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Willingness to Pay for Improving River Water Quality: Do Households' Environmental Attitudes Matter?

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Abstract

This paper investigates the determinants of a household's willingness to pay for improving the water quality of an impaired urban river by employing the contingent valuation method (CVM) in a developing country like Bangladesh. For this study, primary data are collected through an in-person survey of the households in Dhaka city. Using the logit model, this analysis focuses on the relationship between environmental attitudes and willingness to pay for improving river water quality. The outcomes indicate that respondents with stronger environmental attitudes are more likely to pay, while those with weaker attitudes are less likely to pay for hypothetical contingent valuation (CV) scenarios. Some of these results support the motivation for non-use value that people place on non-marketed goods and can be employed to enhance CV reliability as the National Oceanic and Atmospheric Administration (NOAA) recommended. This study also suggests that the government increase people's understanding and attitude toward environmental preservation so that people will willingly pay for the preservation effort.

Keywords *River · Water Quality · Environmental Attitudes · Willingness to Pay · Contingent Valuation*

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1. Introduction

Clean and quality surface water offer a wide range of market and non-market benefits (Halkos & Matsiori, 2017; Halkos & Matsiori, 2018; Woodbury *et al.,* 2018). Water resources provide various benefits; therefore, severe damage to such resources curtails the welfare of society. Henceforth, the deterioration of natural resources due to anthropogenic activities has raised different challenges regarding environmental resource protection and consciousness in individual behaviour (Gutiérrez-Cánovas *et al.,* 2019). However, to overcome these challenges, ecological economists urged integrating human-environment relations in valuing such natural amenities (Witt *et al.,* 2019). Accordingly, the decision-makers and resource managers are eager to examine motivational factors that affect an individual's decision to support natural resource conservation.

Framing a sound management policy for improving river water quality needs reliable information about the total economic value of clean water (Zhao *et al.,* 2019). The method that can efficiently calculate the total economic value of such natural resources is the contingent valuation method (CVM), which derives both the use and non-use value of the said goods by directly questioning people through a survey (Mitchell & Carson, 2013; Boyle, 2017). However, suggestions have been made that the design of CVM has to strive for a better understanding of the attitudes and behaviours of how individuals respond to valuation questions related to non-market goods and services (Sarvilinna *et al.,* 2018). Incorporating individuals' environmental attitudes in CVM is thus to understand the underlying motivations and belief systems to value environmental goods (Kotchen & Reiling, 2000; Sarvilinna *et al.,* 2018). On the other hand, controversy regarding contingent valuation leads the economists to seek the actual motivations of the respondents to answer in the first place. Thus, understanding the behavioural intention, such as stated willingness to pay, requires a comprehensive investigation of psychological factors (Spash *et al.*, 2009; Sarvilinna *et al.,* 2018).

Although it is argued that environmental quality improvements must acknowledge respondents' attitudes and perceptions (Arrow *et al.,* 1993), the complicated relationship is still poorly understood in contingent valuation studies (Bartczak, 2015). Moreover, in empirical research, attitudes are often confused with the related concepts of perceptions, beliefs, and values, which raise questions about what has been analysed (Luzar & Cosse, 1998). Therefore, a proper elicitation of environmental attitudes can be worthwhile to measure willingness to pay is contingent valuation study to explain the valuation response and underlying motivation (Spash *et al.,* 2009; Bartczak, 2015).

In recent decades, researchers have focused on comprehending the non-economic motivations of individuals to place value on environmental goods. For instance, the environmental attitude has been identified to influence the willingness to pay for the protection and conservation of natural resources (Spash et al., 2009; Bartczak, 2015; Sarvilinna *et al.*, 2018). Likewise, Sarvilinna et

al. (2018) examined the environmental attitudes on people's willingness to pay using an attitude-behaviour framework. Their findings validate the non-economic motives of willingness to pay. Dunlap (2008), on the other hand, developed a scale to explain the environmental attitude that can explain individuals' behavioural intention toward natural resource protection.

