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Recreational Value of Vembanad Lake in Kerala Using Individual Travel Cost Method

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A B S T R A C T

The Vembanadlake is the longest lake in India and also the largest wetland ecosystem in Kerala recognized as a Ramsarwetland site. The lake meanders through three districts of the state, Alappuzha, Ernakulum and Kottayam. It has been a source of livelihood to the population living alongside the wetland ecosystem. The economic activity carried in and around the backwater includes fishing, shrimp farming, clam picking, rice cultivation, duck rearing and livelihoods related to recreation like etc. Backwater tourism is a major revenue generation activity for the community by means of house boats, motor boats, shikara boat, speed boat etc. Around 1480 boats were operational in the Vembanadlake which are registered under the Department of Ports, Government of Kerala. The increase in boats is due to increase in the arrival of both foreign and domestic tourists, the increase of which over the past decade has risen by 11.69% and 7.07% respectively. In the year 2018, foreign and domestic tourists who visited the Vembanad in the three districts (Alappuzha, Ernakulum and Kottayam) was approximately 0.63 and 4.48 million respectively. This paper aimed at measuring the recreation benefits obtained by tourists visiting the Vembanadlake (and the wetland ecosystem) using travel cost approach. The model considers number of visit made by the individual per annum as the dependent variable is and several independent variables such as cost of travel, family income, age, family size, time spent and quality of the backwater. The analysis was carried out using trip generating function. The results reveal that, the total recreational value of Vembanad backwater was 363 billion INR. The potential value of the ecosystem necessitates sustainable management and conservation of the lake and the backwater ecosystem, which is being affected by increasing pollution as a result of, ironically, increasing tourist activities.

Introduction

In Kerala there are large number of perennial or temporary lakes which are locally also called as backwater *Kayal*. Kerala is famous for its backwater s which plays a vital role in sustaining the livelihood of local communities living in around the water bodies. During the past two decades there has been consistent increase in the number of tourists visiting Kerala, especially to visit the backwaters.

The Vembanadkol wetland covers about 1515.5 sq. km (http://wiienvis.nic.in/ Database/ramsar wetland_sites_8224.aspx) and is a major back water tourist destination. It is famous for its biological diversity and provides various ecosystem services to the local communities. It supports fishing activities with its rich fish and shell fish resources and also has along its banks Chinese dip nets. Traditional aquaculture, brackish water agriculture (paddy field) are also carried out. Other traditional industries like coir making are also livelihood options for the people living in these areas. There are mangroves and bird sanctuaries and these are the activities that support the livelihood needs of the local population. Apart from these, tourism is growing sector in Kerala and backwater tourism is considered as one of the most popular forms which attracts investors in in houseboats, shikaras, passenger boats, speed boats with various packages etc. as also resorts, Ayurvedic centers, hotels, home-stay, restaurants, shops, travel agents, tour operators, taxi services etc. providing varied employment opportunities. Backwater tourism in Kerala attracts tourists from all over the world. The total number of tourists who arrived in the three districts (Alappuzha, Ernakulum and Kottayam) for visiting Vembanad backwaters was about 0.63 million foreign and 4.48 million domestic tourists (Kerala Tourist Statistics report, 2018), which shows about 11.69& 7.07%increase from its previous year. The increase in number of tourists between 2010 and 2018 has been from 2.82 to 5.11 million, with tourism earnings of 13.62 billion INR in the year 2018 in the three district alone (Kerala Department of Tourism, 2018), clearly indicating the immense potential from backwater tourism.

On the flip side, increasing tourism leads to increase in the number of house boat operations, resorts and other infrastructure development in around the Vembanad backwater which has been affected due pollution generated in the form of solid waste, oil leakage from house boat engines etc. Which are causing damage to the environment and ecosystem of the backwater. This in turn affects other activities such as fishing, clam harvesting an agriculture. This has also led to a shift in employment of the tourism sector.

