User-based Financing of Marine Protection in the Maldives

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Abstract

Maldivian atolls are known for their beautiful coral structures, fish abundance, white sandy beaches, coastal vegetation and mangroves. This paper provides an economic valuation of the recreational uses of atoll-based marine resources in the Republic of the Maldives. We use a travel demand model to estimate the benefits of atoll-based marine tourism. We contribute to the literature by estimating two separate travel demand models—one without and one with endogenous costs. Our results suggest a large disparity between the amount of economic value generated from nature-based tourism and the amount going into atoll conservation. Currently, more than half the Maldivian government's annual environmental protection expenditure comes from unstable international aid, which makes it imperative that more stable financing sources be found. Our study shows that transferring four per cent of the total annual recreational benefits from visitors as a one-time conservation fee would generate enough resources to cover government and foreign donor contributions towards environmental protection. The additional per tourist tax or user fee necessary to raise funds at the current level of conservation funding (domestic and overseas) is USD 41. This amount constitutes only a small percentage of what an average tourist spends on each trip (1.25 per cent) and the economic surplus (benefit) s/he derives from each trip (3.98 per cent). The paper concludes with a discussion of the policy implications of sustainable user-based financing mechanisms.

Key Words: Atolls, Coral reef, Travel cost model, User-based finance, the Maldives

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1. Introduction

Atolls—small, flat islands formed of coral reefs and embedded with an open lagoon at their center—are home to some of the world's most unique ecosystems. They are to be found predominantly in the tropical Indo-Pacific oceans and are home to more than 700,000 people (Spalding *et al.*, 2001). Four countries and four states or territories of the world are primarily composed of atoll islands (Yamano *et al.*, 2007). The Republic of the Maldives of the central Indian Ocean is one of them and is endowed with a large number of atolls. The Maldivian atolls are known for their beautiful coral structures, fish abundance, white sandy beaches, coastal vegetation and mangroves. The Global Environment Facility has recognized the Baa Atolls of the Maldives to carry "*globally significant biological diversity*" and has recently, therefore, funded a major conservation project (Emerton *et al.*, 2009).

Until recently, corals served as a source of building materials for the construction industry in the Maldives. Consequently, the Maldivian coral reefs have been heavily quarried since the 1970's to meet the nation's construction demand, especially around the capital island of Male which is a major urban and international tourist center (Edwards and Clark, 1998). Threats to the coral reefs also come from other development activities such as near-shore reclamation, harbor construction, dredging and other island expansion activities, and nutrient enrichment from inland sewage discharges.

The Maldivian Government, as a policy response to both the increasing tourism demand and the degrading coral reef fishery, has already declared 25 marine protected areas in order to protect the diving spots from overuse (UNEP, 2002). However, these areas do not strictly conform to the protected area management regime because they continue as popular diving spots for tourists, with 14 of them exclusively for shark watching, and permit bait fishing by the local communities. Moreover, the demand for reef fishes from the local tourist resorts and exporting companies continue to grow, forcing local fishermen to encroach into protected areas. Both a lack of political will and budgetary constraints appear to hinder the effective implementation of the marine protection law on the part of the Maldivian government.

To complicate matters further, the marine protected area program from inception has received only meager financial support from the government and is handicapped by an inadequate staff. In the year 2007, for instance, the entire environmental conservation program in the country received less than one per cent of the Gross Domestic Product [GDP] although the tourism and transportation sector together contributed about 46 per cent of the GDP (MPND, 2009). The inadequate funding of such programs seriously limits the ability of the management agencies to enforce protected area boundaries, use restrictions, impose penalties, and conduct educational programs. Part of the reason that institutions and mechanisms for the conservation of the environment around the world receive insufficient funding is the failure of governments to recognize both the market and non-market values derived from natural resources (Baral, *et al.*, 2008). With nature-based tourism in particular, there exists a significant amount of economic surplus which the tourists derive but which does not enter the market process. As a result, the government fails to recover at least a portion of that surplus which could in turn be used to defray the costs of protecting the resource from its users.

In the case of the Maldives, the tourism industry continues to expand significantly, making tourists the major user group of the marine resource base. However, while the user group who most benefits from the rich natural resource are foreigners, the responsibility for the sustainable and fair use of the resource largely falls on the local population and the government. One way to overcome this disparity is to identify funding sources from the group who directly benefit from tourism and the tourism dollars, and to design policies to ensure appropriate money transfer from

beneficiaries to those responsible for conservation and regulation. Emerton *et al.* (2006) and Reid-Grant and Bhat (2009) have discussed at length possible alternative mechanisms for the purpose of funding protected areas.

This paper focuses on the recreational activities of tourists visiting the Maldives. We aim in the paper to estimate the size of the economic benefits or welfare derived by tourists and to identify suitable financial sources from within the tourism sector for the purpose of recovering, as user fees and/or additional service charges, a reasonable portion of the tourists' economic surplus. We conduct a travel cost study therefore for international visitors in order to estimate their economic surplus from recreational activities, which is a key indicator in determining the feasibility of a user-based scheme to finance marine protection programs. The study develops alternative estimates of economic surplus by considering (i) exogenous travel costs (i.e., costs that tourists have no control over), and (ii) combined exogenous and endogenous costs (i.e., costs chosen by tourists). We then analyze the expenditure profile of tourists in order to identify feasible user-fee bases which could be used to improve the financing for Maldivian atoll and coral reef conservation.

We consider this an exploratory study the objective of which is to provide quick, but policy-relevant, estimates of the economic value of the recreational uses of the atolls. Due to limited funding available at the time of the study, we based the analysis on a relatively small sample obtained during one travel season. The results, nevertheless, are encouraging and merit further refinement through the collection of data from a larger sample based on updated information on the activities of tourists in the Maldives.

In the next section we briefly discuss the past studies on the economic valuation coral reefs and the significance of atolls in the Maldives. In Section 3, we develop the conceptual model of the study and describe how the data is collected and analyzed. In Section 4, we present the study results and discuss how this economic valuation study can be used in policy making. In the last section we provide conclusions of this study.

2. Recreational Value of Coral Reefs: The Background

2.1 Economic Valuation Studies

Environmental economic valuation literature is replete with studies that have investigated two distinct types of economic values associated with reef-related tourism activities: (a) the economic multiplier effects of reef tourism expenditure (Hodgson and Dixon, 1988; Dixon *et al.*, 1993; Cesar, 2000; Leeworthy and Bowker, 1997), and (b) the economic welfare benefits that tourists themselves derive from reef recreational activities (Leeworthy and Bowker, 1997; Arin and Kramer, 2002; Bhat, 2003; Reid-Grant and Bhat, 2009). The first category analyzes the tourists' expenditure dollars in a given region, and then estimates the total income, employment and tax revenue impacts of those expenditures on the region's economy. The analysis depends on the observed market prices and quantities of tourism activities (food, hotel, recreational equipment, local transportation, souvenirs, etc.).

