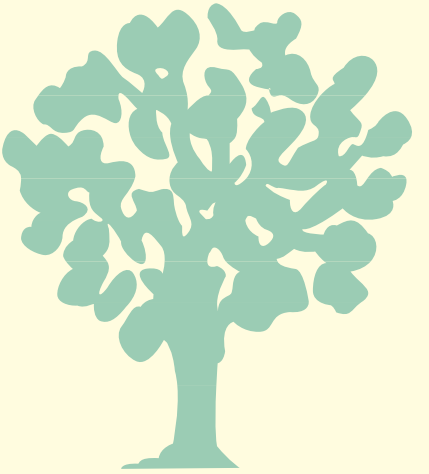
WORKING PAPER

To Develop or to Conserve? The Case of the Diyawanna Oya Wetlands in Sri Lanka

No. 52 - 10

Thusitha Dilhani Marawila
Manoj Thibbotuwawa



SANDEE
South Asian Network for Development and Environmental Economics

September 2010

To Develop or to Conserve? The Case of the Diyawanna Oya Wetlands in Sri Lanka

Thusitha Dilhani Marawila
Manoj Thibbotuwawa

Institute of Policy Studies of Sri Lanka (IPS),
Colombo, Sri Lanka

September 2010

South Asian Network for Development and Environmental Economics (SANDEE)
PO Box 8975, EPC 1056
Kathmandu, Nepal

SANDEE Working Paper No. 52 - 10

Published by the South Asian Network for Development and Environmental Economics (SANDEE)
PO Box 8975, EPC 1056, Kathmandu, Nepal.
Telephone: 977-1-5003222 Fax: 977-1-5003299

SANDEE research reports are the output of research projects supported by the South Asian Network for Development and Environmental Economics. The reports have been peer reviewed and edited. A summary of the findings of SANDEE reports are also available as SANDEE Policy Briefs.

National Library of Nepal Catalogue Service:

Thusitha Dilhani Marawila and Manoj Thibbotuwawa
To Develop or to Conserve? The Case of the Diyawanna Oya Wetlands in Sri Lanka
(SANDEE Working Papers, ISSN 1893-1891; 2010- WP 51)

ISBN: 978 - 9937 - 8376 - 1- 3

Key words:

1. Recreation
2. Travel cost
3. Non-market valuation
4. Consumer surplus
5. Count data models
6. Wetlands

The South Asian Network for Development and Environmental Economics

The South Asian Network for Development and Environmental Economics (SANDEE) is a regional network that brings together analysts from different countries in South Asia to address environment-development problems. SANDEE's activities include research support, training, and information dissemination. Please see www.sandeeonline.org for further information about SANDEE.

SANDEE is financially supported by International Development Research Center (IDRC), The Ford Foundation, Swedish International Development Cooperation Agency (SIDA), the World Bank and the Norwegian Agency for Development Cooperation (NORAD). The opinions expressed in this paper are the author's and do not necessarily represent those of SANDEE's donors.

The Working Paper series is based on research funded by SANDEE and supported with technical assistance from network members, SANDEE staff and advisors.

Comments should be sent to Thusitha Dilhani Marawila, Institute of Policy Studies of Sri Lanka (IPS), Colombo, Sri Lanka, Email:devsenara@yahoo.com.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Abstract

The Diyawanna Oya wetland ecosystem has proven to be an important recreational site in the greater Colombo area in the face of the growing demand for urban recreational amenities. It provides a wide spectrum of use- and non-use benefits, including production, hydrological, and ecological values. However, the wetland suffers from both inadequate recognition of these benefits and poor representation in the national protected area network. This study evaluates the recreation related social welfare benefits that visitors derive from the Diyawanna Oya wetlands. The study employs the Individual Travel Cost Method in order to estimate the welfare gains from recreation as well as changes in consumer surplus if authorities were to convert parts of the wetland to other development uses. The study also assesses the present value of non-market benefits from preserving the site. The findings indicate that the Diyawanna Oya wetlands generate an annual consumer surplus of LKR 3,890 million (or USD 35 million) to people who use the area for recreation. The welfare loss from converting the natural wetland area to development projects is LKR.19.45 million (or USD 173,107) per hectare. Our study also shows that imposing an entry fee (the equivalent of LKR.50) will increase government revenue by LKR 5.4 million (or USD 48,055).

Key words: Recreation, Travel cost, Non-market valuation, Consumer surplus, Count data models, Wetlands.

To Develop or to Conserve?
The Case of the Diyawanna Oya Wetlands in Sri Lanka

Thusitha Dilhani Marawila and Manoj Thibbotuwawa

1. Introduction

Not even the wide spectrum of ecosystem services generated have been successful in arresting the rapid decrease in the coverage and quality of urban wetlands in Sri Lanka over the past few decades. In recent years, the rapid conversions of wetlands for development purposes has become a serious problem because such unplanned development in or around wetlands has a negative effect on urban and sub-urban communities. The question of how to manage urban wetlands in order to maximize social welfare benefits requires careful analysis because it entails a trade-off between economic and environmental priorities.

According to the Directory of Asian Wetlands (1989), Sri Lanka contains 41 wetlands (covering a total land area of 274,000 hectares) of varying importance out of a total of 947 identified wetlands in the South and South East Asian region. The Directory further emphasizes that Sri Lankan wetlands are only marginally protected while the continued ecological functioning of over two-thirds of them is at present seriously threatened. Of these, the Diyawanna Oya wetland, situated in close proximity to the city of Colombo, is one of the few remaining wetlands as well as one of the most important marshlands in the region supporting various forms of life.

The value of the Diyawanna Oya wetlands is three fold. Firstly, they provide good recreational grounds for exercise, sports and family outings. Secondly, inhabitants from the surrounding areas use this wetland for purposes of income generation such as fishing and cattle grazing, and collecting reeds, rushes and fuelwood. Finally, from an environmental point of view, the wetlands provide important hydrological services as well as being a rich habitat of endogenous fauna and flora. Thus it contributes significantly to the social wellbeing of the surrounding urban and sub-urban communities. However, there is still little recognition of these values. Instead, clearance of land, illegal reclamation and construction, dumping of garbage, and encroachments are taking place at the site, which hamper the services provided by the wetland. IUCN Sri Lanka and Central Environment Authority (2006) have come to identify the Diyawanna Oya wetlands, which are also widely recognized as the Colombo flood retention area, as wetlands at a high level of risk.

The Diyawanna Oya wetlands currently serve as a major recreational venue for both residents from the vicinity as well as visitors from a considerable distance because sites with ecological, environmental and recreational properties are quite limited in the Colombo metropolitan area and the nearby suburbs while the few recreational sites available are either costly or offer only limited entertainment value. The Diyawanna Oya site is quite popular among people of all strata from the surrounding urban and sub-urban communities due both to its varying attributes and open access. Historical records provide evidence that Portuguese soldiers used this area as a recreation and brawling spot in the Kotte era.

The state has transferred the management of certain parts of these wetlands to private agents both because of the burgeoning demand for land and the inability of the state to manage urban wetlands effectively as a public good. Chronic inefficiencies and resource scarcity among state

institutions are responsible for this situation. However, the market allocation of a public good can result in sub-optimal solutions unless those responsible take measures to ensure efficiency and equity as well as sustainability. While there has been much debate in the recent past over the issue of the conversion of urban wetlands in Sri Lanka to other uses, there has been little attempt to date to evaluate the economic aspects of the recreational or other uses of the Diyawanna Oya wetlands. However, while a study measuring both the use and non-use values of the site within the urban region would make a valuable contribution to scholarship, due both to the expense and the complexity associated with measuring these values, we confine our attempt at economic valuation in the present study to only its recreational value.

This study employs a basic non-market valuation technique, viz., the Individual Travel Cost Method, to estimate: a) the welfare gains from recreation in the wetlands; and b) the change in consumer surplus/welfare due to the implementation of development projects. We estimate the demand for recreation using a count data model that accounts for truncation, over-dispersion and endogenous stratification that result from on-site sampling. The study moreover examines the impact of imposing an entry fee on regular visitors to the site and assesses the present value of non-market benefits provided to users if the authorities preserve the site as a natural recreational area.

We have organized the paper as follows: Section 2 reviews existing literature on the application of the Travel Cost Method to evaluate recreational benefits. Section 3 describes the study area, sampling and data collection strategy. We deal with economic and estimation issues in Section 4 while Section 5 discusses the results and limitations of the analysis. Section 6 offers conclusions and policy recommendations on the sustainable utilization and conservation of the Diyawanna Oya wetland.

2. Recreational Valuation: Empirical Evidence

Scholars have generally estimated the recreational value associated with wetlands using non-market valuation techniques, which can be broadly categorized under two methods, direct and indirect. While indirect methods rely on the behavior of consumers in related markets to reveal their valuation of non-market goods, direct methods use surveys to ask an individual's valuation of these goods in a hypothetical market (Smith *et al.*, 1986).

Haab and McConnell (2002) categorize methods to estimate recreational value under three basic approaches: single site demand (Travel Cost) method, site choice (Random Utility) method, and stated preference (Contingent Valuation) method. Researchers have widely used the revealed preference and stated preference methods, either individually or in combination, in order to estimate the welfare changes resulting from quality changes in recreational sites (see Whitehead *et al.*, 1999; Seenprachawong, 2003). Yoshiaki *et al*. (1995) has suggested a similar classification of the measures of welfare change, one being the effect of the quality variation on the number of trips taken using a household production framework and the other being a random utility model to describe how the quality influences individual decisions. Hedonic wage models and hedonic travel cost methods are the other methods, and they involve variation in quality across a number of sites (Gunatilake, 2003).

The Travel Cost Method (TCM), proposed by Hotelling (1947), is one of the oldest methods in environmental valuation. It is a revealed preference method based on observed behavior reflecting utility maximization subject to a constraint (Freeman, 1993). TCM estimates the Marshallian

consumer surplus, which approximates, and is bounded by, the compensating variation (CV) and equivalent variation (EV) welfare measures (Brander *et al.*, 2006). According to TCM, if a consumer visits a recreational site, the benefits he receives should be less than or equal to the cost incurred although he does not pay a market-determined price. As such, this method uses the travel cost as a proxy for the price of recreation assuming rational behavior on the part of the consumer. The sole decision variable is the number of visits paid by the consumer to a certain recreation site within a particular time period. Since the travel cost varies with distance from the recreational site, it is possible to derive a surrogate demand curve from the varying cost information. Based on the demand curve, it is possible to estimate the consumer surplus as a measure of welfare (Gunatilake, 2003). Since there is little consensus in the literature about the correct method to estimate the travel cost, some scholars have taken the perceived costs as reported by recreation users (Rolfe and Prayaga, 2007).

