



Indirect and Non-use Values of Halda River- A Unique Natural Breeding Ground of Indian Carps in Bangladesh

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Abstract: Bangladesh is a Riverine country; however, Halda River is of special interest among them in recent time for being the only tidal freshwater River in the world that serves as a natural spawning ground for major Indian carps. Besides, this River serves some indirect and non-use values. This study aims at estimating the economic worth of the indirect and non-use value of Halda River. Both indirect and non-use values of this River were calculated by using contingent valuation method. The study found that total indirect use value per year from this River was Tk. 29.50 million. We also estimated that total non-use value was Tk. 31.46 million which comprised of bequest value of Tk. 14.85 million and option value of Tk. 16.61 million. The study suggests that this valid source of information should take into consideration for the decision makers in taking projects and programmes aimed at managing this River more wisely in the future.

Keywords: Contingent valuation method, Halda River, Indirect value, Willingness to pay

Introduction

Halda, the third main River of Chittagong after the Karnaphuli and the Sangu, is a resourceful River of Bangladesh which provides as a source of drinking water supply, income source of adjacent fishermen, natural spawning ground for major Indian carps, a hot spot for biological diversity, place for tourism and so on. Originating at the Batnatali Hill Ranges of Ramgarh Upazila under Khagrachari District, Bangladesh, the River flows through Fatikchhari, Hathazari and Raozan Upazilas and Chandgaon Thana of Chittagong before ending into the Karnaphuli River. This is the only River in Bangladesh from where fertilized eggs of major carps are collected (Tsai *et al.*, 1981; Patra and Azadi, 1985). This River is famous as a breeding ground for pure Indian carp fish populations. As a tidal River, this is the only of its kind in the world from where fishermen can collect fertilized eggs directly (Kibria *et al.*, 2009). In past, sixty percent of the country's pond carps culture was reliant on the fish fry naturally produced in the River which is of insurmountable economic and nutritional value. The River also provides navigation, drinking water supply and generates an unparallel number of employment opportunities for the local communities. In this way, it plays pivotal role in the local and the national income generation which makes this River a natural resource of immense economic value.

Marketed and marketable goods and services are well accounted for in the decision making process in both developed and developing countries. This is due to the assigned or easily assignable values attached to them. However, most non-market benefits remain unaccounted for in the decision-making process, particularly in developing countries like Bangladesh, mostly because of the difficulties they present in

bringing them under agreeable valuation scheme. To some extent, valuing the environment is more important in developing countries in that there needs to be a balance between the goals of economic development and environmental protection or conservation (Alam, 2006). Proper valuation of non-market environmental goods has significant policy implications. The 'true' economic value of environmental resources e. g. Halda River is accounted for when making investment whether from Government or private sector as well as in making environmental policy decisions. Such non-marketable goods are generally been assigned zero or low values. The depletion of floodplain and wetland resources in Bangladesh demonstrates the acute failure related to proper accounting of the values of environmental resources which has resulted in decisions leading to negative implications on the environment and society (Alam, 2006). So far no such study has been done to evaluate the indirect and non-use value of Halda River. Consequently, this study was aimed at estimating the indirect and non-use value of this Riverine order to give the decision makers a basis for coming up with its better management.

Methods and Materials

Study area

Halda, a River flowing through the South-Eastern landscape of Bangladesh was selected purposively for the study on total economic valuation of indirect and non-use values of this River.

Sampling design for questionnaire survey

A total of 65 villages located along the two banks of Halda River were identified. Of which, 12 villages were sampled at six locations (Fig. 1) in such a way that two villages of along the two banks can be

accessed by crossing the River with the help of boat. These six locations, 12 villages, were selected at an interval of about 5-7 kilometers apart from each other. From each village 10 households were selected on the basis of the respondent's willingness to participate in

the survey to provide information about Halda River. Both male and female respondents were selected for questionnaire survey ignoring the participants under the age of 18 years. From the 12 sampled villages, the total sampling population was 120.

