



**SCHOOL OF ECONOMICS AND MANAGEMENT**  
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# **Nature-Based Tourism in the Cuyabeno Reserve of Ecuador**

- A Choice Experiment Survey

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Master's Thesis and Minor Field Study (20 p)

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25/04/2006

# Abstract

Ecotourism is a strong and upcoming branch of the traditional tourism industry. Is there a strong demand among tourists for travelling in accordance with ecological and ethical principles? This study uses an established framework for the definition of ecotourism to estimate the demand for some ecotourism criteria among visitors at the Cuyabeno Reserve in Ecuador. A survey based on the Choice Experiment (CE) method is used to elicit preferences among Cuyabeno visitors. The survey shows that there might be a significant willingness to pay for higher qualities of guiding and more ecological means of transport along the Cuyabeno River. The results are subsequently discussed to say something about how the implicit value of conserving the local ecosystem is linked to the results. To provide these criteria might also imply positive externalities that will not be captured by the survey but should be accounted for in Cost Benefit Analysis (CBA) on conservation.

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# Acknowledgements

The first person I would like to thank is my girlfriend Carin Tillman for helping me greatly in conducting the field survey and with valuable comments on the Thesis.

I would also like to thank my supervisor Krister Hjalte at the Department of Economics, Lund University for helping me with comments on the Thesis, inspiring ideas and suggestions on the survey methods.

Lena Hiselius at Banverket and Curt Wells at the department of Economics, Lund University helped me greatly with comments on technical issues in the survey design and the regression analysis.

My dear friend Molly Lopresti helped me reviewing the grammars of the Thesis.

In Ecuador I would like to thank naturalist guide Diego Monteros, Freddy Espinosa of the Fundación para la Sobrevivencia del Pueblo Cofán and Edgar Rivera at the Department of Environment for kindly answering all my questions.

I am also grateful to the Swedish International Development Cooperation Agency (SIDA) for financing this study.

# List of Abbreviations and Terminology

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- ASC - Attribute Specific Constant**  
*Dummy used in for MNL regression analysis*
- CBA - Cost Benefit Analysis**  
*Economic appraisal of social or private projects*
- CE - Choice Experiment**  
*Stated preference technique. A subcategory of CM*
- Choice set**  
*The scenarios available to the respondent in each discrete CE question*
- CL - Conditional Logit**  
*Probability distribution used for econometric analysis*
- CM - Choice Modelling**  
*Common name for a collection of SPTs including the CE*
- CV - Contingent Valuation**  
*Stated preference technique*
- EB - Environmental Benefit**  
*Intrinsic value of an environmental good that can be used calculating NPV*
- Eco attribute**  
*An estimator of a corresponding eco criterion*
- Eco criterion**  
*Refers to the six eco criteria included in Wallace and Pierce's model. Outlined in Appendix A*
- EV - Existence Value**  
*Monetary value on the amenity of the mere existence of a good.*
- FSPC - Fundación para la Sobrevivencia del Pueblo Cofán**  
*Indigenous organization of the Cofán people*
- IIA - Independence of Irrelevant Alternatives**  
*Restriction on some econometric models used in CE*
- IBP - Incentive Based Program**  
*Program aimed at creating an incentive for environmental conservation*

- LR - Likelihood Ratio**  
*Statistic e.g. used for testing the unrestricted model*
- LTD - Lancaster Theory of Demand**  
*Theory with an alternative definition of a good other than the classical Consumer Theory*
- MNL - Multinomial Logit**  
*Econometric model used for multiple option alternative designs*
- MRS - Marginal Rate of Substitution**  
*The rate at which one good is implicitly traded for another holding utility constant*
- NGO - Non Governmental Organization**
- NPV - Net Present Value**  
*Discounted value of present and future benefits and costs (used for CBA)*
- OLS - Ordinary Least Square**  
*Econometric model*
- RPT - Revealed Preference Technique**  
*Preference eliciting method that uses data on actual behaviour*
- RUM - Random Utility Model**  
*An individual indirect utility function consisting of one deterministic part and one error term*
- Scenario**  
*An alternative (a tour package) included in a choice set. The scenario consists of a composite of attribute levels. Note that the Status Quo is also considered a scenario.*
- SPT - Stated Preference Technique**  
*Preference eliciting method for eliciting WTP/WTA by asking a respondent to state her preferences*
- UV - Use Value**  
*Amenity of consuming or experiencing an environmental good*
- WTA - Willingness to Accept**  
*The minimum amount that someone would be willing to accept for a deterioration or to forego an improvement*
- WTP - Willingness to Pay**  
*The maximum amount that someone would pay for an improvement, or for avoiding deterioration*

# Summary

**Background:** Over the last decades, tourism has proven to be a successful venture in Ecuador. Tourism to pristine natural regions often depends on a diversified and somewhat unexploited ecosystem. However, exploitation of oil deposits and unsustainable uses of natural resources stand in contrast to conservation of the country's Amazon region. In order to promote less adverse uses of the country's natural resources, a more complete picture of the true benefits of conservation and alternative economic projects would be useful. This paper looks at the current nature-based tourism in the Cuyabeno Reserve and how this venture could enhance welfare benefits by following criteria of true ecotourism.

In order to promote a standard on definitions, a famous model designed by Wallace and Pierce is used as a definition of true ecotourism criteria.

**Objective:** The principal objective of this paper is to elicit whether there is a demand among visitors at the Cuyabeno Reserve for ecotourism criteria 1-3 in Wallace and Pierce's model. The secondary objective is to establish a link between these findings and the process of future decisions on conservation on a political level and to discuss whether there are other welfare benefits of conservation that would accrue to the population with standing?

**Methods:** Based on criteria from Wallace and Pierce's model (i.e. in terms of transport, degree of guiding and possibility to work voluntarily), questionnaires were handed out to visitors at the Cuyabeno Reserve. The purpose was to estimate whether there is Willingness to Pay (WTP) for applying these criteria on the Cuyabeno tourism. To measure the demand for different fractions (attributes) of ecotourism criteria I used the Lancasterian theory of demand (LTD). Preferences are estimated using the Choice Experiment (CE) technique for stated preferences and its feature of welfare consistency. The results derived from the study are also discussed in terms of a possible Cost-Benefit Analysis (CBA) on conservation of the region.

**Results:** Extensive guiding was most highly demanded with estimated WTP of US\$67 per visitor. Also important was the choice of a more ecological river transport in the rainforest with a WTP of US\$52 per visitor. There was no indication of willingness to contribute by working voluntarily on the trip. The result validity is dependant on several assumptions that are listed in the results section.

**Conclusions:** There seems to be an economic incentive for tour operators to provide higher levels of some eco attributes. One possible obstacle for developing nature-based tourism in Cuyabeno is the political insecurity and criminality of the region. Conservation is therefore dependant on politics as well as on a functioning market for tourism commodity. Providing these eco attributes might possibly generate welfare benefits that should be accounted for when conducting an environmental CBA on conservation or exploitation ventures in the future. Incentives for substituting other unsustainable uses of natural resources, like intensive agriculture, timber exploitation and cattle ranching, will depend on efficient welfare distribution and incentive based economic activity.



# 1. Introduction

The Amazon Basin of eastern Ecuador hosts some of the world's most unique biodiversity. The region entails the six provinces of Sucumbíos, Orellana, Napo, Pastaza, Morona Santiago and Zamora-Chinchiipe, which together consist of 100000 km<sup>2</sup> of tropical rainforest and is home to eight groups of indigenous people (San Sebastián and Hurtig 2004, p.1). Within the north-eastern region of Sucumbíos lies the Cuyabeno Wildlife Reserve, which has been a protected area since 1979 and has proven a fertile ground for tourism ventures for visitors interested in pristine rainforests and close-to-nature experiences. This paper will focus on Cuyabeno as a case study of tourism ventures in the Ecuadorian Amazon Basin.

In 1967 the Texaco-Gulf Consortium discovered important oil deposits in the Ecuadorian Amazon. This soon grew into a big industry and has since been a motor for the country's economy. The oil boom of the seventies brought changes to the region with the construction of pipelines, roads and oil facilities. The exploitation of oil has had positive effects on per capita income and economic growth, but has also inflicted damage on public health and the environmental quality of the region due to contamination (San Sebastián and Hurtig 2004, p.1). Since Ecuador's economy strongly depends on oil export income, there is a strong economic incentive for exploiting these natural resources. Exploitation of oil deposits inside the reserve is (at least formally) restricted by conservation legislation. Extraction of oil occasionally leads to contamination which has several known and possibly unknown negative impacts on the environment and human health. Parallel to oil extraction, other socioeconomic activities, like cattle ranching, intensive agriculture and timber exploitation, have also had detrimental effects on the local ecosystem.

To some extent, exploitation and conservation stand in contrast to each other. Economic growth should not come at the expense of environmental degradation. The most efficient way of combating unsustainable uses of natural resources is to provide an economic alternative rather than to impose prohibitive legislation.

The overall welfare gains of conservation for the population with standing (identified in section 2.3) and for the tourism industry are less prominent than the economic gains of extraction. In order to present alternatives to negative exploitation, it is necessary to study the potential of alternative economic uses of the natural assets. One such alternative use is the already firmly established nature-based tourism industry inside Cuyabeno. Tourism has risen to become the country's fourth most important export in terms of income, with well known destinations like the Galapagos Islands, the Cotopaxi Volcano and the Cuyabeno Wildlife Reserve to name a few.<sup>1</sup> Tourism to pristine wilderness areas like the Cuyabeno Reserve often depends on the level of environmental conservation, which also provides a haven for wildlife and the traditional way of life of indigenous communities. Negative impacts on the environment will be likely to affect the possibilities of keeping the area attractive as a tourism destination.

Travel agencies operating in the Cuyabeno Reserve are all privately owned and do not stem from governmental projects nor from NGOs (Wunder 2000). It is therefore likely that the Cuyabeno tourism market is more competitive than would be the case if tourism were not run by the private sector. Surveying the implicit demand in the market might yield valuable predictions on how nature-based tourism will develop in the near future.

## 1.1 Disposition

The first chapter of this essay outlines previous studies, underlying theory and concepts behind the study.

Chapter number two gives the objectives of this paper which are also illustrated by an objective algorithm. Some formulas for evaluating environmental projects are also described, establishing a link between economic incentive and political decisions. The population with standing and the target population are subsequently identified.

The third chapter presents the case study of this paper. This includes describing the Cuyabeno Reserve, the nature-based tourism in Cuyabeno, resource uses within the reserve,

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<sup>1</sup> Source: Ecuadorian Ministry of Tourism web site: <http://www.vivecuador.com/html2/eng/economy.htm>

unsustainable uses of natural resources within the reserve and descriptive statistics on the survey target population.

The fourth chapter gives an illustration of the methods used for this study, including CE and welfare consistency. This is followed by presenting the econometric model used for regression analysis of the survey data.

Chapter number five handles the survey design with topics of reliability and validity in a survey designed with a focus on Choice Experiment (CE). Then follows an explanation of the steps taken in the final survey design.

The results of the survey are presented under chapter number six. This includes descriptive statistics of the sample, regression results and regression analysis.

Chapter number seven provides a discussion on the findings of this study, identifying some possible positive externalities and the endogenous regional problems for the future of nature-based tourism, such as criminality and political instability.

The eighth and last chapter summarises the conclusions drawn from the findings and discussions of this study.

Sections 4.2.1 – 4.2.2 and 6.2 (but not its subsections 6.2.1 – 6.2.2) are of a technical nature and could be tedious for a reader not familiar with econometrics and microeconomics. These sections are included for completeness and can be omitted without loss in overall comprehension of the study. Section 2.4.1 is an extension that can also be omitted.

Section 3.3, chapter 5 (except section 5.2 *The Survey* and 5.3 *The Status Quo*) and section 7.2 can be read extensively.

## 1.2 Defining Ecotourism

Ecotourism is a complex concept by all definitions. In defining ecotourism there is a consensus among researchers that it should entail small scale tourism to relatively undisturbed and unexploited areas. Cultural and ethical values are of imperative importance in most definitions. Ecotourism should furthermore aim at ameliorating knowledge of local ecosystems as well as local customs and contribute to preserving them. Included in the concept of ecotourism is also the notion that it should contribute to the wellbeing of local society and leave large decisions in the hands of local residents.<sup>2</sup> These are concepts that Wallace and Pierce strive to capture in their model of true ecotourism.

It is not the purpose of this study to evaluate to what extent tourism in Cuyabeno fulfils the criteria of Wallace and Pierce's model. However, it seems at least some ecotourism criteria are met in the Cuyabeno case (see chapter 3).<sup>3</sup> Tourism in Cuyabeno clearly classifies as some kind of nature-based tourism. Since it cannot be established with certainty whether tourism in Cuyabeno fulfils the criteria for true ecotourism, the weaker definition of nature-based tourism will be used when referring explicitly to Cuyabeno tourism. The Wallace and Pierce model criteria will be referred to as the definition of true ecotourism.

## 1.3 Wallace and Pierce's Model

In a paper published in 1996, Wallace and Pierce presented the results of a field study they had undertaken four years earlier in Manaus, Brazil. For the purpose of their study, they constructed an ideal type model consisting of six criteria which they used as a frame for the concept of true ecotourism (appendix A). The purpose of the study was to investigate and evaluate to what extent tourism in Manaus met the requirements of these eco criteria. A number of ad hoc attributes for each criterion were chosen as estimators and a data sample on the attributes was collected from trips organized by tour operators that were all using the prefix *eco* for describing their tours. The results were then compared to the criteria of the

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<sup>2</sup> For a comparison between definitions read, for example, Wunder 1999 and Wallace and Pierce (1996)

<sup>3</sup> E.g. small group sizes, some decisions in the hands of local residents, etc.

model. The conclusion was that the tour operators in the area were not satisfactorily living up to the model; the average result was 1.6 of a maximum of four.

Furthermore, interviews with tourists gave an indication on which services were most highly demanded and that supply of the tourism good in Manaus did not fully meet demand. Of those asked, 66 % said their expectations had been met and 22 % stated that their expectations had not been fully met (Wallace and Pierce 1996). Many of the expectations that were not satiated were clearly associated with the ecotourism model as presented by Wallace and Pierce. The study implies, thus, that many tourists might derive utility from services based on the ecotourism criteria.

While definitions of ecotourism have often been shattered, it would be valuable to work for a standard of definitions in order to more accurately make comparisons between different countries and regions. Wallace and Pierce's model is an attempt to work with a standardized scale by using ad hoc estimators of eco criteria that are chosen according to conditions in geography, politics, culture, etc. (Wallace and Pierce 1996). Contributing to a more standardized and flexible definition is the main purpose for using Wallace and Pierce's model as a frame for true ecotourism in this paper.

Criteria one, two and three of Wallace and Pierce's model focus on how tourism should contribute to environmental protection, ecological and cultural awareness of the visitor and strengthen conservation of the protected area. These are the criteria that have been chosen for the survey of this paper. Three ecotourism attributes are used as estimators of the first three criteria in the model (see section 2.1).

Criteria four to six in Wallace and Pierce's model stress the importance of active participation of locals in tourism venture development, moderation of tourism income substitution (so that traditional customs are not abandoned) and that access to the protected area is not restricted to locals because of tourism. These topics are vital for the overall concept of ecotourism. They are also relevant when discussing Incentive Based Programs (see section 3.1.3) but are hard to use in a meaningful way as an estimator of tourist Willingness to Pay (WTP). This survey will therefore limit its scope to the first three criteria in the model. An outline of Wallace and Pierce's complete model of true ecotourism is found in appendix A.

## 1.4 The Intrinsic Value of Self-Image Projection

In an experimental study, Olof Johansson-Stenman and Henrik Svedsäter (2003) suggested self-image projection might be of importance when individuals make choices that involve ethical and ecological issues. Self-image projection is defined as the way an individual looks upon herself when acting in accordance with or contrary to her true ethical principles. Decisions with ethical dimensions would accordingly entail indirect utility that is dependant on underlying individual ethical principles.

The ecotourism criteria of Wallace and Pierce's model are specifically set with ethical and ecological concerns in mind. This implies that tourists might derive utility not only from participating in a tour per se, but also from the notion of being an ethically concerned individual.<sup>4</sup> The utility any given individual derives from participating in a tour can consequently be expressed as a function of both direct consumption and the self-image projection that the consumption induces. Accordingly, there should be a higher demand for ecotourism attributes derived from Wallace and Pierce's model if they both entail Use Value (the concept of Use Value will be explained under section 2.4) and an intrinsic value of positive self-image projection. In a well functioning market, high demand should bring an economic incentive among tour operators to adjust their services according to the criteria set up by Wallace and Pierce. The market for nature-based tourism in Cuyabeno might not yet provide many of these services due to lack of information about underlying demand. Surveying the actual demand for the ecotourism market will help overcome obstacles of this sort.

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<sup>4</sup> This also implies running the risk of biases in the stated WTP, sometimes referred to as the bias of warm inner glow (Perman et al. 2003). This will be discussed more thoroughly below

## 1.5 The Lancaster Theory of Demand

In 1966 Kelvin Lancaster introduced a consumer theory alternative to the classical consumer theory. In the classical consumer theory, it is assumed that every consumer has a personal set of preferences for consuming units of a particular commodity. Demand for a commodity is measured in unit quantity as arguments in the consumer utility function. For quality changes or new market goods, this consumer theory is inappropriate because the utility function will have to be estimated for each quality change and each new commodity on the market.

LTD relaxes the assumptions on how the consumer derives utility from a commodity. In LTD, any particular good can be thought of as composed of a number of attributes. The utility that a consumer derives from a good is the aggregate value that she puts on its attributes. These attributes, not the quantity of goods, are now the arguments in the consumer utility function.

One important restriction in the LTD is that the attributes of each good should be objectively defined. This does not mean that all consumers value each attribute the same, but only that the set of attributes are the same for all consumers.

If the good is a book, then market prices could be used for estimating WTP for different attributes such as hard/soft cover, well-known or unknown writer, content of the book, etc.

The LTD could be used for market goods with observable market prices like a book, but the best use for LTD is for *composite*<sup>5</sup> non-market goods or public goods where prices are not observable since there is no real market where trade could take place. For the purpose of describing the nature-based tourism commodity, the LTD is well suited because it captures the notion that the experience of visiting a wilderness area depends of the composite of several specific attributes. In this study the nature-based tourism good is defined as a composite of ecotourism criteria which subsequently consist of a number of criteria-specific attributes for which there may or may not be a high demand among tourists. Although a market for nature-based tourism already exists, some of the attributes might not currently be provided. To estimate demand for ecotourism with a different mix of attributes than what is currently offered by the market it is necessary to create a hypothetical market with *shadow prices*, or price tags, on each attribute. The LTD allows conceptualizing the nature-based

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<sup>5</sup> Composite in this context means a commodity composed by a large number of relevant attributes

tourism good as a commodity with attributes not yet provided by the market, which would not be possible using the classical consumer theory. The shadow prices could subsequently be used as information in a Cost Benefit Analysis (CBA) (see section 2.4) on different degrees of legislated protection of the natural reserve.



