Journal of Resources Development and Management
ISSN 2422-8397 An International Peer-reviewed Journal
Vol.29, 2017

Valuing the Benefits of Recreational Wetland Ecosystem: An Application of Contingent Valuation and Travel Cost Methods: The Case of Boye Recreational Wetland, Jimma Zone, Oromia National Regional State, Ethiopia

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Abstract
The Wetlands provide a multitude of ecosystem service such as recreational opportunities, habitat and biodiversity conservation or regulation of nutrient, livestock fodder production and greenhouse gas fluxes. This study seeks to address the valuing the benefits of recreational wetland ecosystem. The Purposively selected Boye wetland and was employed to take 120 visitors as a sample to assess consumer WTP for the direct use value and 100 non visitors for non-use value. To find the total economic value of the site, contingent valuation and travel cost methods have been used for the non use value and use value part of the wetland, respectively. The survey was conducted to collect information on WTP and the socio-economic characteristics of the respondents. Results show that Indicate that knowledge about wetland (NAW) at 1%, income at 5%, and Bid price at 5% and 1% level of significant for the first and second WTP answer were significant variables. While, age and numbers of dependent people in a family (NODP) were not significant. Regarding option value, the future direct and indirect use value, the researcher finds that all respondents were extremely motivated regardless of their response about the bid price. Concerning the stewardship valueTherefore, general consensus that the value of recreational wetland ecosystem services often outweighs economic use and that protecting wetland ecosystem services is one of the most important responsibilities of today's politicians, resource managers, and the surrounding society.
Keywords: contingent valuation method, cluster analysis, Ethiopia, recreational wetland ecosystem, travel cost method, and willingness to pay

INTRODUCTION

Background and Justification

The Wetlands provide a multitude of ecosystem service such as recreational opportunities, habitat and biodiversity conservation or regulation of nutrient, livestock fodder production and greenhouse gas fluxes. Wetland management inevitably involves trade-offs regarding the management and allocation of the two key resources, water and land, that taken together determine the status of ecosystems and the potential flow of benefits to human wellbeing. Providing a precise definition of wetlands is fraught with controversy and difficulty, because of the enormous variety of wetland types and the problems of defining their boundaries. Fortunately, some 100 countries have adopted a definition by signing the Ramsar Convention on wetlands of International Importance. The Convention adopts an extremely broad approach in determining the 'wetlands' which come under its aegis. In the text of the Convention wetlands are defined as areas of marsh, fen, peat land or water, whether natural or artificial, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters (Barbier et al., 1997).

According to EPA (2006) a wetland is a natural area that is often wet but may not be wet all year round. Wetlands are characterized by their distinctive hydrology, soils and plants. Once regarded as waste lands, wetlands are now recognized as important features of the landscape that provide numerous beneficial services for people and wildlife. The economic value of a wetland is an estimate of the importance, or worth, of one or more of its services to society. Some of these services, or functions, include protecting and improving water quality, supporting the fishing industry, storing floodwaters and providing opportunities for education and recreation. If wetlands are destroyed or damaged, it can be difficult or impossible to replace all of these functions. In the European Community, Wetlands are environmentally amongst the most sensitive areas. Although they now probably cover less than one per cent of its territory, they are among the most productive and fragile ecosystems. Early Mediterranean civilizations were based around coastal wetlands and depended on them for food, water and building materials. In more recent times the same areas have often been regarded as wastelands. Consequently there has been a massive loss of wetlands, especially in the Mediterranean basin (Davis, T. J. (ed.) 1993).

Ethiopia has also various types of wetlands that vary in size, type and location in different parts of the country which have different socio-economic values. These include food crops supply through agriculture by draining and recession, vital sites for dry season grazing, resource extraction, fish harvesting, source of medicinal plants and sites for tourist attraction and various traditional ceremonies. They are also part of the rural people's economy as they traditionally play an important role for rural communities through the provision of

water, and other materials, for both humans and livestock. However, many wetlands in Ethiopia are being affected due to over-extraction of their resources beyond their rejuvenating capacity by the surrounding societies. Draining for growing food crops, the appearance of invasive plant species due to mismanagement of the resources, and the introduction of perennial crops e.g. eucalyptus into the wetland ecosystem are the major threats that are posing a danger to the country's wetlands. In most parts of southwestern Ethiopia, headwater wetlands have been particularly subjected to drainage for dry season maize cultivation (Woldu and Yeshitela, 2003).

Economic science has methodologies available today for revealing the valuation of ecosystems and ecosystem goods and services, a great deal of which is not traded in the market and, therefore, there exist no explicit market prices for them. These methodologies use information on related goods that do have markets or that is obtained from specially designed surveys applied directly to those from whom we are interested in revealing or determining their valuations. The technique to be used in each case depends on the type of ecosystem good or service we want to value and the type of contribution it makes to the wellbeing of individuals or society. Economic valuation is the attempt to assign quantitative values to the goods and services provided by environmental resources, whether or not market prices are available to assist the valuator (Barbier et al., 1997). Although some of the significance of environmental resource is obvious this may not be enough if we are to ensure their wise use. Many environmental resources are complex and multifunctional, and it is not obvious how the myriad goods and services provided by these resources affect human welfare. In some cases, it may be worthwhile to deplete or degrade environmental resources; in others, it may be necessary to 'hold on' to these resources. Economic valuation provides us with a tool to assist with the difficult decisions involved. Currently, non-market valuation techniques are increasingly gaining grounds in the forefront of most research work in economics. This is so because some goods and services which readily have some kind of value either do not command a market price or that the market prices of such goods and services do not correctly match the values of the goods or services. Examples of such goods and services include environmental goods and services such as recreation sites (public parks, beaches, zoos, rivers, etc).

The wetlands in southwestern Ethiopia have various socioeconomic and ecological values such as grazing land for all seasons, agriculture, bricks and different types of pottery making, habitat for a variety of plant and animal species, water source for human and livestock consumption, etc (Desta and Mengistu,2009). Although these values are appreciated, but little understood, investigation on their economic values has not yet been undertaken.

The study site Boye, which is located 4km east along the main road to Addis-Ababa from Jimma town, is not far from the stated above problems. It is one of the potential areas that provide recreational service to people of Jimma and surroundings, and habitats for bird diversity. The wetland receives water from two rivers, Kito and Awetu. These two rivers inter into the pond of Boye wetland after covering almost 3km the surface area of the pond (Wacho, 1999). River passing through Jimma town by receiving all types of municipal wastes discharged to Boye wetland with extensive amounts of pollutants. As a result of this increasing anthropogenic disturbance, notably via the waste discharge from Jimma town, nowadays Boye wetland has been changed to almost a Wasteland. Prior to the couple of decades it was to host many species that are rare and endangered today like fish specious, birds, hippopotamus, crocodile and etc; nowadays they are overwhelmed. Therefore, this study is designed to assess the prevailing situation in valuing the benefits of improved recreational Boye wetland ecosystem in light of the above needs.

Although Boye wetland have a critical role in providing a variety of ecological and socio-economic benefits, In spite of its importance it has been degrading with time owing to agricultural land expansion, Jimma town expansion towards the wetland, eucalyptus plantation at the bank of the wetland, waste deposition in the wetland and intensive grazing. Degradation of this wetland is mainly associated with unwise use and exacerbated by lack of understanding of wetland value. As a result the valuable wetland resources are depleted, particularly the biodiversity is severely affected and in great danger of being lost. This might be due to little or no efforts have been made in the light of valuing this natural resource (especially of that not directly marketed). On account of such threats and rapid degradation of this resource, the urgent need to manage it should be essential. However, decision makers cannot take management decisions based on intuition alone, they need facts and values to feed the decision making process. According to Tariku et al., (2011), if ones compare the ecological, economical and social advantages of this wetland maintenance with conversion to other land use types, maintaining the wetland was by far greater than conversion to other land use types to obtain short term benefits.

Thus, in order to alleviate the stated above problems, imputing values that reflect the true social costs and benefits of this recreational site using some techniques of valuation of environmental resources is necessary. In the study area, a few non economics (valuation) studies have been investigated but, these studies do not consider the economic value of the wetland. For instance, Desta, (2006) conducted his thesis on the three wetlands found in the city, namely Koffe, Kitto and Boye. From his study resulted, of the 76 respondents participated in the household survey, 80% of the households had 0.1-2.0 size of land holding in the wetlands.

100% of the households reported the disadvantages of living around the wetlands due to high incidence of malaria despite the many economic and societal benefits they gained out of the wetlands. This is also due to the current status of the wetland and shows as a fast management action is needed.

Therefore, this study tries to overcome these problems by combining contingent valuation (CV) and travel cost methods (TCM) of valuation techniques to provide immense information regarding the non use value and use value of Boye wetland respectively so as to enable the policy makers to take a sound full management decision. Since non use values are significant, the travel cost method alone will underestimate the benefits of preserving the site and hence the researcher will combine both CV and TC methods of valuation in order to estimate the total economic value of the site.

Objectives of the Study

The general objective of this study is to estimate how much the surrounding community is willing to pay for an improvement of Boye wetland –Direct, indirect and non use: aggregate value of bundled service of the site using environmental economic tools. The specific objectives are:

To estimate the mean willingness to pay for the non use value contribution of Boye wetland

To estimate the recreational demand function and the total economic benefit of Boye wetland.

To assess the socio-economic and demographic characteristics that influence society‘s willingness to pay for use value and non use value of Boye wetland ecosystem

To identify key challenges and advocate alternative policy options-which permit to maintain quality of Boye wetland ecosystem for future generation.

Research Methodology

This section provides an overview description of the study area, data requirement and methods collection, sampling techniques, and method of analysis.