The valuation of the tourists' economic welfare or surplus is made using two different approaches: the contingent valuation method (CVM) and the travel cost method (TCM). In CVM, users are asked to directly express their value of (i.e., the benefit that they derive from) a given natural amenity (Hanemann, 1984). The method is extremely useful when there is no direct or indirect market for the environmental good under consideration. This approach entails conducting a survey of users in order to elicit their values (i.e., the amount of their willingness to accept or pay) for a hypothetical, future environmental change. While the method has become a popular policy tool for assessing people's willingness to pay (WTP) for a variety of environmental goods (for e.g., biodiversity, endangered species, protected areas, water quality, wildlife, etc.), its use in assessing the values of tourism-related amenities is limited (Dixon *et al.*, 1993; Arin and Kramer, 2002; Baral *et al.*, 2008). Mohamed (2007), for instance, conducted a contingent valuation study of tourists visiting the Baa Atoll, Maldives, to elicit their WTP for a marine-protected area. According to his estimate, they would be willing to pay a mean conservation fee of USD 35 per visit.

TCM is a more popular method for valuing marine recreational amenities (Ward and Loomis, 1986). It assumes the costs of travel to the site as the price of recreation. Using the visitors' data on costs of travel and the number of visits to a given site under different economic, demographic and recreational use conditions, the method allows for estimating the travel demand curve. From this curve, one can first compute an average visitor's consumer surplus

(i.e., the net benefit from recreation) and, secondly, the total surplus for the entire population. Leeworthy and Bowker (1997), Bhat (2003) and Reid-Grant and Bhat (2009) have applied TCM to estimate the recreational values of coral reefs and marine parks. Their studies show that the administrative costs of marine protection programs constitute an insignificant portion of the total recreational benefits.

The trip costs or the price of recreation comprises two major components: (a) the costs and time value of travel to the amenity site, and (b) on-site costs of food, hotel, amenity fees, and incidentals. The first cost component is strictly exogenous in that a recreationist has limited control over these costs for a given site which are imposed upon him/her (Ward, 1984). In contrast, the second category of costs is largely endogenous, i.e., chosen by the recreationist. A large number of TCM studies have considered both exogenous and endogenous costs into the price of the trip. As Ward (1984) and Randall (1994) have noted, tourists facing high travel costs, for instance, due to long travel distance and large group size, may substitute more on-site time for a fewer number of trips. Therefore, including both exogenous and endogenous costs into trip costs may overestimate the visitor's consumer surplus or WTP (Ward, 1984).

2.2 Significance of the Coral Reefs and Atolls in the Maldives

The islands that comprise the Republic of the Maldives are located virtually at the centre of the Indian Ocean between the 72° 30' and 73° 45' east longitude, and between the 7° 9' north latitude and 0° 45' south latitude, where the equator passes through the southern-most island of the country (see Figure 1). The Maldives, which consists of natural atoll formations, are arraigned in a north-south stretch and are approximately 750 km in length and 130 km in width. There are 26 natural atoll formations of various sizes and shapes, ranging from small single-island atolls to very large atoll formations having over 100 islands. The total number of islands contained within these atolls is 1190, of which around 200 islands from various atolls are currently inhabited. Although the country occupies a vast sea area of approximately 1,000,000 km^2 inclusive of its Exclusive Economic Zone, the land area is only 298 km^2, which makes the country one of the smallest in terms of surface area and one of the most watery on the face of the planet.

The Maldives is one of the fastest growing economies in the South Asian region with a continuous growth rate of 7 per cent to 9 per cent during the last decade (NDMC, 2007a). With a per capita GDP of USD 2,674 (PPP of USD 4,083), the Maldives has the highest real per capita income in the South Asian region. The majority of the employment is generated from primary industries such as fishing and tourism which have a direct link with the marine environment. The real GDP (at 1995 prices) increased from RF 6,992 million in 2002 to RF 10,067 million in 2007 (MPND, 2009).[1]

There has been an impressive growth in the tourism sector of the Maldives in recent years. The total bed capacity, for instance, has increased from 18,730 in 2000 to 21,741 in 2007, a 16 per cent increase (MPND, 2009). During the same period, the total tourism receipts have increased from USD 320.7 million to USD 493.0 million. Total export earnings increased from USD 75.9 million to USD 107.8 million while the imports increased from USD 388.8 million to USD 1,092 million. During the same period, total tourism revenue also increased from USD 54 million to USD 196 million, registering an increase of 263 per cent.

3. Methodology

The main purpose of this study is to assess the degree to which tourists and other direct atoll users are willing to support any kind of user-based financing of government programs for the conservation of the atolls. The first logical step in this effort is to value the total economic benefits that the tourists derive from engaging in various marine recreational activities. Secondly, researchers must find out if the beneficiaries are actually willing to support a user-fee policy. Finally, they must ensure that any proposed tax or user fee revenues are small enough to stay within the total recreational economic benefits of tourists while being sufficient to cover the costs of atoll and reef protection programs.

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[1]   (1 USD = RF 12.85).

This study deals with a unique empirical situation where portions of exogenous and endogenous travel costs are brought together in group travel packages so that recreationists are unable to observe or report the two cost components apart. It is now customary for international recreational travelers to buy package deals that combine costs of travel with on-site activities for all members of the group traveling together. This paper contributes to the literature by first developing an empirical regression model to separate the exogenous costs from the total trip cost bundle. It then estimates two separate travel demand models—one without and one with endogenous costs—to demonstrate the empirical and policy consequences of failing to adjust for endogenous costs in estimating the recreational values of coral reefs. In this section, we present the conceptual model and the analysis developed for the study.

3.1 Data Collection

We conducted a visitor survey over a period of six months from January to June 2009 at two major resorts in the Addu atoll, the domestic airport on that island, and the Male International Airport. This period partially coincided with both the peak tourism season (December to April) and the lean season (May to November). Due to budgetary and time constraints, our study could not cover the entire year or multiple years. Further, the private resorts would not allow us to have any direct contact with their customers while they were in the islands. We therefore sent 100 questionnaires to the managers of the two resort hotels, who in turn distributed them to tourists. We received only 30 questionnaires back. In order to increase the sample size, we then decided to intercept the tourists while they were waiting to leave the Maldives at the Male International Airport at the end of their trip. We distributed more than 400 questionnaires on different days during the study period. Respondents were asked to fill out the self-administered questionnaire and leave it in a drop box before they boarded the flight. The questionnaire was designed in four different languages: English, Japanese, German and Russian. Respondents could fill out the questionnaire in any one of the four languages. Obviously, those who did not understand any of these languages could not participate in the survey. However, we believe them to be a small minority of the tourists.

In all, we were able to collect 112 questionnaires from our surveys at both the resorts and the airport, which came to a 22 per cent response rate approximately. However, not all of these responses were usable. The most common reason for the non-usability of responses was that the that they were incomplete. Thus, we decided to include a total of 85 responses in the final analysis. We collected a wide range of information during the survey. The data included the number of times they had visited the atolls and reefs in the Maldives during the past five years, the distance they had travelled (mostly by air), the cost of their travel package, the nature of their recreational activities, and their demographic characteristics.

