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Use Values of an Estuarine Ecosystem: the Case of Ashtamudi Estuary in South India

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Estuarine ecosystems are very unique with respect to biodiversity as well as the services provided to the community. Ashtamudi estuary in Kerala state is a RAMSAR site and designated as the "wetland of international importance". It provides means of livelihood for the people surrounding it by way of fishing, coconut husk retting for coir production, and inland navigation services. The estuary supports 92 identified fish species including prawns, crabs and other bivalves, of which 28 are of commercial importance. The clams from this estuary are being exported to countries like Japan. Retting of coconut husk, which is a pre – treatment for coir production, is another major economic activity and a source of livelihood for people.

There are umpteen number of direct use benefits provided by the estuarine ecosystems. In case of Ashtamudi estuary the direct use benefits identified for valuation includes fishery, coconut husk retting, inland navigation and recreation.

At present the estuary is facing severe threats from human as well as non- human interferences like pollution, land - reclamation, over-fishing etc. Under these circumstances, an attempt was made to quantify the direct use values of the estuary to appraise the need of conserving and managing it in a sustainable manner.

METHODOLOGY

The study area was Ashtamudi estuary in Kollam district of Kerala. Respondents for collecting primary data were selected at random from the panchayats surrounding the estuary. There were three categories of respondents viz. fishermen, coir producers and visitors. A total of 120 sample respondents were selected with 40 in each category. All the direct use values identified for valuation, except recreation, are marketed in nature. Hence the market valuation approach was employed to estimate the value of those direct use benefits. In case of recreation a standard travel cost model was employed for the purpose.

For valuing the inland navigation benefits data regarding the revenue generated from the ferry services operated by Kerala State Water Transport Department was collected. Data regarding the tourist arrivals to Ashtamudi estuary were collected from the District Tourism Promotion Council, Kollam.

For the marketed use benefits net returns obtained from marketing the resource was considered for assessing the value which is represented as ,

Net returns = $\sum (P_i Q_i - C_i)$ ……. (1)

Where,

P_i = price of the i^{th} resource

Q_i = quantity of i^{th} resource

C_i = cost of extracting or marketing the resource

Travel cost method of assessing the recreation benefits assumes a count data model (Poisson distribution). Here the factors affecting the number of visits made by a visitor to the site is considered and can be represented as follows,

$Q = \exp (\beta_0 + \beta_1 A_i + \beta_2 MI_i + \beta_3 S_i + \beta_4 MS_i + \beta_5 TC_i + \mu_i)$ …….. (2)

Where,

A_i – Age of respondent in number of years

MI_i - Monthly household income (Rs.)

S_i - Dummy for gender (male- 0, female – 1)

MS_i - Dummy for marital status (unmarried-1, married-2)

TC_i – Travel cost incurred per trip to visit the site including opportunity cost (Rs.)

μ_i - Error term.

The recreation value is estimated as the consumer surplus of the visitors which can be obtained as

$$CS = | 1 / \beta_5 |$$

Where, β_5 is the estimated coefficient of travel cost.

Here the distance traveled by the visitors is not considered in the model because of its co-linearity with the travel cost.

The model was analyzed using the count data programme in LIMDEP (statistical package).

Aggregate direct use values were derived for each benefit and were discounted at four percent rate to obtain the net present value (economic value). The discount rate of four percent is widely accepted in social science research especially to value the natural resources because of lack of well defined property rights.

Net present value = S / d

Where, ‘S’ is the expected annual benefit and ‘d’ is the rate of discount.

RESULTS

Fishery constituted the major share among the direct use values. Value of fishery was estimated as the net returns from the different fishing gears used in the estuary. Cast net, a stationary net used for capturing the fish coming and going out during high and low tides, accounted for largest share of net returns with Rs. 19.2 million per annum followed by clam collection (Table 1). The total net returns from fishery in Ashtamudi estuary amounted to Rs. 67 million per annum (Table 1). The higher value of fishery can be attributed to the large fish stock and umpteen number of fishing units operating in the estuary. Clams from the estuary are now getting a premium price owing to overseas demand from countries like Japan.

Details of travel cost model are presented in table 2 which shows that age of the visitors and the travel cost are had significant negative influence on the number of visits taken in a year. The annual consumer surplus per visitor was estimated to be Rs. 83.33 and the recreation benefit for the estuary as a whole amounted to Rs. 1.50 million. The number of travelers visiting the estuary is comparatively low due to lack of better tourism and other recreation amenities.

Coconut husk retting service offered by the estuary accounted for Rs. 5.10 million per annum and the value of inland navigation service amounted to Rs. 3.70 million per annum (Table 3). The net present value of each direct use benefit, using a discount rate of four percent, is also presented in table 3. The total direct use value of Ashtamudi estuary was estimated to be Rs. 77.30 million per annum among which fishery alone contributed Rs. 67 million. The aggregate net present value of direct use benefits of Ashtamudi estuary amounted to Rs. 1927.50 million.

CONCLUSIONS

Results of this study has clearly shown that fishery is the major direct use value of Ashtamudi estuary and hence it should be the focal point for the economic development of the estuary since majority of people living around the estuary earns livelihood out of fishing. Nowadays signs of decline in fish availability in Ashtamudi estuary have been noticed according to the fishermen, scientists as well as environmentalists. Hence there is a need of initiating concerted effort with people's participation to conserve the fish stock of the estuary in a sustainable manner. The value of coconut husk retting is low because of depression in the coir sector due to low price and competition from near by states especially Tamilnadu. Local bodies and governing authorities can initiate programs to improve the marketing of coir with the coordination of self help groups by encouraging product diversification of coir. Tourism sector of Ashtamudi estuary is still in its infant stage with poor recreation amenities and facilities. District tourism promotion council as well as private agencies can tap the benefit out of recreation potential of the estuary. Regarding inland navigation also there is ample scope for availing better service and value since the current ferry services and facilities are inadequate which is reflected as the low value of this service.

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Table 1: Net returns from fishery – gear wise (Rs / annum)

Sl.No.	Type of gear / collection	Net returns (Rs. million / annum)
1	**Gill net**	10.80
2	**Cast net**	8.80
3	**Sein net**	7.90
4	**Stake net**	19.20
5	**Chinese dip net**	6.80
6	**Clam collection**	13.50
	Total	67.0

Table 2: Recreation value (Travel cost – count data model)

Variable	Coefficient	Standard error	t - stat
Constant	2.53**	0.347	7.283
Age	-0.231E-01**	0.781E-02	-2.958
Gender	0.183	0.216	0.845
Marital status	-0.469E-01	0.234	-0.200
Travel cost	-0.120E-02*	0.504E-03	-2.379
Log likelihood function	- 55.08757		
Consumer surplus per visit (Rs.)	**83.33**		
No. of visitors per year	18250		
Recreation benefit (Rs. / annum)	1,520,773		

Note: ***** and ** indicate significance at 5 % and 1 % levels respectively

Table 3: Total direct use value of Ashtamudi estuary

Sl . No.	Value	Value (Rs. million per annum)	Net present value (Rs. million)
1	Fishery	67.0	1670
2	Coconut husk retting	5.10	127.50
3	Inland navigation	3.70	92.50
4	Recreation	1.50	37.50
	Total	**77.30**	**1927.50**