While contingent valuation studies on valuing non-market goods confirm that willingness to pay is significantly associated with income and education level (Balana *et al.,* 2013; Grazhdani, 2015; Tilahun *et al.,* 2015; Voltaire, 2017; Islam *et al.,* 2019), several studies found low intention to pay and protest responses despite having the constructs income and education (Choe *et al.,* 1996; López-Mosquera *et al.,* 2014; Lo & Jim, 2015). In addition, the predictor variables, such as education, often failed to explain the individuals' stated willingness to pay (Ahmad & Hanley, 2009). On the contrary, socio-economic and demographic predictors often provide mixed results in measuring WTP. Therefore, the individual's motivation for a monetary contribution to an environmental improvement program is deemed essential to be explored by incorporating psychological factors that still are in disguise (Filippini & Martínez-Cruz, 2016).

While the body of academic work on these themes has become a topic of interest among academics and policymakers in developing countries, there remains a lack of theoretical work and even less empirical work to engage with the findings from other contexts and explore their relevance to the river improvement framework in Bangladesh. This article is thus motivated to understand the relationship between psychosocial variables and their influence on WTP for water quality improvement. This paper adopted a new ecological paradigm (NEP) scale to measure individuals' environmental attitudes to predict stated willingness to pay. To the authors' best knowledge, this is the first attempt which used NEP involving water quality improvement in developing countries to understand further how attitudinal measures may contribute to the contingent valuation methodologies. This paper uses CV responses from urban households of Dhaka. It investigates the relationship between environmental attitudes and willingness to pay for a hypothetical project that addressed improving the Buriganga River's water quality and impaired urban freshwater resources in Dhaka, Bangladesh.

2. Review of Literature

The present study hypothesised that environmental attitude could predict respondents' willingness to pay for river water quality improvement. Typically, an environmental attitude may determine the behaviour which influences the human action toward the utilisation and preservation of the environment (Gifford & Sussman, 2012). Gifford and Sussman (2012) also concluded that people with pro-environmental attitudes showed some degree of support for environmental improvement action. The current study used the New Ecological Paradigm (NEP) to measure environmental attitudes developed by Dunlap and Van Liere (1978).

This scale aimed to gauge a new worldview about human-environment relations on the notion that humans were the measure of all values and earth's natural resources were for human needed. Among the 15 items of NEP, 12 items showed a high degree of internal consistency and were easily understood by environmentalists and the general public (Dunlap & Van Liere, 1978). The environmental attitude was linked with a score on NEP scales; higher NEP scores indicated high pro-environmental attitudes.

Can the environmental attitude predict the intentional behaviour of an individual for willingness to pay? It has been studied on a limited scale under non-market valuation literature. Using the NEP scale, Kotchen and Reiling (2000) explored the relationship between environmental attitude and non-use value for endangered species. Their study found that respondents with higher NEP scores were more likely to respond 'yes' in a hypothetical CV scenario, while those with low NEP scores were less likely to answer 'yes' to the offered bid amount. Using Choice Modeling, Choi and Fielding (2013) found environmental attitudes as the significant motive behind the willingness to pay response to endangered species conservation. Their study supported the NEP scale as a predictor for eliciting WTP.

People's willingness to pay for environmentally-certified products has been examined by Husted *et al.* (2014), and their study summarised that individuals with pro-environmental attitudes showed more likeliness to pay the premium for products with eco-certification. Association between NEP and WTP was also significant in a study of marine biodiversity protection and coastal zone improvement (Halkos & Matsiori, 2017). However, Suziana's (2017) study on preference for wetland conservation in Greece identified four latent classes, which integrated NEP components with the scale-adjusted latent class (SLC) model. Despite showing flooding preference, many respondents were against wetland protection and did not refer to any of the NEP components, while others showed a biocentric attitude.

Despite some research in environmental economics that examined the effect of environmental attitudes on policies related to environmental goods, like the protection of endangered species (Kotchen & Reiling, 2000; Choi & Fielding, 2013) or wetland conservation (Halkos & Matsiori, 2017; Gkargkavouzi *et al.*, 2019), it is rare to find research that studied the relationship between environmental attitudes and willingness to pay for river water quality improvement, particularly in developing countries. Keeping several of the insights from previous studies on attitude and willingness to pay, the present study adopted this framework into a hypothetical water quality improvement project to know whether environmental attitude could predict respondents' WTP for clean water. Therefore, the primary objective of this study is to investigate the linkage between environmental attitudes and willingness to pay in the case of river water quality improvement in a developing country like Bangladesh.

