signs were as expected and indicate that WTP increases proportionally per unit change in income, and amongst respondents with degree level education, prior knowledge of the causes of tropical biodiversity loss, members of environmental organisations; with increasing frequency of choosing environmental goods over regular, the belief that developed countries should help pay the costs of conserving tropical biodiversity, and that the environment is the number one priority for additional government funding.

[115] The Entreaty variable is discussed in the next chapter.

Table 5.10. MLE Interval Regression on WTP across Payment Vehicles

Variables	WTP Tax			WTP Higher Prices			WTP Donations		
	Coeff.	z stat		Coeff.	z stat		Coeff.	z stat	
Income/1000	0.0113	5.09	***	0.0122	5.76	***	0.0120	5.70	***
Kids	-0.1599	-1.79	*	-0.2400	-2.59	**	-0.0668	-0.75	
Degree	0.5771	2.49	**	0.4672	2.01	**	0.3931	1.70	*
Know_Causes	1.0418	2.17	**	1.3455	2.87	***	1.2503	2.71	***
Member	0.7022	3.35	***	0.6091	3.02	***	0.6583	3.00	***
Choose Env	0.3054	2.73	***	0.3943	3.61	***	0.3039	2.89	***
Env_No1	0.9011	4.02	***	0.7399	3.45	***	0.7156	3.21	***
Dev_Pay	1.2161	3.56	***	1.3422	4.23	***	1.0780	3.56	***
Entreaty	0.3339	1.79	*	0.2955	1.63		0.2968	1.64	
Constant	-1.7471	-2.77	***	-2.0625	-3.28	***	-1.9087	-3.27	***
Sigma	1.9315			1.9426			1.9145		
Log Likelihood	-1317.72			-1367.28			-1374.56		
Wald chi2(9)	148.91		***	115.99		***	133.88		***
McKelvey & Zavoina R2	0.24			0.26			0.23		
Obs.	468			488			482		
Median WTP	£13.20			£16.56			£10.90		
95% C I.	£10.67 - £15.73			£13.41 - £19.70			£8.81 - £12.99		
Mean WTP	£85.26			£109.25			£68.14		
95% C I	£68.92 - £101.59			£88.47 - £130.02			£55.07 - £81.21		

Note: ***, **, and * represent statistical significance at 1%, 5% and 10% levels. Regression excludes protestors and outliers.

The only real difference between the three vehicles occurs with the KIDS variable. In all cases, KIDS has a negative coefficient which indicates that WTP decreases as the number of children increases; consequently KIDS may be interpreted as a constraint on expenditure rather than as a bequest-value indicator. Interestingly KIDS is not a significant determinant of WTP under the donations vehicle, and is significant only at the 10% level for the tax vehicle but is significant at the 5% level under the higher prices vehicles. This suggests that respondents with children perceive the proportional impact of increases in higher prices to a have greater knock on effect on budgets (and thus WTP) compared to increases in income tax or making voluntary donations.

The predicted estimates of median WTP, (as derived from Cameron & Huppert 1989 formula) formula (see chapter 3), towards the protected area programme are estimated to be £13.20, £16.56 and £10.90 per person per year for 10 years, under the tax, higher prices and donations

vehicles. Predicted mean WTP estimates are £85.26, £109.25 and £68.14, respectively. As expected, these estimates are greater than those derived non-parametrically (from the raw data) (see Table 5.6) since the later were based on the lower bound of the WTP interval only (in order to derive conservative estimates of WTP). Contrary to the non-parametric results, a comparison of the 95% confidence intervals[116] for predicted mean and median WTP only indicates a significant difference between the higher prices and donations vehicles[117]. However, this is a medium size sample and it is likely that in larger samples sensitivity between all payment vehicles may become more apparent.

Overall, the predicted determinants of WTP are in line with expectations derived from economic and psychological theory, intuition and empirically driven expectations, and add to the validity of the results. The predicted models of WTP have reasonable explanatory power. The McKelvey and Zavoina pseudo-R square values[118] suggest the models account for 24%, 26% and 23% of the variability in the latent WTP variable under the tax, higher prices and donations vehicles respectively[119]. Further the results of the Wald Chi2 test indicate that each model as a whole is statically significant (1% sig. levels for all vehicles).

Representative Estimates of Willingness to Pay

In order to derive representative estimates of individual and aggregate WTP the sample estimates need to be adjusted for any non-response bias[120,121], and to be expanded to the target population, since the former can have serious repercussions for the validity of aggregate welfare estimates if the differences occur in variables which determine WTP (Mitchell & Carson 1989)[122].

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[116] Calculated using the delta method.

[117] Non-parametric results indicated significant differences between all payment vehicles.

[118] McKelvey and Zavoina's R square may be used as an indication of goodness of fit in models with censoring such as the interval regression model (Long & Freese 2000;Long.J.Scott 1997).

[119] Given the shape of the WTP distribution a spike model may be more effective at incorporating the high level of zero bids which may provide an even better fit to the data – this is a recommendation for future research.

[120] Non-response bias occurs where the sample characteristics fail to represent the population, usually because not all of the intended respondents return the questionnaire.

[121] A further complication can arise if there is sample selection bias which results when the non-response is not random such that there is a correlation between the probability of responding and WTP. In such cases the Heckman (1979) two-step procedure can be used. This procedure treats the sample selection problem as an omitted variable however it is dependent on information being available on the factors affecting non-response. In the current study no data is available on non-respondents, as is typically the case with most CV surveys; as a result analysis is restricted to correcting for unit non-response with the acknowledgment that the estimates may also be affected by sample selection bias.

[122] In the case of public goods, such as this, research has found that individuals that are uninterested in the good are typically less likely to reply such that non-response will be correlated in some way with the size of reported WTP (Mitchell & Carson 1989). For example if lower income people are less likely to respond and if income is related to WTP such that lower income WTP less then it is likely that welfare estimates will be biased upwards if these groups are under-represented in the population.

There are several different procedures reported in the CV literature (see Loomis 1987 for an overview), for example: Walsh, Loomis and Gillman (1984) applied the sample WTP to the wider population with no adjustment; in contrast Bishop & Boyle (1985) treated all non-respondents as zero bids thereby providing a conservative lower bound estimate of WTP; Schulze et al. (1983) simply substituted the population averages into an OLS of WTP based on the sample data and multiplied mean WTP by number of households in the state; and, Loomis (1987) used a weighted Least Squares regression to take into account the differences between sample and population characteristics. In the current study the latter approach is adopted using a weighted interval regression model with the sample weighted to correspond to the known population as recommend by Mitchell and Carson (1989).

As discussed in the section on sample characteristics (section 5.5.2), a number of socio-demographic variables were found to differ significantly between the sample and target population (see Table 5.2). However regression analysis indicated that only two of these variables were significant determinants of willingness to pay, namely income and degree level education or above. Since the response categories used in the survey differed from those used in the official statistics, several different weights[123] were tested for income and education. These included weights based on adapted income categories, above average income, adapted education categories, degree level or above education, and combined income and degree level or above education[124]. The most accurate representation was provided by weighting solely for degree level education or above, since this also reduced the gap between average income in the sample and the target population (see Appendix 10 for weighting)[125]. It should however be noted that this weighting is crude; average income remained significantly higher in the sample compared to the London's population, and thus all weighted estimates should still be treated with some caution[126].

[123] Weights for the non-parametric estimation were defined by dividing the population proportion by the observed sample proportion, following the removal of non-valid responses, such that underrepresented groups received a weight greater than 1 and over-represented groups a weight less than 1 (Bateman et al. 2002). The weighted parametric multivariate regression models were conducted using the STATA pweight command.

[124] In addition, weights were tested for variables that were not determinants of willingness to pay, namely age and gender and combinations of these variables with income and education.

[125] In contrast, weighting for income failed to sufficiently correct average income or the over-representation of respondents with degree level education or above. This was also found to be the case with a combined weighting scheme based on income and degree.

[126] Further, weighting by degree level education also affected age although age was not found to be an explicit determinant of WTP.

Table 5.11. MLE Interval Regression on *Weighted* WTP across Payment Vehicles

Variables	Weighted Sample (excluding protestors & outliers)								
	WTP Tax			WTP Higher Prices			WTP Donations		
	Coeff.	z stat		Coeff.	z stat		Coeff.	z stat	
Income/1000	0.0103	4.57	***	0.0111	5.21	***	0.0105	4.91	***
Kids	-0.0823	-0.88		-0.1877	-2.00	**	0.0060	0.07	
Degree	0.6028	2.58	**	0.4940	2.11	**	0.4194	1.82	*
Know_Causes	0.7323	1.50		1.0219	2.21	**	0.9477	1.95	*
Member	0.7090	3.72	***	0.6154	3.36	***	0.7106	3.52	***
Choose Env	0.2490	2.20	**	0.3624	3.26	***	0.2817	2.73	***
Env_No1	0.7912	3.44	***	0.6889	3.17	***	0.5489	2.44	**
Dev_Pay	1.3367	3.58	***	1.4493	4.41	***	1.1331	3.82	***
Entreaty	0.2942	1.57		0.2413	1.35		0.2758	1.53	
Constant	-1.3450	-2.16	**	-1.6999	-2.81	***	-1.5451	-2.65	***
Sigma	1.8650			1.8581			1.8247		
Log Likelihood	-4390.17			-4550.43			-4588.01		
Wald chi2(9)	147.05		***	157.73		***	127.26		***
McKelvey & Zavoina R2	0.47			0.51			0.45		
Obs.	468			488			482		
Median WTP	£7.91			£10.22			£7.24		
95% C I.	£5.50 - £10.32			£7.04 - £13.41			£5.02 - £9.46		
Mean WTP	£45.03			£57.46			£38.28		
95% C I	£31.33 - £58.73			£39.56 - £75.35			£26.55 - £50.00		

Note: ***, **, and * represent statistical significance at 1%, 5% and 10% levels. Regression excludes protestors and outliers.

The interval regression model weighted by degree level education results are reported in Table 5.11[127]. The results are similar to those reported in the sample data, the same seven variables consistently significantly influence WTP across the three vehicles, namely: income; degree education; knowledge of causes of biodiversity loss; membership of environmental organisations, frequency of choosing environmental products over regular products; the perceived importance of environment and attitude that developed countries should help pay the costs of conserving tropical biodiversity (with exception that knowledge of causes is no longer significant for the tax vehicle). Weighting by degree improves the fit of the model, McKelvey & Zavoina R-square values increase to explain 47%, 51% and 45% of variations in latent WTP under the tax, higher prices and donations vehicles respectively.

[127] The weighted non-parametric estimates of mean and median WTP towards the protected area programme are presented in the Appendix.

The *weighted* predictions of median WTP of London residents towards a 30% expansion (an additional 3.5 million km2) of protected areas across the developing countries are £7.91, £10.22, and £7.24, per person per year, across the tax, higher prices and donations vehicles respectively. Predicted mean WTP estimates are £45.03, £57.46, and £38.28, respectively. The 95% confidence intervals for both measures of WTP overlap between all the vehicles, indicating that the predicted *weighted* mean and median WTP measures are not sensitive to payment vehicle.

Although comparisons with previous empirical studies are constrained by differing goods, markets, elicitation formats and payment vehicles[128], there does appear to be some evidence of convergent validity (after adjustments to £2005). The most striking similarity is between the current estimate of mean annual WTP under the donations vehicle of £38.28 and Svedstar's (2000) estimate of mean WTP (for a combined Swedish and UK sample) of £39.97 per annum, albeit for a much smaller area (roughly 20,000 km2). Whilst the current predicted estimates of annual WTP under the tax (£45.03) and higher prices (£57.46) vehicles, are greater than those derived by Horton et al. (2001; 2003) for UK WTP for protecting a smaller area (760,000 km2) of Brazilian Amazon (£23.50-£27.57), they do converge with those derived from the Italian sub-sample (£45.98- £69.82) and the combined sample (£44.56). The estimates are similar but marginally lower than those derived by Hanley, Spash and Walker (1995) of £63.12 - £82.85 although arguably their sample was extremely small (n = 100) and the amount of biodiversity to be protected was not explicitly specified (thus the perceived scope of change may have been greater than offered in the current study). The current estimate of willingness to pay under the donation vehicle is also similar to that derived by Kramer & Mercer (1997) of £24.35 for protecting 110 million acres (approximately 445,154 km2) of rainforest, although the later was a one-off donation[129]. Encouragingly, on the whole, the current estimates and those derived from previous empirical work literature appear to be very similar, in most cases they are of the same order of magnitude.

Aggregates estimates of Willingness to Pay

To derive representative aggregate estimates of WTP towards the protected area programme for the target population of London the weighted predicted estimates of individual WTP were multiplied by the adult population, currently estimated to be 5,939,952 (ONS 2005). Predicted estimates of median WTP rather than mean WTP were used in order to provide conservative estimates. The results are presented in Table 5.12.

[128] Notably, most previous empirical studies considered programmes that protected much smaller areas compared with the current study (3,500,000 km2), and were for rainforests solely.

[129] There is a greater divergence with the result reported by Manoka (2001) of £5.36-£5.62 (one-off donation) however WTP responses were found to be highly uncertain.

Table 5.12: Aggregate Estimates of Welfare Benefits to Adult Population of London

Mechanism	Individual Median WTP £/yr	Aggregate Adult Pop WTP £ million /year	
		Median	CI 95%
Tax	£7.91	£47.0	£32.7 - £61.3
Higher Prices	£10.22	£60.7	£41.8 - £79.7
Donations	£7.24	£43.0	£29.8 - £56.2

As discussed Bruner, Gullison and Balmford (2004) estimate that the costs of expanding protected areas across the developing countries by 30% amounts to approximately $10.8 billion per year which when converted into UK Sterling and corrected for inflation amounts to approximately £6 billion per annum. Subject to the cautions noted earlier, aggregating the predicted *weighted* estimates of median WTP per year to the adult population[130] of London provides a potential annual fund of £47.0 million, £60.7 million and £43.0 million per annum through increased taxes, higher prices and donations respectively. Although the aggregated results amount to a sizeable fund they only account for a small proportion of the estimated costs. However this does not take into account that these estimates are representative of London only, for the purposes of cost benefit analysis the relevant population would be benefits accruing to all residents of developed countries.

Assuming the estimated costs were split between developed countries on the basis of the burden-sharing framework adopted for the third replenishment of the GEF (see GEF 2005), the UK would be expected to meet approximately 6.92% of the total costs. This equates to approximately £415.2 million per annum. Clearly this figure should be compared with aggregate benefits accruing to the population of the UK however this is beyond the scope of this study. Instead, a comparison with aggregate benefits accruing to the adult population of London (which makes up around one-eighth of the UK's total adult population) indicates that approximately one-seventh of the total UK commitment could be funded by a higher prices vehicle; one-ninth could be funded by increasing income taxes, or one-tenth could be funded through a charitable donations fund, paid by London residents only. These results suggest there may well be potential for meeting the UK's share of the additional costs of expanding the protected area network through a higher prices vehicle (based on the removal and redirection of perverse subsidies). Furthermore, a significant amount of the costs could alternatively be met through contributions via increases in income tax or a voluntary donation fund.

[130] London adult population estimates are based on people aged 16 years or above.

Overall, these aggregate estimates indicate that in London there is considerable potential for making significant increases in contributions towards tropical conservation. Interestingly, the lower bound predicted aggregate benefits for London of £47.0 million per annum under the tax payment vehicle are much higher than current UK spending on protected areas as committed via contributions to the GEF which amounts to approximately £5.2 million per annum[131]. Taking into account that predicted benefits are aggregated solely for London and not for the wider population of the UK, this suggests that current spending would be inadequate compared to the potential UK wide benefits.

5.6 CONCLUSION

This chapter examines public attitudes, knowledge and awareness of tropical biodiversity and public preferences towards expanding the tropical protected area network and funding mechanisms. A concurrent objective is the investigation of the reason behind respondent sensitivity to different payment mechanisms. The research provides a number of important findings both methodologically and for future policy.

Firstly, with regard to the policy objectives. Contrary to studies elsewhere, the majority of respondents were familiar with the term biodiversity and were able to provide a related meaning. Significant associations were found between knowledge of 'biodiversity' and socio-demographic characteristics such as income and education. This in part may explain the higher levels of familiarity. It is encouraging that a high proportion of respondents had understanding of the term since elsewhere concerns have been expressed that low levels of familiarity may lead to the use of lexicographic preferences. In addition, the vast majority of respondents had previous knowledge of the conservation of tropical wildlife and habitats and of causes of biodiversity loss and nearly a quarter of respondents had previously donated towards biodiversity conservation either in UK or overseas.

In relation to the second objective, the results indicate that the vast majority of respondents are in favour of developed countries like the UK helping developing countries to pay the costs of conserving tropical biodiversity. This is consistent with findings of the Horton et al (2001; 2003) and Kramer and Mercer (1997) and provides further support for the commitment made under Article 20 of the CBD (that developed countries should transfer additional and new resources to developing countries to meet global biodiversity objectives). Over half of the

[131] The UK committed £29.5 million to the GEF to cover all focal areas in 2005-2006 (Secretary of State for International Development 2005), of which biodiversity accounts for approximately 36% of GEF grants (GEF 2006), making the UK commitment via GEF to biodiversity approximately £10.62 million per annum. Of this, approximately 49% or £5.2 million per annum would go towards strategic priority one which focuses on catalyzing sustainability of protected area systems.

respondents preferred these costs to be shared on the basis of a country's wealth, for example, along the lines of the ODA target of a fixed proportion of GNP. A much lower proportion supported the use of voluntary targets (that is, what a country is willing to pay) which is (arguably) the type of cost-sharing arrangement currently used in replenishments of the GEF. This is an interesting finding. Recent reports suggest both ODA and GEF commitments have declined. The results reported here suggest however that the majority of the public do support such cost-sharing policies in particular those that seek to ensure equitable cost sharing based on a country's wealth.

A key objective of this chapter is to investigate ways of capturing international WTP for tropical biodiversity by exploring public preferences under different funding mechanisms. The selected mechanisms (loosely) reflected: existing (traditional) funding options, for example, contributions to GEF supported by increases in existing taxes; hypothetical funding options, for example, increasing government contributions via removal and redirection of perverse subsidies resulting in higher prices; and individual funding options, that is, voluntary charitable donations. Mitchell & Carson (1989) raise the question of whether there is a mechanism capable of capturing most of the public's WTP for a good. In the current context, this appears to be provided by the higher prices mechanism which provides the highest estimates of individual WTP (using the unweighted and weighted non-parametric and parametric estimates), this was followed by increases in existing taxes vehicle. The voluntary donations vehicle captures the least amount of the public's WTP.

The aggregate estimates, although only relating to London, do suggest sizeable funds could be captured through these mechanisms, which could make a significant contribution to the funding of the much needed expansion of tropical protected area network. Moreover, if such an expansion were achieved, these results provide preliminary support to the assertion by Bruner, Gullison and Balmford (2004) that this would generate considerable benefits to society. Critically, the results also suggest that the UK would need to significantly increase current spending (via the GEF) on protected areas for 'payments' to be commensurate with the potential UK-wide benefits.

From a methodological point of view, it is a concern that 58% of respondents gave different WTP values for the same good across the three payment vehicles. However given previous empirical evidence and anecdotal advice in the contingent valuation literature it was anticipated that such sensitivity would be likely to occur. As expected the tax vehicle received the highest proportion of protest zeros whilst the donation vehicle received the greatest proportion of valid zeros. Non-parametric tests revealed significant differences in WTP between all three vehicles. In contrast the results of the econometric prediction of WTP indicated sensitivity only between

the higher prices and donations vehicles, although if larger samples were used it is possible that confidence intervals would diverge for all three vehicles. Respondent certainty was found to be significantly different between all vehicles, which is consistent with the suggestion by Mitchell & Carson (1989) that different payment vehicles may have differing perceived probability of providing the good. There were very few differences in the determinants of WTP between the vehicles

One of the key methodological objectives of the current chapter was to investigate the reasons why respondents are sensitive to payment vehicles. The results indicate that sensitivity is driven by perceptions and attitudes towards: the coerciveness of the vehicle; its appropriateness as a funding option; its fairness in cost-sharing; the perceived effectiveness and efficiency of the mechanism including associated institutions; its trustworthiness; and, also, the 'personal impact' of the vehicle. While the majority of these have been cited as important considerations in scenario design in the valuation literature, the later in particular is an interesting finding. The results suggest that respondents may factor in a transaction charge under donations vehicles due to perceptions of increased effort (personal impact) which may partly explain the lower WTP. Indeed, personal impact in general resulted in a lowering of WTP under the donation vehicle and increases in WTP under the taxes and higher prices vehicles – the latter were typically considered more convenient, less visible and noticeable. Although it was not directly captured through self-reported responses it is likely that the lower WTP under the donations vehicle may also be due to free-riding. Indeed, the lower reported certainty under this vehicle may provide further support for this hypothesis, since in reality respondents don't really have to pay. One possibility for the greater WTP under the higher prices vehicle may be due to this being the most hypothetical of the vehicles, as discussed earlier, Jakobsson and Dragun (1996) suggest that a lack of credibility can lead to unrealistic high bids. However, responses to the open-ended follow-up questions suggest that respondents associated several advantages to the higher prices vehicle, such as, less effort, less noticeable, as well as, general support for the removal and redirection of subsidies together with the wider knock-on benefits, which collectively may explain the higher WTP under this vehicle.

In summary, the results indicate that the proposed expansion of the tropical protected area network would generate sizeable benefits to residents in the UK. According to public preferences, most, if not all, of these benefits, would be captured through a higher prices vehicle connected to the removal and redirection of perverse subsidies. This is interesting since there have been recent calls amongst conservationists and through the CBD for such action yet politically there may be many barriers. A more traditional funding mechanism based on existing tax increases would also accrue sizeable benefits, as would a voluntary donation mechanism although benefits are likely to be significantly lower under the latter. From a methodological

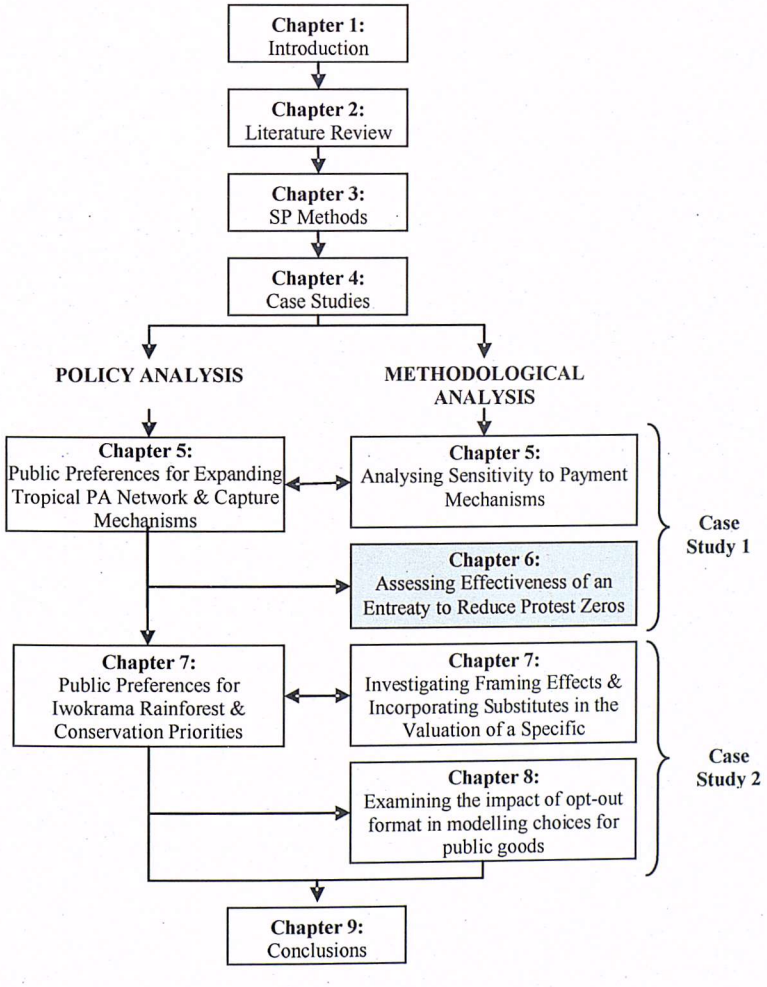
perspective, there is evidence of respondent sensitivity across the payment vehicles in terms of: (1) whether or not to report WTP; (2) the size of stated WTP; and (3) certainty towards paying. This is consistent with expectations from the CVM literature. Reasons for sensitivity are manifold, thus, in line with the advice of Bateman et al (2002), it is recommended that future CV studies use payment vehicles which are most likely to be used in the real life situation to ensure that *realistic* aggregate estimates of welfare benefits are derived.

In terms of future work, with some refinement the survey instrument could be expanded to explore WTP across UK and other developed countries in order to provide more accurate guidance on the size of the international benefits associated with expanding protection of tropical biodiversity and which would also be useful in assessing the adequacy of existing transfers. Given that the higher prices vehicle provided the highest estimates of WTP, further research should also be undertaken to explore potential support for the removal and redirection of subsidies as a payment mechanism, based on more robust modelling of the likely effects of subsidy removal. In relation to sensitivity towards payment mechanisms, further work is recommended to explore the effect of perceptions towards the 'personal impact' of payment mechanism, using cognitive methods.

Chapter 6: Exploring Public Preferences for Tropical Biodiversity: Can an Entreaty Help to Reduce Protest Zeros?

SUMMARY

This is the second chapter in case study 1. It reports the results of a field experiment to investigate the usefulness of an entreaty in reducing protest zero responses, in a contingent valuation study to estimate willingness-to-pay for tropical biodiversity, amongst distant beneficiaries. To the best of the author's knowledge using an entreaty in this way to "talk people out of their protests" represents a novel contribution to the existing literature which has previously applied entreaties such as 'cheap talk' scripts to deal with the different problem of hypothetical bias. Results indicate that the script was effective in reducing protest zero responses even though the protest rate was not high. The potential of entreaties to reduce protest responses should be further explored, particularly in contexts where rates of protests are expected to be high.



6.1 INTRODUCTION

Many contingent valuation (CV) studies experience a high level of protest responses. Such responses are problematic since they do not represent "true" economic values (Jorgensen *et al.* 1999). The most common type of protest response occurs where a respondent does not provide his or her genuine willingness-to-pay (WTP) but instead states a zero value, referred to as a protest zero (Mitchell and Carson 1989). This presents a crucial problem for the analyst since there is no way to impute the true value held for the good (Mitchell and Carson 1989; Bateman *et al.* 2002). Consequently, the typical approach to dealing with protest zeros is to remove them from the sample which can leave the resulting welfare estimates open to bias and reduce survey efficiency.

This chapter focuses on tackling the problem of protest zeros in a different way, by attempting to reduce the number of protest zeros reported. More specifically, it presents the results of an empirical study to investigate the effectiveness of an entreaty in reducing the propensity of respondents to protest. This builds on a number of mainly US studies which have recently used entreaties such as 'cheap talk' scripts to deal with the different problem of hypothetical bias (see Cummings and Taylor 1999; List 2001; Poe *et al.* 2002; Aadland and Caplan 2003; Brown, Ajzen, and Hrubes 2003; Lusk 2003; Bulte *et al.* 2005; Carlsson, Frykblom, and Lagerkvist 2005; Murphy, Stevens, and Weatherhead 2005). Despite some success at reducing hypothetical bias, the potential of these scripts for dealing with other types of contingent valuation bias, such as protest responses, remains unexplored. To the best of the author's knowledge using entreaties in this way to "talk people out of their protests" represents a novel contribution to the existing literature on contingent valuation.

The remainder of the chapter is organized as follows: the next section reviews the literature on protest responses and the use of cheap talk to deal with hypothetical bias. Following this, the experimental design is introduced including the criteria used to classify protest responses, and the research hypotheses. In the next section the results are presented and discussed. The chapter concludes with a summary of the main findings with recommendations for future research.

6.2 LITERATURE REVIEW

This chapter is specifically concerned with the problem of protest zeros, a situation which arises where a zero value is reported for a good even though a respondent truly values its provision (see, for example, Mitchell and Carson 1989). Such responses are particularly evident in

situations where the good in question has traditionally been provided free of charge (Strazzera *et al.* 2003). For example, in estimating willingness-to-pay for various endangered species Jakobsson and Dragun (1996) report that on average 31% of all responses were protest zeros. There are many reasons for this kind of behaviour but typically it is the result of an objection to some aspect of the valuation process or contingent market: for example, the payment vehicle, the policy intervention, the institutional setting, lack of comprehension of the task, insufficient information, ethical objections or it may simply reflect some form of strategic behaviour such as free-riding (Morrison, Blamey, and Bennett 2000; Boyle *et al.* 2001; Jorgensen, Wilson, and Heberlein 2001; Strazzera *et al.* 2003).

Since protest responses do not reflect the true value of a good including these responses in the final welfare analysis may lead to biased estimates. As a result they are typically excluded. In order to do this the analyst is first required to identify which responses are true zeros and which are protest zeros. The standard procedure is to use follow-up questions to distinguish between those that state zero because they genuinely do not value the good and those that state zero for some other valid reason (Mitchell and Carson 1989).

Clearly, this procedure is reliant on self-reporting and there may be many reasons for a respondent's stated response. For example, Jorgensen and Syme (2000) argue that respondents that do not wish to pay for valid reasons such as budget constraints may also object on the basis of some aspect of the contingent market. The situation is further complicated by the lack of an established protocol on how to identify protest responses. Indeed recent articles suggest some controversy exists over how to define or identify protest responses (Boyle and Bergstrom 1999; Jorgensen *et al.* 1999; Meyerhoff and Liebe 2006). For example, some authors only consider payment vehicle rejections as protest zeros whilst others use wider criteria including insufficient information and ethical objections (see Jakobsson and Dragun, 2001). In effect, two separate analyses of the same good could provide widely different welfare estimates depending on how the analyst interprets these aspects of the data (Jorgensen *et al.* 1999).

Running parallel to differing views over how to identify protests, there is also debate over the efficacy of censoring protest bids once identified. This stems from concern that the exclusion of protest responses may affect the validity and potential for generalization of the results if there is evidence of systematic bias amongst those protesting (Mitchell and Carson 1989; Jorgensen *et al.* 1999; Morrison, Blamey, and Bennett 2000; Bateman *et al.* 2002; Strazzera *et al.* 2003). For example, Jorgensen and Syme (2000) find that censoring protests would bias CV results towards those individuals who favour paying for environmental goods or with higher income. Schlapfer, Roschewitz and Hanley (2004) found that most of their protest zeros were given by 'disappointed voters'.

As a result of the challenging issues that surround the identification and treatment of protest responses there has recently been some exploration in the contingent valuation literature of alternative ways to deal with protest zeros. Strazzera *et al.* (2003), for example, suggest a sequential procedure to deal with the sample selection problem which can occur if protestors are significantly different from the censored sample, in CV models with open-ended WTP data. Morrison, Blamey and Bennett (2000) use follow-up questions to recode protestors, at the model estimation stage, as being in support of the proposed change if their concerns could be dealt with (for example if 'an alternative, acceptable way of collecting money could be found' p. 419) and they can afford to pay. The current research takes a different approach to dealing with the problem of protest responses by exploring a novel way of reducing the propensity to protest through the use of an entreaty.

As noted above, entreaties such as cheap talk scripts have been previously used to deal with hypothetical bias. The term cheap talk itself arises from its use in information, bargaining and game theory literature where it typically refers to the 'cost-less transmission of information and signals' (Cummings and Taylor 1999, p.650). In the contingent valuation literature, it usually refers to a script, typically quite lengthy, which is added to the valuation scenario in order to directly draw respondents' attention to the problem of mis- or over-stating true values as a result of the hypothetical setting, instead asking them to focus on their responses *as if* they were in a real-life setting. For the most part its application has been successful – in terms of its impact on hypothetical bias – albeit with some sensitivity to differing script lengths, respondent experience and, more recently, payment levels (see, for example, Cummings and Taylor 1999; List 2001; Lusk 2003; Brown, Ajzen and Hrubes 2003; Murphy, Stevens and Weatherhead 2005).

The current chapter is concerned with testing whether a cheap talk-type entreaty might be effective in reducing protest responses in a CV application. In some of the cheap talk applications on hypothetical bias respondents have been found to be receptive to instructions to self-correct overestimates of WTP. Correspondingly, the rationale here was that through a similar type of entreaty it might be possible to persuade protestors to reveal their true preferences for a good rather than providing a protest zero. It is contended that in the later situation respondents may want to pay but don't reveal this willingness to pay since they object to various aspects of the scenario. Thus, similar to the hypothetical bias applications of cheap talk, the script used here points out to the respondent the problem facing analysts, namely that some respondents fail to reveal their true WTP instead stating zero due to objections to aspects of the scenario, and asks that instead they focus their responses on how much the outcomes would mean to them if they were in place. While, as noted, the cheap talk literature to date has

been concerned with the problem of hypothetical bias, a number of its findings are relevant in the current context.

First, an important question addressed by Cummings and Taylor (1999) is whether the corrections induced by the cheap talk script are related only to the degree of (hypothetical) bias occurring. Put another way, might it rather be the case that respondents may overcorrect responses under cheap talk? Analogously, it is asked later in this chapter whether a script designed to deal with the problem of protest zeros has the unintended effect of influencing 'non-protest' responses.

Secondly, previous empirical work has involved both laboratory and field experiments. Each has its merits. The chief virtue of the former lies in its use of a closely-controlled environment allowing an in-depth investigation of behavioural responses such as in Cummings and Taylor (1999) test of variations of an eight-paragraph script. Field experiments, as used in the current research, by contrast mean less control over participant behaviour and, in all likelihood, shorter (and less varied) scripts. Shorter cheap talk scripts have been found to be less effective as intuition might suggest (see Poe *et al.* 2002). Recently, however a small number of studies have had more success with short scripts (see Carlsson, Frykblom and Lagerkvist, 2005; Bulte et al 2005), although in some cases only with certain types of individuals (Aadland and Caplan 2003). Interestingly, Lusk (2003) uses a self-administered format (in a field experiment using a mail survey) providing some support for the use of cheap talk in the absence of a moderator to ensure the script is fully read and assimilated. More generally, if the policy relevance of entreaties is to be fully explored it seems important also to test its efficacy in the field as well as in the laboratory.

6.3 EXPERIMENTAL DESIGN

The main objective of this study is to test the use of an entreaty to reduce protest zero bids in a contingent valuation survey to estimate willingness-to-pay for protecting tropical biodiversity, amongst distant beneficiaries.

The proposed policy change was adapted from that used by Bruner, Gullison, and Balmford (2004) in estimating the financial costs of upgrading and expanding the protected area network in developing countries but focuses solely on the expansion of the protected area network[132].

[132] No attempt was made to place a value on improving effectiveness of the existing protected areas as, to date, no comprehensive assessment of the management effectiveness of the world's protected areas has been undertaken. This lack of data makes the definition of a meaningful scenario from which to measure the value attached to marginal changes in effectiveness very difficult. Hence, in the current study, the valuation focuses solely on the expansion of the existing network of protected areas.

Their scenario was based on the latest data available on how to prioritize the expansion of the existing protected area network utilizing the results of the global gap analysis by Rodrigues *et al.* (2003; 2004a; 2004b). To this end, in the valuation scenario, respondents were asked to consider a programme which would expand the existing network of protected areas by 30%. This means an additional 3.5 million km2 of protected areas would be created to conserve the highest priority sites in the developing countries which contain many rare and endangered species, and many different types of habitats and ecosystems. This was in response to recent calls by policymakers for a better understanding of the costs and benefits of establishing a comprehensive and representative system of protected areas which is widely regarded as a crucial step in the achievement of the Convention of Biological Diversity's 2010 goal of a significant reduction in the rate of biodiversity loss (CBD 2003a; 2005). The payment mechanism was an international fund supported in the UK via increases in income tax.

Similar scenarios, involving a substantial increase in protected areas, have been used in, for example, Kramer and Mercer (1997) and, more recently, Horton *et al.* (2003). These contributions have been useful in providing ball-park figures of the WTP values that, in principle, could be transferred to bring about biodiversity conservation. Nevertheless, there remain legitimate and interesting practical questions about the implementation of such measures. Indeed, in initial focus groups in the current study a number of participants expressed concerns, related to this issue. These include possible management problems and difficulties with corruption that might hamper any such large expansion in the protected area network.

From the standpoint of eliciting WTP values, such concerns, in essence, boil down to a very real anxiety among respondents about whether the good in question – i.e. biodiversity conservation – will be provided by this mechanism of expanding protected areas in this way. For the CV practitioner the answer to this problem would be to ensure that credible information is provided in the valuation scenario that allays these concerns. However, Carson (1998) comments on the likely difficulty of devising implementation programmes for the provision of global public goods, including tropical forest protection, in this context where respondents' concerns about outright corruption and general inability of developing countries to provide the requisite protection loom large. These concerns have a genuine basis in the real world. One reason why conservation programmes involving payment for environmental services are almost non-existent in many areas particularly Africa is precisely because of such implementation problems. As discussed in the preceding chapter, there is a growing recognition amongst conservation experts that protected areas are frequently little more than 'paper parks' where protection is provided in name only (see, for example, Pearce 2007).

Without addressing these concerns in a CV scenario, it is arguable that respondents – implicitly – are being asked simply to suspend their disbelief. To the extent that respondents are not willing to 'play along' in this way, then one outcome might be, for example, protest responses (particularly protest zeroes) or heavily discounted WTP values[133]. That such values might not reflect respondents' true preferences is an understandable artefact of the inability of a CV scenario to resolve a problem that emanates from elsewhere (for example, Carson 1998). Yet, it remains important to know the value that the public places on the provision of global public goods such as tropical forests given that these values are critical to the task of establishing the case for conservation efforts.

With this in mind, the scenario in the current study was constructed with the explicit addition of an entreaty. The entreaty itself was designed specifically to address any concerns about real world issues relating to the provision of the proposed programme that were legitimately not part of the scenario description (for the reasons already discussed). In other words, the purpose of the script was to provide an appeal to respondents to set aside any residual concerns they might have that the proposed programme was not possible. Of particular interest was the impact that this treatment might have on the numbers of respondents that would otherwise state a zero WTP value (additionally the impact the entreaty might have on positive WTP values is also investigated later). Given that the script was intended to 'talk people out' of their protest bids, the treatment could be said to provide more accurate estimates of the true benefits attached to *achieving the principle* of the proposed policy change. Hence, a split-sample design was used with the additional script inserted immediately after the valuation scenario and prior to the payment principle question in one version of the questionnaire. The other version was identical except for the absence of the entreaty. The full script is presented in Figure 6.1.

Willingness to pay was assessed in two stages. The first stage was a payment principle question, in which respondents were asked whether in principle they would be willing to contribute to the protected areas programme. Those responding YES or DON'T KNOW went on to the second stage of the valuation scenario and those stating NO went straight to follow-up questions. At the second stage, respondents were asked to report their maximum WTP per annum for the next 10 years for the proposed change. The elicitation format was a payment ladder[134]. This format was selected since dichotomous choice formats as recommended by the NOAA panel have been found to have strong anchoring effects and starting point bias, whilst open-ended questions can

[133] Similar types of concerns have been found to be a problem in many other policy areas as well, for example in the valuation of water benefits, where respondents often object to the valuation scenario not because they don't care about the proposed benefits but due to strong objections towards water companies.

[134] Notably, the literature using cheap talk to deal with hypothetical bias has done so only in the context of dichotomous choice, referenda and open-ended questions. To the best of the author's knowledge there have been no studies which use entreaties in the context of a payment card elicitation format.

lead to excess bid variability for unfamiliar goods such as this (Horton *et al.* 2003). Indeed in valuing an endangered species Reaves, Kramer and Holmes (1999) found that in comparisons with the dichotomous choice, and open-ended formats, payment cards had the most desirable responses properties, in particular with significantly lower protest responses. They can however be sensitive to implied value cues and range bias (Mitchell and Carson 1989). Thus, in order to reduce any potential effects the range of values displayed on the ladder were based on pre-test surveys and an open-ended 'other amount' category was included.

Figure 6.1: The Entreaty

Some people have stated that they would not be willing to pay anything toward the protected area programme, **not because they do not value it** but because they **do not really think the proposed change is possible.**

For example, some people felt that **such a large expansion is not possible**; some **did not believe local institutions would be able to effectively manage the areas**; whilst others **simply did not trust** institutions in the developing countries to put all the money into the protected areas due to **corruption.**

These are **all valid** concerns however they do **unfortunately mean that it is not possible for us to tell whether or not these people place any value** on ensuring these tropical species and ecosystems are conserved.

To do this we need estimates from people about how much it is worth to them, if anything, to ensure the protected area programme takes place.

So, for the purposes of this valuation we ask that you set aside any doubts you may have about the plausibility of the proposed expansion and focus instead on how much it would mean to you if these outcomes were truly in place.

6.3.1 Classification of Protests

Protests were identified at the two stages of the valuation question. At the first stage respondents stating NO to the payment principle were asked to choose their main reason for being unwilling to do so from a list of reasons including an open-ended 'other' category. At the second stage, respondents were asked to provide a brief explanation for a zero WTP response in a separate open-ended follow-up question.

In the current study, protests were defined as any zero response that was given on the basis of: (1) concerns over the credibility of the proposed scenario, for example, concerns that the protected area programme would not work or concerns over corruption; (2) objection to some aspect of the payment vehicle, for example, 'inappropriate vehicle' or 'lack of trust in the institution' or 'government should pay'; and, (3) objection to some other aspect of the valuation scenario, for example, 'I need more information'. As discussed earlier, the classification of protests is subjective, different studies report different methods of classification, however, the latter two categories are frequently identified in the CV literature as protest responses. The decision to also include the first type of response was, as discussed above, due to the contention that these types of respondents were not revealing their true preferences for the *achievement* of the proposed programme. Responses which were considered to be valid zeros were those that reflected a genuine lack of economic value for the good, for example, 'I don't care about this issue', or 'I prefer to spend my money on other things'.

6.3.2 Research Hypotheses

The inclusion of the entreaty was examined primarily in terms of its effect on the incidence and likelihood of protest zero responses. As the additional script was included prior to the payment principle question it was possible to test the effect of the script both in terms of the effect on responses to the payment principle question as well as the second-stage of the WTP questions (payment ladder). The key hypotheses to be tested are that the inclusion of the script would serve to lower the incidence of protest zero bids at each stage, since the purpose of the script is to 'talk people out of their protests'.

Hypothesis 1: Incidence of protest NOs to the payment principle is lower under the entreaty treatment

Hypothesis 2: Incidence of protest ZEROs at the second stage of WTP is lower under the entreaty treatment

Although the main purpose of the script was to reduce the number of protest responses, it was also of interest to examine whether it would have any effect on willingness to pay. There was no *a priori* expectation regarding the potential effect of the entreaty on the resulting welfare estimates since there are a number of ways it could affect individual WTP. As the script is targeted at reducing protest bids which are excluded in the final welfare analysis, its inclusion may have no effect at all on the resulting welfare estimates. Alternatively, it could lead to higher estimates if it reduces uncertainty towards the proposed change, or, less desirably, if it encourages some respondents to over-state their true WTP (introducing a new form of upward bias). Additionally, if there is evidence of systematic bias amongst those protesting then this

could also lead to differences in the final welfare estimates, the direction of the difference being dependent on the nature of the bias.

6.4 DATA

The data used in this chapter comes from case-study 1. The analysis was performed on the willingness-to-pay data resulting from the tax valuation question *only,* since this is where the problem of protests was found to be greatest (protest rates were lower for the higher prices and donation vehicles, correspondingly, the effect of the entreaty for these vehicles was of less concern, see Chapter 5, section 5.5). Indeed, in the wider valuation literature one of the main drawbacks associated with *tax* payment vehicles is precisely this problem of high protest rates (for example, Bateman et al. 2002). A full description of the survey instrument and data collection procedures is provided in Chapter 4. To recap the survey consisted of 6 sections covering: general issues; understanding, awareness and attitudes towards biodiversity conservation and funding tropical conservation; a valuation section; follow-up questions exploring motivation for WTP and perceptions towards payment vehicles; socio-demographic questions; and finally a section on environmental beliefs and behaviour. The survey instrument was designed following the Tailored Design Method with efforts to establish trust, to increase rewards and reduce social costs (Dillman, 2000). The survey was implemented using a drop-off and mail-back approach with a follow-up reminder sent approximately two weeks later[135]. The survey was delivered to a total of 1836 households in six randomly selected areas of London between 18th and 30th January 2006.

6.5 RESULTS AND DISCUSSION

In total 601 complete or partially usable questionnaires were returned, providing an overall response rate of 33% which is within the realm of those reported by other CV mail surveys (Mitchell and Carson 1989)[136]. The responses were evenly split between the two split-samples.

In terms of the key socio-demographic and attitudinal characteristics, there were no significant differences (5% sig. level) between the two treatments enabling a direct comparison of the results. In general, respondents were highly educated, wealthy and knowledgeable with respect

[135] Mail surveys have been found to be suffer from self-selection bias with those typically more interested in the good having higher response rates, nevertheless they remain one of the most commonly used modes of CV administration, offering the key advantage of being generally less expensive (Carson, Flores and Meade, 2001).

[136] Mitchell and Carson (1989) review response rates for CV mail surveys finding rates range from as low as 8% up to 93%.

to the good to be valued. A summary of the main socio-demographic characteristics is provided in Table 6.1.

Table 6.1. Socio-demographic Characteristics of Split-samples

Variable	Entreaty	No Entreaty
Sex (% male)	46.5%	41.1%
Age (mean)[a]	44.2 yrs	44.4 yrs
Education: Degree level or above (%)	71.8%	70.2%
Employment Status (%):		
Self-employed	19.3%	16.5%
Employed (>30 hrs/week)	44.9%	44.1%
Employed (<30 hrs/week)	9.3%	9.1%
Unemployed	2.0%	2.4%
Retired	12.3%	13.8%
Gross annual household income (mean) [a]	£55,515.26	£59,157.35
Member of environmental organization	13.6%	14.1%
Number of Observations	302	299

[a] Age/Income taken as mid-point of category

6.5.1 Zero Willingness to Pay Responses

On average 23% of the respondents with the additional script and 32% without it, were not willing to pay anything towards the proposed change. The main reasons for zero WTP, categorized into valid and protest responses, are reported in Table 6.2 (see previous section for criteria used in classifying protestors).

The main reasons for zero WTP were found to be similar between treatments. The most frequently cited reason was 'I cannot afford to contribute', this accounted for 27% and 25% of all zero responses with and without the entreaty, respectively. Of the valid reasons for zero WTP (reflecting a genuine lack of economic value for the good) the most notable difference between treatments is the higher proportion reporting 'I prefer to spend my money on other things', which was 1% under the entreaty treatment compared to 7% without it. The protest reasons yielded similar responses between treatments, with the exception of those selecting 'It should be voluntary' which was higher under the entreaty treatment, 15% compared to 5% without it. On average, in both treatments, roughly half of the reasons given for zero WTP consisted of protest responses. The incidence of protest zeros is discussed in more detail below.

Table 6.2: Reasons for Zero WTP

Reasons for Zero bids	Entreaty	No Entreaty
Valid Reasons		
I cannot afford to contribute	27%	25%
I prefer to give to other causes	12%	8%
I prefer to spend my money on other things	1%	7%
This is not a problem	4%	2%
I don't care about this issue	0%	1%
Protest Reasons		
I don't believe the programme would work	4%	3%
I'm concerned about corruption	0%	3%
I need more info	3%	2%
It should be voluntary	15%	5%
Government should pay	5%	6%
Taxes already too high	10%	10%
I don't pay taxes/not applicable	5%	5%
Inappropriate vehicle	4%	7%
I don't trust taxes/government	3%	4%
Should use existing taxes/tax reform	1%	4%
Other reasons	4%	10%
Total (N)	(73) 100%	(102) 100%

Note: Expressed as % of total responses.

6.5.2 Effect of Entreaty on Incidence of Protest Zeros

At the first stage of the valuation exercise only a small number of respondents protested to the payment principle question. In the entreaty treatment only 2.7% of the respondents answering the payment principle question provided a protest NO compared to 4.0% without the additional script (Table 6.3). Chi2 tests revealed no significant difference at this stage between the two treatments.

Whilst the entreaty was primarily aimed at reducing protests relating to the provision of the proposed policy change, it had a much more noticeable effect at the second stage of the valuation exercise (payment ladder) which received a higher proportion of protest responses (see Table 6.3). As expected, the results of chi squared tests indicate that protests responses at this stage were statistically significantly lower (5% sig. level) with the additional script (10.4%)

compared to without (17.0%) (chi2 stat=4.61, p value=0.032). The results suggest that the script has had some effect in reducing protest zeros by lowering the proportion of zeros reported at the second stage of the valuation.

Table 6.3. Incidence of Protest Zeros With and Without Entreaty

Valuation stage		Entreaty			No Entreaty			Chi2 (p)
		Total	Protest zeros		Total	Protest zeros		
		N	N	%	N	N	%	
1st	Payment Principle	298	8	2.7%	298	12	4.0%	0.363
2nd	Payment Ladder	259	27	10.4%	241	41	17.0%	0.032

Note: Protest zeros expressed as % of total responses for each question. Only respondents stating YES or DON'T KNOW went onto the second stage.

This was further tested by running a logit model to explore in a multivariate context the effect of the entreaty on the probability of protesting at the second stage. The dependent variable was coded 1 if the respondent protested and 0 if not. The explanatory variables are defined in Table 6.4 and the regression results are reported in Table 6.5.

Table 6.4: Definition of Logit and Interval Regression Variables

Variable	Description
INCOME/1000	Mid-point of income interval divided by 1000
DEGREE	Dummy coded 1 if degree level education or above, 0 otherwise
KIDS	Number of children < 16 yrs in household
MEMBER	Dummy coded 1 if currently a member of an environmental organisation, 0 otherwise
RECYCLE_HI	Dummy coded 1 if recycles often or always
CHOOSE ENV	Frequency of choosing environmental goods over regular products from 1 (never) to 5 (always)
KNOWLEDGE	Dummy coded 1 if respondent has some knowledge of causes of biodiversity loss, 0 otherwise
LONGTERM	attitude towards the likelihood that the new protected areas will lead to long-term conservation of species and ecosystems from 1 (very unlikely) to 5 (very likely)
ENV_NO5	Dummy coded 1 if respondents rank environment as lowest priority amongst 5 general issues
ENV_NO1	Dummy coded 1 if respondents rank environment as top priority for additional government funding amongst 5 general issues
NO_DEV_PAY	Dummy coded 1 if respondents do not believe developed countries should help pay the costs of conserving tropical biodiversity
DEV_PAY	Dummy coded 1 if respondents believe developed countries should help pay the costs of conserving tropical biodiversity, 0 otherwise
ENTREATY	Dummy coded 1 if respondents received Entreaty script, 0 otherwise

The probability of protesting was found to significantly increase with income and amongst respondents that considered the environment to be the least important priority for additional government funding[137]. In contrast, respondents with degree level education or above and respondents that recycled often or always were significantly less likely to protest. Protest responses also declined with the perceived likelihood that the protected areas would result in long-term conservation. As expected the entreaty dummy variable was found to be a significant determinant of the probability of protesting (5% sig. level). The negative sign on the coefficient confirms the findings of the non-parametric results, namely that the inclusion of the script significantly reduces the likelihood of protesting.[138]

Table 6.5: Results of Logit Regression on Probability of Protesting at 2nd Stage

Variables	Coeff.	Z stat	
Income /1000	0.005003	1.68	*
Degree	-0.560563	-1.72	*
Long-term	-0.419206	-2.40	**
Env_No5	0.761767	2.35	**
Recycle_Hi	-1.088374	-2.54	**
No_Dev_Pay	0.63499	1.08	
Knowledge	-0.48839	-0.86	
Entreaty	-0.679037	-2.32	**
Constant	1.231668	1.38	
LR Chi2(8)	30.39		***
Pseudo R2	0.08		
Obs	471		

Note: ***, **, and * represent statistical significance at 1%, 5% and 10% levels.

[137] This involved a ranking exercise of five general issues: crime, education, the National Health Service, environment and poverty.

[138] Additional analysis was undertaken to investigate whether the entreaty is more effective at reducing the propensity to protest amongst certain types of individuals. This follows on from the literature using cheap talk to deal with hypothetical bias, where there has been some evidence to suggest that cheap talk is more effective at reducing stated WTP for certain types of individual (see List 2001; Lusk 2003; Aadland and Caplan 2003). To investigate whether the entreaty was more effective with certain types of individuals its effect on protestors was re-examined by comparing the characteristics of those protesting with and without the additional script (using student ttests and chi2 tests). Overall, the key socio-demographic and attitudinal variables (age; sex; number of children; degree level education; choose_env; dev_pay) were not significantly different for protestors between treatments suggesting that the entreaty was similarly effective for most respondent types. However, given the low number of protestors it is recommended that these results are treated with caution.

6.5.3 Effect of Entreaty on WTP Estimates

While the main purpose of the use of entreaties in the hypothetical bias literature is to correct WTP, in this example the main purpose is to reduce protests, however it was also of interest to examine any potential effects on WTP. The results of the non-parametric estimation of mean and median WTP using the raw data, with protestors and outliers removed,[139] are reported in Table 6.6. It should be noted that there were no significant differences in the key socio-demographic variables (income, age, education and membership of environmental organizations) between the censored sub-samples. Mean and median WTP was found to be slightly higher under the entreaty treatment however the results of a Mann-Whitney test[140] indicate no statistically significant differences in willingness to pay between the treatments (p value = 0.4238). This suggests that the additional script did not appear to significantly influence WTP amongst the respondents reporting valid bids.

Table 6.6. Non-parametric Lower-bound Mean and Median WTP (Protestors and Outliers Removed)

Treatment	N	Median WTP	Mean WTP	SD
Entreaty	260	£20.00	£40.35	£57.11
No Entreaty	239	£12.00	£40.19	£54.73
Mann Whitney:	Ho: WTP(No_E)=WTP(E)			P = 0.4238

Note: These estimates are based on the raw data using lower bound of interval only. The E (entreaty) split had 3 missing observations and the no_E (no entreaty) 5 missing observations.

To further explore this finding an interval regression model was run using maximum likelihood estimation procedures to identify the main determinants of WTP for the pooled data, with protestors and outliers removed. The results of the regression model are reported in Table 6.7. A number of socio-demographic, behavioural, and attitudinal variables were found to be significant in explaining variations in WTP. Willingness to pay was found to increase with: income; degree level education; membership of environmental organizations; frequency of choosing environmentally-friendly goods over regular; knowledge of biodiversity causes; belief that developed country should help pay the costs of conserving tropical biodiversity; and ranking of environment as No 1 priority. The negative coefficient on kids suggests that as the number of children increases WTP decreases, consequently it may be interpreted as a constraint

[139] Only two respondents reported WTP above £350; these were treated as outliers.
[140] A Mann-Whitney test was used instead of Students Ttest since the results of a Shapiro-Wilk W test indicate that WTP is not normally distributed (a critical assumption of the Student Ttest being that the variable is distributed normally, the Mann-Whitney test does not require such assumptions).

on WTP rather than as a bequest value indicator. These findings are in line with *a priori* expectations and economic theory.

Table 6.7. Interval Regressions using Maximum Likelihood Estimation on WTP

Variables	Coeff.	z stat
Income (divided by 1000)	0.0113	5.09 ***
Kids	-0.1599	-1.79 *
Degree	0.5771	2.49 **
Knowledge	1.0418	2.17 **
Member	0.7022	3.35 ***
Choose_Env	0.3054	2.73 ***
Env_No1	0.9011	4.02 ***
Dev_Pay	1.2161	3.56 ***
Entreaty	0.3339	1.79 *
Constant	-1.7471	-2.77 ***
Sigma	1.9315	
Log pseudo-Likelihood	-1317.718	
Wald chi2 (9)	148.91	***
McKelvey & Zavoina's R2	0.24	
Obs.	468	
Median WTP	£13.20	
Confidence Intervals	£10.67	£15.73

Note: ***, **, and * represent statistical significance at 1%, 5% and 10% levels. Excludes protestors/outliers.