## 2. Objective

The principal objective of this study is to estimate whether there is a demand among visitors at the Cuyabeno Reserve for the first three criteria of true ecotourism as defined by Wallace and Pierce (1996).

The secondary objective is to put the results into a context of possible implications on future decisions on conservation.

An additional aim in this study is to discuss positive externalities. Providing higher levels of eco attributes in the Cuyabeno tourism industry might generate positive effects that is not accounted for in the survey. If this is the case, welfare estimates will underestimate the true welfare gains of providing new services.

To meet the ends of obtaining quantitative estimates of tourism demand, the following steps are taken using the corresponding instruments:

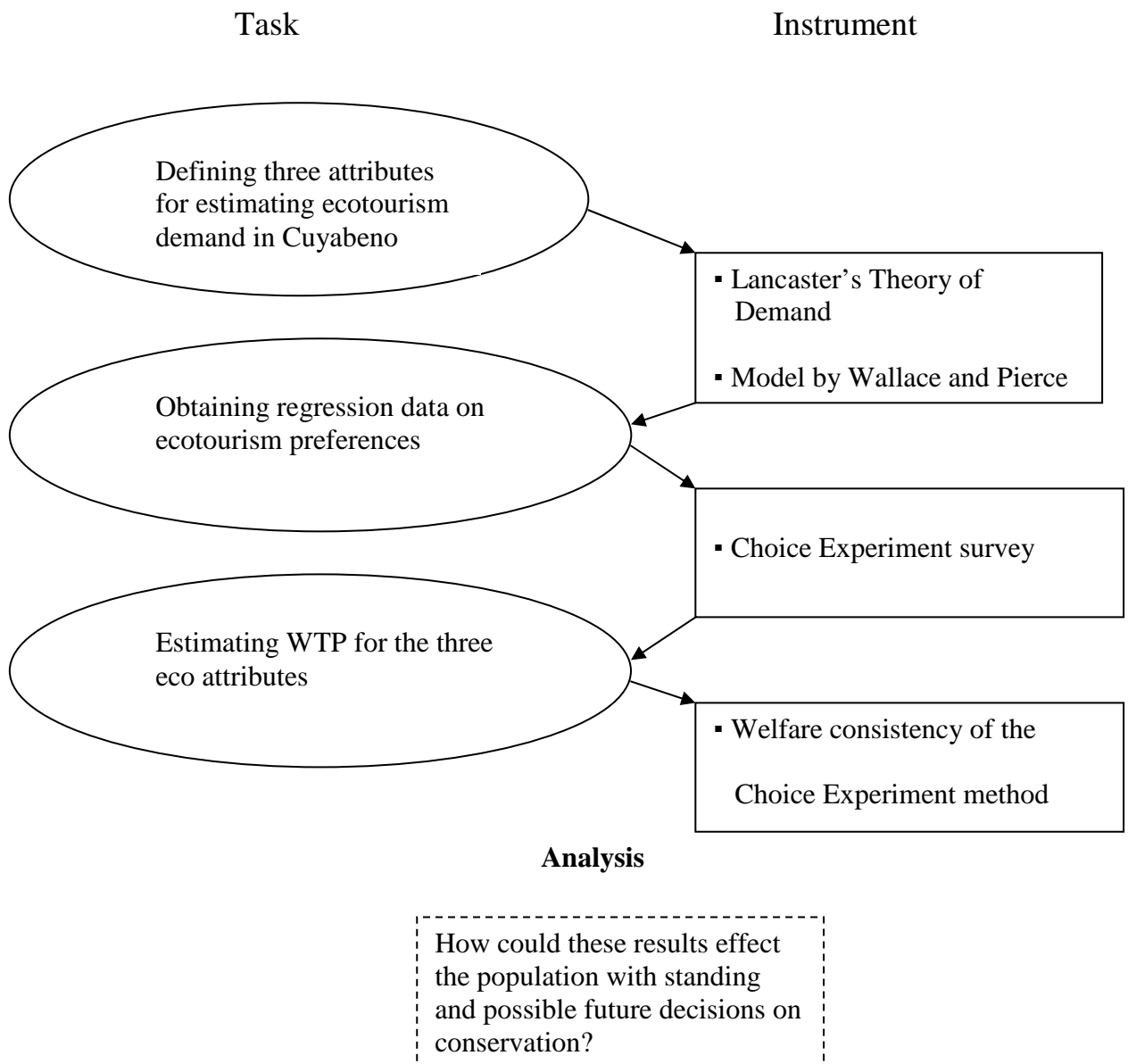


Figure 1. Analysis algorithm for the disposition of the objective

## 2.1 Linking Wallace and Pierce's Model to the Survey

In order to apply Wallace and Pierce's model on the field study, three eco criteria were isolated from the original model.

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### *Ecotourism Criteria*

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- Tourism that respects the local community (Criterion I)
  - Tourism that enhances understanding of the local community (Criterion II)
  - Tourism that contributes to conservation of legally protected areas (Criterion III)
- 

Table 1. Eco criteria 1-3

The three criteria in table 1 are outlines of criterion one, two and three in Wallace and Pierce's model (appendix A). The survey of this paper is linked to the three criteria by the following ad hoc attributes with cost as the fourth survey attribute:

- **Survey attribute No 1 -Means of transport**

Linked to: *Tourism that respects the local community*

- **Survey attribute No 2 – Extent of guiding**

Linked to: *Tourism that enhances understanding of the local community*

- **Survey attribute No 3 - Possibilities of contributing to legally protected areas and the local community through voluntary work**

Linked to: *Tourism that contributes to conservation of legally protected areas*

- **Survey attribute No 4 – Tour price**

## 2.2 Rational for Choosing the Attributes

Wallace and Pierce stress the importance of using estimators of the attributes that are specifically chosen for the local conditions (i.e. regarding geography, politics, etc.). This makes the model more flexible and useful as an instrument of comparison between different tourism sites. The first two estimators in this study have been chosen based on previous findings from field studies in Cuyabeno and the Amazon. The third eco attribute is chosen out of curiosity of a phenomenon that is already taking place elsewhere in Ecuadorian tourism to see whether it is also applicable on tourism in Cuyabeno.<sup>6</sup>

Lincango (1995) conducted a survey for estimating to what extent tourism in Cuyabeno lived up to the criteria by Wallace and Pierce.<sup>7</sup> For this purpose, she asked visitors and tour operators about their opinions on the means of transport in Cuyabeno. Most visitors found boat size and speed to be acceptable while opinions on the type of canoes used for transport were ambiguous. She found that the choice of river transport in the Cuyabeno Reserve was an important aspect of ecotourism criteria number one in Wallace and Pierce's model.

Based on this, the attribute of *means of transport* is used as an estimator of criterion number one in Wallace and Pierce's model. In accordance with the findings of Lincango, this attribute focuses on the choice of canoe type rather than speed and size. The respondent is presented with a choice between travelling in a traditional wooden canoe or, alternatively, a locally produced fibreglass canoe, which causes less environmental harm than the traditional wooden canoe because of the use of smaller engines, less water turbulence and a longer life span.<sup>8</sup> A more extensive description on the fibreglass eco canoe is provided in appendix C.

In their study from Manaus, Wallace and Pierce found that education and understanding of local culture and ecosystem are highly demanded but insufficiently supplied by tour operators. A higher quality of guiding might provide better possibilities of satiating this interest among tourists. The possibility of WTP for this enhanced experience is the reason for including guiding in this survey as an estimator of ecotourism criterion number two. The respondent is given the possibility to choose extensive guiding over normal guiding.

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<sup>6</sup> For an example, see: [www.creamos.org](http://www.creamos.org)

<sup>7</sup> Lincango 1995, referred to in Wallace (1999)

<sup>8</sup> [www.cofan.org](http://www.cofan.org), and interview with Freddy Espinosa (24/11/05)

Extended guiding is here defined as guiding with longer excursions, more specialized guides and fewer visitors per guide.

The possibility of contributing to the legally protected area through voluntary work is chosen as an attribute for estimating eco criterion number three. Unsalariated work where the tourist helps during longer periods of time (e.g. more than one month), covering her own expenses of living already exists to a certain extent in Ecuador as in other countries.<sup>9</sup> There might, I argue, also be WTP for the opportunity (but not the obligation) to work voluntarily with development projects among visitors at the Cuyabeno Reserve. This would be a good example of active participation which is an important aspect of the very core of the concept of ecotourism.

Appendix D provides an extract from a survey questionnaire where the definitions of the attributes are explained to the survey respondents.

## 2.3 Target Population and Standing

The survey target population of this study is identified as all tourists visiting the Cuyabeno Reserve. The population with standing is identified as all visitors to the Cuyabeno Reserve and Ecuadorian residents.

The survey targets preferences among Cuyabeno visitors, but this does not mean that only visitor utility is important. All welfare benefits accrued to Ecuadorians or reserve visitors are considered a welfare gain. The survey elicits potential welfare gain among visitors while welfare gains or transfers to Ecuadorians are treated as positive externalities. No externality effect is quantitatively measured but only qualitatively discussed. Since this paper does not entail eliciting preferences among others than visitors, it will probably underestimate the total intrinsic value of the reserve amenity.

Conservation of pristine nature and cultural identity are the mere basis for nature-based tourism activity and can therefore to some extent be considered regional economic

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<sup>9</sup> Example: <http://www.creamos.org/requirements.php>

endowments. I argue that this justifies giving positive weights on benefits accrued to residents within the reserve above other national residents and foreigners.

## 2.4 Environmental Cost-Benefit Analysis

An important issue is how the economic interpretation from such data could be used in practice. One use is in environmental CBA for which an outline is now provided. It is not the purpose in this study to perform a complete CBA. However, the survey results of this study might have some effect on components pertaining to environmental CBA, which in turn could have effects on how future decisions are made on conservation of the reserve.

When deciding on implementing private or governmental projects, it is customary to conduct an advisory CBA to estimate the potential effects of the projects on the population with standing. The objective of a CBA is to provide an advisory decision rule on whether to implement a project or not. This kind of analysis would, for example, be conducted before building a new highway, introducing a new drug or deciding on the degree of protection of a natural reserve. A Net Present Value (NPV) can be estimated as the difference between the present value of all future benefits (B) and the present value of all future costs (C) (Perman et al. 2003, p.362-367).

$$NPV = B_d - C_d$$

The valuation of future costs and benefits would be discounted at some approximated discount rate ( $d$ ) over time.<sup>10</sup> The NPV in this example is the present value of conserving the reserve for recreational purposes.  $B_d$  is the discounted present value of all financial benefits from tourism and  $C_d$  is the discounted present value of all direct costs and foregone profits from closing the park for tourism and fully exploiting its oil deposits. If the NPV is non-negative, the rule of thumb would be to conserve the area for recreational purposes.

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<sup>10</sup> For a discussion about how to set an appropriate discount rate, see Boardman et al. 2001 or Perman et al. 2003, p.55, 369-373

Apart from setting the discount rate, there are two major challenges in calculating the NPV; the first one is to collect reliable data on preferences, benefits and expenditures and the second is to define the population with standing. When an environmental good like an ecosystem is subject to CBA, even more problems are likely to arise. The reason for this is that they often exhibit market imperfections or intrinsic values that are not captured by conventional models.

In the case of ecotourism, there might be an intrinsic amenity value that is not captured by the NPV model. To capture this value it is necessary to include another component in the model. This component can be expressed as an Environmental Benefit (EB) of preserving an area for recreational purposes. The new formula NPV' would then be:

$$NPV' = B_d - C_d + EB$$

In this model, EB entails Use Value (UV) and Existence Value (EV) (Perman et al. 2003, p.373-375, 402-403).<sup>11</sup> The meaning of these concepts will now be explained.

For the purpose of illustration, a hypothetical decision on whether to prioritize tourism in Cuyabeno or to close the park in favour of extraction of oil will be used. To my knowledge there are no such decisions on the political agenda; it is simply used in order to explain the relevance of including the EB component.

*Example:* A natural park is currently not open for tourism or resource exploitation. Geologists find an oil deposit within the reserve. The options are to leave the deposit unexploited and open the park for tourism ventures or to open the park for exploitation and close the park to tourism. When estimating the social benefits of opening the park for tourism, the CBA would start by focusing on potential benefits from extracting the oil and compare it with estimated net present benefits of tourism. A similar analysis would then look at possible net present costs of tourism and the estimated costs of setting up oil extraction facilities. Since the park is an environmental good, monetary benefits are likely to be an understated estimator of the true value of keeping the reserve open for ecotourism if the EB

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<sup>11</sup> The EB component would also include some components of risk premium. Also, Use Value is sometimes subdivided into Direct Use Value and Indirect Use Value

component is not included. Conducting an environmental CBA, the researchers would try to include this kind of environmental benefit.

The population with standing would have to be identified (e.g. all residents in the country, or region). A sample of this population would then be randomly chosen to answer questions about the amenity they get from keeping the park for recreational use. If a monetary value can be approximated for these amenities, the true benefit of keeping the park open for visitors can be approximated.

The Use Value refers to the amenity of visiting the park. A visitor at the park would enjoy experiencing relatively undisturbed nature. The visitor might also derive utility from a positive self-image projection implicit in the UV.

The component referred to as Existence Value also entails the concept of self-image projection. However, the EV focuses on non-visitors as opposed to UV. The EV is the altruistic value that an individual puts on preserving the natural reserve even though she might never actually visit the park herself.

The NPV' formula can be rewritten as:

$$NPV' = B_d - C_d + UV_d + EV_d$$

(Perman et al. 2003, p.374)

The survey estimate of  $EB=f(UV, EV)$  would be used as an input in the NPV' formula.

After having defined and isolated these components, it will be useful to look at how it applies to the economic and qualitative results of this paper.

Ecotourism with its direct amenity and possible value of positive self-image projection is likely to be related to both the UV and the EV of the EB component. The principal objective of this paper is to elicit WTP for quality changes in the present tourism ventures in Cuyabeno. The results could have an impact on the EB component of the environmental CBA.<sup>12</sup> If the EB is positively affected then the incentive for keeping the park open for

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<sup>12</sup> The survey of this paper will capture the UV but not the EV or any positive self-image projection implicit in EV



ecotourism ventures would be stronger. This is the link between economic interpretation of environmental values and political decisions on conservation.

#### 2.4.1 Ethics in CBA

To implement an environmental CBA directly or implicitly means putting a monetary value on aspects of the environment. It might seem repulsive to monetarily measure the value of clean water or air quality. There is an argument that there are aspects that should always be given priority no matter the economic cost. As is the assumption of this study, people might be willing to pay for environmental improvement. Nevertheless, the argument to always prioritize some ethical or ecological aspects overlooks the fact that resources are almost always limited.

Sometimes a choice has to be made on how to allocate resources between two equally important goods. The mere core of economics is really to provide decision rules on how to allocate finite resources. The main problem is the concept of opportunity costs; e.g. resources allocated in favour of the environment cannot simultaneously be used to improve health care. Decisions on how to allocate resources between goods have to be taken and almost always come at the expense on something else (i.e. as an opportunity cost).

To many people it seems cheap to use money as a measure on the environment or public health. The reason money is normally used is that it is a good which exhibits some very favourable properties for economic theory. Since money is perfectly divisible and a very close substitute for most goods, it is very useful in measuring the trade-offs between two goods.

If extraction of oil in Cuyabeno generates income for the local community that cannot be matched by other economic ventures (e.g. tourism), then it will probably not be socially optimal to terminate all extraction in the area. At least in theory, these incomes could be channelled into social projects like health care or education.

For Stated Preference Techniques (SPT)<sup>13</sup> like the CE, it can be argued that each respondent acts on self interest, rather than on the interest of the society as a whole. There is no consensus as to whether the summation of preferences is analogous to the aggregate preferences of all individuals. This is an issue debated within political philosophy (Bateman et al. 2002, p.17-18).

The issue of self-interest need not be a problem. The SPT estimates whatever preferences the individual might have, including any potential EV. Accordingly, there is no reason to believe that the best interest of the society as a whole is not somewhat included in these estimates. It is important to consider that CBA on any project should be used only as an advisory rule of thumb (Bateman et al. 2002 p17-18).

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<sup>13</sup> SPT is further explained in section 4.1

### 3. The Field Study

This chapter introduces the field study (the Cuyabeno Reserve) and the study object, namely the tour and the survey target population.