TCM has two basic variants depending on the definition of the dependent variable: Individual Travel Cost Method (ITCM) which is appropriate for sites with high individual visitation rates and the Zonal Travel Cost Method (ZTCM) which is applicable for sites with very low individual visitation patterns (Rolfe and Prayaga, 2007). ITCM has distinct advantages over ZTCM because it takes into account the inherent variation in the data compared to the aggregation and can be estimated using a smaller number of observations. Furthermore, ITCM is more flexible and can be applied to a wide range of sites (Khan, 2004) while eliciting rich information on visitors' characteristics, preferences and behavior. Bowker and Leeworthy (1998) argue that researchers prefer ITCM over ZTCM for reasons such as statistical efficiency, theoretical consistency in modeling individual behavior, the ability to avoid arbitrary zone definitions, and increasing heterogeneity among populations within zones. However, the application of the correct TCM depends on the identification of the dependent variable. Therefore, some studies use both methods (see Rolfe and Prayaga, 2007; Nam *et al*., 2005).

Scholars have extensively used TCM in natural resources related recreation research in order to value site access as well as changes in site quality in developed countries (Kealy *et al*., 1986; Hellerstein, 1991; Englin and Shonkwiler, 1995; Whitehead, 1992; Grigalunas *et al*., 2004; Poor and Smith, 2004) whereas only a handful of valuation studies have used this method in developing countries, particularly in South Asia. While Gunatilake and Vieth (1998) applied ZTCM to estimate the recreational value of the Pinnawela Elephant Orphanage of Sri Lanka, Khan (2004) used ITCM to estimate the recreational benefits from the Margalla Hills National Park in Northern Pakistan where he estimated a hypothetical demand curve to assess the change in visitors' perceptions of improvements in the quality of amenities in the park. A number of studies have used the travel cost analysis with numerous modifications to the original methodology.

Recreational demand studies traditionally utilized a two-step valuation method, first estimating the conditional recreation participation probabilities and then the intensity of use decisions. In contrast, Whitehead (1992) has introduced a one-step resource valuation method based solely on the recreation participation decision, which has the added benefits of reduced data requirement and effort. Basically, TCMs use cross-sectional data in the analysis. However, the use of panel data is also possible (Siderelis *et al.*, 2000). Generally, travel cost models have estimated short run demand, mostly over a season or within a year but there has been the occasional study observing long run recreational demand using the method (Englin and Shonkwiler, 1995).

It has also been the practice to employ the Ordinary Least Squared (OLS) estimation in order to estimate the parameters of the recreational demand equation. However, for the purpose of analyzing

truncated samples, scholars have found the maximum likelihood method more appealing since recreation demand behavior is only defined for non-negative values and the trips occur in integer values (Creel and Loomis, 1990). Since the ordinary regression methods require the dependent variable to take on values over the full range of real numbers, it leads to biased coefficient estimates in the analysis of recreational demand curves. Thus, researchers now apply the truncated count data models in single-site recreational demand models (Creel and Loomis, 1990; Hellerstein, 1991; Englin and Shonkwiler ,1995; Shrestha *et al*. 2002; Martinez-Espineira and Amoako-Tuffour, 2005).

In the case of ITCM, Dobbs (1993) has looked at several potential problems and causes of bias, for example, sample selection and multi-site bias, truncation and censoring, trip duration and sensitivity to error, and functional forms specifications. A frequently adopted sampling method in travel cost analysis is on-site sampling of the visitors to a recreational site. However, there is a growing consensus on the use of off-site sampling techniques to avoid possible biases. Parsons (2003) shows, for instance, that researchers need to address a number of issues when using an intercept survey,[1] such as the possibility of truncation of data on one trip, the difficulty in obtaining a random sample, election bias, endogenous stratification, over-dispersion, etc. Scholars have identified sample truncation, resulting from on-site sampling that overlooks non-visitors, as a main limitation, which is often overcome by applying methods relying on off-site sampling (i.e., the hedonic travel cost model) or else by correcting econometrically. Endogenous stratification refers to the possibility of sampling avid visitors rather than occasional visitors because of choice-based sampling or sample-size limitations. Endogenous stratification occurs when the systematic variation in the sampling proportion is dependent on the characteristics of the individuals in the sample. In such cases, the sample average number of trips is likely to be higher than the population mean (Haab and McConnel, 2002).

There is also a need to correct econometrically the issue of the tendency in data to exhibit over-dispersion, which means that the variance is greater than the mean resulting from the phenomenon of a few frequent visitors and more occasional visitors (Martinez-Espineira and Amoako-Tuffour, 2005). Devkota *et al*. (2006) employed a bootstrapping technique to overcome the problem of over-dispersion and to determine the statistical accuracy of the procedures used. All of the above-mentioned studies, in general, agree that the Poisson and Negative binomial distributions increase the estimation efficiency and that count data estimation is consistent with utility maximization models with repeated choice.

Multi-destination and multi-purpose visits biases are the other limitations encountered in travel cost analysis. Some studies show that treating multi-destination and single-destination trips alike leads to an over-estimation in the consumer surplus (Loomis *et al*. 2000, Martinez-Espineira and Amoako-Tuffour, 2005). However, Kousmanen (2004) has shown that treating multi-destination trips as single-destination trips does not involve any systematic upward or downward bias in consumer surplus because the direct negative effect of a price increase (that is, treating a multi-destination trip as a single-destination trip) is offset by a shift in the estimated demand curve. It is common to address the problem by identifying multiple-trip visitors and dropping them from the sample (Smith and Kopp, 1980). Others disaggregate travel costs and time and take a certain proportion for the analysis (Gum and Martin, 1975). A recent approach to deal with multi-destination trips treats the incidental visits to other recreation sites as complements to the study site, and include multi-destination trips in the demand estimation (Parsons and Wilson, 1997).

[1] It is the practice to refer to intercept surveys as field surveys undertaken using on-site interviews.

Assessing the opportunity cost of time is a major issue in recreation demand analysis. Measuring the value of recreation while ignoring the time cost can generate significant bias in the analysis (Clawson, 1959; Knetsch, 1963). Although researchers recognize the importance of the opportunity cost of time for welfare implications, they are forced to make strong assumptions due to the unavailability of a direct methodology to address it (Larson *et al.*, 2004). Thus the most commonly used strategy is to use an arbitrarily selected fraction of wage ranging from one quarter to half to evaluate time costs (see Hellerstein, 1991; Bowker *et al*., 1996; Parsons and Hauber, 1998; Phaneuf, 1999; Martinez-Espineira and Amoako-Tuffour, 2005). However, recent strategies to assess the time cost include using behavioural relationships in auxiliary travel mode choice models (Hausman *et al*., 1995) and labor supply models (Feather and Shaw, 1999). Larson *et al*. (2004), for example, rely on stated preference data to assess the marginal value of time.

Scholars have extended recreational demand studies to compute the welfare loss due to disintegration of natural sites as well as the non-market benefits from preserving them. For example, Farber (1996) estimated the discounted annual losses in recreational benefits due to wetlands disintegration in Louisiana. Grigalunas *et al*. (2004), on the other hand, estimated the benefits of preserving estuarine watershed open space through restrictions on development, where they quantified three main categories of benefits using different levels of discount rates. Similarly, Mcgrath (2006) estimated the non-market benefits of an environment center and determined the short-term value of public investment. All the above studies, however, presumed a perfectly linear relationship between recreational demand and acreage, which may not be theoretically sound.Furthermore, only a few studies have attempted to assess the distributional impacts of imposing an entrance fee on a freely enjoyed public good (Huszar, 1974) or to estimate an optimal entrance fee or user fee for recreational sites (Khan, 2004; Nam *et al.*, 2005).

3. Study Area and Data

3.1 Study Area

The Diyawanna Oya wetlands include the recreational site comprising the Diwayanna Oya wetland and its surrounding wide open and green expanse. The wetlands are located 11 km away from the city of Colombo in Sri Jayewardenepura, Kotte, which is the administrative capital of Sri Lanka. The Parliament is located in a small island in Diyawanna Oya, which is an ancient water way, while the surroundings consist of the wetlands which have become a major recreational site in recent years. The Diyawanna Oya wetland comprises vast marshlands, wooded areas and a flowing Diyawanna Oya and this network of waterways and marshlands contribute significantly towards water retention and flood protection in the Colombo Metropolitan area. The Diyawanna Oya wetlands are inland fresh-water marshes and are one of the three interconnected marshes which form the Colombo marshes. The three marshes - Kollonnawa marsh, Kotte marsh and Heen marshes (covering approximately 400 ha), and a low lying area named the Green Belt wetlands (surrounding the Parliament complex of 200 ha), together form the Colombo Flood Retention area. It moreover has a high faunal and floral diversity and is home to many invertebrates and vertebrates including many endemic birds, fish, amphibians, reptiles and mammals such as the endangered fishing cat (*Prionailurus Viverrinus*).

The Diyawanna Oya wetlands are surrounded by both suburban middleclass neighborhoods as well as low-income neighborhoods, the occupants of which use the wetlands for purposes of

income generation such as fishing and cattle grazing, and collecting reeds, rushes and fuelwood. However, due to poor planning when it comes to both garbage collection and disposal in and around the city of Colombo, city dwellers have been using some parts of the site for garbage disposal purposes for some time. Moreover, the authorities have given permission to reclaim a considerable extent of land for development purposes including the building of the Parliament complex, luxury condominiums, urban amenities, and state and private institutions. For the construction of the Parliament alone, the authorities permitted the reclamation of a marsh area 272 ha in extent while the area under wetlands has declined by 50 percent over the last three decades due in part to encroachments by people from the surrounding neighborhoods.

Nevertheless, over the past decade or so, people have also started using the wetlands for recreational activities making it the most popular recreational ground in the Colombo Metropolitan region today. However, the area available for recreation has decreased greatly over the past few years owing to reclamation and development with some recreation activities such as boating and motor racing reaching almost a standstill due to these reasons. But a large number of people, irrespective of their social or economic status, still enjoy the recreational benefits provided by the wetlands, including family outings, exercise, cycling, cricket and other games. The Diyawanna Oya wetlands lie over four Divisional Secretary Divisions (DSD), namely, Nugegoda, Colombo, Kaduwela and Kollonnawa. Hence, the recreational sites are also dispersed. The focus of this study is the popular recreational site, which is approximately 200 ha in extent, that surrounds the Parliament complex and is located within the greenbelt wetland.