3.2 Conceptual Travel Cost Model

In order to estimate the tourists' willingness to pay (WTP), we use a travel cost model (TCM). The TCM is a recreational travel demand model that allows for estimating consumer surplus as a proxy for the net WTP of an average tourist for an average number of visits in a given period of time. The travel demand data used in this study possesses unique features. Firstly, the demand variable is a count of the total number of trips that each visitor undertakes during a fixed time period. Thus, observations are integers. Secondly, since we collected the data through an on-site survey, the model only included visitors. That is, non-visitors were not part of the sample which meant that the travel demand variable was zero-truncated. As Hellerstein (1991) has noted, in such cases, the trip demand is generated by a discrete choice process and, therefore, a continuous functional form for the demand curve is inappropriate. A Poisson or Negative Binomial model would better capture the count nature of the trip demand and zero truncation (Haussman *et al.*, 1984; Hellerstein, 1991; Greene, 1998; Rosenberger and Loomis, 1999).

3.2.1 Poisson Regression Model

Following Hellerstein (1991), we assume the number of observed trips (TRIP) to follow the Poisson probability distribution,

$$\text{Prob}(\text{TRIP} = n; n = 0,1,2,...n) = \exp(-\lambda)\lambda^n / n! \tag{1}$$

where λ is the mean and variance of the above distribution. Further, we assume the expected value of the trip demand, E(TRIP), to be the best predictor of λ [i.e., λ = E(TRIP)], and to follow the exponential demand equation given below:

$$\begin{aligned}
\text{TRIP} = \exp[&\beta_0 + \beta_1(\text{TRCOST}) + \beta_2(\text{INCOME}) + \beta_3(\text{AGE}) + \beta_4(\text{EDUCATION}) + \\
&\beta_5(\text{MARRIED}) + \beta_6(\text{GENDER}) + \beta_7(\text{TRLENGTH}) + \\
&\beta_8(\text{OWATER}) + \beta_9(\text{UWATER}) + \beta_{10}(\text{RFISH})].
\end{aligned} \tag{2}$$

The various independent variables included in the above travel demand model are price or round-trip cost of travel to the Maldives (TRCOST), per capita income (INCOME), age (AGE), education (EDUCATION), marital status (MARRIED), gender (GENDER), the length of the trip in days (TRLENGTH), over-water marine recreational activities such as glass-bottom boat rides and whale watching (OWATER), underwater recreational activities such as scuba diving and snorkeling (UWATER), and recreational fishing (RFISH).

The dependent variable TRIP was defined as the number of trips each person made to the Maldives within the past five years, including the current trip. Since this is a relatively remote travel destination with mostly international travelers, any given respondent was unlikely to take multiple trips in any given year. Therefore, we assumed that a five-year period would allow sufficient variation in the number of trips. Following Leeworthy and Bowker (1997) and Bhat (2003), we constructed this variable by multiplying the number of trips that each respondent made by the number of individuals that traveled with the respondents during the current trip.

The TRCOST variable represents the price of the trip or the costs per person per round trip. As indicated before, some travel cost studies included only the costs of actual travel and the opportunity cost of the travel time in this variable. These costs are called exogenous costs and are not controlled by the visitor (Ward, 1984). In addition to the exogenous costs, several other studies have included on-site costs or endogenous costs such as food and accommodation in this variable. In this study, we have estimated the travel demand model both with and without endogenous costs. In our survey, most respondents had purchased group travel packages, which included exogenous air travel costs and a significant portion of the on-site costs (i.e., accommodation and a part of the food costs). However, travelers normally had some control over choosing the endogenous portion of the package cost (i.e., costs relating to on-site activities). It was necessary therefore to separate the air travel costs from the total value of the group travel package. We therefore assumed the group package cost in USD per group (PCOST) to be equal to the sum of exogenous air travel cost for the group and the endogenous on-site costs of food, accommodation, and local transportation. Formally,

$$\text{PCOST} = [\text{GRRATE} * \text{DIST}] + [\text{ONCOST} * \text{PDAY}] \tag{3}$$

where GRRATE is the group air travel cost in USD per km, DIST is the round-trip distance in km from the visitor's city of origin to the city of Male in the Maldives, ONCOST are on-site endogenous costs in USD per person per day, and PDAY is the product of the number of persons in the group (GRSIZE) and the number of days a group spends on the island (TRLENGTH). We hypothesized that the package cost depended non-linearly on the total number of person-days (PDAY). That is, larger the group size and longer the trip length, higher the cost advantage to the group. In other words, PCOST increased with PDAY but at a decreasing rate. Further, we also assumed that the package cost depended on the type and level of recreational use intensity (RINT). We measured RINT as the total number of recreational activities (e.g., diving, snorkeling, whale watching, recreational fishing, etc.) that a respondent undertook during the current trip. We then estimated the following package cost regression model:[2]

$$\begin{aligned}
\text{PCOST} = 0.22 * \text{DIST} &+ 151.73 * \text{PDAY} - 1.70 * \text{PDAY}^2 - 357.56 * \text{RINT} \\
(p = 0.00) \quad &(p = 0.01) \qquad (p = 0.01) \qquad (p = 0.34) \\
&(n = 72; R^2 = 0.77)
\end{aligned} \tag{4}$$

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[2] We recognize that per-capita income could be a strong determinant of the PCOST. However, the income variable was closely related to the PDAY variable in our sample and, therefore, including the income variable in equation (4) made the coefficients of other model variables insignificant and did not improve the R^2.

All the variables, except RINT, in the above model are statistically significant and have the right signs. The R2 value of 0.77 reflects a fairly high goodness of fit. The co-efficient of the DIST variable in (4) of 0.22 is nothing but the GRRATE in (3), i.e., the group air travel rate in USD per km. This per km group rate is remarkably close to the group air travel rate of USD 0.38/mile (i.e., USD 0.23/km) used by Reid-Grant and Bhat (2009).[3]

Using this estimate, we computed the per-person per-trip air travel cost by multiplying the group rate [i.e., the estimated GRRATE = USD 0.22/km, from equation (4) above] by the round-trip distance (DIST) traveled by each group and divided by the number of people in each group (GRSIZE). Further, we calculated the opportunity cost of the travel time by multiplying the duration of the round-trip travel in hours (TDURN) by one-third of the per-capita hourly wage rate (HWAGE) (Hellerstein, 1991). We computed the hourly wage rate by first dividing the family annual income by family size and then by the number of working hours per year, i.e., 2080. Finally, we calculated the total exogenous trip cost (TRCOST), expressed in US hundred dollars per person per trip, using the following equation:

TRCOST = 0.01* [0.22 * TRIPDIST / [GRSIZE] + 0.01 * [TDURN*0.33*HWAGE] (5)

For the second travel demand model, which included both exogenous and endogenous travel costs, we first separated the on-site portion of the PCOST variable by taking the sum of the last three terms on the right-hand side of the estimated model (4), and then dividing the result by the number of persons in the group (GRSIZE). This operation yielded the on-site costs per person per trip, which then was expressed in hundred USD and added to the exogenous per-person per-trip cost in (5). Further, we also added out-of-pocket costs, on a per-person per-trip basis, incurred by respondents on food and beverages, recreational entry and equipment fees, souvenirs and other shopping charges. These were the costs in addition to the package portion of the on-site costs.