Description of the study area

Physical location of study area

The study was conducted in south western Ethiopia Oromia National Regional State, Jimma Zone, Dedo district. Ethiopia is a landlocked country in Eastern Africa, bordered by Eritrea, Sudan, Kenya, Somalia and Djibouti to the North, West, South and East, respectively. It is located within the tropics between 3°24` and 14°53` N; and 32°42` and 48°12` E (Fig. 1) Alemayehu, 2003). Ethiopia has an area of 1.13 million km^2 (Mulugeta, 2004) and is divided into nine regional states. The National Regional State of Oromiya has a "T" shaped land mass in central and southern Ethiopia, extending to the western, eastern and the southern borders of the country. It encompasses highland plateaux, lowland river valleys and a wide variety of agro-ecological zones. Geographically, it extends from 30 40'N to 100 35'N latitude and from 340 05'E to 430 11'E longitudes. Oromiya has a total area of 353,690 km^2, which is about 32% of the total area of the country. The Region is divided into 14 administrative zones and 197 weredas (BoPED, 1997). Jimma Zone is one of the Zones in the Oromia Regional State, bordered on the east and south by the Southern Nations, Nationalities and Peoples Regional state, on the west by Illu Ababor Zone, on the north by East Wollega zone , West Shewa and on the north east by South West Shewa zone.Its absolute location extends between the co-ordinates of 7^{0}23' – 8^{0}47’ N latitude and 35^{0}52’ –37^{0}30’ longitude (OBoPED, 2002). According to OBoPED (2002), the total area of Jimma zone is 19293.5 Km^2.There are 13 woredas separated from each other’s by natural demarcations such as rivers, mountain chains, and/randomly designated marks.

Dedo location is marked as 7^{0}13' -7^{0}39’ N latitude and 36^{0}43' - 37^{0}12' E longitude and is 22 km South Eastern of the zonal town Jimma, along the main road to Dawuro-Chida district (SNN).The districts is located about 360 km to the south western of the capital, Addis Ababa. The district shares its boundaries with Omo Nadda district to the east, Kersa district to the North, Seka Chokorsa district to the west and Southern Peoples Nations and Nationalities Regional State (SPNNRS) to the South. (See the map in Fig. 2).

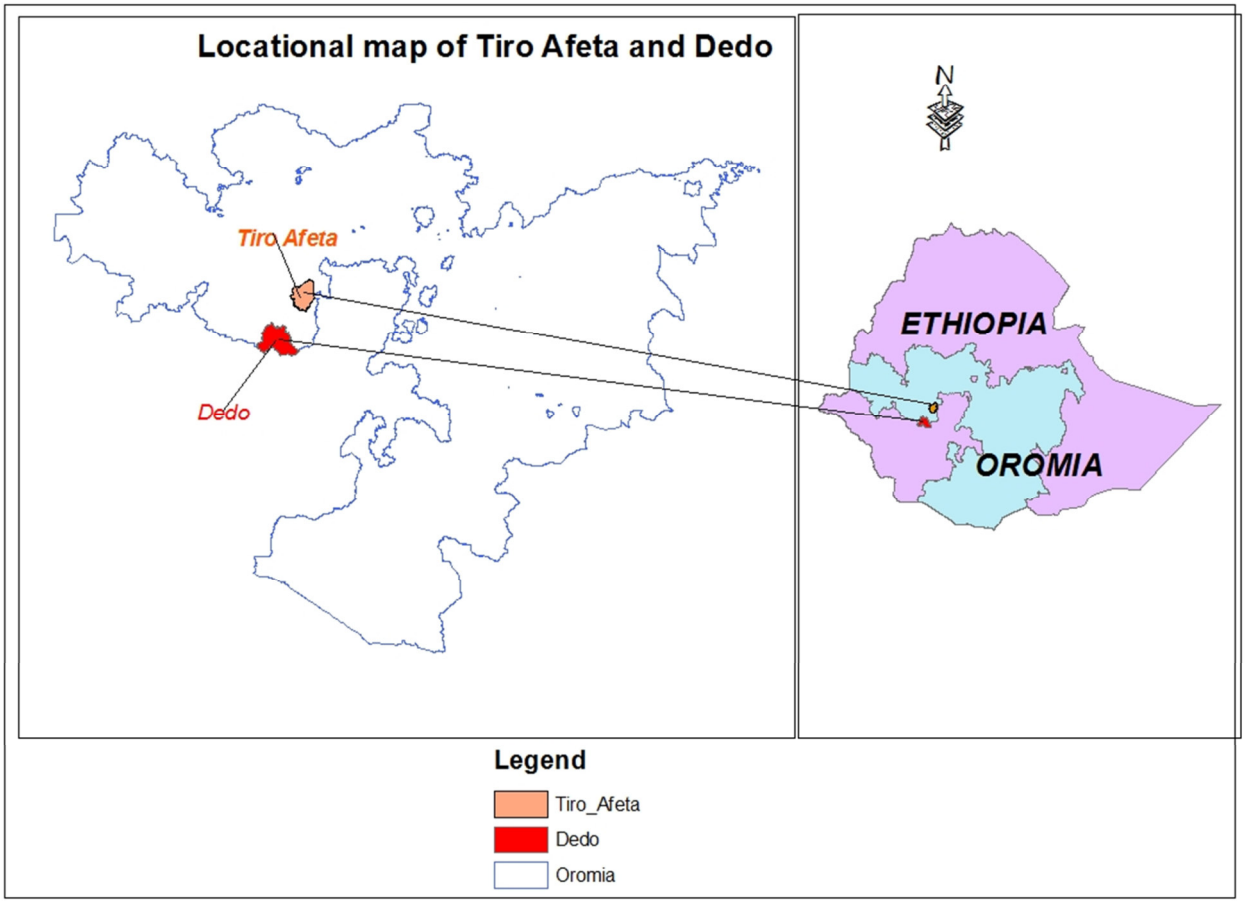

Figure 2: Location Map of study area

The study district climate is generally a tropical, highland climate characterized by heavy rainfall, warm temperature and long wet periods. The mean annual rainfall of the districts ranges between 1200 and 2800 mm with a mean temperature of 20 –250C. The rainy season extends from February to the end of November with bi-modal rainfall characteristics. Dedo extends between 880 and 2400 m.a.s.l, is classified into dega (18%), woinadega (48%) and kolla 34%) zones.

Socio economic and Demographic condition

a) Population

According to the 2007 population and housing census, the total population of Dedo district was 255,420 out of which 97.8% live in rural areas and 2.2% live in urban. It is one of the densely populated areas of the region with 171 persons per sq. km.

b) Economic activities

Since, agriculture is the main stay of Ethiopia's economy; it is the main economic activity for the vast majority of the population in the study area. Agriculture of the study area districts are characterized by mixed farming system where both crop and livestock production are sources of livelihood. The cropping system in the study areas, like any other parts of Ethiopia, is small-scale subsistence farming employing simple implements and methods of production. Crop production is one of the most important sub-sectors of the districts which are mainly dependent on rainfed agriculture. There is no significant irrigation activity except attempts made by farmers through traditional small-scale irrigation activities. Due to the diversity of climatic and soil conditions, different types of crops are grown, of which cereals, pulses, root crops and vegetables are the major ones. Maize, wheat and teff are the leading crops accounting for about 21%, 20.5%, and 20% of the total cultivated area with average productivity of 23.37, 13.24, and 8.67 quintals per hectare respectively.

Livestock production plays an important role in the study area. The district had 42,563 cattle, 4,377 sheep, 4,120 goats, 600 mules, 835 horses, 722 donkeys and 5,904 poultry. Animals are kept as a source of milk, meat, cash, and draught power. Cattle dung is also an important source of fuel. Like the other parts of the zone the animals kept in the districts are mostly indigenous species. Shortage of animal feed is the major and serious problem of livestock production in the district

c) Soils

The study district Dedo is dominated by clay, porous and well-drained soils of Nitosol with deep reddish brown

to red in color which has good potential for agriculture. Mostly, applied methods of maintaining soil fertility is cow dung application, constructing rotating barns over their plots, and in rare cases, crop rotation and intercropping. Soil erosion is serious due to the hilly broken landscape and incidence of landslides. Traditional practices of soil conservation are diversion ditches, trash lines, grass strips, and soil bunds at stone terraces.
The study was conducted in particular area in Boye recreational wetland, 4 km from Jimma town. The study area receives a rainfall between 1200 and 2400 mm per annum with an average annual rainfall of 1477 mm having the heaviest concentration from June to September, and the average maximum and minimum temperature is 28.8 and 11.8°C respectively with a mean daily temperature of 19.5°C (CSA, 2005). The wetland is unprotected with regard to conservation issues. The major challenges in the areas leading to deterioration and degradation of the resource are expansion of farm lands at the expense of wetland and forestland. Moreover, there are small scale industries in the areas producing bricks for which clay soils are dug up here and there from the wetland areas aggravating land degradation, and also deforestation due to the large amount of fuel wood demand for these small-scale industries and the down dwellers (Desta and Mengistu, 2009)

Sampling Design
Sampling is that part of statistical practice concerned with the selection of an unbiased or random subset of individual observations within a population of individuals intended to yield some knowledge about the population of concern, especially for the purposes of making predictions based on statistical inference. The three main advantages of sampling are that the cost is lower, data collection is faster, and since the data set is smaller, it is possible to ensure homogeneity and to improve the accuracy and quality of the data. Purposively Boye wetland has taken random sampling procedure was employed to take 120 visitors as a sample to assess consumer WTP for the direct use value and 100 non visitors for non-use value. To make the sample more representative it was stratified to include different segments of the society, that is, unemployed, students, high income group and low income group. The target population size for the CVM is the population of Jimma city far away from the wetland (this is considered because of people near the site have both use value and non use value which may under estimate the value attached to non use value. On the contrary, people living far away from the site have only non use value) and for TCM the total number of visitors was used. In TCM, the number of respondents' is constrained by the project budget, interviewer work load, and difficulty in intercepting visitors before they departed from the wetland.