However, contrary to the non-parametric results, in a multivariate context, the entreaty was found to be a significant determinant of WTP in the regression model but only at the 10% sig. level. The coefficient on the entreaty dummy variable was positive, suggesting that WTP increases with the inclusion of the additional script. It was suggested earlier that the positive coefficient could be driven by positive bidders increasing their stated WTP either in response to the improved credibility of the scenario or as a form of upward bias. To assess whether the script had encouraged some respondents to increase their stated WTP a comparison was undertaken of mean WTP for positive bids only between treatments. The results are reported in Table 6.8.

Table 6.8. Non-parametric Lower-bound Mean and Median WTP Using Positive Bids Only (Protestors and Outliers Removed)

Treatment	N	Median WTP	Mean WTP	SD
Entreaty	227	£20.00	£46.22	£58.87
No Entreaty	196	£30.00	£49.00	£56.76
Mann Whitney:	Ho: WTP(No_E)=WTP(E)			P = 0.763

Note: Based on the raw data using lower bound of interval for positive bids only. E: entreaty

The results of the non-parametric Mann-Whitney test indicate that positive WTP responses are not significantly different between the treatments (p value = 0.763). These results suggest that the entreaty did not significantly increase stated WTP amongst those reporting positive bids[141]. Moreover, multivariate regression on the positive bids only (excluding protestors and outliers), confirms the insignificance of the added script (see left-hand side of Table 6.9). These findings suggest that the significant positive coefficient for the entreaty dummy variable in the regression model may be the result of some other effect.

Table 6.9. MLE Interval Regressions on: (1) WTP Positives only; and (2) WTP Valids Recoded, (excl. protestors & outliers).

	(1) WTP Positives			(2) WTP Valids Recoded		
Variables	**Coeff.**	**z stat**		**Coeff.**	**z stat**	
Income (divided by 1000)	0.0088	5.61	***	0.0111	5.04	***
Kids	-0.0826	-1.13		-0.1160	-1.34	
Degree	0.1591	0.94		0.5837	2.55	**
Knowledge	0.4239	1.08		0.9164	1.90	*
Member	0.5668	3.48	***	0.6789	3.27	***
Choose_Env	0.0601	0.73		0.2872	2.59	**
Env_No1	0.5236	2.78	***	0.8680	3.91	***
Dev_Pay	0.4540	1.82	*	1.1831	3.48	***
Entreaty	0.0730	0.52		0.2528	1.38	
Constant	1.4995	3.26	***	-1.4627	-2.32	**
Sigma	1.3525			1.8942		
Log pseudo-Likelihood	-1103.72			-1304.78		
Wald chi2 (9)	91.89		***	140.24		***
McKelvey & Zavoina's R2	0.154			0.234		
Obs.	404			462		

[141] If the entreaty had significantly increased WTP amongst the positive bidders due to the removal of respondent uncertainty towards the proposed scenario then this too would have been an acceptable result since the overall purpose of the script was to do exactly this (i.e. to remove any perceived credibility issues which might have affected respondents stated WTP in order that to provide valid welfare estimates for the wider policy analysis).

Thus, consideration was given to the possibility that the positive coefficient on the entreaty dummy variable could be due to its effect on the proportion of respondents reporting valid zeros. In other words, the script may be having an additional impact on those respondents stating zero which was not accounted for by the analysis of the protest zeros. Indeed, on closer inspection, the results indicate a significant difference (borderline 10% sig. level) in the number of valid zeros reported between the two treatments at the payment principle stage (chi2 = 2.5939, p value = 0.107). The results of the comparison of valid zeros are reported in Table 6.10.

Table 6.10. Incidence of Valid Zeros With and Without Entreaty (excl. Protestors & Outliers)

Valuation stage		Entreaty			No Entreaty			Chi2 (p)
		Total	Valid zeros		Total	Valid zeros		
		N	N	%	N	N	%	
1st	Payment Principle	290	28	9.7%	286	40	14.0%	0.107
2nd	Payment Ladder	232	5	2.2%	199	3	1.5%	0.619

Note: One outlier excluded under No Entreaty. Valid zeros % expressed as % of total responses for each question

Consequently, it appears that the entreaty, in addition to reducing the number of protests zeros, has also had an effect on the number of valid zeros. More importantly, it appears to be the later that is driving the positive coefficient on the entreaty dummy variable in the interval regression model. In other words the additional script appears to have encouraged some respondents whom would otherwise have reported a 'valid' zero to instead report positive WTP bids.

This raises the question of why there are fewer valid zeros under the entreaty treatment? As discussed in the introduction, the standard procedure for identifying protests is crude, it relies on self-reporting and as Jorgensen and Syme (2000) point out there may be manifold reasons for a respondent's stated WTP. In the current context it is surmised that this crudeness may have resulted in some respondents in the 'without' entreaty treatment being incorrectly identified as 'valid' zeros. If this is the case, then it is reasonable to assume that under the entreaty treatment incorrectly identified 'valid' zeros would be swayed to report their true WTP rather than a zero bid, explaining the lower proportion of 'valid' zeros. Given the insignificant effect of the entreaty on the positive bids (as indicated by the non-parametric and parametric results), it is contended that the positive influence of the additional script on WTP appears to be mainly driven by its effect on the incidence of valid zeros rather than in inflating positive bids.

6.5.4 Effect of Re-classifying 'Valid' Protest Zeros

To test the assumption that some valid zeros may be incorrectly classified, respondents' reasons for zero WTP were re-examined. Amongst the 'valid' responses, it was observed that the proportion of respondents stating NO because 'I prefer to spend my money on other things' was consistently lower in the entreaty treatment (see Table 6.2). This is an interesting result since superficially this response appears to be a valid zero but in the entreaty treatment respondents seem to have been talked out of it. It is possible that this response may have been a different way of articulating a protest although there is not enough information to assess this properly.[142] With this caveat in mind, the assumption that these respondents were incorrectly classified as 'valid' zeros was tested by re-classifying them as protestors and re-running the earlier tests. The non-parametric results indicate that, excluding the re-classified zeros, there is no longer a significant difference in the proportion of valid zeros between the two treatments at the first stage (chi2 = 1.1652, p value=0.280). More importantly, the incidence of protest zeros is now significantly lower under the entreaty treatment at the payment principle stage (chi2 = 3.1424, p value = 0.076) in addition to the second stage of the valuation (chi2 = 5.1462, p value = 0.023) (see Table 6.11).

Table 6.11. Incidence of Protest Zeros using Re-classification of 'Valid' Zeros

Valuation stage		Entreaty			No Entreaty			Chi2 (p)
		Total	Protest zeros		Total	Protest zeros		
		N	N	%	N	N	%	
1st	Payment Principle	298	9	3.0%	298	18	6.0%	0.076
2nd	Payment Ladder	259	27	10.4%	241	42	17.4%	0.023

Note: Respondents stating NO because 'I prefer to spend money on other things' reclassified as 'protest' zeros. Protest zeros % expressed as % of total responses for each question.

Further the results of Mann-Whitney test on WTP re-affirm that with the exclusion of the re-classified valid zeros the difference in WTP remains insignificant between the two treatments (p value 0.709) Table 6.12. This finding was further tested by re-running the interval regression model excluding the reclassified valid zeros. The results are reported on the right hand side of Table 6.9. As expected the coefficient on the entreaty dummy variable is no longer significant (p value 0.167), corroborating the earlier suggestion that the effect on WTP is driven by the effect on the valid zeros.

[142] This would require personal de-briefing with cognitive procedures.

Table 6.12. Non-parametric Mean and Median WTP Using Re-Classification of 'Valid' Zeros (excl. Protestors and Outliers)

Treatment	N	Median WTP	Mean WTP	SD
Entreaty	259	£20.00	£40.51	£57.16
No Entreaty	232	£15.00	£41.40	£55.10
Mann Whitney:	Ho: WTP(No_Erc)=WTP(Erc)			P = 0.709

Note: Respondents stating NO because 'I prefer to spend money on other things' were reclassified as 'protest' zeros. These estimates are based on the raw data using lower bound of interval only and with reclassification of 'valid' zeros. E: Entreaty.

Although this re-classification was entirely subjective, if it is the case that these 'valid' zeros were incorrectly classified then the results provide some tentative support to the earlier finding that the entreaty appears to reduce the propensity to report protest zeros. Of course, this analysis also highlights the subjective and imprecise nature of the treatment of protests.

6.6 CONCLUSION

The purpose of this chapter was to test the usefulness of entreaties as a way to reduce protest zeros. The results suggest that it had some success at encouraging respondents not to protest.

The script was found to be most effective at dealing with payment vehicle protests rather than protests towards the payment principle, although this is likely to reflect the higher proportion of protests received at this stage of the valuation. The entreaty was not found to have a significant effect on positive WTP which suggests that respondents were not encouraged to overstate their bids due to the inclusion of the script.

Perhaps the most interesting finding was that the entreaty also had an effect on the number of valid zeros which was hypothesized to be the result of incorrectly classifying some of the zero bids. Re-classifying these bids as protest zeros improved the effectiveness of the script at both stages of the valuation questions. This finding highlights the need for further research into understanding the reasons behind zero WTP with particular attention on developing procedures to ensure the correct classification of protest and valid zeros, especially in survey formats which rely on self-reporting.

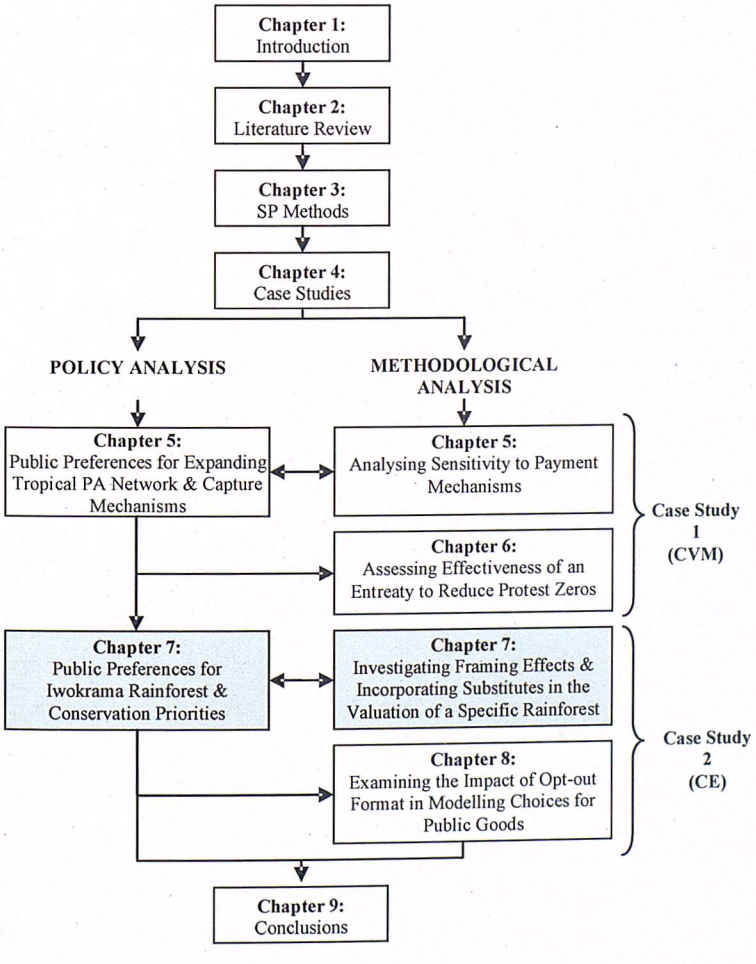
Overall this chapter provides evidence to suggest that entreaties can be effective in dealing with the problem of protest zeros. Although the scenario did not receive a high proportion of protest responses there are many contexts where protests may be more likely to occur, where this approach could be utilized. It is recommended that further studies are undertaken to fully test

the usefulness of entreaties in reducing protest zeros, for example, in other contexts, through cognitive de-briefing, and, also in dealing with other types of bias in contingent valuation.

Chapter 7: Examining Public Preferences for Rainforest Conservation: Incorporating Substitutes in the Valuation of a Specific Rainforest

SUMMARY

This is the first chapter in case study 2. It reports the results of a choice experiment study to estimate London residents' WTP towards conserving Iwokrama Rainforest, in Guyana, South America, and investigates how the public prioritise policy responses to rainforest conservation. A key element of the research is the use of a novel approach, using a split sample design, to incorporate information about substitutes as well as the specific baseline conditions, to establish absolute estimates of willingness to pay for a *specific* rainforest. In doing so, the current chapter explores how framing may affect choices about rainforest provision, and provides new information about how the public prioritise rainforests in different conditions. The use of a choice modelling approach rather than CVM offers the advantage of providing more in depth knowledge (due to the multiple trade-offs involved) about the nature of public priorities towards rainforests, for example, how the public prioritise between the various social, economic and environmental policy aspects. This chapter also investigates public attitudes, knowledge and awareness of tropical rainforests.



7.1 POLICY BACKGROUND

Less than 6% of the world's original rainforests remain, and large shortfall exists in the funding available for both current and future conservation efforts. This presents a dilemma since 'not everything can be saved' (Ginsberg 1999;Moran, Pearce, & Wendelaar 1997). Correspondingly, policy makers and donor organisations need to find ways to prioritise between the remaining rainforests to ensure that future conservation efforts focus on the 'most important' areas and maximise the benefits per dollar spent. This presents a number of challenges. Firstly, rainforests are complex and multi-faceted goods, which means there are a wide variety of attributes on which to base priorities. Secondly, there is no clear consensus over which aspects matter the most[143]. Indeed, O'Connor et al (2003) comment on the difficulty of deciding how to weight social, economic and political factors against biological indicators. Moreover, it is not always clear how certain aspects should affect prioritisation. For example, two of the most well-known priority-setting approaches, biodiversity hotpots (Myers 1988) and tropical wilderness areas (Mittermeier et al. 1998;Myers 1988), focus on opposite ends of the same spectrum. Both feature high levels of species and endemism, yet hotspots are highly vulnerable areas, which have already lost most of the original vegetation and are often highly fragmented, while Wilderness areas are still largely intact with most of the original vegetation in pristine condition[144]. Economic valuation techniques, such as those described in this thesis, offer the potential to illuminate some of the priority setting dilemmas by providing information about which aspects and which policy responses maximise welfare (Hughey, Cullen, & Moran 2003). Moreover, there is a strong case for considering public preferences in deciding between priorities since much of the money directed towards global conservation efforts comes from public funds.

7.2 RESEARCH OBJECTIVES

As discussed in the preceding chapters, there is a marked absence of stated preference studies which estimate WTP amongst residents in developed countries for the conservation of tropical rainforests and biodiversity. This represents an important gap in knowledge since it is widely acknowledged that there exists a large shortfall in funding for tropical conservation, and much of the money needed to secure future conservation efforts is expected to come from public

[143] Indeed, a variety of priority-setting approaches have emerged in both the policy and academic literature. For example, Olson and Dinerstein's (1998) Global 200 focuses on ecosystem and habitat coverage while IUCN's Red List concerns threatened species (see IUCN 2004a).

[144] Biodiversity Hotspots are defined primarily on basis of species richness and level of threat: they must have lost at least 70% of original primary vegetation, and typically are highly vulnerable areas with high human presence (Myers et al 2000). In contrast Tropical Wilderness Areas are extensive areas of intact pristine vegetation with high species richness, at least 70% -75% of their primary vegetation intact and fewer than 5 people per km2 (Mittermeier et al. 1998).

funds in developed countries. Yet, we know very little about public preferences towards tropical conservation in developed counties like the UK nor about how the public might prioritise policy responses.

Most of the empirical research to date (see Chapter 2 for a detailed review of the literature) has focused on estimating WTP for marginal changes in 'world's rainforests' regardless of location (see, for example, Kramer & Mercer 1997;Manoka 2001) or on single-trade-offs regardless of the multiple facets of rainforest provision (see Horton et al. 2003). While such studies are useful in providing ball park figures for the non-use values attached to rainforest conservation, they provide little guidance to policymakers about how such benefits may be maximised. Additionally, few studies have considered how different policy responses, for example, the duration of the project or the management approach, might affect values.

As Rolfe, Bennett and Louviere (2000) point out, the lack of information on how the public would prioritise between different rainforests, for example specific or regional rainforests, limits the usefulness of estimates, and makes it difficult to incorporate these values into the appraisal of specific policy decisions. Herein, more specific estimates of the benefits of provision, both in terms of the size and nature of the proposed policy change, would be required, in order for accurate comparisons with costs. Moreover, to be reliable, such estimates would need to take into account how the provision of other rainforest conservation programmes might affect the values attached to the specific rainforests of interest (Carson, 1998).

Rolfe, Bennett and Louviere (2000)[145] attempt to address some of these issues in a choice modelling (CM) study to explore *Australian residents'* preferences for rainforest conservation in Vanuatu, which was framed amongst other rainforest locations. While their work provides valuable information with regard to *Australian residents*' geographic priorities for rainforest conservation and also on how rainforest conservation compares with other substitute ecosystems such as wetlands (see Chapter 2 for a review of the findings), the authors fail to obtain 'absolute' measures of WTP for the specific rainforest in question, due to the omission of information about the baseline conditions, instead providing measures relative only to the other rainforests included in the choice task.

The current chapter seeks to address this shortcoming by estimating the absolute WTP of UK residents, for a specific rainforest programme, Iwokrama Rainforest Conservation Programme in Guyana, South America. A key component of the research focuses on the methodological challenge of taking into account the impact of substitute goods, for example, other rainforests, when estimating public preferences for a *specific* rainforest. The research also seeks to inform

[145] See also related work: Rolfe and Bennett (2001) and Rolfe, Bennett and Louviere (2002).

the priority-setting debate by providing new information on how the UK public prioritise policy responses to rainforest conservation, in particular investigating attitudes and preferences towards different management approaches, and the conditions of rainforests.

More specifically the policy objectives are:

(1) to estimate the value attached to conserving Iwokrama rainforest from the perspective of UK residents;

(2) to investigate which aspects of rainforest conservation programme the public prioritise;

(3) to explore how benefits could be maximised by examining preferences towards different management responses;

(4) to examine how the public prioritise between rainforests in different conditions and to consider the policy implications; and

(5) to review the adequacy of existing financial transfers from UK to Iwokrama rainforest.

The methodological objectives are:

(6) to test the effect of framing rainforest conservation choices in the context of information about baseline conditions and information about substitutes, on: (i) taste parameters; (ii) marginal prices and (iii) welfare estimates; and

(7) to derive more meaningful estimates of WTP using a novel methodological approach which explicitly incorporates information about the baseline conditions and substitute goods.

Correspondingly, this research extends the existing work on public preferences for rainforest conservation in a number of novel ways: (1) through the use of a novel methodological approach to derive *absolute* estimates of willingness to pay for a specific rainforest while *explicitly taking into consideration substitute* rainforests; (2) by *framing* rainforest conservation in a novel way to uncover *new information on public priorities for rainforests in different conditions*; (3) by conducting the first *choice modelling study* to examine *public preferences in the UK* for rainforest conservation, thereby providing more detailed information on the nature of preferences than the only other UK study to date to investigate this issue (see Horton et al. 2003)[146].

The remainder of the chapter is organised as follows: the next section reviews the challenges in valuing specific rainforests. This is followed by a description of the experimental design and research hypotheses. The final sections present and discuss the results, and the chapter concludes with a summary of the main findings and recommendations for future research.

[146] Horton et al (2003) used CVM to examine UK preferences for rainforest conservation.

7.3 VALUING A SPECIFIC RAINFOREST

Obtaining valid estimates of the non-use values attached by distant beneficiaries to a *specific* rainforest raises a number of methodological challenges. In particular, both Carson (1998) and Rolfe, Bennett and Louviere (2000) comment on the difficulty of ensuring respondents have sufficient basic information on rainforests, which are complex, and for many unfamiliar goods, without reaching 'over load'. Carson (1998) also specifically highlights the importance of considering how the provision of other rainforest conservation programmes might affect the values attached to a specific set of rainforests that may be presented in a survey instrument (p. 22). This echoes concerns reported elsewhere in the CVM literature that if respondents are not reminded about other similar goods they may overestimate their WTP for a specific good or instead state the value they hold for the general type of good (Arrow et al. 1993;Loomis, Gonzalezcaban, & Gregory 1994).

The NOAA panel recommends the use of reminder statements to ensure that respondents give full consideration to substitute goods (Arrow et al. 1993). These have had mixed results (see Loomis, Gonzalezcaban, & Gregory 1994;Whitehead & Blomquist 1995)[147,148]. Approaches which have sought to stimulate more explicit consideration of substitutes appear to have been more successful (see Hailu, Adamowicz, & Boxall 2000;Neill 1995). Indeed, Rolfe and Bennett (2001) consider that the choice modelling approach offers a key advantage over CVM in that it can be designed to explicitly require consideration of substitute goods, for example through the inclusion of labels to indicate alternative investment opportunities . Furthermore, by offering a range of substitute goods, the good of interest is effectively disguised, ensuring respondents do not become 'super-informed'[149], and likewise lessening opportunity for strategic behaviour (Rolfe & Bennett 2001).

Even so, the issue remains that in order to ensure respondents adequately consider substitutes it is necessary to provide a similar amount of information about substitutes, as the good of interest (Rolfe, Bennett, & Louviere 2002). In the context of unfamiliar and complex goods this may be particularly challenging. In the Rolfe, Bennett and Louviere (2000) study the obvious compromise in providing information about substitute rainforests in other locations (and other

[147] Hence, recent interest in the CVM literature for alternative approaches such as use of 'cheap talk' scripts.

[148] For example, Loomis, Gonzalezcaban and Gregory (1994) in a CVM study to estimate the benefits of reducing fire hazards to old-growth forests, found a reminder statement did not yield significantly different WTP estimates. In contrast Whitehead and Blomquist (1995) in a CVM survey of a less familiar good, wetland preservation, found that inclusion of information about related environmental goods (substitutes or complements) can significantly affect estimates of WTP.

[149] Whilst a 'super informed' respondent may still report genuine preferences, the difficulty lies in the fact that their reported values may no longer be representative of the target population (Rolfe & Bennett 2001).

vegetation types), is the omission of information about the baseline conditions[150], hence the results are relative only. To do this for each of the six rainforests presented would likely result in 'information overload'. Of course, it remains the case that without such information valid and reliable estimates may be hard to establish. Indeed, Kramer and Mercer (1997) found that most focus group respondents were unwilling or unable to allocate their willingness to pay between specific rainforests or across regions, stating that there was insufficient information to make intelligent allocations between regions and areas. Moreover, respondents considered that the amount of information that would be required to do so would be overwhelming.

This study provides a first attempt at resolving the problems of information transfer in deriving absolute estimates of willingness to pay for a specific rainforest while explicitly incorporating substitute effects. In doing so, it seeks to provide additional information on how framing may affect choices about rainforest provision and to uncover new information regarding public priorities for rainforest conservation.

7.4 EXPERIMENTAL DESIGN

The underlying purpose of this research it to estimate the preferences of UK residents for a specific rainforest conservation programme, Iwokrama rainforest in Guyana, South America (a description of Iwokrama Rainforest is presented in Chapter 4).

In order to avoid overloading respondents by including full information about substitute investment opportunities as well as the specific rainforest of interest, a split sample design was employed in which choices about Iwokrama Rainforest were framed in one of two ways:

(1) against the 'baseline' alternative (BASE); and,
(2) against 'substitute' rainforest investment opportunities (SUB).

In the BASE treatment respondents were presented with a choice between the future situation with no Iwokrama conservation programme (fixed) and two different Iwokrama conservation programme alternatives, which varied across the choice sets. In the SUB treatment respondents were presented with a labelled choice experiment consisting of three different rainforest investment opportunities: Iwokrama Rainforest, Atlantic Rainforest and Any Rainforest, (and a fixed 'choose neither' alternative).

[150] Baseline (or status quo) conditions refer to the situation without the policy intervention; this information should be included to ensure estimates are consistent with welfare theory (Bateman et al 2002).

The framing of the choices in the SUB treatment was intended to serve the dual role of disguising the Iwokrama rainforest amongst alternative investment opportunities, and, of ensuring respondents explicitly incorporate substitutes in their decisions. Indeed this follows on from the design used by Rolfe, Bennett and Louviere (2000).

In the current study, the framing of choices based on the conditions of the rainforest aims to help inform the current debate over how to set priorities for biodiversity conservation. The Atlantic Forest was specifically selected since it is a Biodiversity Hotspot, having already lost much of its original vegetation and is fragmented[151]. In contrast, Iwokrama Rainforest is part of the Guyana Shield, an area identified as Tropical Wilderness. Iwokrama Rainforest is in pristine condition, with over 80% of its original vegetation intact. Although the descriptions presented to respondents were somewhat simplified, the choice of these two rainforests provides an opportunity to examine how respondents prioritise between Biodiversity Hotspot and Tropical Wildernesses. The author is unaware of any studies that have previously investigated these issues in the context of tropical rainforests. In addition the inclusion of 'Any Rainforest' was to test the observation of Kramer and Mercer (1997) that respondents were not concerned with specific rainforests.

Through the inclusion of alternative specific modelling constants (ASC's) in the regression model, it is possible to capture preferences for the label attributes (Iwokrama Rainforest; Atlantic Rainforest; and Any Rainforest), thereby providing information on priorities for alternative rainforests[152].

7.4.1 Research Hypotheses

The effect of framing Iwokrama Rainforest either against its baseline condition or against substitutes is tested through a number of hypotheses:

The first hypothesis examines whether taste parameters differ across treatments. It is anticipated that framing effects will occur given the choice tasks differ between the two treatments. Significant differences in attribute parameters would imply different cognitive processes and the presence of framing effects (Blamey et al. 2000). Swait and Louviere (1993) outline a procedure to test for parameter equality[153], using a one-dimensional grid search technique to

[151] The Atlantic Forest stretches along Brazil's Atlantic coast and extends inland to eastern Paraguay and the Misiones province of northeastern Argentina. Less than 7.5% of the original forest remains (Myers et al. 2000), much of this is fragmented and in some regions degraded (Conservation International 2007).
[152] It should be noted that the ASC's may also capture other unobserved effects for example, 'presentation effects' where some respondents simply opt to select the 'middle' option in each choice card (Blamey et al. 2000).
[153] Since attribute parameters are confounded with the error terms, direct comparisons are not permissible.

identify the scale ratio factor[154] which maximises the log-likelihood of the pooled dataset[155]. Using this approach, it is then possible to test whether the parameters are equal between the datasets while permitting the scale factors to differ using standard likelihood ratio statistics (Swait & Louviere 1993).

The second hypothesis examines the effect of framing on the marginal rates of substitution of the non-monetary attributes with the price attribute, between treatments. It is anticipated that marginal prices will be lower in the SUB treatment for at least some attributes due to the inclusion of the additional 'type of rainforest' label attribute (Iwokrama, Atlantic and Any Rainforest). This follows Blamey et al. (2000) that the inclusion of additional information via labels may reduce the importance of some of the attributes as attention is shifted to the labels, resulting in lower implicit attribute prices. This is tested by directly comparing the marginal prices of the attributes in each dataset.

Thirdly, a key issue of interest concerns whether the inclusion of additional information regarding substitute investments opportunities may result in significantly different welfare estimates of the value attached to conserving a specific rainforest than in the absence of such information. Moreover, it is important to test the effect on overall welfare estimates since the inclusion of the labels relating to substitutes rainforests, may simply redistribute the utility associated with rainforest conservation choices (after Blamey et al. 2000). In order to test this hypothesis estimates of the compensating surplus associated with Iwokrama rainforest in the BASE treatment with the specified baseline are compared to those derived from the SUB treatment with the non-specific baseline. The expectation is that mean WTP for Iwokrama Forest will be significantly lower in the SUB treatment as a result of the explicit incorporation of information on substitutes into the decision process. In addition, the absence of information about the specific baseline conditions may also serve to reduce welfare estimates in the SUB treatment.

Finally, the overall objective of this chapter is to derive a meaningful estimate of willingness to pay for a specific rainforest that explicitly takes into consideration substitute rainforest investment opportunities *and* the status quo conditions. To do this, the datasets from each treatment are pooled and optimally scaled, using the Swait-Louviere procedures outlined above, to derive an absolute measure of willingness to pay. Empirical evidence suggests that

[154] The scale factor is the inverse ratio of the variances of the error distributions of the separate models (Rolfe & Bennett 2001).

[155] This involves defining a range of values for μ_{base} within which the log likelihood value is expected to be maximised, and at each trial value estimating the corresponding conditional logit model. The log-likelihood value for each value of μ_{base} is then plotted against its corresponding μ_{base} value; due to the concavity of the log likelihood function, there will be only one peak thus the estimate of the scale factor corresponds to the value at which log-likelihood is maximised (Swait & Louviere 1993).

accounting for scale differences when pooling data can lead to superior model fits (Swait & Louviere 1993). Indeed Swait and Louviere (1993) note that 'even if one rejects scale and parameter equality among the data sets being compared, our approach still provides a way to scale data to maximise the fit and improve parameter estimates for pooled data sets' (p. 313).

7.4.2 Attributes

In both treatments, the rainforest conservation programme alternatives were described by the same 6 attributes: (i) size of conservation area; (ii) number of rare or endangered species present; (iii) management approach; (iv) duration of conservation programme; (v) local community impact; and (vi) the size of the one-off donation required. A full description of the attributes and levels are set out in Table 7.1. The BASE treatment included an additional level to represent the 'no conservation programme' conditions, while the SUB treatment was labelled to identify the different rainforests[156]. Aside from this, the survey instruments were identical between treatments. Respondents were randomly allocated to a treatment.

Table 7.1: Attributes, levels and variables

Attribute	Levels	Variable
Rainforest conservation area:	185,000 hectares or 371,000 hectares or *0 hectares (baseline only)*	AREA
Number of rare or endangered species present:	30 species or 45 species or *20 species (baseline only)*	SPECIES
Management approach:	Complete Preservation or Sustainable Uses (ecotourism and sustainable logging) or *No restrictions on rainforest use (unsustainable mining and timber logging) (baseline only).*	MANAGEMENT
Conservation period:	15 years or 50 years or *0 years (baseline only).*	TIME
Local community impact:	Community Benefits (e.g. jobs, training) or No Community Benefits or *No Community Benefits and Worse off (baseline only).*	LOCAL COMMUNITIES
One-off donation amounts:	£3; £10; £14; £20; £30; £50; £65; £100; £500; *£0 (baseline only)*	PRICE

Note: *italics* indicate levels specific to the baseline alternative only in the BASE treatment.

[156] Note, the attribute levels were not alternative specific in the labelled SUB treatment.

A fractional factorial design was used to reduce the possible combinations to a subset which would enable the main effects of interest to be estimated (Louviere, Hensher, & Swait 2000)[157]. A set of 16 profiles or cards were generated and choice sets were constructed by randomly drawing pairs (or triples in the case of the SUB treatment) without replacement from two (or three) sets of the cards. In the second round of data collection an extra three choice cards (6 cards in the substitutes survey) were added which replicated three (or six) of the existing choice sets but with the price increased to £500 (preliminary results from the first round of data collection indicated presence of 'fat-tails'). Thus, in total 19 (or 22) choice sets were used, these were grouped into three blocks, such that each respondent was required to answer five, six or seven choice sets depending on the randomly allocated block and the treatment.

An example of the choice cards used in each of the treatments is presented in Figure 7.1.

7.5 DATA

The data used in this chapter comes from case-study 2. The analysis was performed on the choice experiment data resulting from BASE (using status quo (SQ) version only) and the SUB split samples. A full description of the survey instrument and data collection procedures is provided in Chapter 4. To recap the survey instrument covered: general issues; knowledge; awareness and attitudes towards tropical rainforests and their management; choice experiment questions; choice experiment follow-ups; and a final section about respondent socio-demographic characteristics. The survey was implemented using a drop-off and mail-back approach with a follow-up reminder sent approximately two weeks later. The survey was distributed using a drop-off/mail-back procedure to a total of 1716 households in 18 randomly selected areas of London between 18th Oct 2004 and 17th Nov 2005[158].

[157] Whilst using a main effects design requires assumptions about the insignificance of interaction effects, it has been justified on the basis that such designs can typically account for 70% to 90% of the variance in choice models (Louviere, Hensher, & Swait 2000). A complete factorial design includes all the possible combinations of attributes and levels. In the current context this would have resulted in 256 possible combinations which given the study constraints would have been impractical to implement.

[158] Two round of data collection were conducted.

Figure 7.1: Example of 'baseline' and 'substitutes' choice cards

Baseline Format

Please place a tick below the ONE option you most prefer:

Attributes	Iwokrama Rainforest in 2019		
	Option A No Conservation	**Option B Conservation**	**Option C Conservation**
Size of conservation area (hectares)	No conservation Area	185,000 ha	371,000 ha
Rare species present	20 species	45 species	45 species
Management	No restrictions on rainforest use	Sustainable Uses	Sustainable Uses
Conserved Period	0 years	15years	50 years
Local communities	No Benefits Worse off	No Community Benefits	Community Benefits
Donation Required	£0	£30	£100

Please tick ONE only: ☐1 ☐2 ☐3

How certain are you of your choice? Please circle **ONE** point on the scale below:

0% 20% 40% 60% 80% 100%

Absolutely uncertain — Absolutely certain

Substitutes Format

Please tick the ONE option you most prefer below:

Attributes	Option A	Option B	Option C
	Iwokrama Forest Untouched	**Atlantic Forest** Little Left	**Any Rainforest** Any condition
Size of conservation area (hectares)	185,000 ha	185,000 ha	185,000 ha
Rare species present	45 species	30 species	45 species
Management	Sustainable Uses	Sustainable Uses	Sustainable Uses
Conserved Period	50 years	50 years	50 years
Local communities	Community Benefits	No Benefits	Community Benefits
Donation Required	£30	£10	£20

Please indicate preference: (Tick ONE)

- ☐ Option A
- ☐ Option B
- ☐ Option C
- ☐ I would not support any option

How certain are you of your choice? Please circle **ONE** point on the scale below:

0% 20% 40% 60% 80% 100%

Absolutely uncertain — Absolutely certain

7.6 RESULTS AND DISCUSSION

7.6.1 Response rates

A total of 658 complete or partially usable questionnaires were returned, these were evenly split between the two treatments, giving a response rate of 38.3% for each split-sample. These rates fall within the range reported for other stated preference (SP) mail surveys (Mitchell & Carson 1989).

The survey was favourably received by most respondents, with 60.9% finding it 'interesting' and 26.4% considering it to be 'educational'. Around 7.3% of respondents considered the questionnaire to be 'unrealistic', whilst 10.6% found it to be 'difficult'. Although efforts were made to keep the questionnaire as brief as possible, 23.0% of respondents found it to be 'too long'. This result is not unsurprising; Carson (1998) comments on the difficulty of ensuring all respondents have sufficient information to share a common basic understanding of tropical rainforests without providing too much information, (given some respondents may be more or less knowledgeable than others).

7.6.2 Sample Socio-demographic Characteristics

Table 7.2 provides an overview of the socio-demographic characteristics of the respondents in each of the treatments. No significant differences were identified between the split-samples with the exception of the degree variable which was significantly higher in the SUB treatment (5% sig level). Since the majority of the analysis is conducted on the pooled data sets this does not represent a significant problem. Moreover as will be seen in the valuation section, degree is not found to be a significant determinant of choices.

Thus, based on the pooled data sets, almost half the sample are male and the average age is 44.8 years. The sample is highly educated with 69.9% of respondents attaining a degree level education or above, and is wealthy with average gross household income of £53,117.58 per annum.

A comparison of the pooled sample data and the available statistics for the target population of London, (see column 4 in Table 7.2), indicates that the sample is not representative in terms of education and income[159]. In general respondents were found to be more highly educated and

[159] Although comparisons relating to employment status and age are confounded by the unavailability of matching statistics for London and survey sample, it is clear from the summary provided that the pooled sample is a fairly good match for age and sex.

wealthier than the target population. This is a common problem in mail surveys[160], which can be susceptible to non-response and sample-selection bias, mainly due to the lack of control over participation (Loomis 1987;Messonnier, Bergstrom, Cornwell, Teasley, & Cordell 2000;Mitchell & Carson 1989). While this does not invalidate the current findings, it should be noted that the results are not necessarily representative of the target population, and the resulting welfare estimates should be reviewed with this caveat in mind.

For the remainder of this chapter, the results reported relate to the pooled samples unless otherwise stated.

Table 7.2: Sample and Population Socio-Demographic Characteristics

Variable	BASE	SUB	POOLED	LONDON	BASE=SUB P value
Sex (% male) [a]	47.3%	45.8%	46.6%	49.4% [b]	0.718
Age (mean) [a]	45.0 yrs	44.5 yrs	44.8 yrs	43.2 yrs [c]	0.560
Education: Degree level or above	66.3%	73.6%	69.9%	24.8% [d]	0.041
Employment Status (%):					
Self-employed	18.7%	21.5%	20.1%	12.5%[f]	0.379
Employed [e]	57.4%	57.4%	57.4%	79.9% [f]	1.000
Unemployed [g]	5.8%	6.1%	6.0%	7.1% [f]	0.869
Retired	14.4%	12.6%	13.5%	n/a	0.492
Gross annual HsH income (mean)	£52,870.61	£53,365.35	£53,117.58	£37,024[f]	0.905
Member of environmental organization	19.6%	20.1%	19.8%	n/a	0.875
Number of Observations	329	329	658	7,387,800	
Response Rate	38.3%	38.3%	38.30%	n/a	

Notes:
[a] Age/Income taken as mid-point of response category
[b] London statistics for sex based on resident population using mid-2003 population estimates (ONS 2005).
[c] London statistics for age include aged 16 years or above as adults (ONS 2005); survey sample statistics include adults aged 18 years or above.
[d] London statistics for degree level education or above are based on population of working age which is defined as: males aged 16 to 64 and females aged 16 to 59 (ONS 2005); while the survey sample statistics include those aged 18 years or above.
[e] Employed includes part-time, full-time and unpaid family workers.
[f] The London statistics for employment status (from ONS, 2005) are based on the population of working age only: for males this is defined as 16 to 64 and for females 16 to 59.
[g] Unemployed includes unemployed and unable to work.

[160] Indeed Horton et al (2001; 2003) in a study to investigate UK WTP for protecting Amazonia also report significantly higher levels of income and education in their sample compared to the national average, (in their case average income was greater by 30%), despite using a face-to-face interview method.

[h] The London average annual household income calculated by multiplying average gross household weekly income, £712, by 52 weeks (ONS 2005).

7.6.3 Knowledge, Experience and Attitudes towards Rainforests

Rainforest conservation was ranked the number one priority for additional government funding (amongst five general issues: air pollution, conserving British countryside, Marine pollution, poverty reduction) by only 16% of the respondents, in contrast 45% considered poverty reduction to be the top priority and 27% considered air pollution. Interestingly, of the five issues considered, conservation of the British countryside was considered to be the least important priority by the most respondents (31%), while conservation of tropical rainforests was considered to be the least important by just 19%.

In order to assess respondents knowledge of rainforests, two rating scale questions were presented: the first asked respondents to classify their own knowledge of tropical rainforests, while the second question asked respondents to indicate how familiar they were with information presented in the questionnaire on tropical rainforests. It is useful to ask both questions as it provides a gauge for what respondents consider to be 'knowledgeable'. The results indicate that some respondents may underestimate their knowledge in this respect. Around half of the respondents (47.5%) classified themselves as 'unknowledgeable' or 'very unknowledgeable', yet less than one-tenth (8.6%) were actually 'unfamiliar' or 'very unfamiliar' with the rainforest facts presented. Indeed, while only 14% of respondents considered themselves to be knowledgeable or very knowledgeable about rainforests, approximately two-thirds (65.5%) of respondents were 'familiar' or 'very familiar' with the information presented on rainforests. Overall, the majority of respondents appear to have some previous knowledge of rainforests, and for those that did not, the inclusion of the rainforest 'information box' served to ensure a basic level of knowledge was available to all respondents (after Carson 1998;Rolfe, Bennett, & Louviere 2000).

Just over two-fifths of respondents (41.5%) had previously visited a rainforest. This is a high proportion although not unexpected given the sample is relatively wealthy. In addition, over one-third of respondents (36.0%) expected to visit a rainforest at some point in the future (23.0% were uncertain). This suggests that for these respondents the proposed policy change may be perceived as offering potential user benefits or option value.

With respect to the location of the case study rainforests, the vast majority of respondents had not visited the countries where the specific rainforests were located (only 7.6% had visited Brazil and only 1.8% had visited Guyana), although approximately two-thirds of respondents (62.6%) had previously visited a developing country and almost one-fifth of respondents (18.1%) had visited South America.

Consistent with results reported earlier in this thesis, and also with those reported elsewhere (Horton et al. 2003;Kramer & Mercer 1997), the majority of respondents (73.3%) agreed that developed countries like the UK should help developing countries to pay the costs of conserving tropical rainforests (17.0% responded DON'T KNOW and 9.8% responded NO). In a subsequent question which asked *"In principle, do you think that you would be willing to contribute something to help rainforest conservation"*, over half of the respondents (58.4%) stated YES, around 13.5% stated NO and the remainder stated DON'T KNOW (28.3%)[161]. Interestingly, comparing the responses from this question and the preceding question, it becomes apparent that a small proportion of the respondents (3.6%) are not opposed to be UK contributing *but* would not themselves be willing to pay.

7.6.4 Perceptions of Rainforest Conservation Priorities

7.6.4.1 Geographic Priorities

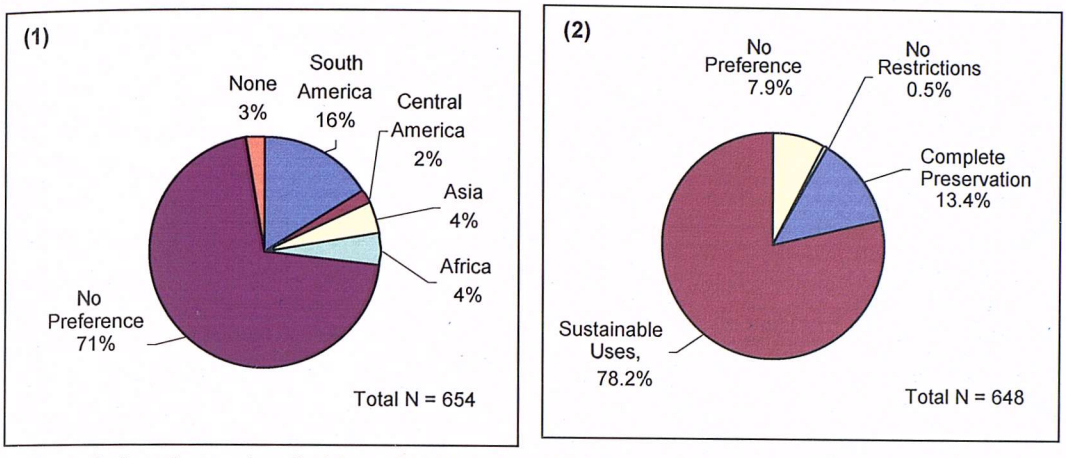
All respondents were asked to indicate where geographically they would most prefer the UK government to direct funding for rainforest conservation. The results are reported in the top left hand-side of Figure 7.2.

Interestingly, the majority of respondents, 71%, had no preference over the location of rainforests. This would appear to be consistent with the findings of Kramer and Mercer (1997) that focus group respondents are equally concerned about rainforest in all regions but is inconsistent with Rolfe, Bennett and Louviere (2000) who found that rainforest location was a significant determinant of preferences for rainforest preservation amongst Australian residents. In the current study, of those that did report geographic preferences, most respondents preferred future investments to be directed towards rainforests in South America; this is perhaps unsurprising given the significant amount of media coverage in the last decade over the plight of the Amazon[162]. Furthermore, it is consistent with Rolfe, Bennett and Louviere (2000) who find that (if rainforests in Australia are excluded), the most desirable local for rainforest conservation is South America. In the current study, of the remainder, an equal proportion preferred funding to be direct towards rainforests in Asia and Africa (4%), while just 2% held preferences for rainforests in Central America, and 3% preferred no funding to be directed towards rainforest conservation.

[161] The slightly higher proportion of DON'T KNOW's in this survey compared with the same question presented in the survey reported in chapter five (19.8%) may be due to the ordering of the question, in the current survey it was presented prior to the full description of the valuation scenario.

[162] Interestingly, during the cognitive interviews, several respondents expressed surprise that tropical rainforests were found in locations outside of South America in particular that rainforests existed in Africa.

Figure 7.2: Distribution of responses to (1) "If the UK government were to help pay the costs of conserving tropical rainforests, where would you most prefer funding to be directed?" and (2) "Which of the management approaches do you most prefer".



Notes: Missing observations in (1) n = 4 and in (2) and n = 9.

7.6.4.2 Prioritising the Conditions of Rainforest

All respondents in the SUB treatment were also asked to indicate their priority for future investments between rainforests in different conditions. In contrast to the responses to the geographic priority setting question, a much higher proportion of respondents in this sub-sample held preferences for priority setting on the basis of the condition of the rainforest. Indeed, in this sub-sample, less than two-fifths of respondents (35.6%) had 'no preference', choosing to support any rainforest worldwide. Approximately one-third of respondents (33.4%) indicated a preference for prioritizing the Atlantic Forest, a rainforest which is already fragmented with little original vegetation left, whilst just over a one-quarter (26.6%) preferred priority to be given to Iwokrama Rainforest, a pristine untouched rainforest. This is an interesting result; with the caveat that the descriptions are much simplified, it does tentatively suggest that for these respondents, there may exist greater support for priority-setting approaches that are line with those established under the Biodiversity Hotspot approach rather than the Tropical Wilderness Areas [163]. Overall, the results indicate that approximately two-thirds of respondents (in this sub-sample) would prefer to contribute to a specific rainforest of known condition, rather than 'any rainforest'. In comparison with responses to the geographic priority-setting question, this suggests that the condition of the rainforest may be a more important factor for many respondents when considering how to prioritize future investments.

[163] The main distinction between these two priority setting approaches which have been prominent in the recent policy literature is that the Tropical Wilderness Areas are typically pristine areas with at least 70-75% of original vegetation intact whilst Biodiversity Hotspots have typically lost at least 70% of their original vegetation and area under extreme threat (Mittermeier et al. 1998;Myers et al. 2000).

7.6.4.3 *Prioritising the Attributes of Rainforest Conservation Programmes*

All respondents were asked to indicate their preferences for the various aspects of a rainforest conservation programme which they would prioritise in future policy responses. The results for the separate and pooled datasets are presented in Table 7.3. Interestingly, the majority of respondents did have preferences regarding the perceived importance of the various aspects of the conservation programmes, indeed only 17% and 15% in the BASE and SUB treatments respectively, reported having no preference.

Table 7.3: Attitudinal Ranking of Programme Attributes by Dataset

(1) BASE		RANK					
		Highest				Lowest	
Attribute	**Average**	**1**	**2**	**3**	**4**	**5**	**Total**
Area	3.0	20.5%	18.9%	19.7%	21.3%	19.7%	100.0%
Species	3.1	18.9%	15.4%	19.7%	25.2%	20.9%	100.0%
Management	2.5	36.2%	19.3%	16.9%	12.2%	15.4%	100.0%
Time	3.3	8.3%	22.0%	22.8%	27.2%	19.7%	100.0%
Local Communities	2.9	17.7%	25.2%	21.7%	15.4%	20.1%	100.0%

(2) SUB		RANK					
		Highest				Lowest	
Attribute	**Average**	**1**	**2**	**3**	**4**	**5**	**Total**
Area	3.5	9.6%	16.6%	18.5%	21.0%	34.3%	100.0%
Species	3.0	19.6%	17.0%	25.1%	23.6%	14.8%	100.0%
Management	2.5	34.3%	23.6%	14.0%	15.5%	12.5%	100.0%
Time	3.3	12.9%	14.8%	21.4%	27.3%	23.6%	100.0%
Local Communities	2.6	25.1%	28.0%	21.8%	11.8%	13.3%	100.0%

(3) POOLED		RANK					
		Highest				Lowest	
Attribute	**Average**	**1**	**2**	**3**	**4**	**5**	**Total**
Area	3.3	14.9%	17.7%	19.0%	21.1%	27.2%	100.0%
Species	3.1	19.2%	16.2%	22.5%	24.4%	17.7%	100.0%
Management	2.5	35.2%	21.5%	15.4%	13.9%	13.9%	100.0%
Time	3.3	10.7%	18.3%	22.1%	27.2%	21.7%	100.0%
Local Communities	2.8	21.5%	26.7%	21.7%	13.5%	16.6%	100.0%

The only attributes with significantly different ranking distributions between the two treatments were AREA and LOCAL COMMUNITIES (chi2 (df 4) stat: 21.2, p: 0.000; and, chi2 (df 4) stat: 8.5, p: 0.076, respectively). AREA, was ranked the top priority by 20.5% respondents in the BASE treatment but was ranked top by only 9.6% of respondents in the SUB treatment,

correspondingly, it was ranked the least important priority by the greatest proportion in the SUB treatment, 34.3% compared to 19.7% in the BASE treatment. This difference in perceptions was offset by a greater proportion ranking LOCAL COMMUNITIES as the top priority in the SUB treatment (25.1%) compared to in the BASE treatment (17.7%). It is not clear why the perceived importance of these attributes differs between treatments; it's possible that the inclusion of the Atlantic Forest may have raised awareness that some rainforests are already much reduced, thus decreasing the perceived importance of the area attribute; this is discussed further in the valuation section.

Overall, using the pooled data sets, the average rank indicates that socio-economic factors such as the management approach and policies relating to local communities are considered higher priorities than the traditional biological indicators of species and area. The duration of the programme received the lowest average rank suggesting that either respondents consider that duration is not important, (which may indicate future benefits or bequest values are not of concern to respondents), or, that they perceive sustainability to be accounted for by the other attributes, for example, through the management approach which concerned revenue generating activities and local community impacts, (due to the common, often misplaced perception, that local communities present the main threat to tropical conservation efforts).

These outcomes are interesting. The most influential biodiversity priority-setting approaches emphasise the importance of biological indicators first and foremost see for example Mittermeier et al (1998), in most cases regardless of the socio-economic or political factors. Yet, these results suggest that the public place high importance on socio-economic factors. These findings would seem to support the recommendation of Hughey et al (2003), amongst others, that there is a need to move from the single discipline approach proposed by ecologists which have typically focused on biological parameters to a more balanced evaluation of biodiversity actions, involving wider socio-economic criteria (see Mace et al. 2000;O'Connor, Marvier, & Kareiva 2003;Veech 2003).

7.6.4.4 Preferences for management approaches

In order to understand more about public preferences for approaches to managing rainforest conservation programmes, all respondents were asked in a closed-ended question to indicate their preferred management approach. The approaches presented were those used in the description of the attributes, namely: 'sustainable uses'; 'complete preservation' (meaning no commercial activities); and 'no restrictions on rainforest uses'; in addition respondents were able to choose 'no preference'. It is noted that there is no universally accepted definition of

'sustainable use'[164], in the current context it was defined as including sustainable logging and ecotourism, of course, implicit in this description is that the activities are sustainable, respondents may or may not buy into this. Indeed Hutton and Leader-Williams (2003) highlight that, in the real policy context, sustainable uses may in fact not always be sustainable.

The results of the pooled data sets[165] are presented in the right-hand side of Figure 7.2. Only 7.9% of respondents indicated no preference for the management approach. Interestingly, the vast majority of respondents (78.2%) preferred to support a regime of sustainable uses (suggesting that they did indeed buy into the notion of 'sustainability'), in contrast, around one-tenth (13.4%) preferred rainforests to be managed under complete preservation. The strong preference for a 'sustainable use' scenario is a positive outcome for the Iwokrama International Centre for Rainforest Conservation and Development (IICRCD) which has already set in place procedures for sustainable logging and ecotourism within half of the forest reserve. It is also an interesting outcome since one might expect that respondents would gain greater non-use benefits from a complete preservation scenario as the rainforest would be preserved intact. It is perhaps the case that such benefits are offset by the potential option values offered by the sustainable use approach which permits ecotourism. Rolfe, Bennett and Louviere (2000) report that Australian residents hold positive values for rainforest conservation programme that permit visits. Overall, these results are consistent with the findings of Swanson and Kontoleon (2003) who found that the majority of the public in the UK would support conservation programmes which involved the commercial use of wildlife and wildlife products (in their case, as long as the harvesting activities did not involve an element of enjoyment for example hunting).

7.6.5 Valuation Results

Following a description of the valuation scenario all respondents were required to answer a series of choice experiment questions.

7.6.5.1 Valid and Invalid Responses

Follow-up questions were used to identify invalid positive and zero responses amongst respondents. Invalid positive responses were classified as those where respondents always or sometimes chose conservation alternatives but stated that in reality they wouldn't really pay. Protestors were classified as those choosing to opt-out across all choice sets for reasons other than utility maximization. The main protest responses consisted of: 'government/others should pay' and 'mistrust'.

[164] According to Mace and Hudson (1999) sustainability is a widely used but problematic and complex concept.

[165] Preferences towards the various management approaches were not found to be significantly different between treatments (chi2 stat (3 df): 3.74, p: 0.29).

The proportion of invalid responses was small, 4.3% and 3.3% in the BASE and SUB treatments respectively[166] and no significant association was detected between the likelihood of giving an invalid positive response and the treatment (chi2 (1df) stat: 0.3742, p: 0.541). Similarly, in both treatments, the proportion of protestors was very small, accounting for 1.8% and 3.6% of total respondents in the BASE and SUB treatments respectively[167]. No significant association was detected between the likelihood of protesting and the treatment (chi2 (1df) stat: 2.0562, p: 0.152).

The exclusion of the invalid positive responses and protestors, yields a total of 4608 observations in the BASE treatment and a total of 6012 observation in the SUB treatment[168], giving a pooled data set of 10620 observations. The remainder of the chapter reports the results for the censored samples.

7.6.5.2 Econometric Models

Maximum likelihood estimation techniques were used to model the choices in the separate and pooled datasets using a conditional logit specification with interaction variables included to improve model fit[169]. Four econometric models are presented: (1) the BASE treatment: (2) the SUB treatment; (3) the Pooled treatments; and (4) the Pooled treatments with optimal rescaling; invalid positive responses and protestors were removed. In each of the models, the quantitative attributes (AREA, SPECIES, TIME and PRICE) were coded using the levels set out in the experimental design, and the two qualitative attributes (LOCAL COMMUNITIES and MANAGEMENT) were coded as three-level ordinal variables[170]. Alternative specific constants (ASC) were used to model the effect of the three different rainforest labels (coded 1 for a rainforest label and 0 otherwise): Iwokrama Rainforest (ASC_IWOK), Atlantic Forest

[166] In absolute numbers, fourteen respondents in the BASE treatment and eleven respondents in the SUB format were identified as invalid respondents.

[167] In absolute numbers only six respondents in the BASE treatment and twelve respondents in the SUB treatment were identified as protestors.

[168] Although both treatments yielded similar rates of invalid responses the SUB treatment contains a higher number of total observations since the choice experiments presented four alternatives (including the opt-out) while the BASE treatment presented only three alternatives.

[169] Hausman tests on the SUB treatment revealed no IIA violations when dropping any of the labelled alternatives. Tests on the BASE treatment did indicate the presence of IIA violations, however due to design differences between the two treatments it is not possible to run a nested logit model (which relaxes the IIA assumption) on the pooled data, hence, a conditional logit specification is retained but with the inclusion of interactions on the socio-demographic characteristics to improve fit, and with the caveat that it is acknowledged that an alternative specification such as the mixed logit or random parameter model would be preferred (the software necessary to run this type of model was unavailable to the researcher).