3.2 Sampling and Data Collection Methods

We obtained the data for the present study from primary sources as well as secondary sources. We collected primary data from an on-site survey of visitors and stakeholders. Prior to the main survey, we carried out a census on visitors in order to collect information regarding the use of the recreational site so as to design an appropriate sampling plan and to develop the questionnaire. In addition to the census, we pre-tested the questionnaire. We also collected secondary data on the change in land use and acreage. We collected aerial maps for this purpose from the Urban Development Authority (UDA), the Central Environment Authority (CEA), and the IUCN office, Sri Lanka.

We carried out the census for a period of one week in February 2008. We found the recreational area to be dispersed over and activities concentrated mainly in 3 locations. Hence, we placed the enumerators at the entry points to each location in order to capture the number of visitors to the 3 locations. The enumerators noted the number of visitors in terms of the activity performed during the different times of the day for a week continuously. They recorded 9687 visitors during the week under survey. Table 1 shows the number of visitors and their main recreational activities based on the census.

The census data further shows that the number of visitors during weekends is substantially higher compared to weekdays. Moreover, the data recorded a slight difference in visits for Friday in comparison with the other weekdays. Out of the many recreational activities taking place at the site, outings by family and friends ranked the highest followed by exercise/jogging. Next in importance were small groups playing cricket while the public children's park which goes underwater during heavy rains also seemed to attract a sizeable fraction of the visitors. The census also captured visitors who were out to enjoy cycling and games such as volley ball, badminton, etc., while among the occasional visitors were those interested in photography and in

training for racing events, for instance, motor bike and motor car racing, although these were fewer in number.

We carried out the main survey for a period of 2 months during the October-November period of 2008. We carried out the survey at the entry points to the recreational area and at a series of popular sites among visitors within the wetland. In the survey, we asked visitors questions regarding their travel costs, traveling behavior to the site and other substitute sites, demographic information, and their opinion on how to develop the recreational site (see Annexure for the questionnaire). Before the survey team started on the survey, we briefed them on the importance of the survey and gave them a thorough training on administering the questionnaire and the survey procedure. The interviewers were under instruction to interview only those who were over the age of 16 and, in the case of groups, to interview only one member per group.

We weighted the sample of 500 visitors, depending on the census to capture the variation in recreational activity and the temporal variation in visitation behavior, as a means of obtaining a representative sample of the population to the site (see Table 2). Although quota sampling captures variation within a population by giving appropriate weights for different attributes, it may not necessarily be representative of the population. Therefore, we gathered data throughout the week including rainy days and public holidays. Furthermore, considering the fact of variation in visits during any particular day, we conducted the survey from 6 am to 9 pm.

It is now generally accepted that a sample obtained through systemic sampling is more uniformly spread over the entire population and more informative about the population than simple random sampling (Schaeffer *et al.*, 1996; Kahn, 2004). Hence, the study used systematic random sampling where we interviewed every 10th visitor. In cases where the visitors refused to respond, we interviewed the next available visitor. The survey response rate was approximately 70 percent.

4. The Theoretical Model

4.1 Research Questions

Our study attempted to elicit answers to the following research questions:

i. What is the annual recreational value and which factors influence the recreational demand for the Diyawanna Oya recreation site?
ii. What would be the impact on the annual recreational value of imposing an entry fee?
iii. What was the welfare loss due to the loss in acreage from the natural site for development purposes and what would be the benefits of preserving it?
iv. What is the present value of the non-market benefits from preserving the site?

4.2 Estimating Annual Recreational Value of Diyawanna Oya Site

In the study, we employed ITCM to estimate the annual recreational value of the site taking into consideration the fact that the majority of the visitors were frequent visitors from surrounding suburbs. Since there were few close substitutes available for regular visitors to the Diyawanna Oya site, we considered a single site demand model to be more appropriate for the purposes of our study.

In order to model the travel cost function, we follow McConnell (1992) and assume that the individual's utility depends on the total number of visits to the site, the quality of the site, and a bundle of other goods. The underlying assumption is that the utility is additively separable in the recreation activity, all other income and all other leisure time (Kealy *et al.*, 1986).

We represent the utility maximizing problem of the consumer as:

$$Max\ U\ (X, r, q) \quad (1)$$

subject to two budget constraints (money and time):

$$M + p_w t_w = X + cr \quad (2)$$

$$t^* = t_w + (t_1 + t_2)r \quad (3)$$

where,

U:	utility function of the consumer/household,
X:	bundle of other commodities,
r:	number of visits to the site,
q:	an index of quality of the site,
M:	exogenous income or non-wage income,
p_w:	wage rate,
t_w:	hours of work,
c:	monetary cost of a trip,
t*:	total discretionary time,
t_1:	round-trip travel time, and
t_2:	time spent at the site.

Here, equation (2) is income constraint and equation (3) is time constraint. Substituting the term t_w from equation (3) into equation (2), we obtain the following combined constraint,

$$M + P_w.t^* = X + c.r + p_w(t_w + (t_1 + t_2)r) \quad (4)$$

The number of visits will be an increasing function of the site's environmental quality and r and q are assumed to be (weak) complements in the utility function. The time constraint reflects that there is an opportunity cost to the time spent in the recreation activity, which is the wage rate.

The price of recreation, p_r includes the monetary cost of travel to the site, the time cost of travel and the cost of time spent at the site, i.e., $p_r = c + p_w(t_1+t_2)$. The monetary cost of a trip to the site is the monetary cost of travel since the entry fee f is zero in the case of Diyawanna Oya, which is a public property with open access. The cost of travel (two-way) is $p_d.d$, where p_d is the per-kilometer cost of travel and d is the total distance to the site (two-way) as shown in equation (5).

$$p_r = c + P_w(t_1 + t_2) = f + p_d.d + p_w(t_1 + t_2) \quad (5)$$

From equation (4) and equation (5),

$$M + p_w.t^* = X + r.f + p_d.d + p_w(t_1 + t_2) \quad (6)$$

Maximizing (1) subject to (6) will yield the individual's demand functions for visits:

$$r = r(p_r, M, q) \quad (7)$$

The economic valuation of a recreational site involves the estimation of the demand for recreation (equation 7) and the calculation of the associated consumer surplus, i.e., the area under the

demand curve. We therefore surveyed individuals to find out the number of visits they actually made to the site during a specified period of time, the travel cost, time costs and individual characteristics in order to be used in the estimation of the ITCM function.

The ITCM function that relates an individual's monthly visits to his/her travel cost is as follows:

$$r_i = f(TC_i, I_i, A_i, D_i, S_i, E_i, M_i) \quad (8)$$

where

r_i:	the number of visits made by individual *i* in a month (visitation rate),
TC_i :	per trip travel cost of individual *I*,
I_i :	monthly household income,
A_i :	age (years),
S_i :	cost of visiting the closest substitute site,
D_1:	gender (=1 if male, =0 if female),
D_2- D_3:	education level (primary, secondary, tertiary),
D_4- D_8:	type of occupation (regular employee, casual employee, contractual employee, employer, no employment, retired),
D_9:	marital status (=1 if married, =0 otherwise),
D_{10}- D_{12}:	desired attribute (scenic beauty, games, relaxing, exercise, etc.).

We took the number of trips taken by an individual to the recreational site during a month, which was the average of two months, as the dependent variable in the recreational demand model depicted by equation (8). The explanatory variables include the travel cost per individual to the site, age of the respondent, and average cost of visiting the closest substitute sites based on the distance from the visitor's house to the substitute site. We included dummy variables for the monthly income bracket of the household, sex of the respondent, desired recreational activity, educational level, type of occupation and marital status.

We calculated the travel cost as the summation of the round trip travel cost to the site plus the opportunity cost of the time. We used the product of total time (round trip time + onsite time) multiplied by a fixed fraction of the wage rate as proxy to the opportunity cost of time. Considering the fact that a majority of visitors would be unlikely to forego wage-earning work to visit the site, and not forgetting that limited hours of paid overtime work are also available to most workers, we used a wage fraction of 0.3 which studies similar to ours have often used. Moreover, in order to test for the sensitivity of the wage fraction, we estimated a travel cost model using a wage fraction of 0.25. Treating multi-destination trips was not a serious problem since only ten visitors of the total sample were on multi-destination trips. They were automatically eliminated from the sample when we removed outliers who were visiting the site from more than 30km distance.

The regression equation (8) gives the demand function for the 'average' visitor to the site, and the area below the observable Marshallian demand curve gives the average consumer surplus, based implicitly on the assumption that the demand is known with certainty. In general, the consumer surplus or access value is the area under the demand curve between an individual's current price and the choke price. The choke price is the price at which trips (i.e., the quantity demanded) fall to zero in the model (Parsons, 2003).

$$ICS_i = \int_{TC}^{CP} f(TC_i, X)dTC \quad (9)$$

where,

CP:	choke price
TC_i:	individual travel cost
X:	other explanatory variables as in equation (8) above.

We multiply this by the total yearly population of visitors to the recreational site[2] in order to estimate the total annual consumer surplus for the site. Since the dependent variable, i.e., the number of trips, takes the form of a non-negative integer, count models seem more appealing in estimating recreational demand functions. Count models specify the quantity demanded, i.e., trips, as a non-negative integer with a mean that is dependent on exogenous regressors (Haab and McConell, 2002).

The basic count data model that satisfies discrete probability distribution and non-negative integers is Poisson regression. We assume the number of trips that a person takes to a site in a given season (r_i) to be generated by a Poisson process (Creel and Loomis, 1990). Following Haab and McConnel (2002) and Parsons (2003), we write the basic count data model as,

$$p_r(r_i = n) = f(r, X_i, \beta) \qquad r = 0, 1, 2, ..,n \tag{10}$$

We can express the probability of observing an individual taking n trips in a season (probability density function) by

$$P_r\left(r_i = n|X_i\right) = \frac{e^{-\lambda_i}\lambda_i^{r_i}}{r!} \tag{11}$$

where λ_i is both the mean and the variance of the distribution of the expected number of trips and is assumed to be a function of the vector of the explanatory variables, X, and parameter β and takes strictly positive values. However, it is not unusual to find this assumption violated with recreational data due to the presence of over-dispersion so that the variance is often greater than the mean. Since it is necessary that $\lambda_i > 0$, researchers generally specify the probability function as an exponential function,

$$\lambda_i = \exp(X_i\beta) \qquad \text{and} \qquad E(Y|X) = \text{var}(Y|X) = \lambda$$

To ensure non-negative probabilities, λ usually takes a log linear form. Hence, we may write the Poisson form of the recreation demand for individual as,

$$L_n(\lambda) = \beta_{tc}TC + \sum \beta_i X_i \tag{12}$$

Equation (12) shows the probability of observing the number of trips taken by an individual and it is possible to estimate the parameters by maximum likelihood estimates.