#### 3.1 The Cuyabeno Reserve

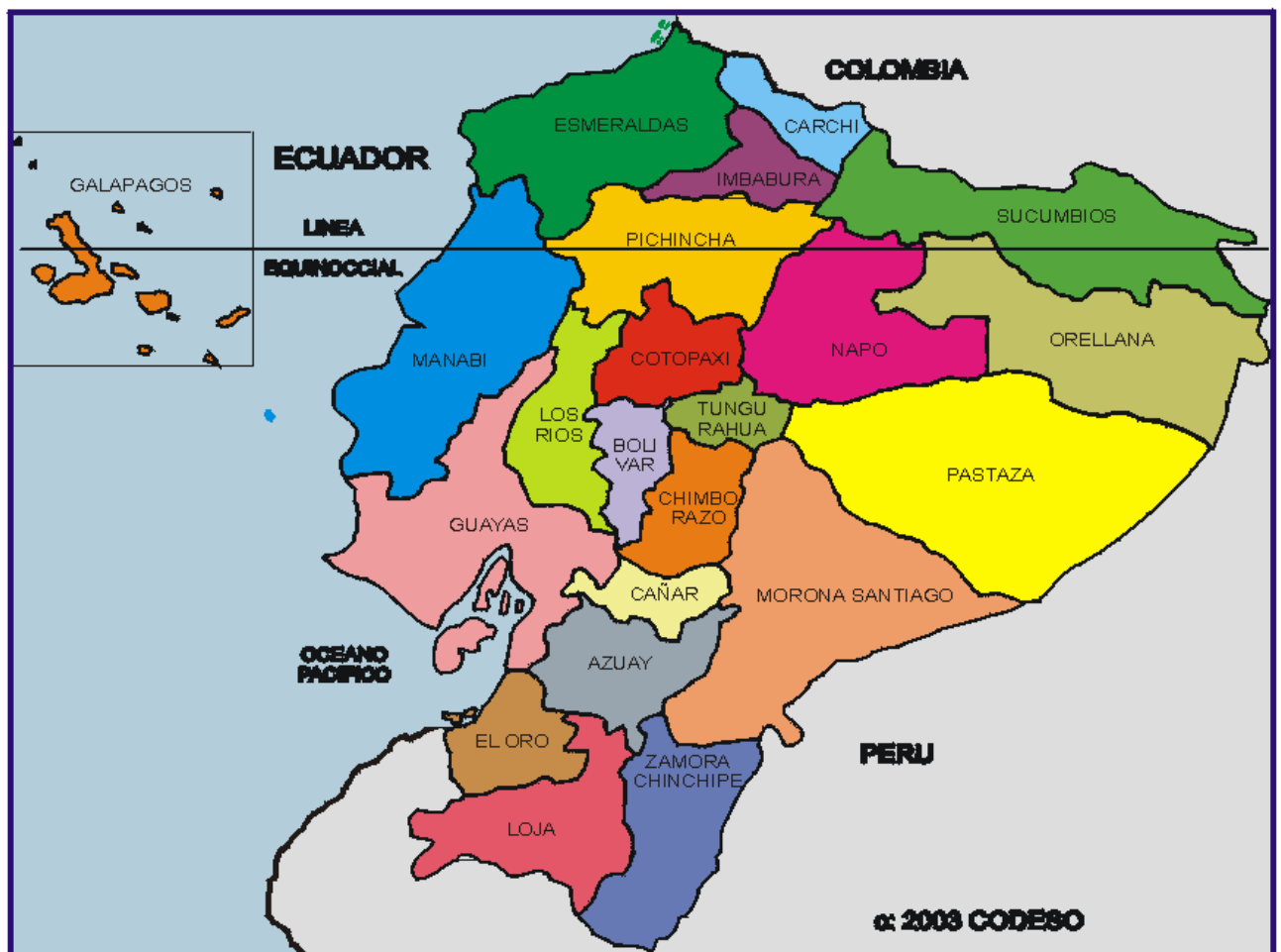


Figure 2. Provinces of Ecuador

The above map shows the Ecuadorian provinces. The Cuyabeno Wildlife Reserve lies in the eastern part of the Sucumbíos province. The Amazon entails the Napo province and the eastern provinces bordering Colombia and Peru. The Equator is marked by a line that crosses over the Amazon provinces of Sucumbíos, Napo and Orellana



Figure 3. Sucumbíos and the Cuyabeno Reserve. The square covers the area where most guide led tours are held

The Cuyabeno Reserve is situated in the north eastern Ecuadorian province of Sucumbíos, which borders Colombia in the north and Peru in the east. The reserve consists of 6034 sq km of tropical rainforest. The reserve was originally declared a protected area in 1979 with the goals of preserving the rainforest, protecting the wildlife and providing sanctuary for the traditional way of life of the various indigenous habitants of the region. In 1991 the protected area was enlarged to the east and south to its present size. Currently, national and foreign NGOs, travel agencies and conservation groups are efficiently working to protect the reserve from further adverse exploitation (Lonely Planet, Ecuador and the Galapagos 2003). The entrance to the reserve (called *El Puente de Cuyabeno*<sup>14</sup>, situated where the Tarapoa Road crosses with the Cuyabeno River) is reached by the dirt Tarapoa Road originating in the

<sup>14</sup> Translated as *The Cuyabeno Bridge*

outskirts of the Sucumbíos regional capital of Lago Agrio<sup>15</sup> and ending in *Puerto el Carmen* near the Colombian border. The presence of the petroleum industry in the area is strongly felt in Lago Agrio as is its importance as a point of trade in Sucumbíos and for the nearby Colombian province of Putumayo. The warm, humid climate of the rainforest becomes extensively palpable as one travels by the Tarapoa Road deeper into the reserve. The meandering Cuyabeno River passes by the park entrance, travelling southeast by the Laguna Grande, and continues southbound (eight hours travel)<sup>16</sup> until it meets the wider and deeper Aguarico River. The variety of trees and plants by the river is diverse, but becomes more homogenous some distance down the river; this being because the soil becomes damper which is not a favourable condition for many plant and tree species. Down the Cuyabeno River lies the entrance to the Canangüeno Reserve where tourism and motor canoes are forbidden entrance in order to provide a safe haven for animal life and vulnerable plants.

The shoreless vegetation on the river side gives way to seasonal changes of the abundant river branches because of differences in water level.<sup>17</sup> The rainy season stretches from June to August (which coincides with the high peak tourist season) and the dry season starts around late November and ends early February. Between the rainy and the dry seasons are the two semi-dry seasons.

Wild predators like anacondas, caimans, tarantellas, piranhas and pumas are all indigenous to the region as are several species of monkeys, the pink sweet water dolphin and many species of insects. At some parts of the river (like in Laguna Grande) the waters take a dark nuance giving raise to its name *black water*. The water at these locations gets its colour from waste products of the surrounding vegetation, making it inappropriate for nourishing insects. Mosquitoes are therefore not a major problem for visitors in black water regions.<sup>18</sup>

Tourism in the natural reserve of Cuyabeno has been firmly established for decades. The tourism industry is influential and has powerful lobbyists. This is possibly a reason why the area has been somewhat protected from exploitation and has been extended to its present

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<sup>15</sup> Also known as Nueva Loja

<sup>16</sup> Because of the meandering of the Cuyabeno River, measuring distance in hours is often more relevant than distance from a bird's perspective

<sup>17</sup> The only part with solid ground by the Cuyabeno River down to Laguna Grande is a small land fringe called *El Paso del Tigre*

<sup>18</sup> These descriptions are based on observations at the reserve together with interviews with naturalist guide Diego Monteros

size. The tourism sector in Cuyabeno is dominated by a small number of tour operators, with 14-20 doing business in the area as of the year 2000.<sup>19</sup> Tour operators in Cuyabeno are all Ecuadorian owned and come from the private sector rather than from foreign aid or NGO activity (Wunder 2000).

Tourism in Cuyabeno can hence be seen both as an economic venture and a conservative contra force to the adverse effects of exploitation of the area's natural resources. Economic incentive could be an important factor in the development of tourism in the region. Also, since driven by private interests, the tourism industry of Cuyabeno should be more flexible than would be the case if centrally directed as a governmental project.

### 3.1.1 Visiting the Reserve

Practically all tours to the reserve are sold and administered from the capital Quito and, to a lesser extent, from the town of Baños south of Quito. All organized tours to Cuyabeno begin in Lago Agrio which can be reached from Quito in 30 minutes by airplane or 7-8 hours by bus. The trip normally starts at 10:00-12:00 from a gathering point in Lago Agrio. The travellers are then brought by bus (3-4 hours) to *El Puente de Cuyabeno*.

Wallace and Pierce noted in their study from Manaus that many tour operators avoided paying entrance fees to the reserve by running their tours on the outskirts of the reserve. In Cuyabeno all organized tours are run inside the reserve either along the Cuyabeno River, the Laguna Grande or (for longer trips) further down the river where the Cuyabeno River meets the Aguarico River. Human activity in the area and oil companies operating inside the reserve have disturbed the wildlife on the outskirts of the reserve. Therefore, in order to have any chances of seeing wild animals and flora diversity, the tourist will have to travel deeper inside the reserve. The risk of tour operators avoiding paying the entrance fee is therefore minimal. The entrance fee is 20 US dollars for foreigners and 5 US dollars for national residents.<sup>20</sup> The minimum stay at a campsite offered by any tour operator stretches over three nights and four days.

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<sup>19</sup> The Cuyabeno park guides estimated in semi-structured interviews that about nine agencies are currently operating in the area all year round

<sup>20</sup> The entrance fee is normally excluded from the tour price

### 3.1.2 Effects of Oil Extraction

The Cuyabeno Reserve stands on important petroleum deposits of which many are currently being exploited by national and foreign entrepreneurs. A pipeline stretches from the reserve westward all the way to the Pacific coast for refining and exportation abroad. This is a natural resource that generates income to the Ecuadorian state and gives employment opportunities in Lago Agrio and communities inside the reserve. Oil exportation has accounted for up to 50 % of Ecuador's foreign exchange earnings during recent decades which can hardly be matched by income from nature-based tourism and other sustainable uses (Wunder 1999). Some landowners are currently being economically compensated for the pipeline passing over their land.<sup>21</sup> Also, the present year (2006) will see the initiation of a fund financed by the petroleum companies destined to compensate for the environmental deterioration caused by the oil industry.<sup>22</sup>

Theoretically, there is a strong economic incentive not to conserve the area for sustainable activity, but prioritize unlimited exploitation.

Notwithstanding, the petroleum industry has had adverse effects on the local ecosystem that are sometimes hard to estimate. The pipeline is known to leak, resulting in contamination of water reserves and possibly deterioration of soil quality.<sup>23</sup> The subterranean oil deposits contain a mixture of oil, natural gas and formation water. The formation water consists largely of hydrocarbons, heavy metals and a high concentrations of salt. The oil extraction produces waste of formation water and mud that are frequently deposited into open, unlined pits called separation ponds. Waste is discharged from degraded pits or pits overflowing with rain water. There are currently approximately 200 such separation ponds in the Amazon region and 53 million cubic feet of waste gas is burned daily without temperature or emission control. Several studies have showed high concentrations of hazardous chemicals in water bodies in the Amazon, and residents relate that streams and rivers once rich in fish now support little or no aquatic life. There have been no studies on the effect on soil degradation

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<sup>21</sup> Interview with Diego Monteros

<sup>22</sup> Interview with Edgar Rivera (23/11/05)

<sup>23</sup> There are many documented cases of oil spills. For example, in 2005 there was an oil spill near the village of Dayuma, Orellana ([www.elcomercio.com](http://www.elcomercio.com))

in the Ecuadorian Amazon (San Sebastián and Hurtig 2004 p.207-208). A map on oil extraction activity inside the Cuyabeno Reserve is provided in appendix B.

Apart from the direct environmental risks of contamination, there is a risk of health related problems to consider. According to a study conducted by Miguel San Sebastián and Anna-Karin Hurtig (2004), there have been documented cases of headaches, skin rashes, digestion problems, miscarriages, and possibly an increased risk of some sorts of cancer among communities living close to the extraction ponds inside the reserve.

The economic importance of Ecuador's oil exportation is easily observable. It would probably not be socially optimal to terminate oil extraction activity. However, in order to put the extraction into perspective, all qualitative and monetary aspects should be considered. Benefits from extraction should not come at the expense of health risks and deterioration of the sensitive ecosystem. Striving to make the present nature-based tourism in the area resemble the ideal type model of Wallace and Pierce might increase the intrinsic value of conserving the reserve both in terms of quality of life for residents as well as local flora and fauna. Exploitation of petroleum is a counterweight to conserving the Cuyabeno ecosystem, which is the mere base for nature-based tourism in the area.

Large scale tourism might also result in a burden on the ecosystem. It is therefore important to consider how tourism ventures inside the reserve should be developed in a sustainable way.



### 3.1.3 Other Uses of Natural Resources

The local livelihood of residents inside the reserve also has some potentially detrimental effects on the environment. Adverse effects of intensive agriculture, timber exploitation and cattle ranching could be reduced by a tourism-income effect. Employment opportunities in the tourism venture could generate income that will ease economic dependency on other activity and create an incentive to lead such activities in a sustainable way (Wunder 1999).<sup>24</sup> According to Wallace and Pierce's model, the tourism-income effect should only be complementary to current economic activity in the reserve. If this is not considered, the tourism might substitute the traditional way of life and make communities totally dependant on future development of nature-based tourism that has an uncertain future.

It has been suggested that exclusive and small scale ecotourism to pristine and well conserved natural areas generates a superior income comparative to areas where tourism is conducted on a large scale (Wunder 1999, p.3). If Wunder's assumption is valid, specializing in small scale tourism in a well conserved environment will generate higher WTP among visitors. This might enhance the positive effects of conserving the reserve and minimize the adverse effects of tourism on the environment caused by extensive visitor influx. Accordingly, there could be a link between conservation and tourism revenue.

Sustainable use of land depends on the incentive to participate among the local community. However, there is no guarantee that benefits from conservation will accrue to this population. Incentive Based Programs (IBPs) have the purpose of creating a balance between conservation and providing livelihood opportunities and benefits to those most affected by conservation efforts. The principal methods for achieving these goals are to create an incentive for residents to follow the guidelines of conservation and empower local people in the management process. If the IBP fails, there is a risk of *the tragedy of the commons*<sup>25</sup> with the over use of natural resources (Spiteri and Nepal 2006).

Spiteri and Nepal (2006) identify three vital components for an efficient IBP on conservation.

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<sup>24</sup> Wunder also stresses the danger of residents becoming totally dependant on tourism income since fluctuations in visitor influx are common

<sup>25</sup> This concept was originally described by Garrett Hardin (1968) in an article titled *The Tragedy of the Commons*. He gives an illustrative example of the problem with some open access resources where every individual strives to maximize her own benefit and thus overuses the resource

The first issue is that, when implemented, the IBP should take into account the heterogeneity of the community's values and needs. Attitudes on conservation and IBP have proven to depend on a multitude of sociodemographic variables like age, ethnicity, education, etc. The incentives should meet the particular needs of each sub-population.

The second important issue for the IBP is to adequately identify the beneficiaries (i.e. the program target population). If some parts of a community that are affected by the conservation actions are excluded from the IBP, there might be resentment. If conservation benefits are not distributed in an equitable way, it might lead to poor implementation efficiency of the IBP. Some likely benefits from conservation in the Cuyabeno case are further discussed under section 7.1. Special effort should be taken to include minorities in the benefit dispersion of the IBP. These groups are often greatly affected by conservation programs and lack means of getting their voices heard due to inherit social structures.

The third important issue is to provide community inhabitants with the opportunity to actively participate in conservation programs. This should aim at providing the community with real decision power. This should reach further than just consulting with the local community which only provides a channel of rather toothless feedback on decisions that are really taken somewhere else.

Local welfare changes are given a positive weight in this study and are therefore most important considering welfare transfers. Development of nature-based tourism in Cuyabeno could generate employment possibilities (e.g. guides, motorists and administration), reduced health hazards, increased ecosystem quality and compensation from tour operators. If such amenities can be distributed in an equitable manner to all target beneficiaries, nature-based tourism development would be an effective contra weight to unsustainable use of land. Without an efficient IBP, there might be no efficiently targeted welfare transfer and therefore no tourism income effect that could promote sustainable uses of land among local residents. For these purposes, incentive based programs will have to develop parallel to development of the tourism venture.

### 3.2 Descriptive Target Population Statistics

The target population of the survey of this study is all visitors at the Cuyabeno Reserve. The data presented below were collected from the Ecuadorian Ministry of Environment. In this section, some statistics describing the target population are presented.

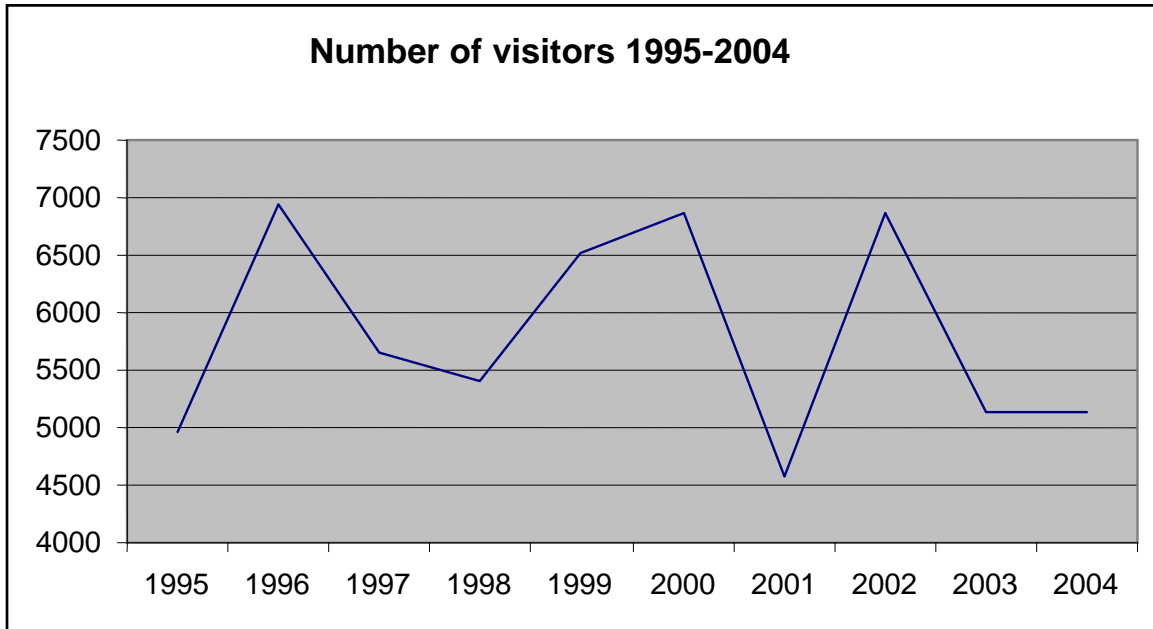


Figure 4. Number of visitors 1995-2004 (Source: Ecuadorian Ministry of Environment) (n = 58047)

The statistics on yearly number of visitors at the Cuyabeno Reserve during the period 1995-2004 show some dramatic fluctuations. The Ministry of Environment coordinator of tourism for natural areas in Ecuador, Edgar Rivera, stated in an interview (23-11-05 in Quito) that the initiation of the Plan Colombia in 2000 put much focus on the military conflict in Colombia, giving bad publicity to the neighbouring countries and especially bordering regions like Sucumbíos. This might somewhat explain the drastic drop in visitors between the year 2000 and 2001. Rivera recognizes safety and civil disorder as a main preoccupation for nature-based tourism development in Cuyabeno. The unease in number of visitors is likely to be considered by tour operators when planning on making future investments.