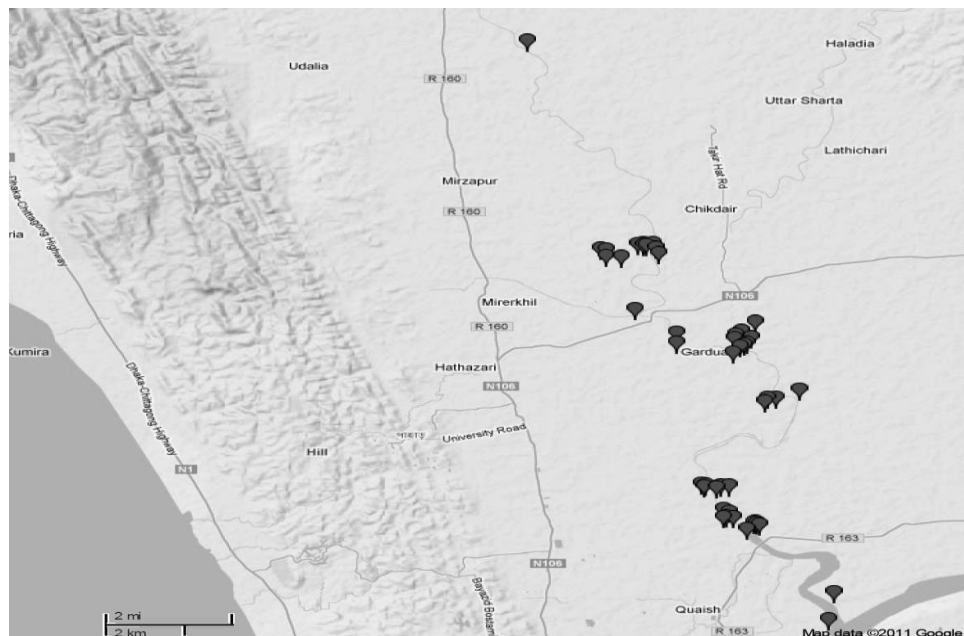


Fig.1. Map showing the geographic position of some of the surveyed households at different locations along the Halda River

Data collection

A pilot survey was undertaken through contingent valuation method (CVM) to amend questions and interviewing technique with 20 households at different parts of the study area. After modifying the questionnaire, both indirect (biodiversity and recreational use) and the non-use value¹ of Halda River, i.e. option value, bequest value was collected following the recommendation of by NOAA panel on contingent valuation method (Arrow *et al.*, 1993) from month of August to November 2012. To execute this calculation, respondent's average willingness to pay (WTP) for indirect and non-market resources of this River for future generation is multiplied the total households of study area.

¹**Option value** is the extra payment an individual is willing to pay to ensure that one can make use of resource in the future. To measure the option value, respondents were questioned about how much they would be paid in order to conserve the goods and willing to reduce the consumption for future.

Bequest value is preserving the resources and the environment for other generations. People may value being able to pass on certain natural resources or environmental function to their children.

Data Analysis

Quantitative data from questionnaire survey were processed and analyzed by Statistical Package for Social Science (SPSS, version-16.0) and Microsoft Excel 2010.

Results and Discussion

Indirect Use values of Halda River WTP for Biodiversity of Halda River

Among 120 households surveyed, only 22.43% respondents were willing to pay for biodiversity of Halda River. The number of positively responding households increased with increasing bid amounts up to Tk. 101-150. Surprisingly, none of the participants were willing to pay the highest bid (Tk. >250) for biodiversity of Halda River. However, number of participants at bid amount Tk. 101-150 was significantly higher than that the lowest bid (Fig. 2).

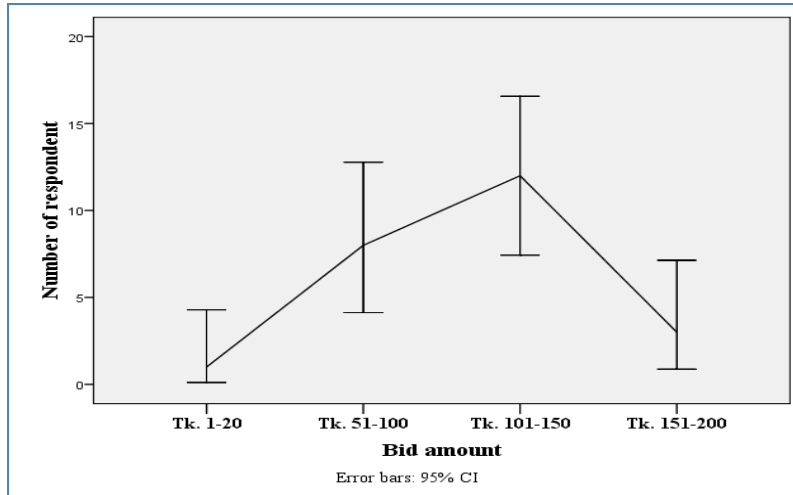


Fig. 2. Households' WTP for biodiversity of Halda River

Respondent households' mean WTP for biodiversity was Tk. 107 per month. Based on it the total annual

economic value of biodiversity of Halda River was estimated to be Tk. 15 million (Table1).