The Poisson likelihood function for the sample in terms of parameter β then takes the form of,

$$L\left(\beta|X,r\right) = \prod_{i=1}^{r}\frac{\exp\left(-\lambda_n\right)\lambda_n^{r_n}}{r_i!} \tag{13}$$

Equation (13) gives the actual pattern of the visits which is the product of the individual probabilities where we denote individuals by $i=1\ldots T$.

[2] We estimate the visitor population to the recreational site based on a head count of the census carried out before the sample survey.

We adopt on-site random sampling in the study and, when corrected for truncation at one trip and over sampling of frequent users (endogenous stratification), the probability equation takes the form of,

$$\Pr\left(r_n | r_n \rangle 0\right) = \frac{\exp\left(-\lambda_n\right)\lambda_n^{r_n-1}}{\left(r_n - 1\right)!} \tag{14}$$

Once we account for over-dispersion, which is also common in on-site sampling, the probability distribution takes the form of a negative binomial. We depict the function in equation (15) (Creel and Loomis, 1990):

$$P_r\left(r_n | r_n > 0\right) = \frac{\Gamma\left(r + 1/\alpha\right)}{\Gamma\left(r+1\right)\Gamma(1/\alpha)}(\alpha\lambda_i)^r (1+\alpha\lambda)^{-(r+1/\alpha)} \tag{15}$$

where 0 (.) indicates the gamma function, a discrete probability function defined for *r* with parameters λ with α being strictly positive.

Once we have accounted for over-dispersion, truncation and endogenous stratification, the conditional negative binomial density function takes the form of,

$$P_r\left(r_n | r_n > 0\right) = \frac{\Gamma\left(r + 1/\alpha\right)}{\Gamma\left(r+1\right)\Gamma(1/\alpha)}(\alpha\lambda_i)^r (1+\alpha\lambda)^{-(r+1/\alpha)}\left[\frac{1}{1-(1+\alpha\lambda)^{(-1/\alpha)}}\right] \tag{16}$$

The mean of the random variable $r = E(r) = \lambda$ and variance = $\lambda + \alpha\lambda^2$ and when $\alpha \rightarrow 0$, the gamma distribution converges to Poisson distribution.

For a basic Poisson probability function, we can write the consumer surplus S_n or access value per year for individual *n* as in equation (17) (Parsons, 2002):

$$S_n = \lambda_n / - \beta_{tc_r} \tag{17}$$

where λ is the expected number of trips from equation (12). We express the estimated access value for the n[th] individual in the sample for the period as,

$$\hat{S}_n = \frac{\hat{\lambda}_n}{-\hat{\beta}_{tc_r}} = \frac{\exp(\beta_{tc_m} + \sum \hat{\beta}_i \hat{\chi}_i)}{-\hat{\beta}_{tc_r}} \tag{18}$$

When estimating with an on-site sample, the mean access value is a biased estimate[3] of the population mean. The corrected sample mean will then be

$$\bar{S}_n = \frac{1}{N}\sum_{n=1}^{N}\frac{\hat{S}_n}{r_n} \tag{19}$$

where

$$N^* = \sum_{j=i}^{R}\frac{n_j}{j}$$

[3] On-site sampling over samples the more frequent visitors to the site relative to occasional visitors, thus leading to biased estimates of the population mean.

n_j: the number of persons in the sample taking j trips;
R: the largest number of trips taken by a person in the sample.

We can aggregate this surplus value for an individual over the population of users in order to obtain the total access value, which we can depict as,

$$AS = \bar{S} .population \quad (20)$$

where population is the total number of participants or visitors to the site for the period.

4.3 The Effect of Imposing an Entrance Fee (Distributional Impact)

At present, visitors enjoy the recreational benefits provided by the site free of charge. Hence, the imposition of a fee (i.e., an entry fee, a parking fee, etc.) is likely to affect visitors of different income strata to varying degrees. We estimated the impact of an entrance fee (*f)* on the visitors' consumer surplus using the following equations.

$$r = \beta_0 + \beta_i TC + ...\beta_n X_n + \mu \quad (21)$$

$$\hat{r} = \beta_0 + \beta_1(\overline{TC} + f) + ...\beta_n \overline{X_n} + \mu \quad (22)$$

where

$\overline{TC}$=Mean TC
f= entry fee
$\overline{X_n}$ =Mean X_n

We used an entrance fee of LKR 50, based on the WTP question of the questionnaire, in the above estimation. We calculated the consumer surplus based on this. We indicate the effect of imposing an entrance fee by giving the difference between the consumer surpluses *with* and *without* the entrance fee.

$$NewCS = TC/\beta_i \quad (23)$$

4.4 Welfare Loss due to Acreage Loss from the Natural Site for Development Purposes

The implementation of new development projects in natural recreational areas is likely to affect the social welfare of the present visitors to the site. We calculated the consumer surplus per unit area of land by dividing the total annual consumer surplus by the total area used for recreational activities at present. In this instance, a better estimate would be relating consumer surplus with the areas used. However, it was not possible to find a marginal value for changes in the area since visitors to the site used the same area for all of their activities. Given this fact, we used an average value of the consumer surplus to find the welfare loss due to changes in acreage.

We show this in Equation (24):

$$\Delta WL = \partial CS/\partial(\text{acreage}) \text{ x } \Delta(\text{acreage}) \approx CS/\text{acreage x } \Delta\text{acreage} \quad (24)$$

4.5 Present Value of Non-market Benefits from Preserving the Site

Land that is under preservation can provide a flow of annual benefits over a very long period and the sum of aggregate consumer surplus estimated provides an insight into the 'social value' of preservation (Grigalunas *et al.*, 2004). While there are a number of use and non-use values derived from the Diyawanna Oya wetlands, this study focuses only on the recreational benefits provided by the site. Moreover, the study estimates only the benefits[4] of preserving the recreational use value of the site ignoring the cost of doing so.

The consumer surplus refers to the difference between the maximum that a user is willing to pay[5] in order to engage in recreational activities or to maintain amenities and the cost they incur in order to do so (Grigalunas *et al.*, 2004). Hence, it is possible to obtain the yearly benefits (i.e., the consumer surplus accruing to users) from enjoying the amenities at the natural recreational site by:

$$\text{Present Value Benefits} = PVB = \frac{Y}{(1+v)^1} + \frac{Y}{(1+v)^2} + \ldots\ldots\frac{Y}{(1+v)^n} \qquad (25)$$

where Y is the annual consumer surplus in Rupees, and v is a discount rate. In the case of a constant annual benefit of LKR Y received in perpetuity, we can simply depict the present value formula as,

$$\text{Present Value Benefits (PVB)} = \text{LKR } Y/v \qquad (26)$$

In calculating the PVB, we took a discount rate of 10 percent as proposed by the National Planning Department of Sri Lanka. We further carried out a sensitivity analysis using discount rates of 8 and 12 percent.

5. Results and Discussion

5.1 Descriptive Statistics

Table 3 provides a summary of the descriptive statistics of the recreational behavior, the demographic characteristics, and travel cost information of the sample of visitors to the Diyawanna Oya site. On average, the respondents in the sample had visited nature-based recreational sites within the region 9 times during the month out of which 7 were to the Diyawanna Oya site while the number of trips to the closest substitute sites was around 2. The average age of the sample respondents was 31 years with a minimum of 16 years, a maximum of 76 years and a standard deviation of 12 years. The monthly wage of the respondents varied considerably with a standard deviation of LKR 24,000. The mean monthly wage of the respondents was LKR 21,000 while the maximum was LKR 300, 000.

Most of the visitors to the Diyawanna Oya site were from the surrounding area with a mean distance of 7 km while the maximum distance reported in the sample was 130 km. It was also

[4] Estimating the cost of preserving the recreational area is complicated. Hence, in the study, we will consider only the benefits of preserving the lands for policy purposes.

[5] In the case of use values, WTP is the compensating variation.

evident that most visitors come to the site in large groups to enjoy recreational activities. The average group size in the sample was around 4 while the maximum group size was 25. The average travel cost per visit was around LKR 238 while some frequent visitors had spent an amount exceeding LKR 4,000 per month.

In the sample, nearly three fourths of the visitors were male while approximately 50 percent of the visitors were married (see Table 4). More than 75 percent of the respondents had had a secondary education while the less educated or literate percentage was comparatively low. In terms of occupation, almost half of the respondents had regular employment while one fourth of the respondents were unemployed, among whom were students and unpaid family workers. Moreover, a majority of the respondents were earning LKR 30,000-50,000. Only a few visitors (a mere 1 percent) ranked below the national urban minimum monthly income of LKR 10,000, implying that members of the middle and higher income brackets enjoy and spend more time at the recreational site compared to those from the lower income brackets.

A high percentage of visitors (88 percent) in the sample visited the site with the sole intention of enjoying the recreational benefits it had to offer. However, 11 percent enjoyed the recreational benefits of the site while visiting their friends or relatives resident in the area (see Table 5). More than 80 percent of the visitors were satisfied with the present condition of the recreational site while a little over 10 percent were not happy and suggested improvements to the site. Depending on the type of activity that they were involved in, almost 60 percent of the visitors were also of the opinion that they had at least one substitute site in which to enjoy the particular activity that they enjoyed at the present site. Although most respondents were happy with the present situation of the site, more than 40 percent were happy to pay an entry fee in order to maintain the quality of the site. When we asked visitors for their opinion on how to finance site improvements, a majority (65 percent) stated that it was the responsibility of the government. Of the rest, 14 percent proposed charging an entry fee while 16 percent favored private donations. Only a few visitors were interested in charging a vehicle fee. The findings show that nearly half of the visitors in the sample were willing to pay for an improvement in recreational facilities. These findings are of importance in arriving at policy decisions on the management of the Diyawanna wetland which is undermanaged owing to limited public funding.