Data type and collection methods
The source of data for this study was both primary and secondary data sources. To find the economic value of Boye wetland, primary data that was collected from a survey through semi-structured questionnaires were used. Respondents were asked directly their willingness to pay for the use and non use value of the wetland and indirectly asked their willingness to pay through market based mechanism. The data was collected from a sample of on-site visitors at Boye wetland and from the population of Jimma by means of semi-structured questionnaire. The data set includes all the information necessary to represent all the variables to estimate the required models. The field work for the survey was conducted by the author and by 3 enumerators (after giving training to them, to make the survey less time consuming). The survey was administered using face-to-face (in-person) interview.

Two types of semi-structured questionnaires were designed to collect information. The first questionnaire helps to gather information about the non use value of the wetland using the contingent valuation technique. Semi-structured questionnaire consists of the following: (a) socio economic characteristic of non visitors, (b) attitude of non visitors in relation to sustainability of the wetland ecosystem, (c) non visitor's awareness about Boye recreational wetland, and (d) willingness to pay of non visitor for the wetland conservation fee (bid price was presented).

The second questionnaire was prepared for on- site visitors which help to estimate the use value of the site using Travel cost method. Relevant information was collected on the following variables:

- ✓ Travel expenses (the total amount of money spent to arrive to the park)
- ✓ The length of the trip (travel distance to the site plus travel distance from the site to visitors destination in kilo meters)
- ✓ The amount of time spent for the trip (time spent for the trip measured in hour)
- ✓ The number of times they visited the site in the past year or season (measured in number of visits)
- ✓ Other locations visited during the same trip, and amount of time spent for each
- ✓ Substitute sites that the person might visit instead of Boye wetland, and the travel distance to each of the substitute sites
- ✓ Other reasons for the trip (was the trip only to visit the site or for several purposes?)
- ✓ Quality of the recreational experience at the site (asking visitors satisfaction level)
- ✓ Characteristics of the site and other substitute sites
- ✓ The person's monthly income or other information on the value of their time

- ✓ Other socioeconomic characteristics of the visitor

Methods of Data Analysis

The method of analysis that was used in this study was based on a joint analysis of contingent valuation and travel cost method. The travel cost method is to estimate the recreational use value of the site and the contingent valuation method is to investigate the non use value contribution of wetland. These two methods are chosen in consideration to the following reasons:

- ✓ The site is primarily valuable to people as a recreational site, the travel cost method is more appropriate since there are reasonable number of visitors.
- ✓ The expenditures for projects to protect the site are relatively low. Thus, using a relatively inexpensive method like travel cost makes the most sense.
- ✓ For this study almost all visitors are from the city of Jimma, so travel cost method is more appropriate in predicting the required use value. Because, when the distance of travel is short, travel cost is more appropriate (Rietbergen, 1998; Goshu, 2011)
- ✓ Contingent valuation is used when there are endangered species or other highly unique qualities that would make non-use values for the site significant (Ibid). As mentioned earlier the wetland under study has a wide range of species that are rare and endangered today. It was used to host important endemic plant and animal species including some worldwide endangered bird species and more than 25 macro invertebrate species (Desta and Mengistu, 2009).

Elicitation method for Contingent valuation

It is clear from past studies that people are willing to pay for non-use or passive use of environmental benefits and contingent valuation method remains the only technique capable of placing a value on commodities that have a large non-use value (Perman et al, 2002; Bolt et al, 2005). Since the non-use values contribution of wildlife and wetlands are significant, especially for endangered species, other methods, such as the travel cost method, will tend to underestimate the benefits of preserving the site. With CV studies, the type of question used will have an important effect on results. Formally there are four types of elicitation formats: open ended, Bidding game, payment card and; single and double bounded dichotomous choice formats.

This study used double bounded dichotomous choice questions (DBDC), which are those most commonly used in practice (Ibid). The essence of a double bounded model is as follows. Respondents are presented with initial bid prices. Following their initial responses, they are given new prices, lower if their initial responses were no, higher if the responses were yes. Double-bounded models increases efficiency over single dichotomous choice model in three ways. First, the answer sequences yes-no or no-yes yield clear bounds on willingness to pay (WTP). For the no-no pairs and yes-yes pairs, there are also efficiency gains. These come because additional questions, even when they do not bound WTP completely, further constrain the part of the distribution where the respondent's WTP can lie. Finally, the number of responses is increased, so that a given function is fitted with more observations (Haab and McConnell, 2002).

Bid Design for CVM

The bids are obviously important for efficiency because they are exogenous variables that determine the variance-covariance matrix in the simple dichotomous discrete choice CV where the Bid is the only regressor. According to Haab and McConnell, 2002, any information available on the distribution of WTP should be used to help design the vector of offers bids. This is because failure to identify the tails of the distribution can have significant effects on the estimation of parameters. Consequently, the researcher goes through focus group discussion in order to have prior information on the distribution of WTP that will serve to identify a preliminary estimate of the central tendency of willingness to pay and also help to identify the location and size of the tails of the distribution. In this regard, the result showed that, the range of response varied between 0 and 80 with high concentration at the lower end.

The survey involved five different starting bids with values of 5, 10, 15, 20 and 25 ETB. 100 sampled individuals were randomly assigned to one of the five WTP treatments. If the respondents agreed to pay the offered bid the follow up bid is doubled and in case of a no response the respondents are offered a bid that is half of its initial value. For instance, when offered a bid of 10 ETB a follow up bid of 20 ETB is offered if the response is yes and in case of a no response a bid offer of 5 ETB is given to the respondent.

Theoretical Frame work and Model Specification for CVM

The contingent valuation method (CVM) is a direct method in that it involves asking a sample of the relevant population questions about their WTP or WTA. It is sometimes referred to as a stated preference method. It is called 'contingent valuation' because the valuation is contingent on the hypothetical scenario put to respondents. Its main use is to provide inputs to analyses of changes in the level of provision of public goods, and especially

of environmental 'commodities' which have the characteristics of non-excludability and non-divisibility (Perman et al., 2003).

Given two bid prices, the level of the second bid is contingent upon the response to the first bid. If the individual responds "yes" to the first bid (y_1), the second bid (to be denoted y2) becomes twice higher than the first bid $(y_2 = 2y_1)$; if the individual responds "no" to the first bid, the second bid (y_2) is twice smaller than the first bid $(y_2 = 1/2\, y_1)$.

Econometric Model Specification for CV

The appropriate method for analysis depends on how responses generated –elicitation method. In this regard since this study was used the referendum dichotomous choice questions-DBDC questions, parametric estimation models are considered.

The Random Utility Model (RUM)

RUM is a basic model for analyzing a dichotomous CV response and assumes that the utility derived by individuals from their preference is not directly observable, but an indirect determination of preferences is possible. There are two alternatives, so that indirect utility for respondent j can be written as

$$u_{ij} = u_i\left(y_j, z_j, \varepsilon_{ij}\right)$$

Where i=1 is the state or conditions that prevails when the CV program is implemented, that is, the final state, and i=0 for the status quo. The determinants of utility are y_j, the j^{th} respondent's discretionary income, z_j, an m-dimensional vector of household characteristics and attributes of the choice, including questionnaire variation, and ε_{ij}, a component of preferences known to the individual respondent but not observed by the researcher. The $u_{ij} = u_i\left(y_j, z_j, \varepsilon_{ij}\right)$ function is written with only the subscript indicator i and the random component of preferences changing. It is obvious that something has been changed from the status quo to the final state. It could be a measurable attribute- for example a quality indicator q could change from q^0 to q^1 so that utility for the status quo would be $u_{0j} = u\left(y_j, z_j, q^0, \varepsilon_{0j}\right)$ and utility in the final state would be $u_{1j} = u\left(y_j, z_j, q^1, \varepsilon_{1j}\right)$. Based on this model, respondent j answers yes to a required payment of t_j if utility with the CV program, the net of the required payment, exceeds utility of the status quo

$$u_1\left(y_j - t_j, z_j, \varepsilon_{1j}\right) > u_0\left(y_j, z_j, \varepsilon_{0j}\right)$$

However, researchers do not know the random part of preferences and can only make probability statements about yes and no. the probability of a yes response is the probability that respondent thinks that he is better off in the proposed scenario, even with the required payment, so that $u_1 > u_0$. For respondent j, this probability is

$$\Pr\left(yes_j\right) = \Pr\left(u_1\left(y_j - t_j, z_j, \varepsilon_{1j}\right) \triangleright u_0\left(y_j, z_j, \varepsilon_{0j}\right)\right)$$

But this probability statement is to general for the parametric specification and needs two modeling decisions regarding the functional form of $u_i\left(y_j, z_j, \varepsilon_{ij}\right)$ and the distribution of ε_{ij}. Thus, assuming the utility function as additively separable in deterministic and stochastic preferences, the indirect utility is the sum of a deterministic component that has the arguments that are important to the CV scenario and to the individual, and stochastic component. That is $u_i\left(y_j, z_j, \varepsilon_{ij}\right) = u_i\left(y_i, z_j, q_i\right) + \varepsilon_{ij}$. With this specification, the probability statement for respondent j becomes

$$\Pr\left(yes_j\right) = \Pr\left[u_1\left(y_j - t_j, z_j\right) + \varepsilon_{1j} \triangleright u_0\left(y_j, z_j\right) + \varepsilon_{0j}\right]$$

If ε follows a gamble distribution then the probability of an individual saying yes, assuming linear indirect utility function and logit model, is

$$\Pr(yes_j) = \frac{e^{(\alpha - \beta_t)}}{1 + e^{(\alpha - \beta_t)}}$$

While, if ε follows the normal distribution assumption of zero mean and constant variance, the model modify itself to probit model. In either case, α and β can be estimated using a standard statistical package. The calculation of willingness to pay uses estimated parameters, depends on the covariates chosen and is also a

function of the random component assumed for preferences. For the linear random utility model of $u_{ij} = \alpha_i z_j + \beta_i (y_j)$ the expected willingness to pay with respect to preference uncertainty is

$$E(WTP_j / \alpha, \beta, z_j) = \frac{\alpha z_j}{\beta},$$

The parameter α represents the extra utility generated by the provision of the environmental good, z_j is an m-dimensional vector of variables related to individual j, whereas the parameter β represents the negative of the marginal utility of income.