[170] Ordinal coding, rather than dummy coding, was used on the two qualitative variables to avoid confounding the baseline levels with the opt-out category. Based on the responses to the earlier question, the management approach attribute was coded: 0 for no restrictions; 1 for complete preservation and 2 for sustainable use. The Local Communities attribute was coded 0 for no benefits/worse off; 1 for no benefits and 2 for benefits.

(ASC_ATLAN) and Any Rainforest (ASC_ANY). An additional ASC was included in the pooled models to model the effect of the baseline option in the BASE treatment (ASC_OPT1).

Table 7.4 lists the interaction variables, and Table 7.5 and Table 7.6 present the regression results.

Table 7.4: Definition of Interaction Variables

Variable	Definition
_INCOME	Mid-point of income category divided by 1000.
_AGE	Mid-point of age category
_MEMBER	Dummy variable coded 1 if member of environmental organisation, 0 otherwise.
_DEVPAY	Dummy variable coded 1 if respondents believed developed countries should help developing countries pay the costs of conserving tropical rainforests, 0 otherwise.
_RAIN1	Dummy variable coded 1 if respondents consider loss of rainforest to be highest priority for additional government funding, 0 otherwise.
_EXP_RAIN	Dummy variable coded 1 if respondents expect to visit a rainforest at some point in the future, 0 otherwise

Note: Each of the above variables were interacted with each of three alternative specific constants representing the three rainforest conservation options: Iwok meaning Iwokrama Rainforest; Atlan meaning Atlantic Forest; and Any meaning Any Rainforest.

Table 7.5: Maximum Likelihood Regression Results by Treatment

Variable	(1) BASE			(2) SUB		
	Coeff.	t stat.		Coeff.	t stat.	
Asc_Iwok	-4.3353	-6.84	***	-3.0115	-5.89	***
Asc_Atlan				-1.6619	-3.41	***
Asc_Any				-2.482	-5.04	***
Area	0.0007	1.66	*	0.0002	0.48	
Species	-0.0059	-1.04		0.0094	1.99	**
Management	0.7154	8.17	***	0.3496	4.71	***
Time	0.0006	0.23		0.0156	7.19	***
Local Communities	0.7885	9.29	***	1.0167	12.36	***
Price	-0.007	-7.8	***	-0.0105	-8.78	***
Iwok_Income	0.0104	2.62	***	0.0088	3.29	***
Atlan_Income				0.0022	0.84	
Any_Income				0.0062	2.39	**
Iwok_Age	0.0579	5.43	***	-0.0114	-1.75	*
Atlan_Age				-0.03	-4.66	***
Any_Age				-0.0123	-1.96	**
Iwok_Member	0.5437	1.12		0.5996	2.8	***
Atlan_Member				0.3307	1.54	(*)
Any_Member				0.1626	0.76	
Iwok_Rain1	0.6448	1.59	(*)	0.7155	2.51	**
Atlan_Rain1				0.8951	3.25	***
Any_Rain1				0.5504	1.96	**
Iwok_Devpay	2.3587	8.47	***	0.7534	3.72	***
Atlan_Devpay				0.7561	3.9	***
Any_Devpay				0.6021	3.19	***
Iwok_Exprain	0.5504	1.93	***	0.2102	1.1	
Atlan_Exprain				0.2622	1.42	
Any_Exprain				0.1639	0.88	
Log-Likelihood	-1145.32			-1827.377		
Pseudo R2	0.3213			0.123		
LR Chi2 Stat	1084.31		***	512.45		***
No of Obs.	4608			6012		

Notes: ***, **, and * represent statistical significance at 1%, 5% and 10% levels. Parentheses indicate borderline significance.

Table 7.6: Maximum Likelihood Regression Models for Pooled and Optimally Pooled Datasets

Variable	(1) POOLED			(2) POOLED OPTIMAL		
	Coeff.	T stat.		Coeff.	t stat.	
Asc_Iwok	-4.3119	-10.35	***	-4.4995	-10.55	***
Asc_Atlan	-2.218	-5.16	***	-2.3938	-5.44	***
Asc_Any	-3.0496	-6.99	***	-3.2445	-7.28	***
Asc_Opt1	-2.2592	-13.04	***	-2.7594	-14.65	***
Area	0.0008	2.67	***	0.0008	2.29	**
Species	0.004	1.12		0.0043	1.12	
Management	0.4757	8.71	***	0.4908	8.24	***
Time	0.0099	6.09	***	0.0117	6.64	***
Local Communities	0.8827	15.39	***	0.9742	15.38	***
Price	-0.0088	-11.49	***	-0.0099	-11.7	***
Iwok_Income	0.0094	4.28	***	0.0095	4.31	***
Atlan_Income	0.0025	1.03		0.0025	1.03	
Any_Income	0.0066	2.77	***	0.0067	2.79	***
Iwok_Age	0.0099	1.89	***	0.0099	1.9	***
Atlan_Age	-0.0186	-3.07	***	-0.0189	-3.1	***
Any_Age	-0.0007	-0.11		-0.0006	-0.1	
Iwok_Member	0.5586	2.95	***	0.5607	2.95	***
Atlan_Member	0.3367	1.65	*	0.3334	1.62	(*)
Any_Member	0.1588	0.77		0.1572	0.76	
Iwok_Rain1	0.6474	2.83	***	0.6498	2.83	***
Atlan_Rain1	0.8317	3.37	***	0.8434	3.4	***
Any_Rain1	0.5135	2.02	**	0.5126	2.01	**
Iwok_Devpay	1.3208	8.45	***	1.3247	8.46	***
Atlan_Devpay	0.9932	5.53	***	0.9984	5.53	***
Any_Devpay	0.8546	4.89	***	0.857	4.88	***
Iwok_Exprain	0.3363	2.14	**	0.3373	2.14	**
Atlan_Exprain	0.3417	1.99	**	0.3409	1.98	**
Any_Exprain	0.2442	1.42		0.2435	1.41	
Log-Likelihood	-3017.325			-3015.268		
Pseudo R2	0.1999			0.2004		
LR Chi2 Stat	1507.49		***	1511.6		***
No of Obs.	10620			10620		

Notes: ***, **, and * represent statistical significance at 1%, 5% and 10% levels. Parentheses indicate borderline significance.

BASE Treatment:

Firstly, with regard to the BASE treatment, (see column 1 in Table 7.5), the results indicate that this specification produces a very good model fit, yielding a pseudo r2 value of 0.32. The majority of the attributes are significant and correctly signed. Importantly, the PRICE attribute (a one-off donation), is significant and negative, meaning that utility declines (consistent with theoretical predictions) as the size of the donation required increases. As expected, the positive significant coefficient on the AREA attribute indicates that utility increase as the size of the rainforest conservation area increases. Similarly, a conservation programme which provides benefits to the local communities' increases utility compared to a programme with no benefits.

The insignificance of the SPECIES and TIME attributes is unexpected but is consistent with responses to the earlier attitudinal ranking question, in which these attributes received the two lowest average ranks. With respect to the SPECIES attribute, the specific baseline conditions state that 20 species of the 45 species would be expected to remain after 15 years if no conservation takes place. Thus it may simply be that the change from 20 to 30 or 20 to 45 species is perceived to be too small for this attribute to be a significant determinant of choices. There is no obvious reason why the TIME attribute is insignificant other than respondents do not consider this attribute important in this context.

The interaction variables indicate that the likelihood of choosing to 'do something', that is to support an Iwokrama conservation programme, (as opposed to the status quo) is significantly and positively influenced by: income, age, by the belief that developed countries should help pay the costs of rainforest conservation, and by an expectation that the respondent will visit a rainforest in the future. The later point is particularly noteworthy since this suggests that for some respondents the decision to contribute towards rainforest conservation may be motivated by option value (see Figure 3.1 in Chapter 3).

SUB Treatment:

The SUB treatment specification (see column 2 in Table 7.5) yields a lower pseudo r2 value of 0.12, suggesting that the use of a non-specific baseline and the inclusion of the additional information regarding substitute rainforests adds complexity to the choice decisions, such that this model explains much less of the variability in choices than is accounted for in the BASE treatment. Even so, all attributes in this treatment, with the exception of AREA, are significant and correctly signed. This is interesting since it suggests that either the removal of the specific baseline conditions or the addition of the information regarding substitutes, has affected the perceived importance of the SPECIES, TIME and AREA attributes, increasing the importance

of the first two and reducing the importance of the last. In all cases, these differences are supported by the results of the attitudinal ranking question reported earlier[171].

A number of possible explanations are proposed for the observed differences between treatments. Firstly, with respect to the SPECIES attribute, the lack of information about the specific baseline conditions appears to have resulted in respondents perceiving the levels and choices offered differently. It is possible that respondents in the SUB treatment filled in this missing information with their own assumed reference level, for example assuming that all levels represented absolute improvements. In contrast with the AREA attribute, the observed differences are likely to be the direct result of the inclusion of the information about substitute rainforests. Indeed, Blamey et al (2000), find that the inclusion of additional policy information via labels, can result in respondents focusing more attention on option labels than some of the attributes such that they make less discerning trade-off decisions, resulting in the insignificance of some attributes. In the current context, this may explain the decreased importance of the AREA attribute. In contrast, the increased importance of the TIME attribute, may similarly be due to the inclusion of additional information on substitute investment opportunities, more specifically, the inclusion of rainforests that in worse condition may have served to increase the perceived importance of implementing conservation programmes of greater duration, thereby resulting in a significant coefficient on TIME[172].

With respect to preferences for the alternative rainforest investment opportunities, a clearer picture may be gained by examining the basic SUB model without the ASC interaction variables (see Table 7.7). The results indicate that each of the three rainforest label ASC's are significant but in all cases negatively signed. This suggests that utility decreases with 'do something' choices, that is, respondents hold preferences for choosing to support none of the options presented[173]. This is not an uncommon outcome in CM experiments (see for example Adamowicz et al (1998)), and is discussed in greater detail in the following chapter. However, the important point is that given all the rainforest option ASC's are significant, the size of the associated coefficients can be used to indicate the implied rankings (or preferences) of the

[171] A greater proportion of respondents ranked TIME and SPECIES as the highest priority in the SUB treatment compared to the BASE treatment, and a much lower priority ranked AREA to be the highest priority.

[172] Another possible explanation for the differences in taste parameters between treatments is the occurrence of interaction effects between the labels and attributes in the SUB treatment, such that the true effects are not being sufficiently picked up by the current specification. However, the main effects design used here should be capable of picking up 70-90% of the variance (Louviere, Hensher, & Swait 2000). To detect interaction effects would require a more complex experimental design and a much larger sample than was possible with the current study constraints. In addition, the use of such a design would be likely to require different experimental design specifications between treatments which could complicate model comparisons (Blamey et al. 2000).

[173] There are a number of possible explanations for this effect, for example the presence of status quo bias or survey satisficing.

various rainforest investment opportunities relative to each other (and with respect to the unspecific baseline included in the SUB treatment)[174].

Table 7.7: Maximum Likelihood Regression Results on SUB Dataset Without Interactions

Variable	SUB Coeff.	t stat.	
Asc_Iwok	-2.1292	-7.60	***
Asc_Atlan	-1.9408	-6.82	***
Asc_Any	-2.0228	-7.17	***
Area	0.0000	0.02	
Species	0.0095	2.11	**
Management	0.3636	5.13	***
Time	0.0138	6.66	***
Local Communities	0.9419	12.15	***
Price	-0.0095	-8.57	***
Log-Likelihood	-2032.371		
Pseudo R2	0.91		
LR chi2 stat	404.67		***
No of obs.	6448		

The results indicate that on average, assuming all other attributes are constant, respondents gain greater utility from contributing to the Atlantic Rainforest, followed by Any Rainforest, and that Iwokrama Rainforest is the least preferred investment opportunity. This preference ordering is similar to that reported in the earlier attitudinal ranking question (with the exception that Atlantic Rainforest is now preferred to Any Rainforest[175]) which provides some internal validation. (This preference ordering is discussed further in the section on marginal prices).

To examine the factors influencing these preferences it is necessary to return to the extended SUB model (see column 2 in Table 7.5). With respect to the interaction variables, a number of findings are noteworthy. Firstly, income is only significant when interacted with Iwokrama rainforest and Any rainforest; it is not significant for the Atlantic Forest (that is, income is not significant over and above the income effect which is already capture through the price attribute). This is interesting finding which may simply reflect the fact that since the Atlantic rainforest has only 8% of its original vegetation intact, both low- and high-income respondents, equally, regard it as an important conservation target.

Secondly, in this SUB treatment all interactions between the various rainforest ASCs and age result in significant but negatively signed coefficients, indicating that as age increases the likelihood of choosing to 'do something' decreases for all rainforest investment options. One

[174] With the caveat that these constants may also capture other unobserved effects, related or unrelated to the label attributes, for example, 'presentation effects' where some respondents simply opt to select the 'middle' option in each choice card (Blamey et al. 2000).

[175] In the earlier attitudinal question more respondents preferred Any Rainforest to the Atlantic rainforest however the difference was very small: 35.6% compared to 33.4%, respectively.

possible explanation is that the presentation of more information with regard to the various rainforest investment opportunities may result in older respondents considering the achievement of rainforest conservation to be an 'insurmountable task' within their lifetime, thus preferring in this treatment to 'do nothing'. Other explanations are that the additional information may increase task complexity for older respondents, resulting in greater opt-out choices, evidenced through preferences for the 'do nothing' option, or it may simply be a proxy for income.

Thirdly, interactions between Atlantic and Iwokrama rainforests and membership of environmental organisations, yield significant positive coefficients, while the Any Rainforest interaction is insignificant. This suggests, that members of environmental organisation are more likely to choose to contribute to specific rainforest investment opportunities rather than non-specific targets. This seems intuitively correct: members of environmental organisation may be more knowledgeable about the specific rainforests and/or more interested in knowing where their investments are specifically targeted.

Lastly, interactions between the ASCs and the expectation of visiting a rainforest in the future are not significant in the SUB treatment for any of the rainforests. This may simply be due to the greater variability in choices as a result of the increased complexity of the design.

In summary, the main differences in the regression results between the BASE and SUB treatments are: the insignificance of SPECIES and TIME in the BASE treatment; the insignificance of AREA in the SUB treatment; and the greater model fit in the BASE treatment. These differences are examined in further detail in the pooled data.

Pooled and Optimally Pooled Data Sets:

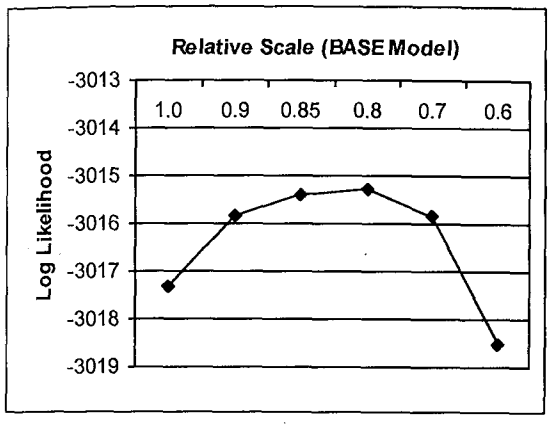
Pooling the data sets provides an opportunity to test the hypothesis of scale and parameter equality between treatments (see Table 7.6). Swait and Louviere (1993) outline a procedure for scaling data to maximise the fit and improve parameter estimates for pooled data sets (p. 313), and for conducting such parameter and scale equality tests. Correspondingly, the two datasets were concatenated vertically, and a one-dimensional search conducted to identify an estimate of the scale factor for the BASE treatment relative to the SUB treatment[176], which would maximise the likelihood value of model for the pooled dataset[177]. This procedure was conducted with re-scaling on the common attributes only (AREA, SPECIES, MANAGEMENT, TIME, LOCAL

[176] It was more intuitive to rescale the BASE treatment by the SUB treatment, meaning, the scale factor in the SUB treatment, μ_{sub}, was normalized to the value of one and the scale factor in the BASE treatment, μ_{base}, was relative to this normalization. However, it is noted, after Swait and Louviere (1993), that since the scaling procedure is based on the normalization of the scale factor in one dataset to value of one, it is unimportant which data set is used as the reference point.

[177] After Swait and Louviere (1993) a graph of the log likelihood values versus the relative scale factor will have only one peak due to the concavity of the log likelihood function.

COMMUNITIES and PRICE)[178]. The log-likelihood was maximised when the scale factor μ_{base} corresponded to 0.8 [179] (see Figure 7.3)

Figure 7.3: BASE and SUB Pooled Log Likelihood as a Function of BASE treatment Relative Scale



Correspondingly, the LR test statistic for partial equality of parameters (while allowing scale factors to differ) is given by:

$$LR = -2(-3015.27 - (-1145.32 + -1827.38) = 85.15.$$

Thus, the LR test statistic is 85.15, and the corresponding critical value of the χ^2 distribution is 49.6, at the 95% significance level on 29 degrees of freedom[180, 181]. This means the differences in the scale parameter are not enough to account for the differences in the coefficients. Thus, the hypothesis of equality in the vector of common attribute parameters is rejected[182]. Thus, the estimated scale factor of 0.8 simply represents an average multiplier that optimally scales the data of the BASE treatment to offset the imposition of equality in the parameters (Swait & Louviere 1993).

[178] Scaling was conducted on the common attributes only as scaling on the ASC interaction terms would require that the aggregate shares of the alternatives are equal between the models (Swait & Louviere 1993). In the current context, this would be unlikely to hold true since the choice tasks differed between the treatments with an additional alternative included in the SUB treatment. Indeed, Blamey et al (2000) note that the Swait-Louviere test is usually only applied to the terms not involving ASCs.

[179] If the parameter vectors are equal this would imply that the SUB treatment has lower variance.

[180] The degrees of freedom for the test is calculated as (k + 1) where k is the difference between the number of parameters in the pooled model and in the separate models and the additional degree of freedom is due to the fact that the scale factor is allowed to vary under the alternative hypothesis (Swait & Louviere 1993).

[181] Similarly, as expected, the results of rescaling the BASE treatment on all common attributes and ASC interactions (by a factor of 1.05 which is the point at which the log-likelihood is maximised) results in an even greater LR test statistic of 89.21.

[182] Swait and Louviere (1993) note that the presence of heterogeneity in the error terms can lead to incorrect conclusions that parameter vectors and scale factors are different.

This result implies that the choice tasks in each treatment have different underlying models, suggesting that each task measures a different cognitive process. This is not unexpected since the choice tasks do differ between treatments; however, it remains an important finding since it highlights the significant impact that the framing of choice tasks can have on choice behaviour. Moreover in the current context, it suggests that respondent preferences towards the underlying attributes of rainforest conservation are sensitive to the conditions of the rainforest. After Rolfe and Bennett (2001) the size of the scale factor, which is less than one, indicates that respondents were more comfortable framing their choices in the context of substitutes than with respect to the baseline conditions alone. Indeed Rolfe and Bennett (2001) found that respondents were more comfortable making choices about rainforest preservation, the wider the substitutes available.

Thus, in relation to hypothesis 1 (see experimental design), overall, it is clear that the two treatments result in significantly different underlying taste parameters, implying different cognitive processes between the two treatments. Although, the hypothesis of parameter equality is rejected, as noted by Swait and Louviere (1993) this procedure is still useful as it provides a way to scale the data to maximise the model fit and improve the parameter estimates for the pooled data sets. Correspondingly, the POOLED OPTIMAL dataset is used for the remainder of the chapter in place of the POOLED data set, since this maximises the log-likelihood value.

With respect to the effect of pooling and optimally rescaling the common attributes (POOLED OPTIMAL) the regression results are reported in column 2 of Table 7.6. This specification yields a good model fit with a pseudo r2 of 0.20. All attributes are significant and correctly signed, with the exception of the SPECIES attribute only, which as reported earlier was insignificant in the BASE treatment. The ASC_OPT1 is significant and negative indicating that the likelihood of choosing the 'do nothing' is higher in the SUB treatment. All rainforest ASC's are significant and negative. The only noteworthy differences in relation to the interaction variables are that the coefficient on the interaction between AGE and Iwokrama rainforest is significant and positive but this coefficient is significant and negative when interacted with Atlantic Forest and is not significant for Any rainforest. The intuitive explanation for this effect would be that older respondents may receive more utility from the Iwokrama Forest than the Atlantic through bequest values since the later may be expected to disappear sooner. In addition, respondents who expect to visit a rainforest in the future are more likely to choose the Iwokrama or Atlantic Forest options.

7.6.5.3 *Marginal prices*

Given that taste parameters differ significantly between the two treatments it is reasonable to expect that the marginal rates of substitution (with respect to the monetary attribute) will also differ for at least some of the attributes between the BASE and SUB treatments. Moreover, it is expected that implicit price will be lower in the SUB treatment compared to the BASE treatment, since the inclusion of labels may result in lower weights on attribute parameters (Blamey et al 2000). The implicit prices and 95% confidence intervals (calculated using the Delta method) for each of the BASE, SUB and POOLED OPTIMAL 1, data sets are reported in Table 7.8. Re-scaling the parameters by the price coefficient permits direct comparisons of the ratio of the coefficients across treatments (Bennett & Adamowicz 2001).

Table 7.8: Marginal Prices for Attributes and Rainforest Labels by Dataset

Attribute	**BASE**	**SUB**	**POOLED OPTIMAL**	**UNIT**
Area	£0.10	£0.02	£0.08	per 1000
	(-£0.02 - £0.22)	(-£0.06 - £0.10)	(£0.01 - £0.14)	hectares
Species	-£0.85	£0.89	£0.43	per
	(-£2.51 - £0.82)	(£0.02 - £1.77)	(-£0.32 - £1.19)	species
Management	£102.85	£33.30	£49.43	[a]
	(£66.38 - £139.32)	(£16.68 - £49.91)	(£34.44 - £64.42)	
Time	£0.09	£1.49	£1.18	per year
	(-£0.64 - £0.81)	(£1.00 - £1.98)	(£0.81 - £1.54)	
Local Communities	£113.36	£96.83	£98.11	[b]
	(£81.75 - £144.98)	(£74.36 - £119.30)	(£80.52 - £115.71)	
Rainforests (From/To):	**BASE**	**SUB**	**POOLED OPTIMAL**	
Iwok to Atlantic	-	£14.95	£19.20	
		(£0.26 - £29.64)	(£3.33 - £35.07)	
Iwok to Any	-	£9.82	£14.94	
		(-£4.45 - £24.09)	(-£0.48 - £30.36)	
Any to Atlantic	-	£5.13	£4.25	
		(-£8.82 - £19.07)	(-£10.62 - £19.13)	

Notes: figures in parentheses are the 95% confidence intervals. [a] The implicit price for Management represents a unit move from Baseline to Complete Preservation to Sustainable Uses. [b] The implicit price for Local Communities represents a unit move from Baseline to No benefits to Benefits.

In relation to hypothesis 2 (see experimental design section), a comparison of the marginal prices for the BASE and SUB treatments indicates that AREA, MANAGEMENT and LOCAL COMMUNITIES have lower marginal prices in the SUB treatment, as expected, since the effect of including an additional label attribute may be to redistribute WTP. For example, in the

BASE treatment each one unit (1000 ha) increase in the AREA of rainforest conserved has a marginal value of £0.10 compared to a value of £0.02 in the SUB treatment. (In both treatments these values are much lower than those obtained by Rolfe, Bennett and Louviere (2000), who estimate Australian residents WTP £3.20 per 1000 hectares; although it is not unexpected since their study included domestic rainforests.) In contrast, SPECIES and TIME have higher marginal prices in the SUB treatment, however this is likely to reflect that these attributes were not significant determinants of choices in the BASE treatment. On closer inspection the 95% confidence intervals indicate that the only significant differences occur in relation to the MANAGEMENT and TIME attributes. It would thus appear that the removal of the specific baseline information and the inclusion of additional information on substitutes has resulted in a shift in the distribution of WTP, with a significant decrease in the marginal price for MANAGEMENT but with a significant increase in the marginal prices for TIME. Thus, the effect of re-framing the rainforest conservation choices are focused on these two attributes. One possibility is that respondents are less favourably inclined towards a sustainable use management approach when more fully informed about the conditions of the rainforest, for example, in the case of the Atlantic Forest, complete preservation may in fact be preferred.

Another point to note is that the 95% confidence intervals for the marginal prices for each attribute are wider in the BASE treatment compared to be SUB treatment. This is consistent with the earlier finding that the ratio of scale factors of BASE to SUB is less than one, indicating more variability in the choices in the BASE treatment. As expected, the optimally scaled Pooled data adjusts for the differences in the marginal prices between the two treatments.

Inference regarding the implied ranking of the various attributes (based on the marginal prices) is constrained by the differing units of measurement. However, it is perhaps notable that the MANAGEMENT and LOCAL COMMUNITIES attributes both have relatively large marginal prices, which is consistent with the results of the attitudinal questions reported earlier[183]. It is also consistent with Rolfe, Bennett and Louviere (2000) who report that respondents were concerned with the social impacts of rainforest conservation (see Chapter 2). Although the authors do not report confidence intervals for the marginal prices it is notable that their estimated value for a move from 'worse off' to 'better off' of £61.08 (adjusted) in a one-off donation, is of a similar magnitude to the value obtained in the SUB treatment (£96.83), adding validity to the current estimates. Overall, in the current context, these findings highlight once more the importance of considering social and economic as well as environmental factors in the assessment of future policy proposals.

[183] The high marginal values for these attributes may be reflect underlying perceptions that these attributes are 'causal' (Blamey et al. 2002).

The marginal prices for the rainforest labels (see lower half of Table 7.8), indicate the value, holding all other things constant, for changing between the various rainforests. For example, using the SUB dataset, the value of a change from Iwokrama to Atlantic Forest is £14.95. Likewise, the value of a change from Iwokrama to Any Forest is £9.82. These values (using either the SUB or POOLED OPTIMAL datasets) imply that the three rainforest investment opportunities are ranked in the following order:

Atlantic Rainforest > Any Rainforest > Iwokrama Rainforest

This preference ordering is consistent with earlier findings. Examination of the 95% confidence intervals indicates that only in the case of moving from Iwokrama to Atlantic (the highest and lowest rankings) is the value significantly different from zero. However, the move from Iwokrama to Any rainforest is almost significant in the POOLED OPTIMAL dataset and is in fact significant at the 90% confidence level which suggests that with a larger sample size these differences would become more evident[184].

The results indicate that the greatest benefits are generated from investing in Atlantic Forest while investing in Iwokrama Rainforest would generate the lowest benefits. This suggest that the average respondent is most concerned with rainforests that are already fragmented and vulnerable, and is less concerned with rainforests that are in pristine condition; as a result greater utility is gained from investing in an unknown rainforest of unknown condition than in investing in Iwokrama rainforest. Of course, these results may also reflect other issues too such as geographic location and familiarity[185]. Overall, these findings indicate significantly greater benefits would be generated by investing in programme to conserve the Atlantic Forest when compared to Iwokrama Rainforest, assuming all other things hold constant.

7.6.5.4 Welfare Estimates

Welfare estimates were calculated for a change from the no conservation programme conditions to different Iwokrama conservation programmes, using each of the BASE, SUB and POOLED OPTIMAL datasets. The results are presented in Table 7.9

[184] The value of a change from Iwokrama to Any rainforest using the POOLED OPTIMAL dataset is within the range of £2.00 to £27.88, at the 90% confidence level.
[185] For example, some respondents may not be concerned about Iwokrama since they are not familiar with Guyana; others may simply prefer to support rainforest conservation in Brazil.

Table 7.9: Welfare Estimates for Iwokrama Rainforest by Conservation Programme and Dataset

Move from Baseline:	BASE	SUB	POOLED OPTIMAL
to Iwokrama Prog 1 (371000 ha,	£582.60	£177.16	£448.17
45 sp, 50 yrs, sus use, benefits)	(£442.82 - £722.38)	(£141.18 - £213.14)	(£376.39 - £519.95)
to Iwokrama Prog 2 (185000 ha,	£460.43	£140.06	£384.35
45 sp, 50 yrs, com pres, benefits)	(£345.82 - £575.04)	(£109.55 - £170.58)	(£323.00 - £445.70)

The purpose of this was to illustrate that the models could be used to estimate the benefits under different policy conditions, thereby helping to inform policy decisions. For example, using the BASE dataset, willingness to pay for a change from the specific baseline conditions, in which there would be no conservation programme meaning no conservation area, no restrictions on rainforest use, only 20 rare or endangered species would remain and the local communities would be worse off, to Programme 1, a scenario where a conservation programme would be set up to protect the whole rainforest (371,000 ha), with some sustainable uses (eco-tourism and some sustainable logging), all rare or endangered species would remain and the local communities would receive benefits through development projects, training and jobs, is estimated to be £582.60 per person (through a one-off donation). In contrast, a move from the baseline conditions described above, to Programme 2, which differs in that it would protect half the rainforest area and would adopt a complete preservation approach (meaning no sustainable logging, no ecotourism and no revenue generation), generates estimated benefits of £460.43 per person. Likewise, benefit estimates could be generated for other potential programmes as long as the levels are within those described in the experiment.

Table 7.10: Welfare Estimates for Various Rainforest Conservation Programmes relative to Iwokrama Conservation Programmes using SUB dataset

Move from Iwok Prog 1:	WTP
to Atlantic Prog 3 (185000 ha, 45 sp, 50 yrs, com	-£118.98
pres, no benefits)	(- £155.73 - -£82.22)
to Any Prog 2 (185000 ha, 45 sp, 50 yrs, com	-£27.27
pres, benefits)	(-£52.70 - -£1.85)

Similarly, using the SUB treatment results, it is possible to examine how[186] the benefits derived from different rainforest conservation programmes compare across the rainforest investment opportunities presented (see Table 7.10). This is important because although the Atlantic Forest is generically preferred, depending on the specific details of the conservation programme, investment in other rainforests may provide greater benefits. For example, a rainforest conservation programme which protected the full extent of *Iwokrama* rainforest (*371000*

[186] With the caveat of a non-specific baseline.

hectares) and all the endangered species present (45 species) under a *sustainable manage*ment approach, with *benefits* to local communities, for next 50 years, would yield greater benefits than a conservation programme which protected 185000 hectare area of the *Atlantic* Forest, with the same number of species for the same length of time but under *complete preservation* with *no benefits* to communities; a difference of £118.98 per person. This is an important point to make since Iwokrama forest may indeed be perceived as a higher priority for future investments compared to other rainforests if its conservation programme features highly rated elements which are not available in rainforest conservation programmes elsewhere. Iwokrama Rainforest has a great expanse of undisturbed rainforest and is focusing efforts on developing sustainable use management procedures and on fostering improvements in the welfare of local communities, both of which have been highly rated by respondents, suggesting that it may indeed offer a good investment opportunity for future rainforest funding.

Finally, in relation to hypothesis 3 (see section 7.4) a comparison of the figures in the BASE and SUB columns in Table 7.9 clearly indicates that the welfare estimates derived differ considerably depending on how the choices are framed. As expected, WTP is significantly higher in the BASE treatment when compared to the SUB treatment. For example, a move from the baseline conditions to Programme 1 generates estimated benefits of £582.60 per person and £177.16 per person in the BASE and SUB treatments respectively. There are two possible explanations for this effect:

Firstly, in the BASE treatment, despite the inclusion of a reminder, respondents may not be adequately taking into consideration substitute rainforests in their choice decisions. Indeed, there is empirical evidence in the CVM literature to suggest that such reminders do not affect reported WTP (see for example, Loomis et al (1994) and Kotchen and Reiling (1999)). If this is the case, the values derived from the BASE treatment may be overestimates, or, they may simply be estimates of the value of the general type of good, that is the 'world's rainforest' (after Arrow et al (1993) and Loomis et al (1994)). Secondly, in the SUB treatment, the lack of specific information regarding the baseline conditions may have a downward effect on the resulting welfare estimates. Indeed, in the previous section, it was reported that the marginal estimates for AREA, MANAGEMENT and LOCAL COMMUNITIES were lower in the SUB treatment compared to the BASE treatment (although only significantly so for the MANAGEMENT attribute).

In relation to hypothesis 4, using the pooled data, and optimally scaling for differences in error components, it is possible to take into account both effects in deriving absolute welfare estimates. Thus, using the POOLED OPTIMAL dataset, for Iwokrama rainforest, a move from the specific baseline conditions to Programme 1, generates estimated benefits of £448.17 per

person, compared to £582.60 in the BASE treatment and £177.60 in the SUB treatment. The value is closest to the BASE treatment estimate (indeed the 95% confidence intervals overlap), which suggests that the specific baseline conditions have a greater effect on WTP than the inclusion of substitutes.

Aggregate Benefits

Although it is not possible in this application to derive a *representative* estimate for the target population of London since the sample is not representative, it possible to gain an idea of the magnitude of aggregate benefits by using the lower bound of the 95% confidence interval of mean WTP. (Note, the important contribution here is the method, if the current sample was better, it is expected this approach would yield more accurate and meaningful representative estimates of aggregate benefits). Thus, a programme to conserve the whole of Iwokrama rainforest including all rare and endangered species therein, with sustainable uses permitted and benefits to communities for a 15 year period (the length of time Iwokrama has been established) generates a lower bound estimate of benefits of £340.01 per person[187]. If just 1% of London's population have a willingness to pay equal to this lower bound estimate, the total aggregate (one-off) benefits would be approximately £20.2 million. This is almost six times the magnitude of total UK contributions to Iwokrama which stand at approximately £3.4 million, in the 15 year period since its inception, (pers. comm. Watkins 2004)[188]. Notably, the estimate of the aggregate benefits reported here refers to the study target population of London only. This suggests that the UK as a whole may derive far greater benefits from Iwokrama conservation programme than has been evidenced in the size of bilateral transfers to date, and, crucially, may imply that the UK should increase funding in the future. On a methodological note, this rough approximation of the one-off aggregate benefits also suggest that the estimate provided by van Beukering and van Heeren (2003) of the *global* non-use value of Iwokrama calculated from real annual transfers in period 1999 to 2001 of £45,900 per annum is a large underestimate of the potential non-use benefits provided by Iwokrama rainforest.

Validity and Reliability

On first impressions this estimate of WTP of £340.01 per person may seem high, however as noted the sample comprises wealthy individuals. Moreover, taking into account that this a *one-off* donation it is very comparable with some of the CVM estimates of UK WTP for tropical

[187] This is essentially the value of change from the baseline to Programme 1 but running for 15 years rather than 50 years, using the pooled optimal dataset this gives a mean welfare estimate of £406.96 per person with 95% confidence interval range of £340.01 to £473.90.

[188] This consisted of contributions of: approximately £3, 385,000 from DFID; £49,140 from Darwin Initiative; and £9,792 from British High Commission (pers. comm.Watkins 2004). In addition, and not accounted for in the total described above, the UK has contributed via multilateral donations through EU, Commonwealth Secretariat and the GEF.

biodiversity. For example, Hanley, Spash and Walker (1995) in an open-ended CVM study of Scottish residents WTP for international biodiversity report mean estimates of £63.12 - £82.85 *per annum* (adjusted for inflation). Svedstar (2000), again using an OE CVM question, estimate the mean willingness to pay of UK residents to protect 50,000 hectares of Bolivian rainforest, to be £48.70 *per annum* (adjusted for inflation). Notably, the one-off WTP estimate obtained in the current study would yield much lower aggregate benefits than a lifetime or even a 10 year period of paying these annual estimates. Indeed, taking the reverse approach, by annualizing the one-off estimate obtained in the current study over a 15 year period (the current project lifetime) provides an estimate of £28.52 per annum[189], which is in fact remarkably similar to the estimate of £23.50 - £27.57 per annum obtained by Horton et al (2003) for UK WTP for protecting the Brazilian Amazon. Furthermore the estimated marginal prices for the social aspects of rainforest conservation obtained in this study are very similar to those reported by Rolfe, Bennett and Louviere (2000) in the only other choice experiment study to examine WTP for tropical rainforests. Notably, since the authors do not provide absolute welfare estimates it is not possible to compare the current welfare estimates with a like approach. Finally, it should be noted that CE studies conducted in the UK to value local biodiversity also report high values, for example Christie et al (2006) find respondents are willing to pay £189.05 *per annum* for a marginal change in the provision of a rare unfamiliar species in UK farmland.

7.7 CONCLUSIONS

This chapter examines how framing rainforest conservation choices in different ways affects choice behaviour. The methodology adopted provides a first attempt at deriving absolute estimates for a specific rainforest whilst incorporating values for other alternative rainforest investment opportunities. This addresses a key issue highlighted by Carson (1998) that has not been adequately considered by the previous empirical literature. This research provides a number of useful findings methodologically and for future policy.

Firstly, in relation to the policy objectives, this research indicates contrary to Rolfe, Bennett and Louviere (2000) that the majority of respondents are not concerned with setting priorities on the basis of rainforest location, but, they are concerned with prioritising on the basis of the condition of the rainforest. Indeed, the results suggest the public have strong preferences for prioritising rainforests that have already lost much of their original vegetation and are already fragmented over rainforests that are untouched and in pristine condition. Furthermore, respondents would appear to prioritise 'any rainforest' over one of known pristine condition. The implicit message is that the majority of respondents are most concerned with rainforests

[189] Using the HM Treasury Greenbook social discount rate of 3.5% (HM Treasury 2004).

that are in a more vulnerable condition. This may be due to an underlying perception that these rainforests are more 'highly threatened' than pristine untouched rainforests. In the real world this is not necessarily the case since a pristine rainforest could quickly become highly threatened if the logging rights were sold to a timber company. Indeed in Guyana this represents the greatest threat. The exploration of perceptions towards 'threat' would be an interesting avenue for future research. Overall, these results suggest that the priority setting approach used in Biodiversity Hotspots which focuses on vulnerable areas, may receive considerably greater public support than that used in the Tropical wilderness approach.

Secondly, with regard to future policy responses the results indicate that socio-economic factors such as community impact and management approach are higher priorities than biological indicators such as area and species. This is an interesting finding. The most prominent biodiversity priority-setting approaches focus mainly, and in some cases only, on biological indicators (and threat) (see Mittermeier et al. 1998). The results reported here suggest that public priorities would be better reflected by approaches based on wider criteria incorporating socio-economic factors alongside biological factors (see for example, Veech 2003; Hughey et al 2003).

Thirdly, the results indicate the public have strong preferences for policy responses that permit the sustainable use of rainforest resources to generate revenues. This is consistent with findings reported elsewhere (see Swanson and Kontoleon 2003). In the context of Iwokrama forest, the preference for sustainable uses is a positive outcome. Indeed its mission is to provide an example to the rest of the world that sustainable solutions to the conservation and management of tropical rainforests do exist. These results suggest that adopting such an approach instead of one of complete preservation would maximise benefits to society[190].

Crucially, the results indicate that the conservation of Iwokrama rainforest generates sizeable benefits to residents in the UK. Although representative estimates of aggregate benefits are not available, the results suggest that the non-use benefits experienced by UK residents are likely to exceed actual UK transfers to date. If Iwokrama could capture these benefits and turn them into real resource flows it would no doubt provide even stronger evidence that sustainable solutions to the management of tropical rainforests do exist.

From a methodological perspective the main focus of this chapter relates to the methodological challenges in obtaining valid and accurate estimates of WTP for a specific rainforest, in particular in with regard to framing and the inclusion of substitutes. The results indicate,

[190] Of course in reality not all 'sustainable use' approaches are sustainable, thus it is not suggested that these results should be used to promote this as a sole policy response.

consistent with Blamey et al (2000) and Rolfe, Bennett and Louviere (2002; 2000), that the framing of choices about rainforest conservation does matter.

Firstly, the results indicate that framing has a significant effect on overall taste parameters. It is suggested that this is the result of the combined effect of the presence/absence of information about specific baseline conditions and substitute rainforests.

Secondly, framing was found to have a significant effect on marginal prices for some but not all attributes resulting in both increases and decreases in marginal prices depending on the attribute.

Thirdly, as expected, the introduction of information about substitute rainforest investment opportunities (together with the removal of information about specific baseline conditions) results in significantly lower welfare estimates. This is a positive finding for the choice modelling approach, which offers the key advantage over CVM that it can be designed to ensure that respondents are explicitly required to consider substitutes.

Fourthly, the results suggest that respondents may be more comfortable when choices are framed in the context of substitute rainforests (as evidenced by the size of the scale factor and wider confidence intervals on the marginal prices in the BASE treatment).

Finally, by combining and optimally scaling data taken from split samples which separately examine preferences in the context of baseline conditions and the presence of substitutes, it is possible to derive absolute estimates of willingness to pay for a specific rainforest taking into consideration the effect of substitute rainforest investment opportunities. .

Caveats

Although the research described in this chapter makes a valuable contribution to the existing empirical work, in particular methodologically, a number of caveats should be noted with regard to the findings reported. Firstly, as noted (and as evidenced in the following chapter), Hausman tests indicate that the nested logit rather than the conditional logit model is more appropriate for the BASE dataset, correspondingly, the conditional logit estimation on the *pooled dataset* should be reviewed with the caveat that the results may be biased for part of the sample (the BASE dataset). Secondly, as noted, the sample is not representative of the target population therefore it is not possible to provide accurate estimates of the aggregate benefits. Thirdly, despite thorough pre-testing of the bid ranges, there is evidence of the presence of fat-tails in the choice modelling results With regard to the method outlined for obtaining absolute estimates of WTP for a specific rainforest it is noted that for true absolute measures for each of

the rainforest investment opportunities presented the baseline conditions would need to be included for each – the purpose of this study was solely to secure valid estimates for Iwokrama. Finally, different welfare estimates would be likely to be obtained for Iwokrama if the SUB treatment included different alternative investment opportunities, for example, if rainforests under different conditions were included or if other types of substitutes were included, for example, other public goods.

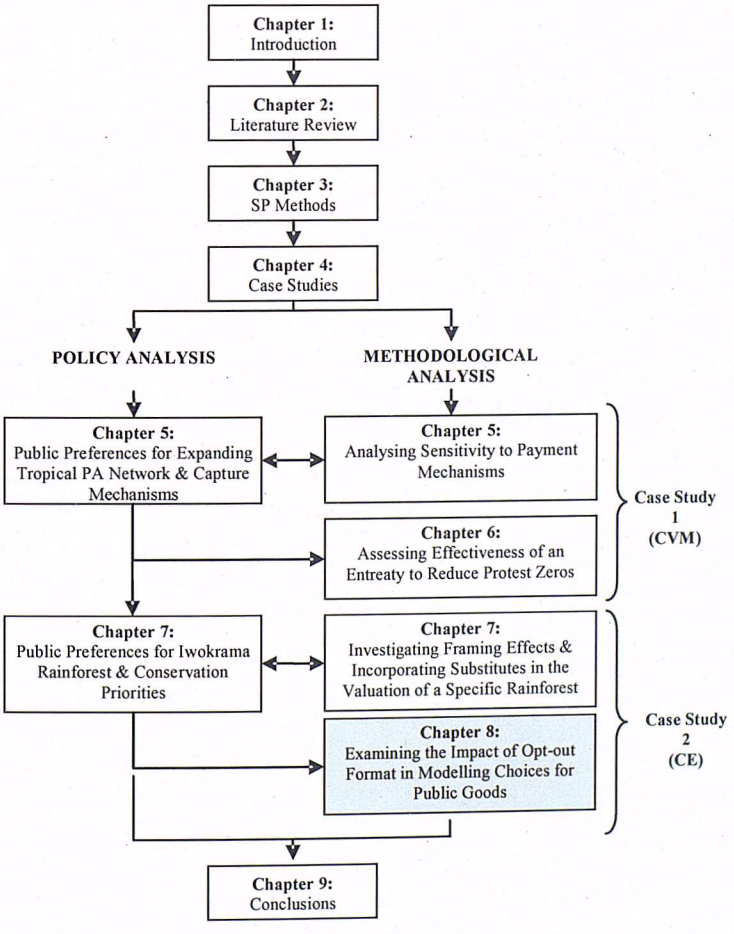
Future work

This research was restricted to sampling the London population; future research efforts should focus on obtaining representative estimates of the aggregate benefits to the UK since this would allow a more accurate assessment of the adequacy of existing resource transfers. Future work should also investigate alternative ways of framing rainforests in order help to inform the priority-setting debate, for example, by examining more explicitly the effect of 'threat' on public preferences.

Chapter 8: Investigating the Impact of the Opt-Out Format in Modelling Choices for Public Goods

SUMMARY

This is the second chapter in case study 2. It reports the results of a field experiment to investigate the effect of different opt-out formats in exploring preferences for rainforest conservation, a distant and unfamiliar public good. Previous work in the context of recreational user values (see Banzhaf, Johnson, & Mathews 2001) and the consumption of private goods (see Kontoleon & Yabe 2003) has found that the form of the opt-out can significantly affect the way respondents evaluate choice tasks. Yet, no such work has been conducted to investigate the effect of alternate opt-out formats in the context of valuing public goods where other opt-outs are relevant. The current chapter addresses this gap by investigating the effect of presenting the 'do nothing' alternative as either a fixed 'status quo' alternative or as a fixed 'choose neither' alternative together with a statement in the pre-text describing the 'do nothing' conditions. In doing so the current chapter considers an important unresolved issue, namely how best to frame the opt-out option and provides a novel contribution to the existing empirical work.



8.1 INTRODUCTION

An important unresolved issue in the design of choice modelling experiments concerns the inclusion and associated format of opt-out alternatives (Adamowicz & Boxall 2001;Banzhaf, Johnson, & Mathews 2001;Carson et al. 1994;Kontoleon & Yabe 2003). Such options allow the avoidance of forced choices that may otherwise result in the overestimation of welfare estimates, in particular where respondents may prefer none of the hypothetical goods or services on offer (Banzhaf, Johnson, & Mathews 2001;Kontoleon & Yabe 2003). Moreover, their inclusion is typically required to ensure consistency with welfare theory (Bateman et al 2002).

Despite the important role played by opt-out alternatives, surprisingly little attention has been given to understanding the effect of different formats on choice responses (Kontoleon & Yabe 2003). Initial work in the context of recreational user values (see Banzhaf, Johnson, & Mathews 2001) and the consumption of private goods (see Kontoleon & Yabe 2003) has found that the form of the opt-out can significantly affect the way respondents evaluate choice tasks. These studies have explored the effect of presenting the opt-out as either a 'no purchase' or a 'my preferred alternative' (for example 'my own brand' or 'preferred fishing site'). However, further work is required in the context of valuing public goods where different opt-out formats may apply (Banzhaf, Johnson, & Mathews 2001;Kontoleon & Yabe 2003). In particular in the case of unfamiliar or unique public goods where the 'my preferred alternative' is less relevant.

The current research addresses this gap by investigating the effect of different opt-out formats in exploring preferences for rainforest conservation, a distant and unfamiliar public good. More specifically, it compares two different ways of presenting the 'do nothing' opt-out and examines the effect on: (1) perceptions of choice task complexity; (2) respondent choice certainty; (3) choice shares and response patterns; (4) invalid responses (invalid positives and protest zeros); (5) factors affecting opt-out selection; and (6) attribute salience, marginal prices and welfare estimates.

To the best of the author's knowledge, there have been no previous empirical studies to investigate whether, in the context of valuing public goods, the opt-out format has an effect on choice behaviour and on resulting welfare estimates. In addition, the author is unaware of any studies which specifically investigate whether the opt-out format has an effect on perceptions of task complexity or on respondent certainty, nor whether these impact on selection of the opt-out differentially between different opt-out formats[191].

[191] Related research in this area has sought to investigate the factors affecting selection of the opt-out but has not done so in terms of assessing the effect of different opt-out formats.

The remainder of the chapter is organised as follows: the next section reviews the literature on the role of the 'opt-out' in choice experiments, the main opt-out formats in non-market valuation and the effect of opt-out format in the context of valuing user or private goods. Then, the experimental design is presented, including a description of the two opt-out formats, and the research hypotheses. Following this, the results are presented and discussed, and the chapter concludes with a summary of the main findings and recommendations for future research.

8.2 LITERATURE REVIEW

In choice experiments respondents are required to choose their preferred option amongst a series of alternatives which are described by their constituent attributes and associated levels. By varying the levels across the alternatives and by including a monetary attribute it is possible to estimate the marginal prices associated with each attribute and the value attached to the composite good. In order for such estimates to be consistent with welfare theory, the alternatives presented to respondents must usually include an opt-out or 'do nothing' alternative, unless in the real-life context an individual cannot realistically avoid a choice[192] (Adamowicz & Boxall 2001). To ensure comparability between alternatives (and across choice sets), the opt-out is usually included as a fixed alternative within the choice set (Rolfe, Bennett, & Louviere 2000). The inclusion of such options ensures that respondents are not forced to choose to 'do something' when they may prefer none of the hypothetical programmes, goods or services on offer (Banzhaf, Johnson, & Mathews 2001)[193]. In doing so opt-outs help to ensure the theoretical validity of welfare estimates (Adamowicz & Boxall 2001; Bateman et al. 2002) and ensure consistency with normative theories of rational choice which state that respondents should be allowed the option to choose 'not to choose' or to 'do nothing'. The inclusion of an opt-out can also help to ensure realism by mimicking conditions in the real marketplace (where consumers cannot be forced to purchase) and is thought to enable a closer approximation of real market behaviour(Batsell & Louviere 1991).

However there are complications associated with opt-out options. Of primary concern is the evidence that respondents may choose the opt-out for reasons other than utility maximisation[194] (and rational theory of search[195]), such that the opt-out is chosen disproportionately. (In

[192] For example if some form of change is inevitable (Adamowicz & Boxall 2001).
[193] In such instances the absence of a 'do nothing' option may result in the overestimation of welfare estimates (or overstatement of the likelihood of purchase).
[194] Rational theory of choice states that respondents choose an alternative on the basis of its attributes and levels which maximises their utility – it assumes that aside from attributes and levels no other factors affect choice (Meyerhoff & Liebe 2006).
[195] Rational theory of search assumes that respondents choose the no-choice option where none of the alternatives are attractive (in line with rational theory of choice discussed above) or where there are benefits to further search (Karni & Schwarz 1977) for example to find better alternatives or to obtain more information such that there would be a reduction in the risk of a wrong decision.

modelling choices this is usually indicated by a significant coefficient on the alternative specific constant (ASC) associated with the opt-out.[196]). A number of explanations have been put forward for this behaviour. Firstly, respondents may prefer the status quo option simply because it is labelled as such, Samuelson and Zeckhauser (1988) identify this as 'status quo bias' in decision making[197]. Adamowicz & Boxall (2001) state that if this type of behaviour is evident in the real decision context then it should be allowed for in the experimental choice setting. Of more concern is the considerable evidence to suggest that respondents may choose to opt-out simply because it represents an 'easy' option. Indeed, Krosnick (1991) finds that 'opt-out' options may discourage respondents from putting in the required effort or cognitive work necessary to report true preferences such that they seek other ways of responding that simplify the task, for example answering randomly or selecting the opt-out option. Krosnick et al. (2002) term this behaviour survey 'satisficing' (as opposed to optimizing) and suggests the reasons may be (1) limited cognitive ability; (2) minimal motivation; and (3) too much effort required (i.e. task complexity is too great). Dhar and Simonson (2003) also suggest that respondents tend too choose the 'no choice' option as an alternative way of resolving difficult choices. This builds on earlier work by Dhar (1997) which found evidence to suggest that the decision to defer choice is influenced by absolute differences in the attractiveness of alternatives in a choice set such that preferences uncertainty may also be an important determinant of the decision not to choose. In the context of non-market valuation, Adamowicz et al. (1998) suggest a number of additional reasons for status quo effects including mistrust over institutions, doubts over effectiveness of programme, uncertainty over trade-offs and protest responses. Indeed, in a subsequent study Meyerhoff and Liebe (2006) found protest beliefs, attitudes towards environmental change and task complexity to be significant in explaining selection of the opt-out, such that positive attitudes towards the good decreased the likelihood of selection but protest beliefs and perceptions of task complexity increase opt-out selection. They argue that non-preference based associations such as the later, may have important implications over whether or not the opt-out ASC should be included in welfare estimates.

8.2.1 The Opt-out Option in Non-market Valuation

In the context of non-market valuation studies which aim to estimate willingness to pay (WTP) for changes in the provision of public goods ('state of the world' or 'passive use' studies), the

[196] The ASC captures the average effect of the omitted variables that influence choices over and above the attributes and levels (Louviere, Hensher, & Swait 2000).

[197] In such contexts status quo bias is generally considered to occur where the framing of an alternative as the status quo significantly affects its likelihood of being chosen. In other words status quo bias exists where a respondents has a higher preference for the status quo simply because it is the 'status quo' such that the same alternative without the label of status quo would provide lower utility. Samuelson and Zeckhauser (1988) suggest three possible explanations for this type of behaviour: (1) rational decision-making in presence of transition costs or uncertainty; (2) cognitive misperceptions; and (3) psychological commitment from misperceived sunk costs, regret avoidance or drive for consistency (p33.).

opt-out usually represents the baseline or 'do nothing' scenario. It describes the conditions either currently or at some point in the future if no policy intervention goes ahead[198]. A review of the recent empirical literature indicates that in such contexts the opt-out is usually presented in one of two ways: (1) a 'status quo' alternative within the choice set described by attributes and associated levels or some other wording (see Adamowicz et al. 1998;Bennett, Rolfe, & Morrison 2001;Bergmann, Hanley, & Wright 2006;Blamey, Bennett, Louviere, Morrison, & Rolfe 2002); or (2) a 'choose neither' alternative together with a statement in the pre-text describing the 'do nothing' conditions (see Bateman et al. 2002;Birol, Karousakis, & Koundouri 2006;Colombo, Calatrava-Requena, & Hanley 2006;Gordon, Chapman, & Blamey 2001)[199].

As with other types of choice modelling study, it is not always clear which form of the opt-out is most appropriate to use (Adamowicz & Boxall 2001). In general the 'status quo' format is the most commonly used, however both formats have their pros and cons[200]:

8.2.1.1 Status Quo format:

As earlier, the status quo (SQ) format is the most frequently used format in passive use or state of the world choice experiments. The main advantage of this format is that the inclusion of the 'do nothing' levels within the choice set provides a context for decisions. Indeed Morrison, Bennett and Blamey (1997) found that focus group participants preferred this type of format as it provided a basis from which to evaluate alternative policy options and helped to provide a context in which to form decisions. Furthermore, Adamowicz and Boxall (2001) suggest that in the case of state of the world studies context is likely to be very important.

However, the SQ format may not always be appropriate. For example in real life consumers are often required to make decisions based on partial information, thus it may not always be reflective of the real life decision context. This runs contrary to the advice of Batsell and Louviere (1991) that the real life choice situation should be mimicked as closely as possible. Further, in situations where the 'do nothing' conditions are particularly negative and the context emotive, respondents may perceive this option as a 'socially unacceptable' choice. This relates to findings elsewhere that respondents can have a tendency 'to present themselves in a favourable position with respect to social norms', Blamey and Bennett (2001) refer to this as 'social desirability bias' (p.179). Although not empirically proven, this may manifest itself as

[198] This is the equivalent of a 'no purchase' opt-out in the context of user or private goods.
[199] In addition, a 'choose neither' alternative but with no information describing the status quo conditions neither within the choice set nor in the pre-text has also been used - in this case the estimates derived will be 'relative only' rather than 'absolute' (see Rolfe, Bennett, & Louviere, 2000).
[200] Although both formats represent the 'do nothing' or status quo conditions, for ease of reference in the remainder of the chapter, format (1) is referred to as the 'status quo' (SQ) and format (2) as the 'choose neither' (CN).

respondents not wishing to be seen to support a negative baseline. If this is the case, then this opt-out format could exacerbate 'social desirability bias', such that some respondents feel 'forced' to choose in favour of substantive alternatives even when these are not preferred.