In addition, key demographic variables, namely, income, age, education, marital status, and gender were hypothesized to influence the number of trips that each visitor might undertake to the Maldives. We also expected that the length of the trip would have a significant negative impact on the number of trips. People who stayed longer during each trip would visit a fewer number of times and vice versa. We also hypothesized that not everyone visiting the Maldives would have the same level of recreation demand. That is, visitors whose primary visiting purpose is different (e.g., cruise ship underwater activities, over-water activities, recreational fishing or other activities) would differ in their visitation preferences from each other. We included three dummy variables, namely OWATER, UWATER, and RFISH, to represent over-water activities (for e.g., whale watching), underwater activities (such as diving and snorkeling), and recreational fishing, respectively. The effect of other purposes (e.g., new-year celebration, honeymooning, health reason, etc.) was considered as a trap variable.

3.2.2 Negative Binomial Distribution Model

A limitation of the Poisson count model is that its mean and variance are the same. That is, E(TRIP) = Var(TRIP). As described earlier, the TRIP variable represents the number of trips each respondent took in the last five years multiplied by the number of persons who traveled with each respondent. Moreover, the respondents came from a wide range of geographic areas and represented a wide range of recreational interests. In such a situation, one could expect a large variation in the observed TRIP values and a large degree of variance across individuals (i.e., the presence of heteroskedasticity). This means that the sample variance exceeds the sample mean. In other words, the observations are said to be over-dispersed with respect to the Poisson Model. If we force the Poisson Model on such over-dispersed data, the estimated coefficients will be unbiased but inefficient in that standard errors are usually biased downward (Cameron and Trivedi, 1986).

Previous studies have used the negative binomial distribution model for travel demand in order to relax the above condition (Cameron and Trivedi, 1986; Hellerstein, 1991; Leeworthy and Bowker, 1997). Using this model, we assume the observed TRIP variable to follow the negative binomial distribution given below:

$$\text{Prob}(\text{TRIP} = n; n = 0,1,2,...n) = \left(\frac{\alpha}{\alpha + \lambda}\right)^\alpha \frac{\Gamma(\alpha + n)}{\Gamma(n+1)\Gamma(\alpha)}\left(\frac{\lambda}{\alpha + \lambda}\right)^n$$

(6)

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[3]   Reid-Grant and Bhat (2009) obtained the group rate of USD 0.38 per mile by multiplying the 1997 estimate of a per-mile group rate of 0.30 (Leeworthy and Bowker, 1997) by an inflation factor of 1.265. The rate USD 0.38/mile amounts to USD 0.23/km using the conversion rate of 1 mile = 1.609344 km.

where λ is the mean of the TRIP variable as in the Poisson model, α is the dispersion parameter, and Γ is the gamma distribution. The variance of the TRIP variable is given by $\lambda + \lambda^2/\alpha$. Note that the variance is a function of the mean parameter and an inverse function of the dispersion parameter. For a large dispersion parameter, the variance tends to the mean, i.e., the negative binomial distribution becomes identical to the Poisson distribution. Thus, the Poisson distribution is a special case of the negative binomial distribution. We assume the expected value of trip demand, E(TRIP), to be the best predictor of λ [i.e., λ = E(TRIP)], and to follow the exponential demand equation (2).

3.2.3 Consumer Surplus

The above travel demand models allow us to compute consumer surplus (CS) or net WTP. TRCOST is the equivalent of a price variable in a standard demand equation. Thus, following Bockstael and Strand (1987), we can compute CS for an average sample visitor with the following formula:

$$\mathrm{CS} = \int_{x_0}^{x_c} \lambda dx = \frac{\lambda}{\beta_1} \tag{7}$$

where x is the TRCOST variable, and λ is the mean of the TRIP variable. We obtain CS by integrating the travel demand λ from an initial price x0 to the choke price xc at which the demand λ becomes zero. We substitute the estimated value of TRIP for an average visitor for λ in the above equation in order to obtain CS. We need to then adjust the CS per person so estimated by an adjustment factor of 1/(1+(t)-2) to ensure that the consumer surplus is not biased because even if the travel cost variable is unbiased, the CS estimated may still be biased. In the adjustment factor, t represents the t-value of the TRCOST coefficient in (2). Additionally, we can calculate the CS per person-trip by dividing the adjusted CS by the estimated number of trips.

We used the LIMDEP software program to estimate two sets of models: Poisson Models 1 & 2 for without and with endogenous trip costs, respectively, and Negative Binomial Models 3 & 4, for without and with endogenous trip costs, respectively. After estimating the travel demand models, we estimated the number of trips (TRIP) under different recreational use scenarios. We held all other independent variables at their respective sample means for this calculation.

3.3 Analysis of User-based Financing

Since the main aim of this study was to develop estimates of user fees or taxes on services related to recreational activities in the Maldives for the purpose of designing a self-sustaining, user-based financing system that adequately pays for atoll conservation and management, the following criteria were established for the proposed user-based financing system: (a) the total annual user fee to be collected from tourists must not exceed the total net consumer surplus that they enjoy; (b) the total user fee must cover at least the current expenditure on conservation and management; and (c) the proposed fee must be a small portion of the tourists' expenditure lest the proposed fee appears unreasonably high. Using published literature and government reports, we gathered information on the latest expenditures on environmental conservation and the total number of visitors. We also consulted representatives from the Environmental Protection Agency (EPA), and the Ministry of Housing, Transport and Environment of the Maldives for the purpose of discussing the adequacy and reliability of government and external funding for environmental conservation.

Using this information on environmental expenditure and the annual number of visitors, we computed the per visitor user fee necessary to cover the total environmental expenditure. We then compared this per visitor user fee with the estimated consumer surplus per visit. We also compared this estimated user fee with the average tourist expenditure per visit. The information on tourist expenditures came from the primary data collected from the sample tourists. Finally, we also estimated what the tax burden would be on each tourism sector (e.g., hotels, food, transportation, recreational services) if the government were to recover the conservation expenditure exclusively from just one or two sectors. We later inferred the policy implications of the various user fee proposals from the above analysis.

4. Results and Discussion

4.1 Sample Characteristics

The majority of the sample respondents were female (63 per cent). The average respondent was 42 years of age. A large majority of them (73 per cent) had either a college or professional degree. Only 17 per cent of the visitors were married while the remaining sample were either single or divorced. The average per capita annual income was computed to be USD 26,739.