To formulate the model the study assumes two willingness to pay functions, which is $WTP_{ij}(Y_{ij}*) = \mu_{ij} + \in_{ij}$, where WTP_{ij} =Y_{ij} is the j^{th} respondents willingness to pay, i=1,2 represents the first and second answers to the proposed bid price, depending on a set of economic and social characteristics μ_{ij} and $\in_{ij}$, the unobserved variables.

WTP_{ij} (Yij*) =μijβ+εij, Y_{ij}=1 if Y_{ij}*>0, 0 otherwise

The probability that respondent j answer yes to the first and no to the second bid price (t^i) is given by:

Pr [yes, no] =Pr [$WTP_{1j} \geq t^1$, $WTP_{2j} < t^2$], $WTP_{1j}=Y_{ij}$

=Pr [$\mu_1 + \in_{1j} \geq t^1$, $\mu_2 + \in_{2j} < t^2$]

The rest probabilities that enter to the likelihood function are then:

Pr [yes, yes] =Pr [$WTP_{1j} > t^1$, $WTP_{2j} \geq t^2$]

=Pr [$\mu_1 + \in_{1j} > t^1$, $\mu_2 + \in_{2j} \geq t^2$]

Pr [no, yes] =Pr [$WTP_{1j} < t^1$, $WTP_{2j} > t^2$]

=Pr [$\mu_1 + \in_{1j} < t^1$, $\mu_2 + \in_{2j} > t^2$]

Pr [no, no] =Pr [$WTP_{1j} < t^1$, WTP2j<t2]

=Pr [$\mu_1 + \in_{1j} < t^1$, $\mu_2 + \in_{2j} < t^2$]

Then, the jth contribution to the likelihood function becomes,

$L_j(\mu|t)$ = Pr [$\mu_1 + \in_{1j} \geq t^1$, $\mu_2 + \in_{2j} < t^2$] ^{YN} x Pr [$\mu_1 + \in_{1j} > t^1$, $\mu_2 + \in_{2j} \geq t^2$] ^{YY}

x Pr [$\mu_1 + \in_{1j} < t^1$, $\mu_2 + \in_{2j} > t^2$] ^{NY} x Pr [$\mu_1 + \in_{1j} < t^1$, $\mu_2 + \in_{2j} < t^2$] ^{NN}

Where, YY=1 for the yes-yes answer, 0 otherwise and NY=1, for the no-yes answer, 0 otherwise, YN=1 for the yes-no answer, 0 otherwise and NN=1 for the no-no answer, 0 otherwise. This formulation is the bivariate discrete choice model. The errors are assumed to be normally distributed with zero mean and constant variance of δ_1^2 and δ_2^2, then the WTP_{1j} and WTP_{2j} have a bivariate probit normal distribution with mean μ_1 and μ_2, variance δ_1^2 and δ_2^2, and correlation coefficient between the error for the two WTP functions ρ. Given the dichotomous choice response to each question, the normally distributed model is the bivariate probit model. The likelihood function for the bivariate probit modal is thus,

Pr [yes, no] =Pr [$\mu_1 + \in_{1j} \geq t^1$, $\mu_2 + \in_{2j} < t^2$] = $\phi \in_1 \in_2 \left(-\frac{t^1 - \mu_1}{\delta_1}, \frac{t^2 - \mu_2}{\delta_2}, -\rho \right)$

Pr [yes, yes] =Pr [$\mu_1 + \in_{1j} > t^1$, $\mu_2 + \in_{2j} \geq t^2$] = $\phi \in_1 \in_2 \left(-\frac{t^1 - \mu_1}{\delta_1}, -\frac{t^2 - \mu_2}{\delta_2}, \rho \right)$

Pr [no, yes] =Pr [$\mu_1 + \in_{1j} < t^1$, $\mu_2 + \in_{2j} > t^2$] = $\phi \in_1 \in_2 \left(\frac{t^1 - \mu_1}{\delta_1}, -\frac{t^2 - \mu_2}{\delta_2}, -\rho \right)$

Pr [no, no] =Pr [$\mu_1 + \in_{1j} < t^1$, $\mu_2 + \in_{2j} < t^2$]= $\phi \in_1 \in_2 \left(\frac{t^1 - \mu_1}{\delta_1}, \frac{t^2 - \mu_2}{\delta_2}, \rho \right)$

Where, $\phi \in_1 \in_2$, is the standard bivariate normal cumulative distribution function with zero means, unit variance and correlation coefficient ρ.

The choice of an appropriate model depends on the relationship between the two dependant variables (WTP_{1j} and WTP_{2j}). The Wald Test shows that ρ, the correlation parameter, is significant for the data collected and the study chooses seemingly unrelated bivariate probit model.

Independent Variables and Expected Sign for CVM

Bid prices: The study expects a negative relationship between bid price answers and bid prices. When the bid prices for conservation of the wetland increases, respondents' willingness to pay will decrease. This is because of the law of demand.

Age: The study expects a negative relationship between age and willingness to pay for the designed policy. As an individual's age increases, his/her attitude toward recreation might be reduces.

NAW: The study anticipates a positive relationship between the first bid price answer and knowledge about wetland. As individual knowledge about the importance of wetland increases, their interest towards a payment for the protection of it becomes high.

NODP: The study expects a negative relationship between bid price answer and the Number of dependent peoples in family. When the number of dependent people in a family increases individual's willingness to pay for wetland protection will decrease. This is as an individual spends income to help his/her family, their ability to pay for protection of Wetland starts to decline.

Income: Is expected to have a positive relationship with the intended bid price. That is, those on higher incomes to be more likely to answer yes to the referendum question and subsequently to express a higher WTP.

Theoretical Frame work and Model Specification for TCM

TCM appears to have first been proposed in outline in a letter from Hotelling to the US Park Service in 1947 in which he suggested that the costs incurred by visitors could be used to develop a measure of the recreation value of the sites visited (Perman et al., 2003). It is a revealed preference technique for estimating use values and designed to measure in monetary terms the benefits people enjoy from visiting a recreation site. The method is based on the relationship between the non-market use value and the market goods and services that are purchased as complements to a site visit. It uses data on costs incurred by visitors travelling to a recreational site to infer their willingness to pay for the recreation facilities that the wetland/recreation site offers. This enables estimation of the demand curve for recreation at the wetland and therefore provides an estimate of the recreational value of the wetland. However, it can be seen now that the TCM is an application of the weak complementarily idea. This implies that when consumption expenditure falls to zero, the extra utility of visitation is also zero, or alternately the recreational site will only be valued if consumption expenditure is positive (Ibid; Yibrie, 2011).

Two main variants of the TCM are the zonal travel cost method (ZTCM) and the individual travel cost method (ITCM). The zonal travel cost method is applied by collecting information on the number of visits to the site from different distances. Because the travel and time costs will increase with distance, this information allows the researcher to calculate the number of visits "purchased" at different "prices." This information is used to construct the demand function for the site, and estimate the consumer surplus, or economic benefits, for the recreational services of the site. The individual travel cost approach is similar to the zonal approach, but uses survey data from individual visitors in the statistical analysis, rather than data from each zone. This method thus requires more data collection and slightly more complicated analysis, but will give more precise results. Accordingly, this paper employed the individual travel cost method in order to obtain more accurate results. In addition to the necessity of accurate result almost all visitors of Boye wetland recreation site also come from one area and that is why the ITCM is selected over the ZTCM.

Independent Variables and Expected Sign for TCM

Travel cost: For people living close to the recreational site the travel cost was low, and the expectation was that they would tend to visit the site more often. The opposite would be the case for those visitors traveling to the site from more distant places. Thus, other things remaining constant, the general expectation would be that an inverse relationship between the travel cost and the number of visits to the given recreational site.

Cost of the substitute site: The relationship between this variable and the number of visits to the site is indeterminate a priori. This is because this variable depends on the distance of the substitute site. For instance, when a recreationist lives within a corridor between a primary and alternate site, then as travel cost (T) to the primary site increases, the cost to the alternative site will decrease. For these recreationists the correlation between the two travel costs is negative. If recreationists do not live within such a corridor, then as the travel costs to the primary site increase so do the costs to the alternative site.

Education: In this study education is included as a dummy variable, where 1 is assigned for those with educational status of degree and above, while 0 is assigned for those below degree level and it has expected to have a positive impact on a visit function.
Income: It is expected that those on higher incomes are more likely to visit the recreational wetland many times. So income will have a positive effect on the number of visits
Group: Travel characteristics of visitors as whether they visit in group or alone are also included in this study as a dummy variable, where 1 is assigned for group visits and 0 for non group visits. Though, the relationship between this variable and the number of visits to the site is indeterminate a priori.
Age: The study expects a significant relationship between age and the number of trips to recreational site. Young people are more likely to visit parks than older ones. When age increases they are more likely to be engaged in social activities and they are less likely to make visits to recreation sites. However, the relationship between visitors' age and the number of visits is indeterminate a priori.
NODP: The study expects a negative relationship between bid price answer and the Number of dependent peoples in family. When the number of dependent people in a family increases individual's willingness to pay for wetland protection will decrease. This is as an individual spends income to help his/her family, their ability to pay for protection of Wetland starts to decline.