3. Research Methodology

3.1 Survey Instrument

A written questionnaire was administered to 298 households in Dhaka city between May and September of 2017 to collect responses to primarily closed-ended questions. The survey respondents were male or female household members above 18 years old. The survey questionnaire was divided into three sections: 1) household information including socio-demographic characteristics; 2) environmental overview including knowledge and attitude about the good to be valued; 3) household willingness to pay for the improvement of the water quality Buriganga river under a hypothetical management scenario. The survey consisted of multiple-choice, dichotomous yes/no, and ordered-rank responses. Survey questions were written in basic English and translated into the local language to maximise response rates and respondent understanding. A paragraph explains that the improvement of the water quality of Buriganga relies solely on wastewater treatment plants, which will worsen the condition of Buriganga. Accordingly, households must pay for its installation, maintenance, and operation to improve water quality and conserve the river Buriganga preceded the WTP question**.** Since the current water bill in Dhaka city is extremely low-priced compared to another Asian metropolis (Arfanuzzaman and Rahman, 2017), the management authorities believed the current water bill of USD 0.12 per 1000 litre to be low and were contemplating raising it. More importantly, the increased water bill could provide more funds to install additional wastewater treatment plants, which will make better the water quality of Buriganga. Respondents then presented a referendum-type WTP question asking if they would be willing to pay a specific amount in the form of a high water bill. Ten bid amounts were assigned randomly, one bid amount for each survey: BDT 15, 20, 25, 30, 35, 40, 50, 60, 80, and 100.

3.2 Hypothetical Scenario

This study adopted the dichotomous choice type elicitation technique to estimate residents' willingness to pay for the surface quality improvement of river water quality in Dhaka, Bangladesh. To construct a suitable hypothetical market scenario, this study followed the guidelines of the NOAA panel on contingent valuation (Arrow *et al.,* 1998). The NOAA panel advocates that a contingent market should be presented to the respondents sufficiently by delineating the goods and services to be valued without a well-structured market. Since surface water quality has no well-defined market, the hypothetical scenarios were presented to the respondents by describing them in detail to know what they would be paying for.

> *The river Buriganga is currently polluted and contaminated due to sewage and industrial waste. If no action is taken to improve its water quality, the river is expected to have deteriorated permanently in the next few years. These include a complete loss of freshwater availability, no fish population, an increase in*

waterborne and skin diseases of the people residing nearby, no recreation activities, and a significant land and housing price reduction. Water pollution must be controlled to improve water quality, ensure people's water demand and function river biodiversity. One way to improve surface water quality is by removing some or all contaminants, making it fit for reuse or discharge back to the environment, which requires building more "wastewater treatment plants". This will lead to improved water quality, increased freshwater availability, augmentation of the fish population, and more recreational activities. The overall city life will improve through water quality restoration.

The hypothetical scenario was developed to understand the respondents and what they paid for.

3.3 Sampling

Without a credible list of the population and the extensive study area, this study employed a multi-stage cluster sampling to select desired households, as in Barrow (2009). Dhaka city[1] was primarily divided into four zones due to the large study area, and two Zones were randomly chosen. One Ward was randomly selected from each Zone. From each Ward, two Mahallahs were randomly chosen. Finally, about 400 households were targeted for the sample survey using proportionate simple random sampling. However, around 7% of samples proved to be business addresses, leaving approximately 372 households. The response rate was about 80% (from the 372), meaning that the sample consisted of about 298 households. The rationale for using multi-stage sampling in this study was that a complete list of all members of the population did not exist. In such a situation, a multi-stage sample was deemed appropriate.