In this study, recreation benefits obtained from the Vembanad backwater ecosystem was estimated using the Travel Cost Model (TCM). The TCM as a revealed preference method which is derived from the theory of consumer preferences and is measured by estimating the willingness-to-pay for the recreational benefits demanded, but not allocated, through market (Khan, 2006). Further, the perception of the quality of the backwater among the tourists and also their measure of happiness have been taken into consideration for number of visit to the site. This technique has been found to be useful in understanding the benefits of the ecosystem thus enabling the management of human intervention in an environmental sustainable manner (Paul *et al.,* 2014; Varkey *et al.,* 2016) which can be applied in other developing nations where there is risk to the natural capital. The quantification of recreational value as also study the visitors' perception about backwater quality will be highly useful for understanding the benefits of

estuary ecosystem. This will helpful for managing the impacts of human activities as there is growing concern on environmental impacts of backwater tourism.

Materials and Methods

The recreation site selected for this study was Vembanadlake (backwater) which is situated in the central part of the Kerala spread acrossthree districts, namely Ernakulum (North), Alappuzha (West and South) and Kottayam (East). Vembanadlake and wetland is located between Lat. 9º30'46"–10º11'11" N and Long. 76º09'48"–76º25'45"E which is running parallel to the west coast of central part of Kerala.It is the longest coastal wetland water spread area with about 1512.50 Sq Km. It is also the largest lagoon – backwater, humid tropical wetland ecosystem on the South West coast of India, designated as Ramsar site no.1214 during the year 2002 by the UNESCO.

Data collection

The primary survey was conducted during 2018-19 and data was collected using a well-structured questionnaire directly from domestic tourists arriving from different parts of India for recreational purpose to Vembanad backwater. The sample respondents (tourists) at various spots were randomly selected in such a way that total sample size was 120 respondents. Individual Travel Cost Method (ITCM) has been used to measure the individual willingness-to-pay for the recreation site based on visiting rate to Vembanad backwater. Specifically the domestic tourist on single day visit to the Vembanad backwater was selected and expenditure incurred for air, road, water transport to make visit around recreational site was taken for study. The interview schedule consisted of two parts; one which sought respondent profiles such as age, marital status, education, income, place of residence and occupation and other basic information; and the second to measure the recreational behaviour of the visitors, which included questions on the number of visits, time spent, travel expenditure, mode of transportation and backwater qualitative aspects like ranking of both backwater quality and their overall satisfaction of the backwater trip.

Tools and techniques

Recreation benefits obtained from the Vembanad backwater ecosystem were estimated using the Individual Travel Cost Model (TCM). It is a revealed preference method which is derived from the theory of consumer preferences and is measured by estimating the willingness-to-pay for the recreational demanded destination. It is used to estimate economic use values associated with ecosystems or sites that are used for recreation. In the TCM, the environmental quality and demand for the site assume weak complementarity between them and measure how the environmental quality of the good (in this case Vembanadlake) affects the frequency of the visit by the people. It was assumed that the individuals utility depends on the total time spent at the site, the quality of the site and the quantity of private good other than travel consumed (Turpie and Joubert, 2001; Turpie *et al.*, 2001; Bockstael, 1995; Willis and Garrod, 1991 and Clawson and Knetch, 1966). The time spent on the site can be represented by the number of visits.

The recreational use value of the Vembanad backwater was estimated using Individual travel cost method. In this model, dependent variable is considered as number of visit made by the individual per annum and the independent variable such as cost of travel, family income, age, family size, time spent and quality of backwater. The analysis was

carried using trip generating function with count data poisson model (Hellerstein, 1991).

Here the Individual Travel Cost of single site model was used to describe the demand for recreation of a person during a year. The quantity demanded is the number of visits, price is the cost per visit and other variables are age of the respondent, income, experience, availability of substitute sites which may affect the number of visits to the site etc. The functional form is as given below:

$V=f(tc_v,tc_s, y, z)$

Where,
V= number of visits during a season
tc_v = cost of a visit
tc_s = price of trip to substitute site 's' (expect a positive correlation)
z = vector of socio-demographic characteristics of the respondent (age, gender, marital status, experience, etc.)