8.2.1.2 Choose Neither

The 'choose neither' (CN) is the main alternative to the 'status quo' format although it is used less frequently. This format does not present full information regarding the consequences of 'doing nothing' in the actual choice set but instead provides information on the implications of 'doing nothing' in the pre-text to the choice sets. In doing so, a column of information can be removed from the choice set. This offers the potential advantage of reducing task complexity and respondent fatigue (Colombo, Calatrava-Requena, & Hanley 2006), although this has yet to be proven empirically. This partial presentation of information may also have the advantage of providing a closer representation of the real life decision context as recommended by Batsell and Louviere (1991). As discussed, consumers in the marketplace do not always have perfect or complete information when making decisions, and in this sense, the use of a 'choose neither' format may more closely mimic the real life choice situation. It is noted that Kontoleon and Yabe (2003) find that using a more 'realistic' opt-out provided a better model fit of choice behaviour. The CN format also presents the opt-out in a more neutral way, which may reduce the potential for respondents to perceive it to be 'socially unacceptable' to choose to 'do nothing'.

Of course, a drawback of the CN format is that the neutral and simplified presentation of the opt-out may serve to encourage the problem of 'survey satisficing', whereby respondents choose the opt-out as an 'easy way out'[201]. The other potential disadvantage is that respondents may simply fail to recall the baseline conditions when making decisions, such that they incorrectly interpret the information presented.

8.2.2 The impact of alternative opt-out formats

On the above bases, intuition suggests that respondents may evaluate choice tasks differently according to whether the opt-out is presented in the SQ or CN format. However no empirical research has been undertaken to test the potential effects of these two specific formats. Indeed, little is known about the effect of different opt-out formats, in the context of non-market valuation nor in the wider choice modelling context.

[201] Survey satisficing refers to the idea that some respondents may, for a variety of reasons such as task difficulty, inability, or lack of motivation, seek to avoid the cognitive effort required to report true opinions by using simpler ways of responding to survey questions for example by incorrectly selecting the opt-out or answering randomly (Krosnick et al. 2002).

To the best of the author's knowledge, only two studies have been conducted to examine the effect of alternative opt-out formats in choice experiments. As noted, these were conducted in the context of valuing angler's preferences for recreational fishing sites (see Banzhaf, Johnson, & Mathews 2001) and consumer preferences for genetically modified content in food products (see Kontoleon & Yabe 2003), where different formats apply. They presented the opt-out as either a 'no purchase' or a 'my preferred alternative'. Both studies found considerable evidence that the form of the opt-out can affect choice behaviour. A number of their findings seem particularly relevant.

Firstly, alternative opt-out formats have been found to significantly affect choice shares. Kontoleon and Yabe (2003) found that the total proportion of opt-out choices almost doubled between opt-out treatments: in the 'No Purchase' format 27% of choices were opt-out responses and in the 'Own Brand' format 47% of choices were opt-outs. Similarly the proportion of respondents always choosing the opt-out was over three times higher between treatments (23% in the 'Own Brand' compared to 6% in the 'No Purchase' treatment). In both cases, this was taken to indicate the presence of a 'forced choice' or unrealistic opt-out, whereby respondents chose substantive alternatives instead of the opt-out even though the later was preferred. This is an important finding since it highlights that the form of the opt-out can significantly affect respondent choice behaviour.

Secondly, both Kontoleon and Yabe (2003) and Banzhaf, Johnson and Mathews (2001) found that the form of the opt-out affects the way respondent perceive the choice task resulting in significantly different weights being assigned to one or more attributes. In both cases there were no significant differences with the less important attributes. However the opt-out format significantly affected the salience of the more important attributes to the extent that this doubled in the 'my preferred alternative' in the Banzhaf study. These findings are consistent with earlier work by Olsen and Swait (1998) which investigated the effect of 'forcing' choices. They found that in the absence of an opt-out, key attributes can become either inflated or deflated compared to when an opt-out is offered. The direction of the difference depends on whether the key attributes are used in resolving preference ambiguities. They note that this deflation or inflation can also have a consequent impact on attributes of 'secondary importance', by respectively, inflating or deflating them (see also Kontoleon & Yabe 2003).

Unsurprisingly, given the previous discussion, Kontoleon and Yabe (2003) found that the opt-out format had a significant impact on marginal prices for certain but not all attributes. It is noted however that Banzhaf, Johnson and Mathews (2001) did not report marginal WTP and neither study reported the effect on overall welfare estimates.

Both studies, concluded that the 'my preferred alternative' outperformed the 'no purchase' alternative since it collected more information on respondents preferred characteristics and crucially since it presented a more realistic alternative compared to the 'no purchase' format which was argued to present a 'forced choice'. This later finding is particularly important since it provides empirical evidence for the recommendation of Batsell and Louviere (1991) that opt-out formats should be as realistic as possible.

In addition, the Kontoleon and Yabe (2003) study was particularly interesting since it also explored the effect of opt-out format on 'respondent fatigue'. Respondent fatigue refers to the increased occurrence of atypical choices as a respondent progresses through the choice set, such as failure to select dominant options or increased selection of the opt-out[202]. Kontoleon and Yabe (2003) measured the effect on respondent fatigue by comparing the occurrence of opt-out responses across the first two choice questions and the remainder of the choice questions. Although fatigue effects were evident in both treatments, the form of the opt-out was found to significantly affect the extent to which respondents experienced these effects[203]. This is an interesting finding since it provides initial evidence that some opt-out formats may perform better than others in terms of reducing the effects of respondent fatigue.

In summary, these findings highlight the importance of understanding more about the effects of alternative opt-out formats, in particular in the context of non-market valuation where to the best of the author's knowledge no previous empirical research has been conducted and where different opt-out formats apply.

8.3 RESEARCH HYPOTHESES:

The main aim of this research is to further understanding about the effect of the opt-out format on choice behaviour in the context of passive use or 'state of the world' studies where the 'opt-out' is usually presented as some form of 'do nothing' option. The study explicitly compares the presentation of the opt-out as either (1) a fixed 'status quo' alternative within the choice set which is described in terms of attributes or levels, thereby presenting complete information and (2) a simple 'choose neither' format together with a statement in the pre-text explaining the consequences of opting-out. In particular, the research investigates the effect of the two opt-out formats on: (1) perceptions of choice task complexity; (2) choice certainty; (3) choice shares

[202] Another example of respondent fatigue would be increased failure to select dominant options as a respondent progresses through the choice set.
[203] Kontoleon and Yabe (2003) found respondents displayed higher consistency and endurance under the 'own brand' format, and suggested this may be due to 'more realistic and less restrictive choice setting provided by the 'own brand' format' (p. 17).

and response patterns; (4) invalid responses (invalid positives and protest zeros); (5) factors affecting opt-out selection; and (6) attribute salience, marginal prices and welfare estimates.

(1) Perceptions of Task Complexity and Cognitive Burden

To date there has been no other empirical work to test whether alternative opt-out formats affect overall perceptions of task complexity. This is an important issue since it should help in understanding which format of the opt-out is more appropriate in different circumstances. Research has found that if choice tasks are too complex respondents may be unable to make reliable choices, instead using shortcuts or random answer strategies (Bennett & Blamey 2001)[204]. This is clearly undesirable since it increases the variance in responses, reducing model fit and predictability. and can lead to the occurrence of status quo bias effects, 'in which individuals disengage from the task and opt to simply stay with the status quo alternative' (Bennett & Blamey 2001, p.236). However, clarity in the presentation of information within the choice sets may help in reducing task complexity (Blamey, Louviere, & Bennett 2001)[205]. To this end, it is of interest to establish whether alternative opt-out formats affect perceptions of task complexity. No *a priori* expectations are specified regarding the possible effects since both formats are thought to offer advantages with respect to cognitive burden and task complexity. Indeed, the main advantage associated with the 'choose neither' format is the supposed reduction of task complexity (Colombo, Calatrava-Requena, & Hanley 2006) while the 'status quo' format may make choice easier since it provides a context in which to form decisions (Morrison, Bennett, & Blamey 1997). This issue of task complexity is re-visited in discussing the potential factors affecting selection of the opt-out.

(2) Choice Certainty

The form of the opt-out has been found to influence the way respondents perceive choice tasks (see Kontoleon and Yabe 2003; Banzhaf, Johnson and Mathews. 2001), thus it follows that it may also affect choice certainty. To investigate this, respondents were asked to report their choice certainty after each choice set, using a scale of 0% (absolutely uncertain) to 100% (absolutely certain). Using this information, it is possible to examine whether: (1) overall respondent certainty is significantly greater under one opt-out format compared to the other; and (2) whether individual respondent certainty is significantly different when selecting the opt-out compared to the other alternatives. It is noted that no previous empirical studies have investigated the effect of opt-out format on choice certainty.

[204] Bennett and Blamey (2001) note that task complexity may contribute to the use of simplified decision strategies.

[205] Task complexity may also be reduced by reducing the number of attributes, trade-offs or number of tasks to be completed (Bennett & Blamey 2001).

With regard to the possible effects in relation to (1) (overall respondent certainty), intuition suggests this may be greater in the 'status quo' treatment since the choices are presented in the context of complete information regarding decision consequences. However, if respondents perceive the 'choose neither' format to represent a more realistic decision context then overall respondent certainty may be higher under this treatment. With regard to (2) (individual respondent certainty), ideally it would be expected that certainty would be similar regardless of the option chosen, since respondents would be making choices on the basis of utility maximisation. If however, respondents in the SQ treatment regard the opt-out as 'socially unacceptable' then certainty would be expected to be lower in opt-out choices compared to the conservation alternative choices. Likewise if respondents in the CN treatment regard the opt-out as an 'easy way out' certainty would be expected to be higher in the opt-out choices relative to the other alternatives.

(3) Choice Shares and Response Patterns

Alternative opt-out formats have been found to affect respondent evaluation of alternatives, thereby resulting in significant differences in choice shares (see Kontoleon and Yabe 2003). As hypothesized earlier, the SQ format may be viewed by some respondents as a 'socially unacceptable' choice even when it is the preferred alternative. Conversely the CN format offers a more neutral opt-out choice and may be regarded as being more reflective of the real decision context, although it may also present an 'easy way out'. Under these circumstances it is expected that respondents would be more likely to opt-out in the CN treatment. In view of this the opt-out choice shares are expected to be significantly greater in the CN format compared to the SQ format.

(4) Protest Responses and Invalid Responses

Clearly it is desirable to have low rates of invalid and protest responses. To this end, it is interesting to examine whether alternative opt-out formats deliver a greater (or lower) proportion of valid responses. Neither Kontoleon and Yabe (2003) nor Banzhaf *et al.* (2001) investigated this issue however it is reasonable to assume opt-out format may have an effect on the occurrence of invalid and protest responses since: (1) the form of the opt-out has been found to influence whether choices are perceived as 'forced' or unrealistic; and (2) Meyerhoff and Liebe (2006) find evidence to suggest that selection of the opt-out is significantly influenced by protest beliefs. If the opt-out is perceived as offering a 'forced choice' in favour of 'do something' alternatives then a higher proportion of invalid 'do something' responses would be expected. Similarly if the opt-out is perceived as offering an easy way out, a higher proportion of protest zero responses would be expected.

(5) Factors affecting Opt-out Selection

As discussed, a number of studies have highlighted that the opt-out alternative may be selected for reasons other than utility maximisation. In view of this, this research investigates in a multivariate setting the factors affecting opt-out selection and, more especially whether alternative opt-out formats encourage (or discourage) non-preference based selection of the opt-out. Of particular interest, is whether selection of the opt-out is significantly affected by perceptions of task complexity and respondent fatigue. This follows on from Meyerhoff and Liebe (2006) that perceptions of task complexity can affect opt-out selection. Neither Kontoleon and Yabe (2003) nor Banzhaf, Johnson and Mathews (2001) investigated whether alternative opt-out formats may be differentially affected by perceived task complexity. Thus this represents a novel and important contribution, to the existing literature since it enables an assessment of whether alternative opt-formats contribute to the occurrence of satisficing behaviour. Kontoleon and Yabe (2003) found evidence that the form of the opt-out can affect the extent to which respondents experience fatigue effects. To further current understanding of the relationship between the form of the opt-out and the occurrence of fatigue effects this research investigates whether opt-out selection increases (or decreases[206]) as respondents progress through the choice sets in each treatment. If the CN format does serve to encourage satisficing, evidence of fatigue effects would be expected in this treatment.

(6) Attribute Salience, Marginal Prices and Welfare Estimates

According to Olsen and Swait (1998) the use of different decision rules can result in different weights being assigned to one or more attributes. Indeed both Kontoleon and Yabe (2003) and Banzhaf, Johnson and Mathews (2001) found evidence to suggest that the form of the opt-out affects the way respondent perceived the choice task such that different formats resulted in different weights being assigned to one or more attributes. In line with this finding, this research investigates whether different opt-out formats result in different attribute weightings, and the effect on welfare measures. It is expected that differences in the marginal prices will occur on the bases that (1) respondents in SQ format may feel unable to choose opt-out (2) respondents in CN treatment may interpret attributes levels differently (3) respondents in CN treatment may choose opt-out more frequently.

8.4 EXPERIMENTAL DESIGN

These issues are examined in a choice experiment to investigate the preferences of UK residents for a rainforest conservation programme in Guyana, South America.

[206] Decreases in opt-out selection as a respondent progresses through the choice sets may indicate 'learning effects'. This refers to the phenomenon where respondents become more proficient at choice tasks after completing the initial choice sets (Bennett & Blamey 2001).

In each choice set, respondents were presented with a choice between two conservation programme alternatives and a 'do nothing' alternative (opt-out). Respondents were asked to choose the option they most prefer in each question, treating each question separately. The conservation programme alternatives were described in terms of six attributes: (i) size of conservation area, (ii) number of rare or endangered species present, (iii) management approach, (iv) duration of conservation programme, (v) local community impact and (vi) the size of the one-off donation required. A full description of the attributes and levels are set out in Table 8.1.

Table 8.1: Attributes, levels and variables

Attribute	Levels		Variable
Conservation Area:	Options 1 & 2:	185,000 hectares (half rainforest) or 371,000 hectares (whole rainforest)	AREA
	Opt-out:	0 hectares	
Rare/Endangered species present:	Options 1 & 2:	30 or 45 species.	SPECIES
	Opt-out:	20 species	
Management Approach:	Options 1 & 2:	Complete Preservation or Sustainable Uses (ecotourism and sustainable logging).	MANAGEMENT
	Opt-out:	No restrictions on rainforest use (unsustainable mining and timber logging).	
Conservation Period:	Options 1 & 2:	15 years or 50 years	TIME
	Opt-out:	0 years.	
Local Community impact:	Options 1 & 2:	Community Benefits (e.g. jobs, training) or No Community Benefits.	LOCAL COMMUNITIES
	Opt-out:	No Community Benefits and Worse off.	
One-off Donation Amounts:	Options 1 & 2:	£3; £10; £14; £20; £30; £50; £65; £100; £500	PRICE
	Opt-out:	£0	

The 'do nothing' alternative (opt-out) was fixed across all choice sets and represented the likely scenario if the current programme closed down. This scenario involved no restrictions on rainforest use, resulting in severe degradation of the rainforest, a decline in number of rare or endangered species and a decline in welfare of the local communities.

As discussed earlier, there are a number of ways of presenting the opt-out format. The current study tests the effect of presenting the opt-out as either: (1) a fixed 'status quo' alternative described by attributes and levels; or, (2) a 'choose neither' alternative, with a framing

statement in the pre-text. To do this, a split-sample design is used in which the questionnaires differ only according to the presentation of the opt-out. Figure 8.1 provides an example choice set illustrating the two opt-out formats.

The pre-text framing statement for the 'choose neither' format stated *'Under option C no conservation programme would be set up and no donation would be required. Recall that if no conservation programme is set up the rainforest is likely to be used for unsustainable mining and timber logging, meaning that within 15 years, most of the rainforest would become severely degraded, only 20 of the 45 rare and endangered species would remain and the local communities would be worse off'.*

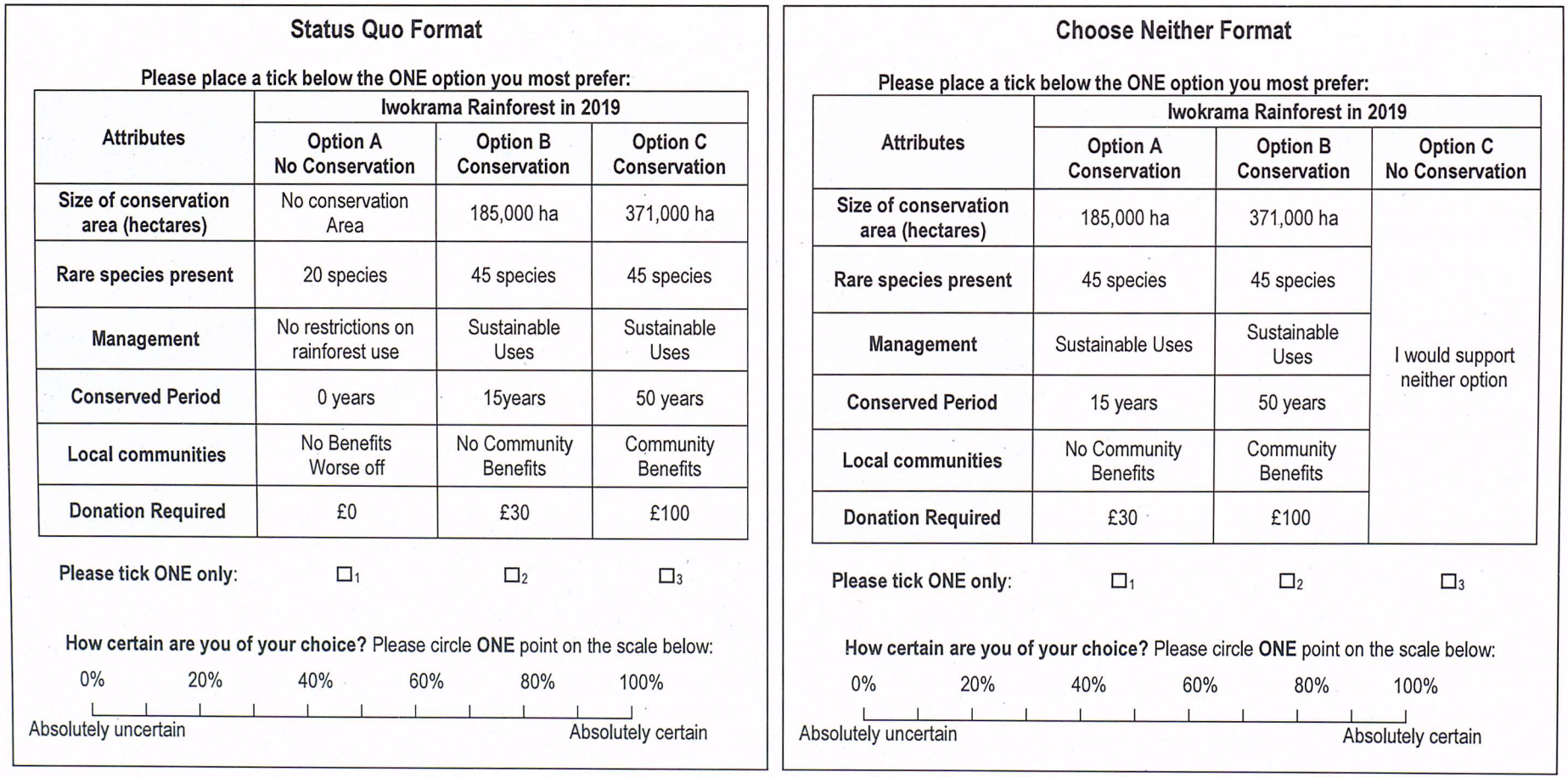
A fractional factorial design was used to reduce the possible combinations to a subset which would enable the main effects of interest to be estimated (Louviere, Hensher, & Swait 2000)[207]. A set of 16 profiles or cards were generated and choice sets were constructed by randomly drawing pairs without replacement from two sets of the cards (one original and one fold-over set[208]). Preliminary results from the first round of data collection indicated presence of 'fat-tails', hence, in the second round of data collection an extra three choice cards were added which replicated three of the existing choice sets but with the price increased to £500. Thus, in total 19 choice sets were used. These were grouped into three blocks; each respondent was required to answer five, six or seven choice sets depending on the randomly allocated block.

8.5 DATA

The data used in this chapter comes from case-study 2. The analysis was performed on the choice experiment data resulting from the BASE treatment, using both the SQ and CN sub-samples. A full description of the survey instrument and data collection procedures is provided in Chapter 4. To recap the survey instrument covered: general issues; knowledge, awareness and attitudes towards tropical rainforests and their management; choice experiment questions; follow-up questions; and a final section about respondent socio-demographic characteristics. The survey was distributed using a drop-off/mail-back procedure to a total of 1698 households in 18 randomly selected areas of London between 18th Oct 2004 and 17th Nov 2005[209].

[207] Whilst using a main effects design requires assumptions about the insignificance of interaction effects, it has been justified on the basis that such designs can typically account for 70% to 90% of the variance in choice models (Louviere, Hensher & Swait, 2000). A complete factorial design includes all the possible combinations of attributes and levels, in the current context this would have resulted in 256 possible combinations which given the study constraints would have been impractical to implement.
[208] This technique is recommended by Louviere, Hensher and Swait, (2000) as a way of increasing the statistical efficiency of the design
[209] Two rounds of data collection were conducted.

Figure 8.1: Example of 'status quo' and 'choose neither' choice cards



Status Quo Format

Please place a tick below the ONE option you most prefer:

Attributes	Iwokrama Rainforest in 2019		
	Option A No Conservation	Option B Conservation	Option C Conservation
Size of conservation area (hectares)	No conservation Area	185,000 ha	371,000 ha
Rare species present	20 species	45 species	45 species
Management	No restrictions on rainforest use	Sustainable Uses	Sustainable Uses
Conserved Period	0 years	15years	50 years
Local communities	No Benefits Worse off	No Community Benefits	Community Benefits
Donation Required	£0	£30	£100

Please tick ONE only: ☐1 ☐2 ☐3

How certain are you of your choice? Please circle **ONE** point on the scale below:

0% 20% 40% 60% 80% 100%

Absolutely uncertain — Absolutely certain

Choose Neither Format

Please place a tick below the ONE option you most prefer:

Attributes	Iwokrama Rainforest in 2019		
	Option A Conservation	Option B Conservation	Option C No Conservation
Size of conservation area (hectares)	185,000 ha	371,000 ha	I would support neither option
Rare species present	45 species	45 species	
Management	Sustainable Uses	Sustainable Uses	
Conserved Period	15 years	50 years	
Local communities	No Community Benefits	Community Benefits	
Donation Required	£30	£100	

Please tick ONE only: ☐1 ☐2 ☐3

How certain are you of your choice? Please circle **ONE** point on the scale below:

0% 20% 40% 60% 80% 100%

Absolutely uncertain — Absolutely certain

8.6 RESULTS AND DISCUSSION

A total of 631 complete or partially usable questionnaires were returned. Response rates were similar between the two split-samples: the SQ format received a response rate of 38.3% and CN format of 36.0%. These rates fall within the range reported for other stated preference (SP) mail surveys (see Mitchell & Carson 1989 for a review of response rates in SP surveys).

Table 8.2 provides an overview of the key socio-demographic characteristics of the two sub-samples. No significant differences were detected between the two sub-samples, thus enabling a direct comparison of the results. In general respondents were found to be highly educated and wealthy with respect to the target population.

Table 8.2. Socio-demographic Characteristics by Opt-Out Treatment

Variable	SQ	CN	P value
Sex (% male)	47.3%	48.3%	0.787 [b]
Age (mean)[a]	45.0 yrs	44.6 yrs	0.648 [c]
Education: Degree level or above	66.3%	69.2%	0.430 [b]
Employment Status (%):			0.409 [b]
Self-employed	18.7%	16.0%	
Employed (>30 hrs/week)	38.3%	41.0%	
Employed (<30 hrs/week)	11.0%	13.3%	
Unemployed	4.3%	2.0%	
Retired	14.4%	14.7%	
Gross annual household income (mean) [a]	£52,870.61	£54,235.77	0.715 [c]
Member of environmental organisation	19.60%	18.60%	0.758 [b]
Number of Observations	329	302	
Response Rate	38.3%	36.0%	

Notes: [a] Age/Income taken as mid-point of category; [b] indicates chi2 test p value; [c] indicates Wilcoxon Mann-Whitney test p value.

8.6.1 Perceptions of Task Complexity between Opt-out Treatments

Firstly, overall perceptions of the choice tasks were compared between treatments. Using a 5-point Likert scale, respondents were asked to indicate the strength of their agreement regarding whether the choice questions were 'extremely difficult' and 'confusing'. In both treatments responses to each question were similar[210]. The results of a chi squared test indicated no

[210] In both treatments approx one-fifth of respondents agreed or strongly agreed that the choice tasks were confusing and just under one-fifth agreed or strongly agreed that the choice tasks were difficult. These proportions are not unsurprising given respondents were required to make decisions about a previously unfamiliar and distant public good.

significant differences in the perceived complexity of the choice tasks between treatments[211]. Thus neither opt-out format out-performs in terms of improving the clarity or reducing the perceived complexity of the choice tasks. This is an interesting result since it has been suggested that one of the main advantages of using the CN format is that it may reduce task complexity (see Colombo, Calatrava-Requena, & Hanley 2006). The issue of task complexity is further discussed in reviewing the factors affecting opt-out selection.

8.6.2 Choice Certainty between Opt-out Treatments

Similar results are observed with respect to choice certainty. Average overall respondent choice certainty across the choice sets is 69% in SQ treatment and 70% in the CN treatment. Thus no significant differences occur in overall respondent certainty between the two treatments[212]. This suggests that neither opt-out format is superior with respect to increasing the average certainty with which respondents make their choices. It should be noted however that this refers to average certainty; it is not specific to the alternative chosen. (Later, it is investigated whether respondent certainty is significantly different when the opt-out is chosen and whether this is affected by the opt-out format.)

8.6.3 Choice Shares and Individual Response Patterns

A summary of the responses to the choice questions (all blocks grouped together) is presented in Table 8.3.

As expected there is a significant difference in the proportion of opt-out responses between the two formats. On average, the proportion of opt-out responses is more than three times greater under the CN format compared to the SQ format, 25.7% compared to 7.1% respectively. A chi squared test of independence confirms that the likelihood of choosing the opt-out is significantly associated with opt-out format at the 1% significance level (chi square statistic 235.36, p value 0.000). These findings are consistent with those of Kontoleon and Yabe (2003) and indicate that the form of the opt-out has a significant effect on choice shares.

[211] Chi squared test of association between the opt-out format and 'difficulty' yielded chi square statistics of 2.3104 (p value 0.679) and between opt-out format and 'confusing' a chi square statistic of 3.4126 (p value 0.491), indicating no significant associations.

[212] A Mann-Whitney (Wilcoxon Rank-Sum) test for significant differences in the rank-sum of the mean of respondent certainty between the two treatments yielded a p value of 0.3016, indicating no significant differences. (A Mann-Whitney test was used since the results of Sharpiro-Wilk test indicated that respondent certainty was not distributed normally, making a t-test inappropriate).

Table 8.3: Choice Share by Opt-out Format: 'Status Quo' vs 'Choose Neither'

Alternatives	Choice Shares 'Status Quo' Format (SQ)							
	Card 1	**Card 2**	**Card 3**	**Card 4**	**Card 5**	**Card 6**	**Card 7**	**Total**
Alternative 1	64.4%	32.2%	40.7%	54.7%	51.7%	50.0%	71.4%	49.2%
Alternative 2	26.4%	54.4%	49.5%	34.0%	37.4%	41.5%	21.4%	40.2%
Status Quo	**5.5%**	**8.2%**	**7.0%**	**7.9%**	**7.9%**	**5.5%**	**3.6%**	**7.1%**
Non-response	3.6%	5.2%	2.7%	3.3%	3.0%	3.0%	3.6%	3.5%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Alternatives	Choice Shares 'Choose Neither' Format (CN)							
	Card 1	**Card 2**	**Card 3**	**Card 4**	**Card 5**	**Card 6**	**Card 7**	**Total**
Alternative 1	63.9%	21.2%	34.8%	38.7%	34.1%	41.4%	34.5%	38.8%
Alternative 2	22.5%	49.0%	40.1%	28.8%	39.1%	27.5%	12.7%	33.2%
Opt-out	**11.6%**	**26.8%**	**22.5%**	**30.5%**	**24.5%**	**28.8%**	**51.8%**	**25.7%**
Non-response	2.0%	3.0%	2.6%	2.0%	2.3%	2.3%	0.9%	2.3%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

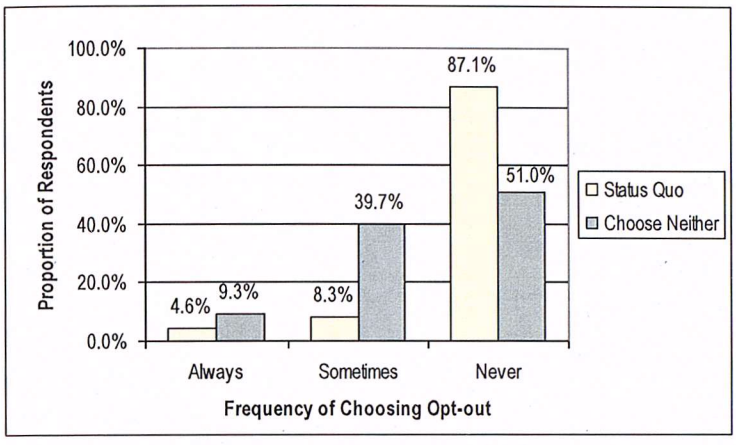
A closer examination reveals that, when excluding the opt-out responses, the choice shares for conservation alternatives 1, 2 and non-response, are very similar between the two formats, accounting for 53%, 43% and 4% under the SQ format and 52%, 45% and 3% under the CN format, respectively. This is an interesting result as it suggests that presenting the opt-out in different ways does not appear to affect the perceived attractiveness of the other options relative to each other. It is concluded that, in terms of choice shares, the main effect of varying the opt-out format is on whether or not a respondent chooses to opt-out.

To investigate this further respondents were classified into three groups according to whether they: 'ALWAYS', 'SOMETIMES' or 'NEVER' chose the opt-out across choice sets. The results are presented in Figure 8.2.

As shown in Figure 8.2, frequency of opt-out selection differs between the two treatments, with a much lower proportion 'ALWAYS' or 'SOMETIMES' opting-out in the SQ treatment compared to the CN treatment. Although in both cases only a small proportion of respondents 'ALWAYS' selected the opt-out, this was significantly lower in the SQ treatment compared to CN treatment, 4.6% vs 9.3% respectively (5% significance level). The difference is even greater for those that 'SOMETIMES' opt-out, with over four times as many respondents doing so in the CN format (39.7%) compared to the SQ (8.9%) treatment. Correspondingly, as expected, in the SQ treatment a much greater proportion 'NEVER' opt-out compared to the CN treatment, 87% vs 51%, respectively. At all levels these differences were found to be statistically significant. Indeed, a chi squared test confirms that the frequency of choosing to opt-out is

significantly associated with the opt-out format at the 1% significance level (chi2 stat = 100.27, p value = 0.000).

Figure 8.2: Frequency of Choosing Opt-out amongst Respondents



Note: Total sample size SQ = 326 and CN = 300.

It is clear from these results that the form of the opt-out has a considerable impact on a respondents decision over whether or not to opt-out (and correspondingly over whether or not to choose a conservation alternative). Respondents are more likely to opt-out when presented as a 'choose neither' and are less likely to 'opt-out' when the opt-out is presented as a 'status quo' alternative. This raises the question, which is a more accurate representation of true preferences?

On the one hand the lower opt-out rate in the SQ format could be seen as indicating a more robust survey since by default there must be a lower occurrence of 'easy opt-out' decisions, however, as discussed this may be artificially deflated if respondents perceive it to be 'socially unacceptable' to choose the opt-out (in particular since rainforest conservation is such an emotive issue). Likewise, the higher opt-out rate in the 'choose neither' treatment may indicate that this more neutral presentation facilitates a higher occurrence of 'easy way out' choices, (i.e. greater survey satisficing), for example in the context of difficult trade-offs, or due to fatigue. Of course, it may also be that by presenting the opt-out more neutrally, a more realistic representation is gained of those that in reality wouldn't pay, for example, free-riders or protestors. In addition the provision of full information in the SQ format may have made choices easier thus fewer satisficed, or alternatively the lack of complete information in the CN format may have led to increased satisficing. These issues are discussed further in the following sections.

8.6.4 Invalid Responses: Protest Zeros and Invalid Positives

To assess validity, the proportion of respondents that 'ALWAYS' opt-out was compared to the proportion that stated NO to the payment principle question (PPQ)[213]. The proportion of NO responses should be similar to the proportion that 'ALWAYS' choose the opt-out, since the later indicates an unwillingness to support rainforest conservation. In both treatments 13% of respondents stated NO to the PPQ (the remainder stating YES or DON'T KNOW). Referring back to Figure 8.2, the CN treatment was closest to this figure, however both treatments yielded significantly fewer 'ALWAYS' opt-out than expected. This suggests that either opinions changed during the course of the questionnaire, or, more crucially, that a small proportion of respondents felt unable to indicate their true zero WTP. Notably, this proportion was significantly higher in the SQ format.

To more formally test the validity of 'ALWAYS' opt-out responses, responses to follow-up questions were examined to identify 'protestors'. Protestors were classified as those choosing to opt-out across all choice sets for reasons other than utility maximization. The main protest responses consisted of: 'government/others should pay' and 'mistrust'. In both treatments the proportion of protestors was very small, accounting for 1.8% and 3.3% of total respondents in the SQ and CN formats respectively[214]. The results of Fishers exact test revealed no significant association between the opt-out format and the likelihood of protesting.

This is interesting for two reasons. Firstly, it indicates that the opt-out format does not appear to affect protest behaviour. Secondly, it implies that the significantly higher proportion of 'ALWAYS' opt-outs observed in the CN treatment must be due to a significantly higher proportion of *valid* 'ALWAYS' opt-outs rather than *protest* 'ALWAYS' opt-outs. Indeed, it is noted that even with protestors removed the proportion of valid 'ALWAYS' opt-out remains significantly higher in the CN treatment compared to the SQ treatment (5% significance level). This suggests that the SQ format may indeed discourage some respondents with genuine zero WTP from choosing the opt-out even though it is their preferred option.

Next, reported motivations for choices were examined amongst respondents that 'NEVER' or only 'SOMETIMES' opted-out. Invalid positive responses were classified as those where respondents always or sometimes chose conservation alternatives (i.e. 'NEVER' or 'SOMETIMES' opting out) but stated in the follow up questions that in reality they wouldn't really pay.

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[213] A closed-ended PPQ was presented prior to the choice modelling tasks to establish whether in principle respondents would be willing to contribute towards rainforest conservation; all respondents then answered the choice modelling tasks.

[214] In absolute numbers only six respondents in the SQ format and ten respondents in the CN format were identified as protestors.

The proportion of invalid responses was small, 4.3% and 1.7% for the SQ and CN treatments respectively[215], even so this means a small proportion of respondents in both treatments chose in favour of conservation alternatives even though they genuinely prefer to 'do nothing'. More notably, it is noted that the proportion is greater in the SQ treatment. Indeed, a one-sided Fisher's test indicates that there is a significant association between the likelihood of an invalid response and the opt-out format (p value 0.045), such that respondents in the SQ format are more likely to provide an invalid positive response. This suggests that the SQ opt-out may indeed be perceived by some respondents as a 'forced choice' such that they answer in favour of a conservation alternative when in fact they prefer to opt-out. As earlier, this may due to some form of social desirability bias[216], for example, free-riders may consider it socially unacceptable to reveal their true behaviour in the SQ treatment in comparison with the more neutral CN format.

In summary, these findings would appear to corroborate the earlier hypothesis that the SQ format may, for some respondents, represent a 'forced' or 'socially unacceptable choice' since: (1) a significantly lower proportion of valid 'ALWAYS' opt-outs is observed in the SQ treatment compared to the CN treatment; and (2) a significantly higher proportion of invalid 'SOMETIMES' or 'NEVER' opt-outs is observed in the SQ treatment compared to the CN treatment.

8.6.5 Econometric Results

In a multivariate context, the form of the opt-out was investigated in terms of its effect on attribute salience, model estimation, the factors affecting opt-out selection, and resulting welfare estimates.

Three separate econometric models were estimated for each treatment (invalid positives responses and protestors were removed): (1) basic conditional logit; (2) extended conditional logit including interaction variables; and (3) nested logit. The quantitative attributes (AREA, SPECIES, TIME and PRICE) were coded using the levels set out in the experimental design, and the two qualitative attributes (LOCAL COMMUNITIES and MANAGEMENT) were coded as two-level dummy variables (the baseline level is estimated through the ASC constant). An alternative specific constant (ASC1) was used to model the effect of the opt-out alternative

[215] In absolute numbers, fourteen respondents in the SQ format and five respondents in the CN format were identified as invalid respondents.

[216] This was further supported by the results of an attitudinal question on perceptions towards the opt-out, which was included in the second round of data collection. Although limited by smaller sample size for SQ treatment (n=67 in the SQ format compared to n=243 in CN format), almost double the respondents in the SQ treatment compared to the CN treatment, stated they didn't feel able to chose the opt-out option since it was 'socially unacceptable', 43% vs 22%, respectively.

(coded 1 if opt-out and 0 otherwise). Table 8.4 list the definitions of the interaction variables and Table 8.5 presents the results of the three specifications.

Table 8.4: Definition of Interaction Variables

Variable	Definition
INCOME	Mid-point of income category divided by 1000.
MEMBER	Dummy variable coded 1 if member of environmental organisation, 0 otherwise.
DEVPAY	Dummy variable coded 1 if respondents believed developed countries should help developing countries pay the costs of conserving tropical rainforests, 0 otherwise.
RAIN_5	Dummy variable coded 1 if respondents consider loss of rainforest to be lowest priority for additional government funding, 0 otherwise.
TASK_COMPLEX	Index of perceived task complexity based on average Likert scale agreement with the following two statements (from 1 (strongly disagree) to 5 (strongly agree)): 'I found the choice questions confusing' 'I found the choice questions extremely difficult'
#CHOICE_SET	Indicator variable for the sequential order of the choice set where 1 means the first choice set presented and 5 or 6 or 7 (depending on the block) the last choice set presented
CERTAINTY	Score indicating the level of perceived certainty associated with each choice from 0% (absolutely uncertain) to 100% (absolutely certain).

Note: All of the above variables were interacted with the alternative specific constant for the opt-out option which was coded 1 for the opt-out and 0 for conservation alternatives 1 and 2.

Table 8.5: Comparison of Model Results for Conditional Logit and Nested Logit specifications for the Opt-Out Treatments

	Status Quo Treatment									Choose Neither Treatment								
	(1) Basic C Logit			(2) Extended C Logit			(3) Nested Logit			(1) Basic C Logit			(2) Extended C Logit			(3) Nested Logit		
Variable	Coeff.	t stat		Coeff.	t stat		Coeff.	t stat		Coeff.	t stat		Coeff.	t stat		Coeff.	t stat	
Area	0.001	1. 30		0.001	2.00	**	0.001	2.27	**	0.001	2.29	**	0.001	2.61	***	0.001	2.54	**
Species	-0.007	-1.23		0.000	-0.07		0.002	0.30		0.014	2.83	***	0.010	1.96	**	0.010	1.96	**
Management	0.678	8.14	***	0.749	8.25	***	0.808	8.37	***	0.567	7.09	***	0.591	6.87	***	0.598	6.45	***
Time	0.000	-0.01		0.002	0.66		0.002	0.70		0.013	5.51	***	0.014	5.68	***	0.014	5.62	***
Local Comm.	0.799	9.88	***	0.859	9.80	***	0.896	9.74	***	1.002	12.76	***	1.016	11.95	***	1.026	10.60	***
Price	-0.007	-8.01	***	-0.008	-7.86	***	-0.008	-7.82	***	-0.004	-10.80	***	-0.004	-9.76	***	-0.004	-9.53	***
Asc1	-1.696	-7.04	***	1.612	2.15	**	0.559	0.64		0.911	4.46	***	-1.521	-3.07	***	-1.591	-2.69	***
Asc1_Income/				-0.008	-2.07	**	-0.008	-2.13	**				-0.008	-3.79	***	-0.008	-3.79	***
Asc1_Member				-1.011	-2.11	**	-0.999	-2.09	**				-0.146	-0.83		-0.146	-0.83	
Asc1_DevPay				-1.962	-7.24	***	-1.938	-7.19	***				-0.938	-5.88	***	-0.936	-5.86	***
Asc1_Rain_5				0.516	1.83	*	0.506	1.82	*				0.340	1.74	*	0.340	1.74	*
Asc1_Task Comp				-0.191	-1.21		-0.194	-1.24					0.290	3.48	***	0.290	3.47	***
Asc1_#Choice Set				-0.163	-2.12	**	-0.078	-0.92					0.065	1.65	*	0.069	1.60	(*)
Asc1_Certainty				-0.010	-1.73	*	-0.010	-1.83	*				0.034	9.44	***	0.034	9.40	***
IV Parameters																		
Do nothing (fixed)							1.000									1.000		
Do something							0.401	1.52								0.966	6.31	***
Model Statistics																		
Log-Likelihood	-1318.7			-1105.3			-1103.0			-1745.4			-1474.5			-1474.4		
Pseudo R2	0.279			0.326						0.110			0.169					
Chi-Square Stat.	1020.9		***	1067.6			1072.2		***	429.1			597.4		***	597.5		***
No of Obs	4995			4476			4476			5352			4842			4842		
LR homosked.							4.580		**							0.050		

The basic conditional logit model yields a good model fit for the SQ format with a pseudo r2 of 0.28 but performs poorly for the CN format producing a pseudo r2 of 0.11[217]. This indicates there is greater variability in the responses in the CN treatment, which cannot be explained by the attributes or the ASC opt-out - which suggests the presence of more 'random' responses. It is noted that in both treatments the ASC1 is significantly different from zero, however the signs are opposing. This is consistent with earlier observations regarding the significantly higher incidence of opt-out responses in CN format. Thus in the SQ format the negative sign on ASC1 indicates that utility declines with selection of the opt-out, whilst in CN treatment, the positive sign indicates as expected utility increases with selection of opt-out.

The extended conditional logit specification improves model fit for both treatments, producing a pseudo r2 in the SQ format of 0.33 and in the CN format of 0.17, and increases the number of significant attributes in the SQ format, with AREA now significant (and correctly signed). In addition a number of variables were found to be significant in determining the selection of the of the opt-out option (discussed later). However, despite improvements in model fit, further Hausman tests reveal continued IIA violations meaning model estimates may be biased[218]. To address this, a nested logit model was estimated for each treatment (the nested logit allows a partial relaxation of the IIA assumption (Bateman et al. 2002;Hensher, Rose, & Greene 2005;Louviere, Hensher, & Swait 2000)[219].

A two-level nested specification was used, in which the first level represents a choice between 'do nothing' or 'do something'. The 'do nothing' branch degenerates to the opt-out alternative and the 'do something' branch consists of the two conservation programme alternatives. The utility of the choice between the 'do nothing' or 'do something' branches is modelled as a function of the opt-out ASC and its interaction with the socio-demographic, attitudinal and design variables. At the bottom level, the choices between the two 'do something' conservation alternatives are modelled in terms of the six attributes and levels.

Firstly, a likelihood ratio test on the null hypothesis of homoskedasticity produces a chi squared value of 4.58 and a p value of 0.03 supporting the use of the nested logit (heteroskedasticity) model in the SQ format. Indeed the inclusive value parameter (iv) for 'do something' branch in the SQ format is not significantly different from zero providing support for the partition of the

[217] According to Louviere, Hensher and Swait (2000), MNL models with pseudo-R^2 of between 0.2 and 0.4 can be considered to have extremely good fit.

[218] A Hausman test on the extended conditional logit models with conservation alternative 1 excluded indicate the IIA assumption is not met under either opt-out format. In the SQ format the test produces a chi squared test statistic of 65.91 (13 degrees of freedom) with a p value of 0.000 and in the CN format a chi squared test statistic of 27.25 (with 13 degrees of freedom) with a p value of 0.012.

[219] The nested logit allows for differential variation in the unobserved effects across branches but not within branches (Hensher, Rose, & Greene 2005).

tree structure at this level of the model[220] (Hensher, Rose, & Greene 2005). However the chi squared statistic under the CN format is only 0.05 with a p value of 0.83. Further, a Wald test indicates that the null hypothesis of the iv parameter for 'do something' branch being equal to one cannot be rejected. This implies that for the CN format the extended conditional logit model may be a more appropriate specification for the data. This is an interesting finding since it indicates respondent perceptions of the alternatives differ between the two opt-out formats. For the purposes of comparability, the remainder of the econometric analysis uses the results of the nested logit specification since the conditional logit specifications cannot be robustly applied to the SQ format due to the IIA violation.

In general, the nested logit results suggest that the form of the opt-out does affect the perceived salience of the attributes – this is consistent with the findings of Banzhaf, Johnson, and Mathews (2001) and Kontoleon and Yabe (2003). Indeed, in the CN format all attributes are significant and correctly signed. In contrast in the SQ format, only AREA, MANAGEMENT, LOCAL COMMUNITIES and PRICE are significant - both SPECIES and TIME are insignificant. Two possible explanations are proposed:

Firstly, with regard to the SPECIES attribute, the inclusion of the status quo level, which states that 20 species would remain if no conservation programme was present, may serve to reduce the perceived significance of ensuring 30 or 45 species are provided under the conservation programme alternatives. In other words, in the CN format the removal of this information may result in respondents perceiving the 30 and 45 species to be an absolute improvement rather than being relative to the baseline of 20 – thus in the SQ format it may be that protecting an additional 10 or 15 species does not represent a large enough improvement to be significant to respondents. This underlines the important role played by the SQ format in providing a context for decision-making, in particular with regard to attributes which are defined in absolute terms. Respondents may simply fail to recall the baseline conditions when this information is not presented within the choice set. However, it is noted that in the current context this does not appear to explain the insignificance of the TIME attribute.

Indeed it is not clear why the TIME attribute is perceived as significant in one treatment but not in the other. This may in fact be evidence of the 'forced choice' discussed earlier. Indeed, if respondents consider it to be socially unacceptable to choose the opt-out in the SQ treatment even when it is their preferred choice then they may seek to 'minimize effort' in selecting between the remaining inferior options by using simplified decision strategies. For example by focusing solely on the most important attribute and ignoring the least important attributes (see

[220] An insignificant iv parameter (that is, statistically equal to zero) indicates that the two scale parameters taken from the two different levels to calculate the iv parameter are statistically very different and hence supports the partitioning of the choice model (Hensher, Rose, & Greene 2005, p.547).

Kontoleon & Yabe 2003; and Olsen & Swait 1998)[221]. This would have the effect of 'deflating' the importance of secondary or less important attributes (see Olsen & Swait, 1998), which in the current context may explain the insignificance of TIME in the SQ treatment[222]. Further, this may also explain the effect on the SPECIES attribute.

Overall, it is clear from these results that varying the presentation of the opt-out affects the perceived importance of the attributes – this is re-visited later in the discussion on marginal prices and welfare estimates.

In relation to the factors influencing selection of the opt-out, as expected, in both treatments, selection of the opt-out significantly decreases with increasing income and with a positive attitude towards supporting rainforest conservation (DEVPAY). In addition under the SQ treatment, membership of an environmental organisation significantly decreases the likelihood of opting-out (MEMBER). Similarly, in both treatments, a negative attitude towards the importance of rainforest conservation (RAIN5) significantly increases selection of the opt-out. These relationships are in line with *a priori* expectations and offer preference based explanations for selection of the opt-out. However as per Meyerhoff and Liebe (2006), selection of the opt-out is also found to be influenced by non-preference based factors, as indicated by the significance of the design variables (TASK_COMPLEX; #CHOICE_SET; CERTAINTY). Furthermore, contrary to the non-parametric analysis reported earlier, in a multivariate context, contrasting trends are observed for these variables between the two treatments[223]:

Firstly, in relation to the SQ treatment, the coefficient for task complexity is not significantly different from zero, thus it is concluded that selection of the opt-out is not affected by respondents perceptions of task complexity. This can be considered a positive result for the SQ format. In addition, the coefficient on the number of the choice set (#CHOICE_SET) is also insignificant in the nested logit, indicating no evidence of increased opt-out selection as respondents progress through the choices, (commonly referred to as 'respondent fatigue' effect). (It is noted however that in the extended conditional logit specification that the #CHOICE_SET coefficient is significant at the 5% level and negatively signed, suggesting that the presentation

[221] Kontoleon and Yabe (2003) suggest that if an opt-out format presents a forced choice respondents may seek to minimize effort in selecting between inferior options by using simplified decision strategies.
[222] Olsen and Swait (1998) investigate the effect of 'forcing' choices by excluding an opt-out option. They find that in the absence of an opt-out that key attributes can become either inflated or deflated in comparison to the situation when an opt-out is offered. The direction of the difference depends on whether the key attributes are used in resolving preference ambiguities. Importantly, they note that this deflation or inflation can also have a consequent impact on attributes of 'secondary importance', by respectively, inflating or deflating them (see also Kontoleon & Yabe 2003).
[223] The earlier non-parametric analysis considered *overall* effects regardless of the option selected. In this section, the multivariate analysis examines the factors specifically affecting selection of the opt-out option (through the use of interaction variables) relative to the other options.

of the opt-out as a fully described alternative may induce some form of 'learning effect' as respondents progress through the choice sets.). Interestingly, in both the nested logit and extended conditional logit models, the CERTAINTY variable is found to be significant and negatively signed. This indicates that respondents are less certain of their choices when selecting the opt-out alternative compared to the 'do something' alternatives. This is interesting, since it suggests that respondents may be less comfortable with selecting the opt-out when it is presented as a fully described alternative. Further this is consistent with the earlier observation that respondents in the SQ treatment may perceive this opt-out format to be a socially unacceptable or forced choice.

In contrast, in the CN treatment very different findings occur. Firstly, in the CN treatment the coefficient on TASK_COMPLEXITY is significant and positive, indicating that as perceptions of task complexity increase the likelihood of opting-out increases. This is consistent with the earlier hypothesis that 'choose neither' formats may present an 'easier' option for respondents facing difficult or complex decisions. This is further corroborated by the significant positive coefficient on the #CHOICE_SET attribute. This indicates that as the number of choice sets answered increases the likelihood of opting out increases – thus suggesting the presence of 'respondent fatigue' effects. These findings suggest that the CN format may encourage 'survey satisficing' relative to the SQ format. In relation to respondent CERTAINTY, the significant and positive coefficient indicates that certainty increases when the opt-out is selected compared to choices where the 'do something' is selected. Of course under the opt-out option respondents are not required to pay anything, and since the description of the opt-out is more neutral in this format, it follows that respondents may be more certain of their decisions to 'do nothing' relative to 'do something'. However, this too may provide evidence of survey satisficing since if respondents choosing the opt-out are 'avoiding' difficult trade-offs, then it follows that they will be more certain when choosing the opt-out or avoidant choice. Although there is insufficient information to qualify this, the coefficients on the task complexity and number of choice sets variables do indeed suggest the presence of survey satisficing in the CN treatment.

In summary, it is noted that significant differences occur in attribute salience and in the factors affecting opt-out selection between the two treatments. Most notably, in the CN treatment opt-out selection is significantly influenced by variables which are closely associated with survey satisficing, and these variables are not significant in the SQ treatment.

To test the overall significance of these results a likelihood ratio test was conducted (after Ben-Akiva & Lerman 1985). The test compares the log-likelihood function for the model estimated on the pooled datasets, where the coefficients are implicitly restricted to be equal, with the sum of the log-likelihoods for the separate split samples where the coefficients are unconstrained.

The t stat follows a chi-squared distribution with n degrees of freedom where n is the difference in the number of coefficients estimated between the restricted and unrestricted models. The results reveal the test statistic of 303.49 exceeds the critical value of 26.3 at the 95% confidence level, confirming that the overall models for each opt-out treatment are statistically significantly different.

8.6.6 Marginal Prices

The marginal prices for unit changes in the attributes (using the nested logit specification) are presented in Table 8.6. Re-scaling the parameters by the price coefficient removes the effect of the scaling parameters, permitting direct comparisons of the ratio of the coefficients across treatments (Bennett & Adamowicz 2001). The confidence intervals were calculated at the 95% level using the delta method[224].

Table 8.6: Marginal Prices for Unit Changes using Nested Logit Specification

	Status Quo			Choose Neither			SQ=CN CI
Attribute	Price	95% Conf. Interval		Price	95% Conf. Interval		Overlap
Area (per 1000 ha)	£0.13	£0.02	£0.24	£0.28	£0.07	£0.50	YES
Species (per species)	£0.22	-£1.23	£1.67	£2.60	£0.00	£5.20	YES
Management [a]	£98.45	£64.04	£132.86	£149.19	£99.43	£198.94	YES
Time (per year)	£0.24	-£0.42	£0.91	£3.52	£2.15	£4.89	NO
Communities [b]	£109.19	£80.33	£138.06	£255.99	£196.80	£315.18	NO

Notes: [a] The marginal price for Management represents a move from non-sustainable use to sustainable use approach. [b] The marginal prices for Communities represents a move from No Benefits to Benefits.

The results indicate that presenting the opt-out as a 'choose neither' rather than a 'status quo' format produces significantly higher marginal prices for the TIME and LOCAL COMMUNITIES attributes (5% significance level), although no other significant differences are detected. This is consistent with Kontoleon and Yabe (2003) (and Banzhaf, Johnson, & Mathews 2001) who find that varying the opt-out format has a significant effect on the marginal prices (salience of attributes) for certain but not all attributes. They observe that significant differences in marginal prices occur for attributes that matter in choices, since respondents are willing to opt-out in favour of obtaining these preferred attributes in their 'preferred alternatives'. In the current context, the effect on the marginal prices for TIME attribute may be explained by the insignificance of this attribute in the SQ treatment. As discussed earlier, this was suggested to be either the result of different perceptions of the attribute levels or due to

[224] Confidence intervals for parameter estimates can be calculated in STATA using the nonlinear combination of estimates command, calculations are based on the 'delta method' (StataCorp 2003).

simplified decision making in the context of a 'forced' choice. With respect to LOCAL COMMUNITIES, there is no obvious explanation for the significant difference in marginal prices; this is likely to be result of a combination of factors including those suggested in relation to the effect on TIME attribute.

8.6.7 Welfare Estimates

Welfare estimates were calculated for a change from the no conservation programme conditions to a new conservation programme as described by Option C in SQ treatment and Option B in CN treatment in Figure 8.1. This refers to a change from a scenario in which there would be no conservation programme meaning no conservation area, no sustainable uses, only 20 rare or endangered species would remain and the local communities would have no benefits to a scenario where a conservation programme would be set up to protect the whole rainforest (371,000 ha), the programme would allow sustainable uses (eco-tourism and some sustainable logging) in parts of the forest to help generate revenue, all rare or endangered species would remain and the local communities would receive benefits through community development projects, training and jobs. Estimates of compensating surplus were derived from the formula described by (Kling & Thomson 1996), with socio-demographic, attitudinal and design variables set at mean values.

The resulting welfare estimates indicate that mean willingness to pay (in a one-off donation) for the described change is £616.70 per person in the SQ treatment and £595.66 per person in the CN treatment. Thus, although higher marginal prices are observed for the programme attributes in the CN format, this is offset by the greater positive utility associated with opting-out in this treatment compared with the SQ treatment. A comparison of the 95% confidence intervals (calculated using the delta method) indicates that mean welfare estimates are not statistically significantly different between the treatments[225]. Thus, it may be concluded that, in the current context, opt-out format does not significantly affect welfare estimates.

8.7 CONCLUSIONS

The objective of this chapter is to investigate the effect of varying the presentation of the opt-out in a choice experiment to investigate public preferences for rainforest conservation. The results indicate a number of significant findings.

[225] In the SQ treatment the 95% confidence interval for mean willingness to pay are £431.77 to £801.62. In the CN treatment, the 95% confidence intervals for mean willingness to pay are £379.73 to £811.57.