3.4 Contingent Valuation Method

The CVM is an approach to value non-market resources using a direct technique by cautiously designing a sample survey and administering it to individual respondents (Arrow *et al.,* 1993; Hanemann, 1994). In our case, CV methods have two major benefits over other assessment techniques: 1) CV methods can assess an individual's willingness to pay (WTP) for hypothetical changes in water quality, and 2) they can reliably value water quality regardless of whether the installation of wastewater treatment plants in question is the primary or secondary purpose for the overall water quality improvement program. Strong criticism of CV is that answers from surveys relying upon hypothetical propositions are subject to various biases (Diamond & Hausman, 1994). The primary sources of bias identified in the

[1] According to latest census of 2011, Dhaka city consists of 41 Thanas, 92 Wards, 841 Mahallah, and 1576746 households (see http://en.banglapedia.org/index.php?title=Dhaka_District). Currently, the Dhaka municipality is divided into two city corporations, the Dhaka South City Corporation (DSCC) and Dhaka North City Corporation (DNCC). Thana is the first layer administrative unit which comprises with one or more Wards. A Ward has several Mahallah which is the lowest administrative unit in the city corporation.

literature include design bias, which involves subjectivity in the establishment of initial bids or payment vehicles; operational bias, which refers to unfamiliarity with the good to be valued; hypothetical bias, usually an upward bias in WTP based on the fact that expectations of having to submit an actual payment may not be present; and strategic bias, which is related to individuals' intention not to reveal their true preferences, comparable to the free-rider problem (Hanemann, 1994). While specific sources of potential bias cannot be entirely removed from the method, each can be controlled to a certain degree through careful study design, allowing for reasonably reliable results (Arrow *et al.,* 1993).

In this study, we designed the CV survey to simulate as closely as possible a real market. We minimised design and operational biases by establishing bids based upon the pre-existing water price and using it as a familiar vehicle for payment. In this way, respondents had a real-world baseline and example on which to base their responses. A referendum-type question was employed to present respondents familiar with discrete choices in market transactions with easy response categories (Hanemann, 1994). Hypothetical bias was addressed by suggesting to residents that water quality improvement may consider raising the water price. While strategic bias may be impossible to eliminate, we have no reason to suspect a uni-directional bias in the study. Some respondents may have minimised their WTP by fearing paying it. In contrast, others may have maximised it to reflect a desire to demonstrate environmental solid or cultural values associated with the river Buriganga.

3.5 Logit Regression

We used logit regression to model the relationship between the binary dependent variable (WTP) and independent variables. A statistical summary and explanation of all variables included in the model are provided in Table 2. This study hypothesised that older respondents with higher income and education levels and pro-environmental solid attitudes would be willing to pay higher water prices than others. Most of the variables tested have shown significant predictability in other contingent valuation studies regarding natural resources. The following equation was estimated:

$$\text{Probability (WTP)} = \alpha + \beta_1 \text{ bid amount} + \beta_2 \text{ age} + \beta_3 \text{ education} + \beta_4 \text{ income} + \beta_4 \text{ nep} + \beta_5 \text{ att} + \text{error} \quad (1)$$

where α is the constant and βi are the coefficients of the explanatory variables. The model's goodness-of-fit was estimated using a series of statistical measures, such as link-test, collinearity, and ROC analysis. Using the 'lroc' command in STATA, we obtained that the area under the curve was approximately 0.88, indicating acceptable discrimination for the model. We also performed the link test and found that the prediction squared did not have the explanatory power

indicating the model was fit with the required covariates. The explanatory variables also passed the collinearity diagnostics; therefore, our model specification was as good as we expected.

3.6. WTP Econometric Model

The WTP question presented a dichotomous response option. The respondents were asked if they would or would not be willing to pay a given bid amount A. Households were assumed to maximise their utility while expressing their willingness to pay the specified bid amount in exchange for access and improved experience. Following Hanemann (1994), the probability that a respondent would be willing to pay a given bid amount is assumed to follow a standard logistic variate:

$$\text{Prob (YES)} = \left(1 + e^{-(\alpha+\beta A+X\varphi)}\right)^{-1} \qquad (2)$$