Model Specification for TCM
The first basic assumption for the TCM is that visits to the park are determined by a visit-generating function. In this paper the single-site demand model was assumed than the multiple site demand model, the difference between these two approaches arises from the fact that individuals are able to make trips to alternative recreational sites is explicitly considered in the multiple-site models.
The visit generating function is thus,
$Vi = f(Ci, X1i, X2i, \ldots XNi)$ (12.7)
Where, Vi is visits by the i^{th} individual, Ci is the cost of a visit by individual i, and the Xs are other relevant variables.

The second basic assumption is that the cost of a visit comprises both travel costs Ti, varying with i, and admission price, P, constant across i, and that visitors treat travel costs and the price of admission as equivalent elements of the total cost of a visit. Visitors respond, that is, in exactly the same way to increases or decreases in total cost whether they are due to increases or decreases in travel cost or admission price, with $\partial Vi / \partial Ci < 0$.

Assuming that the function $f(\cdot)$ is linear in costs, and suppress the role of other variables, this means that the trip generating equation to be estimated is

$V_i = \beta_0 - \beta_1 C_i + \varepsilon i$
$= \beta_0 - \beta_1 [T_i,(t_i,z_i)+P] + \varepsilon i$

Where, εi is the stochastic component, assumed to be normally and independently distributed, with zero expectation. Travel and the recreational amenity services of the park are being assumed to be weak complements and it is assumed that travel and access costs are behaviorally equivalent. In the data for the case we are considering, P is zero. However, given the second assumption here, α and β can be estimated from data on Vi and Ti and used to figure the effects on visits of hypothetical changes in P.[1]

This model further assumes that travel time and time spent at the site are exogenous, that there is no utility or disutility from traveling to the site, and that each trip to the site is undertaken for no other purpose than visiting the site. Moreover, in this model time is valued at the wage rate and combined with travel costs to produce one full cost variable, which is indicated by the subscript ti and zi in equation 3.12 above. Where, ti is the travel cost and zi is the opportunity cost of time evaluated at wage rate for individual i.[2] As Kerry (1997) recommended in his discussion paper about time and the valuation of environmental resources, ad hoc rules, scaling wage rates by one-fourth to one-half, are the dominant approaches used to derive an opportunity cost for travel time.[3] In theory, an individual increases the number of hours worked until the wage at the margin is equal to the value of an hour in leisure. Multiplying the hourly wage times travel time, in this case, is a fair estimate of the opportunity cost of time. Unfortunately, the simple leisure/work trade off does not apply to individuals working a fixed 40-hours per week job for a salary. As suggested by Hynes et al. (2004) these individuals do not have the flexibility to shift time in and out of work in exchange for leisure. The tradeoff is also incredible for retired individuals, homemakers, students, and the unemployed. In this paper we make the assumption that all respondents are flexible in their work schedules.

[2] As Bockstael, et al. (1992) demonstrates, for individuals at corner solutions in the labor market, utility maximization is subject to two constraints, leading to a demand function with travel costs and travel time as independent variables. With interior solutions in the labor market, time is valued at the wage rate and combined with travel costs to produce one "full cost" variable.

[3]The time cost assumed opportunity costs were a multiple, k, of the wage rate, w, (e.g., k x w). This formulation implied that if both vehicle related distance costs (together with any entry fees) and the time costs of

a trip had the same effect on demand, then the estimated parameters of the demand model identified estimates of the multiplier converting the wage to the opportunity cost of time.

Count Models of Recreational Demand

Count data models are intuitively appealing for recreational demand because they deal with non-negative integer valued dependent variables. For recreation, the number of trips is a non-negative integer. The count model specifies the quantity demanded, trips, as a random non-negative integer, with a mean that is dependent on exogenous regressors. For the Poisson or variants thereof, the functional form for expected demand is typically exponential, though it is easy to estimate a power function. This becomes another advantage of the count model, because it is hard to estimate anything besides a linear model in a Tobit framework. The integer nature of recreational survey data explicitly arises because of the discrete choices type of questions for recreational trips. The number of trips becomes greater than or equal to zero as only the users visiting the sites are considered as respondents of survey. Under such scenarios, the count data approach is the mostly used estimation method to measure individual recreational behaviors (Shonkwiler and Shaw 1996; Haab and McConnell 2002).

This study used Truncated Poisson count data model to estimate the demand function of number of visits and the total economic benefit of the site. Assuming that the ith potential user of a specific recreation site has been randomly drawn from a relevant population[4], the probability density function in the basic Count-Data Model is given by;

$$\Pr(Y_i = v_i) = \frac{e^{-\lambda_i}\lambda_i^{v_i}}{y_i!} = \frac{e^{-\lambda_i}\lambda_i^{v_i-1}}{(v_i-1)!} \qquad v_i=0, 1, 2$$

Where, *vi* denote the number of visits to the recreation site made by the individual i which is truncated at zero, Pr(.) is the probability function for *vi* and *Yi* is a potential integer outcome. The parameter λ_i is both the mean and the variance of the distribution. This particular result has often been found to be violated in recreational data, and will lead to a more general model below. Because it is necessary that $\lambda_i > 0$, it is common to specify it as an exponential function:

$$\lambda_i = \exp(Z_i\beta)$$

[4]The relevant population is the population of users plus potential recreators.

Given this specification, we can then get the likelihood function in terms of the parameters β. The Poisson likelihood function is straightforward. We observe the number of trips each individual takes, and then use equation (3.13) to write the probability of observing that number of trips. The sample likelihood function and the estimated Poisson Model are given by equation 3.15 and 3.16 below, respectively.

$$L(\beta_{|Z,\,Y}) = \prod_{i=1}^{T} \frac{\exp(-\exp(Z_i\beta))\exp(Z_i\beta)Y_i)}{Y_i} = \prod_{i=1}^{120} \frac{\exp(-\exp(Z_i\beta))\exp(Z_i\beta)Y_i)}{Y_i}$$

$$E(Y_{i\,|Z_i}) = \exp(\beta_0 + \beta_1 C + \beta_n X_n)$$

Where, βn shows the estimated coefficient of other explanatory variables in the model. In this case, cost of substitute site, education, income, age, visit character of respondents (weather the trip is with a group or alone), and number of dependent peoples in family (NODP).

EMPIRICAL RESULTS

This section presents the important findings and results obtained from the sample survey. The main objective is to determine individuals 'willingness to pay for the total economic value of Boye recreational wetland in Jimma. To find the total economic value of the site, contingent valuation and travel cost methods have been used for the non use value and use value part of the wetland, respectively. The survey was conducted to collect information on WTP and the socio-economic characteristics of the respondents.

Descriptive Statistics for contingent valuation method

This section presents the descriptive statistics of the data that was collected from 100 respondents to determine their willingness to pay for the protection of Boye recreational wetland.

Table 1: Distribution of respondents' demographic and socio economic characteristics

Demographic characteristics		%	Total
Age	18-29	52	100
	Above 29	48	
sex	Male	48	100
	Female	52	
Marital status	Married	50	100
	Unmarried	50	
Education level	Below degree	58	100
	Degree and above	42	
Gross monthly income	Low income group	56	100
	Medium income group	31	
	High income group	13	

Source: the survey data

As one can observe from the above table, out of the total sample of 100 respondents, 48% were male and 52% were female. Regarding to marital status, the ratio of married to unmarried were one, 50% of respondents were married and the rest 50% were unmarried. The level of education among the sampled respondents is more or less similarly distributed. 42% of respondents had at least a first degree and above while 58% of the respondents had lower level of education. Information on monthly income of the respondents was collected in categories. There were five categories of income groups and for simplicity, after the survey response, the researcher denotes the first income group starting from zero to 1500 ETB by lower income group, the second income group of 1501-3000 ETB, by medium income group and those above 3000 by higher income groups. From table 4.1 above, 56% of respondents reported that they have relatively low monthly income, 31% of the respondents have lower income and the rest 13% of respondents have higher monthly income.

Table 2: Cross tabulation of respondents' knowledge about Boye recreational wetland (BRW), Wildlife (WL) and WTP answers

WTP answers for the two bid prices (first bid price and second bid price)	Knowledge about BRW and WL		Total (%)
	Non-knowledgeable about BRW and WL (%)	Knowledgeable about BRW and WL	
Yes-Yes	2	41	43
No-Yes	2	5	7
No-No	9	4	13
Yes-No	18	19	37
Total	31	69	100

Source: the survey data

Table 3 shows respondents Knowledge about Boye recreational wetland, wildlife in general and the proportion of WTP answers for the two bid prices. 43% of the respondents agreed to pay for the intended bid prices (Yes-yes). Among these 2% of respondents do not have knowledge about BRW and WL, and the rest 41% had a good knowledge of both the wetland and wildlife. While, 7% of the respondents denied paying the first bid price and willing to pay the second bid price (No-Yes). From the sample, 13 % of respondents were unwilling to pay for the two bid price regardless of their knowledge about BRW and WL (No-No) and 37 % of respondents were willing to pay for the first bid price and denied the second bid price (Yes-No).

On the other hand, about 69% of respondents had a good knowledge about wildlife and BRW, and 31% of respondents were non-knowledgeable. Among those knowledgeable respondents, only 4% of them denied to pay for the two bid prices, while out of those non- knowledgeable 9% were unwilling to pay. This shows that, knowledge about wildlife and Boye recreational wetland has its own impact on the respondents' response about the bid price. Generally, 80% and 50% of response were willing to pay for the first and second bid price, respectively.