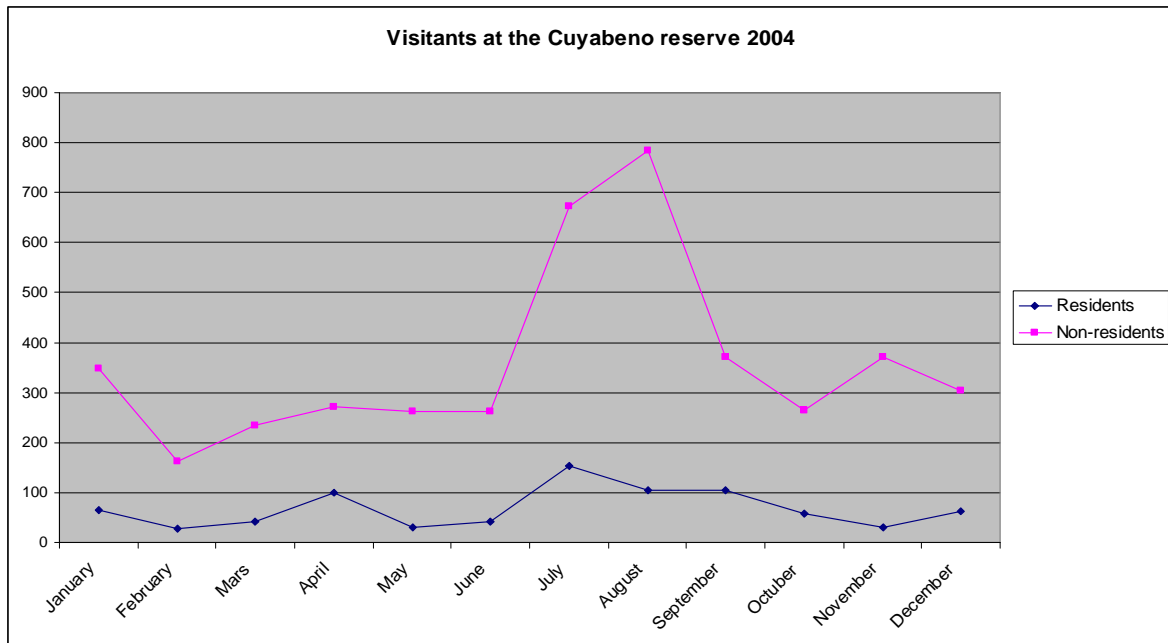


Figure 5. Ingression of visitors (Source: Ecuadorian Ministry of Environment) (n = 5132)

Visitor influx data from the year 2004 illustrates the seasonal fluctuations of visitors and the peak of the high season between June and September. Non-residents visitors are dominant in the target population. Frequency of non-resident visitors also fluctuates more than is the case for resident visitors. Several tour operators also claimed there were different seasonal patterns for influxes of foreign visitors from different countries. Since the 2004 data was the most recent complete yearly data, it is used instead of the 2005 data. The field study was conducted from October to November 2005, which is why there was not yet any data for November and December that year. Data for the year 2003 and January to October 2005 show the same pattern as 2004, and are presented in appendix D

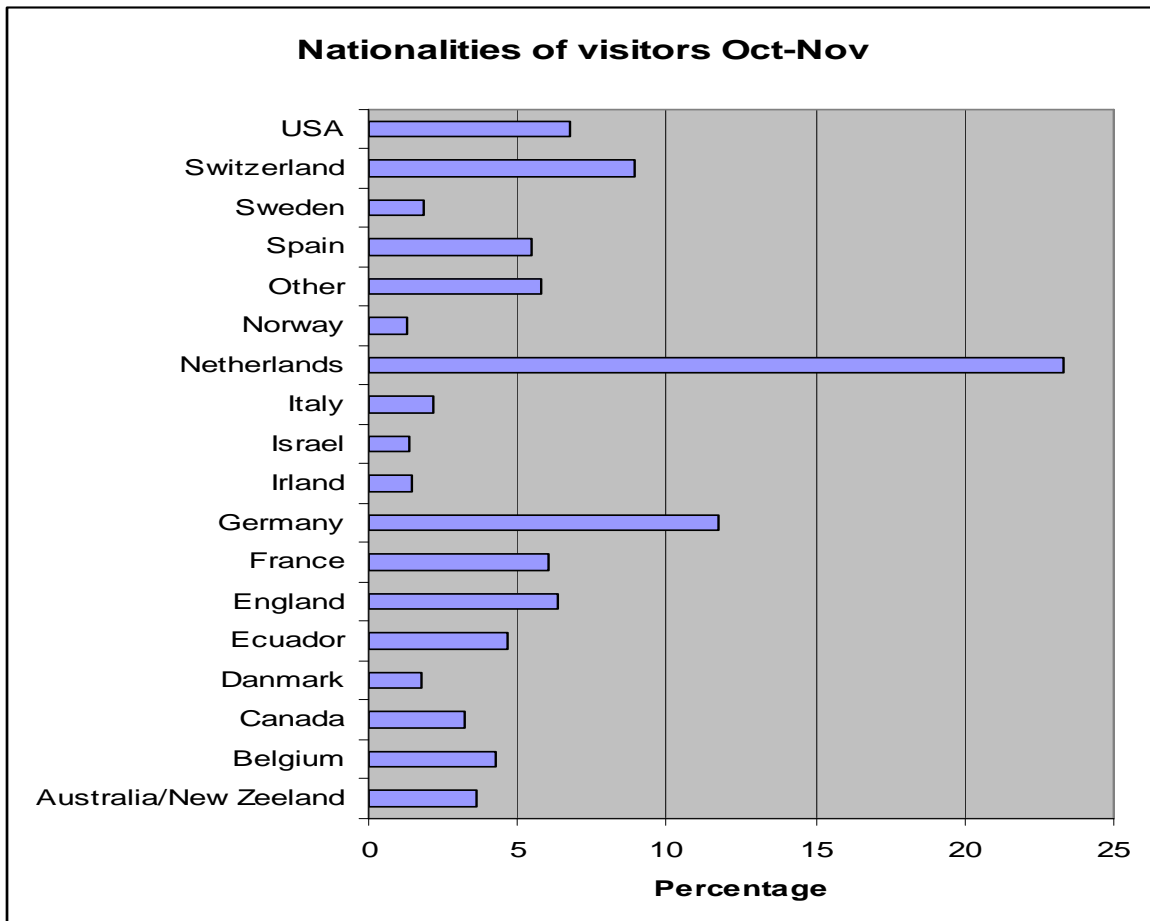


Figure 6. Nationalities of visitors Oct-Nov (Source: Ecuadorian Ministry of Environment) (n = 5396)

The above figure illustrates visitor nationality out of a pro medium from October 2001-2005 and November 2003-2004. The data is presented for the period October to November to resemble the survey period (31/10/05 to 09/11/05). Residents of developed countries dominate the statistics.

Notable is also the over representation of Dutch visitors. After consulting the physical archives at the *El Puente de Cuyabeno*, it became clear that one particular tour operator frequently brought large groups of Dutch visitors to the reserve. This indicates a direct link between potential tourists in the Netherlands and this particular tour operator. This was later confirmed by the owner of the travel agency in question at the office in Quito.

### 3.3 The Ministry of Environment

The Ecuadorian Ministry of Environment is a governmental entity with its headquarters situated in the capital of Quito. Each protected area within Ecuador is assigned a regional head office which, in the case of Cuyabeno, is located in the Sucumbíos regional capital of Lago Agrio.

The Ministry of Environment partly relies on self financed funds which largely consist of income from entrance fees collected at the entrances of each natural park. In Cuyabeno, each tour operator pays an annual licence fee to operate in the reserve. The Ministry of Environment does not charge tour operators for building shelters for nature-based tourism inside the park. However, some rules apply for everyone willing to undertake investment of tourism infrastructure within the reserve. As way of example, no buildings are allowed closer than 50 meters from the river bank.<sup>26</sup> Apart from this, it is up to the indigenous community living inside the park to grant undertaking of this sort. In fact, in some cases indigenous owners have set up their own facilities. Travel agencies then hire the shelters with the owners running the place for them. Some (but far from all) agencies have built their own facilities within the reserve.

Each protected area has got its own administration under the Ministry of Environment. The department of Lago Agrio delegates to an administrative office in Tarapoa (on the road to Cuyabeno). The office in Tarapoa then employs the chief of area, park technicians and park guides.<sup>27</sup> Nature-based tourism in the area has clearly given opportunities for employment in the regional administration. Funds are also granted by the Ecuadorian state as well as external financing (e.g. the World Bank).

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<sup>26</sup> Park guards relate that one newly built shelter recently had to close down because of violation of this rule

<sup>27</sup> Interview with Edgar Rivera (23/11/05)

## 4. Method

### 4.1 Stated and Revealed Preference Techniques

The method used for the survey of this study is a Stated Preference Technique (SPT). In a SPT survey the respondent is directly or indirectly asked about how much she would be willing to pay or, alternatively, how much she would be willing to accept as compensation for some sort of quality change. The SPT way of eliciting preferences stands in contrast to Revealed Preference Techniques (RPT) by which data is collected from observed behaviour. An advantage with RPT is that data is based on observed behaviour rather than statements, in which case there is no risk of non-true responses.

One advantage with Stated Preference Techniques is that they could encompass preferences among non-users. One RPT shortcoming is that preferences among non-users will not be accounted for, which means true WTP could be underestimated.<sup>28</sup>

Examples of SPT are Contingent Valuation (CV) and Choice Modelling (CM). The CM and CV techniques stem from the need to elicit preferences of public goods or non-market goods for which demand cannot be directly observed. This feature is the main reason for using a SPT for this study. A CM technique is here chosen over CV for its efficiency and comprehensiveness. In using CM techniques WTP is indirectly estimated by asking the respondent to order, rank or choose between different scenarios while direct questions about WTP are used in CV. It is much easier for a respondent to choose a scenario or rank attributes than to directly state her WTP for a quality change, as is the case with CV. Another advantage with CM techniques is that they allow for several attributes to be altered simultaneously, which is more informative than asking about preferences for altering only one attribute at a time.

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<sup>28</sup> For a review of SPT and RPT see e.g. Boardman et al. (2001) or Perman et al. (2003)

## 4.2 Choice Experiment

The CE method used for the survey of this study sorts as a CM technique among with Contingent Ranking, Contingent Rating and Paired Comparison (Hanley, Mourato and Wright 2001 and Bateman et al. 2002). The CE is chosen in this study because of its potential feature of welfare consistency, which is explained under section 4.2.2.

CE has previously been extensively used for public transport valuation and marketing, but has also recently been used for valuation of health economics and environmental economics. The CE captures the Lancasterian idea that utility is derived from the commodity attributes rather than the commodity itself. In a CE survey the respondent is presented with a number of discrete choice situations called choice sets. She is asked to chose between different scenarios, where one scenario is typically defined as the status quo (defined as no buy or, alternatively, to stick with the default scenario). By presenting the respondent with scenarios with different attribute levels, it is possible to indirectly derive a preference trade-off between the attributes. Including cost as an attribute together with the status quo will allow for estimations on WTP for each eco attribute, which means the CE is welfare consistent (Hanley, Mourato and Wright 2001).

One of the underlying assumptions on CE is that in picking a scenario other than the status quo the respondent increases her utility. This assumption will be important when describing the econometric model below. There is extensive literature on the theory behind the CE method. Detailed mappings on the CE method are described, for example, in Hanley, Mourato and Wright (2001), Bateman et al. (2002) or Alpizar et al. (2001).



### 4.2.1 Econometric Model

Before deciding on an econometric model for interpreting the survey data, it is necessary to make some assumptions on the indirect utility function implicit in the model. The CE builds on the Random Utility Model (RUM) presented below:

$$U_{ij} = V_{ij}(X_{ij}) + e_{ij} = bX_{ij} + e_{ij}$$

$U(.)_j$  is defined as the visitor (index  $i$ ) indirect utility and index  $j$  is the number of alternatives in the discrete choice set. The indirect utility  $U(.)_j$  consists of two components.  $V_{ij}$  is the deterministic element of visitor utility from choosing an alternative.  $V_{ij}$  is a linear index of the attributes ( $X_{ij}$ ) and  $e_{ij}$  is an error term that captures any utility change not included in the deterministic element (e.g. Hanely, Mourato and Wright 2001, p.439).

It was previously argued that the visitor increases her utility when she makes a choice other than the status quo. An expression will have to be found for the probability that a random individual will choose some alternative  $g$  to any alternative  $h$ , which is the same as the probability of a positive utility change. This probability can be stated as:

$$\Pr(V_{ig} + e_{ig} > V_{ih} + e_{ih}) = \Pr(V_{ig} - V_{ih} > e_{ih} - e_{ig})$$

This expression states that the probability of an individual choosing alternative  $g$  over alternative  $h$  is analogous to the probability that the difference in utility between alternative  $g$  and alternative  $h$  is greater than the difference between the error terms of alternative  $h$  and alternative  $g$ . Assuming the error term to be independently and identically distributed (iid) and to follow an extreme-value Gumble distribution, this probability can be expressed in terms of the Logistic Distribution presented below (e.g. Hanely, Mourato and Wright 2001, p.439).<sup>29</sup>

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<sup>29</sup> "The Gumble distribution is similar to the Normal distribution in shape, but the mathematics associated with it is much more tractable, ..." (Bateman et al. 2002 p.280)

$$\Pr(U_{ig} > U_{ih}) = \frac{\exp(\mu V_{ig})}{\sum_j \exp(\mu V_{ij})} \quad \forall g \neq h \quad g, h \in j$$

(where exp = the base  $e$  of the natural logarithm)

This expression is known as the Conditional Logit (CL) model and states the probability of respondent  $i$  preferring package  $g$  to any other package  $h$ . Index  $j$  is the total number of alternatives available to the respondent in the choice set. The  $\mu$  is a scale parameter inversely proportional to the error term. This scale parameter is not observable but will not affect the WTP estimate if the individual utility function is assumed to be linear in income. The scale parameter is often assumed to be unity for simplicity (Hanely, Mourato and Wright, p.439).

For the statistical analysis there are several econometric models for estimating the probability of the CL model. The choice of econometric model depends on assumptions of the distribution of the error term and the number of choices available to the respondent.

If the respondent is presented with only two options (A,B), a Binary Logit model should be used. In case the respondent is presented with three or more options, a Multi Nomial Logit (MNL) model is required (Hanley, Mourato and Wright 2001 and Bateman et al. 2002). The respondents are typically asked to choose between scenario one, two or the status quo scenario. The MNL model is used for the econometric analysis below with the implicit condition that the error term distribution follows an Extreme-Value Gumble distribution. The scale parameter  $\mu$  is assumed to be unity.

In order to use the MNL model, the selections from the choice sets must obey the Independence from Irrelevant Alternatives (IIA) property. This means that the choice probability ratio between two attributes is unaffected by the introduction or exclusion of another alternative. Or, stated differently, that the relative probabilities of one scenario being chosen before another is unaffected by the introduction or removal of other alternatives. If the assumption of an Extreme Value Gumble distribution of the error term holds, the IIA will also hold (Bateman et al. 2002). The IIA can be tested by means of a Hausman-McFadden

test in which one scenario is excluded from the choice sets to test whether the odds-ratio of the logistic model changes.<sup>30</sup>

#### 4.2.2 Welfare Consistency

Welfare consistency is one of the major advantages with CE as compared to other CM methods. The concept of welfare consistency means that if one of the attributes is monetary or can be interpreted in monetary terms, WTP can be derived by changing the level of one attribute while controlling for other non-monetary attributes. The WTP can then be estimated as the trade-off between one particular eco attribute and the monetary attribute. This concept builds on the Marginal Rate of Substitution (MRS) which is the marginal trade-off between two attributes keeping utility constant.

As way of illustration, the  $MRS_{X_1, DI}$  between eco attribute number one (*means of transport*) and Disposable Income (DI) for respondent  $i$  will equal:

$$\frac{\partial V_i / \partial X_1}{\partial V_i / \partial X_{DI}} = - \frac{\beta_{X_1}}{\beta_{DI}}$$

Using the same notations as before,  $V_i$  represents the deterministic part of the indirect visitor utility from choosing a tour package. This expression shows the ratio between the marginal deterministic utility of ecotourism attribute one and the marginal utility of DI which is graphically explained below.

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<sup>30</sup> The procedures of conducting a Hausman-McFadden test are more thoroughly described in Mazzanti (2001)

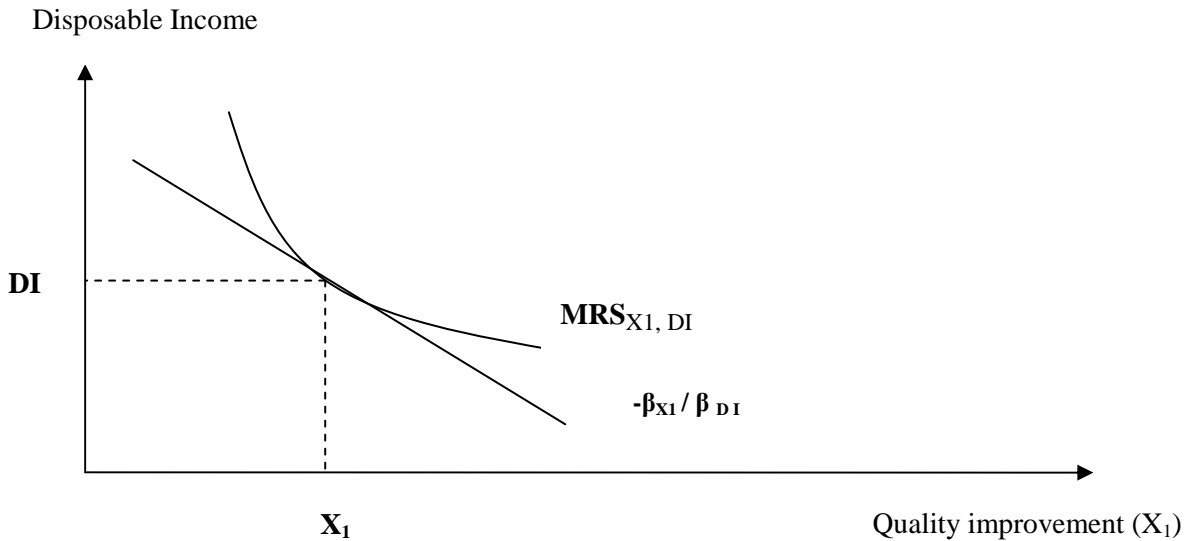


Figure 7. Marginal Rate of Substitution

Figure 7 illustrates the trade-off between the ecotourism attribute *means of transport* ( $X_1$ ) and disposable income. The MRS curve can also be interpreted as the visitor indifference curve for trade-offs between two commodities holding utility constant. In accordance with basic microeconomic theory, when utility is maximized, the slope  $-\beta_1/\beta_{DI}$  will be tangent to the visitor's indifference curve.<sup>31</sup> The slope at the tangency point can be interpreted as the shadow price of changing the level of the eco attribute on the margin.

The survey data does not directly provide the information on marginal utility of disposable income. However, the monetary attribute *tour price* ( $X_4$ ) can be used after establishing the direct link between the tour price and Disposable Income (DI) as:

$$DI = \text{income} - \text{tour price}(X_4)$$

This is the theory behind the economic interpretation of the survey results in chapter 6.

It is also worth noting that while all eco attributes of this survey are dichotomous, the price tag will only be valid for a situation where the visitor is either provided with the improvement or not (i.e.  $X_1$ ,  $X_2$  and  $X_3$  cannot take any value between zero and one).

<sup>31</sup> For a complete description of the MRS see, e.g. Nicholson (2002), p.70-72

## 5. Survey Design

### 5.1 Reliability and Validity

For the CE to be meaningful it is imperative to choose an experimental design that is reliable and valid. These issues are addressed by using an appropriate survey design and make use of the findings of previous surveys.

The reliability of a SPT depends on the replicability of a WTP/WTA measurement over time. *“Reliability exercises typically entail the repetition of studies at different points in time and so are not considered to be a reasonable requirement for each individual study”* (Bateman et al. 2002, p.340). No similar studies on the same population could be found in the Cuyabeno case. The issue of reliability was therefore not further investigated in this study.

Some validity and efficiency issues of the CE survey design are presented below.

The validity of a SPT depends on how well it measures the intended quantities of WTP or WTA (Bateman et al. 2002, p.296). In SPT methods, all data will be based on what each individual states as her true preferences. There is consequently a danger that, for some reason, the sample results will not correspond with true underlying preferences; there is a risk that the survey will be biased and hence not valid.