The sample tourists traveled in an average group size of four to five people. An average visitor spent 12.35 days on the island. The highest number of tourists came from Europe (at 46 per cent), the second highest from Asia (at 29 per cent), and the rest from other parts of the world (at 24 per cent). We found the average exogenous cost of the trip (i.e., airfare plus time value of travel) to be USD1,681 per person per trip. On the other hand, the average combined exogenous and endogenous cost was USD 2,936 per person per trip.

Underwater activities such as snorkeling and scuba diving were the most popular among the visitors, with 86 per cent of them partaking in these activities. About 16 per cent of the visitors also engaged in over-water activities such as whale watching. About seven per cent of the visitors went fishing for recreation. A significant portion of the visitors (at 25 per cent of the sample) visited the Maldives for other reasons such as New Year celebrations, honeymooning, or for relaxation.

4.2 Determinants of Travel Demand

We report the estimation results of the four different travel demand models in Table 1. Models 1 and 2 are the Poisson regression (PSR) models of exogenous trip costs and total trip costs respectively. Models 3 and 4 are the respective Negative Binomial regression (NBR) models. Multicollinearity among the model variables was found to be minimal. The maximum correlation was observed between income and the travel cost variables (r = 0.38). We considered estimated coefficients that had conventional levels of probability of 10 per cent or less as statistically significant.

We found a majority of the variables in the PSR models (Models 1 and 2) to have statistically significant relationships with the recreation demand. An increase in the travel costs resulted in a statistically significant decrease in the demand, as hypothesized, in both Models 1 and 2. The statistical significance and positive sign of the coefficients of the income variable were consistent with our expectation. The coefficients of age variables suggested a direct relationship between age and the number of trips, which meant that older people were more likely to visit the Maldivian atolls for recreational purposes. Visitors with a college or professional degree also appeared to visit the islands significantly more often. Marital status and gender variables, however, had no statistically significant impacts on the travel demand.

Contrary to our hypothesis, we found the trip length variable to have a positive influence on the travel demand. While the variable coefficient was not statistically significant in Model 1, it was so in Model 2. This meant that tourists who stayed longer during the trip also visited the islands more often. It is possible that such tourists, who were more knowledgeable about the Maldivian environment, knew what to expect from their recreational experience and, therefore, visited the Maldives more often and spent more time in the Maldives. What this result indicates is that visitors to the Maldives did not substitute the number of trips with the number of days spent on the island. Instead, those who came to the islands more often were also the ones to stay longer in the islands during their trip.[4]

In both the Poisson regression models, we found the recreational use dummy variables to have a significant impact on the travel demand. The only exception was the over-water activity dummy variable in Model 1. Thus, those who engaged in underwater activities (scuba diving or snorkeling) appeared to record a higher visitation rate than those who did not. This suggests that underwater activities available in the Maldivian atolls bring a unique recreational

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[4] This result may have some effect on the welfare (consumer surplus) measures reported in the next section, especially for the model with endogenous travel costs. Visitors who spend more days during a given trip will obviously end up spending more in endogenous costs (food, lodging, etc.). Larger endogenous costs might cause an overestimation of welfare measures.

experience to tourists, which perhaps cannot be duplicated by similar activities in the tourists' home countries. Interestingly, visitors who went fishing on the islands visited a significantly fewer number of times than those who were engaged in other forms of recreation. This could very well be due to the fact that substitute sites for fishing are more easily available in one's own country than substitute sites for diving and snorkeling in the coral reef.

For both the NBR models (Models 3 and 4), the dispersion parameter (α) estimate was statistically significant. This indicates that the trip count data was over-dispersed (i.e., its variance was higher than the mean) because of a large unobserved heterogeneity across tourists. This heterogeneity can be attributed to the fact that the participants in the study came from different parts of the world and from diverse cultural, social and economic backgrounds. It also suggests that a significant number of sample tourists visit the Maldives frequently returning in hopes of an experience they have had before in the Maldives. According to the above, the NBR model appears a better model for the case under consideration. However, only trip cost, income and age were statistically significant. Finally, for all four models, the Chi-square measures of goodness of fit with p = 0.000 suggested that the estimated model coefficients as a whole were significantly different from zero.

4.3   Economic Values of Recreational Use

Using the estimated model, we further calculated the net economic values of recreation or consumer surpluses per visitor and per trip. We present the results in Table 2. Based on Model 1 (2), an average visitor made 3.82 (3.91) trips to the Maldives over the study period of five years for the purpose of recreational activities. The estimated number of trips per person did not vary much between the two models. Considering only the exogenous costs of travel (i.e., as per Model 1), we estimated the economic recreational value from these trips at USD 5,913 per person. This amount is equivalent to a per person trip use value of USD 1,549 and a per day value of USD 121. In a consideration of both exogenous and endogenous trip costs (Model 2), the per person recreational use value jumped to USD 13,004, the per person trip value to USD 3,328, and the per day value to USD 260. As expected, when the endogenous costs were included in the trip cost, the recreational values of marine resources per visitor, per person trip and per day all increased more than double. Such a drastic increase suggests that the costs of on-site tourism services in the Maldives are fairly high. Both in comparison with the reef economic values made available in previous studies and according to our own assessments, the estimates that the present study yields are extremely high. The results confirm the assertions of Ward (1984) and Randall (1994) that endogenous travel cost models would overestimate the recreational use values of resources. Therefore, in the rest of the paper, we confine our discussion to the models based on exogenous trip costs.

The estimated number of trips and the use values were slightly lower for the NBR (Model 3). It estimated the number of trips at 3.64 per person during the study period, the use value per person at USD 5,337, the use value per person trip at USD 1,468 and the use value per day at USD 115. We regard these estimates a bit more conservatively than the estimates derived from the PSR (Model 1), and therefore at best as the lower bounds of the respective economic values.

The above per day values of reef recreational uses, i.e., USD 121 and USD 115 per Models 1 and 3, respectively, are remarkably close to the per day estimate of USD 122 estimated by Bhat (2003) for the Florida Keys coral reef recreational use. However, the per person trip value for the current Maldivian reef use (USD 1,549) was much higher than the value for the Florida Keys coral reef (USD 463). This difference can be attributed to the unusually long length of the trip for the sample visitors of our study (at 12.79 days/trip), compared to the 3.79 days reported for the Florida Keys.

Table 2 also presents the estimated number of trips and per person use values for visitors who were engaged in different recreational activities. As expected, visitors who participated in underwater activities (for e.g., diving and snorkeling) had the most number of average estimated visits at 4.0 per person, along with a per person use value of USD 6,188 during the sample period of five years. The over-water marine recreational users (such as whale watchers and glass-bottom boat riders) had the secnd largest number of visits (at 2.31 trips), followed by other marine users (at 2.27 trips) and recreational fishers (at 2.14 trips). The per person recreational use values for over-water users, other users and fishers were estimated at USD 3,575, USD 3,522, and USD 3,317, respectively. The

above results therefore indicate that diving and snorkeling activities are the most popular recreational activities in the Maldivian atolls.