Table 3: Cross tabulation of respondents attitude toward non use value and future use value of BRW and WTP answers

Non use values and future use value		Response proportion for bid value (WTP)				Total (%)
		Yes-Yes (%)	No-Yes (%)	No-No (%)	Yes-No (%)	
Option value		43	7	13	37	100
Intrinsic value		43	7	13	37	100
Existence value	Bequest value	43	7	13	37	100
	Benevolence value	43	7	13	37	100
	Stewardship value	43	7	13	37	100

Source: the survey data

Table 4 shows respondents response about reasons for holding and conserving Boye recreational wetland. The respondents strongly recognized different non use values related to management of BRW. Regarding option value, the future direct and indirect use value, the researcher finds that all respondents (100%) were extremely motivated regardless of their response about the bid price. Concerning the stewardship value, again, surprisingly 100% of the respondents were highly motivated for an altruistic sense of responsibility toward the preservation of environment generally and had desire to reduce the degradation of Boye recreational wetland specifically. In addition, relating to the satisfaction gained through the ability to endow a natural resource on future generation and desire to conserve an environmental resource for potential use by others- bequest and benevolence value, respectively, and the belief that all living organisms are valuable regardless of the monetary value placed on them by society- intrinsic value, all of the respondents were highly motivated and they had a positive response yet again regardless of their response for the first and the second bid prices. This fact shows that, almost all populations of Jimma have a positive attitude towards the non use value contribution of BRW and are highly motivated towards the conservation of it for this generation and for the future as well.

Table 4: Cross tabulation of way of payment and WTP answers

Mode of payment	Answer for bid price (WTP)				Total (%)
	Yes-Yes (%)	No-Yes (%)	No-No (%)	Yes-No (%)	
I will pay through responsible agents	6	2	0	1	9
I will pay with my Iddir book	10	0	0	13	23
Deduct from my salary	20	3	0	18	41
Include with my monthly water bill	5	2	0	3	10
Include with my monthly electricity bill	2	0	0	2	4
Total (%)	43	7	0	37	87

Source: the survey data

Mode of payment in the contingent valuation studies is necessary in getting information on how to collect the designed bid prices. To avoid Vehicle biases, the study uses a lump sum price which is not based on income or tax rate. Table 5 shows the respondents payment of vehicles. Out of 87 % of respondents who had positive WTP for both and for one of the bid prices, almost half (41%) of the respondents preferred to contribute to Boye recreational wetland a lump sum amount that would be deducted from their salaries. A small number of respondents preferred to pay through responsible agents, with their monthly electricity and water bill. The rest 23% of respondents chooses their Iddir book.

Table 6 below shows, out of those respondents who were unwilling to pay for the first, the second or both bid prices 33% of them were unable to pay the required bid amount. To my surprise, 16% and 7% of respondents not willing to pay the intended bid price because of their believe that conserving Boye recreational wetland and paying the related cost is the responsibility of government and investors, respectively. The rest 1% of the respondents were unwilling to pay just for the reason that they don't believe conserving wild life is important.

Table 5: Cross tabulation of respondents reason for unwilling to pay and WTP answers

Reasons	Response proportion for bid price (WTP)				Total (%)
	Yes-Yes (%)	No-Yes (%)	No-No (%)	Yes-No (%)	
I am not able to pay	0	5	2	26	33
It is the responsibility of government	0	1	9	6	16
It is the responsibility of investors	0	0	2	5	7
I don't believe that conserving wild life is important	0	1	0	0	0

Source: the survey data

Estimation of the Willingness to Pay for the Non Use Value of Boye recreational wetland

The WTP question was whether the respondent would vote for the non use value part of Boye recreational wetland, given that one-off households bid price would be an amount "Y" ETB. The survey involved five different treatments in which the amount Y varied as shown in Table 4.6 below in the column 2 which was the initial WTP question number in the survey instrument.

Table 6: Monetary values used in WTP questionnaire for various treatments

Treatment	First bid price (I)	2nd bid price (II), for those who say "yes" to I	2nd bid price (III), for those who say "no" to I
A	5	10	2.50
B	10	20	5
C	15	30	7.50
D	20	40	10
E	25	50	12.50

Source: the survey data

Depending on the answer to that question, a second WTP question was put to the interviewee. If the respondents answer was 'yes' to the initial bid price, he/she was asked whether they would vote for conserving BRW if the bid price were to be the higher amount shown in column 3. If the answer at column 2 was 'no', the respondent was asked about voting given a bid value at the lower amount shown in the column 4.

Table 7: Distribution of treatment and response proportions

Treatment	Response proportion for the bid price				
	Yes	Yes-Yes	Yes-No	No-Yes	No-No
(5,10,2.50ETB)	17	17	0	0	3
(10,20,5ETB)	18	11	6	2	1
(15,30,7.50ETB)	15	10	6	1	3
(20,40,10ETB)	13	2	11	2	5
(25,50,12.50ETB)	19	3	14	2	1

Source: the survey data

Table 8 demonstrates the total Response proportions for the intended bid price from 100 sample respondents taken. The second column of this Table gives the proportion of 'yes' responses to the initial bid price (WTP) question, "I", across the five treatments. The next four columns give the proportions for response patterns over the two WTP questions that 100 respondents were asked. For example, in the second column of the response proportion section, 17% of respondents were willing to pay for the first bid value 5ETB and the second bid value 10 ETB.

The absolute values of age and number of independent people from a family were used as independent variables. The income data was obtained in categories and the average of the reported category was used as the income variable in the estimation. A knowledge variable about wetland was constructed by obtaining responses to whether people should have a knowledge about wetland, for which a 'yes' or 'no' answer was solicited. This was used as a dummy independent variable. The first WTP bid price answers and the second WTP bid price answers were the two dummy dependant variables. The equation was fitted using a maximum likelihood method and seemingly unrelated bivariate probit model was used for analyzing the response from a sample of 100 respondents. The functional relationship is presented below;

$Y1=\beta0+\beta1Initialbid+\beta2AGE+\beta3INCOME+\beta4NAW+\beta5NODP+\varepsilon_1$

$Y2= \beta0+\beta1Bid2+\beta2AGE+\beta3INCOME+\beta4NAW+\beta5NODP+\varepsilon_2$

Where,

Y1= WTP answer for the first bid price as dummy variable (1=agreed to pay for the first bid price, 0= denied to pay the designed bid price), Y2= WTP answer for the second bid price as dummy variable (1=agreed to pay for the second bid price, 0= denied to pay the designed bid price), BID= the first designed bid price in ETB, Age: Age of the respondent as measured in count number, NAW: knowledge about the importance of wetland as a dummy variable, 1 if knowledgeable, 0 otherwise, NODP: Number of dependent peoples in family as measured in a count number, Income: monthly income of the respondent as measured in ETB and εi, i=1,2 are residual terms which has a normal distribution with zero means and constant variances.

Table 8: The proportion of respondent who vote at least for the initial bid (py1)

Respondents response	The total response proportion
Yes-yes	43.00
Yes-no	37.00
No-yes	7.00
No-no	13.00
Py1	0.80=80%

Source: the survey data

Table 9 above shows that, about 80% of the respondents were voted for the initial bid. This confirms with the data analyzed.

The results of the analysis presented in Table 10 indicate that knowledge about wetland (NAW) at 1%, income at 5%, and Bid price at 5% and 1% level of significant for the first and second WTP answer were significant variables. While, age and numbers of dependent people in a family (NODP) were not significant.

Table 9: Results of Seemingly unrelated bivariate probit regration for the first bid response (Y1)

Variables	Coef.	Std. Err.	P-values
Bid	-0.0166	0.0023	0.478**
Age	0.0034	0.0126	0.783
Income	0.0001	0.00001	0.267**
NAW	0.7651	0.3195	0.017***
NODP	-0.0050	0.0942	0.957
_cons	0.3048	0.7309	0.677

Table 10 Results of Seemingly unrelated bivariate probit regration for the second bid response (Y2)

Variables	Coef.	Std. Err.	P-values
Bid2	-0.0579	0.0099	0.000***
Age	-0.0176	0.0125	0.157
Income	0.0003	0.00005	0.492**
NAW	1.4210	0.3679	0.000***
NODP	-0.1803	0.0945	0.056
_cons	1.3687	0.6165	0.026

Source: the survey data

**5 percent level of significance

***1 percent level of significance

The sign of the coefficients all make intuitive sense. As indicated in table 11 the probability of a yes answer declines with increase in bid price, and the number of dependent people in a family (NODP). Conversely, the probability of a yes to both bid price increases with increment in the respondents' income and knowledge about wetland (NAW). While, the effect of age on the first WTP answer is positive and it has a negative effect on the second WTP answer.

Table 11: Krinsky and Robb (95 %) Confidence Interval for WTP measures

MEASURE	WTP	LB	UB	ASL*	CI/MEAN
MEAN/MEDIAN	75.72	-416.79	472.62	0.2408	11.75

Source: own computation

*: Achieved Significance Level for testing H0: WTP<=0 vs. H1: WTP>0

LB: Lower bound; UB: Upper bound

The mean WTP for the conservation of Bore recreational wetland is 75.72 ETB per person per annum and when multiplied with the total population of Jimma town, the total non use value contribution of Boye recreational wetland is 11,294,849.52 (149,166 x 75.72) ETB per annum, which is calculated according to Ethiopian 2012 population census report.

Descriptive Statistics for Travel Cost Method

A semi-structured questionnaire was prepared and administered to produce the necessary data to address one of the research questions. This section presents the descriptive statistics of the data that was collected from 120 visitors from the onsite interview. Based on the survey data demographic and travel characteristics of the visitors are presented in Table 4.6.