A crucial issue is to model the survey design so that the number of respondents that are unable or unwilling to answer the questions be minimized. One potential problem is that the questions are too difficult so that too much effort is required (Bateman et al. 2002, p.159). Some way of excluding protest answers or answers biased by *fatigue* or *lexicographic biases* are important to consider for any SPT survey.<sup>32</sup>

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<sup>32</sup> Fatigue and Lexicographic biases are further explained below

Another issue to address is the truthfulness of the responses. One pitfall is the potential bias of self-image projection. Johansson-Stenmark and Svedsäter (2003) found in a set of experiments with hypothetical and *incentive compatible*<sup>33</sup> CEs that choice sets with strong ethical aspects sometimes influence how respondents make their choices. When it comes to the matter of whether or not to protect a natural area, there is consequently a risk of self-image projection bias. Even if a respondent is not willing to pay for a scenario with more protection of a natural reserve, she might like the idea of being an ecologically concerned individual and thus choose a scenario that she would not be willing to pay for in practice. Since this study entails ethical aspects, this has to be kept in mind. Self-image projection might influence true visitor preferences but can also generate the potential problem of survey bias. It is very important to be careful in describing the attributes to the respondents. On the other hand, all scenarios have to be exhaustively described or the results will not be reliable. It is out of the scope of this study to conclude whether any effects of self-image projection are true preferences or only an upward bias.

Steps involved in designing a valid and efficient CE include some topics listed below (Alpizar et al. 2001, p.14-22). How some of these issues were addressed in the survey will be explained under section 5.2.

- i Definition of attributes, attribute levels and customisation
- ii Experimental design
- iii Experimental context

Before conducting a survey it is important to decide on how many attributes to include and how many levels to apply to each attribute. Including many attributes and levels will broaden the scope of the survey but will require a larger survey sample. A larger survey sample can be obtained by increasing the number of respondents or by extending the number of choice sets in each questionnaire.

With many attributes and attribute levels, the choice situation will be more complex for the respondent (Alpizar et al. 2001, p.14).

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<sup>33</sup> Meaning that the respondent will actually have to pay what she states as her WTP or, alternatively, that she thinks that she will be charged the stated amount of money. For example, this could be implemented by granting the respondent a sum of money and letting her trade this sum within the frame of the study

An inverted U-shaped relation between choice complexity and variance of underlying utility amounts has been suggested (Hanely, Mourato and Wright 2001, p.448). Therefore, care should be taken to keep question complexity to a minimum.

The attribute levels should only span the range over which the respondents are expected to have preferences. Furthermore, the customization of the attribute level should be realistic; there is no rationale for including an attribute level that is not practically achievable (Bateman et al. 2002, p.259). If this issue is not addressed, the respondent might not take the question seriously.

Relevant attributes and attribute levels are ideally set after performing a pilot survey. A monetary attribute is typically included to allow for an economic interpretation of the results. It is also important to detect potential *interaction effects* between the attributes (Alpizar et al. 2001, p.14).<sup>34</sup>

(ii) Experimental design deals with the issue of constructing credible scenarios and pairing the scenarios into discrete choice sets. One complication is that the number of possible scenarios can be very large. The total number of scenarios is the number of attribute levels raised to the power of the number of attributes. If all combinations are covered (i.e. a complete factorial design), the total number of scenarios is raised to the power of two. It is customary to use a fractional factorial design in order to reduce the number of scenarios.

Since attribute levels differ in each choice set, reducing the total number of scenarios means that potential interaction effects between the attributes may not be captured. The effect of any given attribute level on respondent utility can be subdivided into main effects and interaction effects. The main effect is the isolated effect of each attribute level on utility. Interaction effects are defined as the additional utility change from altering one attribute level with a simultaneous change in another attribute level. There are no interaction effects if the utility of changing one attribute is not dependant on the values of the remaining attributes. (Bateman et al. 2003, p.263).

The scenarios of the fractional factorial design are paired together in a random way into discrete choice sets. If the total number of choice sets is too high for a respondent to handle, randomisation will be used. Randomisation means that each respondent is presented with a fraction of all choice sets included in the fractional factorial design.

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<sup>34</sup> The interaction effect is further explained below

If the survey does not explicitly target interaction effects, the survey attributes should be uncorrelated (i.e. orthogonal). Apart from orthogonality, the choice sets should be designed using level balance, minimal overlap and utility balance. Level balance means that attribute levels are presented with similar frequency. Level balance is applied to avoid skewing the survey towards any particular outcome. Neglecting the minimum overlap will yield less informative responses since the strength of CE is to measure how utility changes when several attributes change simultaneously. The utility balance has a similar purpose; if the choice is too easy, the responses will not be very informative; there should not be a choice that is objectively superior to the others. Minimal overlap means that each attribute level should differ in the choice set. Utility balance is implemented by pondering the utility of each scenario (e.g. consulting experts or conducting a pilot survey) (Alpizar et al. 2001, p.16).

(iii) The experimental context is the way the questions are posed to the respondent. Questions should be put into a comprehensible context and the respondent should have sufficient knowledge to give a truthful answer. If the experimental context is not considered, the survey will run the risk of being biased by factors like fatigue or lexicographic bias. Fatigue will be a potential problem if the respondent is not able to give a truthful answer because of a stressful situation or because the questions are too complex. Lexicographic bias means that the respondent does not consider all the information given in the choice situation but considers only one element (e.g. to always choose a scenario with extensive guiding without considering other attribute levels). In order to minimize the risk of such biases the number of choice sets presented to each respondent should be minimized (Alpizar et al. 2001). Hanley et al. (2001) recommend that no more than six choice sets be presented to each respondent, while Bateman et al. (2002) suggest up to eight choice sets to be an appropriate maximum depending on the comprehensiveness of the questions asked.



## 5.2 The Survey

In order to test the model and find adequate levels on the corresponding attributes, a pilot study was conducted on students of elementary economics at the University of Lund in September 2005. The survey did not yield significance in parameters. Nevertheless, an unexpected negative sign on one attribute level was taken as an indicator of omitting this level in the final survey.

Customisation of levels in the final survey was treated by including only dichotomous eco attributes. The customization of the cost attribute levels was modified after arriving in Ecuador with the lowest level set at a slightly lower price than the status quo tour price level of US\$ 200.

Caution was taken when choosing the eco attributes in order to minimize possible interaction effects. As way of example, *group size* was initially considered a variable in the survey. The number of people participating in a tour is an important aspect of true ecotourism as defined by Wallace and Pierce. Nevertheless, this attribute was omitted because of possible strong interaction effects. One important feature of the attribute *extensive guiding* is the possibility of having several guides at the traveller's disposal to meet every individual's preferences. This feature encompasses a smaller group size. Including both attributes would run the risk of inducing strong interaction effects between the eco attributes. If a respondent already pays for a smaller group size, she might not value extensive guiding as highly as she would do otherwise. Therefore, it was important to exclude one of them in the final survey. Extensive guiding was chosen over smaller group size since the first one fully entails the other while this is not necessarily true vice versa.

The total number of scenarios of the complete factorial design was  $2^3 * 6 = 48$  and the total number of choice sets was  $48^2 = 2304$ . A fractional factorial design was constructed using the SPSS Orthoplan design. Following the assumption that eco attributes positively affect visitor utility, some scenarios were not credible and were thus modified. This came at the expense of some loss in orthogonality in the scenario design but was believed to be indispensable for the overall efficiency of the survey. The modified orthogonal design yielded 16 scenarios which were combined randomly.

Level balance, minimal overlap and utility balance was applied yielding 54 choice sets for the final survey.

By randomised procedures, the paired choices were then distributed over 8 questionnaires with 6-7 choice sets in each questionnaire.

The attribute levels were customized with the following values:

<i>Level</i>	<i>Cost US\$</i>	<i>Guiding</i>	<i>Transport</i>	Voluntary work
<b>1</b>	180	Ordinary	Traditional wooden canoe	No
<b>2</b>	200	Extensive	Fibreglass canoe	Yes
<b>3</b>	230			
<b>4</b>	275			
<b>5</b>	325			
<b>6</b>	375			

Table 2. Attribute levels in the final survey

The observed rates for the standardized tour varied between 190-220 US\$. The lowest level of cost (180 US\$) was set below the cheapest attainable price to allow for WTA for any of the eco attributes (i.e. to allow for the cost coefficient to be positive in the regression analysis under section 6.2).

Each questionnaire in the final survey design includes 6-7 choice sets where each scenario is composed of 4 attributes of which 3 are dichotomous and the fourth (cost) takes six levels, including status quo. The questionnaire begins with some sociodemographic and socioeconomic questions followed by the CE questions. A description of a tour is given to the respondent. The respondent is then presented with several choice sets where she is asked to choose between two different scenarios or the status quo (an example of a questionnaire is provided in appendix D). The experimental context was assumed to be easy for the respondents. All respondents were taking a trip that largely resembled the status quo scenario, which made it easy to conceptualize the scenarios. An introduction describing the definitions of each level was included in the questionnaire. Misinterpretations of the eco attributes were considered the potentially most severe risk for the survey reliability. This was one of the reasons for not using more than two levels in any ecotourism attribute.

In order to minimize protest answers and the problem of fatigue, an opt-out was included in each questionnaire. In each choice set, the respondent could opt-out by stating she would not choose any of the scenarios. If the respondent chose the opt-out for any of the choice sets,

the entire questionnaire was excluded from the survey. 18 respondents were excluded following this procedure.

Responses were collected from tourists travelling into or leaving the Cuyabeno Reserve between 31 October - 9 November, 2005. The survey yielded 332 usable CE observations from 49 respondents. The responses were based on willingness to participate where only a handful (3 persons) did not agree to participate. The stated reasons for this were fatigue or lack of time. A majority of the responses were collected at *El Puente de Cuyabeno* from tourists travelling into the reserve. Prior to their arriving, visitors spend 3-4 hours on a bus from Lago Agrio. Transporting the equipment and supplies from the bus to the canoes gave plenty of time for respondents to answer the questionnaires. A smaller sample was collected on the bus going from Lago Agrio to *El Puente de Cuyabeno*. Some responses were also collected at the campsite. Visitors were coded as entering the reserve if they had spent less than 24 hours inside the reserve. Respondents were asked about nationality rather than country of residence. When asked about previous participation in ecotourism (yes or no) the subjective opinion of each respondent was applied. The question about previous participation in ecotourism ventures were ultimately interpreted as previous participation in nature-based tourism (i.e. the less restrictive definition).

During the survey period, the visitors were subject to an armed assault in *El Paso del Tigre* by the Cuyabeno River. This was not considered a potential bias in the survey outcome since responses were not collected from anyone after experiencing the assault. However, this incident can readily affect the tourism industry in Cuyabeno in a longer perspective. As previous data suggested, insecurity (real or perceived insecurity) might be an important influence in visitor frequency between different years.<sup>35</sup>

Questionnaires had been prepared in Spanish in order not to exclude any important sub-sample. Ultimately, very few respondents asked for Spanish questionnaires, and no respondent had Spanish as their native tongue (although several respondents were Ecuadorian residents).

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<sup>35</sup> See figure 5, p.32

### 5.3 The Status Quo Scenario

Constructing a status quo scenario for a trip to the reserve was important for establishing the welfare consistency property of the CE. Tour packages were compared among various tour operators; they all included three meals a day, basic equipment, land and water transport, a bilingual *naturalist guide*<sup>36</sup> and an overnight stay on a campsite inside the reserve. Differences in price were mainly due to differences in lodge comfort and length of stay at the camp site. Groups varied in size but did not exceed ten travellers (or the group will be split). As for the provision of the ecotourism attributes in focus for this study, few or none were supplied. Only one tour operator was using an eco canoe for its tourist transport from *El Puente de Cuyabeno* to the campsite.<sup>37</sup> No tour operator provided the possibility of working voluntarily as defined in the questionnaire.<sup>38</sup> More than one guide was not provided for any single group (which would in practice also entail reducing the group size). The itineraries were broadly set beforehand (none of which included longer trips from the campsite with overnight stays outside the campsite). According to naturalist guide Diego Monteros, on some occasions the itineraries had been changed to satisfy the wishes of a particular tourist group. These changes in itinerary, however, were never set beforehand.

From this information it was possible to establish the status quo as a tour with rudimentary comfort over 4 nights and 5 days with no provision of fibreglass eco canoes, possibilities to work voluntarily or extensive guiding, at a price of 200 US dollars. Rudimentary lodging means provision of mattresses with mosquito nets but no private baths, fans or hot water showers. Travelling by means of a traditional wooden canoe means sitting 2 by 2 (10-12 persons) in a 12 meter canoe. The duration of the water transport depends on the location of the campsite, but most lie within a travelling distance of three to five hours by canoe from the entrance. For most wooden canoes, a 40 hp engine is used. Because the Cuyabeno River meanders, the maximum speed could not be considerably higher than the present level without jeopardizing the safety of the passengers.

The alternatives to the status quo scenario in the survey choice sets were scenarios with provisions of one or several eco attributes at different prices.

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<sup>36</sup> The term naturalist guide means a local guide that is specialized in the region of interest (as opposed to a national guide who is a licensed tour guide for all of Ecuador)

<sup>37</sup> Interviews with naturalist guide Diego Monteros gave a rough estimate of 25 canoes in use for ecotourism inside de Cuyabeno, of which only one was a fibreglass canoe

<sup>38</sup> One operator offered the experience of being present when a native woman prepared and baked traditional bread made of Yucca (manioc) flour



# 6. Results

## 6.1 Descriptive Sample Statistics

The descriptive statistics survey sample entailed 49 respondents and is presented below:

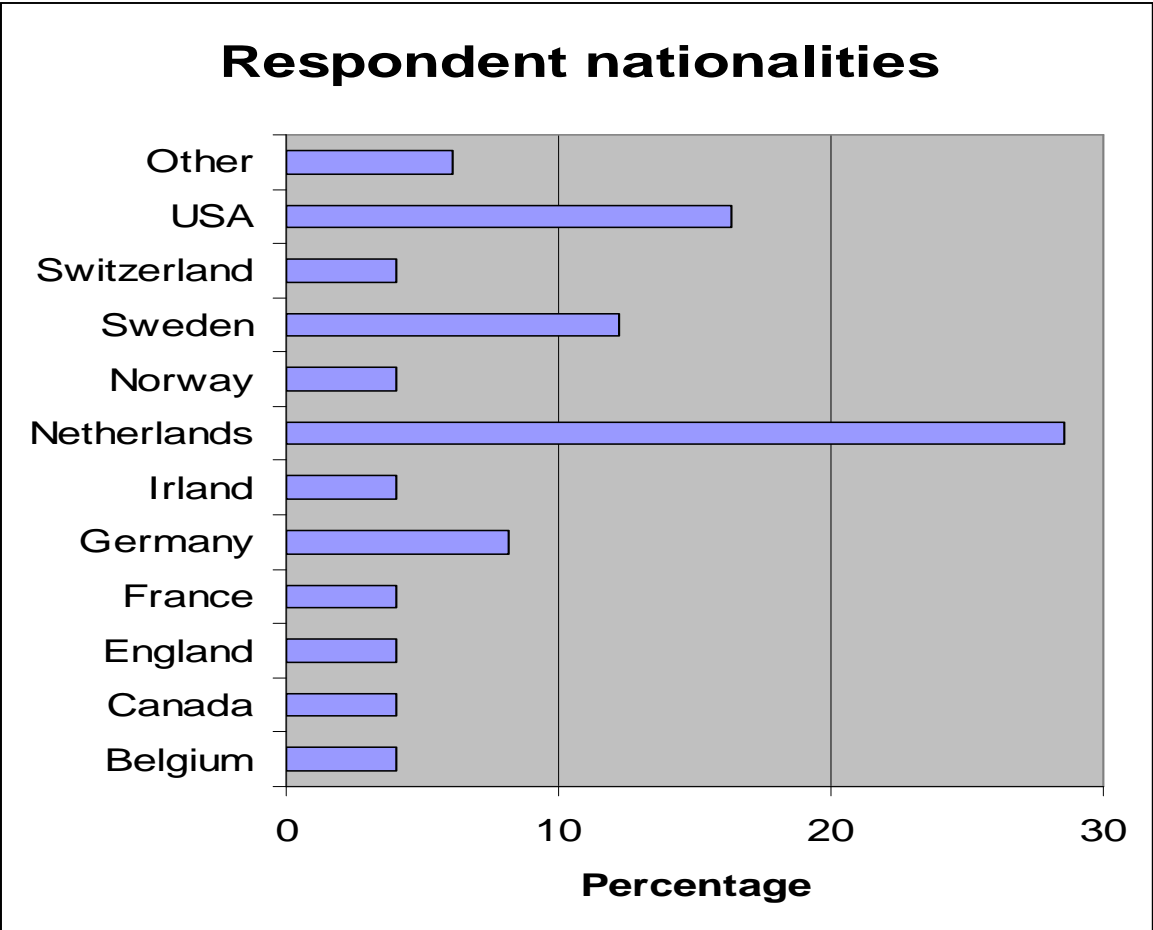


Figure 8. Nationalities of Visitors in Sample (n = 49)

European visitors dominate the sample as in the target population data. The fraction of US-citizens is higher than would be expected when comparing with target population data. Also

notable is the lack of Ecuadorians in the sample. This might be partly explained by the fact that the questionnaire forms were designed asking for nationality while statistics from the Ministry of Environment focused on place of residence. Foreign nationals living in Ecuador and some students were therefore accounted for as nationals in the official statistics while this would not show in this survey. Several examples of this sort were found while conducting the field study. The respondent nationalities are presented as percentages instead of frequencies to allow for comparison with the descriptive statistics on the target population (figure 6, p.35).

<i>Yearly income US\$ (after tax)</i>	<i>Frequency (n)</i>
0 – 12 000	17
12 000 – 19 000	8
19 000 – 25 000	9
25 000 – 37 500	4
35 000 -	6
NA	5

Table 3. Income (n = 49)

Respondents were asked to estimate a US dollar equivalent of their yearly income after tax. The answers are illustrated in the above table. It seems most respondents are low income individuals with less than US\$ 12000 in yearly after tax income. This might also reflect the fact that many respondents in this sample were students and fairly young.