Where α is a constant parameter, β is the coefficient of the bid variable A, X is the vector of other explanatory variables influencing the response, and Φ is the vector of the corresponding slope parameters. Using estimated parameters of Eq. (2), the mean WTP amount was computed as,

$$\text{WTP} = \frac{\alpha+\bar{X}'\varphi}{\beta} \qquad (3)$$

Table 1: A Summary of Variables Used in the Logit Regression Model

Variables	Description	Mean ± SD
Age	Ratio scale: respondents were asked to write their actual ages based on calendar years	40.6 ± 10.52
Education	Ordinal scale (0 to 5): no degree achieved = 0, Secondary education = 1, higher secondary = 2, bachelor's degree = 3, master's degree = 4, doctorate degree = 5.	3.70 ± 1.28
Income	Ratio scale: households were asked to write their monthly income in Bangladeshi currency (BDT).	43750 ± 12882
	Ordinal: weaker = 1, moderate = 2, stronger =3. Firstly, respondents were asked to rate 15 statements on a 5-point scale from strongly disagree (1) to strongly agree (5): whether they were revealed their environmental overview under five broad issues such as reality to limits of growth, anti-anthropocentrism, fragility of nature's balance, anti-exceptionalism, and possibility of an eco-crisis. An index was developed by summing the responses to each statement. The summated scores were then divided into three categories to represent the respondents having weaker, moderate, or stronger pro-environmental attitudes.	

Variables	Description	Mean ± SD
Environmental Attitude (NEP)	Weaker attitudes are those with NEP scores of 50 or below, moderate is those greater than 50 and less than 59, and stronger are those 59 or greater. Boundaries are determined that approximately one-third of all respondents are included in each category (see for details, Kotchen & Reiling, 2000). Reliability analysis revealed Cronbach's α= 0.89, suggesting a valid index. Theoretically, the index score can range from different values (depending on the scale). Higher scores indicate a greater pro-environmental attitude.	1.92 ± 0.67
Environmental Attitude (ATT)	Ordinal: weaker = 1, moderate = 2, stronger =3. Following the NEP scale, ATT was constructed where higher scores indicate greater environmental concern toward reducing, reusing and recycling household waste. Reliability analysis revealed Cronbach's α= 0.82, suggesting a valid index.	1.81 ± 0.60
Bid amount	Ratio scale: the bid amount ranged from 15 to 40 BDT.	27.51 ± 8.56
Willingness to pay	Binary: willing to pay = 1, not willing to pay = 0.	0.56 ± 0.49

4. Results and Discussions

4.1 Sample Characteristics

Of 298 respondents, 3% had no formal education, 19% completed high school, 26% had higher secondary degrees, 28% had bachelor's degrees, and 17% had master's degrees. Concerning the respondent's age, most respondents fell within the age bracket of 31-40, constituting 32% of all samples. The following highest categories were those whose age fell in 41-50 (29% of total samples). The household's total income was calculated from all sources after paying tax. About 22% of the respondents had an income below the national average of BDT31,883. However, this finding showed that they were still earning higher than the sampled population of Dhaka city. The PPRC Governance and Economy Survey 2015 showed that Dhaka city's bottom 40 per cent population had a monthly average income of BDT14,421. Notably, the higher percentage of the samples (55%) fell within the income range of BDT30,000 - BDT49,999. The finding showed some convergence toward a monthly average income (BDT37,323) of the middle 50% of the population in Dhaka city.

4.2 New Ecological Paradigm (NEP)

The new ecological paradigm scale (NEP scale) is a set of questions to measure the respondent's environmental beliefs, attitudes, and values (Dunlap *et al.*, 2008). The NEP scale items are summarised in the Appendix. The reverse-ordered items were four items such as item2, item8, item10, and item12. The mean values were computed after each item was reverse-scored to obtain a maximum score. The range of mean values was between 2.9 and 4.4, indicating a good ecological

worldview (Xiao, Dunlap & Hong, 2019). A high NEP score shows a more positive pro-environmental attitude of the individuals. The higher NEP scores also describe the high ecocentric orientation of the individuals. The NEP scale comprised 15 items, having a scale reliability coefficient of approximately 0.90 greater than that (α=0.83), consistent with the results of Cooper, Poe, and Bateman (2004). This scale is further classified into three groups: strong, moderate and weak in terms of individual environmental attitudes, following Kotchen and Reiling (2000).

4.3 Analysis of Environmental Attitude and WTP

This section presents the empirical findings of the contingent valuation survey and discusses the result obtained. To estimate the association between WTP and environmental attitude, we applied the logit model, which took the following explanatory variables: bid, income, education, age, and environmental attitude measured by the NEP scale in three different groups (strong, moderate, weak) and attitude scale for reducing, reuse and recycle household waste. Table 3 presents the logit regression result, which indicates that income and education were statistically significant at 1 and 5 per cent significance levels, respectively, and the sign was positive as expected. It suggests that the higher the income and education level, the higher the probability of willingness to pay. As shown in Table 3, the more robust and moderate groups were statistically significant at a 1 and 5 per cent significance level, respectively. The result in Table 4 supported a statistical difference between the mean WTP estimate of the 'weak' group and the other two groups at the 1 per cent significance level.