Table 12: Distribution of the respondents' demographic characteristics

Demographic characteristics	Descriptions	Total=120	
		Number	%
Age	18-40	80	66.67
	Above 40	40	33.33
Sex	Male	90	75
	Female	30	25
Marital status	Married	33	27.5
	Unmarried	87	72.5
Educational level	Below degree	70	58.33
	Degree and above	50	41.67
Preferred day of visit	Weekdays	13	10.83
	Weekends	85	70.83
	Public holidays	22	18.33

Source: the survey data

Out of the total sample of 120 visitors, 66.67% of them were between the age distribution of 18 and 40.

While the rest 33.33% were above 40 years old. 75% were male and 25% were female. This shows that, even if many efforts has been taking place to change the societies attitude towards gender equality, still there is a gap between male and female proportion in recreation areas. The study also illustrates that 27.5% of the visitors are related or married, while single and divorced visitors together account 72.5%. Level of education among the sampled respondents is almost similarly distributed. 41.67% of respondents have at least a first degree and above while 58.33% of the respondents have lower level of education. The respondents were asked about the preferred day of visits and 70.83% of the respondents preferred to visit Boye recreational wetland during weekends and 10.83% and 18.33% of the respondents preferred to visit during week days and public holidays, respectively. This shows that 70.83% visitors prefer to visit the site during their leisure time to working time and hence, the study takes one fourth of the wage rate as an opportunity cost of time since many visitors have preferred to visit the site during their leisure time than working time.

Table 13: Cross tabulation of visitors travel characteristics and number of trips

Number of trips (per year)	Travel characteristics		Total (%)
	Alone (%)	Group (%)	
Small (1-47)	25	45	70(58.34)
Medium (48-84)	10	20	30(25.00)
High (85-144)	5	15	20(16.67)
Total (%)	45(37.5)	75(62.5)	120(100)

Source: the survey data

As the above table shows, 62.5% of the visitors visit the BRW with group and 37.5% were lonely visitors. Relatively small number of lonely visitors made a small number of trips as compared with visitors who were traveling in a group. This indicates that when people travel to recreational areas with a group then there will be a propensity to make more trips than lonely visits. The table also shows that more than half of the respondents made small number of trips to BRW with 58.34% and, high and medium number of trips account only 16.67% and 25% respectively.

Table 14: Cross tabulation of visitors level of service delivery satisfaction and number of trips

Number of trips/year	Level of satisfaction			Total =120	
	Better than I expected	As I expected	Worse than I expected	Number	(%)
Small (1-47)	2	18	50	70	58.33
Medium (48-84)	5	10	15	30	25
High (85-144)	2	5	13	20	16.67
Total	9	33	78	120	100

Source: the survey data

As represented in table 4.13, 65% (78) of the visitors reported that they were dissatisfied with their stay and the service unavailability in the recreational wetland is worse than their expectation and 41.67% (50) of them made small number of trips. 33(27.5%) and 9(7.5%) of visitors found the service delivery at the wetland as their expectation and better that their expectations, respectively.

Table 15: Cross tabulation of the most important motive behind trips to the site and number of trips

Number of trips/year	The most important motive			Total =120	
	Existence of endemic animals and plants	Green environment of the site	Recreational service behind viewing the site	Number	%
Small (1-47)	20	35	15	70	58.33
Medium (48-84)	7	17	6	30	25
High (85-144)	5	11	4	20	16.67
Total (%)	32(26.67)	63(52.5)	25(20.83)	120	100

Source: the survey data

The green environment of the site attracts many visitors as shown in table 4.11 with 52.5% out of which 35(29.17%) of the respondents made small number of visits with the rest 17(14.16%) and 11(9.16%) made medium and high number of trips respectively. Existence of endemic animals and wildlife, and the recreational service that visitors got behind viewing the site accounts the second and third percentage next to the green environment of the site with 32(26.67%) and 25(20.83%) respectively. Although a reasonable number of respondents were attracted for the different motive behind visiting Boye recreational wetland, majority of them were dissatisfied by the unavailability of services around and inside the site, so that, more than half of the sampled population, 58.33% of them only made small number of trips per year.

Estimation of the Willingness to Pay for the Use Value of Boye recreational wetland

The Travel Cost Method (TCM) "estimates economic values associated with ecosystems or sites that are used for recreation. It assumes that the value of a site can be deduced from how much people are willing to pay to travel to visit the site.

Table 16: A maximum likelihood estimation of the truncated Poisson regression

Source	SS	df	MS	Number of obs = 120
Model	103.068303	8	12.8835379	F(8, 111) = 21.55
Residual	66.3508096	111	0.597755042	Prob > F = 0.0000
Total	169.419113	119	1.42369002	R-squared = 0.6084
				Adj R-squared = 0.5801
				Root MSE = 0.77315

ln(Visit)	Truncated Poisson Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]
travel cost	-0.0059204	0.0017744	-3.34	0.001*	-0.0094366 -0.0024043
Income	0.0000268	0.0000261	1.02	0.308	-0.000025 0.0000785
Substitute~t	0.0071856	0.0028765	2.50	0.014*	0.0014856 0.0128856
Education	-0.1476725	0.1470573	-1.00	0.317	-0.4390763 0.1437314
Age	0.0002207	0.0075799	0.03	0.977	-0.0147995 0.0152408
nodp	-0.4627876	0.0583821	-7.93	0.000*	-0.5784755 -0.3470996
Sex	-0.0525009	0.1812456	-0.29	0.773	-0.4116511 0.3066494
group	0.1854975	0.1688782	1.10	0.274	-0.1491459 0.5201408
_cons	4.053746	0.3764096	10.77	0.000	3.307866 4.799627

Source: Own computation from the survey data

* 1 percent level of significance

The travel cost coefficient implies keeping other things constant, a one percent increase in the price of a trip to Boye recreational wetland results in a 0.59% decrease in the expected number of trips. Moreover, the R-squared and Adjusted R-squared value are used to test significance of the data. About 60% of the explanatory variables are explaining the explained variable in this model and thus, the collected data was good. The column headings SS, df, MS stand for 'Sum of Squares', 'degrees of freedom' and 'Mean square' respectively. In table 4.15, the total sum of squares is 169.419, of which 103.068 is accounted for by the model and 66.35 is left unexplained (in the residual).

Recreational demand function for the average visitors can be estimated by relating the number of visit with the travel cost. The results obtained when only travel cost was used as independent variables is given in Table 4.16 – this variables was highly significant at 1% level of significant. The linear semi log travel cost model hypothesis is:

$$\ln(V_i) = \alpha - \beta(C_i) + \varepsilon_i \quad \text{.....4.1}$$

Where,

$\ln(V_i)$ is log of the dependent variable, visit, α is the constant term, β is coefficient of the travel cost, C_i is travel cost for individual i measured in ETB and ε_i is the residual and which has a normal distribution with mean zero and constant variance. Thus, the estimated demand function can be expressed as:

$$V_i = \exp^{(\alpha-\beta C_i)} = \exp^{(3.69528-0.0074882 C_i)} \quad \text{.....4.2}$$

Table 17: Results of the modified Truncated Poisson model regression

lvisit	Coef.	P>|t|	[95% Conf. Interval]
Travelcost	-.0074882	0.001	-.0117602 -.0032161
_cons	3.69528	0.000	3.313418 4.077141

Source: Own computation from the survey data

The next step is to estimate the total economic benefit of the site from the area under the demand curve. The area of this demand function is estimated by integrating the inverse demand function between zero and the average number of visit 3.1322[5]. According to Haab and McConnell (2002), in the Poisson expression for sample mean consumer surplus, one can use the mean of observed trips or mean of the expected trips. Because the Poisson model has the property that it is mean fitting. Likewise, this study used mean of observed trips for calculation of consumer surplus. The result from this estimation gives 1,503.12ETB recreational value for

average number of visits and 479.89ETB of estimated recreational value of the site per visit per person. The annual estimated total number of visits to Boye recreational wetland for the last 12 months is approximately 4,672, which is calculated on the basis of the percentage of mean visits to the total population of Jimma town. The total estimate of economic benefits from recreational uses of the site is then 2,242,046.08ETB (479.89ETB x 4,672visits).

The idea of consumer surplus (CS) is a central principle of the travel cost method. The importance of CS in the TCM lies in the fact that it actually represents how much a visitor values visit to a recreational site. So consistently, the CS represents the recreational use value attached to a recreational site. In the truncated models, where the number of trips is an exponential function of the travel cost and other variables, the CS per trip is computed as $CS = -V/\beta$.

Where, β is the coefficient of the travel cost variable. Accordingly, the consumer surplus for BRW is 418.26ETB and the aggregate consumer surplus for the year under consideration from the total visit of 4672 is 1,954,101.66ETB.

The total economic value of a recreational site is the sum of use value and non use value contribution of the site. Accordingly, the total economic value of Boye recreational wetland is the sum of use value of 2,242,046.08ETB and non use value of 11,294,849.52 ETB which is estimated to be 13,536,895.6ETB.

[5]See table 2 of appendix B1 summary statistics for the average number of trips

Determinants of society‘s willingness to pay for use value and non use value of Boye recreational wetland ecosystem

Determinants of WTP for the non-Use Value of BRW

Table 4.9 shows the effects of the bid prices and different socio economic factors on respondents‘willingness to pay. As shown in the table there are two dependant variables, the first bid price answer and the second bid price answer, each taking the dummy variable 1 for agreement for the designed bid price and 0 for the refusal to the designed bid price. As it was expected for the first bid price answer, except age all explanatory variables; the first bid price, NODP, and NAW registered the expected sign. For the second bid price all explanatory variables registered the expected sign. The first bid price as expected is found to be the main variable that affects WTP. The first bid price is significant at 5% significant level. When an environmental authority increase the first bid price by one birr, then the probability of the respondent‘s willingness to pay for the conservation of wildlife decreases by 0.0166, holding other variables at the given levels. This marginal effect is very small and it shows the irresponsive nature of the price on WTP answer and this is because of the small amount of bid price. It consists with the theory of demand. This shows that, any change in bid price will have an inverse effect on the first WTP answer but its effect is not large.