Firstly, the form of the opt-out is not found to affect overall perceptions of choice task complexity (nor overall choice certainty). This is interesting since it would seem to contradict the main reason for using the CN format which is the potential for reducing task complexity (Colombo, Calatrava-Requena, & Hanley 2006).

Secondly, consistent with Kontoleon and Yabe (2003), the format of the opt-out is found to have a significant impact on choice behaviour, significantly affecting the overall proportion of opt-out responses and the frequency with which respondents choose to opt-out. Consistent with *a priori* expectations, significantly fewer opt-outs occur in the SQ treatment compared to the CN treatment.

Related to this, the form of the opt-out is found to have a significant effect on the likelihood of reporting an invalid response. Responses to the de-briefing questions reveal significantly fewer valid 'ALWAYS' opt-out respondents in the SQ treatment, suggesting that some respondents with genuine zero WTP viewed the opt-out as an 'unacceptable' choice in the SQ treatment. Validation of positive WTP responses seems to corroborate this finding. Indeed, significantly more invalid positive responses are observed in the SQ treatment compared to the CN treatment. This implies that a greater proportion of respondents in the SQ treatment did not choose the opt-out option even though this was their genuine preferred choice. These findings add some weight to the earlier hypothesis that in the current context, with an emotive issue and particularly negative baseline, presentation of the opt-out in terms of attributes and levels may lead respondents to perceive it as a socially unacceptable choice, exacerbating the potential for social desirability bias.

Fourthly, consistent with both Banzhaf, Johnson and Mathews (2001) and Kontoleon and Yabe (2003), it is noted that the form of the opt-out may have a significant effect on the salience of attributes. Two possible explanations for this are proposed, both of which may have important ramifications for future design. Firstly, for attributes which are defined in absolute terms, the removal of baseline information may seriously affect perceptions of what is encompassed in marginal changes, such that, in the absence of this reminder information, attribute levels may be interpreted solely on the basis of the information displayed in the improvement alternatives, (rather than in terms of the relative change from the baseline level). In the current context it is suggested that the significance of the SPECIES attribute in the CN treatment may indeed be the result of this effect. Secondly, after Olsen and Swait (1998) and as observed by Kontoleon and Yabe (2003), it is also noted that if the SQ treatment is perceived as a forced choice then this too may affect salience of attributes since respondents may use heuristics in deciding between the remaining inferior options, for example by focusing on the most important attributes at the

expense of the less important ones, such that in the SQ treatment TIME and SPECIES become insignificant.

With respect to the factors determining selection of the opt-out, further evidence is found (in a multivariate context) that the SQ format may yield forced choices since respondent certainty is significantly lower when respondents choose the opt-out compared to the other alternatives. In the CN treatment, selection of the opt-out is significantly influenced by perceptions of task complexity and by respondent fatigue effects. Both observations seem to indicate that this format may be associated with increased satisficing. Further, it is noted that choice certainty is significantly higher amongst opt-out choices compared to conservation alternative choices, this may either reflect a form of 'status quo' effect or it may simply be driven by 'satisficing' where respondents report higher choice certainty when opting-out since they avoid difficult trade-offs.

On a positive note, despite the significant impact of the opt-out format on choice behaviour, this is found to have only a limited effect on welfare estimates: only two attributes have significantly difference marginal prices and overall welfare measures are not significantly different.

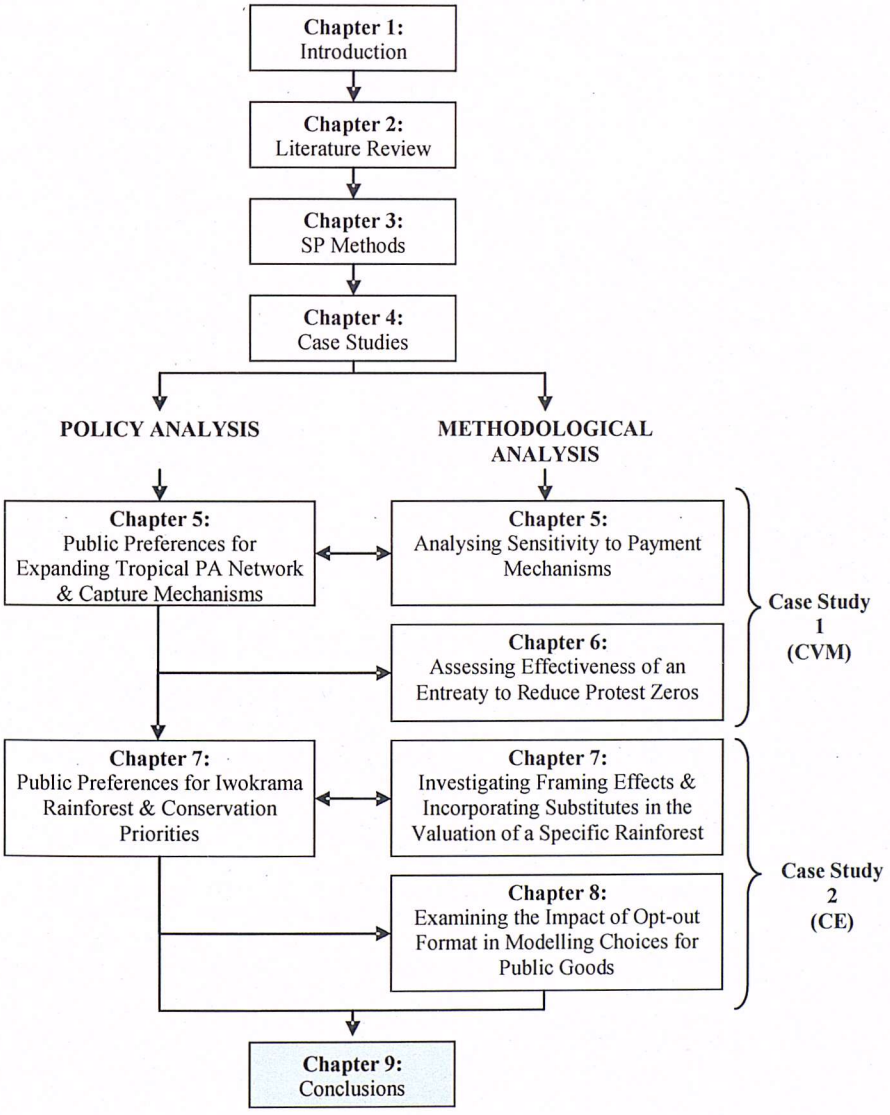
In summary, consistent with both Kontoleon and Yabe (2003) and Banzhaf, Johnson and Mathews (2001), this research finds that the form of the opt-out 'does matter'. Although, it is beyond the scope of the study to identify which format is superior, it is noted that different biases may arise with each of the formats tested. Whilst the SQ format is most commonly used in the non-market valuation literature, it may yield more invalid responses, reduce choice certainty in opt-out choices and if perceived as a forced choice may also result in use of heuristics (although to a lesser extent than the CN format). With respect to the CN format whilst it performs better with regard to the occurrence of protest and invalid responses, there is evidence to suggest that this format suffers from a greater occurrence of satisficing in the face of task complexity and fatigue effects.

It is recommended that further research is undertaken to explore more fully the potential occurrence of 'social desirability bias' and 'satisficing' in the context of both opt-out formats. Furthermore, this research highlights the importance of undertaking careful pre-testing in deciding which opt-out format to use in choice experiments to value public goods since it is not necessarily the case that the SQ format performs better.

Chapter 9: Conclusions

SUMMARY

This chapter presents the main conclusions of the thesis and reviews the implications both for policy and methodology. The chapter concludes with a discussion of the main strengths and weaknesses of the thesis and recommendations for future research.



9.1 PURPOSE OF THESIS

The purpose of this research is to learn more about the size and nature of the values attached to tropical biodiversity by distant populations, about how best to capture these values, and, to identify priorities for future policy responses, based on the exploration of public preferences. A concurrent aim is to develop the application of stated preferences techniques in the valuation of distant and unfamiliar public goods, through methodological contributions to the contingent valuation method and choice modelling approach.

This research comprises two case studies which explore public preferences amongst London residents for tropical biodiversity using stated preference techniques. The first case study focuses on a *broad-scale* change in the provision of tropical biodiversity by examining WTP for the expansion of the tropical protected area network. This is complimented by a second case study which investigates preferences for changes in the provision of a *specific* rainforest conservation programme.

This research represents the first *in-depth* study of UK preferences for tropical biodiversity, and addresses an important policy area which has previously been much overlooked in the stated preference valuation literature.

9.2 SUMMARY OF FINDINGS

The main findings may be summarised in terms of the key policy and methodological contributions.

9.2.1 Policy Findings

The key policy objectives focus on the demonstration of global non-use values; examination of public preferences for capture mechanisms and investigation of public preferences for policy responses and priority-setting.

Demonstration of Global Non-use Values

It has been noted throughout this thesis that there is a significant shortfall in funding for tropical conservation. One of the oft-cited solutions to the tropical conservation funding crisis, and more generally, to problem of biodiversity loss, is the demonstration and capture of the global non-use values attached to tropical biodiversity. Despite this, very little is known about the size of these benefits. In view of the scarcity of studies, one of the main objectives of this research is to gain a better understanding of the size and nature of non-use values for tropical biodiversity amongst developed country residents. This is achieved through two case studies.

Case study 1 investigates willingness to pay amongst London residents for a 30% expansion of the tropical protected area network. The results indicate that on average respondents are willing to pay, via a tax increase, higher prices, and a donation mechanism respectively, £85.26, £109.25 and £68.14 per person per annum to protect an additional 3.5 million km2 of tropical habitats and ecosystems (including savannahs, wetlands, islands, mountains and rainforests) and approximately one thousand species. The median WTP is £13.30, 16.56 and £10.90, respectively. Weighting the sample to represent (approximately) the target population of London yields mean WTP estimates of £45.03, £57.46, and £38.28 per person per annum and median WTP estimates of £7.91, £10.22 and £7.24 per person per annum, via the tax, higher prices and donation vehicles respectively.

Conservative estimates of the aggregate benefits to the London population (based on weighted median WTP) for the protected areas programme are £47.0 million, £60.7 million and £43.0 million per annum. Currently, the UK spends approximately £5.2 million per annum (via the GEF) on protected areas. Based on the burden-sharing adopted under the third GEF replenishment, the UK share of the costs of expanding the network equate to £415.2 million per annum. Thus, two important points follow: (1) the UK could meet approximately one-seventh, one-ninth and one-tenth of its share of the cost of expanding the protected area network through a higher price, tax increase or a voluntary donation vehicle, paid by London residents alone; and (2) if the programme were implemented, the UK would need to significantly increase its current spending on protected areas if payment are to be even slightly commensurate with potential UK benefits.

Case study 2 investigates willingness to pay amongst London residents for a specific conservation programme, Iwokrama Rainforest in Guyana. The results indicate that on average respondents are WTP £340.01 (using the lower bound of 95% confidence interval) in a one-off donation to protect the whole of Iwokrama Rainforest, an area of 371,000 hectares including 45 rare or endangered species, under sustainable use management approach with benefits to local communities, for next 15 years. Consistent, with the findings of case study 1, the results indicate that the conservation of Iwokrama rainforest generates sizeable benefits to residents in the UK. Although representative estimates of aggregate benefits are not available, the results suggest that the non-use benefits experienced by UK residents are likely to exceed actual UK transfers to date, which stand at £3.4 million (pers. comm. Watkins 2004). Furthermore, a rough approximation of the one-off aggregate *UK* benefits also suggests that the estimate provided by van Beukering and van Heeren (2003), using an indirect approach, of the *Global* non-use value of Iwokrama (calculated from real annual transfers in period 1999 to 2001) of

£45,900 per annum is a large underestimate of the potential non-use benefits provided by Iwokrama rainforest.

There is evidence of convergent validity between the two case studies (when taking into account the payment timescale) and of some sensitivity to scope. For example, annualizing the estimates of willingness to pay for conserving Iwokrama rainforest (case study 2) under a one-off donation over a 15 year period yields an estimated mean WTP of £28.52 per person per annum. In comparison, estimates of willingness to pay for conserving a much greater (and more diverse) amount of tropical biodiversity, that is, 3.5 million km2 of tropical habits and ecosystems, under an annual donation vehicle (case study 1) yields mean WTP of £68.14 per person per annum. Thus, estimates are of similar magnitude and, as expected, WTP for the larger change is greater than for the smaller change. It could be argued that the welfare estimates should show greater divergence if respondents were truly sensitive to scope (due to the large differences in actual scope), however, it should be noted that: (i) the relationship between willingness to pay and the quantity/quality of biodiversity is not necessarily a straightforward linear one (Pearce, Atkinson, and Mourato, 2006); (ii) the estimates are derived from different samples which, as noted, are not representative of the target population; correspondingly, key characteristics (reflecting observed and unobserved determinants of WTP) may differ between the samples; (iii) the estimates are derived through different valuation techniques (case study 1 uses CVM and case study 2 uses the CE approach), which have been found elsewhere to produce non-equivalent estimates (see, for example, Hanley et al 1998; Hanley, Wright and Adamowicz, 1998); and, finally, (iv) WTP estimates are specific to the particular valuation context: the goods in each case study are described in very different ways and include different attributes. Correspondingly, it is not necessarily the case that one would expect the WTP estimates of the smaller good to scale up to those of the larger good. It is however acknowledged that the conclusion of 'sensitivity to scope' is based on weak evidence, for example, there may be issues with some respondents attaching 'symbolic meaning' to the smaller scope good (Mitchell & Carson, 1989), or 'warm glow' effects (although this was not detected in follow-up questions) (Kahneman and Knetsch, 1992) or differences in perceived levels of realism (Carson 1997; Powe and Bateman, 2004) – the problem of scope and embedding in the valuation of distant and unfamiliar goods is an area requiring further research.

Across the two case studies, there was evidence of similarity in determinants of WTP. In all cases, these were in line with empirically driven expectations and those based on economic theory. For example, income, membership of environmental organisation, belief developed countries should pay, and ranking of environment (or rainforest) as number one priority for government spending, were in most cases positive significant determinants. Furthermore, respondent certainty in case study 1 was found to be relatively high.

Additionally, there is evidence of convergent validity between the current estimates and those of previous empirical research. For example, the estimates of WTP for expanding the tropical protected area network reported in Chapter 5 are comparable (when taking into account scope differences) with those reported by Svedsater (2000), Horton et al. (2003), and Hanley, Spash and Walker (1995) which also investigate UK preferences. Likewise, the estimates of one-off WTP for conserving Iwokrama rainforest reported in Chapter 7 seem large however annualising mean WTP over 15 years (the current project lifetime) provides a very similar estimate to that derived by Horton et al (2003) albeit for a smaller scope of change. Moreover, current estimates of the marginal prices of the social aspects of rainforest conservation (reported in Chapter 7) are very similar to those reported by Rolfe, Bennett and Louviere (2000) in the only other study to use a choice experiment approach to value preferences for rainforest conservation.

Overall, these results are tentatively encouraging for the future application of stated preference techniques to unfamiliar and distant goods - although as will be seen in the next section they are not without limitations, (for example, sensitivity exist to payment vehicles, opt-out format and so on), they offer the only way to directly estimate the non-use value for tropical biodiversity amongst distant beneficiaries. Moreover, the results reported here provide some evidence of validity amongst estimates.

Capturing Global Non-use Values

A key objective of this research is to investigate ways of capturing international WTP for tropical biodiversity, by exploring public preferences under different funding mechanisms and through attitudinal questions.

The results indicate that the vast majority of respondents, in both case studies, are in favour of developed countries like the UK helping developing countries to pay the costs of conserving tropical biodiversity. This is consistent with findings of the Horton et al (2001; 2003) and Kramer and Mercer (1997) and provides further support for the commitment made under Article 20 of the CBD (that developed countries should transfer additional and new resources to developing countries to meet global biodiversity objectives).

An additional question addressed by this research (and not considered elsewhere) was how the public would prefer the costs of tropical conservation to be shared. The results indicate that over half of the respondents prefer cost sharing based on a country's wealth, for example, along the lines of the ODA target of a fixed proportion of GNP. A much lower (although still significant) proportion supported the use of voluntary targets (that is, what a country is willing to pay) which is (arguably) the type of cost-sharing arrangement currently used in replenishments of the

GEF. Additionally, support was also expressed for a 'polluter pays' type arrangement. Notably, equal per capita payments received little support – although it was not spelt out to respondents that such schemes in reality would require only a very small contribution per person. Overall, non-responses rate to this question were very low indicating that the public do have opinions on how costs should be shared – more research should be conducted in this area.

In view of the urgent need to take action against biodiversity loss and the scale of the funding crisis, significant increases will be needed in financial transfers from developed to the developing countries if global conservation objectives are to be achieved. This means finding ways to capture international willingness to pay for tropical biodiversity. Indeed, Mitchell & Carson (1989) raise the question (albeit in a hypothetical situation) of whether there is a mechanism capable of capturing most of the public's WTP for a good. In the current context, this appears to be achieved through a 'higher prices' mechanism connected to the removal and redirection of perverse subsidies. This is interesting since there have been recent calls amongst conservationists and through the CBD for such action yet politically there may be many barriers. A more traditional funding mechanism based on existing tax increases would also accrue sizeable benefits, while a voluntary donation mechanism captures significantly lower benefits.

Public Preferences, Policy Responses and Priority Setting

Currently, priority-setting approaches are characterised by a lack of consensus, duplicated effort and crucially a dominance of expert opinion. More pertinently, we know little about how the public would prioritise amongst policy responses for tropical conservation. The key questions considered by this research are: how do the public prioritise conservation targets? How do the public weight biological and socio-economic indicators? And, crucially, are public priorities reflected in current approaches and policy responses?

As reported in Chapter 7, this research indicates contrary to Rolfe, Bennett and Louviere (2000) that the majority of respondents are not concerned with setting priorities for rainforest conservation on the basis of location, but, are concerned with prioritising on the basis of the condition of the rainforest. Indeed, the results suggest the public have strong preferences for prioritising rainforests that have already lost much of their original vegetation and are already fragmented, over rainforests that are untouched and in pristine condition. Overall, these results suggest that the priority setting approach used in Biodiversity Hotspots which focuses on vulnerable areas, may receive considerably greater public support than that used in the Tropical wilderness approach.

Interestingly, with regard to future policy responses the results indicate that socio-economic factors such as community impact and management approach are higher priorities than biological indicators such as area and species. Currently, the most prominent biodiversity priority-setting approaches focus mainly, and in some cases only, on biological indicators (and threat) (see Mittermeier et al. 1998;Myers 2003;Myers et al. 2000). The results reported here suggest that public priorities would be better reflected by approaches based on wider criteria incorporating socio-economic factors alongside biological factors (see for example, Veech 2003; Hughey et al 2003). The results also indicate the public have strong preferences for policy responses that permit the sustainable use of rainforest resources to generate revenues. This is consistent with findings reported elsewhere (see Swanson and Kontoleon 2003).

Understanding and Awareness of Biodiversity

A secondary objective of Chapter 5 is to assess understanding of the term 'biodiversity'. The majority of respondents were able to provide a related meaning, and a small proportion had relatively sophisticated levels of understanding. Notably, none of the respondents explicitly mentioned genetic diversity, suggesting awareness may be low for these types of benefits – indeed, as was noted later, genetic option values did not appear to be significant. Knowledge levels were found to increase with income and education, environmental membership and previous donations to environmental causes. Correspondingly, it should be noted that the sample was wealthier and more highly educated than the target population of London. More specifically, virtually all respondents had some previous knowledge and awareness about the conservation of tropical biodiversity and virtually all respondents were able to list causes of biodiversity loss. This is not unsurprising given the high levels of media coverage relating to wildlife conservation, and from a conservation perspective it is a positive outcome that much of the public are aware of these issues.

9.2.2 Methodological Findings

Although stated preference techniques are now widely applied and generally accepted as a methodology for valuing non-market environmental goods, there remain a number of unresolved issues. In particular, the estimation of preferences for tropical biodiversity amongst distant beneficiaries is a much overlooked area that presents a much more difficult challenge than the elicitation of values for local and familiar goods. A key area of interest for this thesis has been how to overcome some of the methodological issues that may arise. Although pertinent to the current context, the lessons learned may apply more generally too.

Payment Vehicle Effects

Consistent with the CVM literature there was considerable evidence of sensitivity towards payment mechanisms: (i) significantly higher protest zeros were reported under the tax vehicle compared to the higher prices vehicle; (ii) non-parametric estimates of WTP were significantly different between all three vehicles and in a multivariate context estimates of mean and median WTP were also significantly different between higher prices and donation vehicles; and, (iii) certainty was significantly different between payment vehicles. Notably, almost two-thirds of respondents stated different WTP amounts between payment vehicles. This was not unexpected given empirical findings elsewhere, but does highlight one of the challenges in measuring public preferences.

Understanding more about why respondents prefer certain payment mechanisms may help to guide researchers on the most sensitive aspects of payment vehicles which should be considered in CVM design. In the current study, the main drivers of sensitivity related to positive and negative attitudes towards the coerciveness of a vehicle, the appropriateness of the mechanism and interestingly the personal impact. Personal impact refers to perceptions towards the amount of effort required, the visibility of the payment, and whether it would be easily ignored. Interestingly, responses suggest that respondents may factor in a transaction charge for vehicles where effort was perceived to be great, that is, amongst voluntary payment vehicles. Lower WTP under donations vehicles may thus reflect this issue, as well as the more prominent free-riding concerns. Overall, the results provided empirical support for advice provided in the CVM literature regarding the key factors that should be considered in selecting payment vehicles. The importance of 'personal impact' was flagged as a new concern in this research.

The Effectiveness of an Entreaty in Reducing Protest Responses

Carson (1998) in considering the valuation of tropical rainforests highlights the potential difficulties of dealing with respondents that even with a plausible provision mechanism, regardless, have concerns about corruption and enforcement in developing countries. Such concerns may be manifested through protest responses. Correspondingly, Chapter 6 tests the effectiveness of an entreaty in helping to reduce protest zero responses which might arise due to such concerns. Protest responses present a number of problems for the CVM analyst – the critical issue is that it is impossible to impute the true value held for the good, correspondingly protests responses are excluded from final welfare analysis. This requires distinguishing between valid and protest zeros which itself presents challenges, as is evidenced in the current research. Correspondingly, this chapter makes an important, extremely useful and novel contribution to the valuation literature. Indeed, even though protest rates were not particularly high in this study (an encouraging result for the valuation of tropical biodiversity) the entreaty

was effective at reducing protest zero responses, in particular, at the second stage of the valuation. Notably, there was no evidence of the entreaty affecting positive WTP; however, it did have an unintended effect of the valid zeros. This was suggested to be the result of 'incorrectly' distinguishing between valid and protest zeros, which highlights one of the key problems with protest responses.

Framing Effects

The main methodological focus of Chapter 7 concerns the challenge in obtaining valid and accurate estimates of WTP for a specific rainforest, with regard to framing and the inclusion of substitutes. The results indicate, consistent with Blamey et al (2000) and Rolfe, Bennett and Louviere (2002; 2000), that the framing of choices about rainforest conservation does matter. Framing was found to have a significant effect on overall taste parameters. Framing was found to have a significant effect on marginal prices for some but not all attributes resulting in both increases and decreases in marginal prices depending on the attribute. As expected, the introduction of information about substitute rainforest investment opportunities (together with the removal of information about specific baseline conditions) results in significantly lower welfare estimates. The results suggest that respondents may be more comfortable when choices are framed in the context of substitute rainforests (as evidenced by the size of the scale factor and wider confidence intervals on the marginal prices in the BASE treatment).

Incorporating Substitutes

One of the problems inherent in asking the public to express their WTP for a *specific* rainforest conservation programme is the risk of upward bias due to super-informing respondents about the specific good in question. Choice modelling offers the potential to reduce this bias by enabling the good in question to be presented amongst other alternatives, ideally the substitutes that would be considered in a real life situation. The research reported in Chapter 7 uses a novel methodological approach to provide welfare consistent estimates of WTP for a specific rainforest in view of substitutes. The results illustrate that by combining and optimally scaling data taken from split samples, which separately examine preferences in the context of baseline conditions and the presence of substitutes; it is possible to derive absolute estimates of willingness to pay for a specific rainforest taking into consideration the effect of substitute rainforest investment opportunities. In view of the importance of ensuring respondents consider substitutes in decisions (as evidenced by significant difference in welfare estimates between the two treatments; and as recommended by the NOAA panel (see Arrow et al. 1993)) and mixed success reported in the CVM literature of simple reminder statements, this is a positive result. This approach should be further explored.

Opt-out Format

Consistent with both Kontoleon and Yabe (2003) and Banzhaf, Johnson and Mathews (2001), this research finds that the form of the opt-out 'does matter'. As expected, significantly fewer opt-out choices occurred in the SQ treatment compared to the CN treatment. Whilst the SQ format is most commonly used in the non-market valuation literature, it may yield more invalid responses, reduce choice certainty in opt-out choices and if perceived as a forced choice may also result in use of heuristics (although to a lesser extent than the CN format). In contrast the CN format performs better with regard to the occurrence of protest and invalid responses; however, there is evidence to suggest that this format suffers from a greater occurrence of satisficing in the face of task complexity and fatigue effects. On a positive note, despite the significant effect on choice behaviour, opt-out format appears to have only a limited effect on welfare estimates: only two attributes had significantly different marginal prices and overall welfare measures were not significantly different. Interestingly, one of the main reasons cited in the literature for using the CN format is the potential for reducing task complexity (see Colombo, Calatrava-Requena, & Hanley 2006), yet the results reported here find no evidence of a significant difference in overall perceptions of choice task complexity between the two formats (nor in overall choice certainty).

9.3 IMPLICATIONS OF FINDINGS

An overview of the main implications for the key policy and methodological findings is provided below:

9.3.1 Policy Implications

The achievement of the CBD's 2010 target of a significant reduction in the rate of biodiversity loss is expected to require substantial increases in the financial (and technical) resources available to the developing countries (CBD 2006a).

Although a note of caution should be expressed in directly applying the WTP estimates in policy analysis (due to evidence of methodological sensitivities, such as payment mechanism, opt-out format), the results reported do suggest the proposed expansion of the tropical protected area network would generate sizable benefits to UK residents. *If* similar benefits are found to accrue amongst residents in other developed countries[226], it seems there may be a strong case for implementing the proposed protected area expansion and moreover, that there may be substantial international willingness to pay, which, if captured, could be used to fund the

[226] Benefits transfer is beyond the scope of this study and indeed, not necessarily recommended given the findings of previous empirical cross-cultural comparisons (see Chapter 2).

programme. And, similarly, this applies to the conservation of Iwokrama Rainforest too (case study 2). Moreover, in the later context, the results tentatively suggest that aggregate UK benefits may greatly exceed existing transfers to date - given the intermittent problem of funding shortfalls faced by Iwokrama, this is a particularly pertinent finding.

On the above bases it is recommended that efforts are made by policy makers to ensure *global* non-use values are: (1) where possible incorporated into CBA; (2) evidenced in the size of financial transfers; and (3) used to stimulate market creation.

On the surface, the results suggest that the mechanism with the potential to capture *most* of the public's WTP for tropical biodiversity is a higher prices vehicle related to the removal and redirect of subsidies. Clearly, this funding mechanism presented a much simplified version of the reality of removing and redirecting subsidies, yet even so, it is interesting that it generated the greatest WTP. Notably, similar benefits would accrue through a tax vehicle – although more objections may be raised, as evidenced by the higher protest rates. However, even a donation vehicle would potentially generate a sizeable fund. From a policy perspective, the key message seems to be that the public are willing to pay more for tropical biodiversity; correspondingly, policymakers should consider the potential for implementing such mechanisms, and, more generally, to identify additional ways of capturing international willingness to pay, through for example market mechanisms which currently remain scarce at the international scale.

The purpose of investigating public preferences for priorities and policy responses is to contribute to policy setting through the provision of information that can be used alongside expert opinion. The most prominent biodiversity priority-setting approaches focus mainly, and in some cases only, on biological indicators (and threat) (see Mittermeier et al. 1998). The results reported here suggest that public priorities would be better reflected by approaches based on wider criteria incorporating socio-economic factors alongside biological factors (see for example, (see, for example, Hughey, Cullen, & Moran 2003;Veech 2003). Additionally, there is evidence to suggest the majority of the public support the 'sustainable use' of biodiversity over 'complete preservation', however, it is not the case that this thesis recommends that 'sustainable use policies' should be used everywhere, rather that in the current context respondents support the sustainable use of Iwokrama rainforest. This is an encouraging result for the IICRCD which has plans to embark on sustainable use – it suggests that non-use and use values are not necessarily in conflict, thus benefits may be maximised through a policy of sustainable uses.

Crucially, the main point is that the public do have views on priorities for conservation which may be useful in resolving policy dilemmas in priority-setting. Moreover, as noted, in many cases biodiversity loss is irreversible, and much of the funding comes from public money, thus there is a strong case to consider public preferences.

How should policy makers use these results? It is noted that there are cases where the results of stated preference studies have been used (or rather mis-used) without the necessary sensitivity analysis to elicit politically convenient results (Niemeyer and Spash, 2001). To this end, it is advised that the results contained within this thesis should be reviewed with all the stated caveats clearly acknowledged. It is expected that the results may be used qualitatively to signify the value attached to the conservation of tropical biodiversity by the general public in UK and their preferences for different types of conservation policy. The results may also be used quantitatively in cost benefit appraisals (for example, CBA of expanding the tropical protected area network), and in assessing the adequacy of current international transfers, subject to the reported caveats being fully acknowledged through some form of sensitivity analysis. More specifically, (after Christie et al. 2006), these results (and those of similar SP studies) could be used to define overall budgets for the specific case studies, but with experts assigning funds to specific targets, or alternatively, public preferences could be used to a greater extent in deciding upon allocation decisions, for example, the choice experiments results reported in case study 2 may be used to guide roughly how much funds go towards biological versus socio-economic aspects – however it is recommended that expert opinion be incorporated into any such decisions, as well as the preferences of more local stakeholders.

9.3.2 Methodological Implications

A key focus of the research is to develop the application of stated preference techniques in the valuation of tropical biodiversity and also in the wider environmental valuation context. Correspondingly, there are a number of recommendations for future stated preference applications:

In view of the findings of Chapter 5, that respondents may experience sensitivity on a number of different levels (for example, protests; certainty; stated WTP) towards different payment mechanisms; it is recommended that future stated preference applications seek to use the payment mechanism that is most likely to be used in the real life situation in order to ensure estimates are realistic, or alternatively, several different mechanisms should be used in order to apply sensitivity analysis.

The results reported in Chapter 6 provide further evidence, alongside the empirical work on cheap talk applications (see, for example, Cummings & Taylor 1999), to suggest that respondents may indeed be receptive to explicit instructions to report true willingness to pay rather than protest zeros. Although further testing of the effectiveness of entreaties is required, this research suggests that future applications of stated preference techniques may benefit from the inclusion of entreaties designed to encourage the statement of true WTP values.

The approach outlined in chapter 7 for establishing WTP estimates which explicitly factor in the effect of substitutes, through a split sample choice experiment approach, was found to be effective. Given findings in the CVM literature that simple reminders of budget and substitutes may not be effective (see, for example, Loomis, Gonzalezcaban, & Gregory 1994), this is a positive finding for the choice modelling approach, which offers the key advantage over CVM that it can be designed to ensure that respondents are explicitly required to consider substitutes.

Moreover, the results also indicate, consistent with Rolfe and Bennett (2001) that respondents may be more comfortable in making choices which are framed in the wider context of substitutes – correspondingly it is recommend that future SP studies try where possible to incorporate explicit consideration of substitutes into the valuation process.

In view of the findings of chapter 8, this research highlights the importance of undertaking careful pre-testing in deciding which opt-out format to use in choice experiments to value public goods since it is not necessarily the case that the SQ format performs better.

9.4 LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

9.4.1 Limitations of thesis:

The research contained in this thesis makes a number of valuable contributions to the existing empirical work, in particular methodologically, however a number of caveats should also be noted. These are reviewed firstly in terms of the overall research design and then by case study and chapter order.

Firstly, as discussed in the introductory chapter, a number of criticisms could be raised with regards to the overall research design, briefly, these include: the efficacy of using public preferences which may be uninformed to guide conservation policy decisions – in this respect it is recommended that the results are used in conjunction with expert opinion. There is also the problem that preferences may be dependent on respondent knowledge of the costs and benefits of conservation policy, correspondingly the stated values may be conditioned by the

information presented and at worst constructed from the valuation context such that true preferences are not revealed – explicit tests for such effects were beyond the scope of current investigation, correspondingly it is not possible to form a clear view on the potential effect, instead it is acknowledged that there may be a degree of preference construction, and other information effects which could impact on the resulting estimates. More generally, it is acknowledged that by reducing values to utilitarian preferences, this research omits other important dimensions of value, such as moral or rights-based concerns (after Niemeyer & Spash, 2001; Vatn & Bromley, 1994).

From a policy perspective, a limitation of the overall thesis is that it investigates the preferences of London residents only. For policy purposes it would be preferable to have estimates of aggregate *national* benefits since this would enable more complete comparisons with actual UK spending and would provide more accurate benchmarks for guiding future financial transfers. Unfortunately, due to budget constraints it was not possible to sample the entire UK population.

On a related note, the samples in both case studies were not representative of the target population of London. Attempts were made to address this in Chapter 5 through the use of a weighted regression, (although the weighting procedures were crude). The choice experiment results reported in Chapter 7 were not weighted due to software limitations. It is possible that a more representative sample may have been achieved through face-to-face survey although at prohibitive expense.

Case Study 1:

In relation to case study 1, the survey instrument was specifically designed to address respondent sensitivity to payment mechanism in the context of paying for tropical biodiversity. On this basis the payment vehicles were selected to represent funding mechanisms discussed in the policy literature. A number of points arise.

Firstly, the higher prices vehicle was designed to reflect possible price increases that might occur if subsidies were removed and redirected towards funding tropical conservation (following recent calls in the policy literature for such a mechanism). It seems reasonable to assume that price increases would result in certain instances where subsidies are removed, however, it is acknowledged that the description presented is a much simplified representation of the likely real-life scenario, and there may be additional knock on effects, positive and negative, that may in reality affect preferences. However, in view of the considerable interest in the policy literature in utilising redirected subsidies as a way for funding tropical conservation, it was of interest to see if this vehicle would receive support amongst the public.

Correspondingly, it should also be pointed out that it is not necessarily the case that the higher prices vehicle is the 'best' vehicle rather that in the current *context* it provides the highest estimates of WTP *out of the three presented.* This investigation of public preferences for funding tropical conservation provides *a first step* in assessing potential mechanisms for capturing international WTP. It is noted that other payment mechanisms could also have been chosen, for example, per capita green planet contributions, which may also yield similar high estimates to the higher prices vehicle – this is an area for future research.

Thirdly, on a methodological point, while a randomised CVM design was used to account for any potential sequencing effects in the use of a within-subject design to assess WTP under three vehicles, it is noted that sequencing effects may still occur.

Additionally, although the interval regression models reported in Chapter 5 provides a reasonable model fit, due to the relatively high level of zero bids it is possible that a spike model would provide a better model fit - this is a recommendation for future research.

Finally, the estimated aggregate benefits of expanding the protected area programme (reported in chapter 5) under each payment vehicle were based on a simple multiplication of weighted predicted median WTP by the adult population of London – this is a crude exercise.

Case Study 2

The survey instrument used in case study 2 was designed to estimate WTP for specific rainforest programme and to investigate framing effects. A number of points arise:

Firstly, in view of the research focus it would be desirable to have more information to assess the possibility of embedding effects in the BASE treatment, – that is, to assess whether respondents were valuing the specific rainforest or valuing the world's rainforests (this is of course the point of including the SUB treatment, however it would be useful to explicitly address this through attitudinal follow-up questions (indeed a follow-up question was included to examine this effect but only in second round of data collection, hence the results were not generalisable).

Secondly, despite thorough pre-testing of the bid ranges and a subsequently increase in bid range in the second round of data collection, there is evidence of the presence of fat-tails in the choice modelling results – this is a limitation.

It is noted that in the investigation of framing effects reported in chapter 7, degree level education was significantly different between the two treatments (SUB and BASE) (this is

surprising given the survey instrument were randomly allocated). Although this was not found to be a significant determinant of choice, it would be preferable to have sub-samples that were directly comparable across treatments in case of undetected effects.

A number of limitations are acknowledged in the design and analysis of the choice experiments used in Chapter 7. Firstly, a drawback of the experimental design used in the SUB treatment is that it is main effects only, meaning it cannot capture potential interaction effects which may arise between the policy labels and the attributes. Secondly, although all attributes in the SUB treatment choice model were significant, the econometric model had a low pseudo r2 of just 0.12. This may be due to the failure to capture interaction effects; alternatively, an improved model fit may be achieved through a different econometric specification (see below). Thirdly, ordinal coding was used on the two qualitative variables, MANAGEMENT and LOCAL COMMUNITIES, to avoid confounding the baseline levels with the opt-out category[227]; however, this assumes linearity which is not necessarily the case[228]. Fourthly, in Chapter 7, the presence of IIA violations in the BASE treatment is a limitation of this research. As noted it was not possible to run a nested logit model on the pooled data (which relaxes the IIA assumption) due to design differences between the two treatments. Correspondingly, the conditional logit specification was retained with the inclusion of interactions on the socio-demographic characteristics to improve fit. However, it is acknowledged that this is not ideal and that an alternative specification such as the mixed logit (random parameters) model would be preferred. The software necessary to run this type of model was unavailable to the researcher - correspondingly, this is a recommendation for future research.

Finally, with regard to Chapter 8 which investigates the effect of the opt-out format on choices, the survey instrument would benefit from the inclusion of more attitudinal questions to investigate perceptions towards the opt-out. This could help in establishing whether or not some respondents were susceptible to 'social desirability bias'. (A question was included to investigate this but only in the second round of data collection limiting the generalizability of the results, hence it was not reported).

[227] The problem of a confounded baseline occurs when the baseline levels for the qualitative variables do not feature in the 'do something' alternatives and there are two or more qualitative variables – it is recommended that the literature on choice experiment design highlights this potential problem. If the current design had incorporated the baseline levels in the 'do something' alternatives the problem of a confounded baseline would be avoided, however, this was not considered to be representative of the local policy situation - although in some instances, a decline in welfare amongst local communities has been associated with conservation programmes, consultation with local policy makers indicated that this was not a realistic scenario with respect to the local situation around Iwokrama forest. Additionally, it was not plausible to include the baseline conditions for the management attribute in a 'do something' alternative.

[228] The marginal prices (and welfare estimates) assume unit changes are equal between the levels.

Secondly, the model fit for the CN treatments was not great, pseudo r2 of 0.16 in the extended logit. As previous, it is possible that there may be a better fit with a mixed logit (random parameters model).

Thirdly, in Chapter 8, the two qualitative variables (MANAGEMENT and LOCAL COMMUNITIES) were coded as dummy variables rather than ordinal variables. Correspondingly, due to the problem of confounded baseline levels discussed earlier, it was not possible to isolate the marginal price for a move from the baseline conditions to the each of the two 'do something' levels – instead the coefficients on the dummy variable represent a move from confounded baseline and level 1 to level 2, for example, the marginal prices indicate the value of moving from 'non-sustainable use' (baseline and level 1) to sustainable use (level 2).

9.4.2 Future Research:

Firstly, and foremost, it is recommended that more studies are undertaken both within and beyond the UK to estimate the size of benefits to developed country residents of conserving tropical biodiversity. With some refinement the survey instrument used in case study 1 could be used to assess willingness to pay amongst the wider UK population and/or citizens in other developed countries.

Further work should be undertaken to explore potential public support for removal and redirection of perverse subsidies as a method for generating funding for tropical conservation, based on more robust modelling of the likely effects of subsidy removal. Moreover, further work should be undertaken to explore the potential benefits under other funding mechanisms, for example, per capita payment or some kind of 'polluter pays' scheme – this could be conducted through a split-sample design to avoid any potential sequencing effects noted above.

Future work should also investigate alternative ways of framing rainforests in order help to inform the priority-setting debate, for example, by examining more explicitly the effect of 'threat' on public preferences. And, also to explore, using designs which allow for interaction effects, how preferences for the multiple facets of rainforest conservation and policy responses may vary according to the circumstances or conditions of the rainforest (or other ecosystems).

In Chapter 7, it was established that the majority of respondents favoured a management policy of sustainable use over complete preservation. In light of comments in the policy literature regarding situations where sustainable use policies may not necessarily be 'sustainable', it would be interesting to further explore public perceptions towards 'risk' in achieving conservation objectives.

In relation to sensitivity towards payment mechanisms, further work should be undertaken to explore the implications of the perceived 'personal impact' of payment mechanisms, (in particular, with regard to donations vehicles) for example, whether it is possible to reduce the effects through careful design, and, also the importance of including personal impact details in the vehicle description, that is, by doing so can we obtain more realistic estimates of WTP?

On the basis of the findings reported in Chapter 6 it is recommended that further research is undertaken to improve understanding of the reasons behind zero WTP with particular attention on developing procedures to ensure the correct classification of protest and valid zeros, especially in survey formats which rely on self-reporting.

More importantly, in view of the success of the entreaty in reducing protest zeros it is recommended that future research focuses on testing the use of entreaties in other policy contexts (for example, in situations where higher protest rates may be likely) to explore the generalizability of these findings, and also, to explore the usefulness of entreaties in dealing with other types of bias in the contingent valuation literature.

On the basis of chapter 8, it is recommended that further research is undertaken to explore more fully the potential occurrence of 'social desirability bias' and 'satisficing' in relation to each of the opt-out formats presented. Further testing is also recommended in order to discern under which conditions each format performs better, for example, whether the SQ format is superior in less emotive policy contexts and where the baseline is not so negative.

The penultimate point relates to the use of CVM and CE techniques in the valuation of distant and unfamiliar goods such as those described in this thesis. While the results reported here suggest that these techniques are capable of reporting valid estimates of WTP – it would be interesting to compare these techniques with alternative valuation approaches, for example, more discursive valuation methods such as valuation workshops which facilitate group discussion and information exchange - these have been found elsewhere to aid the valuation of complex local goods (see Christie et al. 2006; Alvarez-Farizo and Hanley, 2006). An avenue for further research would be the adoption of a more explicit mixed qualitative/quantitative research approach, for example, through the use of a simultaneous 'market stall' study or post-survey debriefing exercises utilizing focus groups or cognitive interviews. This would have the advantage of enabling a more detailed investigation of the motivations and perceptions behind reported responses which a solely survey-based approach may miss out on, while also allowing

further tests of the validity of the SP results[229]. Correspondingly, a mixed approach may yield valuable results (see for example: Kenyon and Nevin, 2001), and in the current context would be particularly beneficial in: clarifying further the reasons for sensitivity towards payment vehicles (chapter 5); understanding more fully the effect of the entreaty on respondent decision process (chapter 6); and, in elucidating perceptions towards the opt-out formats (chapter 8). In addition, it would also be interesting to conduct a direct comparison of CE and CVM in valuing tropical biodiversity – this has not yet been conducted in this policy context; and, also to compare SP techniques with *actual* willingness to pay.

Finally, and importantly it should be noted that global non-use values for tropical biodiversity are not restricted to developed country residents. Correspondingly it is recommended that efforts are also undertaken to estimate the benefits of expanding the tropical protected area network to citizens in developing countries and countries in transition.

[229] A solely qualitative approach may be limited by a lack of representativeness and practical issues relating to recruitment of participant, high sensitivity to design and so on (Niemeyer and Spash, 2001). Quantitative value data is important because it may be easily incorporated into cost benefits analysis.

References

Aadland, D. & Caplan, A. J. 2003, "Willingness to pay for curbside recycling with detection and mitigation of hypothetical bias", *American Journal of Agricultural Economics*, vol. 85, no. 2, pp. 492-502.

Adamowicz, V. & Boxall, P. 2001, "Future Directions of Stated Choice Methods for Environment Valuation", Paper prepared for Choice Experiments: A new approach to environmental valuation, April 10, 2001, London, England.

Adamowicz, W., Boxall, P., Williams, M., & Louviere, J. 1998, "Stated preference approaches for measuring passive use values: Choice experiments and contingent valuation", *American Journal of Agricultural Economics*, vol. 80, no. 1, pp. 64-75.

Adger, N., Brown, K., Cervigni, R., & Moran, D. 2002, "Tropical Forest Values in Mexico," in *Valuing the Environment in Developing Countries: Case Studies*, D. Pearce, C. Pearce, & C. Palmer, eds., Edward Elgar, Cheltenham, pp. 329-357.

Adger, W. N., Brown, K., Cervigni, R., & Moran, D. 1995, "Total Economic Value of Forests in Mexico", *Ambio*, vol. 24, no. 5, pp. 286-296.

Ajzen, I. 1991, "The Theory of Planned Behaviour", *Organizational Behavior and Human Decision Processes*, vol. 50, pp. 179-211.

Alberini, A., Boyle, K., & Welsh, M. 2003, "Analysis of contingent valuation data with multiple bids and response options allowing respondents to express uncertainty", *Journal of Environmental Economics and Management*, vol. 45, no. 1, pp. 40-62.

Alberini, A., and Kahn, J. R. (eds.) 2006 *Handbook on Contingent Valuation*, Edward Elgar Publishing Ltd, Glos.

Alvarez-Farizo, B. and Hanley, N. 2006 Improving the process of valuing non-market benefits: combining citizens' juries with choice modelling *Land Economics*, 82 (3): 465-478.

Anderson, A. B., Basilevsky, A., & Hum, D. P. J. 1983, "Missing Data: A Review of the Literature," in *Handbook of Survey Research*, P. H. Rossi, J. D. Wright, & A. B. Anderson, eds., Academic Press Inc. (London) Ltd., London, pp. 415-494.

Ariely, D., Loewenstein, G. and Prelec, D. 2003 "Coherent Arbitrariness": Stable Demand Curves Without Stable Preferences, *The Quarterly Journal of Economics*, 118 (1): 73-105.

Arrow, K., Solow, R., Portney, P., Leamer, E., Radner, R., & Schuman, H. 1993, "Report of the NOAA panel on Contingent Valuation", *Federal Register*, vol. 58, no. 10, pp. 4602-4614.

Balmford, A. & Whitten, T. 2003, "Who should pay for tropical conservation, and how could the costs be met?", *Oryx*, vol. 37, no. 2, pp. 238-250.

Balmford, A., Bruner, A., Cooper, P., Costanza, R., Farber, S., Green, R. E., Jenkins, M., Jefferiss, P., Jessamy, V., Madden, J., Munro, K., Myers, N., Naeem, S., Paavola, J., Rayment, M., Rosendo, S., Roughgarden, J., Trumper, K., & Turner, R. K. 2002, "Ecology - Economic reasons for conserving wild nature", *Science*, vol. 297, no. 5583, pp. 950-953.

Balmford, A., Gaston, K. J., Blyth, S., James, A., & Kapos, V. 2003, "Global variation in terrestrial conservation costs, conservation benefits, and unmet conservation needs", *Proceedings of the National Academy of Sciences of the United States of America*, vol. 100, no. 3, pp. 1046-1050.

Banzhaf, M. R., Johnson, F. R., & Mathews, K. E. 2001, "Opt-out Alternatives and Anglers' Stated Preferences," in *The Choice Modelling Approach to Environmental Valuation*, J. Bennett & R. Blamey, eds., Edward Elgar, Cheltenham, UK, pp. 157-177.

Bateman, I. J., Carson, R. T., Hanley, N., Day, B. H., Hanemann, M., Hett, T., Jones-Lee, M., Loomes, G., Mourato, S., Ozdemiroglu, E., Pearce, D. W., Sugden, R., & Swanson, J. 2002, *Economic Valuation with Stated Preference Techniques A Manual* Edward Elgar, Cheltenham.

Bateman, I. J., Diamand, E., Langford, I. H., & Jones, A. 1996, "Household Willingness to Pay and Farmers' Willingness to Accept Compensation for Establishing a Recreational Woodland", *Journal of Environmental Planning and Management*, vol. 39, no. 1, pp. 21-43.

Bateman, I. J., Langford, I. H., Turner, R. K., Willis, K. G., & Garrod, G. D. 1995, "Elicitation and truncation effects in contingent valuation studies", *Ecological Economics*, vol. 12, no. 2, pp. 161-179.

Bateman, I. J., Langford, I. H., Willis, K. G., Turner, R. K., & Garrod, G. D. 1993, *The impacts of changing willingness to pay question format in contingent valuation studies: an analysis of open-ended, iterative bidding and dichotomous choice formats*, CSERGE Working Paper GEC 1993-05.

Bateman, I., Munro, A., Rhodes, B., Starmer, C., and Sugden, R. 1997 A Test of the Theory of Reference-Dependent Preferences, *The Quarterly Journal of Economics*, 112(2): 479-505.

Batsell, R. R. & Louviere, J. J. 1991, "Experimental Analysis of Choice", *Marketing Letters*, vol. 2, no. 3, pp. 199-214.

Bayon, R. 1999, *Financing Biodiversity Conservation Prepared for the IDB.*

Bayon, R., Lovink, J. S., & Veening, W. J. 2000, *Financing Biodiversity Conservation*, IADB, Washington, D.C..

Ben-Akiva, M. & Lerman, S. 1985, *Discrete Choice Analysis: Theory and Application to Travel Demand* MIT Press, Cambridge, Mass.

Bennett, J. & Adamowicz, V. 2001, "Some Fundamentals of Environmental Choice Modelling," in *The choice modelling approach to environmental evaluation*, J. Bennett & R. Blamey, eds., Edward Elgar, Cheltenham, Glos, pp. 37-69.

Bennett, J. & Blamey, R. 2001, "The Strengths and Weaknesses of Environmental Choice Modelling," in *The Choice Modelling Approach to Environmental Valuation*, J. Bennett & R. Blamey, eds., Edward Elgar, Cheltenham, pp. 227-242.

Bennett, J. W. 1984, "Using direct questioning to value the existence benefits of preserved natural areas", *Australian Journal of Agricultural Economics*, vol. 28, no. Nos 2 and 3 (August/December), pp. 136-152.

Bennett, J., Rolfe, J., & Morrison, M. 2001, "Remnant Vegetation and Wetlands Protection: Non-market Valuation," in *The Choice Modelling Approach to Environmental Valuation*, J. Bennett & R. Blamey, eds., Edward Elgar, Cheltenham, UK, pp. 93-114.

Bergmann, A., Hanley, N., & Wright, R. 2006, "Valuing the attributes of renewable energy investments", *Energy Policy*, vol. 34, no. 9, pp. 1004-1014.

Bergstrom, J. C., Boyle, K. J., & Yabe, M. 2004, "Trading taxes vs. paying taxes to value and finance public environmental goods", *Environmental & Resource Economics*, vol. 28, no. 4, pp. 533-549.

Birol, E., Karousakis, K., & Koundouri, P. 2006, "Using a choice experiment to account for preference heterogeneity in wetland attributes: The case of Cheimaditida wetland in Greece", *Ecological Economics*, vol. 60, no. 1, pp. 145-156.

Bishop, R. C. & Boyle, K. J. 1985, *The Economic Value of Illinois Beach State Nature Preserve* Final Report to the Illinois Department of Conservation, HBRS Inc., Madison, WI.

Bishop, R. C. & Heberlein, T. A. 1979, "Measuring Values of Extra-market Goods: Are Indirect Measures Biased?", *American Journal of Agricultural Economics*, vol. 61, pp. 926-930.

Bishop, R. C. & Welsh, M. P. 1992, "Existence Values in Benefit-Cost-Analysis and Damage Assessment", *Land Economics*, vol. 68, no. 4, pp. 405-417.

Bjornstad, D.J. and Kahn, J. R. (eds.) 1996 *The Contingent Valuation of Environmental Resources: Methodological Issues and Research Need*, Edward Elgar Publishing Ltd, Glos.

Blamey, R. & Bennett, J. 2001, "Yea-saying and Validation of a Choice Model of Green Product Choice," in *The Choice Modelling Approach to Environmental Valuation*, J. Bennett & R. Blamey, eds., Edward Elgar, Cheltenham, UK., pp. 178-201.

Blamey, R. K. 1998, "Trust, responsibility and the interpretation of contingent valuation results", *Australian Economic Papers*, vol. 37, no. 3, pp. 273-291.

Blamey, R. K., Bennett, J. W., Louviere, J. J., Morrison, M. D., & Rolfe, J. 2000, "A test of policy labels in environmental choice modelling studies", *Ecological Economics*, vol. 32, no. 2, pp. 269-286.

Blamey, R. K., Bennett, J. W., Louviere, J. J., Morrison, M. D., & Rolfe, J. C. 2002, "Attribute causality in environmental choice modelling", *Environmental & Resource Economics*, vol. 23, no. 2, pp. 167-186.

Blamey, R., Louviere, J. J., & Bennett, J. 2001, "Choice Set Design," in *The Choice Modelling Approach to Environmental Valuation*, J. Bennett & R. Blamey, eds., Edward Elgar, Cheltenham, UK, pp. 133-156.

Bockstael, N. E., Freeman, A. M., Kopp, R. J., Portney, P. R., & Smith, V. K. 2000, "On measuring economic values for nature", *Environmental Science & Technology*, vol. 34, no. 8, pp. 1384-1389.

Bonato, D., Nocera, S., & Telser, H. 2001, *The contingent valuation method in health care: An economic evaluation of Alzheimer's disease*, University of Bern, Discussion Paper. Available from: http://www.vwi.unibe.ch/publikationen/download/dp0101.pdf . Accessed 11 March, 2005.

Boxall, P. C., Adamowicz, W. L., Swait, J., Williams, M., & Louviere, J. 1996, "A comparison of stated preference methods for environmental valuation", *Ecological Economics*, vol. 18, no. 3, pp. 243-253.

Boyle, K. J. & Bishop, R. C. 1988, "Welfare Measurements Using Contingent Valuation - A Comparison of Techniques", *American Journal of Agricultural Economics*, vol. 70, no. 1, pp. 20-28.

Boyle, K. J. and Bergstrom, J. C. 1999. "Doubt, Doubts and Doubters: The Genesis of a New Research Agenda?" In I. J. Bateman and K. G. Willis, eds. *Valuing Environmental Preferences Theory and Practice of the Contingent Valuation Method in the US, EU, and Developing Countries*, Paperback edn. Oxford: Oxford University Press, pp. 183-206.

Boyle, K. J., Holmes, T. P., Teisl, M. F., and Roe, B. 2001. "A Comparison of Conjoint Analysis Response Formats." *American Journal of Agricultural Economics* 83(2):441-454.

Brooks, T. M., Bakarr, M. I., Boucher, T., da Fonseca, G. A. B., Hilton-Taylor, C., Hoekstra, J. M., Moritz, T., Olivier, S., Parrish, J., Pressey, R. L., Rodrigues, A. S. L., Sechrest, W., Stattersfield, A., Strahm, W., & Stuart, S. N. 2004, "Coverage provided by the global protected-area system: Is it enough?", *Bioscience*, vol. 54, no. 12, pp. 1081-1091.

Brooks, T. M., Mittermeier, R. A., da Fonseca, G. A. B., Gerlach, J., Hoffmann, M., Lamoreux, J. F., Mittermeier, C. G., Pilgrim, J. D., & Rodrigues, A. S. L. 2006, "Global biodiversity conservation priorities", *Science*, vol. 313, no. 5783, pp. 58-61.

Brown, T. C., Ajzen, I., and Hrubes, D. 2003. "Further Tests of Entreaties to Avoid Hypothetical Bias in Referendum Contingent Valuation." *Journal of Environmental Economics and Management* 46(2):353-361.

Bruner, A. Coordinator CI Conservation Economics Program, 12 September 2005.

Bruner, A. G., Gullison, R. E., & Balmford, A. 2004, "Financial costs and shortfalls of managing and expanding protected-area systems in developing countries", *Bioscience*, vol. 54, no. 12, pp. 1119-1126.