Description of variable

S.No	Variable	Description	Unit
1	Age	21-30, 31-40, 41-50, 51-60, Above 60	No. of Years
2	Income	Income groups: 0-15000, 15001-30000, 30001-45000, 45001-60000, 60001-75000, Above 75001	Rupees
3	Family size	Open ended question	Number
4	Time spent	Total hours spend at the Vembanad backwater	Hours
5	Mode of transport	Owned vehicle, Hired vehicle and Public transport	Number
6	Cost of travel	Total cost from home to Vembanad backwater.	Rupees
7	Backwater quality	Very poor, poor, fair, good and excellent	Number

The empirical model

$$lnV= \alpha+\beta_1 TRVLCO +\beta_2 HHI + \beta_3 FSIZE + \beta_4 TIMESP+ \beta_5 MOT + \beta_6 BWQLTY+ \mathcal{E},$$

Where,
V = *Number of visits made by individual per year*
TRVLCO = *Individual total cost of visiting the site (Rs.)*
HHI = *Income of the household (Rs. /Month)*
AGE = *Age of the respondent*
FSIZE = *Family size*
TIMESP = *Time spend*
MOT = *Mode of transport*
BWQLTY = *Backwater quality*
$\mathcal{E}$ = *Error term*

Finally the Individual Consumer Surplus (ICS) of the recreational site was estimated with the help of integrating generated demand curve (between the number of visit made by the individuals per annum and the cost incurred to made that visits). Individual Consumer Surplus can be calculated by using the following formula (Damigos and Kaliampakos, 2001, Willis, 1991)

$CS = - 1/\beta_{ij}$

Where,
CS - Consumer Surplus per person per trip
β_{ij}- Coefficient of travel cost.

The total annual consumer surplus obtained from the recreation site can be calculated by multiplying the ICS with the number of visits made in a year (Mohammed El-Bekkay *et al.,* 2013). The total recreational value of theVembanad backwaterwascalculated using the formula,

$V_R = CS * V_n$

Where,
V_R=Value of recreational services (Rs. per annum)
CS =Consumer surplus per visitor (Rs.)
V_n=Number of visitors per annum

Multinomial logistic regression model

The multinomial logistic regression model was used to assess happiness among visitors in Vembanad backwater. In this model "Somewhat happy" is taken as the baseline category for group level comparison, i.e., the model compares probability level of being 'very happy' and 'happy' compared to that of 'some-what happy' (Hancock, 2013). The fitted regression model is given below:

$$\boldsymbol{Y_i = In\ (P_j / P_1) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + e_i}$$

Where,
Y_i = Level of happiness (Very Happy; Happy: Some What Happy)
X_1 = Age of household
X_2 = Income of household (Rs)
X_3 = Quality of the Vembanad backwater (ranking)
X_4 = Mode of Transport
X_5 = Travel cost (Rs)
X_6 = No of visits

Results and Discussion

The Vembanadlake and wetland is situated in Kerala and is located in three districts namely Ernakulum, Alappuzha and Kottayam. The number tourists (both foreign and domestic) who arrived in these three districts between 2010 and 2018 (Kerala Tourism Department, 2018) is presented in Figure 2. Out of the total tourists, nearly 87 % are domestic tourists and the remaining 13% from other countries. Compound growth rate estimated for the total tourist arrived over the period from 2010 to 2018 in the three districts showed that there was 7.5 %increase in tourist arrival per annum. The main reason being the unique wetland ecosystems of Vembanad lake which is a major backwater tourist destination with tourists mainly going for boating and appreciating the aesthetic beauty of the land and water bodies, having a taste of the traditional local culture and its biodiversity (Vincy *et al.,* 2012). This also indicates that there was a rapid growth in the backwater tourism, which was bound to have an impact on the water quality which in turn would reduce the aesthetic value of the estuary and affect recreational visitation, which is crucial for the tourism revenue generation(Abraham, 2015; Thimm, 2017).