Knowledge about wetland (NAW) is also the other highly significant variable. This variable affects the first WTP answer at 1% significant level. This indicates when an individual has knowledge about the significant of wetland he/she is willing to pay a specific amount of money for its protection since he/she knows the importance of wetland to the current and the coming generation. consequently, any awareness about wetland is likely to improve people‘s attitude towards the protection of wetland. The last variable which is evaluated at the exact level using a count number and registered the expected sign is respondent‘s income. It is expected to affect respondent‘s second WTP answer positively. As expected, this variable also registers the expected sign and it is significance at 5% significant level. This appears rational to say when monthly income of an individual increases then his/her willingness to pay for the non use value part of wetland will increase.

Determinants of Recreational Demand for the Use Value BRW

The demand function of the independent variables includes Travel cost, Cost of the substitute site, Income, age, NODP, education and group. It is expected that travel cost and NODP are negatively correlated with the number of visits; and income and education positively correlated with the number of visits. The most important coefficients in this study for the purpose of gaining consumer surplus measures is the travel cost. The travel cost is the sum of all travel cost expenses including the travel time measured as the opportunity cost of time in terms of wage rate. The travel cost coefficients have registered the expected signs, negative sign, and is significant at 1 per cent significance level. The travel cost coefficients are consistent with the demand theory, which states that when the price of goods and services increases, the consumption towards goods and services declines, ceteris paribus. Likewise, when travel cost increases then the number of visits to recreational site will decrease, given a fixed level of income. An increase in the travel cost by one birr will decrease the number of visits made to the site approximately by 0.59%. This means that people living closer to the site made many trips while those living far from the site made fewer trips.

Similarly, the variable number of dependent people in a family (NODP) also registered the expected sign. It is also highly significant at 1% significant level. When the number of dependent people in a family

increases individual's willingness to pay for wetland protection will decrease. This is due to the fact that as an individual spends income to help his/her family, their ability to pay for protection of Wetland starts to decline. When a visitor decides to support one more individuals at the margin then his willingness to visit the park will decrease by an approximate value of 46%. Since the entrance fee to the park is zero, the effect of income on number of visits is very small.

As indicated in table 4.13, 65% of the visitors reported that they were dissatisfied with their stay at BRW and out of this, 41.67% of them made only small trips to the site. The major reasons behind respondents' dissatisfaction were; unavailability of services like, appropriate resting facility, toilet facilities, information provision, outdoor and indoor games, fast food shops, insufficient number of guards; forest and landscape degradation of the area and waste disposal from the surrounding community (see appendix B.3).

SUMMARY, CONCLUSION AND POLICY IMPLICATIONS

The aim of this study is to estimate the total annual economic values of Boye recreational wetland by taking a single year as a reference. The double bounded dichotomous choice-CV technique and travel cost method were employed on the selected area of representative interviewers to collect data. This study has obtained the households WTP to preserve and conserve Boye recreational wetland from further degradation. In spite of the limitations of the analysis, this paper illustrates the importance of assessing economic values for wetland resources in planning. The lack of this kind of information can lead to serious damage to the environment and the degradation of resources over the long term. It is, however, only through the cumulative efforts of similar studies that greater credence and the generality of the results can be established so that appropriate management plans for wetlands can be developed.

This study has demonstrated empirically the demand perspectives of recreational values of wetland services. Knowledge of demand and economic benefits and Consumer surpluses estimated in this study can help in setting appropriate entry fees and raising revenue, identifying the compensation required by the public to forgo access to the wetland if such an action is predicted and also to measure the potential to stimulate private enterprise based on market forces. Results from the study can also be used by the local municipal council, state government and interested stakeholders to identify any mismatch between what the public wants and are WTP for wetland recreational services and the desire to exchange the wetland with modern developments. The price of public participation in wetland activities should reflect the benefits experienced. If decisions are taken in ignorance of any of these components it is likely that poor choices will result, to the detriment of the community as a whole. It is important to understand wetland finance, pricing policies and potential income sources to develop effective tourism income policies. The estimates obtained here provide a rough guide to the relevant cost parameters in managing the wetland. This way, a more comprehensive environmental and development policy can be identified, planned and implemented by the relevant authorities. It is worth emphasizing that these valuations do not provide complete answers to management questions, but they do provide useful information and insights to improve the decision-making process.

The study also suggests that the wetland authorities should increase the wetland's recreational benefits by putting an entrance fee on BRW and expand the parks facility to extract some of the large consumer surplus enjoyed by visitors. Improving the major services of the wetland is also important measure to boost the use value of the site. The study also suggests two methods for collecting the total recreational benefit of the wetland. Entrance fee for the use value and a lump sum amount of money that would be deducted from the salary of an individual for the non use value part may perhaps be used to collect the prescribed amount of money. Thus the revenue collected from the public could be used as an additional source of finance, in addition to the limited funds allocated for improvement of the recreational wetland. Furthermore, the revenue derived from the entrance fee must be invested on the wetland to bring more revenues through conservation efforts for a remarkable change.

Moreover, knowledge about wetland was identified as an important determinant of individuals WTP for the conservation of wetland. In this case, awareness creation is an important means to increase the non use value part of recreational wetland and it is reasonable to suggest that the wetland authority should increase these values through advertisement and community based training about the contribution of wetland to economic growth. The result of this study may also be incorporated in the economic analysis for determining the viability of conserving wetland in the long run. However, future research is necessary to fully examine the strength of the welfare values derived from BRW to be used for management decision in the long run. This study suggests that future studies can be conducted on the use and non use value of BRW in order to confirm this finding. Besides, sensitivity test to alternative ways of measurement and estimation of opportunity cost of travel time can be potential areas for further researches.

Acknowledgements

The author thanks the farmers of the study area for the devotion of their time in answering the lengthy questionnaires and giving me hospitality.

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Appendixes:

Appendix A

Table 18: Summary statistics for CVM data, n=100

Variable	Mean	Std. Dev	Min	Max
lbid	7.53	3.608226	2.5	15.5
bid	15.00	7.106691	5	15
hbid	30.00	14.21338	10	50
yy	0.43	0.4975699	0	1
yn	0.37	0.4852366	0	1
ny	0.07	0.2564324	0	1
nn	0.13	0.3379977	0	1
age	34.24	12.42035	18	71
income	2508.14	4480.614	100	35000
naw	0.52	.5021167	0	1
nodp	1.92	1.69777	0	6
Bid2	25.2	15.62939	2.5	50

Source: Own computation from the survey data

Appendix B1

Table 19: Summary and descriptive statistics for TCM data, n=120

Variable	**Mean**	**Descriptions**	**Std. Dev.**	**Min**	**Max**
Visit	40.06667	Trips to Boye Recreational wetland	36.78868	2	144
lvisit	3.132059	Log of trips to Boye Recreational wetland	1.193185	0.6931472	4.969813
travel cost	75.21461	Round-trip travel cost plus monetary value of travel time to BRW	48.50035	15.8594	435.1
income	3101.5	Respondents income in ETB	3805.003	500	25000
substitute~t	71.0035	Round-trip travel costs plus monetary value of travel time to nearest substitute recreational wetland	34.57288	7.1875	225
education	0.4166667	1: has a university degree and above	0.4950738	0	1
age	34.225	Age of respondents in count number	10.01886	19	56
nodp	2.433333	Number of dependent people in a family	1.453673	0	6
sex	0.25	Sex of the respondents as a dummy variable: 1=female	0.4348283	0	1
group	0.6666667	1:visit character with group	0.4733811	0	1

Source: Own computation from the survey data

Appendix B2

Table 20: Linear regression result of visit rate on travel cost and demographic characteristics of the respondents

Source	SS	df	MS	Number of obs = 120	
Model	93191.3793	8	11648.9224	F(8, 111) = 19.05	
Residual	67864.0873	111	611.388174	Prob > F = 0.0000	
Total	161055.467	119	1353.40728	R-squared = 0.5786	
				Adj R-squared = 0.5483	
				Root MSE = 24.726	
Visit	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]
travel cost	-.1701106	.0567486	-3.00	0.003*	-.2825617 -.0576595
Income	.0008088	.0008357	0.97	0.335	-.0008471 .0024648
Substitute~t	.3602726	.0919945	3.92	0.000*	.1779793 .5425659
Education	-1.459108	4.703092	-0.31	0.757	-10.7786 7.860382
Age	-.2039891	.2424167	-0.84	0.402	-.6843539 .2763758
nodp	-12.21874	1.867138	-6.54	0.000*	-15.91859 -8.518877
Sex	-7.538821	5.79648	-1.30	0.196	-19.02493 3.947292
group	4.421185	5.400953	0.82	0.415	-6.281165 15.12353
_cons	61.03125	12.03809	5.07	0.000	37.17697 84.88552

Source: Own computation from the survey data * 1 percent level of significance

Appendix B3

Table 21: Cross tabulation of problems related to BRW and number of trips

problems related to BRW	Number of trips/year			
	Small (1-47)	Medium (48-84)	High (85-144)	Total (%)
Forest and landscape degradation	57	28	20	87.5
Waste disposal from the surrounding community	70	30	20	120
Insufficient number of toilet facilities	45	30	20	79.17
Lack of appropriate resting facilities	44	18	10	60
Luck of information provision, outdoor and indoor games, and fast food shops	58	25	16	82.5
Insufficient number of guards	66	24	13	85.83

Source: Own computation from the survey data