As shown in Figure 1, a majority of the visitors (63 percent) visited the site for less than 5 days per month while nearly 19 percent visited the site 6-10 days per month. Although the sample monthly mean number of visits was 7, there was a considerable number of visitors who visited the site almost daily (4.2 percent).

5.2 Empirical Results

5.2.1 Model Estimation Results

We estimated the recreational demand model using a truncated negative binomial specification. We estimated four different models taking into account the distance to the recreational site (that is, visitors within a 30km and 17km radius) and wage fractions of 0.25 and 0.30 (see Table 6). The different models appeared highly robust and there were no sign changes across specifications. Statistical significance and goodness of fits slightly differ across models. The significant over-

dispersion parameter α in all the models indicated that the data set was significantly influenced by the over-dispersion problem. Hence, we considered a negative binomial estimation more appropriate over the Poisson estimation. Furthermore, the likelihood ratio test with highly significant α in all the four models suggests the use of the negative binomial over a Poisson regression. Among the four specifications, we chose the model which accounted for visitors living within a radius equal to or less than 30 km and a wage fraction of 0.30 based on the log likelihood values and the Pseudo R-squared for calculating the Consumer Surplus. Moreover, we preferred the 30 km distance over 17 km since it included a higher fraction of respondents, excluding only a few outliers.

The overall signs and significance of estimated coefficients were consistent with both economic theory and the existing literature on this subject. The negative sign and the significance of the travel cost variable suggest a downward sloping demand curve. It is consistent with the previous recreation demand studies of Creel and Loomis (1990) and Shrestha *et al*. (2002) and indicates that the visitation rate decreases as the travel cost increases. All the occupational categories show a significant positive impact on the visitation rate with contractual employees, retired people and employers showing the highest impact. The effect of income, though not significant in the model, is clearly reflected in the occupational categories. Contractual employees and employers were among the highest income earners in the sample. The significance of these variables leads to the conclusion that a higher income and the availability of more leisure time produce a higher visitation rate.

The significant positive sign on the travel cost to substitute sites suggests that with an increase in distance to alternative recreational sites visitors tend to visit Diyawanna Oya more frequently, which is in accordance with the theoretical expectation. The coefficient for age is positive and significant implying that participation in recreational activities increases with age. One explanation might be a current trend where, with age, people become more preoccupied with health and nature-based recreation in comparison with their more youthful counterparts who prefer more 'modern' avenues of recreation. The positive and significant coefficient on the attribute exercise implies that many visitors value the site for the facilities it offers for exercise and jogging. The explanatory variables income and education were highly correlated with occupational category. Hence, we excluded them from the model.

5.2.2 Annual Recreational Value of Diyawanna Oya Site

Consumer surplus presents the difference between the individual willingness to pay and the actual expenditure for a good or service. It is a widely accepted measure of net social benefit (Zawacki *et al*., 2000). Based on the estimated models and following Parsons (2002) and Creel and Loomis (1990), we calculated the predicted annual consumer surplus per visitor which is LKR 36,022 (or USD 315) (see Table 7). We estimated the social welfare value of the recreation, which is the aggregate consumer surplus, using the total annual visits by the population of visitors to the site. Since there was no official estimate of the annual population of visitors to the site, we estimated the population of visitors as 108,000 based on the census carried out in the study and unofficial UDA sources.[6] Hence, we estimated the total social welfare for the population of visitors as LKR 3,890 million (or USD 35 million[7]).

[6] We based this figure on the census carried out per week after adjusting for double counting and monsoonal rainy months.

[7] 1 USD=112.37 LKR (2008).

5.2.3 Impact of Imposing an Entry Fee/ Parking Fee

We examined the impact of imposing an entry fee on the visitation rate in the study (see Table 7). We selected an entrance fee of LKR 50 as it was the willingness to pay (WTP) to enjoy the recreational benefits expressed by the highest number of respondents in the sample. The results indicate that there would be an annual loss of LKR 337 million (or USD 3 million) of consumer surplus if an entrance fee (LKR 50) is imposed on the visitors to the wetland. This result suggests that any financing method adopted to improve and maintain the recreational area should be carefully designed in order to avoid possible negative distributional implications. However, we could not assess the distributional impact of imposing an entry fee.

With an entrance fee of LKR 50, the government would be able to earn a revenue of LKR 5.4 million rupees per year based on the number of annual visitors to the site which is approximately 108,000. It would in turn enable the government to increase its budget for the development of the environmental sector in Sri Lanka. However, the total social welfare of LKR 3,890 million, which is more or less equal to the total budget allocation by the government for the environment sector in Sri Lanka, provides an indication of the revenue generation possibilities from the Diyawanna Oya wetland. It was evident from the sample that nearly 80 percent of the visitors come to the site by vehicle. Hence imposing a vehicle parking fee may be more effective compared to an entry fee given the location of multiple recreational sites across the wetlands. This is likely to provide the added benefit of reducing the congestion and pollution due to vehicles in the recreational area.

5.2.4 Welfare Loss due to Acreage Loss

Taking into account the approximate land area for recreational use, we estimate the loss of welfare per hectare of land as LKR 19.45 million which is equal to LKR 49,246 per perch of land[8] (see Table 8). The land value in the area ranges from LKR 1 million to LKR 1.5 million per perch. However, in order to compare land value and per perch social welfare, we need to estimate the net present value of benefits provided by the wetland over a period of time.

5.2.5 Present Value of Non-market Benefits from Preserving the Site

We estimate the present value of the benefits from recreational activities at the Diyawanna Oya wetland site as LKR 38,900 million at a discount rate of 10 percent. This is equal to LKR 0.4 million (or USD 3560) per perch, which is approximately one third of the land value of the area (at LKR.1-1.5 million per perch) (see Table 9). We measure benefits in perpetuity assuming that the wetlands will be preserved in their natural state indefinitely. It is worthy of note that the recreational benefit is just one of numerous benefits provided by the wetlands and that we have not included the other use- or non-use values in the analysis. Including these benefits would undoubtedly increase the present value of the wetlands and strengthen the case for preservation over development.

We were also unable to calculate the cost of open space, which is the value of services foregone by not allocating recreational land to other alternative land uses (i.e., commercial, residential,

[8] 'Perch' is a popular measure of relatively small land areas and equals 0.00625 acres (25.3 m^2).

etc.). Although the restrictions on development involve no out-of-pocket public expenditure, it may entail a private cost, in particular to adjacent property owners.

6. Conclusions and Policy Recommendations

In order to obtain an estimate of the welfare that visitors derive from recreational activities in the Diyawanna Oya wetlands, we used a travel cost model to estimate recreational demand. The basic finding of the study is that visitors derive an annual consumer surplus of LKR 38,900 million from the recreational benefits at the site. The total consumer surplus generated from the wetland would be far higher than this estimate if we were to incorporate other use- and non-use values into it.

The socio-economic variables used in the empirical analysis reveal important information that should be of interest to resource managers and planners. For example, considering the positive impact of attributes on visiting, urban planners could aim at improving different attributes of the site. The present recreational site carries high potential for development into an important urban recreational site while both concern and criticism are growing regarding the implementation of development projects in the area. Taking into consideration both the preference of visitors for quality enhancement as well as the willingness to pay for benefits by a majority of visitors, authorities could design recreational projects which pose the least disturbance to the natural environment. These may include eco-friendly restaurants on stilts, water-front snack bars, nature trails, board walks and decks on stilts, and viewing decks/towers, especially for bird watching.

This study measured the impact of a direct entry fee. The findings indicate that there will be a reduction in social welfare with such a fee. However, considering the estimated revenues from such an entry fee, the government could think of possible alternative fund-generating strategies. Moreover, the imposition of an entry fee is not practical given the multiple recreational sites (without exact boundaries) throughout the wetland. Hence, imposing a reasonable parking fee would be more appropriate while providing the added benefits of reduced congestion and pollution. It is a fact that the Diyawanna Oya wetland has been deteriorating in quality as a recreational site owing to under-management during recent years. Hence, it is timely that the management gives serious thought both to revenue generation and to providing funds to maintain the wetland.

This analysis, as mentioned earlier, has excluded many important use- and non-use values provided by the site. Hence, the actual consumer surplus generated by the wetland area is likely to be far higher than the estimate arrived at in this paper. Furthermore, we base our consumer surplus calculations on travel cost only. Therefore, there is likely to be an underestimation of recreational values. In the sample, a considerable number of visitors lived within a radius of 5 km and their actual cost of enjoying the wetlands may not be accurately reflected in their minimal travel cost. In the case of those who walk to the site, we account for only the opportunity cost of time in the calculation whereas, for nearby residents, property values capitalize the recreational benefits offered by the site. In fact, they may have already paid a higher property value compared to distant residents, which information is not captured in our analysis. Another drawback to the study is that the results are sensitive to the fraction of the wage rate which we have used to account for the opportunity cost of time. Moreover, it is possible that the corrective econometric measures that we have applied in order to account for on-site sampling have left out important information about occasional visitors and non-participants.

Despite these drawbacks to the study, the high present value of benefits from recreation suggests that every effort should be made to maintain, and perhaps enhance, the Diyawanna Oya wetlands. Finally, it is time to include the most sensitive areas of the Diyawanna Oya wetlands in the national protected area network and to declare it a wetland sanctuary.

7. Acknowledgements

We gratefully acknowledge the financial support provided by the South Asian Network for Development and Environmental Economics (SANDEE) and the technical support of SANDEE advisors during the Research and Training Workshops including Enamul Haque, Priya Shyamsundar, Jeff Vincent, Subhrendu Pattanayak, E. Somanathan, Karl Goran-M ler, M.N. Murty, Jean Marie Baland, Pranab Mukhopadhyay and Mani Nepal. We wish to thank Kavitha Shreshta, Krisha Shresta and Anuradha Kafle too for their support throughout the grant period. Our special thanks go to Parakrama Samaratunga and our colleagues for their valuable comments during the in-house seminar at IPS.

References

Barbier, E. B., M. Acreman and D. Knowler (1997), 'Economic valuation of wetlands--a guide for policy makers and planners', Ramsar Convention Bureau, Switzerland.
Available at: http://www.ramsar.org/lib/lib_valuation_e.pdf

Brander, L. M., J. G. Raymond, M. Florax and J. E. Vermaat (2006), 'The empirics of wetland valuation: a comprehensive summary and a meta–analysis of the literature', *Environmental and Resource Economics* 33: 223-250.