Bruner, A., Hanks, J., & Hannah, L. 2003, *How much will effective protected area systems cost?*, Center for Applied Biodiversity Science, Conservation International.

Bulte, E., Gerking, S., List, J. A., and de Zeeuw, A. 2005. "The Effect of Varying the Causes of Environmental Problems on Stated Willingness-To-Pay Values: Evidence from a Field Study." *Journal of Environmental Economics and Management* 49(2):330-342.

Burgess, N., Ricketts, T., Balmford, A., & Wild, R. 2004, "The 5th World Parks Congress, Durban", *Oryx*, vol. 38, no. 1, pp. 1-2.

Cameron, T. A. & Huppert, D. D. 1989, "OLS versus ML estimation of non-market resource values with payment card interval data", *Journal of Environmental Economics and Management*, vol. 17, no. 3, pp. 230-246.

Cameron, T. A. & Huppert, D. D. 1991, "Referendum Contingent Valuation Estimates - Sensitivity to the Assignment of Offered Values", *Journal of the American Statistical Association*, vol. 86, no. 416, pp. 910-918.

Carlsson, F., Frykblom, P., and Johan Lagerkvist, C. 2005. "Using Cheap Talk as a Test of Validity in Choice Experiments." *Economics Letters* 89(2):147-152.

Carson, R. T. & Mitchell, R. C. 1995, "Sequencing and Nesting in Contingent Valuation Surveys", *Journal of Environmental Economics and Management*, vol. 28, no. 2, pp. 155-173.

Carson, R. T. 1997. Contingent Valuation Surveys and Tests of Insensitivity to Scope, in R. J. Kopp, R.K., Pommerehne, W.W. and Schwarz, N. (eds.) *Determining the Value of Non-market Goods: Economic, Psychological and Policy Relevant Aspects of Contingent Valuation Methods*, Kluwer Academic Publishers: London.

Carson, R. T. 1998, "Valuation of tropical rainforests: philosophical and practical issues in the use of contingent valuation", *Ecological Economics*, vol. 24, no. 1, pp. 15-29.

Carson, R. T., Flores, N. E., & Meade, N. F. 2001, "Contingent Valuation: Controversies and Evidence", *Environmental and Resource Economics*, vol. 19, no. 2, pp. 173-210.

Carson, R. T., Louviere, J. J., Anderson, D. A., Arabie, P., Bunch, D. S., Hensher, D. A., Johnson, R. M., Kuhfeld, W. F., Steinberg, D., Swait, J., Timmermans, H., & Wiley, J. B. 1994, "Experimental Analysis of Choice", *Marketing Letters*, vol. 5, no. 4, pp. 351-368.

CBD 2000a, *Incentive Measures Further Analysis of the design and implementation of incentive measures*, CBD, Montreal, Note by the Executive Secretary COP5.

CBD 2000b, *Sustaining Life on Earth: How the Convention on Biological Diversity Promotes Nature and Human Well-Being* Secretariat of the Convention on Biological Diversity, Montreal.

CBD 2001a, *Global Biodiversity Outlook* Secretariat of the Convention on Biological Diversity, Montreal, Canada.

CBD 2001b, *Protected Areas Programme of Work*, Secretariat of the Convention on Biological Diversity; UNEP, Montreal.

CBD 2003a, *Protected Areas: Note by the Executive Secretary. Conference of the Parties to the Convention on Biological Diversity, Seventh Meeting. UNEP/CBD/COP/7/15.*, UNEP, Kuala Lumpur.

CBD 2003b, *Status and trends of, and threats to, protected areas. Revised notes by the Executive Secretary* Document UNEP/CBD/SBSTTA/9/5/Rev.1.

CBD 2005, *Options for Mobilizing Financial Resources for the Implementation of the Programme of Work by Developing Countries and Countries with Economies in Transition: Note by the Executive Secretary: Ad Hoc Open-Ended Working Group on Protected Areas*, CBD, Montreal, UNEP/CBD/WG-PA/1/3/26 April 2005.

CBD 2006a, *Catalogue of Funding Sources* Secretariat of the Convention on Biological Diversity, Montreal.

CBD 2006b, *Global Biodiversity Outlook 2* Secretariat of the Convention on Biological Diversity, Montreal.

Champ, P. A. & Bishop, R. C. 2001, "Donation payment mechanisms and contingent valuation: An empirical study of hypothetical bias", *Environmental & Resource Economics*, vol. 19, no. 4, pp. 383-402.

Champ, P. A., Alberini, A., & Correas, I. 2005, "Using contingent valuation to value a noxious weeds control program: the effects of including an unsure response category", *Ecological Economics*, vol. 55, no. 1, pp. 47-60.

Champ, P. A., Bishop, R. C., Brown, T. C., & McCollum, D. W. 1997, "Using donation mechanisms to value nonuse benefits from public goods", *Journal of Environmental Economics and Management*, vol. 33, no. 2, pp. 151-162.

Champ, P. A., Flores, N. E., Brown, T. C., & Chivers, J. 2002, "Contingent valuation and incentives", *Land Economics*, vol. 78, no. 4, pp. 591-604.

Chape, S., Harrison, J., Spalding, M., & Lysenko, I. 2005, "Measuring the extent and effectiveness of protected areas as an indicator for meeting global biodiversity targets", *Philosophical Transactions of the Royal Society B-Biological Sciences*, vol. 360, no. 1454, pp. 443-455.

Chapin, F. S., Zavaleta, E. S., Eviners, V. T., Naylor, R. L., Vitousek, P. M., Reynolds, H. L., Hooper, D. U., Lavorel, S., Sala, O. E., Hobbie, S. E., Mack, M. C., & Diaz, S. 2000, "Consequences of Changing Biodiversity", *Nature*, vol. 405, no. 11 May 2000, pp. 234-242.

Christie, M., Hanley, N., Warren, J., Hyde, T., Murphy, K., & Wright, R. 2004, "A valuation of biodiversity in the UK using choice experiments and contingent valuation". *Presented at Applied Environmental Economics Conference 2004, 26 March, Royal Society.*

Christie, M., Hanley, N., Warren, J., Murphy, K., Wright, R., & Hyde, T. 2006, "Valuing the diversity of biodiversity", *Ecological Economics*, vol. 58, no. 2, pp. 304-317.

Ciriacy-Wantrup, S. 1947, "Capital Returns from soil-conservation practises", *Journal of Farm Economics*, vol. 29., no. 4, pp.1181-1196.

Clemencon, R. 2000, *Financing Protection of the Global Commons*, GEF, Washington, DC., Working Paper 17 July 2000.

Clemencon, R. 2006, "What Future for the Global Environment Facility?", *Journal of Environment and Development*, vol. 15, no. 1, pp. 50-74.

Collins, D. 2003, "Pretesting Survey Instruments: An Overview of Cognitive Methods", *Quality of Life Research*, vol. 12, pp. 229-238.

Colombo, S., Calatrava-Requena, J., & Hanley, N. 2006, "Analysing the social benefits of soil conservation measures using stated preference methods", *Ecological Economics*, vol. 58, no. 4, pp. 850-861.

Conservation International. 2007 *Biodiversity Hotspots: Atlantic Forest*.[online] Available from: http://www.biodiversityhotspots.org/xp/Hotspots/atlantic_forest/Pages/default.aspx. [Accessed 8 July 2007].

Cooper, J. C., Hanemann, M., & Signorello, G. 2002, "One-and-one-half-bound dichotomous choice contingent valuation", *Review of Economics and Statistics*, vol. 84, no. 4, pp. 742-750.

Costanza, R., dArge, R., deGroot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., Oneill, R. V., Paruelo, J., Raskin, R. G., Sutton, P., & vandenBelt, M. 1997, "The value of the world's ecosystem services and natural capital", *Nature*, vol. 387, no. 6630, pp. 253-260.

Cummings, R. G. & Taylor, L. O. 1999, "Unbiased value estimates for environmental goods: A cheap talk design for the contingent valuation method", *American Economic Review*, vol. 89, no. 3, pp. 649-665.

Daubert, J. T. & Young, R. A. 1981, "Recreational Demands for Maintaining Instream Flows - A Contingent Valuation Approach", *American Journal of Agricultural Economics*, vol. 63, no. 4, pp. 666-676.

Davis, R. K. 1963, "Recreation planning as an economic problem", *Natural Resources Journal*, vol. 3, no. 2, pp. 239-249.

DEFRA 2002, *Survey of Public Attitudes to Quality of Life and to the Environment - 2001*, DEFRA, London.

Dhar, R. & Simonson, I. 2003, "The effect of forced choice on choice", *Journal of Marketing Research*, vol. 40, no. 2, pp. 146-160.

Dhar, R. 1997, "Consumer preference for a no-choice option", *Journal of Consumer Research*, vol. 24, no. 2, pp. 215-231.

Dillman, D. A. 1978, *Mail and Telephone Surveys: The Total Design Method* John Wiley & Sons Inc, USA.

Dillman, D. A. 2000, *Mail and Internet Surveys: The Tailored Design Method*, Second edn, John Wiley & Sons, Inc., USA.

Dixon, J. A. & Pagiola, S. 2001, "Local Costs, Global Benefits: Valuing Biodiversity in Developing Countries," in *Valuation of Biodiversity Benefits Selected Studies*, OECD, ed., OECD, pp. 45-58.

Dudley, N. & Parish, J. 2006, *Closing the Gap. Creating Ecologically Representative Protected Areas Systems for the Convention on Biologically Diversity*, Secretariat of the Convention on Biological Diversity, Montreal, CBD Technical Series 24.

Eken, G., Bennun, L., Brooks, T. M., Darwall, W., Fishpool, L. D. C., Foster, M., Knox, D., Langhammer, P., Matiku, P., Radford, E., Salaman, P., Sechrest, W., Smith, M. L., Spector, S., & Tordoff, A. 2004, "Key biodiversity areas as site conservation targets", *Bioscience*, vol. 54, no. 12, pp. 1110-1118.

Epp, D. & Gripp, S. "Reliability of Contingent Valuation Estimates", *Presented to the Annual Meeting of the Northeastern Agricultural and Resource Economics Association, Mystic, CT, June 21-23, 1993*, Department of Agricultural Economics and Rural Sociology, The Pennsylvania State University.

Ewers, R. M. & Rodrigues, A. S. L. 2006, "Speaking different languages on biodiversity", *Nature*, vol. 443, no. 7111, p. 506.

FAO 2000, *Global Forest Resources Assessment 2000* FAO, Rome.

Fischer, A. and Young, J.C. 2007 Understanding mental constructs of biodiversity: Implications for biodiversity management and conservation, *Biological Conservation*, 136 (2): 271-282.

Fishbein, M. & Ajzen, I. 1975, *Belief, Attitude, Intention and Behaviour* Addison-Wesley, Reading, MA.

Flatley, G. W. & Bennett, J. 1996, "Using Contingent Valuation to Determine Australian Tourists' Values for Forest Conservation in Vanuatu", *Economic Analysis and Policy*, vol. 26, no. 2, pp. 111-127.

Flint, M. 1992, "Biological Diversity in Developing Countries," in *The Earthscan Reader in Environmental Economics*, A. Markandya & J. Richardson, eds., Earthscan, London.

Foster, V. & Mourato, S. 2002, "Testing for consistency in contingent ranking experiments", *Journal of Environmental Economics and Management*, vol. 44, no. 2, pp. 309-328.

Foster, V. & Mourato, S. 2003, "Elicitation format and sensitivity to scope - Do contingent valuation and choice experiments give the same results?", *Environmental & Resource Economics*, vol. 24, no. 2, pp. 141-160.

Freeman, A. M. 1993, *The Measurement of Environmental and Resource Values Theory and Methods* Resources for the Future, Washington, D.C.

GEF 1998, *Valuing the Global Environment: Actions and Investments for a 21st Century*, GEF, Washington DC, USA.

GEF 2003, *Making a Visible Difference in Our World*, Global Environment Facility, Washington, DC..

GEF 2005, *Overview of Burden-Sharing For GEF Replenishments (Prepared by Trustee). Meeting for the Fourth Replenishment of the GEF Trust Fund, October 5-7, 2005, Rome, Italy* GEF/R.4/17.

GEF 2006, *GEF Biodiversity Strategy in Action*, Global Environment Facility, Washington, DC.

Ginsberg, J. 1999, "Global conservation priorities", *Conservation Biology*, vol. 13, no. 1, p. 5.

Gordon, J., Chapman, R., & Blamey, R. 2001, "Assessing the Options for the Canberra Water Supply: an Application of Choice Modelling," in *The Choice Modelling Approach to Environmental Valuation*, J. Bennett & R. Blamey, eds., Edward Elgar Publishing Ltd., Cheltenham, Glos., pp. 73-92.

Haab, T. C. & McConnell, K. E. 2002, *Valuing Environmental and Natural Resources: The econometrics of non-market valuation*, Paperback edn, Edward Elgar Publishing Limited, Cheltenham, Glos, UK.

Hailu, A., Adamowicz, W. L., & Boxall, P. C. 2000, "Complements, substitutes, budget constraints and valuation - Application of a multi-program environmental valuation method", *Environmental & Resource Economics*, vol. 16, no. 1, pp. 51-68.

Hanemann, W. M. 1991, "Willingness to Pay and Willingness to Accept: How Much Can They Differ?", *American Economic Review*, vol. 81, pp. 635-647.

Hanley, N., MacMillan, D., Wright, R. E., Bullock, C., Simpson, I., Parsisson, D., & Crabtree, B. 1998, "Contingent valuation versus choice experiments: Estimating the benefits of environmentally sensitive areas in Scotland", *Journal of Agricultural Economics*, vol. 49, no. 1, pp. 1-15.

Hanley, N., Mourato, S., & Wright, R. E. 2001, "Choice modelling approaches: A superior alternative for environmental valuation?", *Journal of Economic Surveys*, vol. 15, no. 3, pp. 435-462.

Hanley, N., Shogren, J. F., & White, B. 1997, *Environmental Economics in Theory and Practice* Macmillan Press Ltd., Basingstoke, Hampshire.

Hanley, N., Spash, C., & Walker, L. 1995, "Problems in Valuing the Benefits of Biodiversity Protection", *Environmental & Resource Economics*, vol. 5, pp. 249-272.

Hanley, N., Wright, R. E., & Adamowicz, V. 1998, "Using choice experiments to value the environment - Design issues, current experience and future prospects", *Environmental & Resource Economics*, vol. 11, no. 3-4, pp. 413-428.

Hardner, J. & Rice, R. 2002, "Rethinking Green Consumerism", *Scientific American*, vol. May 2002, pp. 89-95.

Hausman, J. & McFadden, D. 1984, "Specification Tests for the Multinomial Logit Model", *Econometrica*, vol. 52, no. 5, pp. 1219-1240.

Heckman, J. J. 1979, "Sample Selection Bias As A Specification Error", *Econometrica*, vol. 47, no. 1, pp. 153-161.

Hensher, D. A., Rose, J. M., & Greene, W. H. 2005, *Applied Choice Analysis: A Primer* Cambridge University Press, Cambridge.

Hicks, J. 1939, "The Foundations of Welfare Economics", *Economic Journal*, vol. 49, no. 196, pp. 696-712.

Hicks, J. 1943, "The Four Consumer Surpluses", *Review of Economic Studies*, vol. 11, no. 1, pp. 31-41.

HM Treasury 2004, *The Green Book: Appraisal and Evaluation in Central Government* The Stationary Office, London.

HM Treasury. Gross Domestic Product (GDP) Deflators: A User's Guide. www.hm-treasury.gov.uk . 2007. 30-5-2007.

Hoft, R. 2004, "Protected Area Coverage - A biodiversity indicator," in *Biodiversity Issues for Consideration in the Planning, Establishment and Management of Protected Area Sites and Networks*, Secretariat of the Convention on Biological Diversity, ed., Secretariat of the Convention on Biological Diversity, Montreal, pp. 128-131.

Holt, A. 2006, "Biodiversity definitions vary within the discipline", *Nature*, vol. 444, no. 7116, p. 146.

Horton, B., Colarullo, G., Bateman, I. J., & Peres, C. A. 2001, "Evaluating non-users willingness to pay for the implementation of a proposed National Parks Program in Amazonia: a UK/Italian Contingent Valuation Study", *CSERGE Working Paper ECM 02-01.*

Horton, B., Colarullo, G., Bateman, I. J., & Peres, C. A. 2003, "Evaluating non-user willingness to pay for a large-scale conservation programme in Amazonia: a UK/Italian contingent valuation study", *Environmental Conservation*, vol. 30, no. 2, pp. 139-146.

Hughey, K. F. D., Cullen, R., & Moran, E. 2003, "Integrating economics into priority setting and evaluation in conservation management", *Conservation Biology*, vol. 17, no. 1, pp. 93-103.

Hutton, J. M. & Leader-Williams, N. 2003, "Sustainable use and incentive-driven conservation: realigning human and conservation interests", *Oryx*, vol. 37, no. 2, pp. 215-226.

IUCN 2004a, *2004 IUCN Red List of Threatened Species* IUCN, Gland, Switzerland and Cambridge, UK.

IUCN 2004b, *The Durban Action Plan, Revised version, March 2004*. [online]. Available from: http://www.iucn.org/themes/wcpa/wpc2003/pdfs/outputs/wpc/durbanactionplan.pdf. [Accessed 22 Augugst, 2005].

Iwokrama International Centre for Rain Forest Conservation and Development (2007)) *The Establishment of Iwokrama Forest.* [Online] Available from: http://www.iwokrama.org/about/iwokramahistory.htm. [Accessed 30th April 2007].

Jakobsson, K. M. & Dragun, A. K. 1996, *Contingent Valuation and Endangered Species* Edward Elgar Publishing Ltd., Cheltenham, Glos.

Jakobsson, K. M. and Dragun, A. K. 2001. "The worth of a possum: Valuing species with the contingent valuation method" *Environmental & Resource Economics* 19(3):211-227.

James, A. N., Gaston, K. J., & Balmford, A. 1999, "Balancing the Earth's accounts", *Nature*, vol. 401, no. 6751, pp. 323-324.

James, A., Gaston, K. J., & Balmford, A. 2000, "Why private institutions alone will not do enough to protect biodiversity", *Nature*, vol. 404, no. 6774, p. 120.

James, A., Gaston, K. J., & Balmford, A. 2001, "Can we afford to conserve biodiversity?", *Bioscience*, vol. 51, no. 1, pp. 43-52.

Jorgensen, B. S. and Syme, G. J. 2000. "Protest Responses and Willingness to Pay: Attitude Toward Paying for Stormwater Pollution Abatement." *Ecological Economics* 33(2):251-265.

Jorgensen, B. S., Syme, G. J., Bishop, B. J., and Nancarrow, B. E. 1999. "Protest Responses in Contingent Valuation." *Environmental and Resource Economics* 14(1):131-150.

Jorgensen, B. S., Wilson, M. A., and Heberlein, T. A. 2001. "Fairness in the Contingent Valuation of Environmental Public Goods: Attitude Toward Paying for Environmental Improvements at Two Levels of Scope." *Ecological Economics* 36(1):133-148.

Kahneman, D. & Knetsch, J. L. 1992, "Valuing Public-Goods - the Purchase of Moral Satisfaction", *Journal of Environmental Economics and Management*, vol. 22, no. 1, pp. 57-70.

Kaldor, N. 1939, "Welfare Propositions of Economics and Interpersonal Comparisons of Utility", *Economic Journal*, vol. 49, pp. 549-552.

Karni, E. & Schwarz, A. 1977, "Search Theory: The Case of Search with Uncertain Recall", *Journal of Economic Theory*, vol. 16, pp. 38-52.

Kenyon, W. and Nevin, C. 2001 The use of economic and participatory approaches to assess forest development: a case study in the Ettrick Valley, *Forestry and Policy Economics*, 3: 69-80.

Kenward, R. 2004, "Incentive-based conservation: moving forward by changing the thinking", *Sustainable (Newsletter IUCN Sustainable Use Specialist Group)*, vol. September 2004, pp. 1-24.

Kling, C. L. & Thomson, C. J. 1996, "The implications of model specification for welfare estimation in nested logit models", *American Journal of Agricultural Economics*, vol. 78, no. 1, p. 103.

Kontoleon, A. & Swanson, T. 2002., "The WTP for Property Rights for the Giant Panda: Can a Charismatic Species be an Instrument for Conservation of Natural Habitat?". *Presented at BIOECON Workshop on Property Right Mechanisms for Biodiversity Conservation, Rome, Italy, 30 May 2002.*

Kontoleon, A. & Swanson, T. 2003, "The willingness to pay for property rights for the Giant Panda: Can a charismatic species be an instrument for nature conservation?", *Land Economics*, vol. 79, no. 4, pp. 483-499.

Kontoleon, A. & Yabe, M. 2003, "Assessing the Impacts of Alternative 'Opt-out' Formats in Choice Experiment Studies: Consumer Preferences for Genetically Modified Content and Production Information in Food", *Journal of Agricultural Policy Research*, vol. 5, pp. 1-43.

Kotchen, M. J. & Reiling, S. D. 1999, "Do reminders of substitutes and budget constraints influence contingent valuation estimates? Another comment", *Land Economics*, vol. 75, no. 3, pp. 478-482.

Koziell, I. 2001, *Diversity not Adversity: Sustaining Livelihoods with Biodiversity* International Institute for Environment and Development and Department for International Development (DFID), England.

Kramer, R. A. & Mercer, D. E. 1997, "Valuing a Global Environmental Good: US Residents' Willingness to Pay to Protect Tropical Rain Forests", *Land Economics*, vol. 73, no. 2, pp. 196-210.

Krosnick, J. A. 1991, "Response Strategies for Coping with the Cognitive Demands of Attitude Measures in Surveys", *Applied Cognitive Psychology*, vol. 5, pp. 213-236.

Krosnick, J. A., Holbrook, A. L., Berent, M. K., Carson, R. T., Michael Hanemann, W., Kopp, R. J., Cameron Mitchell, R. O. B. E., Presser, S. T. A. N., Ruud, P. A., Kerry Smith, V., Moody, W. R., Green, M. C., & Conaway, M. I. C. H. 2002, "The Impact of "No Opinion" Response Options on Data Quality: Non-Attitude Reduction or an Invitation to Satisfice?", *Public Opinion Quarterly*, vol. 66, no. 3, pp. 371-403.

Lancaster, K. 1966, "A new approach to consumer theory", *Journal of Political Economy*, vol. 84, pp. 132-157.

Lapham, N. P. & Livermore, R. J. 2003, *Striking a Balance: Ensuring Conservation's Place on the International Biodiversity Assistance Agenda* Conservation International, Washington, D.C.

List, J. A. 2001, "Do explicit warnings eliminate the hypothetical bias in elicitation procedures? Evidence from field auctions for sportscards", *American Economic Review*, vol. 91, no. 5, pp. 1498-1507.

Long, J. S. & Freese, J. 2000, *Scalar Measures of Fit for Regression Models* [online] Available at EconPapers http://fmwww.bc.edu/repec/bocode/f/fitstat.pdf [Accessed 17 October 2006], Working Paper, Indiana University.

Long.J.Scott 1997, *Regression Models for Categorical and Limited Dependent Variables. Advanced Quantitative Techniques in the Social Sciences Number 7.* Sage Publications, Thousand Oaks, CA.

Loomis, J. & Ekstrand, E. 1998, "Alternative approaches for incorporating respondent uncertainty when estimating willingness to pay: the case of the Mexican spotted owl", *Ecological Economics*, vol. 27, no. 1, pp. 29-41.

Loomis, J. 1987, "Expanding Contingent Value Sample Estimates to Aggregate Benefit Estimates: Current Practises and Proposed Solutions", *Land Economics*, vol. 63, no. 4, pp. 396-402.

Loomis, J. B. & White, D. S. 1996, "Economic benefits of rare and endangered species: summary and meta-analysis", *Ecological Economics*, vol. 18, no. 3, pp. 197-206.

Loomis, J., Gonzalezcaban, A., & Gregory, R. 1994, "Do Reminders of Substitutes and Budget Constraints Influence Contingent Valuation Estimates", *Land Economics*, vol. 70, no. 4, pp. 499-506.

Loreau, M., Oteng-Yeboah, A., Arroyo, M. T. K., Babin, D., Barbault, R., Donoghue, M., Gadgil, M., Hñuser, C., Heip, C., Larigauderie, A., Ma, K., Mace, G., Mooney, H. A., Perrings, C., Raven, P., Sarukhan, J., Schei, P., Scholes, R. J., & Watson., R. T. 2006, "Diversity without representation", *Nature*, vol. 442, no. 7100, pp. 245-246.

Louviere, J. & Hensher, D. A. 1982, "On the Design and Analysis of Simulated Choice or Allocation Experiments in Travel Choice Modelling", *Transportation Research Record*, vol. 890, pp. 11-17.

Louviere, J. & Woodworth 1983, "Design and Analysis of Simulated Consumer Choice or Allocation Experiments: an Approach Based on Aggregate Data", *Journal of Marketing Research*, vol. 20, pp. 350-367.

Louviere, J. J. 2001, "Choice Experiments: an Overview of Concepts and Issues," in *The Choice Modelling Approach to Environmental Valuation*, J. Bennett & R. Blamey, eds., Edward Elgar, Cheltenham, UK., pp. 13-36.

Louviere, J. J., Hensher, D. A., & Swait, J. D. 2000, *Stated Choice Methods Analysis and Application* Cambridge University Press, Cambridge, UK.

Louviere, J. Professor of Marketing, 20 August 2004.

Luce, R. D. 1959, *Individual Choice Behaviour: a theoretical analysis* Wiley, New York.

Lusk, J. L. 2003. "Effects of Cheap Talk on Consumer Willingness to Pay for Golden Rice." *American Journal of Agricultural Economics* 85(4):840-856.

Mace, G. M. & Hudson, E. J. 1999, "Attitudes toward sustainability and extinction", *Conservation Biology*, vol. 13, no. 2, pp. 242-246.

Mace, G. M., Balmford, A., Boitani, L., Cowlishaw, G., Dobson, A. P., Faith, D. P., Gaston, K. J., Humphries, C. J., Vane-Wright, R. I., Williams, P. H., Lawton, J. H., Margules, C. R., May, R. M., Nicholls, A. O., Possingham, H. P., Rahbek, C., & van Jaarsveld, A. S. 2000, "It's time to work together and stop duplicating conservation efforts ", *Nature*, vol. 405, no. 6785, p. 393.

Malhotra, N. K. 2004, *Marketing Research: An Applied Orientation*, Fourth Edition edn, Pearson Education Inc., Upper Saddle River, New Jersey.

Manoka, B. 2001, *Existence Value: A Re-appraisal and Cross-Cultural Comparison*, Economy and Environment Program for South-East Asia (EEPSEA), Singapore.

McFadden, D. 1974, "Conditional logit analysis of qualitative choice behaviour," in *Frontiers in Econometrics*, P. Zarembka, ed., Academic Press, New York.

McNeely, J. A. 1996, *Achieving Financial Sustainability in Biodiversity Conservation Programmes.* Presented to Inter-American Development Bank Workshop on Investing in Biodiversity Conservation, Washington D.C., 28 October 1996.

Menzel, S. 2003, "Financial Support for Developing Countries in Biodiversity Protection - Does the CBD Mechanism lead to an appropriate level of protection?", *Fourth BIOECON Workshop on the Economics of Biodiversity Conservation, Venice, Italy, 28 September 2003.*

Messonnier, M. L., Bergstrom, J. C., Cornwell, C. M., Teasley, R. J., & Cordell, H. K. 2000, "Survey response-related biases in contingent valuation: Concepts, remedies, and empirical

application to valuing aquatic plant management", *American Journal of Agricultural Economics*, vol. 82, no. 2, pp. 438-450.

Meyerhoff, J. & Liebe, U. 2006, *Status Quo Effect in Choice Modeling: Protest Beliefs, Attitutes and Task Complexity*, Presented at Environmental and Resource Economists 3rd World Congress, 3-7 July 2006, Kyoto, Japan.

Meyerhoff, J. and Liebe, U. 2006. "Protest Beliefs in Contingent Valuation: Explaining Their Motivation", *Ecological Economics* 57:583-594.

Millennium Ecosystem Assessment 2005, *Millennium Ecosystem Assessment, Ecosystems and Human Well-being: Synthesis* Island Press, Washington D.C.

Milner-Gulland, E. J. & Mace, R. 1998, *Conservation of Biological Resources*, 1st edn, Blackwell Science, London.

Mitchell, R. C. & Carson, R. T. 1989, *Using Surveys to Value Public Goods: The Contingent Valuation Method* Resources for the Future, Washington D.C., USA.

Mittermeier, R. A., Myers, N., Thomsen, J. B., da Fonseca, G. A. B., & Olivieri, S. 1998, "Biodiversity hotspots and major tropical wilderness areas: Approaches to setting conservation priorities", *Conservation Biology*, vol. 12, no. 3, pp. 516-520.

Mittermeier, R. A., Robles, G. P., & Mittermeier, C. G. 1997, *Megadiversity: Earth's Biologically Wealthiest Nations* CEMEX, Mexico.

Moran, D., Pearce, D., & Wendelaar, A. 1997, "Investing in biodiversity: an economic perspective on global priority setting", *Biodiversity and Conservation*, vol. 6, no. 9, pp. 1219-1243.

Morgan, D. L. & Krueger, R. A. 1998, *Focus Group Kit* SAGE, London.

Morrison, M. D., Bennett, J. W., & Blamey, R. K. 1997, *Designing Choice Modelling Surveys using Focus Groups: results from the Macquarie Marshes and Gwydir Wetlands Case Studies*, School of Economics and Management, University College, The University of New South Wales, Canberra, Australia, Research Report No. 5 August 1997.

Morrison, M. D., Blamey, R. K., and Bennett, J. W. 2000. "Minimising Payment Vehicle Bias in Contingent Valuation Studies." *Environmental and Resource Economics* 16(4):407-422.

Mountford, H. & Keppler, J. H. 1999, "Financing incentives for the protection of biodiversity", *Science of the Total Environment*, vol. 240, no. 1-3, pp. 133-144.

Mourato, S. 1999, *Essays on the Measurement of Environmental Externalities,* Degree of Doctor of Philosopy Department of Economics, University of London.

Mulongoy, K. J. & Chape, S. 2004, *Protected areas and biodiversity: An overview of the key issues*, CBD Secretariat, Montreal, Canada and UNEP-WCMC, Cambridge, UK.

Muriithi, S. & Kenyon, W. 2002, "Conservation of biodiversity in the Arabuko Sokoke Forest, Kenya", *Biodiversity and Conservation*, vol. 11, pp. 1437-1450.

Murphy, J. J., Stevens, T. H., and Weatherhead, D. 2005. "Is Cheap Talk Effective at Eliminating Hypothetical Bias in a Provision Point Mechanism?" *Environmental and Resource Economics* 30(3):327-343.

Myers, N. 1988, "Threatened Biotas: 'Hotspots' in Tropical Forests", *Environmentalist*, vol. 8, pp. 187-208.

Myers, N. 2003, "Biodiversity hotspots revisited", *Bioscience*, vol. 53, no. 10, pp. 916-917.

Myers, N., Mittermeier, R. A., Mittermeier, C. G., da Fonseca, G. A. B., & Kent, J. 2000, "Biodiversity hotspots for conservation priorities", *Nature*, vol. 403, no. 6772, pp. 853-858.

Myung, I. J. 2003, "Tutorial on maximum likelihood estimation", *Journal of Mathematical Psychology*, vol. 47, no. 1, pp. 90-100.

Neill, H. R. 1995, "The Context for Substitutes in CVM Studies - Some Empirical Observations", *Journal of Environmental Economics and Management*, vol. 29, no. 3, pp. 393-397.

Niemeyer, S., and Spash, C. L. 2001 Environmental valuation analysis, public deliberation, and their pragmatic syntheses: a critical appraisal, *Environment and Planning C: Government and Policy*, 19: 567-585.

Norton-Griffiths, M. & Southey, C. 1995, "The opportunity costs of biodiversity conservation in Kenya", *Ecological Economics*, vol. 12, no. 2, pp. 125-139.

Nunes, P. A. L. D. & van den Bergh, J. C. J. M. 2001, "Economic valuation of biodiversity: sense or nonsense?", *Ecological Economics*, vol. 39, no. 2, pp. 203-222.

O'Connor, C., Marvier, M., & Kareiva, P. 2003, "Biological vs. social, economic and political priority-setting in conservation", *Ecology Letters*, vol. 6, no. 8, pp. 706-711.

ODPM 2004, *The English Indices of Deprivation 2004 (revised). Report to the Office of the Deputy Prime Minister, London: Neigbourhood Renewal Unit.* HMSO, London.

OECD 2002, *The Handbook of Biodiversity Valuation: A guide for policymakers* OECD, Paris.

OECD 2003, *Harnessing Markets for Biodiversity: Towards Conservation and Sustainable Use.*, OECD, Paris, France, pp. 1- 136.

OECD. 2007 Exchange Rates for OECD Countries and Major Non-Member Economies. OECD.STAT [online] Available from http://stats.oecd.org/wbos/default.aspx?datasetcode=MEI_FIN. [Accessed 30 May 2007].

O'Garra, T. 2005, *Public Acceptability of and Preferences for Hydrogen Fuel Cell Buses and Refuelling Infrastructure,* Doctor of Philosophy, University of London and Imperial College London.

Olsen, D. G. & Swait, J. 1998, *'Nothing is Important'*, Working Paper, Faculty of Management, University of Calgary, Alberta, Canada..

Olson, D. M. & Dinerstein, E. 1998, "The global 200: A representation approach to conserving the Earth's most biologically valuable ecoregions", *Conservation Biology*, vol. 12, no. 3, pp. 502-515.

ONS 2005, *Region in Figures: London: Volume 9, Winter 2004/2005*, Office for National Statistics, London.

Ozanne, L. K. & Vlosky, R. P. 1997, "Willingness to pay for environmentally certified wood products: A consumer perspective", *Forest Products Journal*, vol. 47, no. 6, pp. 39-48.

Pagiola, S., Bishop, J., & Landell-Mills, N. 2002, *Selling Forest Environmental Services: Market-based Mechanisms for Conservation and Development* Earthscan Publications Limited, London.

Panayotou, T. 1997a "Taking Stock of Trends in Sustainable Development Financing Since Rio". *Paper prepared for the Fourth Expert Group Meeting on Financial Issues of Agenda 21 "Sustainable Development Finance: The Road Ahead, " 8-10 January, Santiago, Chile.* Environment Discussion Paper No. 31 November 1997

Panayotou, T. 1997b, "Win-win finance", *Our Planet*, vol. 9.1, no. Jun 1997.

Pearce, D. & Moran, D. 1994, *The Economic Value of Biodiversity* Earthscan Publications Ltd, London. pp 1–108.

Pearce, D. 1995, *Blueprint 4 Capturing global environmental value* Earthscan Publications Limited, London. pp.1-143.

Pearce, D. 1996, "Global Environmental Value and the Tropical Forests: Demonstration and Capture," in *Forestry, Economics and the Environment*, W. Adamowicz et al., eds., CAB International, Wallingford, UK, pp. 11-48.

Pearce, D. 1998, "Auditing the Earth", *Environment*, vol. 40, no. 2, pp. 23-28.

Pearce, D. 1999, "Can Non-market Values Save the World's Forests?," in *The Living Forest: Non-Market Benefits of Forestry*, C. Roper & A. Park, eds., The Stationary Office, London, pp. 5-16.

Pearce, D. 2007, "Do we really care about Biodiversity?", *Environmental and Resource Economics*, vol. 37, no. 1, pp. 313-333.

Pearce, D., Atkinson, G., & Mourato, S. 2006, *Cost-Benefit Analysis and the Environment* OECD, Paris, France.pp. 1-315.

Perrings, C. & Gadgil, M. 2002, *Sustainable and Equitable Use of Biodiversity: Protecting the Global and Local Public Good* CEDE/02-2002.

Pimm, S. L. & Raven, P. 2000, "Biodiversity - Extinction by numbers", *Nature*, vol. 403, no. 6772, pp. 843-845.

Pimm, S. L., Ayres, M., Balmford, A., Branch, G., Brandon, K., Brooks, T., Bustamante, R., Costanza, R., Cowling, R., Curran, L. M., Dobson, A., Farber, S., da Fonseca, G. A. B., Gascon, C., Kitching, R., McNeely, J., Lovejoy, T., Mittermeier, R. A., Myers, N., Patz, J. A., Raffle, B., Rapport, D., Raven, P., Roberts, C., Rodriguez, J. P., Rylands, A. B., Tucker, C., Safina, C., Samper, C., Stiassny, M. L. J., Supriatna, J., Hall, D. H., & Wilcove, D. 2001, "Environment - Can we defy nature's end?", *Science*, vol. 293, no. 5538, pp. 2207-2208.

Poe, G. L., Clark, J. E., Rondeau, D., and Schulze, W. D. 2002. "Provision Point Mechanisms and Field Validity Tests of Contingent Valuation." *Environmental and Resource Economics* 23, no. 1, pp. 105-131.

Pomerance 1999, *Coral Bleaching, Coral Mortality, and Global Climate Change*, Bureau of Oceans and International and Environmental and Scientific Affairs, US Department of State, US.

Powe, N. A. and Bateman, I. J. 2004 Investigating Sensitivity to Scope: A Split-Sample Test of Perceived Scheme Realism, *Land Economics*, 80 (2): 258-271.

Purcell, S. 2000. *Maximum Likelihood Estimation in Behavioural Genetics Interactive Models* [online]. UK: Institute of Psychiatry. Available from http://statgen.iop.kcl.ac.uk/bgim/mle/sslike_1.html. [Accessed 6 July 2006]

Randall, A. & Stoll, J. R. 1980, "Consumer's Surplus in Commodity Space", *American Economic Review*, vol. 71, pp. 449-457.

Reaves, D. W., Kramer, R. A., & Holmes, T. P. 1999, "Does question format matter? Valuing an endangered species", *Environmental & Resource Economics*, vol. 14, no. 3, pp. 365-383.

Richards, M. 1999, *'Internalising the Externalities' of Tropical Forestry: A Review of Innovative Financing and Incentive Mechanisms*, Overseas Development Institute, London, European Union Tropical Forestry Paper 1.

Robin, S., Wolcott, R., & Quintela, C. E. 2003, *Perverse subsidies and the Implications for Biodiversity: A review of recent findings and the status of policy reforms* Paper presented at the Vth World Parks Congress, September 2003, Durban, South Africa.

Rodrigues, A. S. L., Akcakaya, H. R., Andelman, S. J., Bakarr, M. I., Boitani, L., Brooks, T. M., Chanson, J. S., Fishpool, L. D. C., da Fonseca, G. A. B., Gaston, K. J., Hoffmann, M., Marquet, P. A., Pilgrim, J. D., Pressey, R. L., Schipper, J., Sechrest, W., Stuart, S. N., Underhill, L. G., Waller, R. W., Watts, M. E. J., & Yan, X. 2004a, "Global gap analysis: Priority regions for expanding the global protected-area network", *Bioscience*, vol. 54, no. 12, pp. 1092-1100.

Rodrigues, A. S. L., Andelman, S. J., Bakarr, M. I., Boitani, L., Brooks, T., Cowling, R., Fishpool, L. D. C., da Fonseca, G. A. B., Gaston, K. J., Hoffmann, M., Long, J. S., Marquet, P. A., Pilgrim, J. D., Pressey, R. L., Schipper, J., Sechrest, W., Stuart, S. N., Underhill, L. G., Waller, R. W., Watts, M. E. J., & Yan, X. 2003, *Global gap analysis: towards a representative network of protected areas*, Conservation International, Washington DC, Advances in Applied Biodiversity Science 5.

Rodrigues, A. S. L., Andelman, S. J., Bakarr, M. I., Boitani, L., Brooks, T. M., Cowling, R. M., Fishpool, L. D. C., da Fonseca, G. A. B., Gaston, K. J., Hoffmann, M., Long, J. S., Marquet, P. A., Pilgrim, J. D., Pressey, R. L., Schipper, J., Sechrest, W., Stuart, S. N., Underhill, L. G., Waller, R. W., Watts, M. E. J., & Yan, X. 2004b, "Effectiveness of the global protected area network in representing species diversity", *Nature*, vol. 428, no. 6983, pp. 640-643.

Rolfe, J. & Bennett, J. 2001, "Framing Effects," in *The Choice Modelling Approach to Environmental Valuation*, J. Bennett & R. Blamey, eds., Edward Elgar, Cheltenham, UK, pp. 202-224.

Rolfe, J., Bennett, J., & Louviere, J. 2000, "Choice modelling and its potential application to tropical rainforest preservation", *Ecological Economics*, vol. 35, no. 2, pp. 289-302.

Rolfe, J., Bennett, J., & Louviere, J. 2002, "Stated values and reminders of substitute goods: Testing for framing effects with choice modelling", *Australian Journal of Agricultural and Resource Economics*, vol. 46, no. 1, pp. 1-20.

Rollins, K. 1997, "Wilderness canoeing in Ontario: Using cumulative results to update dichotomous choice contingent valuation offer amounts", *Canadian Journal of Agricultural Economics-Revue Canadienne D Economie Rurale*, vol. 45, no. 1, pp. 1-16.

Rowe, R. D., D'Arge R.C., & Brookshire, D. S. 1980, "An Experiment on the Economic Value of Visibility", *Journal of Environmental Economics and Management*, vol. 7, pp. 1-19.

Ruitenbeek, H. J. 1992, "The rainforest supply price: a tool for evaluating rainforest conservation expenditures", *Ecological Economics*, vol. 6, no. 1, pp. 57-78.

Sagoff, M. 1988, *The Economy of the Earth: Philosophy, Law and the Environment* Cambridge University Press, Cambridge.

Samuelson, W. & Zeckhauser, R. 1988, "Status Quo Bias in Decision Making", *Journal of Risk & Uncertainty*, vol. 1, no. 1, pp. 7-59.

Schlapfer, F., Roschewitz, A., and Hanley, N. 2004. "Validation of Stated Preferences for Public Goods: A Comparison of Contingent Valuation Survey Response and Voting Behaviour." *Ecological Economics* 51, no. 1-2, pp.1-16.

Schulze, W. D., Brookshire, D. S., Walther, E. G., Macfarland, K. K., Thayer, M. A., Whitworth, R. L., Bendavid, S., Malm, W., & Molenar, J. 1983, "The Economic-Benefits of Preserving Visibility in the National Parklands of the Southwest", *Natural Resources Journal*, vol. 23, no. 1, pp. 149-173.

Secretary of State for International Development 2005, *House of Commons Hansard Written Answers for 27 June 2005: International Development: Global Environment Facility [7417]*, The United Kingdom Parliament, London.

Spash, C L. 2000 Ecosystems, contingent valuation and ethics: the case of wetlands re-creation, *Ecological Economics*, 34: 195-215.

Spash, C. L. & Hanley, N. 1995, "Preferences, information and biodiversity preservation", *Ecological Economics*, vol. 12, no. 3, pp. 191-208.

StataCorp 2003, *Stata Statistical Software: Release 8.0* Stata Corporation, College Station, TX.

Stevens, T., Echevarria, J., Glass, R., Hager, T. and More, T. 1991 Measuring the existence value of wildlife: what do CVM estimates really show? *Land Economics*, 6: 390-400.

Strazzera, E., Genius, M., Scarpa, R., and Hutchinson, G. 2003. "The Effect of Protest Votes on the Estimates of Willingness To Pay for Use Values of Recreational Sites." *Environmental and Resource Economics* 25(4):461-476.

Svedsater, H. 2000, "Contingent valuation of global environmental resources: Test of perfect and regular embedding", *Journal of Economic Psychology*, vol. 21, no. 6, pp. 605-623.

Swait, J. & Louviere, J. 1993, "The role of the scale parameter in the estimation and comparison of multinomial logit models", *Journal of Marketing Research (JMR)*, vol. 30, no. 3, p. 305.

Swanson, T. & Kontoleon, A. 2003., "Conflicts in Wildlife Conservation: Aggregating Total Economic Values". *Presented at Fourth BIOECON Workshop on The Economics and Biodiversity Conservation, Venice, Italy, 28 September 2003.*

Teisl, M. F. 2003, "What we may have is a failure to communicate: Labeling environmentally certified forest products", *Forest Science*, vol. 49, no. 5, pp. 668-680.

Teisl, M. F., Peavey, S., Newman, F., Buono, J., & Hermann, M. 2002, "Consumer reactions to environmental labels for forest products: A preliminary look", *Forest Products Journal*, vol. 52, no. 1, pp. 44-50.

Thaler, R. H. 1990, "Anomalies: Saving, Fungibility and Mental Accounts", *The Journal of Economic Perspectives*, vol. 4, no. No. 1 (Winter), pp. 193-205.

The World Bank 2003, *Cornerstones for Conservation: World Bank Assistance for Protected Areas, 1988-2003*, The World Bank, Washington, DC., 28423.

Turner, R. K., Bateman, I. J., Georgiou, S., Jones, A., Langford, I. H., Matias, N. G. N., & Subramanian, L. 2004, "An Ecological Economics Approach to the Management of a Multi-Purpose Coastal Wetland", *Regional Environmental Change*, vol. 4, pp. 86-99.

Tversky, A. and Kahneman, D., 1991, Loss Aversion in Riskless Choice: A Reference-Dependent Model, *Quarterly Journal of Economics*, 106(4): 1039-1061.

Van Beukering, P. & Van Heeren, 2003 Economic Valuation of the Iwokrama Forest, Guyana. 2003. Unpublished report.

Varian, H. R. 2003, *Intermediate Microeconomics: A Modern Approach*, Sixth edn, W.W. Norton & Company, Inc., London.

Vatn, A, and Bromley, D, 2004 Choices Without Prices Without Apologies, *Journal of Environmental Economics and Management*, 26 (2): 129-148

Veech, J. A. 2003, "Incorporating socioeconomic factors into the analysis of biodiversity hotspots", *Applied Geography*, vol. 23, no. 1, pp. 73-88.

Vreugdenhil, D. 2003, *Modeling the Financial Needs of Protected Area Systems: An Application of the "Minimum Conservation System" Design Tool.*, Paper presented at the Fifth Worlds Park Congress, 8-17 September 2003, Durban, South Africa, Paper presented at the Fifth Worlds Park Congress, 8-17 September 2003, Durban, South Africa.

Walsh, R. G., Loomis, J. B., & Gillman, R. A. 1984, "Valuing Option, Existence, and Bequest Demands for Wilderness", *Land Economics*, vol. 60, no. 1, pp. 14-29.

Wang, H. 1997, "Treatment of "Don't-Know" Responses in Contingent Valuation Surveys: A Random Valuation Model", *Journal of Environmental Economics and Management*, vol. 32, no. 2, pp. 219-232.

Watkins, G. Director General of Iwokrama International Centre for Rainforest Conservation and Development, 2 December 2004.

Wells, M. 1992, "Biodiversity Conservation, Affluence and Poverty - Mismatched Costs and Benefits and Efforts to Remedy Them", *Ambio*, vol. 21, no. 3, pp. 237-243.

Whitehead, J. C. & Blomquist, G. C. 1995, "Do Reminders of Substitutes and Budget Constraints Influence Contingent Valuation Estimates - Comment", *Land Economics*, vol. 71, no. 4, pp. 541-543.

Whittington, D 2002 Improving the Performance of Contingent Valuation Studies in Developing Countries, *Environmental and Resource Economics*, 22: 323-367.Wilkie, D. S., Carpenter, J. F., & Zhang, Q. F. 2001, "The under-financing of protected areas in the Congo Basin: so many parks and so little willingness-to-pay", *Biodiversity and Conservation*, vol. 10, no. 5, pp. 691-709.

Willis, G. 1999, *Cognitive Interviewing: A "How To" Guide*, Reducing Survey Error through Research on the Cognitive and Decision Processes in Surveys edn, Research Triangle Institute, Rockville, M.D.

Woodward, R. T. & Wui, Y. S. 2001, "The economic value of wetland services: a meta-analysis", *Ecological Economics*, vol. 37, no. 2, pp. 257-270.

Yaron, G. 2002, "The economic value of Mount Cameroon: alternative land use options," in *Valuing the Environment in Developing Countries: Case Studies*, D. Pearce, C. Pearce, & C. Palmer, eds., Edward Elgar, Cheltenham, pp. 406-443.

Appendix A.1: Focus Group Results (Case study 1)

SUMMARY

This report summarises the results of a focus group held in London in October 2005 in order to assess public understanding of the term biodiversity, attitudes towards conserving tropical biodiversity and preferences for different ways of funding tropical conservation. One of the main objectives was to test aspects of the contingent valuation scenario to be used in the main survey for case-study 1. The results indicated that public have some basic understanding of term biodiversity. In general the conservation of biodiversity was considered to be a 'good thing' although participants were not overly concerned about the problems of biodiversity loss. Consistent with survey findings elsewhere all participants believed that developed countries should help contribute to conservation of tropical biodiversity. The proposal to expand protected areas was considered by all participants to be a good thing although two participants held strong concerns about corruption and enforcement and effectiveness issues. Participants held diverging views on preferred payment vehicles.

OBJECTIVES

The main purpose of the focus group was to explore understanding and awareness of tropical biodiversity, attitudes towards funding conservation and to test aspects of the valuation scenario. The main discussion points consisted of:

(1) Understanding of the term 'biodiversity'
(2) Attitudes towards and awareness of biodiversity loss, and, motivations for conserving biodiversity
(3) Comprehension and attitudes towards the proposed valuation scenario.
(4) Attitudes towards developed countries helping to pay the costs of the proposed protected area programme, and default assumptions about how developed countries would raise the additional money needed to fund the proposed programme (who would pay, and where the money would come from).
(5) To identify WTP for proposed programme and possible protest responses
(6) To explore perceptions of the proposed payment vehicles and preferences for ways of contributing towards tropical conservation.

STUDY DESIGN

Since this case study builds on the findings of the earlier case-study (case study 2) on preferences towards rainforest conservation (and also because of budget constraints), only one focus group was conducted. This consisted of 5 participants, one moderator and an assistant and was held at the parish offices of St Augustine's Church in Kensington on 20th October 2005.

Recruitment and participation

Participants were recruited on a volunteer basis, by a representative of St Augustine's Church, and a £20 donation was made to the church as payment for their time. As participants already had a common bond through their membership of the church and due to the need to capture as many opinions as possible, efforts were made to recruit participants with varying socio-demographics[230]. The group consisted of three males and two females, one aged 25-35; two aged 45-60, and two aged 60+ years.

In the opening introduction participants were encouraged to join in the discussion, with noone dominating, and were advised that it was important to hear as many different things as possible. To further encourage participation, it was stated that there were no right or wrong answers and that the purpose of the discussion was to learn from the views and opinions of participants. Refreshments were also made available throughout the discussion, which have been found to help promote conservation and communication within focus groups.

The focus group lasted for one and a half hours, which is the typical length recommended in the marketing literature (Malhotra 2004). The discussion was tape-recorded, notes were also taken by the assistant and the moderator recorded brainstorming sessions on a flipchart.

Structure of session

At the start of the session participants were advised that discussion topic was about public attitudes towards conservation issues (participants had received no prior information regarding the topic). Following the introductions and warm-up questions, the discussion was structured according to Table 1.

A variety of techniques and materials were used including brainstorming, listing, open-ended questions, and information handouts. Efforts were made to avoid participants dominating the discussion and shy respondents were encouraged to participate using eye contact and by addressing them by name, as recommended by Morgan and Krueger (1998).

[230] The main reason for using groups with participants that are homogenous in terms of demographics is to help facilitate interaction (Bateman et al. 2002).

Table 1: Focus Group Discussion Points

Discussion Points	Questions asked
Comprehension of 'Biodiversity':	(1) What does the term 'biodiversity' mean to you if anything? Flipchart responses and read out definition of 'biodiversity' to clarify understanding.
Biodiversity Loss:	(2) How concerned are you about the information presented about biodiversity loss on a scale of 1 (not concerned at all) to 5 (very concerned)? Probe reasons why. (3) Do you think it's a good or bad thing to conserve biodiversity? Probe reasons why
Valuation scenario:	(4) What did you think of the proposed protected area programme? Probe: good idea or a bad idea; general perceptions.
Funding tropical conservation:	(5) How do you feel about developed countries, like the UK, helping to pay some of the costs if the proposal went ahead? General discussion.
Default assumptions regarding funding options:	(6) If the developed countries were to contribute, where do you think the money would come from?
Perceptions towards payment vehicles	(7) What did you think about each of the funding options? Brainstorming. (8) Which was your preferred option? Probe. (9) Are there any other ways you would prefer to contribute?

STUDY FINDINGS

The focus group findings were evaluated by examining the responses to the questions through thorough and repeated review of the written notes, flipchart notes and audiotape. Responses were analysed both subjectively and using coding to assess the frequency and extensiveness of comments.

Comprehension of term 'biodiversity'

All participants had previously heard the term 'biodiversity' and were able to provide a related meaning, with the exception of one participant who had previously heard the term but on probing felt unable to comment further. This contrasts with findings of a a recent UK survey of which found that only 26% had previously heard the term (DEFRA 2002). Comments included:

- 'variety of species'
- 'All living things'
- 'Contrasts within nature'
- 'Animals, birds everything'

These findings also contrast with those of Spash and Hanley (1995) who found that the most common occurrences of relevant terms were "don't know", "haven't a clue" and "nothing".

However, participants in the current study did appear to have only basic understanding of the term, and further probing suggested that some were not completely comfortable with the term. It wasn't until another participant gave an example of the loss of bird species in the UK that they really seemed to grasp the concept.

Prior to moving onto the next discussion topic participants were provided with a definition of the term biodiversity for clarification purposes. All participants were comfortable with the definition provided.

Attitudes towards Biodiversity Loss:

After presentation of some brief information on biodiversity loss which covered current species extinction rates and the main causes, participants were asked how concerned they were about the information presented, in the context of other issues facing society today (such as local problems like air pollution and other global issues such as poverty and climate change) using a scale from 1 (not concerned at all) to 5 (very concerned).

Responses were mixed, one participant was 'neutral' ('3'); two participants were between 'neutral and concerned' ('3-4') and one was 'concerned' ('4'), the other participant did not give an answer. Comments included:

- 'I think sometimes, not in every case, an extinction of a species would well indicate progress, the survival of the fittest for instance'
- 'I think a lot of this varies, it's a complex system if you change one bit a little bit you have dramatic results somewhere else, and you can have very unintended consequences without realising you've got it and without realising its happened until its too late, so you cant do anything about it ...'
- 'I'm thinking of pollution, ...and population..., more people is difficult , not enough space for species, and even things like councils they have policies that people cant put their garden rubbish into the refuse round so because of that I've paved my garden, this is a small way that its changed but its big in other areas, look at how council policies can affect the way biodiversity has declined.'

Further discussion about the information presented indicated that participants seemed to have good awareness of local changes in biodiversity, with four participants spontaneously providing examples of their own experience of biodiversity loss (within the UK), these included: loss of sparrows (to which there was general agreement); grey squirrels killing off the native red squirrels; habitat loss; and the loss of songbirds.

On further probing most participants seemed to consider the conservation of biodiversity to be a good thing, although motivations for this were varied:

- One participant considered it important to conserve wildlife since ' every animal is put on earth to do a certain purpose, for example certain birds that I know of eat certain grubs roots of the plants and so on, so every animal does have a use'
- Three participants commented on the need to avoid 'upsetting the balance of nature'
- Other positive reasons for conserving biodiversity included 'you don't want animals to lose their habitats and its nice to have the richness of life too'
- One participant had mixed views stating 'I don't think you can answer that one way or the other in the case of conservation , for instance who wants to conserve rats?!' but also stated 'For instance there are other things where its important to conserve, say particular herbs which we know are vital for the use in healing'

Interestingly none of the participants mentioned the importance of conserving biodiversity for future generations nor for its role in providing global ecosystem services, although the later was mentioned later in the discussion.