The descriptive analysis from the socio-demographic characteristics of the respondents is given in the Table 1. This study found that about 67.5 % of the tourists were from urban areas. About 63.3% of respondents were married and 36.7% were single.

Figure 3 shows the distribution of the respondents based on their age and income group. Normally age is an important factor which determines the recreational activities.

Respondents up to 30 years were more frequency of visiting the Vembanad backwater (41.7%). Respondents who were 51 years and above were only about 5%. Overall about 87 (72%) out of 120 visitors were less than 41 years of age. The result clearly shows that young people travel long distances to spend their leisure time rather than older people. The next essential variable to be studied is income of the respondents and it is observed that 35.8% of respondents fall in the income class of INR 20001-50000 per month. The middle income group varies from INR 50001 – 100000 per month of about 27% and 13% of high income group respondents fall under the income category of above INR 100000 per month. Overall, about 79 % of the households fall in the income range of INR 10000 to 75000 per month.

The mode of transportation is shown in Table 3 and it is found that majority of the respondents were coming in their own vehicles (38.33%), since hiring private vehicles is expensive. About 29 % respondents depend on public mode of transportation and 32.5% on private vehicles to reach the recreation site.

The respondents were asked to express their opinion about the quality of the Vembanad backwater on a 5 point scale (very poor, poor, fair, good and excellent). The opinion of the respondents' recreational benefits is given in the Table 4. It is found that 32.5%of the respondents expressed good opinion about quality of Vembanad backwater and 45.8 % of respondents felt from range of fair to very poor in the quality of backwater. This is an indicator that the lake has been affected by various forms of pollution. Studies have pointed out that there was decline in the backwater quality due to regular discharge of domestic and municipal sewage waste, apart from that discharge of waste from fish and shrimp processing units, oil spillage, solid and liquid wastage from houseboat, coir retting, liquid insecticide, weedicides, fungicides and chemical fertilizers discharged from the surrounding paddy field area reach in to this Vembanad backwater (Safoora *et al.,* 2014, Sitaram, 2014; Balachandran *et al.,* 2005). About 21.7% of respondents said that the quality was excellent. From our analysis it is inferred that substantial percentage of the visitors felt that the quality of the backwater is good compared to their places. This perception might be a reason for increase in tourist footfalls to this area. However there has been exploitation in terms of encroachment and reclamation of estuarine ecosystem by the other means of expansion such as harbor development, agriculture, coir industries and aquaculture (Sitaram, 2014). Apart from that, the waste generated from the treated and untreated sewage, deposits from the surrounding settlement as well as houseboats, pollution from the tourism port are also major issues (Mathew *et al.,* 2017;) and may have an impact on tourism in future.

The total coliform Bacteria are 30% higher in Houseboat jetty than in the remaining area.

It may compromise their future ability to sustain healthy ecosystems and the provision of ES. Such deterioration comes in the form of water quality reduction from pollution, eutrophication and mining activities, but also as encroachment and reclamation of lake area (Kokkal *et al.,* 2007; WISA, 2013).

Multiple regression analysis was employed in order to measure the individual consumer surplus, which is mainly used to determine important factors contributing to the visit made by the individual in a year. The recreational use value of the Vembanad backwater estimated using Individual Travel Cost Method is given in the table 5. The R square variable was 0.51, i.e., 51% of the dependent variable is being explained by the

independent variable. Based on these variable construct a demand function for the Vembanad backwater was developed as follows:

$$lnV = 0.5518 - 0.00001_{(TRVLCO)} + 0.00002_{(HHI)} - 0.0045_{(AGE)} - 0.0499_{(FSIZE)} - 0.0096_{(TIMESP)} - 0.0831_{(MOT)} + 0.0917_{(BWQLTY)} + \mathcal{E},$$