Bowker, J. M., D. B. K. English, and J.A. Donovan (1996), 'Toward a value for guided rafting on southern rivers', *Journal of Agricultural and Applied Economics* 28: 423–32.

Bowker, J. M. and V. R. Leeworthy (1998), 'Accounting for ethnicity in recreation demand: a flexible count data approach', *Journal of Leisure Resea*rch 30:

Chen, W. (2004), 'Valuing ecosystem services of recreational opportunities and amenities generated by green spaces in Guangzho', The University of Hong Kong, China.

Clawson, M. (1959), *Methods of Measuring the Demand for and Value of Outdoor Recreation,* Washington D.C.: Resources for the Future.

Creel, M. D. and J. B. Loomis (1990), 'Theoretical and empirical advantages of truncated count data estimators for analysis of deer hunting in California', *American Agricultural Economics Association* 72: 434-441.

Devkota, N., K. P. Paudel, L. Hall and R. H. Caffey (2006), 'Use of bootstrap method to obtain reliable parameter estimation on travel cost demand model', Paper presented at the Southern Agricultural Economics Association Annual Meeting, Florida, USA.

Dixon, J. A., L. F. Scura, R. A. Carpenter, and P. B. Sherman (1994), 'Economic analysis of environmental impacts', Asian Development Bank and the International Bank for Reconstruction and Development, The World Bank, Washington D.C.

Dobbs, I. M. (1993), 'Individual travel cost method: estimation and benefit assessment with a discrete and possibly grouped dependent variable', *American Journal of Agricultural Economics* 75(1): 84-94.

Englin, J. and J. S. Shonkwiler (1995), 'Estimating social welfare using count data models: an application to long-run recreation demand under conditions of endogenous stratification and truncation, *The Review of Economics and Statistics* 77(1): 104-112.

Environmental Economics: a Guide to Training for Policy Makers (2002), Environmental Economics and Global Affairs Division, Colombo, Sri Lanka.

Faber, S. (1996), 'Welfare loss of disintegration: a Louisiana study', *Contemporary Economic Policy* 14(1): 92-106.

Feather, P. and W. D. Shaw (1999), 'Estimating the cost of leisure time for recreation demand models', *Journal of Environmental Economics and Management* 38: 49–65.

Freeman III, A. M. (1993), *The Measurement of Environmental and Resource Values: Theory and Methods,* Washington, D. C.: Resource for the Future.

Grigalunas, T., J. Opaluch and S. Trandafir (2004), *Non-Market Benefits and Cost of Preserving Estuarine Watershed Open Space: A Case Study of Riverhead,* Long Island, NY: Economic Analysis Inc.

Gum, R. L. and W. E. Martin (1975), 'Problems and solutions in estimating the demand for and value of rural outdoor recreation', *American Journal of Agricultural Economics* 57(4): 558-566.

Gunatilake, H. M. (2003), *Environmental Valuation: Theory and Applications*, Peradeniya: Post Graduate Institute of Agriculture, University of Peradeniya, Sri Lanka.

Gunatilake, H. M. and G. R. Vieth (1998), 'An assessment of scenic value of Sri Lankan elephants in case of Pinnawela orphanage', *Sri Lankan Journal of Social Sciences* 21(182): 37-57.

Haab, T. C. and K. E. McConnell (2002), *Valuing Environmental and Natural Resources: The Econometrics of Non-market Valuation,* Edward Elgar Publishing.

Hausman, J., G. Leonard, and D. McFadden (1995), 'A utility-consistent combined discrete choice and count data model: assessing recreational use losses due to natural resource damage', *Journal of Public Economics* 56:1–30.

Hellerstein, M. D. (1991), 'Using count data models in travel cost analysis with aggregate data', *American Journal of Agricultural Economics* 73(3): 860-866.

Huszar, P. C. and D. W. Seckler (1974), 'Effects of pricing a "free" good: a study of the use of admission fees at the California Academy of Sciences', *Land Economics* 50(4): 364-373.

Yoshiaki, Kaoru, V. Kerry Smith, and Liu Jin Long (1995), 'Using random utility models to estimate the recreational value of estuarine resources', *American Journal of Agricultural Economics* 77(1): 141-151.

Kealy, M. J. and R. C. Bishop (1986), 'Theoretical and empirical specifications issues in travel cost demand studies', *American Journal of Agricultural Economics* 68(3): 660-667.

Khan, H. (2004), 'Demand for eco-tourism: estimating recreational benefits from the Margalla Hills National Park in Northern Pakistan', SANDEE Working Paper No. 5-04, South Asian Network for Development and Environmental Economics (SANDEE), Kathmandu, Nepal.

Knetsch, J. L. (1963), 'Outdoor recreation demands and benefits', *Land Economics* 39: 387–96.

Kousmanen, T., E. Nillsen and J. Wesseler (2004), 'Does ignoring multi-destination trips in the travel cost method cause a systematic bias?', *Australian Agricultural and Resource Economics Society* 48(4): 629-651.

Larson, D., Sabina L. Shaikh and David F. Layton (2004), 'Revealing preferences for leisure time from stated preference data', *American Journal of Agricultural Economics* 86(2): 307–320

Loomis, J. B., S. Yorizane and D. Larson (2000), 'Testing significance of multi-destination and multi-purpose trip effects in a travel cost method demand model for whale watching trips, *Agricultural and Resource Economics Review* 29,2: 183-191.

McConnell, K. E. (1992), 'Model building and judgment: implications for benefit transfers with travel cost models, *Water Resources Research* 28(3): 695–700.

Martinez-Espineira, R. and J. Amoako-Tuffour (2005), 'Recreation demand analysis under truncation, over-dispersion, and endogenous stratification: an application to Gros Morne National Park', *Journal of Environmental Management* 88(4): 1320-1332.

McGrath, D. T. (2006), 'The Calumet area ecological management strategy: measuring the non-market economic benefits',
Available at: www.iisgcp.org/research/projects/coast/rse0104.htm

Nam, P. K., T. V. H. Son and H. Cesar (2005), 'Economic valuation of the Hon Mun marine protected area', Working Paper 05/13, Poverty Reduction and Environmental Management (Prem),

Parsons, G. R. (2003), 'The travel cost model', in P. A. Champ, K. J. Boyle, and T. C. Brown (eds.), *A Primer on Nonmarket Valuation*, London: Kluwer Academic Publishing,
.
Poor, P. J. and J. M. Smith (2004), 'Travel cost analysis of a cultural heritage site: the case of historic St. Mary's City of Maryland', *Journal of Cultural Economics* 28(3): PAGE NUMBERS.

Parsons, G. R. and Aaron J. Wilson (1997), 'Incidental and Joint Consumption in Recreation Demand', *Agricultural and Resource Economics Review* April: 1-6.

Parsons, G. R. and A.B. Hauber (1998), 'Spatial boundaries and choice set definition in a random utility model of recreation demand', *Land Economics* 74: 32–48.

Phaneuf, D. J. (1999), 'A dual approach to modeling corner solutions in recreation demand', *Journal of Environmental Economics and Management* 37: 85–105.

Rolfe, J. and P. Prabha (2007), 'Estimating values for recreational fishing at freshwater dams in Queensland', *The Australian Journal of Agricultural and Resource Economics* 51(2):

Scheaffer, R. L., W. Mendenhall III and R. L. Ott (1996), *Elementary Survey Sampling*, 5th Edition, Boston, MA: Duxbury Press.

Seenprachawong, U. (2003), 'Economic valuation of coral reefs at Phi Phi Islands, Thailand', *International Journal of Global Environmental Issues* 3(1):

Siderelis, C., R. Moore and J. Lee (2000), 'Incorporating user's perceptions of site quality in a recreational travel cost model', *Journal of Leisure Research* 32: 406-414.

Smith, V. K., W. H. Desvousges and A. Fisher (1986), 'A comparison of direct and indirect methods for estimating environmental benefits', *American Journal of Agricultural Economics*: 280–290.

Smith, V. K, and R. Kopp (1980), 'The spatial limits of the travel cost recreational demand model', *Land Economics* 56: 64-72.

Shrestha, R. K., A. F. Seidl and A. S. Moraes (2001), 'Value of recreational fishing in the Brazilian Pantanal: a travel cost analysis using count data models', *Ecological Economics* 42: 289-299.

Whitehead, J. C. (1992), 'Measuring use value from recreation participation', *Southern Journal of Agricultural Economics* 24 (2): 113-119.

Whitehead, J. C., H. C. Thimothy and J. Huang (1999), 'Measuring recreation benefits of quality improvements with revealed and stated behavioral data, East Carolina University', *Resources and Energy Economics* 22(4): 339-354.

Zawacki, W. T., A. Marsinko and J. M. Bowker (2000), 'A travel cost analysis of non-consumptive wildlife-associated recreation in the United States', *Forest Science* 46.4: PAGE NUMBERS.