Perceptions of the Proposed Valuation Scenario

Participants were asked to read a handout describing the proposed valuation scenario, after which they were probed on their views on the level of information provided, their general perceptions of the protected area programme and any other issues they felt relevant. The handout included a verbal description of the problem, and the proposed solution, and a map depicting the location of the most urgent unprotected sites.

All respondents were happy with the level of information provided and with the wording of the scenario. All respondents were comfortable with the map – one commented that the Amazon did not appear to contain any priority sites, indicating that close attention was paid to the map.

All respondents indicated that in principle they were in favour of the proposed programme, however two respondents had concerns about the real-life provision scenario. This was not unexpected since Carson (1998) points out that one of the difficulties in assessing public preferences for global scale public goods is convincing respondents that implementation programmes can correct existing problems.

Both of these participants felt that it would be difficult to implement the programme due to: lack of money; other more pressing issues within domestic governments; lack of capacity to 'police' the areas; and, problems with corruption. One participant also commented on the underlying problem of market forces and high international demand from 'more advanced societies' for

mahogany and special hardwoods. These two participants were quite emphatic about the issues with policing and enforcing protected areas - they did not appear to have confidence that new protected areas would be effective citing examples of the 'flouting of laws against logging in the Amazon' and problem with 'Baboons in Africa'[231]. Interestingly these participants appeared to voice the exact concerns predicted by Carson (1998) in the context of valuing provision of international rainforest preservation, namely that 'there will be respondents who believe that even if they pay for the preservation plan, the tropical forests will still disappear as a result of corrupt politicians or simply the inability of some developing countries to enforce tropical rainforest preservation policies' (p. 25). Given commentary in the valuation literature it was expected that such comments may arise – one of the methodological objectives of the thesis is to test the effectiveness of an entreaty in curbing these effects, to address the potential problem of participants being distracted from focusing on the achievement of the outcomes, by real-life implementation issues.

The other three respondents held more positive views: one commented that 'I think it would be possible but it would depend very much on what the threat actually is'; another participant considered that if people were educated about the problems that they could 'try to conserve it from within the community' and a third participant agreed with this stating 'I believe that's been quite successful, a lot of natives you know want to catch the poachers'. Both of the participants who had held more negative views also agreed that increasing awareness would help but felt that funding from this would need to come from "the developed nations" and that local people would need to gain benefits from the protecting these areas through jobs as guards and so on.

Only one participant suggested that efforts should be concentrated on existing parks rather than expanding to new areas.

Attitudes towards developed countries helping to fund tropical conservation

Participants were asked how they felt about developed countries, like the UK, helping to pay some of the costs of the protected area programme.

All agreed that developing countries would not be able to afford the programme themselves and all agreed that developed countries should help contribute towards the costs. For example, one commented that "if it's going to happen it has got to be funded by the western industrialised countries otherwise it just can't happen" and another "they haven't got enough to feed their own people".

[231] However, both agreed in principle that 'something should be done'

The two participants that had previously expressed concerns about implementing the programme repeated their comments about corruption within governments. For example, one stated "that's got to be a concern because for every pound which these governments were putting to these places only a quarter will be applied to the problem". However, this participant also recognised that investing in the programme may be justified by the benefits received for example by helping with climate change and by better off people whom may wish to visit the areas, and also that if may help to raise standard of living in these countries (through tourism) which would make them more "self-supporting".

The other three participants agreed that it would be a good idea, although one with the reservation that 'if they are able to police their contributions so that its not wasted then it would be a good idea".

Interestingly three participants also linked the need for funding with trade issues. One participant made the point that the need for external funding could be reduced if developed countries changed their economic policies e.g. banning imports of special hardwoods which contributes to habitat loss and by ensuring imports from developed countries to developing countries were subjected to pricing tariffs to help local products remain competitive. This seemed to relate to a wider perception of development, that if poverty could be reduced and development encouraged e.g. by fairing trade policies, then this would reduce reliance on overseas aid and thus developing countries could afford to support such causes themselves. Alongside this one participant commented on the need to help sustain local farms; and another on the importance of supporting fair-trade.

Default assumptions regarding funding options

To inform the selection of the payment vehicles for the final questionnaire, participants were asked 'if developed countries do contribute, where do you think the money will come from?'. This question was presented prior to providing participants with information on the payment vehicles. The discussion indicated that default assumptions included all of the three vehicles pre-selected for the focus group valuation scenario, namely government contributions and charitable donations, and payment via higher prices for goods (although in this instance it was related to fair-trade).

- One participant considered that 'probably at least 50% would come from the government itself" and 'charitable donations specifically for that purpose e.g. plant a tree'.

- Two participants commented that governments were already making substantial contributions towards these issues
- Two participants considered that businesses would help contribute, although both seemed to be considering wider sustainability and development issues rather than specific funds for the protected areas, for example: 'large supermarkets are making agricultural development in these countries'
- One commented 'fair trade I suppose'.
- One participant mentioned specialist charities

On further probing about how governments would raise the funds two participants stated it would come from government income in taxes, one commenting "no easy way for the government to raise the funds as it would be in competition with other causes...no politician increase taxes if he can get away with it". Another participant considered it would come from "overseas aid budget".

WTP question

All participants were asked to complete individually a handout which described the three possible funding options and presented the three WTP, payment ladder questions. However, following an objection by one of the participants (no reason was provided however this participant had difficulty writing and it was surmised that this may have been the reason), none of the participants completed this exercise, and instead opinions were sought in a discursive manner.

Two participants expressed difficulty with stating how much they would contribute due to:

- 'too simplistic to break down';
- 'its difficult to decide until you were asked as wildlife isn't something you contribute to. Id need to make a snap decision at the time'.

In order to help address the later comment, the WTP question was subsequently revised in main questionnaire to provide a temporal context by including a date from which payment would begin.

Interestingly, one participant made the explicit comment that the payment amount would depend on the funding system. If the programme was funded through charitable donations this participant stated he would contribute since no one else would (due to free-riding) whilst for the tax vehicle this participant stated he would calculate what his 'fair-share' would be.

Participants were unwilling to disclose payment amounts verbally, thus added emphasis was placed on this during pilot-testing of the questionnaire

Perceptions towards the payment vehicles

Following presentation of the three funding options participants were asked which option would be their preferred way to contribute and the reasons why. Results indicated that participants had different views on the three options, and a variety of pros and cons were associated with each. The main comments are presented in Table 2.

Table 2: Summary of Perceptions Towards the Funding Options

	Comments on Funding Options:		
	Tax Increase	***Higher prices***	***Charitable Donation***
Pros	• *'government must be used to deliver'* • *'most of money can only come from government'* • *'it might only be £10 per person per year'* • *'realistic'* • *'it could be a small amount'* • *'best option if you can do it'*	• *'subsidies are not always a good thing'* • *'farmers get very hefty subsidies for food'* • *fairer trade is a good thing'*	• *'If its charity then id give as I'm the only way they are go ing to make money'* • *'charities are better, less wasteful and voluntary'* • *'charities are genuine'*
Cons	• *'Competition with other priorities'* • *'don't like paying taxes'* • *'no government would ever do that'* • *'not realistic – politicians are busy trying to reduce taxation'* • *'nobody's going to pay [increased taxes]'*	• *'British farmers are already in decline'* • *'should support our own farmers'* • *'its an international issue, there is no good us reducing our subsidies if cheap food comes in from France and Germany'*	• *'Too much money goes to bureaucracy money is wasted'* • *'most of the money goes into administration'*
Preferred	• ***1.5 votes (M & M)***	• ***2 votes (M & F)***	• ***1.5 vote (M)***

Notes: * M and F refer to male and female participants.

Perceptions about which was the 'preferred option' varied amongst the group and changed during the course of the discussion. For example, one participant stated that the tax vehicle was unrealistic but on further probing chose it as the best option. Overall, the higher prices (reducing subsidies) option was preferred by 2 participants whilst the tax and charitable donations options were preferred by 1.5 participants each. With respect to the later one participant wished to

contribute through both the donation and the tax options since he considered that the tax vehicle may be a cheaper way to contribute (fair-share calculation being roughly £10 per person) whilst the charitable donation would also 'need support'.

Consistent with evidence elsewhere, the tax vehicle received the most frequent negative comments (see Kramer & Mercer 1997), including generic objections such as 'I don't like paying taxes', 'nobody's going to pay' as well as comments that it was unrealistic to expect governments to increase taxes, and also that governments had other competing priorities for limited tax funds. Despite this, the tax vehicle also received the greatest number of positive comments, indeed one participant that considered it to be unrealistic, also considered it to be the 'best option if you can do it'. Whilst another participant emphatically disagreed with the point that 'nobody's going to pay' stating that 'if everybody paid it may only be a very small amount e.g. £10 per person PER YEAR, over the WHOLE YEAR!' Interestingly this participant seemed to invoke different strategies to 'work out how much it would be' across the different vehicles, invoking a fair-share type approach for the tax vehicle. Overall the main pros associated with the tax vehicle seemed to centre on: the need for government to be involved to ensure delivery, the advantages of greater coverage (since it was a compulsory vehicle), and that it was more realistic. The later point in particular is indicative of the contrasting viewpoints held by some of the participants.

It had been expected that 'reducing subsidies' vehicle may be too complex for some participants however trade and government policies had spontaneously entered the discussion at an earlier stage and most participants were comfortable with the concept. Only one participant sought clarification – querying whether subsidies came from taxes. Two participants considered reducing subsidies to be their preferred way of funding the programme even though one of these had expressed concern over the impact on UK farmers. In addition one participant made comment that subsidies are 'not always a good thing'. It was anticipated that some concerns would be expressed regarding the social impact of raising prices, for example on the elderly or lower income groups, however this did not appear to be an issue. In fact, participants seemed in favour of contributing to causes by paying more for goods in supermarkets, frequently citing the (positive) example of 'fair-trade'. An additional point was made that the reduction of subsidies was an international issue since 'no good UK doing it on its own and then cheap food comes in from France and Germany'. Efforts were subsequently made to address this in the main questionnaire by stating that 'governments' agree to redirect subsidies.

Two participants commented on charities being wasteful – interestingly one of these still chose donations as preferred method of contributing. In relation to the problem of wasting funds, another participant stated that this was 'a problem everywhere', even with reducing subsidies,

UN and so on. The main advantages associated with the donation vehicle were that charities are 'more genuine' and, as expected, that payments would be voluntary. Surprisingly no-one considered the voluntary nature of this option to be a barrier against choosing it ie on the basis that it would raise fewer funds. Conversely, one participant said that this would be exactly the reason why he would contribute through a donation!

At the end of the discussion participants were asked an additional question which sought to uncover their preferences on how they would most prefer to contribute given all the possible funding options raised during the discussion. One participant suggested a collecting tin on the street. Another participant suggested paying via fair trade type products although acknowledged that this wouldn't be sufficient to cover such a wide area. Three other participants agreed with the suggestion to pay via products in the supermarket, the main advantages were perceived as: 'such a small sum of money, worthy way of doing it'; 'a few pence adds up'; 'effortless'; 'just a few pence'.

SUMMARY

The main findings of the focus group are summarised below:

Participants were familiar with the term biodiversity and with the concept of biodiversity loss: all participants had previously heard the term biodiversity and most could provide basic definitions; most were also aware of local changes in biodiversity.

Participants were not overly concerned about the problem of biodiversity loss when considered alongside other issues facing society today. However, most participants considered the conservation of biodiversity to be a good thing, motivation varied from concerns about animal welfare to the need to avoid upsetting the balance of nature.

Participants had mixed views on the valuation scenario: three were positive, however, two held strong concerns about the problems of corruption in developed countries, and of enforcing the protected areas (effectiveness). This needs to be addressed in the next round of pre-testing, possibly through the use of some kind of entreaty.

All participants were agreed that if the proposed expansion were to go head it would only work if developed countries contributed. Interestingly none of the participants felt that developed countries should not contribute.

Participants did not feel able to state a WTP amount, although this outcome was somewhat led by a dominant participant refusing to 'play the game'. One participant felt that it would only be possible to come up with an answer when actually asked to part with money – to help overcome this a date for when payments would commence will be included in the main questionnaire.

Default assumptions about how the programme would be funded included the vehicles preliminarily selected for the valuation scenario, namely government taxes and charitable donations, and paying via higher prices for goods.

Participants held differing viewpoints on how the programme would best be funded and on the pros and cons of the three proposed funding options. Each of the options was considered by at least one participant to be a 'preferred' option. There was no clearly preferred option. Overall the tax vehicle received the most negative and positive comments compared to the other vehicles. The higher prices vehicle received the most votes as 'preferred option', and the voluntary, charitable donations option received the fewest negative comments.

Appendix A.2: Survey Instrument (Case study 1)

This appendix contains a copy of the survey instrument used in case study 1; it includes the entreaty script (the survey instrument was identical between treatments with the exception of the inclusion of the entreaty script immediately after the scenario description in one version).

Imperial College
London

Questionnaire Survey

What this survey is about...

This survey is part of a research project at Imperial College London to learn more about people's attitudes towards conservation issues.

What we ask you to do...

Please take the time to complete this questionnaire; it should only take about 20 minutes. There are no 'right' or 'wrong' answers and your opinions are very important to our research. All responses will be treated as strictly confidential.

To return the questionnaire ...

You can return the completed questionnaire by placing it in the enclosed pre-paid envelope and posting it to us at the below contact address by 24th February 2006. It would help us greatly if you could return the questionnaire as soon as possible.

Prize Draw...

By returning the completed questionnaire you will be entered into a prize draw to win one of three £20 Marks & Spencer's vouchers.

We hope you enjoy completing this questionnaire

Thank you very much for helping us with our survey

If you have any questions, please contact:
Sian Morse-Jones
Centre for Environmental Policy,
Imperial College London
4th Floor, RSM Building
Prince Consort Road
London SW7 2AZ
Tel: 0207 594 9313
E-mail: sian.morse-jones@imperial.ac.uk

TSD CT

Section A: General Issues

To begin we would like to explore your views on some general issues

A.1 Please rank the following 5 general issues from 1 to 5, in order of the importance you place on them receiving additional government funding, where 1 is highest priority and 5 is lowest priority:

INSERT RANK:	**RANK**
Crime	
Education	
National Health Service	
The Environment	
Poverty	

➔ Go to A.2

A.2 Now, please rank the following 4 environmental problems from 1 to 4, in order of the importance you place on them receiving additional funding, where 1 is highest priority and 4 is lowest priority:

INSERT RANK:	**RANK**
Air pollution	
Climate Change	
Waste management	
Loss of rare and endangered species and habitats	

➔ Go to A.3

A.3 Are you currently a member of any environmental organisations?

CIRCLE ONE ONLY

Yes	1	**➔ Go to A.3a**
No	0	**➔ Go to A.4**
Don't know	99	

A.3a If yes, which organisation(s):

.....

.....

➔ Go to A.4

A.4 Have you donated any time or money to an environmental cause in the last 12 months (excluding any membership fees related to Q A.3)?

CIRCLE ONE ONLY

Yes	1	➔ **Go to A.4a**
No	0	➔ **Go to A.5**
Don't know	99	

A.4a If yes, have you donated any time or money to any of the following environmental causes in the last 12 months?

CIRCLE AS APPROPRIATE:

Natural disaster appeal	1
Pollution campaign	2
Wildlife or nature conservation in the UK	3
Wildlife or nature conservation overseas	4
Other environmental cause (pls specify):	5

➔ **Go to A.5**

A.5 Have you ever visited a developing country?

CIRCLE ONE ONLY

Yes	1	➔ **Go to A.5a**
No	0	➔ **Go to Section B on page 3**
Don't know	99	

A.5a During your visit/s to developing countries have you ever visited a national park, protected area or conservation project?

CIRCLE ONE ONLY

Yes	1	➔ **Go to Section B on page 3**
No	0	
Don't know	99	

SECTION B: CONSERVATION ISSUES

This section explores your experiences and views on conservation issues.

B.1 **Before reading this questionnaire what did the term 'biodiversity' mean to you, if anything?**

.....

.....

.....

➔ Go to B.2

B.2 **Before reading this questionnaire, had you previously read, heard, or watched any programmes about the conservation of tropical wildlife and habitats?** For example programmes on the conservation of rhinos, rainforests and so on.

CIRCLE ONE ONLY:

Yes	1	**➔ Go to B.3**
No	0	
Don't know	99	

B.3 **Before reading this questionnaire, did you previously know anything about why tropical wildlife and habitats are being lost?** For example why rainforests are being lost and so on.

CIRCLE ONE ONLY

Yes	1	**➔ Go to B.3a**
No	0	**➔ Go to Information Box below**
Don't know	99	**➔ Go to B.3a**

B.3a Please list all the causes you have previously learnt about below:

.....

.....

.....

➔ Go to Information Box below

PLEASE READ THE FOLLOWING:

INFORMATION BOX:

Biodiversity is the term given to describe the variety of life on Earth, it includes the all the different species, the differences within species and the different ecosystems. It is often associated with the conservation of species and ecosystems.

Biodiversity provides a large number of goods and services that sustain our lives:

- foods, timber and fibres;
- local ecosystem services eg pollination of plants & natural flood protection;
- global ecosystem services eg the regulation of earth's climate;
- maintenance of the worlds genetic resources which provide key inputs to medicines & crops, eg 1 in 4 medicines have come from materials found in tropical forests; and
- cultural benefits through recreational activities, ecotourism and so on.

Global biodiversity is being lost at a rapid rate:

- current species extinction rates are estimated to be a thousand times higher than typical rates throughout life's history on earth due to human activities;
- many of the worlds ecosystems have already been lost, eg 20% of the worlds coral reefs have now been destroyed & only 6% of the world's tropical forests remain.
- The main causes are habitat loss, over-hunting, pollution, and climate change

What is being done...

In April 2002 over 190 countries committed themselves to the goal of "achieving by 2010 a significant reduction of the current rate of biodiversity loss". One of the key targets for meeting this goal is **the establishment of a representative network of protected areas.**

B.4 Most of the worlds remaining biodiversity is located in the developing countries which are economically very poor. Some policymakers argue that developed countries like the UK should help the developing countries to pay the costs of conserving their species and ecosystems. Do you agree with this?

CIRCLE ONE ONLY

Yes	1	➔ **Go to B.5**
No	2	
Don't know	99	

B.5 If the developed countries were to help, how do you think the costs should be shared between the developed countries?

CIRCLE ONE ONLY

Richer countries should pay more	1
All countries should pay the same amount per person	2
Countries with poorer environmental track records should pay more	3
Countries should pay on a voluntary basis ie they decide themselves how much	4
Other (pls specify):.....	5
Don't know	99

➔ **Go to Section C on Page 5**

SECTION C: VALUATION SCENARIO

Please read this information carefully, your opinions on this are very important to us:

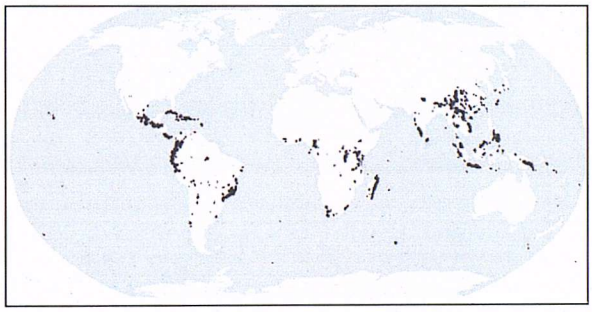
Background:

A recent assessment of the world's protected area network has revealed that important areas in almost all regions but **especially in the developing countries** are outside the network. These countries contain **most of the worlds remaining biodiversity** and are **experiencing the highest rates of loss.**

The Problem

- **New protected areas** are urgently needed across the **developing countries** to conserve the highest priority sites which are under severe threat (see map).
- These sites contain **approx 1000 species,** including many **rare and endangered species,** which are currently **not protected anywhere else in the world;** and,
- They include **many different types of habitat and ecosystem** including tropical rainforests, savannahs, wetlands, islands and mountain ecosystems.

Map: Location of urgent unprotected sites



Proposed Solution:

To conserve these sites the **existing network of protected areas needs to be expanded by 30%,** meaning **an additional 3.5 million km2 of tropical habitats and ecosystems** (an area approx 15 times the size of the UK) **need to be added to the network.**

Without this expansion many of these sites are likely to become **severely degraded** within the next 10 years, **meaning the loss of many species, habitats and ecosystems**

Costs: It will cost approx $11 billion per year for the next 10 years, to create & effectively manage the new protected areas; including ensuring local communities are no worse off.

Some of these costs can be met by the developing countries however **additional funding will be needed from the developed countries if the programme is to go ahead.**

Raising Funds

Developed countries, like the UK, are currently considering **3 ways** of raising the additional money required to set up the protected area programme. In order to work out which option is best, reliable estimates are needed of how much people would be willing to pay towards the programme, if anything, under each funding option.

In the following questions we would like you to state how much you would be willing to pay, if anything, under each of the 3 funding options.

But, before answering these questions, we would like to draw your attention to a particular problem that has been encountered in this study:

Some people have stated that they would not be willing to pay anything toward the protected area programme, **not because they do not value it** but because they **do not really think the proposed change is possible.**

For example, some people felt that **such a large expansion is not possible**; some **did not believe local institutions would be able to effectively manage the areas**; whilst others **simply did not trust** institutions in the developing countries to put all the money into the protected areas due to **corruption.**

These are **all valid** concerns however they do **unfortunately mean that it is not possible for us to tell whether or not these people place any value** on ensuring these tropical species and ecosystems are conserved.

To do this we need estimates from people about how much it is worth to them, if anything, to ensure the protected area programme takes place.

So, for the purposes of this valuation we ask that you set aside any doubts you may have about the plausibility of the proposed expansion and focus instead on how much it would mean to you if these outcomes were truly in place.

C.1 Firstly, do you think that, in principle, you would be willing to contribute something towards the cost of ensuring the proposed protected area programme goes ahead? Please bear in mind there are other causes such as poverty reduction, pollution and so on, as well other things that you may prefer to spend your money on. *CIRCLE ONE ONLY*

Yes	1	**➔ Go to Funding Option 1 on Page 7**
No	0	**➔ Go to D.4b at bottom of page 11**
Don't know	99	**➔ Go to Funding Option 1 on Page 7**

Funding Option 1: international Fund supported by tax increases

- The **UN** sets up an **International Fund** for **governments** to make voluntary contributions to the protected area programme
- **The UK contribution** would be met by **increasing the income tax rate**
- All of the money raised by this **tax increase** would go towards the protected area programme.

C.2 What is the maximum you would be willing to pay in increased income tax, per year for the next 10 years, starting from 31st March 2006, to ensure that the proposed protected area programme goes ahead? Please consider the amounts in the following table and place a tick next to the maximum amount you would be willing to pay. Please bear in mind your income constraints and try to be as realistic as possible.

Annual Payment	*TICK ONE ONLY*	
0		➔ Go to C.4
50p		
£1		
£2		
£5		
£7		
£10		
£12		
£15		➔ Go to C.3
£20		
£30		
£50		
£60		
£100		
£250		
Any other amount (pis specify):		

How certain are you that you would really pay this amount if asked?

CIRCLE ONE POINT ON THE SCALE BELOW:

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Absolutely uncertain										Absolutely certain

➔ Go to Funding Option 2 on Page 8

C.3 If you were not willing to pay anything, why was that?

.....

.....

.....

➔ Go to Funding Option 2 on page 8

Funding Option 2: Reducing subsidies meaning price increases

- Governments agree to **reduce spending on subsidies in agriculture, forestry, fishing, & mining sectors;**
- This would **free up government funds** which would go towards the costs of the protected area programme
- **But, since subsidies keep prices low this would mean price increases** for many **everyday goods**, including **basic food products.**

C.4 What is the maximum you would be willing to pay in higher prices, per year for the next 10 years, starting from 31st March 2006, to ensure that the proposed protected area programme goes ahead? Please consider the amounts in the following table and place a tick next to the maximum amount you would be willing to pay. Please bear in mind your income constraints and try to be as realistic as possible.

Annual Payment	*TICK ONE ONLY*	
0		➔ Go to C.7
50p		
£1		
£2		
£5		
£7		
£10		
£12		
£15		➔ Go to C.6
£20		
£30		
£50		
£60		
£100		
£250		
Any other amount (pls specify):		

How certain are you that you would really pay this amount if asked?

CIRCLE ONE POINT ON THE SCALE BELOW:

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Absolutely uncertain										Absolutely certain

➔ **Go to Funding Option 3 on page 9**

C.5 If you were not willing to pay anything, why was that?

.....

.....

.....

➔ **Go to Funding Option 3 on page 9**

Funding Option 3: Charitable Donations

- An **international charity**, like Worldwide Fund for Nature (WWF), sets up an International Fund for **ordinary members of the public to contribute by sponsoring** different aspects of the programme
- The fund would be **voluntary meaning only those that wish to contribute would do so**
- All money raised by the fund would go towards the protected area programme.

C.6 What is the maximum you would be willing to donate through this scheme, per year for the next 10 years, starting from 31st March 2006, to ensure that the proposed protected area programme goes ahead? Please consider the amounts in the following table and place a tick next to the maximum amount you would be willing to pay. Please bear in mind your income constraints and try to be as realistic as possible.

Annual Payment	*TICK ONE ONLY*	
0		→ Go to C.10
50p		
£1		
£2		
£5		
£7		
£10		
£12		
£15		→ Go to C.9
£20		
£30		
£50		
£60		
£100		
£250		
Any other amount (pls specify):		

How certain are you that you would really pay this amount if asked?

CIRCLE ONE POINT ON THE SCALE BELOW:

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Absolutely uncertain										Absolutely certain

→ **Go to Section D on Page 10**

C.7 If you were not willing to pay anything, why was that?

.....

.....

.....

→ **Go to Section D on Page 10**

SECTION D: FOLLOW-UP

D.1 Did you choose to pay different amounts toward the protected area programme under the different funding options? *CIRCLE ONE ONLY*

Yes	1	**➔ Go to D.1a**
No	0	**➔ Go to D.2**

D.1a If yes, why did you decide to pay more under some of the options rather than others? Please briefly explain:

.....

.....

.....

➔ Go to D.2

D.2 Overall, under which ONE of the 3 funding options would you most prefer to contribute to the protected area programme? *CIRCLE ONE ONLY*

Option 1: International fund/higher taxes	1	**➔ Go to D.2a**
Option 2: Redirecting subsidies/higher prices	2	**➔ Go to D.2a**
Option 3: Charitable donations	3	**➔ Go to D.2a**
Don't know	99	**➔ Go to D.3**

D.2a Please briefly explain why this is your preferred funding option in the space below:

.....

.....

.....

➔ Go to D.3

D.3 Now, using the below key, please indicate which of the funding options you consider to rate highest for each of the following characteristics:

KEY:	*NUMBER*
Option 1: International fund/higher income taxes	= 1
Option 2: Redirecting subsidies/higher prices	= 2
Option 3: Charitable donation scheme	= 3
Don't know	= 99

INSERT ONE NUMBER FROM KEY AGAINST EACH CHARACTERISTIC:

Which option do you think is the...?	**NUMBER**
Fairest way to raise funds	
Most appropriate way to raise funds	
will be most successful in raising funds	
Is realistically most likely to be used to fund the programme	

➔ Go to D.4

D.4 Now, we would like to explore why you were or were not willing to pay something towards the protected area programme:

- **If you were willing to pay something towards the protected area programme under at least one of the funding options presented in questions C.2, C.5 and C.8, please ➔go to question D.4a;**

OR

- **If you were NOT willing to pay anything under ALL of the 3 options ie you ticked 0p in question C.2 AND C.5 AND C.8 please ➔ go to question D.4b.**

D.4a Which ONE of the below best describes your MAIN reason for choosing to pay something towards the protected area programme? *CIRCLE ONE ONLY*

I am very concerned about nature and wildlife conservation	1
I may wish to visit these places in the future	2
For spiritual/religious reasons	3
So that local people can benefit from these areas	4
To preserve genetic resources for future use in medicines	5
For the local services provided eg flood protection & nutrient cycling	6
For global ecosystem services provided ie climate regulation	7
For moral reasons ie these species/ecosystems have a right to exist	8
So that future generations can enjoy these species/ecosystems	9
I get a sense of satisfaction from contributing to good causes	10
To preserve species and ecosystem richness and diversity	11
I value knowing these species and ecosystems exist	12
I don't believe I would really have to pay	13
Other: please specify.....	14

➔ Go to D.5

D.4b Which ONE of the below best describes your MAIN reason for choosing NOT to pay something towards the protected area programme? *CIRCLE ONE ONLY*

I don't believe that the protected area programme would work	1
I don't care about this issue	2
I cannot afford to contribute	3
This is a problem for tropical developing countries not the UK	4
Not a problem: the worlds species have been changing for million of years	5
I prefer to spend my money on other things	6
I prefer to give my money to other causes	7
I needed more information than was provided	8
Other (pls specify):.....	9

➔ Go to D.5

D.5 Assuming sufficient funding is generated, how iikely do you think it is that the proposal to expand the existing network by 30% (3.5million km2) will go ahead?

CIRCLE ONE ONLY

Very unlikely	1	➔ Go to D.5a
Unlikely	2	
Neutral	3	➔ Go to D.6
Likely	4	
Very Likely	5	

D.5 a If you circled 'very unlikely' or 'unlikely' please briefly explain why:

.....

.....

➔ Go to D.6

D.6 Assuming the new protected areas are created, how likely do you think it is that local institutions will be able to effectively manage these sites?

CIRCLE ONE ONLY

Very unlikely	1	➔ Go to D.6a
Unlikely	2	
Neutral	3	➔ Go to D.7
Likely	4	
Very Likely	5	

D.6 a If you circled 'very unlikely' or 'unlikely' please briefly explain why:

.....

.....

➔ Go to D.7

D.7 Overall, assuming the new protected areas are created how likely do you think it is that they will lead to the long-term conservation of these species and ecosystems?

CIRCLE ONE ONLY

Very unlikely	1	➔ Go to D.7a
Unlikely	2	
Neutral	3	➔ Go to Section E on page 13
Likely	4	
Very Likely	5	

D.7 a If you circled 'very unlikely' or 'unlikely' please briefly explain why below:

.....

.....

➔ Go to Section E on Page 13

Section E: Socio-demographics

The following questions are important for our research; they are to ensure that we have a good cross-section of London's population. The information provided will be used for statistical purposes only and will remain confidential.

E.1 What is your gender? *CIRCLE ONE ONLY*:

Male	1	Female	0

E.2 What is your age group?

CIRCLE ONE ONLY

18-19 years	1	45-59 years	5
20-24 years	2	60-64 years	6
25-29 years	3	65-74 years	7
30-44 years	4	75 years or more	8

E.3 How many children under the age of 16 live in your household?

CIRCLE ONE ONLY

No children	0	3 children	3
1 child	1	4 or more Children	4
2 children	2		

E.4 Which of the below best describes your living arrangements?

CIRCLE ONE ONLY

Private Renting	1	Living with Parents	4
Council Renting	2	Housing Association	5
Home owner	3	Other (please specify):	6

E.5 What is your current work status?

CIRCLE ONE ONLY

Self-employed	1	Unemployed	5
Employed full-time (>30 hrs/week)	2	Student	6
Employed part-time (<30 hrs/week)	3	Retired	7
Looking after home full-	4	Unable to work	8

E.6 Do you or does anyone in your household, own a car?

CIRCLE ONE ONLY:

Yes	1	No	0

E.7 What is the highest level of education that you have obtained so far?

CIRCLE ONE ONLY

Primary	1	Professional qualification of degree level	5
O level/GCSE/GCE or equivalent	2	Higher degree (MSc, PhD, etc)	6
A level/HNC/HND/BTEC or equivalent	3	Other (Pls specify):	7
College/University degree	4	.....	

E.8 Which of the below best describes your total annual household income before tax?

CIRCLE ONE ONLY

£0 – 14,999	1	£50,000 – 59,999	6
£15,000 – 19,999	2	£60,000 – 79,999	7
£20,000 – 29,999	3	£80,000 – 99,999	8
£30,000 – 39,999	4	£100,000-149,999	9
£40,000 – 49,999	5	£150,000 or more	10

This information is for **statistical purposes only** and will be **strictly confidential.**

➔ **Now please go to the final Section F on Page 15**

Section F: Environmental beliefs and behaviour

F.1 Using the scale below, please indicate how strongly you agree or disagree with following statements by inserting one number from the scale against each statement:

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly Agree

INSERT ONE NUMBER FROM SCALE AGAINST EACH STATEMENT:	**Number:**
A While some local plant and animal species may have been harmed by environmental degradation, over the whole Earth there has been **little effect**	
B We **must** look after the world's species and ecosystems **if we are to survive**	
C **Science and technology** will allow us to **overcome any problems** associated with the loss of species and ecosystems	

➔ Go to F.2

F.2 Using the below scale, please indicate how frequently you performed the following activities in the last 12 months?

1	2	3	4	5
Never	Rarely	Sometimes	Often	Always

INSERT ONE NUMBER FROM SCALE AGAINST EACH STATEMENT:	**Number:**
A Recycle glass, cans, paper	
B Avoid using your car for environmental reasons eg walk or use public transport instead (LEAVE BLANK IF YOU DON'T HAVE A CAR)	
C Choose an environmentally friendly product instead of regular products	
D Write a letter or campaign about environmental issues	
E Visit a nature reserve or national park or protected area in the UK	

➔ Go to F.3

F.3 In general when considering proposals to conserve the environment are you generally optimistic, pessimistic or neutral about what can be achieved? *CIRCLE ONE ONLY*

Optimistic about what can be achieved	1
Neutral	2
Pessimistic about what can be achieved	3
Don't know	99

➔ Go to F.4

F.4 Lastly, what did you think of this questionnaire?

CIRCLE AS APPROPRIATE

Interesting	1	Educational	4
Too long	2	Unrealistic/Not credible	5
Difficult to understand	3	Other: (Pls specify):.....	6

THIS IS THE END!

THANK YOU VERY MUCH FOR YOUR TIME

If you wish to be entered into the prize draw (see front page) please provide your contact details below:

:.....

.....

TO RETURN THE COMPLETED QUESTIONNAIRE:

PLEASE PLACE IT IN THE ENCLOSED PRE-PAID ENVELOPE AND POST IT TO US AT THE ADDRESS ON THE FRONT PAGE

BY 24th FEBRUARY 2006

It would help us greatly if you could return the questionnaire as soon as possible, thank you

If you would like to add any further comments please use the space below:

Appendix A.3: Case Study 1 Survey Locations

Income	Borough	Nodal Street
High	Kingston-upon-Thames	Sussex Place
	Harrow	Sussex Road
Middle	Hammersmith & Fulham	Archel Road
	Wandsworth	Cowick Road
Low	Hackney	Colvestone Crescent
	Lambeth	Turret Grove

Appendix A.4: Cognitive Interview Report

(Case study 2)

SUMMARY

This report summarises the results of a series of cognitive interviews held in London in July and August 2004 to assess public knowledge, awareness and attitudes towards tropical rainforests. The main objective was to test various aspects of the choice experiment survey to be used in Case study 2. A total of twelve cognitive interviews were conducted over three rounds; the survey instruments were refined in between rounds following the feedback from participants. The results of the cognitive interviews (and pilot testing) were used to inform the design of the final survey instrument.

OBJECTIVES

A series of cognitive interviews were held to explore public understanding, awareness and attitudes towards the conservation of tropical rainforests. The primary objective was to inform the development of the survey instrument to be used in case-study 2. Correspondingly, participants were asked to complete draft versions of the survey instrument, and pre-designed verbal protocols were used to explore the cognitive processes behind responses and perceptions towards the survey instrument. In particular the objectives were to explore:

(1) General comprehension of the questions and information provided: in particular the meaning of specific terms, the level of information provided

(2) Decision processes, in particular, with respect to the choice experiment questions.

(3) Response processes: that is the adequacy of the response categories

STUDY DESIGN

A total of twelve cognitive interviews were conducted over three rounds. The interviews were staggered in order to allow for participant feedback to be incorporated into the testing process. Correspondingly, the draft survey instruments were refined between rounds of interviews. In all cases a pre-designed verbal protocol was followed to ensure the key points of interest were investigated[232].

[232] The other main alternative to verbal protocols is the 'Think Aloud' approach. This was not adopted as thinking aloud is unusual process for some people, consequently it can be difficult to implement, requiring the training of subjects and may be met by resistance (Willis 1999). Moreover, the use of a verbal protocol was more appropriate to the current context as it allows more control over the interview, enabling the interviewer to focus on probing specific areas of interest.

Recruitment and participation

The majority of participants were recruited in and around Hyde Park, London; a £10 voucher was paid as an incentive for participation. Interviews were conducted between 25th July and 13th August 2004. Efforts were made to recruit participants with varying socio-demographics in order to replicate the target population as closely as possible. In total six males and six females were interviewed, consisting of: three participants aged between 18 and 30 years; five participants aged between 30 and 45 years; two participants aged between 45 and 60 years; and two participants over 60 years. The interviews lasted for between 30 minutes and one-hour; longer interviews are not advisable since this can place excessive demands on participants (Willis 1999). Notes were taken during the interviews by the moderator.

MAIN FINDINGS

The key findings of the cognitive interviews relate to respondents comprehension and perception of the survey instrument, the main purpose of the interviews being to inform survey design. This was an iterative process with refinements made throughout the interview rounds. Respondents were probed after each section of the survey instrument for their comprehension, decision processes and response mapping. Responses were analysed subjectively following interview rounds and used to refine the next round of surveying.

The key observations over the three rounds of surveying are reported below. The main findings are organised by survey section: it should be noted that this is a summary only.

Warm-up Section: Exploring Environmental Attitudes

Round 1:

Participants were uncomfortable ranking *specialised* conservation issues; however, the ranking of general issues and global environmental issues was less problematic. One respondents commented: 'The environmental problems were the easiest to answer but not sure what land degradation is'. Correspondingly, the questionnaire was refined for the next round of surveys to include ranking of general and environmental issues.

Round 2:

One participant commented that instructions for ranking question should be made clearer – this was revised for the next round of interviews.

Round 3:

The majority of participants seemed to engage with the task in the correct manor, comments included:

- 'Well there were two or three Id never really thought about like the British countryside and rainforests and then there are things like poverty reduction which I have thought about before so that was first. I mean I wouldn't know how much the British government would interact with rainforests since we don't have any rainforests.'
- 'I immediately latched onto global warming and then ranked the others around it';
- 'British Countryside - I ought to demote one of them, it seems a lower priority than the others, the global issues.'

Tropical Rainforest Information Box

In accordance with Carson (1998) a rainforest information box was included in the survey instrument in order to ensure all respondents had a basic level of understanding about the good of interest. Participants were probed as to their level of familiarity with the information provided and its clarity, in particular, the presentation of the map. Observations included:

Round 1:

- Three participants reported that the information was not biased and was factual.
- One respondent found the level of information too much and was uninterested in reading it.
- One participant commented that some of the phrases were not familiar, and that 'undiscovered medicines' was a sweeping statement that required clarification – this was subsequently revised.
- One participant stated some of the information was new, commenting: 'for example, I didn't know there were any rainforests in Africa'.

Most participants were satisfied with the map, one participant expressed surprise that rainforests were found in Africa and two participants felt the map could be made larger; correspondingly it was increased for the next round. Comments included:

- 'the map was ok, it was readable, it did the job';
- 'OK but not great';
- 'You could blow up the map bigger'.
- 'I didn't know there were any rainforests in Africa'.

Round 2

All participants were happy with the information box, comments included:

- 'information was easy to understand and not biased'; and

- 'Seems quite clear'.

Round 3:

Again, all participants seemed comfortable with the information presented with the exception of a few minor comments. The main observations were:

- 'To pay off foreign debts seemed like a sweeping statement.'
- 'Took a few minutes to read – but didn't have a problem with it.'
- 'Seemed fine.'
- 'Fine apart from didn't like the wording for reasons to use, cut and cleared seemed wrong.'

Geographic Priorities for Rainforest Conservation

Round 1:

The majority of respondents considered South American rainforests to be the highest priority for rainforest conservation, comments included:

- 'I chose South America because they're what I've heard most about'.
- 'I chose South America because of the public profile'.
- 'I chose South America because its where the biggest are'
- Two respondents did not care.

Round 2:

- One participant had no preference regarding geographic priorities and made the point that having a preference would mean selecting one over another, commenting that 'we should be preserving all of them'. This participant also commented that 'a lay person might not know what each one is about.'
- 'I think South America from what I've learnt the most are in South America.'

Round 3:

Participants in this round did not hold strong preferences for the location of rainforests. One participant expressed greater concern for the *condition* rather than the location of the rainforest, and another participant wanted to know more about *specific* rainforest areas.

- 'You can't favour a rainforest on the basis of places where you've been or through the media portrayal so I chose no preference.'
- 'Which rainforest? This is a difficult one; you don't know enough about the individual areas to realise, which is most beneficial '
- 'How did you decide which rainforest? One participant commented 'No preference because I don't know which is more threatened.'

Priorities on Rainforest Investment Opportunities

The majority of participants found the information boxes describing the valuation scenarios to be clear. Participants that were offered the SUB questionnaire were able to distinguish between the three different rainforest organisations in the correct manner. Comments included:

- 'Organisation B: Atlantic Forest was meaning that half the forest had nearly disappeared, but what's the point in protecting this then? You should conserve the ones with best possible chance of surviving'.
- 'Organisation C meant the rainforest organisation would make the judgement on that, on the basis of ease of investment'.
- 'I chose Organisation A (Iwokrama rainforest) as its doing well, Organisation B is nearly dead anyway then should give up. I don't like C as they're making the judgement call for you, but then maybe should trust them to do it for you.'
- 'Organisation C was too general, I didn't like the idea of it, and I felt it was better to have a specific target if you want conservation to work'.
- 'If you had no preference you'd just go to Organisation C'.

Choice Experiment: Attributes and levels

Round 1:

Participants were probed on their comprehension of the information on attributes and levels and on their perceptions towards which attributes were priorities. Participants seemed comfortable on the whole with the information provided. Comments are presented below:

Area:

- 'Bigger the better, size perhaps wasn't so important.'
- 'Hard to make your choices on area, assume bigger area sounds better'
- 'Hard to imagine the size, couldn't quite imagine the size, but bigger was more important.'
- 'Area wasn't important although I understood the size difference'

Management:

Mixed responses: two participants favoured sustainable uses, one participant preferred complete preservation.

- 'the ecotourism and sustainable uses, says its sustainable so I assumed that this is ok, there isn't really a trade-off so wonder whether this is really relevant to decision maker? Why can't you have sustainable uses as a matter of course?'
- 'Management: I thought preservation seemed unrealistic, Ecotourism with sustainable uses, seemed much more likely to be sustainable into the future.'

- 'Of the management policies I felt that complete preservation was best, then ecotourism and then ecotourism and sustainable uses.'
- 'I didn't make a conscious decision that ecotourism meant I could visit'
- 'Not really interested in the actual amount of revenue.'

Programme Length:

Mixed views, some participants were not concerned with this attribute, and one commented on the need to clarify the meaning of this attribute. Correspondingly revisions were made prior to the next round to highlight that the emphasis was that programmes could conserve rainforests for shorter or longer periods.

- 'I interpreted this as that the goal would be achieved quicker, as in 15 years is better than 40 years.'
- 'I didn't programme length was not considered particularly important either.

Local community impacts:

Most participants viewed the local community impact as a key issue, a strongly held view was that communities should not be left worse off but instead should benefits form the conservation programmes. Comments from two participants suggested that local communities were considered by some to be integral to the success of programmes (this attribute may be viewed by some as causal), for example: 'I choice better off, otherwise the project wouldn't work.'

Species

One participant didn't appear to pick up on the fact that the species attribute referred to 'rare or endangered species' rather than all species in the rainforest – this was emphasised in the next round by adding 'rare' into the attribute label in the choice questions.

- 'I don't really care about this, but the difference didn't seem big enough.'
- 'No of Species – surely there would be more potential for species than the numbers here?'

Round 2

On probing about attributes and levels:

- 'Local communities were the most important – I suppose the thing that was less important was species, since its not necessarily how many rare or endangered species that is important.'
- Subject felt she understood term ecotourism and defined it as 'scientists or ordinary tourists coming to see' and sustainable logging as 'using the trees'.
- 'I suppose some attribute are more important than others, conservation Area is v important.'
- 'Maybe too much detail on the endangered and rare species, could just say, depending on how much conserved that would affect the number of species conserved?'

Round 3

General comments on information on attribute and levels:

- 'Took a good 5-7 mins to read, seemed to read thoroughly'.
- 'quite a lot to absorb if not familiar to start with but I got to grips with it, I mean certain things like the size of the conservation area didn't appear relevant not like the number of endangered species.'
- 'Well as long as you're not destroying it I don't see any reason why it should be completely preserved.'

On probing about management approaches and attributes

- 'I don't think we should encourage more ecotourism I mean its good that it helps the area but it's bad too.'
- 'It's a little confusing, fine line between number of endangered and rare species and total number of plants and animals?'
- 'quite a lot to absorb if not familiar to start with but I got to grips with it, I mean certain things like the size of the conservation area didn't appear relevant not like the number of endangered species.'

Choice Experiments Instructions

Round 1:

All participants found the instructions were clear. One commented that the information box which defined the attributes levels should be moved to section prior to the choice questions – rather than being inserted at the back page of the survey (this had been thought to provide an easier reference point).

Round 2

The instructions for the choice modelling questions were felt to be clear. The subject felt that the CM table could avoid repeating Iwokrama in 2015 and have Iwokrama at the top with in 2015 only and a space between Options A, B, C. This was subsequently revised in the main survey instrument

Choice Experiments: Decision Processes

Round 1

Investigation of decision processes in answering the choice experiment questions revealed that the majority of participants considered all the attributes in making choices, but, that local community impact and money were generally the dominant concerns. Comments included:

- 'Area – I don't know why this would be important. Of all the attributes local community impact was the most important, or maybe the ordering of the attributes, no, I don't think so, local community impacts was important'.
- 'The order of the attribute I focused on was: local communities; programme length; area – since I care about global environmental services; management; and then species – this wasn't particularly important to me'.
- 'Programme length worked – I cared about all the attributes'.
- 'just skimmed down in making the choices, obviously money is the most important; then complete preservation, then local community impacts, management – of the management uses I don't really believe in ecotourism as I think its exploiting, I don't think you should rely on it.'
- One participant in particular found the decision hard, commenting that 'it's very complicated, for £3 less communities are worse off. I said no in choice question 2 as there were too many trade-offs'. The later comment indicated that the participant chose the opt-out in order to avoid a difficult decisions.

And on probing about the clarity of descriptions:

- 'I remember what each attribute was from the information list'
- 'Programme length meant to me how long the programme would last'.
- 'So much information....but it probably just depends on money'

Round 3

On probing about choice decisions processes – how did you make choices?

- 'Well the first four attributes weren't really a large factor – the donation made the decision.' And in Q5? 'Again the donation required after local communities.'
- 'I chose B because higher number of species, fairly big, and the money – I can afford to pay more than £2, species really was most important and management.'
- 'Not sure why I put area, there is some that believe that bigger area the better. Endangered and rare species put first because I Endangered and rare species. Conservation Period was probably least important because, 15 years is a decent amount of time anyway.'
- 'Communities and also endangered and rare species – I believe people have to gain in their way of living; I mean people can't just go there and tell the communities.'
- 'Size of conservation area, the bigger the better, because the more you can cover the better for the world for global warming. I mean how it's managed and the conservation length is important too, I mean ideally one would like to see it done indefinitely.'
- 'No don't really understand it enough to have an opinion – don't really understand the significance of protecting a large forest or a smaller forest. I mean with a rainforest I

wouldn't look at it in the same way as an endangered animal, I mean its not as important how large it is or where it is.'

On probing about labelled experiments – participants receiving the SUB versions did consider the rainforest labels, comments included (see also comments in earlier section):

- 'Yes, I didn't really want to choose Any Rainforest, didn't want that for some reason.'
- 'Don't know, Id rather conserve more pristine and learn from that than conserve something that is almost lost.'

Choice Experiments: Opt-out

Comments on the opt-out option indicated the status quo alternative was correctly interpreted however one participant expressed reluctance to choose this option, the reason given suggested possible survey bias.

- One participant commented that they wouldn't contribute but answered affirmatively in the choice experiments on probing this participant stated 'well I was getting into the spirit of the questionnaire'. This suggests that some participants may find it difficult to respond negatively, perhaps due to social desirability or some form of survey bias?
- 'Yes, the no conservation meant you couldn't get anything, the people would be worse off; I mean no restrictions on use, so the rainforest is not conserved.'

Choice Experiments: Cognitive Burden

Round 1

Comments included:

- 'Fine to answer but you have to concentrate.'
- 'Bit technical', had to clarify what had to do.

Round 3

Were they hard or easy to answer?

- 'Later ones were more difficult since my main priority was communities as they had some which were all the same.'
- They were easy but when you've got 4 together and after the first its clear you don't have to make a choice – I feel like I had to make a decision – got to remember you can only give to one – you learn a bit more as you go along – I probably approached the first one a bit more realistically.
- 'Oh god, when I saw all the information, bit off putting. A lot of information, a lot to read and absorb – I mean it was ok to understand just a lot to read.'

It was clear from the comments of three participants (total) that some alternatives were considered implausible – correspondingly the instructions in the survey instrument were revised to emphasise that although alternatives may seem strange they are all possible and to include a stronger framing statement to explain why options may vary. Comments included

- Queried how they could be worse off and it cost £45. 'Having answered all the questions I didn't really understand why the donation amount changed under certain circumstances, you could maybe put that; the donation will vary according to the various political administrative or geographical influences'.
- Queried how communities could have no difference- what does this really mean?
- One participant commented that she felt an urge to choose ones where the 'local community impact was most beneficial although not sure I understand why ecotourism was better and why complete preservation would impact the local communities?' which suggests the need to include a framing statement regarding 'implausible' option to ensure respondents focus

Alternative Valuation

Round 1:

Although all participants were comfortable responding to a second valuation section, a couple of participants did express negative comments in relation to the elicitation method, more specifically to the lack of choice offered in the payment amounts, although this was not considered to represent a major problem. Comment included:

- 'I might be willing to pay more than the lower amount – may be you should have a question that lets you say the highest you would pay?'
- 'I felt frustrated I was only offered two choices, since I would pay more than the lower choice.'

Round 2:

This was fine, the only comments related to incorrect sequencing of skip patterns.

Round 3

- 'By this stage I was like alright Ill give you a tenner!' – possible ordering effect with CVM question placed after CE.
- 'Its fine, a little taxing.'
- 'Fine clear'

SUMMARY

The key findings were in relation to participants perceptions of the survey instrument; these were subsequently fed into the design process to produce the final version. In addition, a number of observations were made with regard to respondents' perceptions, awareness and attitudes towards rainforest conservation, policy responses, and priorities:

Geographic priorities for Rainforest Conservation

Over half of the respondents expressed no preference for prioritising rainforests on a geographic basis; this reflected a mix of reasons including: greater concern for the condition of the rainforest than the location; insufficient information on specific areas; and belief that all rainforests are equally important. The remainder of the participants preferred to contribute to rainforests in South America; this was motivated by greater familiarity with rainforests in this location.

Prioritising between Alternative Rainforest Investment opportunities

Positive perceptions were held for rainforests that were still intact on the basis that this may indicate they were good long term chances. Some participants viewed the conservation of rainforests that were already fragmented as pointless. Some participants expressed preferences for knowing where investments were going rather than simply investing anywhere.

Attributes and Policy responses

Views were mixed in terms of which aspects of rainforest programmes were most or least important. Several participants considered AREA to be very important due the role of rainforests in climate regulation, other environmental services and habitat provision. Others viewed AREA as important due to a belief that 'others' (experts, perhaps) had this view, while a couple of participants did not view it as important at all. Similarly, several participants considered rare or endangered SPECIES attribute to be extremely important (and this was reflected in their choices) due to a concern for species and biodiversity; one participant consider the differences in species to be too small and another felt rare or endangered species weren't necessarily as important as species in general. The majority of respondents considered LOCAL COMMUNTIES and MANAGEMENT to be important attributes. There was a commonly shared view that local communities should benefit from conservation programmes and not be made worse off. The majority of participants were in favour of sustainable uses of the rainforests – complete preservation was perceived by some as unrealistic. In terms of programme length (TIME attribute) some participants considered this to be less important since 15 years was sufficiently long (suggesting a lack of bequest values), while other participants considered it to be one of the most important factors in choices – notably, one participants did not understand the attribute, thus the wording was clarified.

Choice decisions

All participants appeared able to respond to the choice experiment in the correct manner although some participants considered there to be a lot of information. Probing revealed that one participant did not want to choose the opt-out option due to some form of social desirability or survey bias. Conversely, one participants chose the opt-out when there were too many trade-off indicating the use of a heuristic decision process.

Appendix A.5: Survey Instrument (Case study 2)

This appendix contains a copy of each of the survey instruments used in case study 2. It includes: (1) BASE treatment – SQ version (the SQ and CN versions were identical with the exception of presentation of the opt-out format as described in Chapter 4); and (2) the SUB treatment.

Imperial College
London

Survey Instrument [BASE SQ VERSION]

What this questionnaire is about...

This survey is part of a research project at Imperial College London to learn more about how people feel about conserving the environment.

What we ask you to do...

Please take the time to complete this questionnaire, it should only take about 20 minutes and there is no need for any prior knowledge. Your views and opinions are very important to our research and we will treat all responses as strictly confidential.

To return the questionnaire ...

You can return the completed questionnaire by placing it in the enclosed pre-paid envelope and posting it to us at the below contact address by 16th December 2005. It would help us greatly if you could return the questionnaire as soon as possible.

Prize Draw...

By returning the completed questionnaire you will be entered into a prize draw to win one of four £25 Marks & Spencer's vouchers.

We hope you enjoy completing this questionnaire

Thank you very much for helping us with our survey

If you have any questions, please contact:
Sian Morse-Jones
Centre for Environmental Policy
Imperial College London
4th Floor, Royal School of Mines
Prince Consort Road
London SW7 2AZ
Tel: 020-7594 9313
Fax: 020-7594 9334
E-mail: sian.morse-jones@imperial.ac.uk

Section A: The Environment

1. **To begin we would like to explore your views on some general issues.**

   Which of the below issues would you most prefer to receive additional funding from the UK government? Please rank the issues from 1 to 5, where 1 is the highest priority and 5 is the lowest priority:

	RANK (1 to 5)
Air Pollution	
Conserving British Countryside	
Loss of Tropical Rainforests	
Marine pollution	
Poverty reduction	

2. **One of the issues mentioned above was 'conserving Tropical Rainforests', have you ever visited a rainforest? Please tick:**

   ☐$_1$ Yes ☐$_0$ No ☐$_{99}$ Don't know

3. **Do you expect to visit a rainforest anytime in the future? Please tick:**

   ☐$_1$ Yes ☐$_0$ No ☐$_{99}$ Don't know

4. **How would you classify your knowledge of tropical rainforests? Please circle ONE point on the scale below:**

   1 2 3 4 5

   Not very Knowledgeable — Very Knowledgeable

Section B: Tropical Rainforests

Many scientists, conservationists and governments are concerned about the loss of tropical rainforests. In this survey we want to find out more about your views.

RAINFOREST FACTS

Today rainforests cover around 6% of the planet, just less than half their original extent and they continue to be lost at a rapid rate. The main causes of rainforest loss are unsustainable timber logging, clearance for agriculture, mining, fuelwood gathering and cattle grazing.

Most of the remaining rainforests are located in the developing countries, which are typically very poor. The largest concentrations are found in South America, Central America, Africa and Asia (see map).