4.4 Management Implications of Atoll Use Values

Recreational benefits are an important part of the overall natural asset value of the Maldivian atolls. The need to ensure long term protection of this natural asset and, in turn, the recreational industry of the country provide the justification for securing public funding to protect the atolls and their associated resources. Furthermore, both the Maldivian economy and people's livelihoods are largely dependent on marine resources with the marine-related tourism industry a key component of the country's economy. Over and above the beneficiaries from the local economy, however, there is a significantly large user group that depends on this important natural resource. They are the international tourists and the travel-related businesses from all over the world that service those tourists visiting the Maldives. The key economic sustainability question is whether the Maldivian agencies for the conservation of the environment get their share of the tourists' dollar for protecting and regulating these natural resources on behalf of that globally-distributed network of beneficiaries.

There are two main sources of funding that support the Maldivian resource agencies: the central government of the Maldives and overseas donors. In 2007, the total government expenditure on environmental protection was RF 142 million or USD 11.06 million (MPND, 2009). This budget constituted only 1.71 per cent of the total Maldivian Government expenditure of USD 647.9 million. The agencies received another USD 16.30 million from overseas donors in 2007 towards environmental protection (NDMC, 2007b). That same year, an additional USD 14.35 million was contributed by foreign agencies towards tsunami-related recovery activities. Although information on the actual environmental budget needed is not available, our discussions with agency officials suggest that the above funding level may not be adequate to achieve the various environmental goals and protection needs of the marine environment. Also, the overseas funding portion of the available budget for environment-related expenditure is not reliable over time. In this section, we explore therefore two options for the purpose of designing a user-based funding mechanism that would generate enough revenue to cover the above expenditure: (a) a one-time conservation fee at the entry point; and (b) tourism taxes on tourist expenditures incurred on various tourism-related services, for instance, lodging, food, tour boat operations, etc.

4.4.1 Conservation Fee

Compare the above environmental expenditure budget (i.e., USD 11.06 million from the national government and USD 16.30 million from foreign donors) with the total annual recreational use benefits (CS) of tourists visiting the Maldives in 2007 (see Table 3). MPND (2009) reported that during 2007, a total of 675,889 tourists visited the country, with each tourist staying on average 8.5 days per visit. Using the model estimated use value of USD 121 per day, the total annual surplus benefit was computed at USD 695 million. The 2007 annual environmental expenditure (of USD 11.06 million + USD 16.30 million = USD 27.36 million) amounts to only 3.98 per cent of the annual recreational benefit. For instance, transferring just four per cent of the total annual recreational benefit from visitors as a one-time fee towards environmental conservation and protection would generate USD 27.81 million. This is very close to the current government expenditure and foreign donor contributions towards environmental protection (USD 27.36 million). This funding level can either replace the existing funding source, or fund additional and new atoll-related environmental protection and regulation. This new source will also lower the dependence on unsustainable overseas environmental financing.

The four per cent conservation fee, as demonstrated above, amounts to only USD 41 per person per visit (=USD 27.36 million/675,889 visitors per year). Again, it is necessary to compare this additional fee burden to what an average sample tourist spent on each trip, which comes to a total exogenous and on-site endogenous cost of USD 3,348. The suggested additional user fee is only about 1.25 per cent of their total expenditure. In a recent contingent valuation study undertaken for the Baa Atoll in the Maldives, Mohamed (2007) found that tourists were willing to pay an average conservation fee of USD 35 per person. Even if the government decides to implement a user fee of USD 35 per person, more than 85 per cent of the current environmental expenditure can be financed through the new fee, and this new fee would be less than four per cent of their net consumer surplus.

While the user fee suggested above is small, from a political and practical stand point, it is important to understand how this user fee might compare with other expenditures incurred by visitors during their trip. Table 4 reports the sample average endogenous tourist expenditure in the Maldives. This expenditure estimate consists of two components: (a) a portion of the expenditure paid as part of the package cost while booking their travel toward boarding, dinner and some local transportation, and (b) the out-of-pocket, direct expenses incurred by tourists while in the Maldives on food, recreational activities, shopping and other expenses. The portion (a) above can be easily computed by taking the difference between the sample mean of the TRCOST variable between Model 1 (USD 1,682 per trip per person) and Model 2 (USD 2,936 per trip per person) (see Table 2). This difference was computed at USD 1,254 per trip per person. Because the sample average tourist had spent 12.8 days during each trip, the endogenous portion of the package cost of USD 1,254 per trip per person corresponds to a trip length of 12.8 days. We therefore adjusted this average expenditure for the 2007 average trip length of 8.5 days, which amounted to USD 833 per trip per person. The out-of-pocket expenses incurred directly by tourists in the Maldives, i.e., part (b) above, was estimated at USD 834 per trip per person for a trip length of 8.5 days. Therefore, we computed the total expenditure toward on-site travel services [part (a) + part (b)] to be USD 1,666 per person per trip.

Knowing that a total of 675,889 tourists visited the Maldives for recreation in 2007, we estimated that the tourists spent altogether a total of USD 1,126 million (= 675,889 times USD 1,666) towards various travel services in the Maldives. According to MPND (2009), tourist resorts and other related businesses received USD 602 million in 2007, which means that the balance USD 524 million (= USD 1,126 million minus USD 602 million) was made by other tourism-related sectors such as the all recreational tour operators, the local transportation sector, and the retail shops. The MPND further reported that the total tax revenue for the government in 2007 was Rf 2,212 million or USD 172 million, which amounted to 15.31 per cent of the total tourist expenditure (of USD 1,126 million). Therefore, the additional user fee or tax amount of USD 27.36 million, as suggested in the previous section, would raise the current tax burden to 17.77 per cent.

4.4.2 Tourism Expenditure Taxes

We now discuss the option of levying additional taxes on tourism expenditures. The annual expenditure break-down by tourism sub-sectors will give us a better understanding of potential tax sources and possible impacts on visitors and local businesses. As Table 4 demonstrates, we can further divide the on-site expenditure of USD 1,666 per person per trip and the annual total expenditure of USD 1,126 million into different expenditure categories. According to this breakdown, the tourists spent the maximum amount on hotels (35 per cent), followed by food and beverages (23 per cent), recreational activities (19 per cent), miscellaneous (18 per cent), and retail shopping (5 per cent). The policy challenge for the Maldivian government given such a breakdown would be to determine the sector or sectors on whom to impose the new tourism taxes. Since visitors spent the most amount of money on lodging and food and beverages, the proportionate increases in tax on these two items would be lower even if the entire additional budget need is met from the new revenues collected from these two sectors. For instance, in order to raise the USD 27 million that is needed to meet the current annual environmental protection expenditure, the government would have to impose a new tax of 6.85 per cent on hotel expenditure or 10.39 per cent on food and beverages. In contrast, the proportionate tax increases would be 12.73 per cent or 13.59 per cent if the agency were to resort to taxing direct recreational expenditures (such as diving and snorkeling) or miscellaneous activities respectively. Given that visitors spend the least amount of money on retail shopping, the per cent tax burden on this category would be the largest. Table 4 also presents the necessary per cent tax increases if the government had to raise tax revenues by USD 50 million, USD 75 million and USD 100 million in the future.