LIST of TABLES

Table 1: Main Recreational Activities and the Number of Visitors

	Activity	Number of Visitors
1.	Jogging and exercise	2239 (23 percent)
2.	Family/ friends outing	2815 (29 percent)
3.	Playing cricket	2191 (23 percent)
4.	Playing other games (Volleyball, Rugby, Badminton)	439 (5 percent)
5.	Visits to the public children's park	1705 (18 percent)
6.	Cycling	297 (3 percent)
	Total	9687

Source: Field survey, 2008

Table 2: Sampling Plan

Activity	Day	Time					
		6-9 am	9 -12 am	12 -3 pm	3-6 pm	6pm onwards	Total
Jogging	Mon -Thurs	33	0	0	13	12	58
	Friday	9	0	0	4	3	16
	Saturday	11	1	0	4	4	20
	Sunday	13	1	0	4	6	24
Children's Park	Mon -Thurs	0	3	1	12	13	29
	Friday	0	1	0	4	4	9
	Saturday	1	1	1	9	11	23
	Sunday	0	1	1	14	12	28
Cricket	Mon -Thurs	0	4	4	13	8	29
	Friday	0	2	1	4	4	11
	Saturday	2	3	3	9	5	22
	Sunday	4	7	8	16	16	51
Other games	Mon -Thurs	0	0	1	4	4	9
	Friday	0	0	1	1	1	3
	Saturday	1	1	0	3	2	7
	Sunday	0	1	1	2	1	5
Cycling	Mon -Thurs	0	0	0	0	2	2
	Friday	0	0	0	0	1	1
	Saturday	0	0	0	1	1	2
	Sunday	1	1	0	2	2	6
Family outing	Mon -Thurs	2	0	0	17	21	40
	Friday	1	1	1	5	6	14
	Saturday	1	2	3	23	15	44
	Sunday	1	4	10	20	12	47
Total		80	34	36	184	166	500

Table 3: Summary Statistics of Sample Respondents

Variable	Mean	Std. Dev.	Min	Max
Age	31	12	16	76
Monthly wage	20,545	23,658	0.00	300,000
Travel distance (km)	7	11	0	130
Number of recreational visits per month	9	8	1	30
Travel cost per visit w/o time cost (LKR)	68	263	0	4,200
Travel cost per visit with time cost (LKR)	238	310	52	4,408
Monthly visits	7	8	1	30
Monthly visits to the closest substitute sites	1	1.5	0	10
Group size	4	4	1	25

Table 4: Socio-economic Statistics of Sample Respondents

	Frequency	**Percent**
Gender		
Male	367	73.4
Female	133	26.6
Marital status		
Single	228	45.6
Married	272	54.4
Education level		
Primary	13	2.6
Junior secondary (GCE OL)	107	21.4
Secondary (GCE AL)	303	60.6
Degree and above	77	15.4
Employment		
Regular	243	48.6
Casual	19	3.8
Contractual	11	2.2
Employer	8	1.6
Self-employed	59	11.8
Unpaid family worker	38	7.6
Students	92	18.4
Retired	30	6
HH income		
< 10,000	5	1
10,000-20,000	43	8.6
20,000-30,000	128	25.6
30,000-50,000	175	35
50,000-100,000	128	25.6
> 100,000	21	4.2

Table 5: Attitudes about the Recreational Quality and Development of the Site

	Freq.	Percent
Purpose of the visits		
Business	2	0.4
Visiting friends/relatives	56	11.2
To enjoy recreational benefits	442	88.4
Most valued attributes		
Scenic beauty	153	30.6
Playing games	178	35.6
Boating	2	0.4
Family outing	12	2.4
Relaxing	90	18
Exercising/jogging	65	13
Quality of the recreational benefits		
Very poor	9	1.8
Poor	20	4
Fair	65	13
Good	366	73.2
Very good	40	8
Whether you are satisfied with the present benefits		
Yes	439	87.8
No	61	12.2
Whether you would like to have improved recreational services		
Yes	349	69.8
No	151	30.2
Availability of substitute sites		
Yes	293	58.6
No	207	41.4
Method of financing		
Charge an entry fee	68	13.6
Charge a vehicle parking fee	27	5.4
Private donations	80	16
Through the government budget	325	65
Willingness to pay an entry fee		
Yes	215	43
No	285	57
Willingness to pay for projects		
Yes	250	50
No	250	50

Table 6: Estimated Results of Different Zero Truncated Negative Binomial Regression

	Different Models			
	0.30 wage fraction and 30km distance	0.30 wage fraction and 17km distance	0.25 wage fraction and 30km distance	0.25 wage fraction and 17km distance
Variables	Monthly visits	Monthly visits	Monthly visits	Monthly visits
Travel cost	-0.002*	-0.002*	-0.002*	-0.002*
	(0.000)	(0.000)	(0.000)	(0.001)
Age	0.023*	0.021*	0.023*	0.021*
	(0.004)	(0.004)	(0.004)	(0.004)
Regular employees	0.972*	0.860*	0.976*	0.865*
	(0.288)	(0.308)	(0.289)	(0.309)
Contractual employees	1.268*	0.749*	1.270*	0.740*
	(0.406)	(0.444)	(0.408)	(0.446)
Employer	1.063*	0.956*	1.053*	0.943*
	(0.305)	(0.323)	(0.306)	(0.325)
No employment	0.996*	0.869*	0.979*	0.854*
	(0.291)	(0.311)	(0.292)	(0.312)
Retired employees	1.064*	0.963*	1.060*	0.960*
	(0.339)	(0.354)	(0.340)	(0.356)
Exercise	0.551*	0.541*	0.540*	0.534*
	(0.135)	(0.133)	(0.134)	(0.133)
Travel cost to substitute	0.0002*	0.0002*	0.0002*	0.0002*
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.253*	0.470	0.176*	0.380*
	(0.307)	(0.326)	(0.305)	(0.324)
alpha	0.747*	0.711 *	.755*	0.720*
Pseudo R2	0.0444	0.0404	0.0438	0.0395
Log likelihood	-1351.72	-1284.67	-1364.98	-1298.29
chibar2(01)	1197.14	1118.21	1226.11	1148.12

* Significant at 0.05 level.

Table 7: Consumer Surplus Calculation: With and Without Entrance Fee

Description	Without EF	With EF	Change
CS/person/month (LKR)	3001.86 (US$26.7)	2742.15 (US$ 24.4)	259.71 (US$ 2.3)
CS/person/year (LKR)	36022.36 (US$ 320.6)	32905.79 (US$ 292.8)	3116.57 (US$ 27.7)
Total annual CS (LKR mil)	3,890 (US$ mill 34.6)	3,554 (US$ mill 31.6)	336.59 (US$ mill 3)

Note: 1USD=112.37 LKR

Table 8: Welfare Loss due to Acreage Loss

Description	Value
Total annual CS (LKR mil)	3,890 (US$ mil. 34.6)
Approximate recreational land extent (hectare)	200
Per hectare social welfare (LKR mil)	19.45 (US$ 173,107)
Per perch social welfare (LKR)	49,246 (US$ 438)

Note: 1USD=112.37 LKR

Table 9: Present Value of Non-market Benefits

	LKR/perches
Total annual CS	49,246 (USD 438)
PVB (10 percent)	492,460 (USD 14,595)
PVB (8 percent)	615,575 (USD 18,243)
PVB (12 percent)	410,383 (USD 12,162)

Note: 1USD=112.37 LKR

LIST of FIGURES

Figure 1: Frequency of Visits to the Diyawanna Oya Site (per month)

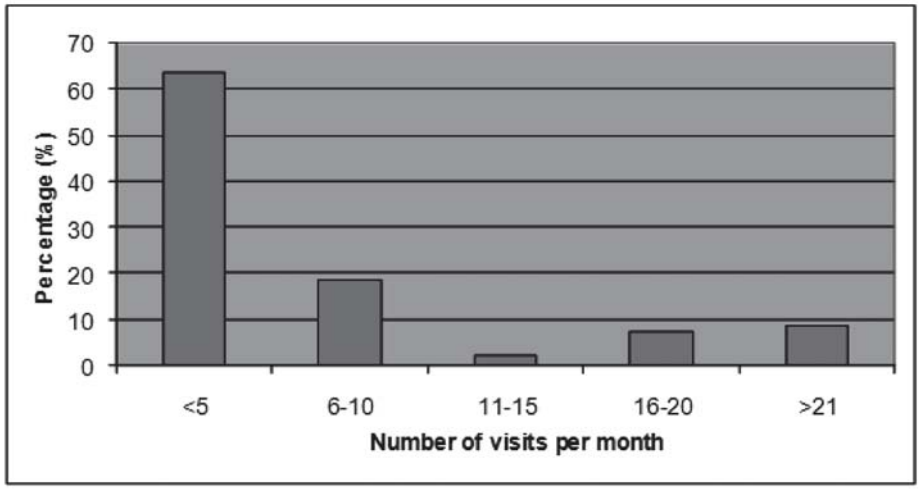
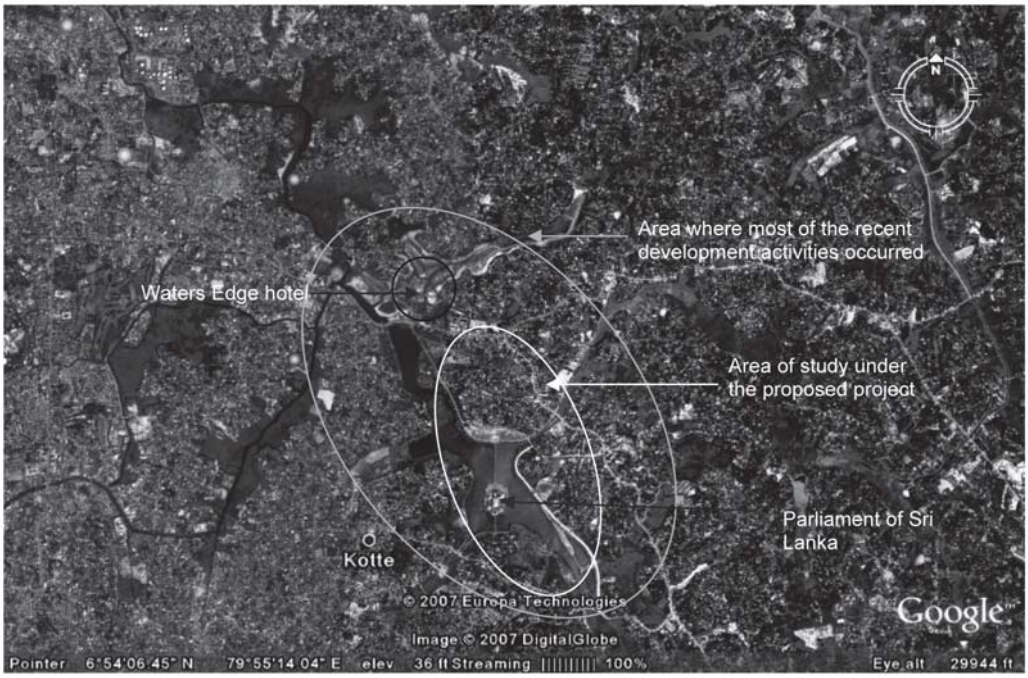


Figure 2: Geographical Location of the Study Area



ANNEXURE

QUESTIONNAIRE

Title of the Project: The Recreational Use Value of the Diyawanna Oya Wetland Eco-System: An Application of the Travel Cost Method

(A research project funded by the South Asian Network for Development and Environmental Economics [SANDEE], Nepal)

Diyawanna Oya wetland has already proven to be an important recreational site in the Greater Colombo area and this study attempts to value the recreational benefits provided by the site as perceived by the visitors. The findings of the study will provide suggestions on effective allocation and management of the recreational area of Diyawanna Oya wetlands.