The analysis of willingness to pay using the logit model showed that NEP positively affected WTP, meaning that respondents with a higher pro-environmental attitude were more likely to pay for the water quality improvement. This result supports previous studies on the NEP-WTP relationship. For example, Aldrich *et al.* (2007) found a high correlation between willingness to pay and NEP for preference heterogeneity study in a contingent valuation study. A similar association was also investigated by Dunlap (2008), Halkos and Matsiori (2018), and Taye *et al.* (2018). These studies demonstrated that NEP significantly affected households' willingness to pay for nature conservation.

Using the NEP scale was to measure residents' environmental attitude and understand how environmental attitude shapes the residents' preferences and willingness to pay for water quality improvement. This paper also aimed to test the theoretical validity by incorporating environmental perspectives in a CV study, as recommended by the NOAA panel (Arrow et al., 1993). By successfully integrating the NEP scale in analysing CV responses, the theoretical validity of this study was confirmed. The replication of NEP into our CV study was consistent with the attitude-behaviour theory of Kil *et al.* (2014). While the study of Kotchen and Reiling (2000) found respondents with stronger pro-environmental attitudes were more likely to respond 'yes' to a referendum CV question about protecting

an endangered species, the current study also found that stronger environmental attachment tends the respondents to pay more for the water quality improvement program.

Table 2: Results of Logit Regression on WTP

Variables	**β**	**β** with margin
BID	-0.0450***	-0.00886***
	(0.00948)	(0.00156)
AGE	-0.00426	-0.000
	(0.0301)	(0.002)
UNIV	0.523**	0.033**
	(0.568)	(0.039)
INCOME	3.159***	0.128***
	(1.012)	(0.082)
NEP (Strong)	1.719***	0.353***
	(0.419)	(0.0746)
NEP (Moderate)	1.655**	0.239**
	(0.551)	(0.109)
ATT (Strong)	0.128	0.0255
	(0.400)	(0.0802)
ATT (Moderate)	-0.300***	0.0598***
	(0.541)	(0.109)

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Since previous studies confirm the association between environmental attitude and willingness to pay in other valuation fields, we found NEP scores could also predict the WTP for water quality improvement. The average marginal effect shows that stronger NEP was found to have a higher impact than weaker NEP, suggesting that households with a more robust pro-environmental attitude were ~35% more likely to pay for the improvement in water quality than Buriganga, the more vulnerable group. We further test how different groups of NEP scores predict mean WTP with the logit model. Currently, the Dhaka Water and Sewerage Authority (DWASA) has fixed a new tariff for the household, and that is BDT 21.04 (=$0.25) for 1000 litter of water use which includes both sewer and water (BDT 10.52 + BDT 10.52) consumption. In our study, the mean WTP from the DBDC model was 45.54 BDT (=$0.54) for 1000 litters. Moreover, we found respondents who had more substantial NEP scores were willing to pay BDT 53.54 (=$0.65), whereas respondents with weaker NEP scores were willing to pay BDT 15.33 (=$0.31), which is half of the overall mean WTP (see Table 3).

Table 3: Mean WTP for Strong, Moderate and Weak NEP score

	Coef.	Std. Err.	z	P>z	95% Conf.	Interval
Mean (include all covariates)	45.54355	2.53598	17.96	0.000	40.57312	50.51398
Strong	53.53256	12.51524	4.28	0.000	29.00313	78.06198
Moderate	34.43189	9.392711	3.67	0.000	16.02252	52.84127
Weak	15.33123	8.260413	1.86	0.063	.8588856	31.52134

Note: Here, coefficients are the mean WTP

5. Conclusion

This study seeks to derive the relationship between environmental attitude and WTP under a hypothetical management scenario in a developing country context. We found environmental attitude measured by NEP was statistically significant in predicting WTP. More substantial NEP scores showed more influence than average NEP scores, meaning that respondents with pro-environmental attitudes were more likely to pay for the environmental good. These findings are consistent with Kotchen and Reiling (2000) and Choi and Fielding (2013), suggesting that the NEP scale can be a good predictor in a CV study. Respondents with weaker, moderate, or stronger pro-environmental attitudes reveal significantly different ways of participating in referenda and CV scenarios involving improving river water quality. Those with stronger pro-environmental attitudes are more likely to pay for the improvement scheme, while those with weaker attitudes are more likely to ignore the improvement scheme.