Table 1. Total annual WTP for biodiversity of Halda River by the inhabitants of its two Banks

Category	Amount
Mean household's WTP for biodiversity in Tk.	107
Proportion of household's number responded	22.4%
Total number of households of villages along the two bank of Halda River	51,433
Total WTP by the households of adjacent villages of Halda River annually (in Tk.)	14,812,704

Notes: Total number of households along the two banks of Halda River as per the authors' calculation from the population census, 20011.

WTP for recreational use of Halda River

Only 35.51% of the respondents from surveyed households voted in favor of WTP for recreational use of Halda River and the rest of them vote against WTP *i.e.*, they opted to accept compensation if they are to refrain from the recreational use of Halda River. In case of WTP, the number of respondents

from households was increased up to bid amount Tk. 51-100 and then decreased gradually (Fig. 3). This figure indicates that the demand for recreational use of Halda River were decreasing with increasing the bid amounts and number of respondents at lowest and highest bid amounts were significantly decreased than the peak pint (Tk. 51-100).

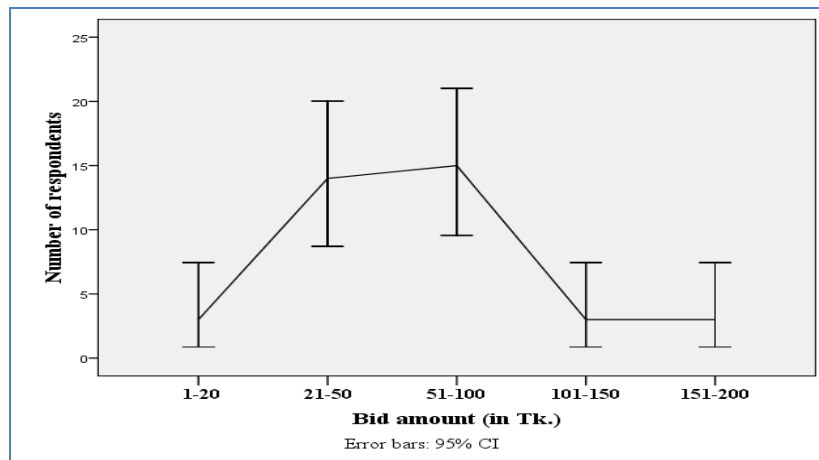


Fig. 3. Households' WTP for recreational use of Halda River

Total annual WTP for recreational use of Halda River by respondents from households along its two banks was more than Tk.14.5 million (Table2)

Table 2. Total annual WTP for recreational use of Halda River by the households of along its two banks

Category	Amount
Mean household's WTP for recreational purpose in per month in Tk.	67
Proportion of household's number respond	35.5%
Total number of households of villages along the two banks of Halda River	51,433
Total WTP by the households of adjacent villages of Halda River annually (in Tk.)	14,685,804

Notes: Total number of households along the two banks of Halda River as per the authors' calculation from the population census, 20011.

Non-use value

Bequest value of Halda River

Among the 120 household surveyed only 36.4% were willing to pay for Halda River for the betterment of

their future generations. The number of respondents at bid amount Tk. 21-50 was maximum (35.9% of responded household) where only 5.1% respondents agreed to pay at a rate Tk. 201-250 (Fig. 4).

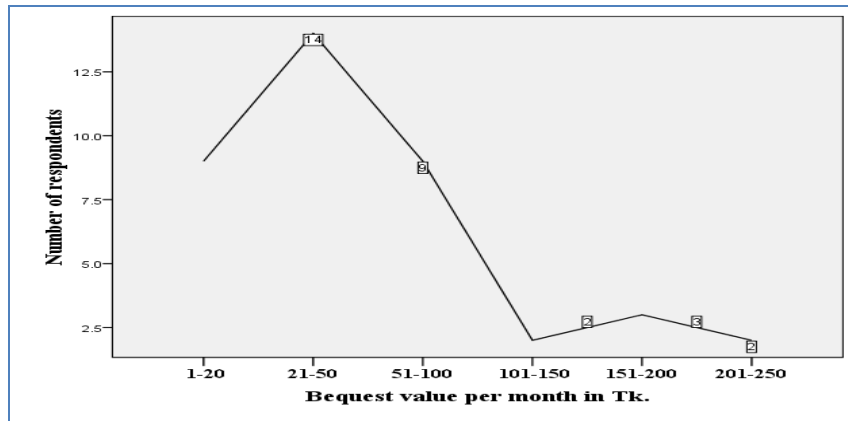


Fig. 4. Number of respondents at different bid amounts for bequest value of Halda River

Mean household's WTP for bequest value of Halda River was Tk. 66. Using this mean value, annual

bequest value was calculated to be Tk. 14.84 million (Table3).