The regression results revealed that, the negative coefficient of the travel cost shows that travel cost incurred by an individual is inversely related to number of visits to the backwater per annum (Anoop *et al.,* 200; Vijayan and Job, 2015). The negative sign indicates that higher the amount spent on travel by visitors to reach the Vembanad backwater, lesser is the frequency of their visit, i.e., people living nearer to the Vembanad backwater made frequent visits and those living far away from the backwater made fewer trips. Another variable which positively influences the visitation rates was monthly income of the respondents. This indicates that higher level of family income increases the backwater visitation rates, with surplus incomes for recreational activities. Age and family size shows significant and opposite relationship between the annual numbers of visits, indicating that with increase in family size and age visits to recreational sites was less. Another crucially important variable is the respondent perception about the quality of the backwater, which shows significant positive relationship with number of visits. This indicates that improvement in the quality of the Vembanad backwater will increase the number of visitors per annum in the recreational site. It is generally observed that pollution is more obvious during the dry season when the tourism demand is also high coinciding with the domestic holiday season and the assimilative capacity tends to be less (Paul *et al.,* 2014). The decline in the quality of the Vembanadback waters was due to continuous increase in the number of houseboats, resorts and hotels to meet the increasing demand, without considering the supporting capacity of the natural ecosystem with in which they reside it (WISA, 2013; Paul *et al.,* 2014; and WISA & CWRDM, 2017).

Estimating of consumer surplus

With help of the above estimated demand curve, individual consumer surplus were calculated which is INR 81039.61 per person (Table 6). The total consumer surplus has been arrived by multiplying with the total number of visitors at the site during the year (as per the Kerala Tourism Statistics, 2018) and has been calculated at INR 4.48 million. Hence the total consumer surplus was estimated at Rs.363.32 billion, which is the annual recreational use value of the Vembanad backwater.

A multinomial logit model (Hencock, 2013) was used to measure the variables influencing happiness among the visitors to the Vembanad backwater. In the multinomial logit regression, the base option in the categorical variable is used for baseline comparison groups. In the iteration the log quickly converged and overall the model is significantly fit with likelihood ratio chi-square value of 87.2. Table 7 shown that travel cost is not significant, but the coefficient of backwater quality is positive and also highly significant in both ‘very happy’ and ‘happy’ visitors, which indicates that quality of the Vembanad backwater decided their happiness rather than the cost incurred for the for visiting the recreational site. In addition to that, visitor’s income and their mode of transportation also significantly influenced their level of happiness.

Table.1 Socio-demographic details of respondents visiting at Vembanad backwater

Particular		Frequency	Percentage
Location	Rural	39	32.50
	Urban	81	67.50
	Total	***120***	***100***
Gender	Male	64	53.33
	Female	56	46.67
	Total	***120***	***100***
Marital status	Married	76	63.33
	Unmarried	44	36.67
	Total	**120**	**100**

Table.3 Different mode of travel details about visitors

Mode of travel	Frequency	Percentage
Own vehicle	46	**38.33**
Hired vehicle	39	**32.50**
Public transport	35	**29.17**
Total	***120***	***100.00***

Table.4 Visitors' perceptions related to the quality of Vembanad backwater

Backwater quality	Frequency	Percentage
Very poor	2	1.67
Poor	20	16.67
Fair	33	27.50
Good	39	32.50
Excellent	26	21.67
Total	**120**	**100**

Table.5 Parameter estimates of trip generating function

Variable	Coefficient		P value
Constant	0.5518***	0.1694	0.0014
TRVLCO	-0.00001***	3.05e-06	0.0000
HHI	0.00002***	6.22e-07	0.0008
AGE	-0.0045**	0.0021	0.0278
FSIZE	-0.0499*	0.0233	0.0343
TIMESP	-0.0096	0.0075	0.2019
MOT	-0.0831***	0.0252	0.0052
BWQLTY	0.0917***	0.0292	0.0004
R^2		**0.51**	

Note: ***, ** and * implies significance at 1 %, 5 % and 10 % respectively. (Standard errors are presented in Parenthesis)