This research is undertaken by the Institute of Policy Studies of Sri Lanka (IPS), an independent research institute coming under the purview of the Presidential Secretariat of Sri Lanka.

Principal Investigator: Dilhani Marawila
Institute of Policy Studies of Sri Lanka
No. 99, St. Michael's Road,
Colombo 03, Sri Lanka.
Tel: (094) 11 2431368
Email: dilhani@ips.lk

Name of Interviewer:……

Date of interview: …… Day of the week:……..

Time started:……. Time finished: …….

Visitor No:…….

Divisional Secretary Division:……

Recreational activity currently involved:…….

- Preferably, this questionnaire can be filled by the visitor, with any necessary help from the investigator.
- The information collected by this questionnaire will be used exclusively for the SANDEE project -2008. The confidentiality of the supplied information will be duly maintained.

A. General Information about the Visitor

A.1 Gender of the respondent[9]: ☐ A.2 Age at last birthday (in years): ☐

A.3 Marital Status: ☐ A.4 Highest Level of Education: ☐

A.5 Employment: ☐

A.6 Household Size: ☐

A.7 Monthly wage of the respondent (LKR) ……..

A.8 Income of the household ☐

A.1 Gender	A.3 Marital status	A.4 Education
1. Male 2. Female	1.Never married 2. Married 3.Widowed/divorced/separated	1. None 2 Primary- up to Grade 5 3 Junior secondary - Grade 5-9 4 GCE O/L –if done the exam 5 GCE A/L –if done the exam 6. Degree and above 7 Other (specify) …….

A.5.Employment	A.8. Income
1. Regular employee 2. Casual employee 3. Contractual employee 4. Employer 5. Self-employed 6. Unpaid family worker 7. Student	1. 0-5000 LKR 2. 5000-10000 LKR. 3. 10,000-20,000 LKR. 4. 20,000-30,000 LKR 5. 30,000-50,000 LKR 6. 50,000 -100,000 LKR 7. More than 100,000 LKR

B. Visitor's Recreational Behavior

B.9 How often do you visit nature-based recreation in the Western Province of Sri Lanka for recreation purpose?

1. No. of times…….. /year 2. No. of times……./month

B.10 If you were not on this trip today, what would you most likely be doing?

B.11 How many times did you visit the Diyawanna Oya recreational site within the last month for recreation purposes?

No. of times: ……../month

[9] Respondent should be an individual who is involved in a recreational activity at the time of the interview. Not more than one respondent from a single family/group should be interviewed.

B.12 How many times do you expect to visit Diyawanna Oya recreational site for recreation purposes during the next month?

No. of times: ……../month

B.13 Do you know any other natural recreational site that you would like to visit instead of Diyawanna Oya?

Yes ☐ No ☐

B.14 If Yes, which other sites do you visit frequently? During the last month/year how many times did you visit those sites and what was the main recreational activity you were involved in there?

Site	Visits/month or Visits/year	Distance to the site	Main recreational activity
1 Galle Face Beach			
2 Viharamahadevi Park			
3 Others			

B.10.Activities	B.14 Main recreational activity
1. Working at job 2- Watching TV 3- Housework 4- Shopping 5. Meeting friends 5- Other (specify) ……	1. Jogging/exercise 2. Family/friends outing 3. Playing cricket 4. Playing other games 5. Children's park 6. Cycling 7. Other……

B.15 Out of the other recreational sites available what is the most preferred site?

B.16 How many hours were you (or will you) be at the recreational site today? ……...hrs.

B.17 If you came with a group,

a. what is the size of the group? ……..

b. male female

B.18 What is the purpose of your visit to the Diyawanna oya area today? ☐

B.19 What is the approximate time and distance it takes you to get to this recreational site from your home? (One way)

…….. ……..hours ……..km

B.20 How did you come to the site today? ☐

B.21 How much did you/your group spend on your trip?

1 Transportation…….LKR (in case of public transport)
2. Fuel……LKR (if private/own vehicle)
3. Food ……. ……LKR
4 Accommodation…….LKR
5 Other ……. ……LKR
6 Total …….....LKR

B.22 What is the tenure of your house? ☐

B.18. Purpose	B.20. Mode of transport1- By public Bus	B.22.Tenure of house
1 Business	2. By taxi	Own house
2 Attend meeting/ conference	3. By private car	Rented house
3 Visiting friends/ relatives	4. By tour bus	Free quarters
4 Recreation	5. By motorcycle	
5 Other (specify)……	6. By bicycle	
	7. By foot	
	8. Other(specify)……	

B.23 If you are living in a rented house, what is the monthly payment? …….....

(at current market price)

B.24 If you are living in own house/free quarters, what is the monthly rentable value?.....

(at current market price)

B.25 Have you chosen your current residence partly to enjoy the recreational benefits provided by the Diyawanna oya site?

Yes ☐ No ☐

B.26 If yes, do you think that you are paying extra in terms of monthly rent to enjoy the site?

Yes ☐ No ☐

B.27 If yes, how much are you paying extra? .....

B.28 If you could have worked at this time (during recreational hours), what is the income you have foregone due to the visit?

…….....

B.29 How would you describe the quality of recreational benefits at the Diyawanna Oya recreational site?

1Very poor	
2 Poor	
3 Fair	
4 Good	
5 Very good	

B.30 Are you satisfied with the present recreational benefits provided by the site?

Yes ☐ No ☐

B.31 What attributes of the Diyawanna oya recreation site would you value most?

1. Scenic beauty		5 Fishing	
2. Playgrounds		6 Relaxing	
3. Boating		7 Exercising/Jogging facility	
4. Family outing		8 Other (Specify) ---------	

B.32 Would you like to have improved recreational services provided by the Diyawanna Oya recreational site?

Yes ☐ No ☐

B.33 If No, what is the reason?

1. Satisfied with the existing recreational benefits/ services	
2. Other (Specify)….	

B.34 If yes, what types of recreational and other improvements would you like to see here?

1 Sight-seeing		7 Road conditions	
2 Bird- butterfly watching sites		8 Food services	
3 Relaxation		9 Lavatory	
4 Walking tracks/Exercising		10 More items at Children's Park	
5 Boat riding		11. Improved play grounds	
6.Waste disposal		12- Other (Specify) ……..	

C. Visitor's view of new projects and WTP for improvements

C.35 If this recreational site requires more income to provide better services for visitors, such as more recreational activities, improved cleanliness, greater public safety and infrastructural facilities, how should these recreational services be financed? ☐

C-36 Suppose there were no other avenues to pay for improvement except through imposing an entry fee, would you be willing to pay it?

Yes ☐ No ☐

C-37 (a) Suppose an entry fee of LKR 50 is charged for enjoying recreational benefits of the site, would you be willing to pay? Yes ☐ No ☐

If yes, how often will you be visiting the site?

……times/month ……..times/year

(If yes, go to C-46(b), if no, go to Q. C-46 (e))

C-37 (b) Suppose that instead of LKR 50, the entry fee was LKR 100, would you be willing to pay? Yes ☐ No ☐

If yes, how often will you be visiting the site?

……times/month ……..times/year

(If yes go to C-46 (c), if no, finish)

C-37 (c) Suppose that instead of LKR 100, the entry fee was LKR 500, would you be willing to pay? Yes ☐ No ☐

If yes, how often will you be visiting the site?

……times/month ……..times/year

(If yes, go to C-46 (d), if no, finish)

C-37 (d) Suppose that instead of LKR 500, the entry fee was LKR 1000, would you be willing to pay? Yes ☐ No ☐

If yes, how often will you be visiting the site?

……times/month ……..times/year

(If yes, finished, If no, finish)

C-37 (e) Suppose that instead of LKR 50, the entry fee was LKR 20, would you be willing to pay? Yes ☐ No ☐

If yes, how often will you be visiting the site?

……times/month ……..times/year

(If yes finished, if no, go to Q. C-46 (f))

C-37 (f) Suppose that instead of LKR 20, the entry fee was LKR 10, would you be willing to pay? Yes ☐ No ☐

If yes, how often will you be visiting the site?

……times/month ……..times/year

(finished)

C-38 What is the reason for you wanting to pay to conserve/improve this recreational site?

C-39 Would you prefer ☐

1. to keep the recreational site as a natural site or ☐
2. to have several development projects to provide more recreational activities at the site, i.e., Diyawanna Uyana Development Project?

C-40 If you prefer to keep it as a natural site (a), what is the reason? ☐

C.35.Financing method	C.38. Need to pay	C.40. Reasons to keep it as a natural site
1. charge an entry fee 2. charge a vehicle parking fee 3. private donations 4. through the govt. budget 5. Other (Specify)……	1. for my own benefit, so that I can enjoy more 2. for the benefit of the society, that every one can enjoy it 3. for future generations 4. Other (specify) ……..	1. Importance of the site as a rich natural ecological system 2. Will attract more visitors since it is less costly 3. Other (specify)…….

C-41 If you prefer to have several projects (b), what is the reason?

1. It will provide more entertainment	
2. Will be able to maintain the quality of the recreational site with limited number of visitors	
3. Other (specify)……	

C-42 In Diyawanna Uyana Development Project what attributes would you like most?

1. Leisure centre		5. Boating	
2. Golf course		6 Nature park	
3. Apartment blocks		7 Other (specify)	
4. Dry weather cricket and football grounds			

(*Rank choices up to 3)

C-43 If a project similar in nature to Diyawanna Uyana Development Project (DUDP) is implemented in this area, how often will you be visiting the site for recreational purposes?

……times/month ……..times/year

C-44 Are you willing to pay for the recreational benefits provided by the above new development project?

Yes ☐ No ☐

C-45 With new development projects coming up in the wetland area, do you expect the recreational benefits provided by the site to increase?

Yes ☐ No ☐

C-46 If No, what prevents you from enjoying the recreational benefits?

1 Congestion		4 Exorbitant entry fee	
2 Environmental pollution		5 Loss of freedom	
3 Loss of recreational activities		7 Other (specify)	

(*Rank choices up to 3)

SANDEE

South Asian Network for Development
and Environmental Economics

SANDEE
PO Box 8975 EPC 1056
Kathmandu, Nepal

Tel: 977-1-5003222
Fax:977-1-5003299
E-mail: info@sandeeonline.org
Website: www.sandeeonline.org

9789937837613

SANDEE Sponsors

ICIMOD

IDRC CRDI
International Development Research Centre
Centre de recherches pour le développement international

Norad

Sida
Swedish International Development Cooperation Agency

THE WORLD BANK