Smaller percentage increases in the service costs may not face stiff resistance from the users or the service providers. Therefore, the lodging and food taxes seem the logical choices for this purpose. However, if the tax burden was distributed evenly across all five expenditure categories, the additional tax revenue would constitute only 2.4 per cent of the total annual tourist expenditure and 3.44 per cent of the annual tourist recreational benefit. Alternatively, the government could consider a more progressive per cent tax structure. Such a system would place the highest absolute tax burden on the hotel sector which brings in the most tourism dollars and the least tax burden on the retail sector that brings in the least.

According to Bhat (2003), tax increases on snorkeling and diving expenditure may be more practical and justifiable. Users might regard a tax on expenses that are incurred directly in connection with a recreational activity less harsh than a tax on expenses incurred in connection with activities that are more distant from recreation itself such as lodging and food. So a tax on diving gear and diving activity might be more feasible. As indicated above, the proposed tax increases constitute a negligible portion of the recreational consumer surplus. Moreover, a majority of the tourists visiting the Maldives engage in underwater activities. The users would associate the additional user fee on diving with the large expected recreational benefit and, thus, would be unlikely to object to the fee increase. However, this tax would constitute a sizable portion of the snorkeling and diving expenditure (at 12.73 per cent) and would draw stiff resistance from the service providers such as diving tour operators and equipment renters. Therefore, the central government in the Maldives may need to attempt a combination of tax strategies.

The stiffest opposition to new taxes or user fees usually comes not from the tourists themselves but from the local businesses. The suggested tax or the proposed user-based finance system is minimal when compared with actual total tourist expenditure. Nevertheless, hotels and restaurants in the area that receive a large share of the tourists' expenditure dollars but already pay significant amounts to the government by way of taxes may oppose new taxes out of fear that they will adversely affect the volume of tourism due to prospective visitors switching to other recreational destinations. If that were to happen, an alternative for the government is to collect a user fee in the form of an entry fee at the airport that each tourist will pay at the time of entering or leaving the country. Such funds must be reserved for the exclusive use of environmental protection and resource enhancement.

5. Conclusions

In this paper, we have developed a recreational demand model and estimated the economic benefits of recreation in the Maldives for the purpose of verifying whether user-based financing would be cost prohibitive. We then compared this recreational economic benefit with current environmental expenditure and tourists' expenditure. For the travel demand model, we considered two types of travel cost variables, one with only exogenous travel costs and one with both exogenous and endogenous travel costs. Since a large majority of the sample tourists had bought travel package deals, which combined exogenous costs (international airfare and opportunity cost of time) with on-site endogenous costs (hotel, boarding, etc.), we required a separate regression model of package costs in order to distinguish between the two types of cost. We found that the model which combined endogenous and exogenous travel costs to overestimate the economic benefit.

Using the estimated economic values of recreation, we devised alternative means of funding the future atoll conservation programs. We found that the recreational benefits were large enough to justify the introduction of one or more types of new user fees. The additional per tourist tax or user fee necessary to raise funds at the current level of conservation funding (domestic and overseas) is only USD 41. This amount constitutes only a small percentage of what an average tourist spends on each trip (1.25 per cent) and the economic surplus (benefit) s/he derives from each trip (3.98 per cent). Significantly, this amount is comparable with the value of USD 35 that was reported by Mohamed (2007) for one of the atolls as the tourists' mean willingness to pay.

Possible alternative modes of raising funds for the purpose of atoll conservation include a one-time conservation fee to be collected at the time of arrival/departure and expenditure taxes on either hotels, food and beverages or underwater recreational activities. Not all of these tax modes, as pointed out earlier, may however be feasible. Owners of resorts and related businesses who already pay a little over 15 per cent of their revenues in different kinds of taxes may strongly oppose measures that may further eat into their profit margins. Therefore, the government must ensure that the new tax burden is equitably distributed across expenditure sectors. That would generate much-needed funds for environmental conservation without negatively impacting on either tourist arrival or the tourist industry.

Acknowledgements

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Tables

Table 1: The Estimated Models of Travel Demand for Recreational Activities in the Maldives

(Models 1 & 3 include only the exogenous trip cost while Models 2 and 4 include both exogenous and endogenous trip costs)

Variable		Sample Mean	Poisson Regression		Negative Bionomial Regression	
			Model 1	Model 2	Model 3	Model 4
Intercept			0.6612 (2.01)**	0.8123 (2.40) ***	0.5819 (0.93)	0.7560 (1.32)
Trip cost (USD 100/person-trip)	TRCOST	16.817a 29.364b	-0.0633 (-7.19)***	-0.0296 (-8.48) ***	-0.0616 (-3.07) ***	-0.0326 (-3.65) ***
Income (USD10,000/ person)	INCOME	2.674	0.0649 (4.46) ***	0.0367 (2.45) **	0.0556 (1.76) *	0.0361 (1.35)
Age (years)	AGE	42.560	0.0194 (4.95) ***	0.0139 (3.48) ***	0.0183 (2.50) ***	0.0147 (2.10) **
Education (1 = college; 0 = lower level)	EDUCATION	0.738	0.2790 (2.08) **	0.2199 (1.63) *	0.3287 (1.19)	0.2563 (0.95)
Marital status (1=married; 0=otherwise)	MARRIED	0.179	-0.0172 (-0.11)	-0.2008 (-1.27)	-0.0267 (-0.08)	-0.2081 (-0.69)
Gender (0=female; 1=male)	GENDER	0.631	-0.1708 (-1.48)	0.0255 (0.21)	-0.1809 (-0.76)	-0.0445 (-0.19)
Trip length (# days)	TRLENGTH	12.798	0.0103 (1.61)	0.0169 (2.81) **	0.0099 (0.72)	0.0170 (0.71)
Over-water activities (1=yes; 0=otherwise)	OWATER	0.167	0.0883 (0.62)	-0.3768 (-2.11) **	0.0204 (0.06)	-0.2685 (-0.96)
Underwater activities (1=yes; 0=otherwise)	UWATER	0.869	0.6482 (2.80) ***	0.5696 (2.46) ***	0.7242 (1.45)	0.6410 (1.57)
Recreational fishing (1=yes; 0=otherwise)	RFISH	0.071	-0.8433 (-2.34) **	-0.8487 (-2.36) **	-0.9153 (-0.57)	-0.9273 (-0.77)
Overdispersion Parameter	ALPHA				0.2737 (2.16) **	0.2160 (2.09) **
Log likelihood function			-201.02	-192.3	-201.02	-192.3
Chi-squared value			171.72	163.87	146.42	163.87
Significance level			0.000	0.000	0.000	0.000

***Significant at 1 per cent level   **Significant at 5 per cent level   *Significant at 10 per cent level

a Mean exogenous trip cost. b Mean combined exogenous and endogenous trip cost.