Table.6 Recreational value of Vembanad backwater

Particulars	Value
Consumer surplus per visit (INR)	81039.61
No. of visitors per annum (Nos)	4483200
Total consumer surplus (INR)	363316779552
Recreational value per annum (billion INR)	363.32

Table.7 Happiness among visitors in the Vembanad backwater

	Coefficient	Std. Error	z	p-value
Very happy Vs Somewhat happy				
Constant	-11.0133**	4.4576	-2.4700	0.0130
Age	-0.0250	0.0420	-0.6000	0.5520
Income	0.0001**	0.0000	2.5200	0.0120
Quality of backwater	5.3840***	1.5523	3.4700	0.0010
Travel cost	0.9212	0.8145	1.1300	0.2580
Mode of transport	-0.0004***	0.0001	-3.2600	0.0010
No of visit	2.2369	1.3919	1.6100	0.1080
Happy Vs Somewhat happy				
Constant	-6.0441	4.2590	-1.4200	0.1560
Age	-0.0484	0.0400	-1.2100	0.2260
Income	0.0001**	0.0000	2.5600	0.0100
Quality of backwater	4.5797***	1.5354	2.9800	0.0030
Travel cost	0.9218	0.7943	1.1600	0.2460
Mode of transport	-0.0004***	0.0001	-3.2800	0.0010
No of visit	1.0046	1.3615	0.7400	0.4610
***Base:* Somewhat happy**				
Multinomial logistic regression –Likelihood chi square = 97.4 *(p value : 0.0000)*				

Note: *** 1%,** 5%& *10% level of Significance

Figure.1 Map showing the location of Vembanadlake and wetland, Kerala, India

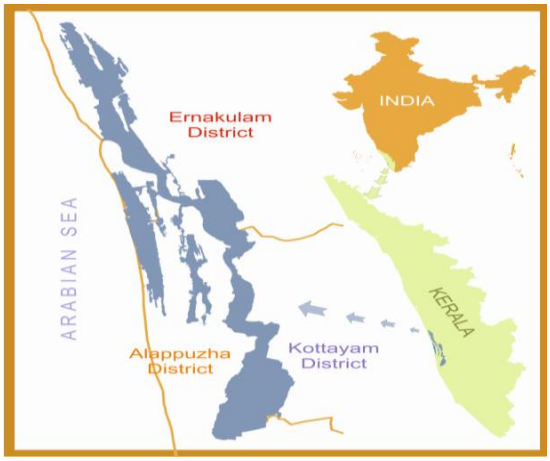


Figure.2 Total no of tourist arrived in three district (Ernakulum, Alappuzha and Kottayam) of Kerala during the year 2010 to 2018