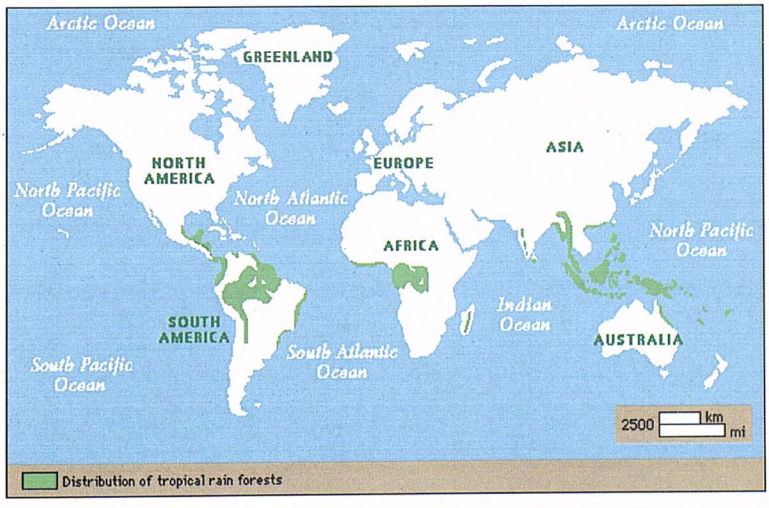
Some of the main reasons for conserving and for using rainforests are presented below:

Reasons for conserving rainforests...

- Contain over 50% of the worlds plant and animal species
- Play an important role in regulating the Earth's climate and water resources
- Thought to contain many undiscovered medicines
- Home to many indigenous communities

Reasons for using rainforests...

- To provide income for development and to pay off foreign debts
- Cleared to provide land for agricultural production
- To provide fuelwood & materials for local people
- To supply global timber commodities



5. **How familiar was the information presented in the Rainforest Facts box? By this we mean, was any of the information new to you? Please circle ONE point on the scale below:**

1	2	3	4	5
All info was new to me	Most new to me	Some new to me	Bits new to me	None of it was new to me

6. **Now, we would like to explore your views on the conservation and use of tropical rainforests.**

Please consider the following statements and indicate how strongly you agree or disagree by ticking the box:

	Strongly Disagree	***Disagree***	***Neither Agree nor Disagree***	***Agree***	***Strongly Agree***
A Rainforests should be protected no matter what the costs	☐1	☐2	☐3	☐4	☐5
B Rainforests should be completely preserved without use	☐1	☐2	☐3	☐4	☐5
C Rainforests should be used to enable economic development in developing countries	☐1	☐2	☐3	☐4	☐5
D We have a duty to protect the world's rainforests	☐1	☐2	☐3	☐4	☐5
E There's nothing I can do to help save the world's rainforests	☐1	☐2	☐3	☐4	☐5

7. **Some policymakers argue that developed countries, like the UK, should help developing countries to pay the costs of conserving their tropical rainforests.**

   Do you agree with this? Please tick:

   ☐$_1$ Yes ☐$_0$ No ☐$_{99}$ Don't know

8. **If the UK government were to help pay these costs, where would you most prefer funding to be directed? Please tick ONE of the below:**

   ☐$_1$ Rainforests in South America
   ☐$_2$ Rainforests in Central America
   ☐$_3$ Rainforests in Asia
   ☐$_4$ Rainforests in Africa
   ☐$_5$ No preference/any location
   ☐$_6$ None

9. **And, in terms of conservation priorities, which rainforests would you most prefer to be supported? Please tick ONE:**

   ☐$_1$ Pristine/untouched rainforests
   ☐$_2$ Fragmented/little left rainforests
   ☐$_3$ No preference/any condition
   ☐$_4$ None

10. **In principle, do you think that you would be willing to contribute something to help rainforest conservation? Please tick:**

    ☐$_1$ Yes ☐$_0$ No ☐$_{99}$ Don't know

NOW PLEASE GO TO SECTION C OVER THE PAGE

Section C: Rainforest Valuation

In this survey we are interested in your views on one particular rainforest. **Please read the information carefully as the rest of the questionnaire asks for your opinions on this.**

Iwokrama Rainforest

Iwokrama Rainforest is located in Guyana, South America. It contains at least 45 rare or endangered species and is approximately 371,000 hectares in size.

Iwokrama is considered to be highly valuable because:

- High number of plant and animal species present
- Home to a number of local Amerindian communities
- At least 80% of its original rainforest is intact
- One of the last remaining untouched pristine rainforests

The problem:

Iwokrama is currently under protection however the funding for the existing conservation programme has run out and if additional money is not raised the programme will close down.

The consequences:

If this happens scientists predict that within approx 15 years most of the forest will be used for unsustainable mining and timber logging, leading to the severe degradation of this pristine rainforest, the loss of many species including around 25 rare or endangered species, and a decline in the welfare of the local communities.

The Solution

To avoid these losses it is proposed to set up a Rainforest Fund in the UK to raise the money needed for a new conservation programme to be set up.

11. **How important is it to you that this rainforest is conserved? Please circle ONE point on the scale below:**

1	2	3	4	5
Not at all important				Very Important

The Iwokrama Rainforest Conservation Programme

There are a number of different options under which the new programme could be implemented. We would like to find out which options you most prefer. Beforehand, please read the box below which explains the five main ways in which the programme could vary:

Size of Conservation Area	The conservation area may cover **none of the rainforest** (no conservation programme); or **half the rainforest meaning 185,000 hectares** (an area approx 1¼ times the size of London); or the **whole rainforest meaning 371,000 hectares** (an area approx 2½ times size of London).
Number of rare or endangered species present	Depending on the level of conservation provided, either **20** (no conservation programme); or **30** or **45 rare or endangered species** are likely to remain present in Iwokrama rainforest after 15 years.
Management Approach	The conservation area may permit some commercial activities in order to raise money towards the running costs of the conservation programme. The options are: **Complete Preservation**: meaning no commercial activities take place, no revenue is generated, no disturbance to the rainforest; or **Sustainable Use**: meaning parts of the rainforest are used for ecotourism and sustainable logging, generating 30-40% of the programmes running costs, some disturbance in areas of the rainforest. **Without the programme** there would be no restrictions on rainforest use, leading to severe degradation of the rainforest.
Conservation Period	The rainforest may be conserved for **0 years** (no conservation programme), **15 years** (until 2020) or **50 years** (until 2055). At the end of the conservation period there is no guarantee that the rainforest will continue to be conserved.
Local Community impact	The communities living in and around Iwokrama Rainforest may be affected in the following ways: **Community Benefits:** Communities receive additional benefit from the conservation programme through provision of jobs, training and development projects; **No Benefits**: Communities receive no additional benefit from the programme. Without the programme communities would receive **No Benefits** and be **Worse off**.

12. **In your opinion which of the programme attributes are the most important? Please rank the attributes from 1 to 5, where 1 is highest importance and 5 is lowest importance, or tick if you have no preference:**

	RANK (1 to 5)
Size of conservation area	
Number of rare or endangered species present	
Management Approach	
Conservation Period	
Local community impact	
Or No preference (tick)	☐1

13. **Of the management approaches described which would you most prefer to see implemented? Please tick ONE:**

☐1 Complete Preservation ☐3 No restrictions on rainforest use

☐2 Sustainable Uses ☐4 No preference

14. **In order to raise the money required for the new conservation programme, it is proposed to set up a Rainforest Fund in the UK for ordinary members of the public to make a one-off donation. We would like to find out whether in principle you would be willing to donate to this fund.**

Please note this is hypothetical, we are not really asking you to pay however we would like you to think about what you would do if in reality you were asked to contribute.

A series of questions have been created which describe the possible options and the likely outcomes after 15 years with or without a conservation programme. In each question: **Option A** represents what would happen if **no further conservation** takes place and requires **no donation** to be made; and **Options B and C** represent the possible **new conservation programmes** which would require a **one-off donation** to be made.

In each question we would like you choose the option you most prefer out of the three presented, treating each question separately. All of the attributes will vary across the questions; the donation required will be between £0 and £500.

Please consider the choices in the context of your real circumstances, and remember that there are other rainforest conservation organisations and other causes that you may wish to spend your money on.

If you feel the conservation options are not important enough or if they are too expensive, you can choose not to donate by choosing Option A the no conservation, no donation option.

Lastly, whilst some of the options may seem strange they are in fact all possible.

An **example** is presented below:

EXAMPLE: Please place a tick below the ONE option you most prefer:

➔ ***If you preferred Option B, you would place a tick as indicated:***

Attributes	**Iwokrama Rainforest in 2020**		
	Option A No Conservation	**Option B Conservation**	**Option C Conservation**
Size Conservation area (hectares)	No Conservation Area	185,000 ha	371,000 ha
No of rare species present	20 species	45 species	30 species
Management	No restrictions on rainforest use	Sustainable Uses	Complete Preservation
Conserved Period	0 years	15 years	50 years
Local communities	No Benefits Worse off	No Benefits	Community Benefits
Donation Required	£0	£10	£3
Please tick ONE only:	☐1	☑2	☐3

NOW, PLEASE GO TO THE CHOICE QUESTIONS OVER THE PAGE

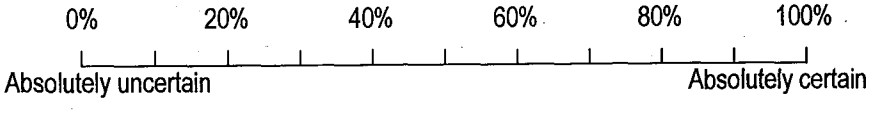
CHOICE QUESTION 1

Please place a tick beiow the ONE option you most prefer:

Attributes	Iwokrama Rainforest in 2020		
	Option A No Conservation	**Option B Conservation**	**Option C Conservation**
Size of conservation area (hectares)	No Conservation Area	185,000 ha	371,000 ha
Rare species present	20 species	45 species	30 species
Management	No restrictions on rainforest use	Sustainable Uses	Sustainable Uses
Conserved Period	0 years	50 years	15 years
Local communities	No Benefits Worse off	Community Benefits	Community Benefits
Donation Required	£0	£30	£3

Please tick ONE only: $\square_1$ $\square_2$ $\square_3$

How certain are you of your choice? Please **circle ONE point** on the scale below:



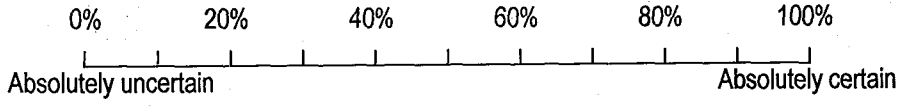
CHOICE QUESTION 2

Please place a tick below the ONE option you most prefer:

Attributes	**Iwokrama Rainforest in 2020**		
	Option A No Conservation	**Option B Conservation**	**Option C Conservation**
Size of conservation area (hectares)	No Conservation Area	371,000 ha	185,000 ha
Rare species present	20 species	45 species	45 species
Management	No restrictions on rainforest use	Complete Preservation	Sustainable Uses
Conserved Period	0 years	50 years	50 years
Local communities	No Benefits Worse off	No Benefits	Community Benefits
Donation Required	£0	£20	£20

Please tick ONE only: ☐1 ☐2 ☐3

How certain are you of your choice? Please **circle ONE point** on the scale below:



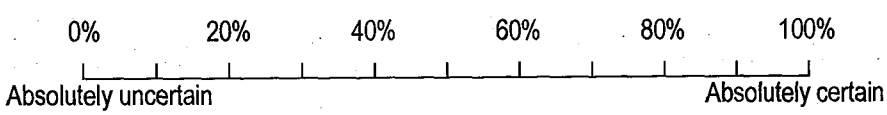
CHOICE QUESTION 3

Please place a tick below the ONE option you most prefer:

Attributes	Iwokrama Rainforest in 2020		
	Option A No Conservation	**Option B Conservation**	**Option C Conservation**
Size of conservation area (hectares)	No Conservation Area	185,000 ha	371,000 ha
Rare species present	20 species	30 species	45 species
Management	No restrictions on rainforest use	Complete Preservation	Complete Preservation
Conserved Period	0 years	50 years	15 years
Local communities	No Benefits Worse off	Community Benefits	Community Benefits
Donation Required	£0	£14	£65

Please tick ONE only: ☐1 ☐2 ☐3

How certain are you of your choice? Please **circle ONE point** on the scale below:



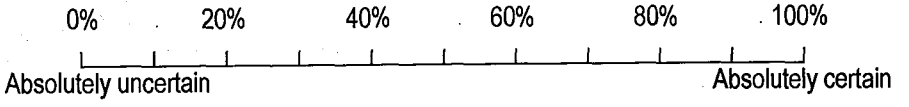
CHOICE QUESTION 4

Please place a tick below the ONE option you most prefer:

Attributes	Iwokrama Rainforest in 2020		
	Option A No Conservation	**Option B Conservation**	**Option C Conservation**
Size of conservation area (hectares)	No Conservation Area	185,000 ha	185,000 ha
Rare species present	20 species	30 species	30 species
Management	No restrictions on rainforest use	Sustainable Uses	Complete Preservation
Conserved Period	0 years	50 years	15 years
Local communities	No Benefits Worse off	No Benefits	No Benefits
Donation Required	£0	£10	£100

Please tick ONE only: ☐1 ☐2 ☐3

How certain are you of your choice? Please **circle ONE point** on the scale below:



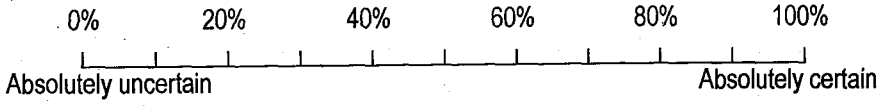
CHOICE QUESTION 5

Please place a tick below the ONE option you most prefer:

Attributes	Iwokrama Rainforest in 2020		
	Option A No Conservation	**Option B Conservation**	**Option C Conservation**
Size of conservation area (hectares)	No Conservation Area	185,000 ha	371,000 ha
Rare species present	20 species	30 species	45 species
Management	No restrictions on rainforest use	Sustainable Uses	Sustainable Uses
Conserved Period	0 years	15 years	15 years
Local communities	No Benefits Worse off	Community Benefits	No Benefits
Donation Required	£0	£20	£50

Please tick ONE only: ☐$_1$ ☐$_2$ ☐$_3$

How certain are you of your choice? Please **circle ONE point** on the scale below:



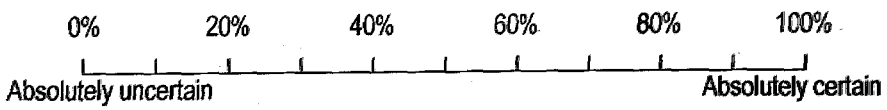
CHOICE QUESTION 6

Please place a tick below the ONE option you most prefer:

Attributes	Iwokrama Rainforest in 2020		
	Option A No Conservation	**Option B Conservation**	**Option C Conservation**
Size of conservation area (hectares)	No Conservation Area	371,000 ha	371,000 ha
Rare species present	20 species	30 species	45 species
Management	No restrictions on rainforest use	Complete Preservation	Complete Preservation
Conserved Period	0 years	50 years	50 years
Local communities	No Benefits Worse off	Community Benefits	No Benefits
Donation Required	£0	£500	£30

Please tick ONE only: ☐$_1$ ☐$_2$ ☐$_3$

How certain are you of your choice? Please **circle ONE point** on the scale below:



Section D: Choice Question Follow-up

15. **Which of the below best describes how you made your decisions in the choice questions? Please tick ONE:**

☐1	I considered most or all of the attributes
☐2	I considered only one of the attributes (please specify):.....
☐3	I always chose the same option (please specify):.....
☐4	Other (please specify):.....

➔ If you chose Option B or C in ANY of the choice questions, please go to Q16.

➔ If you chose Option A in ALL of the choice questions please go to Q17.

16. **Which ONE of these statements best describes your MAIN reason for choosing to support the conservation options? Please TICK ONE:**

☐1	I chose to donate although I wouldn't really pay
☐2	I get a sense of satisfaction from contributing to good causes
☐3	I chose the option which was the best value for money
☐4	I may wish to visit this rainforest in the future
☐5	Its important to me that wildlife is conserved
☐6	Its important to me that this rainforest exists for future generations
☐7	We have a moral duty to support rainforest conservation
☐8	So that local people can use this rainforest today as a resource
☐9	For future use in medicines
☐10	For global environmental reasons ie climate change, water resources
☐11	Because this rainforest has a right to exist
☐12	Other (please specify): .....

➔ Now go to Q18

17. **If you chose Option A 'No conservation' in ALL choice questions, please tick the ONE reason which best explains why:**

☐1	Rainforest conservation is not important to me
☐2	This particular rainforest is not important to me
☐3	I don't believe that this money would really be spent on the rainforest
☐4	The choices were too difficult
☐5	The conservation options were too expensive
☐6	I prefer to spend my money on other things
☐7	The government should pay for this
☐8	There's no guarantee that everybody else will pay
☐9	I prefer to give to other charitable causes
☐10	Other (please specify):.....

→ **Now go to Q18**

18. **Please consider the following statements about Option A, the 'No Conservation' option and tick the ONE which best describes your view:**

☐1	I chose option A when it was my preferred choice
☐2	I chose option A because it was quicker/easier
☐3	I always preferred options B or C
☐4	I didn't feel I could choose option A (ie morally unacceptable)

19. **Now, thinking about the Choice Questions, please indicate how strongly you agree or disagree with the following statements:**

	Strongly Disagree	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*
A I found the choice questions confusing	☐1	☐2	☐3	☐4	☐5
B I needed more information than was provided	☐1	☐2	☐3	☐4	☐5
C I found the choice questions extremely difficult	☐1	☐2	☐3	☐4	☐5
D I chose to donate although I wouldn't really pay	☐1	☐2	☐3	☐4	☐5

Please go to Section E over the page

Section E: Iwokrama Alternative Valuation

Recall that without a conservation programme, Iwokrama Rainforest is expected to become **severely degraded** within 15 years, meaning no restrictions on rainforest use, the **local communities** would receive no benefits and be **worse off** and only 20 of the rare or endangered species would remain. **Now, suppose that a new conservation programme could be set up that would ensure the following outcomes:**

Iwokrama Rainforest Conservation Programme
371,000 hectares rainforest conserved
45 rare or endangered species present
Sustainable Uses
Community Benefits
50 year conservation period (conserved until 2055)

To implement this programme the Iwokrama Rainforest Fund would require a one-off donation of between £50 and £500.

20. **Would you be willing to make a one-off donation of £50 to support this programme?** *(Remember there are other conservation organisations and other causes that you may wish to spend your money on).*

☐$_1$ Yes, I would pay ☐$_0$ No, I would not pay

How certain are you of your answer? Please circle ONE point below:

0% 20% 40% 60% 80% 100%

Absolutely uncertain Absolutely certain

➔ If you ticked '**YES, I would pay**' please **go to Q 21**

➔ If you ticked '**NO, I would not pay**' please **go to Q 22**

21. **If you answered YES to the amount in Q20, would you be willing to make a one-off donation of £500?**

☐$_1$ Yes, I would pay ☐$_0$ No, I would not pay

How certain are you of your answer? Please circle ONE point below:

0% 20% 40% 60% 80% 100%

Absolutely uncertain Absolutely certain

➔ Now, please **go to Q 23**

22. **If you answered NO in Q20, which of the below best explains why? Tick ONE:**

☐1	Rainforest conservation is not important to me
☐2	This particular rainforest does not appeal to me
☐3	I don't believe that this money would really be spent on rainforests
☐4	I cannot afford to pay
☐5	I prefer to spend my money on other things
☐6	The government should pay for this
☐7	I don't believe that the conservation programme will be successful
☐8	There's no guarantee that everybody else will pay
☐9	I prefer to give to other charitable causes
☐10	Other (please specify):.....

➔Now go to Q23

23. **In terms of the Choice Questions and Questions 20 and 21, do your responses reflect the amount you would be willing to donate to conserve Iwokrama rainforest or to conserve all rainforests in general?**

☐1 Iwokrama ☐0 All rainforests ☐99 Don't know

24. **In your opinion, do you think that the Iwokrama Rainforest Fund will receive strong support from the British public? Please tick ONE:**

☐1 Yes ☐0 No ☐99 Don't know

25. **Do you believe that asking for public donations is a good way of raising funds for rainforest conservation? Please tick ONE:**

☐1 Yes ☐0 No ☐99 Don't know

26. **There are many other ways to generate funds for rainforest conservation. Please indicate whether in principle you would be willing to undertake any of the following, please tick as appropriate:**

☐1	Buy rainforest-friendly products over regular products eg rainforest-friendly coffee
☐1	Adopt an acre of rainforest through a sponsorship scheme
☐1	Pay an annual UK Rainforest Charge (applicable to all UK residents)
☐1	Pay an annual Global Rainforest Charge (applicable to all worldwide)
☐1	Pay a surcharge on medicine derived from rainforest plants
☐1	Buy shares specifically in companies which support rainforest conservation
☐1	Pay an International Arrivals Charge for visiting countries with rainforests
☐0	None of the above

Section F: About You

The following socio-economic questions are important for our research; they are to ensure that we have a good cross-section of London's population. **The information provided will be used for statistical purposes only and will remain confidential.**

27. **Gender: Please tick:**

☐1 Male ☐0 Female

28. **Age Group: Please tick ONE:**

☐1 18-19 years
☐2 20-24 years
☐3 25-29 years
☐4 30-44 years
☐5 45-59 years
☐6 60-64 years
☐7 65-74 years
☐8 75 years or more

29. **Have you ever visited any the following? Please tick as many as appropriate:**

☐1 A developing country
☐2 South America
☐3 Brazil
☐4 Guyana
☐5 No to all

30. **Are you currently a member of any environmental or conservation organisations? Please tick:**

☐1 Yes ☐0 No

31. **Have you donated any time or money to an environmental cause in the last 12 months (excluding any membership fees related to Q30)? Please tick:**

☐1 Yes ☐0 No ☐99 Don't know

32. **How many children under the age of 16 live in your household? Please tick ONE:**

☐0 0
☐1 1
☐2 2
☐3 3
☐4 4 or more

33. **Which of the below best describes your living arrangements? Please tick ONE:**

☐1	Private Renting	☐4	Living with Parents
☐2	Council Renting	☐5	Housing Association
☐3	Home owner	☐6	Other (pls specify)..... .....

34. **What is your current work status? Please tick ONE:**

☐1	Self-employed	☐5	Unempioyed
☐2	Employed full-time (>30 hrs/week)	☐6	Student
☐3	Employed part-time (<30 hrs/week)	☐7	Retired
☐4	Looking after home full-time/housewife	☐8	Unable to work (sick/disability)

35. **What is the highest level of education that you have obtained so far? Please tick ONE:**

☐1	Primary	☐5	Professional qualification of degree level
☐2	O level/GCSE/GCE or equivalent	☐6	Higher degree (MSc, PhD, etc)
☐3	A level/HNC/HND/BTEC or equivalent	☐7	Other (Pls specify):..... .....
☐4	College/University degree		

36. **Which of the below best describes your total annual household income before tax? Please tick ONE:**

☐1	£0 – 14,999	☐5	£40,000 – 49,999
☐2	£15,000 – 19,999	☐6	£50,000 – 59,999
☐3	£20,000 – 29,999	☐7	£60,000 – 69,999
☐4	£30,000 – 39,999	☐8	£70,000 or more

This information is for **statistical purposes only** and will be **strictly confidential**

37. **Lastly, what did you think of this questionnaire? Please tick as appropriate:**

☐1	Interesting	☐4	Educational
☐2	Too long	☐5	Unrealistic/Not credible
☐3	Difficult to understand	☐6	Other: Please specify:.....

THIS IS THE END!

THANK YOU VERY MUCH FOR YOUR TIME.

If you wish to be entered into the prize draw (see front page) please provide your contact details below:

.....

.....

TO RETURN THE COMPLETED QUESTIONNAIRE:

PLEASE PLACE IT IN THE ENCLOSED PRE-PAID ENVELOPE AND POST IT TO US AT THE ADDRESS ON THE FRONT PAGE

BY 16th DECEMBER 2005

It would help us greatly if you could return the questionnaire as soon as possible, thank you

If you would like to add any further comments please use the space below:

Imperial College
London

Survey Instrument [SUB VERSION]

What this questionnaire is about...

This survey is part of a research project at Imperial College London to learn more about how people feel about conserving the environment.

What we ask you to do...

Please take the time to complete this questionnaire, it should only take about 20 minutes and there is no need for any prior knowledge. Your views and opinions are very important to our research and we will treat all responses as strictly confidential.

To return the questionnaire ...

You can return the completed questionnaire by placing it in the enclosed pre-paid envelope and posting it to us at the below contact address by 16th December 2005. It would help us greatly if you could return the questionnaire as soon as possible.

Prize Draw...

By returning the completed questionnaire you will be entered into a prize draw to win one of four £25 Marks & Spencer's vouchers.

We hope you enjoy completing this questionnaire

Thank you very much for helping us with our survey

If you have any questions, please contact:
Sian Morse-Jones
Centre for Environmental Policy
Imperial College London
4th Floor, Royal School of Mines
Prince Consort Road
London SW7 2AZ
Tel: 020-7594 9313
Fax: 020-7594 9334
E-mail: sian.morse-jones@imperial.ac.uk

1. **To begin we would like to explore your views on some general issues.**

   Which of the below issues would you most prefer to receive additional funding from the UK government? Please rank the issues from 1 to 5, where 1 is the highest priority and 5 is the lowest priority:

	RANK (1 to 5)
Air Pollution	
Conserving British Countryside	
Loss of Tropical Rainforests	
Marine pollution	
Poverty reduction	

2. **One of the issues mentioned above was the 'Loss of Tropical Rainforests'.**

   Have you ever visited a rainforest? Please tick:

   ☐$_1$ Yes ☐$_0$ No ☐$_{99}$ Don't know

3. **Do you expect to visit a rainforest anytime in the future? Please tick:**

   ☐$_1$ Yes ☐$_0$ No ☐$_{99}$ Don't know

4. **How would you classify your knowledge of tropical rainforests? Please circle ONE point on the scale below:**

1	2	3	4	5
Not very Knowledgeable				Very Knowledgeable

Many scientists, conservationists and governments are concerned about the loss of tropical rainforests. In this survey we want to find out more about your views.

RAINFOREST FACTS

Today rainforests cover around 6% of the planet, just less than half their original extent and they continue to be lost at a rapid rate. The main causes of rainforest loss are unsustainable timber logging, clearance for agriculture, mining, fuelwood gathering and cattle grazing.

Most of the remaining rainforests are located in the developing countries, which are typically very poor. The largest concentrations are found in South America, Central America, Africa and Asia (see map).

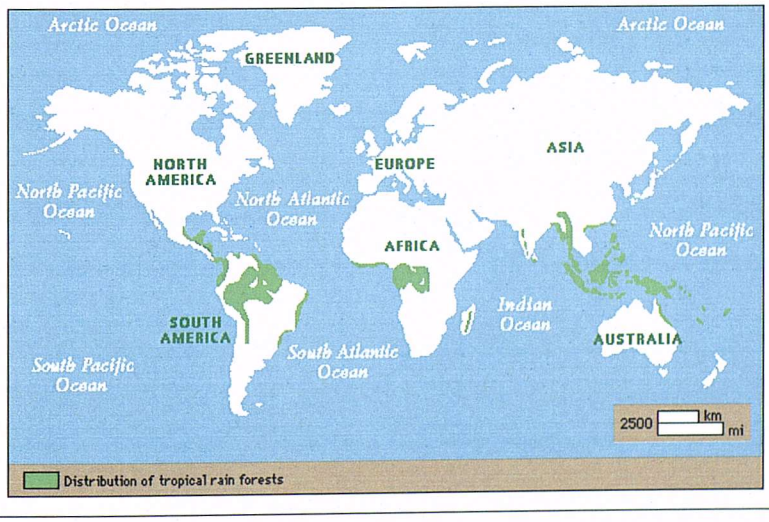
Some of the main reasons for conserving and for using rainforests are presented below:

Reasons for conserving rainforests...

- Contain over 50% of the worlds plant and animal species
- Play an important role in regulating the Earth's climate and water resources
- Thought to contain many undiscovered medicines
- Home to many indigenous communities

Reasons for using rainforests...

- To provide income for development and to pay off foreign debts
- Cleared to provide land for agricultural production
- To provide fuelwood & materials for local people
- To supply global timber commodities



5. **How familiar was the information presented in the Rainforest Facts box? By this we mean, was any of the information new to you? Please circle ONE point on the scale below:**

1	2	3	4	5
All info was new to me	Most new to me	Some new to me	Bits new to me	None of it was new to me

6. **Now, we would like to explore your views on the conservation and use of tropical rainforests.**

Please consider the following statements and indicate how strongly you agree or disagree by ticking the box:

	Strongly Disagree	***Disagree***	***Neither Agree nor Disagree***	***Agree***	***Strongly Agree***
A Rainforests should be protected no matter what the costs	☐1	☐2	☐3	☐4	☐5
B Rainforests should be completely preserved without use	☐1	☐2	☐3	☐4	☐5
C Rainforests should be used to enable economic development in developing countries	☐1	☐2	☐3	☐4	☐5
D We have a duty to protect the world's rainforests	☐1	☐2	☐3	☐4	☐5
E There's nothing I can do to help save the world's rainforests	☐1	☐2	☐3	☐4	☐5

7. **Some policymakers argue that developed countries, like the UK, should help developing countries to pay the costs of conserving their tropical rainforests.**

Do you agree with this? Please tick:

☐$_1$ Yes ☐$_0$ No ☐$_{99}$ Don't know

8. **If the UK government were to help pay these costs, where would you most prefer funding to be directed? Please tick ONE of the below:**

☐$_1$ Rainforests in South America
☐$_2$ Rainforests in Central America
☐$_3$ Rainforests in Asia
☐$_4$ Rainforests in Africa
☐$_5$ No Preference/any location
☐$_6$ None

9. **In principle, do you think that you would be willing to contribute something to help rainforest conservation? Please tick:**

☐$_1$ Yes ☐$_0$ No ☐$_{99}$ Don't know

NOW PLEASE GO TO SECTION C OVER THE PAGE

SECTION C: RAINFOREST VALUATION

In this section we would like to explore your views on different approaches to rainforest conservation. **Please read the information boxes presented carefully as the rest of the questionnaire asks for your opinions on this...**

Please imagine three rainforest organisations are raising money to fund three rainforest conservation programmes, each with a different focus, as explained below:

Organisation A: Iwokrama Forest (Untouched rainforest)

Organisation A is focusing on Iwokrama Rainforest in Guyana, South America. This forest contains a high number of plant and animal species and is home to a number of Amerindian communities. It is in **pristine condition** with **over 80% of its original rainforest intact** and is one of the last remaining **extensive 'untouched'** rainforests.

Organisation B: Atlantic Forest (Little left)

Organisation B is focusing on Atlantic Rainforest in Brazil, South America. This forest contains a high number of plant and animals species and is home to a number of Amerindian communities. It is already **very fragmented** with **less than 8% of the original rainforest left** and is in danger of being completely lost.

Organisation C: Any Rainforest (Any condition)

Organisation C is focusing on rainforest loss worldwide, setting up conservation programmes in **any rainforest**, in **any location** and in **any condition**. The main reason for rainforest selection is ease of investment. If you donate to this organisation you would not know the location of the programme or the quality of the rainforest.

The problem...

All three organisations are **short of funding**, and if sufficient money is not raised then **none of the conservation programmes will go ahead**, meaning no additional rainforest will be conserved. **If this happens these rainforests are likely to become severely degraded within 15 years or less.**

10. **Of the three conservation organisations described which would you most prefer to support? Please tick one:**

- ☐1 A: Iwokrama Forest/untouched
- ☐2 B: Atlantic Forest/little left
- ☐3 C: Any Rainforest/any condition
- ☐4 None

The Rainforest Conservation Programmes

There are a number of different options under which each conservation programme could be implemented. We would like to find out which options you most prefer.

Beforehand, please read the box below which explains the five main ways in which the programmes could vary.

Size of Conservation Area	The conservation area may cover: • **185,000 hectares** (approx. 1¼ times size of London) or • **371,000 hectares** (approx. 2½ times the size of London).
Number of rare or endangered species present	There may be either: • **30 rare or endangered species;** or • **45 rare or endangered species** present within the rainforest conservation areas.
Management Approach	The conservation area may permit some commercial activities in order to raise money towards the running costs of the conservation programme. The options are: • **Complete Preservation**: *meaning no commercial activities take place, no* revenue is generated, no disturbance to the rainforest; or • **Sustainable Uses**: meaning parts of the rainforest are used for ecotourism and sustainable logging, generating 30-40% of the programmes running costs, some disturbance in areas of the rainforest.
Conservation Period	The rainforests may either be conserved for: • **15 years** (until 2020) or • **50 years** (until 2055). At the end of the conservation period there is no guarantee that the rainforests will continue to be conserved.
Local Community impact	The communities living in and around the conservation area may be affected in the following ways: • **Community Benefits:** Communities receive benefits from the conservation programme through provision of jobs, training and development projects; or • **No Benefits**: Communities receive no benefits from the programme.

11. **In your opinion which of the programme attributes are the most important? Please rank the attributes from 1 to 5, where 1 is highest importance and 5 is lowest importance, or tick if you have no preference:**

	RANK (from 1 to 5)
Size of conservation area	
Number of rare or endangered species present	
Management Approach	
Conservation Period	
Local community impact	
Or No preference (tick)	☐1

12. **Of the management approaches described which would you most prefer to see implemented? Please tick ONE:**

☐1 Complete preservation ☐3 No preference

☐2 Sustainable Uses ☐4 None

13. **In order to raise the money required for the conservation programmes to go ahead, each Organisation proposes to set up a Rainforest Fund in the UK for ordinary members of the public to make a one-off donation. We would like to find out whether in principle you would be willing to donate to any of the funds and if so which type of programme you prefer.**

Please note this is hypothetical, we are not really asking you to pay however we would like you to think about what you would do if in reality you were asked to contribute.

A series of questions have been created which describe the possible conservation programmes for each Organisation and the size of the donation required for the programme to go ahead. In each set, **Option A** represents Organisation A: **Iwokrama 'untouched' Rainforest**, **Option B** represents Organisation B: **Atlantic 'little left' Rainforest** and **Option C** is Organisation C: **'Any rainforest/any condition'**.

In each question we would like you choose the option you most prefer out of the three presented, or indicate if you would not support any of the options, treating each question separately. All of the attributes will vary across the questions; the donation required will be between £0 and £500.

Please consider the choices in the context of your real circumstances, and remember that there are other rainforest conservation organisations and other causes that you may wish to spend your money on.

If you feel the conservation options are not important enough or if they are too expensive, you can choose not to donate by ticking 'I would not support any option'.

Lastly, whilst some of the options may seem strange they are in fact all possible.

An example is presented below:

EXAMPLE: Please place a tick below the ONE option you most prefer:

➔ ***If you preferred Option B, you would place a tick as Indicated***

Attributes	**Option A**	**Option B**	**Option C**
	Iwokrama Forest Untouched	**Atlantic Forest** Little Left	**Any Rainforest** Any condition
Size of conservation area (hectares)	185,000 ha	185,000 ha	371,000 ha
No of rare species present	30 species	45 species	45 species
Management	Compiete Preservation	Complete Preservation	Sustainable Uses
Conservation Period	15 years	50 years	50 years
Local Communities	No Benefits	Community Benefits	Community Benefits
Donation Required	£3	£10	£3

Please indicate preference: (Tick **ONE**)

☐$_1$ Option A

☑$_2$ Option B

☐$_3$ Option C

☐$_4$ I would not support any option

CHOICE QUESTION 1

Please Indicate your preference below:

Attributes	Option A	Option B	Option C
	Iwokrama Forest Untouched	**Atlantic Forest** Little Left	**Any Rainforest** Any condition
Size of conservation area (hectares)	371,000 ha	371,000 ha	371,000 ha
Rare species present	45 species	45 species	30 species
Management	Complete Preservation	Complete Preservation	Complete Preservation
Conserved Period	15 years	50 years	50 years
Local communities	Community Benefits	No Benefits	Community Benefits
Donation Required	£10	£20	£10

Please indicate preference: (Tick ONE)

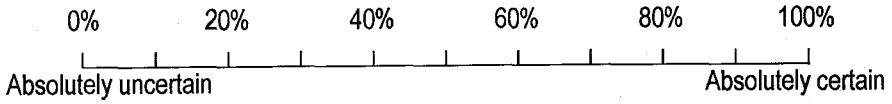
☐1 Option A

☐2 Option B

☐3 Option C

☐4 I would not support any option

How certain are you of your choice? Please **circle ONE point** on the scale below:



CHOICE QUESTION 2

Please indicate your preference below:

Attributes	Option A	Option B	Option C
	Iwokrama Forest Untouched	**Atlantic Forest** Little Left	**Any Rainforest** Any condition
Size of conservation area (hectares)	185,000 ha	371,000 ha	371,000 ha
Rare species present	30 species	45 species	45 species
Management	Complete Preservation	Sustainable Uses	Complete Preservation
Conserved Period	50 years	50 years	15 years
Local communities	Community Benefits	Community Benefits	Community Benefits
Donation Required	£14	£3	£500

Please indicate preference: (Tick ONE)

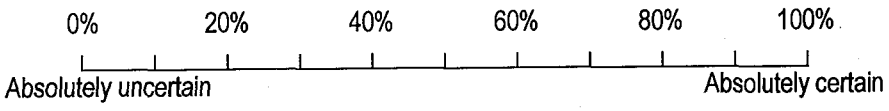
☐1 Option A

☐2 Option B

☐3 Option C

☐4 I would not support any option

How certain are you of your choice? Please **circle ONE point** on the scale below:



CHOICE QUESTION 3

Please indicate your preference below:

Attributes	Option A	Option B	Option C
	Iwokrama Forest Untouched	**Atlantic Forest** Little Left	**Any Rainforest** Any condition
Size of conservation area (hectares)	371,000 ha	185,000 ha	371,000 ha
Rare species present	45 species	45 species	45 species
Management	Sustainable Uses	Sustainable Uses	Complete Preservation
Conserved Period	15 years	15 years	50 years
Local communities	No Benefits	No Benefits	No Benefits
Donation Required	£14	£500	£30

Please indicate preference: (Tick ONE)

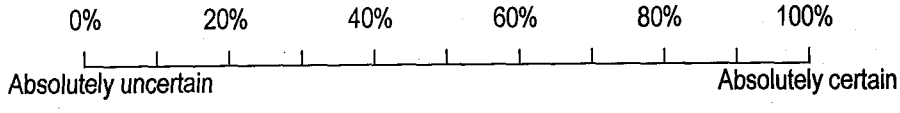
☐$_1$ Option A

☐$_2$ Option B

☐$_3$ Option C

☐$_4$ I would not support any option

How certain are you of your choice? Please **circle ONE point** on the scale below:



CHOICE QUESTION 4

Please indicate your preference below:

Attributes	**Option A**	**Option B**	**Option C**
	Iwokrama Forest	**Atlantic Forest** Littie Left	**Any Rainforest** Any condition
Size of conservation area (hectares)	371,000 ha	185,000 ha	185,000 ha
Rare species present	30 species	45 species	45 species
Management	Complete Preservation	Complete Preservation	Sustainable Uses
Conserved Period	15 years	50 years	15 years
Local communities	No Benefits	No Benefits	No Benefits
Donation Required	£30	£100	£10

Please indicate preference: (Tick ONE)

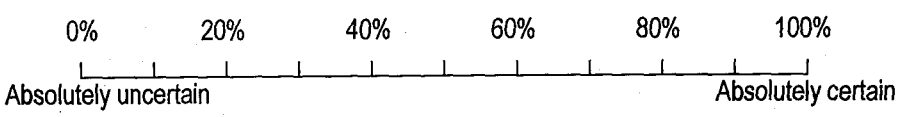
☐1 Option A

☐2 Option B

☐3 Option C

☐4 I would not support any option

How certain are you of your choice? Please **circle ONE point** on the scale below:



CHOICE QUESTION 5

Please indicate your preference below:

Attributes	**Option A**	**Option B**	**Option C**
	Iwokrama Forest Untouched	**Atlantic Forest** Little Left	**Any Rainforest** Any condition
Size of conservation area (hectares)	185,000 ha	185,000 ha	185,000 ha
Rare species present	45 species	30 species	30 species
Management	Sustainable Uses	Sustainable Uses	Complete Preservation
Conserved Period	15 years	15 years	15 years
Local communities	No Benefits	Community Benefits	No Benefits
Donation Required	£500	£20	£100

Please indicate preference: (Tick ONE)

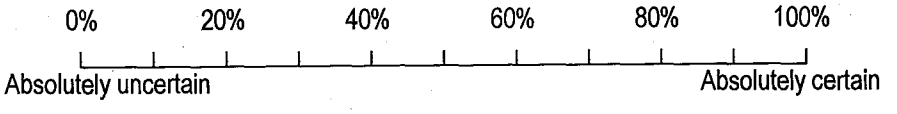
☐1 Option A

☐2 Option B

☐3 Option C

☐4 I would not support any option

How certain are you of your choice? Please **circle ONE point** on the scale below:



SECTION D: CHOICE QUESTIONS FOLLOW-UP

14. **Which of the beiow best describes how you made your decisions in the choice questions? Please tick ONE:**

☐1	I considered most or all of the attributes
☐2	I considered only one of the attributes (please specify):.....
☐3	I always chose the same option (please specify):.....
☐4	Other (please specify):.....

➔If you chose Option A, B or C in ANY of the choice questions, please go to Q15

➔If you chose 'I would not support any option' in ALL choice questions please go to Q16

15. **Which of these statements best describes your main reason for choosing to support the conservation options? Please tick ONE (➔then go to Q 17)**

☐1	I chose to donate although I probably wouldn't really pay
☐2	I get a sense of satisfaction from contributing to good causes
☐3	I chose the option which was the best value for money
☐4	I may wish to visit one of these rainforests in the future
☐5	Its important to me that wildlife is conserved
☐6	Its important to me that rainforests exist for future generations to enjoy
☐7	We have a moral duty to support rainforest conservation
☐8	So that local people can use this rainforest today as a resource
☐9	For future use in medicines
☐10	For global environmental reasons ie climate change, water resources
☐11	Because rainforests have a right to exist
☐12	Other (please specify): .....

➔ Now go to Q 17

16. **If you chose 'I would not support any option' in ALL choice questions, please tick the ONE reason which best explains why:**

☐1	Rainforest conservation is not important to me
☐2	None of the programmes appeal to me
☐3	I don't believe that this money would really be spent on rainforests
☐4	The choices were too difficult
☐5	The conservation options were too expensive
☐6	I prefer to spend my money on other things
☐7	The government should pay for this
☐8	There's no guarantee that everybody else will pay
☐9	I prefer to give to other charitable causes
☐10	Other (please specify):.....

→ **Now go to Q 17**

17. **Please consider the following statements about the 'I would not support any option' and tick the ONE which best describes your view:**

☐1	I chose 'I would not support any option' when it was my preferred choice
☐2	I chose 'I would not support any option' when it was a quicker/easier choice
☐3	I always preferred options A or B or C
☐4	I didn't feel I could choose 'I would not support any option' ie morally unacceptable

18. **Now, thinking about the Choice Questions, please indicate how strongly you agree or disagree with each of the following statements:**

	Strongly Disagree	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*
A I found the choice questions confusing	☐1	☐2	☐3	☐4	☐5
B I needed more information than was provided	☐1	☐2	☐3	☐4	☐5
C I found the choice questions extremely difficult	☐1	☐2	☐3	☐4	☐5
D I chose to donate although I wouldn't really pay	☐1	☐2	☐3	☐4	☐5

PLEASE GO TO SECTION E OPPOSITE

SECTION E: IWOKRAMA ALTERNATIVE VALUATION

Now, keeping in mind the other Rainforest Organisations described (you may wish to refer back to Page 5), suppose that Organisation A set up a conservation programme in Iwokrama Rainforest that would ensure the following outcomes:

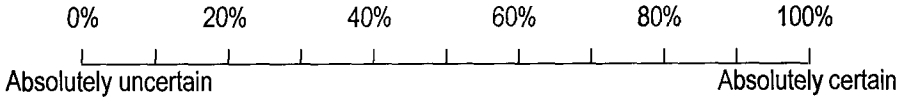
Iwokrama Rainforest Conservation Programme
371,000 hectares rainforest conserved
45 rare or endangered species present
Sustainable Uses
Community Benefits
50 year conservation period (conserved until 2055)

To implement this programme the Iwokrama Rainforest Fund would require a one-off donation of between £50 and £500.

19. **Would you be willing to make a one-off donation of £50 to support this programme?** *(Remember there are other conservation organisations and other causes that you may wish to spend your money on).*

☐1 Yes, I would pay ☐0 No, I would not pay

How certain are you of your answer? Please circle ONE point below:



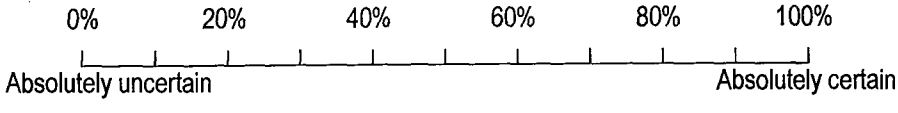
➔ If you ticked '**YES, I would pay**' please **go to Q 20**

➔ If you ticked **'NO, I would not pay'** please **go to Q 21**

20. **If you answered YES to the amount in Q19, would you be willing to make a one-off donation of £500?**

☐1 Yes, I would pay ☐0 No, I would not pay

How certain are you of your answer? Please circle ONE point below:



➔ Now, please **go to Q 22**

21. **If you answered NO in Q19, which of the below best explains why? Tick ONE:**

☐1	Rainforest conservation is not important to me
☐2	This particular rainforest does not appeal to me
☐3	I don't believe that this money would really be spent on rainforests
☐4	I cannot afford to pay
☐5	I prefer to spend my money on other things
☐6	The government should pay for this
☐7	I don't believe that the conservation programme will be successful
☐8	There's no guarantee that everybody else will pay
☐9	I prefer to give to other charitable causes
☐10	Other (please

➔**Now go to Q22**

22. **In terms of Questions 19 and 20, do your responses reflect the amount you would be willing to donate to conserve Iwokrama rainforest or to conserve all rainforests in general?**

☐1 Iwokrama ☐0 All ☐99 Don't know

23. **In your opinion, do you think that the Iwokrama Rainforest Fund will receive strong support from the British public? Please tick ONE:**

☐1 Yes ☐0 No ☐99 Don't know

24. **Do you believe that asking for public donations is a good way of raising funds for rainforest conservation? Please tick ONE:**

☐1 Yes ☐0 No ☐99 Don't know

25. **There are many other ways to generate funds for rainforest conservation. Please indicate whether in principle you would be willing to undertake any of the following, please tick as appropriate:**

☐1	Buy rainforest-friendly products over regular products eg rainforest-friendly
☐1	Adopt an acre of rainforest through a sponsorship scheme
☐1	Pay an annual UK Rainforest Charge (applicable to all UK residents)
☐1	Pay an annual Global Rainforest Charge (applicable to all worldwide)
☐1	Pay a surcharge on medicine derived from rainforest plants
☐1	Buy shares specifically in companies which support rainforest
☐1	Pay an International Arrivals Charge for visiting countries with rainforests
☐0	None of the above

SECTION F: ABOUT YOU

The following socio-economic questions are important for our research; they are to ensure that we have a good cross-section of London's population. **The information provided will be used for statistical purposes only and will remain confidential.**

26. **Gender: Please tick:**

☐1 Male ☐0 Female

27. **Age Group: Please tick ONE:**

☐1 18-19 years
☐2 20-24 years
☐3 25-29 years
☐4 30-44 years
☐5 45-59 years
☐6 60-64 years
☐7 65-74 years
☐8 75 years or more

28. **Have you ever visited any of the following? Please tick as appropriate:**

☐1 A developing country
☐2 South America
☐3 Brazil
☐4 Guyana
☐5 No to all

29. **Are you currently a member of any environmental or conservation organisations? Please tick:**

☐1 Yes ☐0 No

30. **Have you donated any time or money to an environmental cause in the last 12 months (excluding any membership fees related to Q29)? Please tick:**

☐1 Yes ☐0 No ☐99 Don't know

31. **How many children under the age of 16 live in your household? Please tick ONE:**

☐0 0
☐1 1
☐2 2
☐3 3
☐4 4 or more

32. **Which of the below best describes your living arrangements? Please tick ONE:**

☐1	Private Renting	☐4	Living with Parents
☐2	Council Renting	☐5	Housing Association
☐3	Home owner	☐6	Other (pls specify)..... .....

33. **What is your current work status? Please tick ONE:**

☐1	Self-employed	☐5	Unemployed
☐2	Employed full-time (>30 hrs/week)	☐6	Student
☐3	Employed part-time (<30 hrs/week)	☐7	Retired
☐4	Looking after home full-time/housewife	☐8	Unable to work (sick/disability)

34. **What is the highest level of education that you have obtained so far? Please tick ONE:**

☐1	Primary	☐5	Professional qualification of degree level
☐2	O level/GCSE/GCE or equivalent	☐6	Higher degree (MSc, PhD, etc)
☐3	A level/HNC/HND/BTEC or equivalent	☐7	Other (Pls specify):..... .....
☐4	College/University degree		

35. **Which of the below best describes your total annual household income before tax? Please tick ONE:**

☐1	£0 – 14,999	☐5	£40,000 – 49,999
☐2	£15,000 – 19,999	☐6	£50,000 – 59,999
☐3	£20,000 – 29,999	☐7	£60,000 – 69,999
☐4	£30,000 – 39,999	☐8	£70,000 or more

This information is for **statistical purposes only** and will be **strictly confidential**

36. **Lastly, what did you think of this questionnaire? Please tick as appropriate:**

☐1	Interesting	☐4	Educational
☐2	Too long	☐5	Unrealistic/Not credible
☐3	Difficult to understand	☐6	Other: Please specify:.....

THIS IS THE END!

THANK YOU VERY MUCH FOR YOUR TIME.

If you wish to be entered into the prize draw (see front page) please provide your contact details below:

.....

.....

TO RETURN THE COMPLETED QUESTIONNAIRE:

PLEASE PLACE IT IN THE ENCLOSED PRE-PAID ENVELOPE AND POST IT TO US AT THE ADDRESS ON THE FRONT PAGE

BY 16th DECEMBER 2005

It would help us greatly if you could return the questionnaire as soon as possible, thank you

If you would like to add any further comments please use the space below:

Appendix A.6: Survey Locations (Case study 2)

Income	Borough	Nodal Street
High	Kingston-upon-Thames	Woodlands Road
		Dagmar Road
		Arundel Road
	Harrow	Hawthorne Avenue
		Kingsley Road
		Central Avenue
Middle	Hammersmith & Fulham	Hebron Road
		Foskett Road
		Mablethorpe Road
	Wandsworth	Heythorp St
		Cloudesdale Road
		Leckford Road
Low	Hackney	Tottenham Road
		Victoria Park
		Queens Drive
	Lambeth	Blairderry Road
		Studley Road
		Englewood Road

Appendix A.7: Classification of Open-Ended Responses to Understanding of term 'Biodiversity' (Case study 1)

Level 1	Level 2	Level 3
Blank	Blank	**Blank**
Oil/ Solar Power	Unrelated	**Unrelated**
Biodegradable Products/		
Nothing/Don't know/No Idea/Never Heard of it / Not Sure / Not Much	Nothing - Neutral	**Nothing**
Nothing - Negative	Nothing - Negative	
Nothing - Positive	Nothing - Positive	
Heard of it - but no meaning provided	Heard of it but no meaning	
Wildlife/Birds/Animals/Insects/Species/Flora & Fauna/Trees/Plants/Animal	Plants & Animals	**Biological**
Habitats/Ecosystems/Biomes/Environments/Ecology	Habitats & Ecosystems	
Natural Living Things/Organisms/Life Forms/Life Systems/Web of nature	Living Things	
Interactions / Living Together / Balance / Co-dependent / Interconnected / Food Chain / Rely on each other/Co-existing/Support	Biological Interactions	**Biological Interactions**
Measure/ Level of / Number of / Sum	Measure	**Measure / Amount**
Many / Lots of / Abundance/All/Vast	Quantity	
Quality	Quality	
in a given... Area/ environment / habitat / planet / earth / land	Area	
Variability/ Variety / Range/ Diversity / Different / Broad/Spread/Complexity/Types of/Diverse range of	Diversity	**Diversity**
Conservation / Sustain / Preserve / Preservation / Protection / Keeping / Retaining	Conservation	**Conservation and Policy Responses**
Agriculture / Planting Crops / Garden / Using Resources Effectively/horticulture	Sustainable Use	
Campaign / Fairtrade/organic	Other Policy Responses	
Monoculture	Unsustainable Use	**Threats**
Important / Desirable	Importance	**Importance**
Survival of Planet / Sustain Life / Saving Environment / Save life/healthy planet	Survival	

Appendix A.8: Motivations for positive WTP (Case study 1)

Reason for WTP	%
To preserve species and ecosystem richness	25.3%
For global ecosystem services eg climate regulation	22.3%
So future generations can enjoy these species/ecosystems	15.9%
I am very concerned about nature and wildlife conservation	14.6%
For moral reasons ie they have a right to exist	7.5%
So local people can benefit from these areas	5.2%
To preserve genetic resources for future use in medicines	2.3%
I value knowing these species/ecosystems exist	1.7%
Other	5.2%
Total	100.0%

Appendix A.9: Classification of Open-Ended Reasons for Sensitivity to Payment Mechanisms (Case study 1)

Reason	Level 1	Level 2
Everybody should pay/compulsory	Pro-Compulsory	**Coerciveness**
Relate to consumption		
Relate to income		
International cost-sharing		
No control/choice	Anti-compulsory	
Should be voluntary	Pro-voluntary/choice	
Choice/Flexibility/optional/pay realistic amount		
Competing causes/already donate to other causes	Anti-voluntary	
voluntary not good		
More Appropriate/Justifiable	Appropriate/Acceptable	**Acceptability/ Appropriateness**
More acceptable		
tax increase unacceptable/already pay too much tax	Unacceptable /Inappropriate	
price increase unacceptable		
charity inappropriate		
Prefer tax/taxation	Generic preference	
Support reduce subsidies	Pro subsidy removal	
Sub spin-off benefits/trade/level playing field		
Don't support reduce subsidies	Anti subsidy removal	
Less Noticeable/Spread cost/No effect	Less noticeable/Effort	**Personal Impact**
Easier to Pay/less effort		
Easy to forget/ignore	Inconvenient/Effort	
More effort		
Less corruption/more trustworthy	Trust	**Trust/Mistrust**
Mistrust Govt/Tax	Mistrust	
Mistrust charity		
Mistrust price increase		
Mistrust UN		
Greater chance of success/more direct/more effective	Effectiveness & efficiency	**Effectiveness & efficiency**
Less admin costs/all money goes to scheme/efficient		
Ineffective charity	Ineffectiveness & inefficiency	
inefficient/waste resources/admin		
fairer	Fairer	**Fairness**
Unfair on low incomes/affect less well off	Unfair/Inequitable	
Govt committed/Govt led	Pro-Institution	**Other**
Pro charity		
government should not be committed	Neg Institution	
Will raise more	High Fund-Raising	
low fund-raising	Low fund-raising	
More Transparent	Transparency	
Targetted/Specific		
Lack of transparency	Not transparent	
wider coverage	Wider coverage	
Cant afford it	Cant afford it	
Don't know	Don't know	
Diff_other	Other	

Appendix A.10: Weighting of Sample in Chapter 5 (Case Study 1)

Table: Results of Non-parametric Weighting on Key Variables using 'Degree or above' Variable (excl. protestors & outliers)

Variables	London	Sample (Full)	
	Popn.	No weight	Weighted
Degree level	24.8%	71.1%	24.8%
Income	£37,024	£57,223	£43,357
Sex	49.40%	43.80%	45.02%
Age	43.20	44.30	47.7

Table: Weighted Non-parametric Estimates of Individual WTP per annum towards Proposed Protected Area Programme

Mechanism	Weighted Lower Bound WTP			
	Mean	Median	Std Dev.	Std. Error
Tax	£30.63	£10.00	£47.39	£2.12
Higher Prices	£39.16	£15.00	£56.87	£2.49
Donations	£26.73	£10.00	£37.73	£1.66