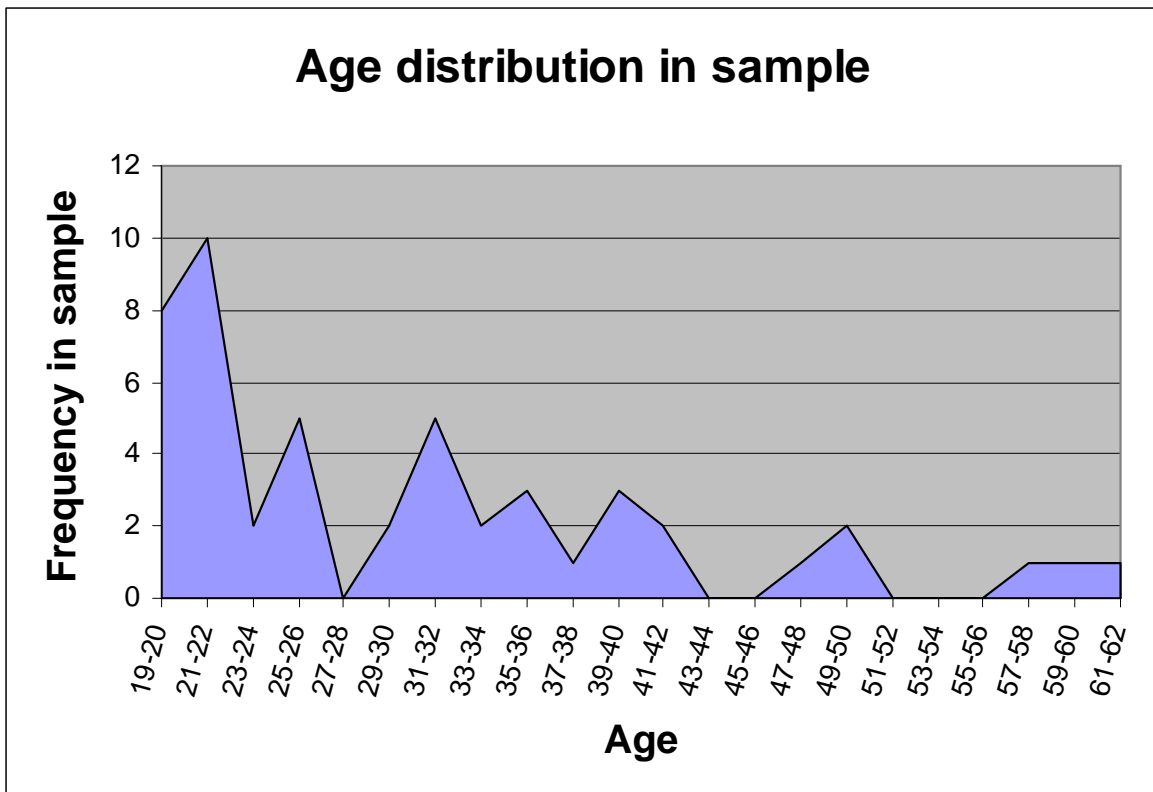


Figure 9. Age Distribution in Sample (n = 49)

This diagram illustrates age distribution from the sample with respondent frequency on the vertical axis. Respondent age ranges from nineteen to sixty-one years of age. Most respondents in the survey sample were between 19 and 22 years old.



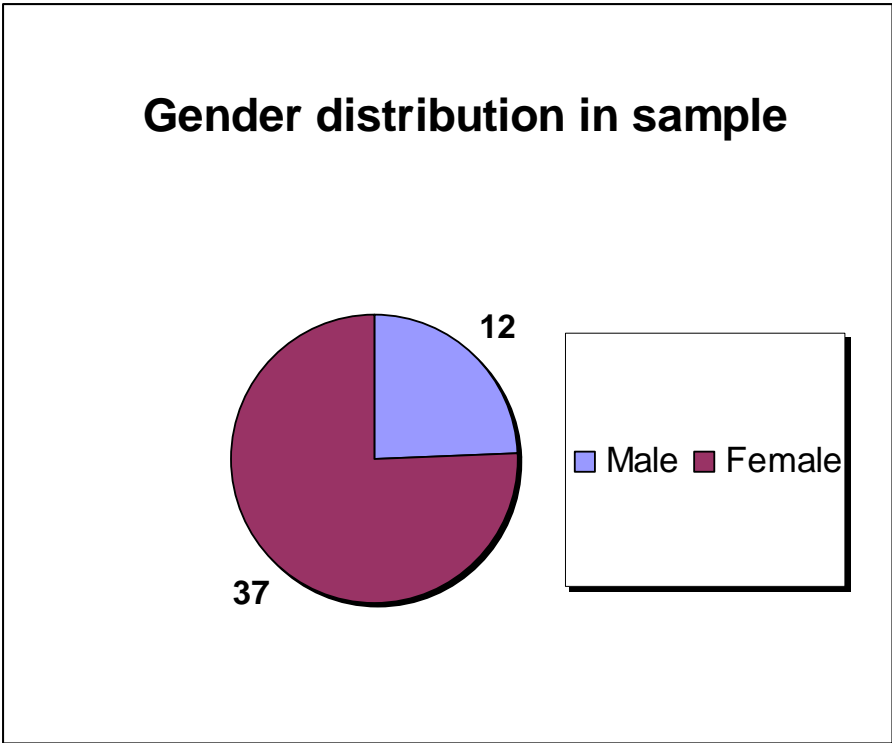


Figure 10. Gender Distribution in Sample (n = 49)

Women were in the majority in the sample with 75 %. Concordance with the target population could not be tested due to shortage of gender data.

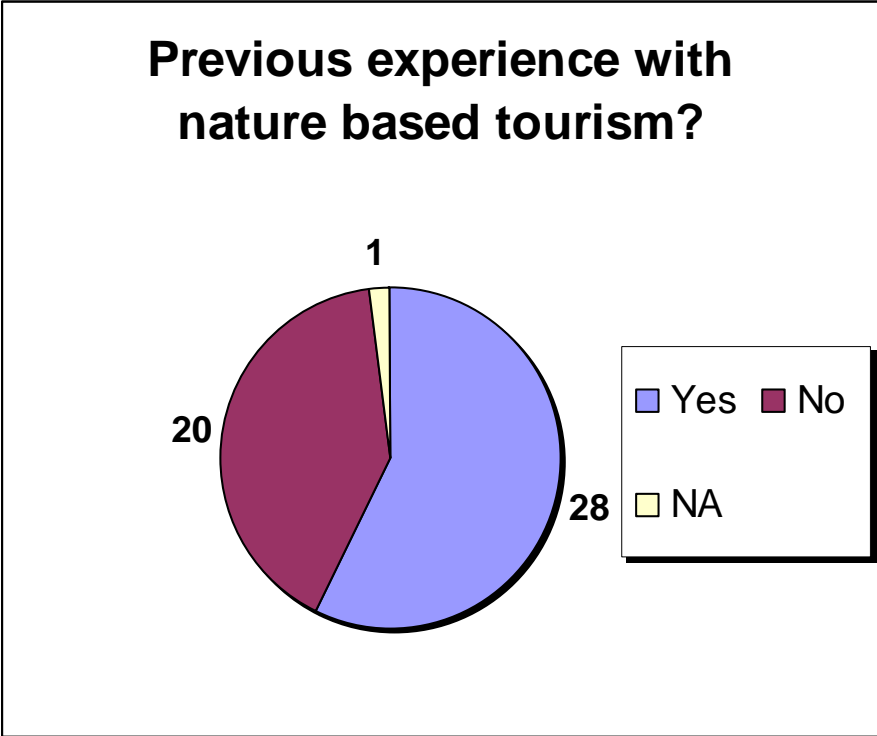


Figure 11. Experience of nature-based tourism (n = 49)

A majority of the respondents stated having previous experience of ecotourism (interpreted as nature-based tourism because of the broad definition provided in the questionnaire).

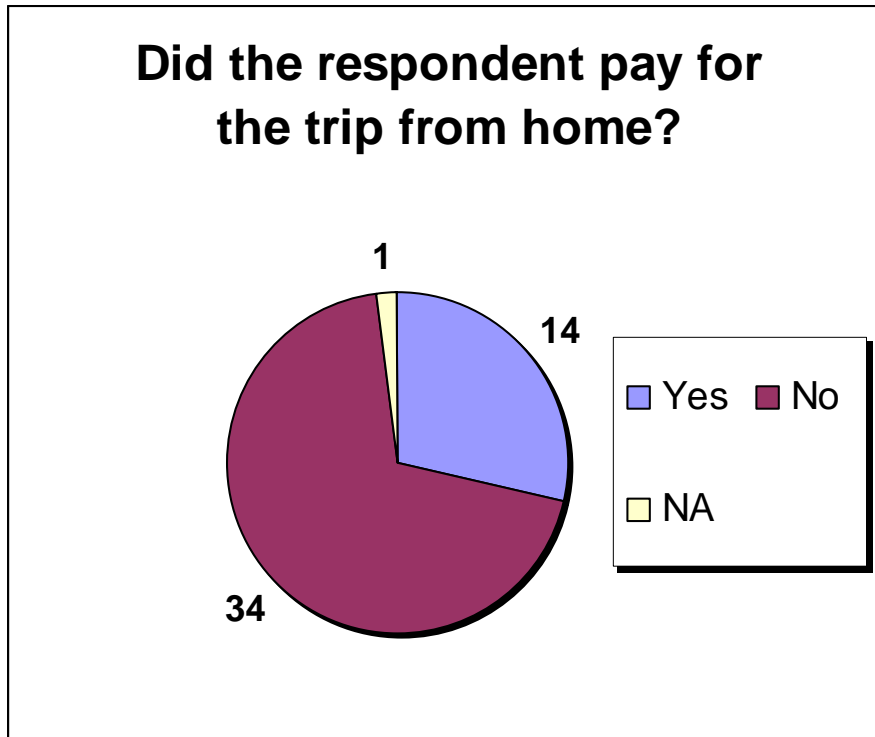


Figure 12. Pay for the trip from home (n = 49)

Most respondents (63 %) bought their trip after arriving in Ecuador. It is possible that the information about the trip that these respondents had access to at home might differ from the information obtainable in Ecuador. Because most respondents bought their trips in Quito and not from home, this might say something about the consumer type of visitors at the Cuyabeno Reserve.

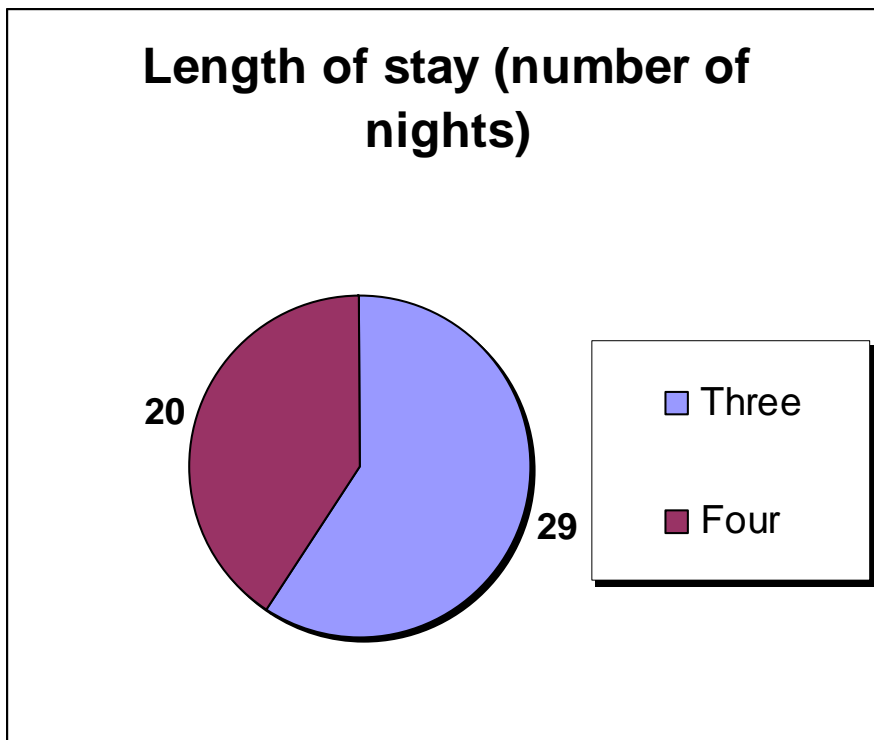


Figure 13. Length of stay (n = 49)

Most respondents (60 %) were staying three nights (and four days) inside the reserve, which is the minimum length of stay with any organized tour. This might also indicate something about what consumer type the respondents of this sample correspond to. It might very well reflect the fact that many visitors in the sample are low income consumers. It could also be because visitors have a tight time restriction for their vacation.

## 6.2 Multinomial Logit Regression Analysis

The following regression on the MNL model was run using Limdep econometric software:

```
--> create ; C2=cost/100$
--> clogit; lhs=prefer
      ; choices=alt1,alt2,base
      ; rhs = transpor,guiding,work,C2,asc1,asc2$
Normal exit from iterations. Exit status=0.
```

```
+-----+
| Discrete choice (multinomial logit) model
| Maximum Likelihood Estimates
| Model estimated: Mar 28, 2006 at 01:33:57PM.
| Dependent variable          Choice
| Weighting variable          None
| Number of observations      332
| Iterations completed        5
| Log likelihood function     -333.5506
| R2=1-LogL/LogL*   Log-L fncn  R-sqrd  RsqAdj
| No coefficients      -364.7393  .08551  .07717
| Constants only      -360.5931  .07499  .06656
| Response data are given as ind. choice.
| Number of obs.=    332, skipped    0 bad obs.
+-----+
+-----+-----+-----+-----+-----+
| Variable | Coefficient | Standard Error | b/St.Er. | P[|Z|>z] |
+-----+-----+-----+-----+-----+
| TRANSPORT | .59292479 | .18908398 | 3.136 | .0017
| GUIDING   | .75850777 | .25185757 | 3.012 | .0026
| WORK      | .10948082 | .21931053 | .499 | .6176
| C2        | -1.13951430 | .21138307 | -5.391 | .0000
| ASC1      | -.51018975 | .31876560 | -1.601 | .1095
| ASC2      | -.31700817 | .26264514 | -1.207 | .2274
+-----+-----+-----+-----+-----+
```

### Coding

Transport = 0 :Traditional wooden canoe  
 Transport = 1 :Fibreglass eco canoe  
 Guiding = 0 :Normal guiding  
 Guiding = 1 :Extensive guiding  
 Work = 0 :No possibility of voluntary working  
 Work = 1 :Possibility of voluntary working  
 C2 :Cost of trip ( $X_4$ ) Us\$ / 100  
 ASC1 :Alternative Specific Constant for scenario 1  
 ASC2 :Alternative Specific Constant for scenario 2

The explanatory variables of the MNL model are the ecotourism attributes used in the study. The estimated coefficients are natural logarithms of likelihood odds-ratios of a respondent choosing a scenario before any other scenario.

Even though the regression coefficients are not easily interpreted per se, their signs can be interpreted. They can also be used for estimating the trade-off between cost and each ecotourism attribute. The interpretation of signs is the following:

With a positive sign on a coefficient, the likelihood increases that a scenario be chosen with higher levels of the given attribute. The signs on all attributes are as expected; they are all positive for the eco attributes and negative for the cost attribute.

An equivalent of the Ordinary Least Square (OLS) F-test for logistic regression is provided by the Likelihood Ratio (LR) statistic. The LR statistic tests the joint null hypothesis that all true regression coefficients are zero with the null hypothesis that the restricted model is just as informative as the unrestricted.

The Likelihood Ratio is defined as:  $LR = 2(L(\beta)_{Unrestricted} - L(\beta)_{Restricted})$ . Under the null hypothesis the LR approximately follows the chi – square distribution with degrees of freedom equal to the number of excluded variables (d.f = 6 = 326). L is the log-likelihood for the restricted and the unrestricted model (Wooldridge 2003, p.559). Using the regression estimates:

$$LR = -2(333.5506 - 364.7393) = 62.3774 \quad (d.f. = 6)$$

The null hypothesis is rejected at the 99 % level which rejects that all true regression coefficients are jointly zero.

There is also an approximation of the OLS  $R^2$  (explanatory power of the model) for the logit model. This is presented as the McFadden  $R^2$  (sometimes also called *pseudo* $R^2$ ) and is defined as:

McFadden  $R^2 = 1 - (L_{Unrestricted} / L_{Restricted})$ . From the regression output:

$$McFadden R^2 = 1 - \left( \frac{-333,5506}{-364,7393} \right) \approx 0,0855$$

Interpretation of the McFadden  $R^2$  is not as strong as the  $R^2$  for OLS i.e. it is not a valid statement that the regression captures 8.55 % of the total variation in the dependent variable. Its usefulness in regression analysis is debated and it is presented in this analysis for the purpose of completeness.

An Alternative Specific Constant (ASC) is included for scenario one and two to reflect the difference in utilities for each alternative relative to the status quo scenario (Hanely, Mourato and Wright 2001). The ASC coefficients could be used to test for a potential status quo bias, i.e. that the respondents choice is biased towards the status quo scenario. Both ASCs are insignificant in the regression model and thus do not provide any useful information on whether there exists a status quo bias or not.

All other coefficients in the regression are significant at the 95% level except for the attribute of voluntary work ( $X_3$ ).

Below follows a Hausman McFadden test of the IIA condition on the MNL model:

```
--> clogit; lhs=prefer
      ; choices=alt1,alt2,base
      ; ias = alt1
      ; rhs = transpor,guiding,work,C2$
Normal exit from iterations. Exit status=0.
```

```
+-----+
| Discrete choice (multinomial logit) model
| Maximum Likelihood Estimates
| Model estimated: Mar 28, 2006 at 02:08:37PM.
| Dependent variable           Choice
| Weighting variable           None
| Number of observations       244
| Iterations completed         4
| Log likelihood function      -160.0364
| R2=1-LogL/LogL*   Log-L fncn  R-sqrd  RsqAdj
| No coefficients      -268.0614  .40299  .39304
| Constants only      -168.6029  .05081  .03499
| Response data are given as ind. choice.
| Number of obs.=    332, skipped 88 bad obs.
| Hausman test for IIA. Excluded choices are
| ALT1
| ChiSqrd[ 4] =      .7635, Pr(C>c) =  .943269
+-----+
```

In the Hausman McFadden test one scenario is removed from the regression in every choice set to test whether this significantly changed the likelihood of the remaining scenario being chosen over the status quo. The null hypothesis of no violation of the IIA assumption could not be rejected ( $p = 0.94 > 0.05$ ) which strengthens the reliability of the results and the rationale for using the MNL model.

It is very important to note that the coefficient estimates in the MNL regression and the MNL hybrid regression under section 6.2.2 are conditional on the assumption that the opt-outs in the survey questionnaires are chosen randomly, i.e. independently of any underlying

sociodemographic or socioeconomic properties among the excluded respondents. If this assumption does not hold the sample selection could be biased which could possibly bias the regression results. The economic interpretation in the following section is also conditional on this assumption.

### 6.2.1 Economic Interpretation

The welfare consistency of the CE makes it possible to estimate a shadow price on each attribute through the MRS between each ecotourism attribute and disposable income (using  $-\beta_{\text{Eco attribute}} / \beta_{\text{Tour price}}$ ). The significant coefficients of the MNL regression were used and the quotas are presented in the following matrix:

<i>Eco attribute level</i>	<i>WTP</i>
Extensive guiding	US\$ 67*
Fibreglass eco canoe	US\$ 52*
Possibility of working voluntarily	-

Table 4. Shadow prices on Ecotourism Attributes

\* Rounded off to whole dollars

The sample gives an indication that extensive guiding and means of transport are important when deciding between the different scenarios of a trip. For a four night and five day trip, the derived WTP was 67 US dollars a person for extensive guiding and an extra 52 dollars a person for using a fibreglass canoe instead of a traditional wooden canoe.

Extrapolating the estimates from the whole target population and using figures from 2004 with 5132 visitors, a quality change in both these attributes would yield the following Compensating Surplus:

<i>Quality change</i>	Compensating surplus (WTP)
Extensive guiding	US\$ 343800
Fibreglass eco canoe	US\$ 266900
<b>Both</b>	<b>US\$ 610700</b>

Table 5. Extrapolated WTP (rounded off to whole 100 US\$)

These figures are not to be taken too literally but should be considered with a lot of caution. First of all, there is a risk that the sample is not fully representative of the target population. Secondly, the stated choices might be biased for many reasons. It is likely that some stated WTP are higher than true WTP. As was previously discussed, there is often a discrepancy on what people say they would be willing to give and what they would actually be willing to pay. It is worth repeating that this study does not separate any true WTP for a positive self-image projection from the potential bias of self-image projection.