Even though this study did not contribute to methodological advances, it has important implications for policymakers. The policymakers should consider this study to design a sound river improvement program. The residents showed that protecting the river, especially its water quality, should be prioritised, which could be seen from the willingness to pay. In addition, the residents were willing to pay more than the current water price to improve the water quality of rivers in Dhaka city, offering a solid basis for generating environmental improvement funds to facilitate the installation and operation of more sewerage treatment facilities in Dhaka city.

Furthermore, the results of the CVM survey imply that the residents of Dhaka placed a substantial value on the water quality of the river Buriganga and were willing to pay for and participate in a program to improve it. Since CVM is one of the few ways to value a good that is otherwise wholly unknown, this study allows policymakers essential information to make informed decisions that affect the residents who depend on water resources for drinking water, the municipal water supply, and recreation. The fund can be generated by aggregating WTP and allocated for surface and groundwater protection and overall river management planning in Dhaka city.

Finally, this attitude–behaviour and economic valuation literature would help understand how psychological considerations may improve valuation methodologies when water resources are in reference. Therefore, this study integrates attitudinal measures (e.g., NEP) and the CV method to understand better the influence of environmental attitudes on WTP for river water improvement programs. Accordingly, this study supports the motivation for people's value on non-marketed goods and can be employed to enhance CV reliability as recommended by the National Oceanic and Atmospheric Administration (NOAA).

Overall, this study suggests that the government increase people's understanding and attitude toward environmental preservation so that people will willingly pay for the preservation effort.

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Appendix

Item	SA	SWA	U	SWD	SD	Mean	Std. Dev
We are approaching the limit of the number of people the earth can support.	54.4	31.2	13.2	0.54	0.54	4.4	0.8
Humans have the right to modify the natural environment to suit their needs.	4.2	11.5	25.4	26.4	32.5	3.3	1.3
When humans interfere with nature it often produces disastrous consequences.	37.8	35.2	14.3	8.3	4.4	4.2	1.2
Human ingenuity will ensure that we do not make the earth unlivable.	14.4	22.9	30.3	19.1	13.3	3.0	1.1
Humans are severely abusing the environment.	36.2	39.6	11.2	7.5	5.5	4.1	1.2
The earth has plenty of natural resources if we just learn how to develop them.	35.1	38.9	12.4	10.6	3.0	2.9	1.1
Plants and animals have as much right as humans to exist.	54.1	31.5	6.4	4.3	3.7	4.2	1.1
The balance of nature is strong enough to cope with the impacts of modern industrial nations	2.6	12.7	16.3	33.1	35.3	4.0	1.1
Despite our special abilities, humans are still subject to the laws of nature.	47.6	40.4	5.7	4.3	2.0	3.8	1.0
The so-called 'ecological crisis' facing humankind has been greatly exaggerated.	6.8	17.9	25.6	25.4	24.3	3.4	1.2
The earth is like a spaceship with very limited room and resources.	28.3	30.7	17.5	14.0	9.5	3.6	1.2
Humans were meant to rule over the rest of nature.	6.9	14.1	10.5	31.5	37.0	3.7	1.3
The balance of nature is very delicate and easily upset.	38.3	34.7	11.5	10.6	4.9	4.0	1.2
Humans will eventually learn enough about how nature works to be able to control it.	6.4	17.8	25.3	32.4	18.1	3.3	1.2
If things continue on their present course, we will soon experience a major ecological catastrophe.	23.6	30.2	28.6	11.4	6.2	3.4	1.1

Note: [a]SA=strongly agree, SWA=somewhat agree, U=unsure, SWD=somewhat disagree, SD=strongly disagree. [b]Frequencies may not sum to 100 due to rounding.