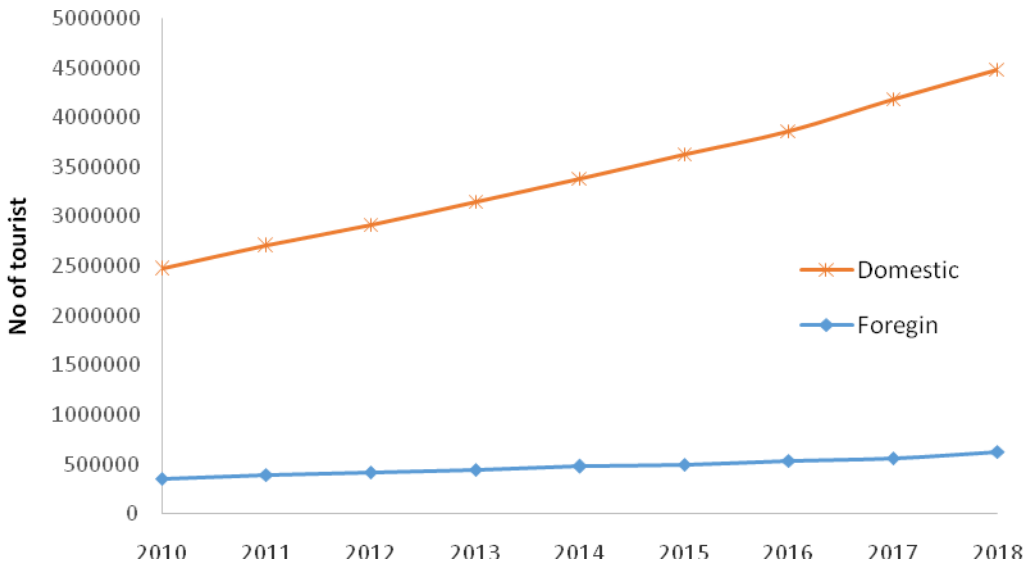
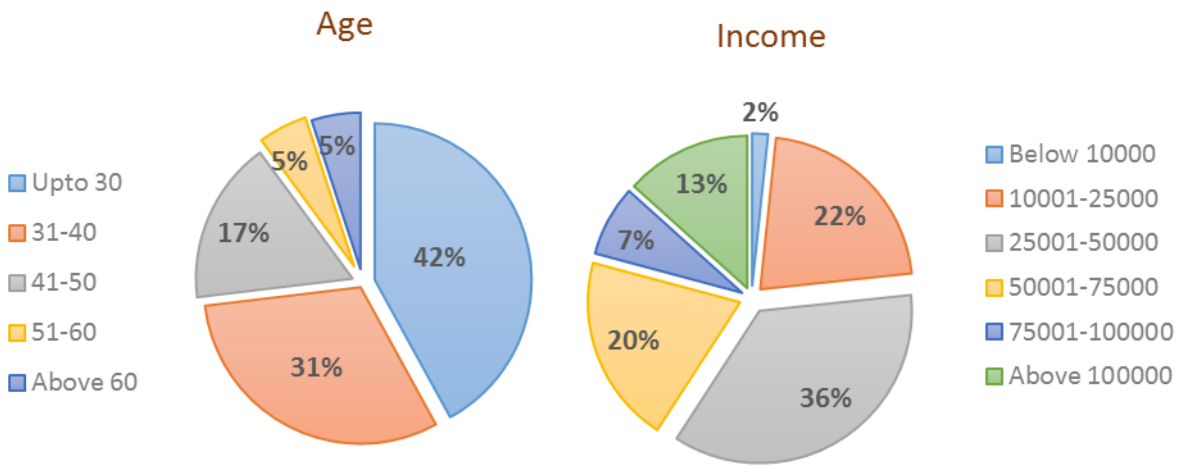


Figure.3 Age and income group distribution of tourist respondents



In conclusion, the results of the above study clearly indicate that visits of domestic tourists to the Vembanad backwater is influenced by their income and quality of the backwater. Travel cost, age, family size and mode of transportation have negative impacts and improvements in transport infrastructure and reduction in costs can improve visitations to the Vembanad backwaters and increase backwater tourism, which has a recreational use value of about INR 363 billion and individual consumer surplus of INR.81039. Over the coming years there will be increase in number of tourists and consequent to this (and other factors) increase in the pollution which if done without considering the supporting capacity of the natural ecosystem will have negative consequences. If it

continues in future, deterioration of water quality will negatively impact on number of tourist visitation rate, which will not only affect the revenue generation from the tourism industry, but also affect the livelihoods of the different people dependent on it. The backwater is a common property resources and various stakeholders such as boat owners, resort, hotels, homestay etc. must take responsibility and come forward to improve the backwater quality. Similarly the percentage of state government fund allocated to protect the wetland water bodies insufficient, and importance on spending funds on setting up of stalls, arranging exhibitions in foreign countries and organizing tourism melas etc. will only serve limited purposes. Other government bodies like the Pollution Control Board also need to take adequate responsibility to protect the water bodies from all sorts of pollution. It is important to manage the impact of human activities so that the backwater tourism can be sustained and will continue to provide economic benefits to the people dependent on it as well as recreational benefits to tourists visiting. .

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