Nevertheless, these figures do indicate significant WTP for a quality improvement of the two eco attributes *extensive guiding* and *means of transport*.

It is also important to note that the above regression model does not consider visitor preference heterogeneity. Sociodemographic and socioeconomic data can be used to relax the assumptions on preference homogeneity and can also be used for drawing conclusions on the consumer patterns of the underlying population.

## 6.2.2 Hybrid Multinomial Logit Model

One way of improving model fit is to include sociodemographic and socioeconomic information in the regression model.<sup>39</sup> This will now be done in order to investigate whether this improves overall model fit or coefficient significance. This model can also provide more qualitative information on visitor preferences. This modified model will from now on be referred to as the hybrid MNL model. The results from the hybrid MNL model regression and the coding of the sociodemographic elements are presented below:

<sup>39</sup> The steps involved in a hybrid MNL analysis are described in Mazzanti (2001) or Hanely, Mourato and Wright (2001)



```
--> clogit; lhs=prefer
      ; choices=alt1,alt2,base
      ; rhs = transpor,guiding,work,c2,asc1,asc2,ph_work,leave_tr$
Normal exit from iterations. Exit status=0.
```

```
+-----+
| Discrete choice (multinomial logit) model
| Maximum Likelihood Estimates
| Model estimated: Mar 29, 2006 at 08:17:41AM.
| Dependent variable           Choice
| Weighting variable           None
| Number of observations       332
| Iterations completed         5
| Log likelihood function      -326.2981
| R2=1-LogL/LogL*  Log-L fncn  R-sqrd  RsqAdj
| No coefficients    -364.7393  .10539  .09448
| Constants only    -360.5931  .09511  .08407
| Response data are given as ind. choice.
| Number of obs.=   332, skipped  0 bad obs.
+-----+
```

Variable	Coefficient	Standard Error	b/St.Er.	P[ Z >z]
TRANSPORT	.72749659	.19432779	3.744	.0002
GUIDING	.74956729	.25448099	2.945	.0032
WORK	.22249664	.23498485	.947	.3437
C2	-1.14743585	.21313390	-5.384	.0000
ASC1	-.44156986	.32294404	-1.367	.1715
ASC2	-.23931038	.26570052	-.901	.3678
PH_WORK	-.60362544	.28557019	-2.114	.0345
LEAVE_TR	-1.23565659	.38617460	-3.200	.0014

### Coding

PH = 1 : Respondent paid for the trip from home  
 LEAVE = 1 : Visitor is leaving the reserve (as opposed to entering the reserve)  
 PH\_WORK : PH multiplied with dichotomous eco attribute nr. 3  
 LEAVE\_TR : Leave multiplied with dichotomous eco attribute nr. 1

The same coding as before for other variables

When including all 95 % significant coefficients of the sociodemographic variables overall model fit increases from 8.55 % to 10.5 %. The two first eco attribute coefficients are still significant at the 99 % level.

The sociodemographic variables can be used to say something about respondent preferences heterogeneity. The interpretations of the findings are the following:

- If the respondent paid for the trip from home, she is less likely to pick a scenario with the option to work voluntarily.
- If the respondent already spent at least 24 hours inside the reserve, she is less likely to opt for a scenario including the fibreglass canoe.

The results could be used for constructing target profiles on visitors. Before drawing any strong conclusions on what these findings say about the target population, one would have to consider the implicit implications of some of the new variables. As way of example, does the fact that a respondent paid for the trip before arrival imply that she consumes differently than any other consumer?

It is hard to establish whether this is a better fit model on visitor preferences. The Mc Fadden  $R^2$  is higher and the significance in the original coefficients is not significantly altered. However, in order to extrapolate the results, one would have to get reliable data on the sociodemographics of the target population. The hybrid MNL model was therefore only used for interpretation of the sociodemographic variables.

# 7. Discussion

## 7.1 Costs and Benefits

As has been argued throughout this paper, the impacts on changing aspects on nature- based tourism in Cuyabeno might have effects on the population with standing that fall out of the reach of the survey study. These changes will have to be considered qualitatively along with the quantitative survey results.

The following table shows some likely outcomes from changing the current tour packages in accordance with the findings of this study:

<b>Ecotourism attribute</b>			
<b>Survey attribute</b>	<b>Fibreglass eco canoe</b>	<b>Extensive guiding</b>	<b>Possibility of voluntary work</b>
<b>Economic cost of providing the quality change</b>	US\$ 4 100*	Unknown – change in itinerary	Zero, or negative
<b>Extrapolated tourist WTP for a quality change</b>	US\$ 266 900**	US\$ 343 800**	Not significant
<b>Possible qualitative externalities</b>	Environmental concern	Employment opportunities, environmental concern	Direct use of Foreign knowledge

Figure 14. Qualitative improvements of ecotourism attributes

\* Diego Monteros stated a lower price than Freddy Espinosa. The higher price of US\$4100 was used because of Freddy Espinosa’s direct access to current price lists through FSPC (see appendix C). These costs would have to be taken by each tour operator

\*\* It should be noted that these are the extrapolated total benefits of providing the quality change and not benefits accruing to each tour operator. Numbers rounded off to even thousands of dollars. These numbers are only rough estimates and should be considered with a lot of caution

Figure 14 lists some possible effects of changing the level of the three ecotourism attributes included in the final survey. Using more ecological means of transport might implicate a higher cost, at least in the short run, by investing in more costly means of transport. The cost estimates of figure 14 are based on an interview with naturalist guide Diego Monteros and the coordinator of the Fundación para la Sobrevivencia del Pueblo Cofán (FSPC), Freddy Espinosa. More details about costs and the project *La Eco Canoa* and the FSPC are found in appendix C. From these figures it seems likely that an investment in fibreglass canoes would be justified. This is probably true even if these canoes could only be used during the rainy season from June to September considering this is the highest peak of visitor influx at the park. According to Diego Monteros, the seasonal water level of the Cuyabeno River might put restrictions on the use of fibreglass canoes because of obstacles in the river that could damage the canoes, while Freddy Espinosa states there had been no reports of such problems even in rivers less deep than the Cuyabeno River.

Education in culture and local ecosystems by extensive guiding might entail a higher cost if more qualified guides have to be contracted at higher wages. As for more extensive excursions, the cost would merely be a costless change in the current itinerary in favour of more time educating tourists (due to the time restriction, more education might have to come at the expense of giving up some other activity).

The economic cost of tourists working voluntarily will be zero or negative but will require a change in itinerary.<sup>40</sup> Theoretically, local residents could be charged by tour operators for these services, in which case any economic gains would be transferred to the private tourism industry. However, this is not ethically appealing. Also, as local residents' welfare is given positive weight, this would not be optimal. Since significant WTP for the option of voluntary work was not firmly established in this study, it might not be relevant to consider in the present tourism market for Cuyabeno.

Apart from these direct welfare gains, there is likely to follow some positive effects from ameliorating environmental concern in nature-based tourism conduct. Some likely positive externalities are suggested below.

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<sup>40</sup> Cost will be negative if the contribution in the workforce by tourists is a substitute for services that were previously paid for by the community or if it releases work hours among the residents that can be used elsewhere as salaried work hours

Possible positive externalities from providing eco attribute number:

1. Harm on nature will be reduced, and irreversible damage on the ecosystem will be prevented. There might be a *quasi option value of endogenous learning*<sup>41</sup> from using the natural resources modestly. This value will be foregone by excessive exploitation of the ecosystem.
2. More specialized guides with greater knowledge of the local ecosystem will be required. This will give employment possibilities to local guides at the expense of national guides.<sup>42</sup> Ecotourists should be able to bring home a more sustainable way of thinking about the environment.<sup>43</sup>
3. Voluntary work would make use of tourism knowledge and manpower at no extra cost in local projects. Also, this might tie tourists closer to the local community which would, in the long run, have positive consequences. Tourists could be more willing to return a second time and be more dedicated to the area. The tourist might also be more likely to focus on Ecuador in the future when undertaking research or choosing a site for investment.

To conclude: There might very well be positive externalities from changing features of nature-based tourism in Cuyabeno. Regional employment opportunities might increase and adverse effects on the local ecosystem might be reduced.

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<sup>41</sup> This refers to the value put on conservation by future generations. The risk to the ecosystem by full exploitation can only be estimated if limited exploitation is undertaken in the first time period. This limited exploitation will contribute with new information in period two. The risk of irreversible damage on the ecosystem from full exploitation in the following period can then be estimated. If full exploitation is undertaken in the first period, this might already have inflicted irreversible damage. If no exploitation is undertaken in period one, there will be no endogenous learning in period two. (Boardman et al. 2001, p.180-181)

<sup>42</sup> This is really a shift in demand from the factor market of labour in favour of the labour market for local guides that would cancel out if everyone were given the same weight in standing. However, as was previously argued, local communities should be given more weight in estimating the benefits of ecotourism. The shift in the factor market of labour should therefore be accounted for as a welfare gain. For a more detailed discussion on shifts in factor markets of labour and different weights in Cost Benefit Analysis, see Boardman et al. (2001)

<sup>43</sup> This is clearly a positive externality, but could only be accounted as such if the countries of origin of the ecotourists were also given weight

## 7.2 Politics and Security

Interviews, analysis of statistics and field study experiences all contribute to draw some additional conclusions about the future conditions for nature-based tourism in Cuyabeno. The picture of the oil industry as the sole counterweight to conservation in the area is far from exhaustive. There are dimensions of the political sphere that are likely to influence how the tourism venture will develop for Cuyabeno. It seems that the nature-based tourism market in Cuyabeno suffers some market imperfections.

Surveys like the one in this paper might help to overcome market imperfections caused by lack of information.

The market might also be skewed because tour operators do not dare break new ground and undertake investment because of the insecurity of the province and the political instability. This problem would have to be resolved by political action. Some important topics are suggested below.

On an international level, the armed conflict in Colombia and the Plan Colombia with its fumigation of the neighbouring Colombian province of Putumayo poses concerns about the future of tourism development in Cuyabeno. The Colombian guerrilla is already present in Sucumbíos, and it is difficult to predict whether the Colombian conflict will fully spill over to Ecuador in the future or not. Either way, the notion of the conflict and the future risks seriously damage tourism in northern Ecuador. There are plans of working jointly between Ecuador, Colombia and Peru in term of nature-based tourism in the future, but these plans are held on ice considering the present situation in the area.<sup>44</sup> Cooperation with neighbouring countries might help promoting tourism and strengthen the whole region which would benefit nature-based tourism in all participating countries.

Ecuador has lived through many years of unstable democracy with sporadic public protests of road blocks and riots. Many of Ecuador's political problems possibly stem from the fact that the country's large indigenous groups do not have an proportional presence in national and regional politics. Political instability impedes investments and reflects a bad image of the country abroad which might make many tourists think twice about where to spend their

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<sup>44</sup> Interview with Edgar Rivera (23/11/05)

vacation. Giving weight to the needs of the indigenous population will be important for calming these sentiments of injustice in Ecuador. As Cuyabeno is the native home of several mayor indigenous groups in Ecuador, it would be a political statement to help conserve the traditional way of life and the environment for its inhabitants. This also relates to the importance of efficient IBP. If welfare gains can be fairly distributed to indigenous minorities, regional instability is likely to be reduced. This is a further argument for giving local residents and minorities a positive weight in standing. Political instability means unstable institutions and makes governmental promises less trustworthy. Be it because of any of these reasons or something else, visitor influx has proven to vary considerably between different years.

On a local level, the issue of insecurity will have to be dealt with. Tourism groups are occasionally subject to armed assaults by local delinquents who try to pass for guerrilla groups to cover their tracks. As opposed to the actual guerrillas, this poses a real threat at present. Luckily, there have been no reports of attacks on tourists with fatal outcomes in Cuyabeno at the time of writing.

Actions on preventing assaults and robberies would give a positive signal to all potential visitors who might otherwise choose another destination for their vacation.

## 8. Conclusions

This study indicates WTP among visitors at the Cuyabeno Reserve for quality improvements of some of the attributes linked to Wallace and Pierce's model. Extrapolation of this WTP seems to dwarf the investment costs of providing these changes. These results are conditional on the assumptions on IIA, the error term distribution and the randomness of the opt-outs in the questionnaires. If these conditions hold, it is possible to draw the following conclusions on visitor preferences:

Extensive guiding is the most highly valued attribute level with estimated WTP of US\$ 67 per visitor. Since this survey did not entail isolating effects of particular itinerary changes, it is not possible to say anything specifically about what aspect of guiding is most important to visitors at Cuyabeno. It does seem exceedingly important that tour operators use specialized and dedicated guides or provide a flexible itinerary for visitors considering the strong demand. As this attribute was defined in the survey it also entails smaller group size. This effect also cannot be isolated from the demand for extensive guiding. Smaller visitor groups and higher demand for guides with extensive and specific knowledge of the region both imply less exhaustion on the environment and employment possibilities for locals.

Another implication of the survey results would be for all tour operators to substitute the traditional wooden canoe with a more ecological means of transport. This would most likely induce a higher WTP among the visitors and reduce some negative effects on the environment caused by the river traffic. Estimated WTP for substituting the fibreglass canoe for the traditional wooden canoe was US\$ 52 per visitor.

There was no evidence of WTP for the possibility of working voluntarily among visitors. This indicates that this attribute might not be important for Cuyabeno visitors.



Under perfect market conditions, investments in eco attribute one and two would already have been implemented by tour operators that maximize their utility by maximizing profits. Some possible reasons why the tour operators in the area do not already fully provide these services are a shortage of information, insecurity problems and political instability. These are all obstacles that might prevent long term investments in the tourism industry

A quality improvement of the current nature-based tourism industry in Cuyabeno would likely increase the consumer surplus of visitors at the park. If the WTP among Cuyabeno visitors increases, the EB component in the CBA will also increase. A quality improvement of the tourism industry would likely contribute to conserving the ecosystem in the future by raising the opportunity cost of environmental deterioration.

Apart from increased WTP among visitors, there are likely to be some positive externalities from increased conservation of the Cuyabeno Reserve. Some possibilities are enhanced quality of the local ecosystem, reduced health risks, reduced unsustainable use of land by a tourism income effect and increased demand for tourism related local employment. These benefits would possibly accrue to local residents who were given a positive weight in standing in this study. If IBPs succeed in identifying the needs of the local communities in Cuyabeno, a tourism income effect could be generated that promotes more sustainable uses of land in community livelihood.

The incentive for tour operators to implement changes in the current tourism venture is not solely driven by visitor preferences but is most likely also affected by the overall insecurity of the region. For any improvements of nature-based tourism in Cuyabeno to have full effect on conservation and welfare, they will have to be matched by political actions at local, national and international levels. Overcoming lack of information thresholds of the current market is accordingly only part of a solution for conserving the ecosystem and the environment in Cuyabeno.

# Future Research

## Environmental and Public Economics

As this paper limits its scope to the tourism population, it thereby excludes EV and UV among other populations with standing (e.g. local and national residents not visiting the area). This is treated as a positive externality in this study. However, preference elicitation of these populations would complement the data presented in this paper. This would have to be done using some kind of SPT.

## Development Economics

This study showed a significant WTP for two of the initial ecotourism attributes (namely *means of transport* and *guiding*). More in depth studies on how this knowledge could potentially affect the residents of the Sucumbíos province can be valuable from a development perspective.

## Other

Security seems to be important when deciding on tourist destinations. This issue should be further explored from a tourism industry perspective. Political decisions as well as crime rates greatly effect the visitor frequency. How could these problems be solved? Is perceived insecurity equally as important as real threats for how tourists choose destinations for their vacations?

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## World Wide Web and Other Sources

[www.cofan.org](http://www.cofan.org) (13/03/06) (Homepage of the Cofán organization FSPC)

<http://www.creamos.org> (13/03/06) (Foundation for promoting voluntary work in Ecuador)

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(13/03/06) (regional newspaper covering the Sucumbíos province)

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<http://www.vivecuador.com/html2/eng/economy.htm> (13/03/06) (Official site of the Ecuadorian Ministry of Tourism)

E-view tutorials, version 4.1

# Appendix A – The Ecotourism Model

Outline of Wallace and Pierce's model of true ecotourism (Wallace and Pierce 1996, p.848-849). [True ecotourism is defined as a type of tourism that]:

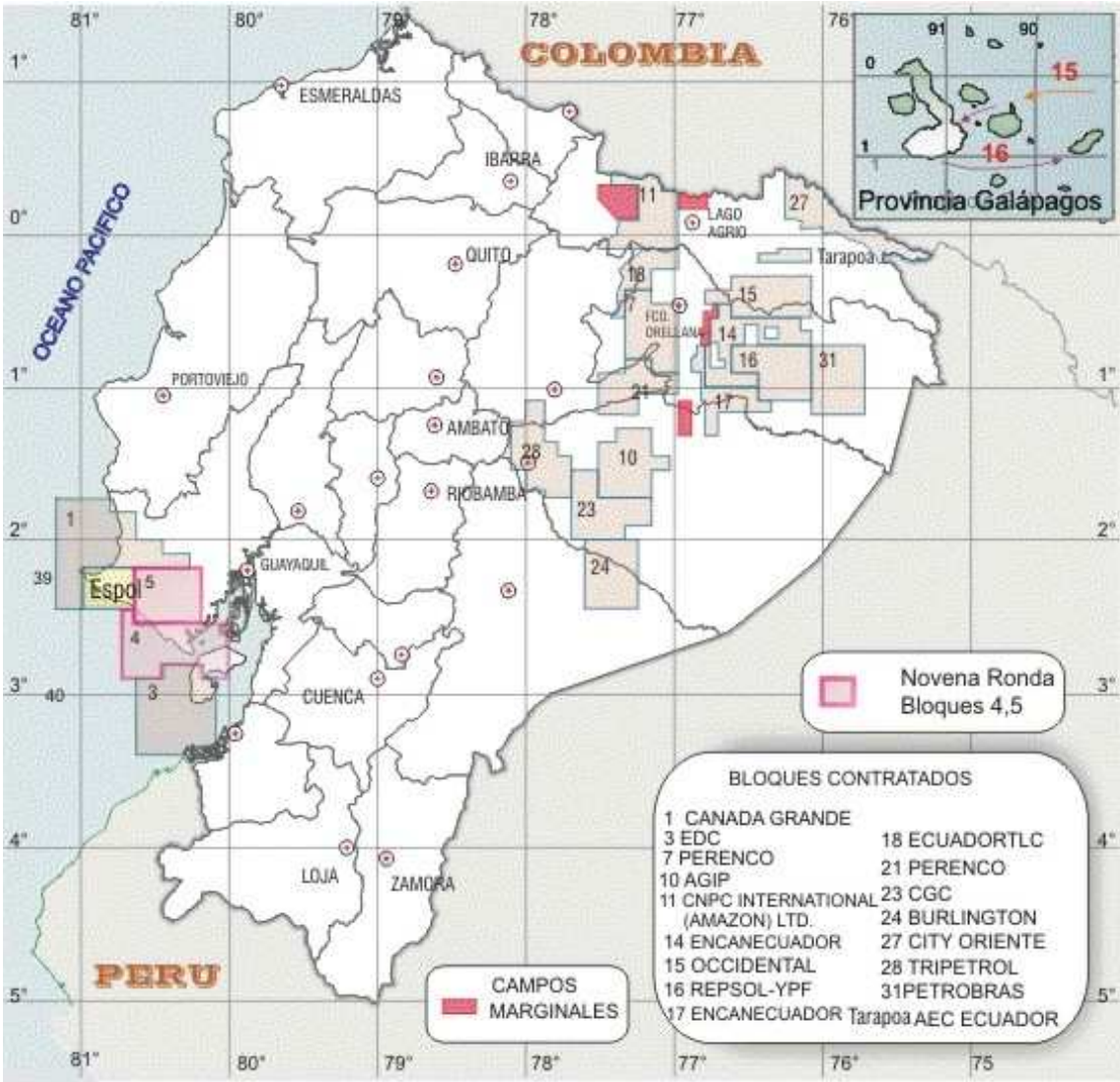
- I**            *“Entails a type of use that minimizes negative impacts on the environment and to local people [...] ecotourism should minimize impacts to wildlife, soil, vegetation, water, and air quality, and emphasize respect for the cultural traditions and activities of local people. Efforts are made to be less consumptive, travel lighter, produce less waste, and be conscious of one's effect on the environment and on the lives of those living nearby. [...] Indicators include: group size; mode of transport; [...]”*
  