Table 2: Trip Responses and Recreational Use Values under Different Model and Use Scenarios

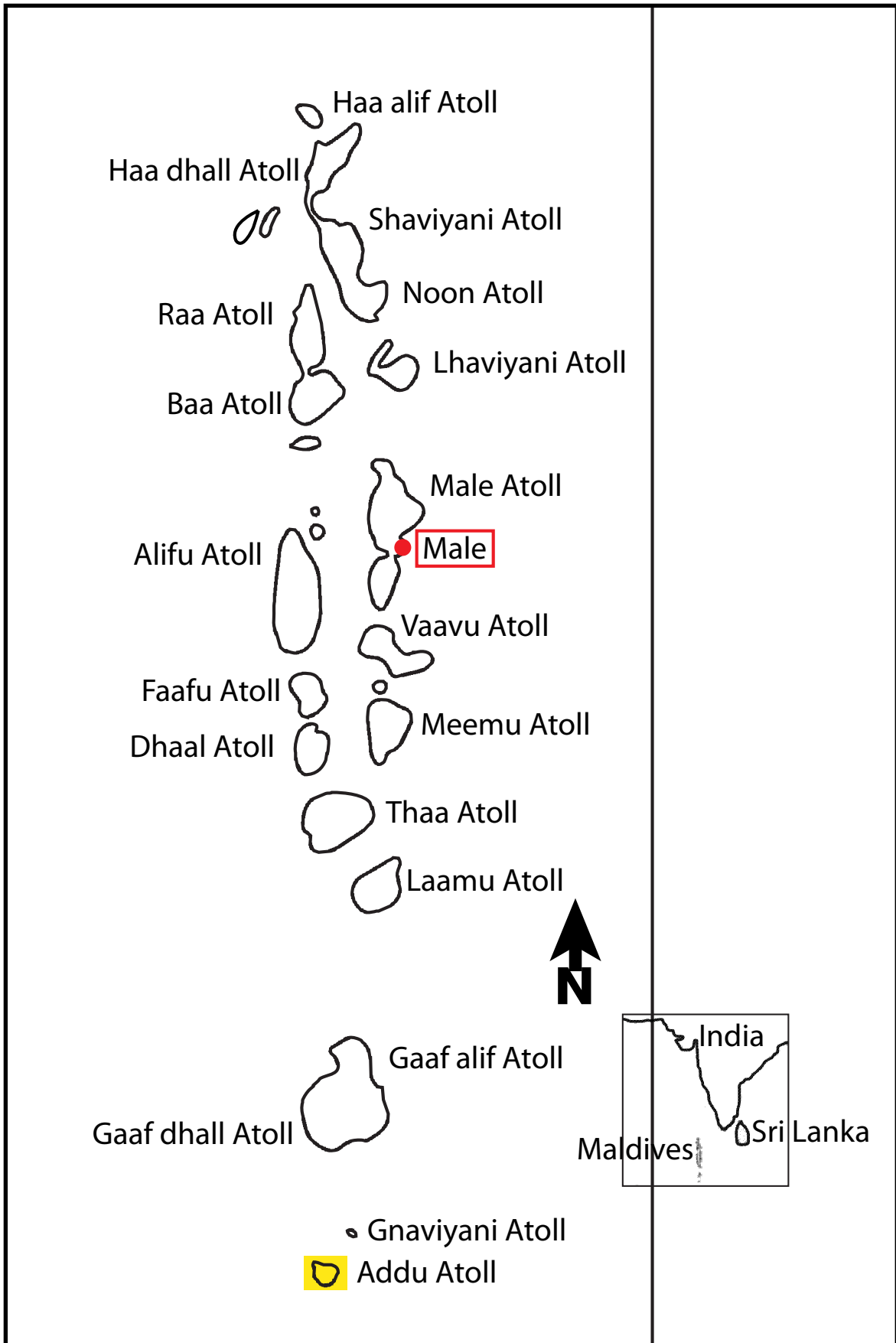| Indicators	For the Entire Sample Using				Over-water Activity	Underwater Activity	Recreational Fishing
	Model 1	Model 2	Model 3	Model 4			
Estimated # of trips per person for five years	3.82	3.91	3.64	3.70	2.31	4.00	2.14
Consumer surplus (CS) per person (USD)	5,913	13,004	5,337	10,565	3,575	6,188	3,317
CS per person-trip (USD)	1,549	3,328	1,468	2,855	1,549	1,549	1,549
CS per day (USD)	121	260	115	223	121	121	121

Table 3: Comparison of Annual Recreational Benefits and Government Expenditure on Environmental Protection in the Maldives
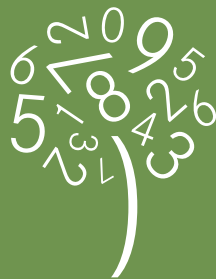
Economic Indicators	Units	Amount	Additional Tax Burden (USD/visit)
A. Consumer surplus (CS) per day	USD/day	121	
B. Average number of days spent	Days/visitor	8.5	
C. Tourist population in 2007	# visitors	675,889	
D. Total annual economic benefit or annual CS of all tourists [A * B * C]	Million USD	695	
E. Annual revenue generated by taxing CS at			
2 per cent	Million USD	14	20.57
4 per cent	Million USD	28	41.14
5 per cent	Million USD	35	51.43
F. Total annual government expenditure (2007)	Million USD	648	
G. Government expenditure on the environment	Million USD	11.06	
Ratio of environmental to total expenditure	Per cent	1.71	
H. Overseas sources donation for environmental protection	Million USD	16.30	
I. Total environmental expenditure [(G)+(H)]	Million USD	27.36	
Ratio of environmental expenditure to annual CS	Per cent	3.98	

Table 4: Tourism Expenditure in the Maldives and Fiscal Impacts of Proposed User-based Financing on Various Tourism Sectors

	Tourist Expenditure		Per cent of Tax on Tourists Expenditure Necessary to Generate Different Amounts of Revenue			
Variable	USD/trip	USD/year	USD 27 mil	USD 50 mil	USD 75 mil	USD 100 mil
On-site portion of the package costs	833	562,836,004				
On-site out-of-package costs	834	563,491,870				
Total on-site expenditure	1667	1,126,327,874	2.40	4.44	6.66	8.88
Expenditure breakdown by sector:			Per cent tax on individual category if one were to raise the entire needed revenue from a given sector			
Hotel	583	393,985,203	6.85	12.69	19.04	25.38
Food and beverages	384	259,748,433	10.39	19.25	28.87	38.50
Recreation	314	212,061,367	12.73	23.58	35.37	47.16
Shopping	92	61,852,743	43.65	80.84	121.26	161.67
Location transportation and other	294	198,680,128	13.59	25.17	37.75	50.33
Ratio of the needed annual tax revenue to annual Consumer Surplus (%)			3.88	7.17	10.79	14.39

Figure 1: Location of the Study Area