Table 3. Total annual bequest value of Halda River by the inhabitants of its two banks

Category	Amount
Mean household's WTP for bequest value in Tk.	66
Proportion of household's number responded	36.4%
Total number of households of villages along the two banks of Halda River	51,433
Total WTP by the households of adjacent villages of Halda River annually (in Tk.)	14,847,313

Notes: Total number of households along the two banks of Halda River as per the authors' calculation from the population census, 20011.

Option value

Among the 120 household surveyed 60% of total households were willing to pay for Halda River in consideration to preserve the River as an option for their future generations. The number of respondents at bid amount Tk. 20 per month were maximum

(45.3% of responded household) where only 17.2% respondents at Tk. 100 per month for the very good condition of Halda River (Fig.5).

Mean household's WTP for bequest value of Halda River was Tk. 45. Using this mean value, annual option value was Tk. 16.6 million (Table 4).

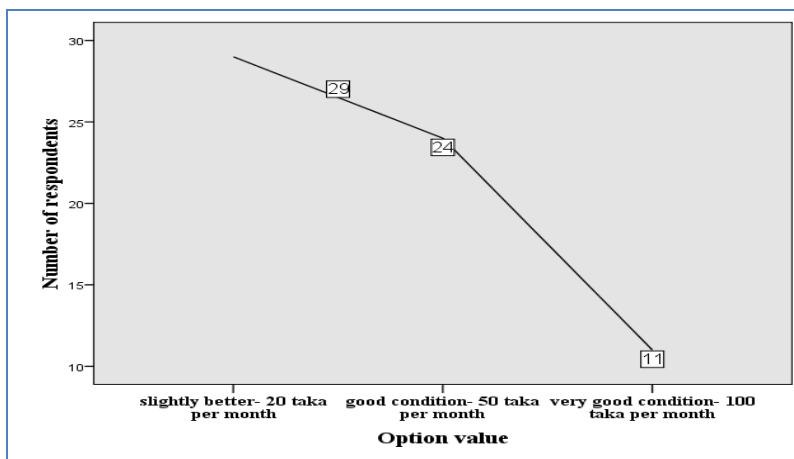


Fig. 5. Number of respondents for willingness to pay for option value of Halda River at different bid amounts

Table 4. Total annual option value of Halda River by the inhabitants of its two banks

Category	Amount
Mean household's WTP for option value in Tk.	45
Proportion of household's number responded	59.8%
Total number of households of villages along the two banks of Halda River	51,433
Total WTP by the households of adjacent villages of Halda River annually (in Tk.)	16,612,379

Notes: Total number of households along the two banks of Halda River as per the authors' calculation from the population census, 20011.

Total indirect and non-use values of Halda River

Halda River was annually Tk. 29,498,508 and Tk. 31,459,692 respectively. Local people of two banks

of Halda River were more interested the existence value which they desired to manage in present situation compared to considering this River as an option for future use by their next generations.

Table 5. Total annual indirect and non-use values of Halda River in Tk.

Category	Total amount (in Tk.) annually
Value of Biodiversity	14,812,704
Recreational value	14,685,804
Bequest value	14,847,313
Option value	16,612,379
Total	60,958,200

Halda River annually was Tk. 60,958,200 (Table 5). Thus, non-use values are large; ignoring them in natural resource policy-making could lead to serious errors and resource misallocations (Freeman, 1993).

Conclusion

Halda River is one of the most resourceful Rivers in Bangladesh. It has attained a very special identity and is frequently referred as a national natural heritage by being the only breeding and spawning ground for major Indian carps. Besides, this River provides a number of products and services all-round the year to the communities living its vicinity. Through this research, our effort was to quantitatively value the indirect and non-use value of this River. For

calculation of both indirect and non-traded resources, we have used the contingent valuation method based on popular perception collected by a structured questionnaire. The study found that total economic value of indirect and non-use value of this River was about Tk. 61 million. This study suggests that both indirect and non-use values should be given due consideration by the policy makers before taking any development project or programme at Halda River.

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