- II**            *“Increases the awareness and understanding of an area's natural and cultural system and the subsequent involvement of visitors in issues affecting those systems [...]. [Tourists should] be able to experience authentic two-way interaction with local resident [...] as well as having experiences that help them consider sustainable development [...] conservation and wildlife protection in both the host and the home country [...]”*
  
- III**            *“Contributes to the conservation and management of legally protected and other protected areas. Where possible this should mean strengthening the management capability, personnel, and stature of units that are part of a national state, and local system of parks and protected areas [...]. Indicators include [...] volunteer work days [...]”.*

- IV**        *“Maximizes the early and long-term participation of local people in the decision-making process that determines the kind and amount of tourism that should occur. The key here is the early establishment and continued functioning of committees, partnerships, and other mechanisms that provide local input to public [...] and private [...] interests who operate in the area [...]”*
- V**         *“Directs economic and other benefits to local people that complement rather than overwhelm or replace traditional practices [...]. Ecotour operations are of smaller scale, and more susceptible to changes in season, weather, access, economic, and political events which yield irregular and modest returns when compared to mass tourism. Local economies will be more robust if they are diverse and if local people are not asked to make wholesale changes away from traditional activities [...]. Benefits themselves should be diverse and should contribute to various aspects of the quality of life [...]”*
- VI**        *“Provides special opportunities for local people and nature tourism employees to visit natural areas and learn more about the wonders that other visitors come to see. [This criterion] emphasizes making both foreigner visitors and local people feel comfortable as visitors to any given natural area. [...]”*

(Wallace and Pierce 1996)

# Appendix B – Oil Extraction

The following map illustrates the geographic extension of oil extraction activity in Ecuador and the companies that operate in the country:



Source: [http://www.petroecuador.com.ec/web04/mapas/web\\_mapas/novena\\_ronda.htm](http://www.petroecuador.com.ec/web04/mapas/web_mapas/novena_ronda.htm)



## Appendix C - The Fibreglass Eco Canoe

Traditionally, transport by the Cuyabeno River and the Aguarico River has been by wooden canoes carved out of trunks of giant trees native to the region. These giant trees need to reach the adequate size which takes no less than 20-30 years.<sup>45</sup> These trees are nowadays hard to find and run the risk of becoming extinct.<sup>46</sup> Furthermore, a wooden canoe has an approximate life span of only 5-6 years. Even though the canoe body is designed for a smooth passage by the river, the wooden canoes weigh a lot and lie deep on the water surface. This produces water turbulence which causes erosion on the river banks which harms vegetation and, subsequently, the regional animal wildlife. Also, wooden canoes require larger engines which contaminate the water of the rivers and generate noise that can disturb aquatic wildlife.<sup>47</sup> All wooden canoes observed during the field study used a motor of 40 hp.

There is no established single price for a wooden canoe. For a new 10-12 passenger wooden canoe (like the ones presently used by most tour operators) Freddy Espinosa (communicative director of the organization *Fundación para la Sobrevivencia del Pueblo Cofán* (FSPC)) gives a price of 2000-3000 US\$.<sup>48</sup> The Cofán is an indigenous community residing within the Cuyabeno Reserve. The FSPC was originally founded by native members of Cofán and others interested in preserving the culture, knowledge and natural areas of the Cofán.<sup>49</sup>

One alternative to the traditional wooden canoe is the fibreglass eco canoe. To help conserve the rainforest and the biodiversity, the European Union and the FSPC launched

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<sup>45</sup> [www.cofan.org](http://www.cofan.org)

<sup>46</sup> The trees used for fabrication of canoes bear the indigenous names of *Amarillo*, *Canelo*, and *árbol de Chuncho* (interview, Diego Monteros)

<sup>47</sup> Interview. Freddy Espinoza. 24/11/05, and Cofán homepage [www.cofan.org](http://www.cofan.org)

<sup>48</sup> Naturalist guide Diego Monteros estimates the price for the same canoe at 1000-1200 US\$ and on the second hand market at 400-600 US\$

<sup>49</sup> [www.cofan.org](http://www.cofan.org)

a project labelled Petramaz.<sup>50</sup> The purpose was to mitigate negative impact from petroleum extraction and destruction of woodlands in eastern Ecuador. With these objectives in mind, Petramaz and the FSPC, with help from the European Union, mounted the project *la ecocanoa* (i.e. *the eco canoe*) in 1999.<sup>51</sup> The Petramaz provided the Cofán in the village of Dureno (by the Aguarico River) with expertise for mounting a workshop for production of these alternative fluvial means of transport. The fibreglass canoe has got several advantages to the traditional wooden canoe; the most important feature being its light weight. This does not only mitigate the erosion damage on the river banks but also permits the use of smaller engines. The expected lifespan of a fibreglass canoe is 20-30 years. A similar size fibreglass canoe (13 meters) admits up to 25 passengers (double that of the wooden canoe) which is an important advantage since it has the potential of drastically reducing the frequency of the traffic on the river. From the tourist's point of view, however, there might be an attraction in using the more traditional way of travelling above the ecological concern.

Considering the fluvial system of the Cuyabeno, one cannot omit mentioning the seasonal conditions of the rivers. As was explained in chapter 3, the rainfall dramatically alters the conditions of the landscape. During the wet season the rainfall is abundant but declines drastically during the dry season. For the Cuyabeno River (which is less deep than the Aguarico)<sup>52</sup> this means that rocks and trunks of trees might become obstacles in the river during the dry season. The thinner material of the fibreglass canoe is more likely to break from these impacts than canoes made of wood. Diego Monteros stated this as a problem with using fibreglass canoes in the Cuyabeno River. Freddy Espinosa, however, reassures that a special technique with layers of a special fibre<sup>53</sup> that cross over each other guarantees the safe use of eco canoes in these waters. Canoes have been used in rivers less deep than the Cuyabeno River without reports of problems of this sort. Damage on the canoe body is quite easily mended in the Dureno workshop.<sup>54</sup> More important, if a

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<sup>50</sup> The Petramaz project was executed in 1994 (Source: European Commission Country strategy Paper (2002))

<sup>51</sup> [www.cofan.org](http://www.cofan.org)

<sup>52</sup> The two rivers originate in different sources. The Aguarico originates in the Andes while the Cuyabeno River originates in the Putumayo River on the Colombian side of the border (Diego Monteros)

<sup>53</sup> Rowan 850

<sup>54</sup> Interview with Freddy Espinoza (24/11/05)

canoe was to sink (especially in the profound Aguarico River with its strong currents) it might implicate a danger for passenger safety.<sup>55</sup>

The project *la ecocanoa* has been a largely successful venture for the Cofán community and its neighbours. The project is now run as an independent business without any external financial help. The workshop receives orders from inhabitants of the region, corporations operating in the area and from the regional government. People travelling among the frequently trafficked Aguarico River almost exclusively use fibreglass canoes for their transport. Notwithstanding, the strong currents of this river do not always allow the use of smaller engines. The positive ecological effects are in many cases limited to the ability to bring more people at a time, thus avoiding unnecessarily frequency of traffic. The largest canoe currently in production is 22 metres in length and allows for up to 50 passengers. Apart from the benefits on the regional ecosystem from using the eco canoe, the production of canoes is an important project for the whole community. The workshop at the time of the field study (November 2005) has more incoming requests than it can cope with. Five workshop masters are currently working on the production with the help of a number of assistants. It is clear that the project is not dependant on the tourism industry for its survival.

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<sup>55</sup> Interview with Diego Monteros (31/10/05-04/11/05)

# Appendix D – Survey Questionnaire

(Note: The following extract has been manipulated in order to fit the appendix size. The actual questionnaire was presented to the respondent in a more spacious format and with 6-7 discrete choice questions. Spanish version available upon request.)

*This survey serves as basis for a Master's thesis for the department of economics at the University of Lund, Sweden. The project is funded and approved by the Swedish International Development Cooperation Agency (SIDA). The study aims at estimating tourist preferences and attitudes towards ecotourism as defined by Wallace & Pierce 1996. This definition states that ecotourism should take environmental and ethical concern to the region where it operates. It further states the importance of respecting the rights of ethnical minorities and that these minorities should benefit from economic gains of the tourism industry. All individual data will be handled confidentially and will only be presented as group data in statistical analysis.*

1. **Male / Female** *(underline one)*
  
2. **Age .....**
  
3. **Nationality .....**
  
4. **Have you ever participated in any ecotourism other than in Cuyabeno? Yes / No** *(underline one)*
  
5. **How many nights are you going to spend inside the Cuyabeno reserve? ..... nights**
  
6. **How much did you pay for this trip? US\$ .....**  
This price includes:  
Flight to Lago Agrio (Nueva Loja)  *(Mark the corresponding boxes)*  
Bus trip to Lago Agrio (Nueva Loja)   
Entrance fee to the national park   
Overnight stay in Lago Agrio (Nueva Loja)
  
7. **Estimated disposable yearly income after tax equivalent to:** *(underline one)*
  - **Less than US\$ 12000**
  
  - **Between US\$ 12000 and US\$ 19000**
  
  - **Between US\$ 19000 and US\$ 25000**
  
  - **Between US\$ 25000 and US\$ 37500**
  
  - **More than US\$ 37500**

## **Imagine the following trip:**

The trip starts in the regional capital of Lago Agrio. Travelling into the Cuyabeno Reserve you participate in a guided group of 6-10 travellers (yourself included). Your trip starts around midday from Lago Agrio with an overland trip until reaching the entrance of the national park. The group travels into the reserve by canoe and arrives at a base camp by the Cuyabeno River with rudimentary bungalows for overnight stay. The campsite provides basic facilities without private baths or hot water but with mattresses and mosquito nets. Departing from base camp you and your group make several guide led tours by canoe and/or by foot where local flora and fauna is taught by a naturalist guide. From the day of departure into the reserve the trip lasts five days and four nights. During all this time three meals a day are included in the tour price. The reserve entrance fee of US\$ 20 is not included in the price. Rudimentary equipment such as rubber boots is available at no extra cost. Other expenditures such as snacks between meals are not included in the price. All prices mentioned below are meant for the tour described here (i.e. do not include travelling expenditures to get to Lago Agrio). The questions that follow will all refer to this description of a trip.

Below follow some concepts important for answering the following questions:

## **Means of transport**

### **Traditional wooden canoe**

The traditional way of travelling the Cuyabeno River is by canoes carved out of whole trunks of trees. Except the harm on the forest from cutting down trees (it takes 20 years for a tree to reach the appropriate size) the canoe lies deep below the water surface, which causes erosion on the riverbanks. Wooden canoes also demand bigger engines, which causes contamination of oil and gasoline into the river. A wooden canoe will have to be replaced much sooner than a canoe made out of fibreglass. On the other hand one might feel a wooden canoe contributes more to the sensation of authenticity due to its long tradition as a means of transport.

### **Fibreglass canoes**

Local production of 9-meters or 13 meters eco-canoes made out of fibreglass is an alternative means of transport along the river. These canoes do not reach as deep under the water surface as the wooden canoe and therefore do not cause as much erosion on the riverbanks. Also because of this, the fibreglass canoes do not demand such powerful engines leading to less contamination of the river.

## **Participation and social commitment**

### **Voluntary work**

Inside the reserve there are several communities of ethnical minorities. In this specific study, the concept of *voluntary work* means the possibility (but not the obligation) of participating actively in community whereabouts. This might mean participating in a class in a local school, construction work, helping out with clearing woodland or digging a well. Any such participation builds on the approval of the local community and is also meant as a mutual cultural exchange between the traveller and the local population.

## Guiding

### Ordinary guiding

An authorised English speaking naturalist guide leads the group on day tours teaching about wild plants and medicinal plants. The guide also teaches about local animals and their habits. The trip includes spotting caimans and piranha fishing. The guided tours extend over a couple of hours before the return to base camp.

### Extensive guiding

Except the ordinary guiding described above the tour provides more specialised tour guiding. All guides have extensive knowledge about bird watching as well as tracking wild animals. If the travellers are interested the guided trips from base camp will be longer. The guided tour might extend over one or more nights in order to reach further into the reserve and the primary rain forest. This will give more chances of spotting wild animals and see rare plant species. More than one naturalist guide are available allowing the group to split up according to the requests of each traveller.

## Survey

Below follow 6-7 questions where you'll be asked to state your preferred choice of travel package. Each question consists of three packages of which the last one is an average estimate of a 5 days and 4 nights travel package currently offered by travel agencies in Quito. All packages correspond to the trip outlined earlier and stretch over 5 days and 4 nights. If you would not be interested in any of the alternatives, mark the alternative *none of the above*. Mark ONLY ONE box in each question.

All questions should be considered independently.

<b>Question 1</b>			
	Travel package 1	Travel package 2	Travel package 3 (base case)
Means of transport	<b>Fibreglass canoe</b>	<b>Traditional wooden canoe</b>	<b>Traditional wooden canoe</b>
Guiding	<b>Extensive guiding</b>	<b>Ordinary guiding</b>	<b>Ordinary guiding</b>
Possibility to work Voluntarily	<b>No</b>	<b>Yes</b>	<b>No</b>
Cost of 5 days trip	<b>US\$ 275</b>	<b>US\$ 275</b>	<b>US\$ 200</b>

I would prefer:    **Travel package 1**     **Travel package 2**     **Travel package 3**

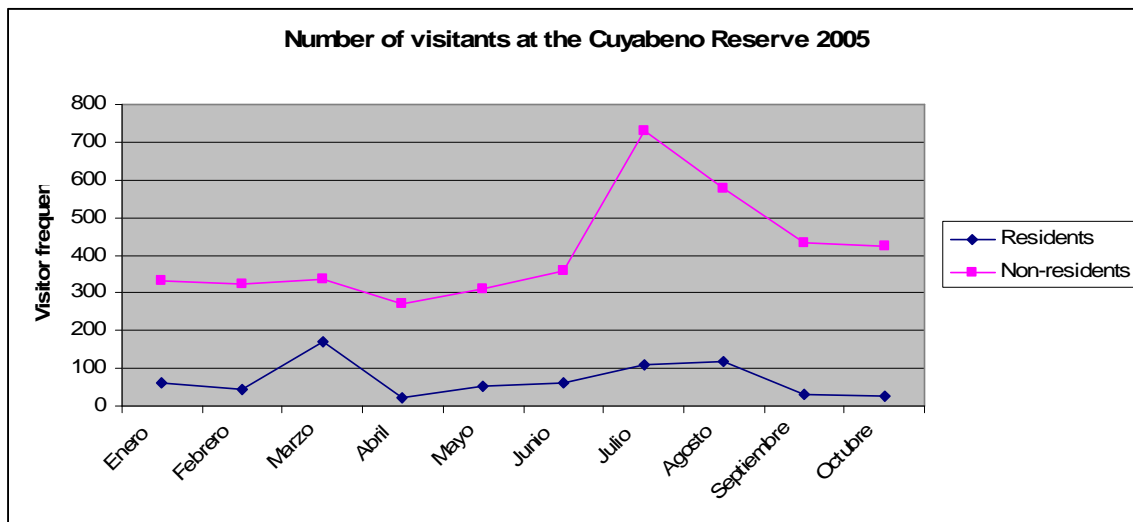
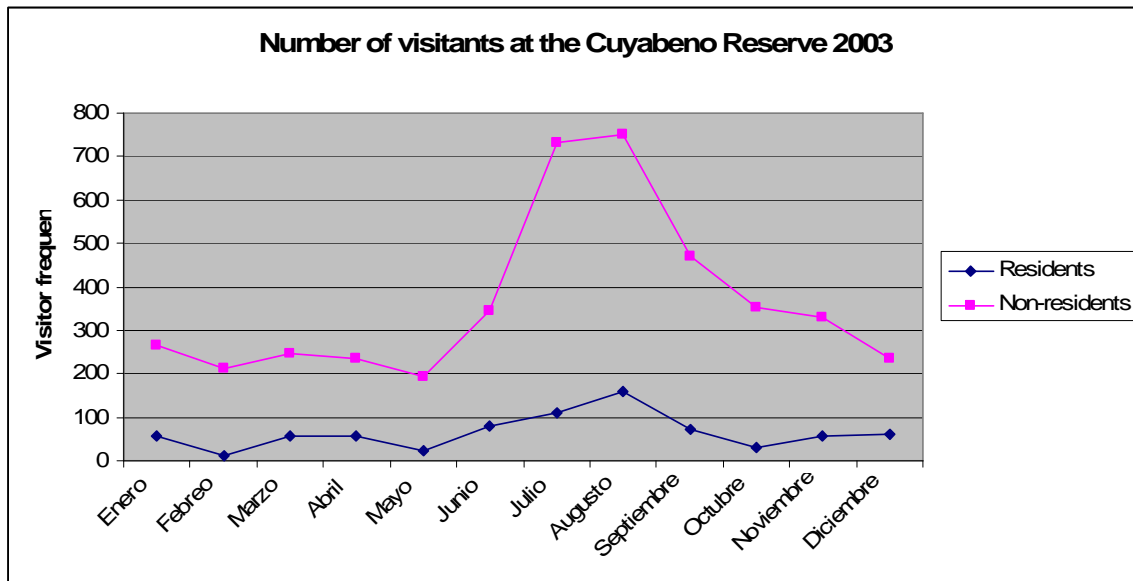
**None of the above**

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**Did you pay for this trip before arriving in Ecuador? Yes / No** *(underline one)*

*Do you have any comments on this study or the questionnaire design? All opinions are valuable.*

# Appendix E - Statistics



(year 2003: n = 5132) (year 2004: n =5132)

These data do not show any deviation in seasonal patterns from the year 2004. Tourism influx peaks during the period July to September. This pattern, however, is more established for non-residents.