Original article

A more efficient valuation of beaches using tourists' perspectives and Geographic Information System (GIS): The case of Patenga of Chittagong, Bangladesh

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ABSTRACT

The valuation of non-marketed goods and services of beaches in developing nations is rarely conducted; thus, lax management efforts at these resource-rich places often lead to degradation. In an attempt to resolve this issue the research used the travel cost valuation method and incorporated the use of geographic information system to estimate a never-before-done non-market valuation of the area visited by respondents at the beach of Patenga of Chittagong, Bangladesh. The uniqueness of the research stems from defining the area enjoyed by the survey respondents, via mapping, which helped assign the value generated to that particular part of Patenga and not the rest; this significantly decreased the underestimation problem of the travel cost methodology. The research used secondary sources and collected responses and geographical data from surveys conducted over a seven day period in March of 2018, from 277 respondents. A value of at least 14,331,044BDT/USD1.71million was estimated for 2018 for only 9% of Patenga. Furthermore, the Willingness to Pay approach was used to propose an entry fee of 15BDT/USD0.18 which would yield a revenue of more than 6,750,000BDT/USD79,882 around the year. The authors believe, these results will push the policy-makers and encourage stakeholder participation to better implement and monitor environmental management measures at Patenga.

KEY WORDS: Travel Cost, Willingness to Pay, Beach, GIS, Chittagong, Patenga

ARTICLE HISTORY: received 18 March 2019; received in revised form 23 July 2019; accepted 13 August 2019

1. Introduction

The lack of the internalization of externalities, valuation research and conservation-based management policy frameworks has (DIXON ET AL., 1994) caused the demise of several of the world's natural resource-rich sites such as marine beaches of developing nations. Chittagong's Patenga with the River Karnaphuly draining into it and located in the south-eastern region of Bangladesh, is such an example. It was once home to thousands of known and unknown species of terrestrial and marine flora and fauna, most of which have now become locally extinct due to

pressures on its marine ecosystem from tourism (BANGLADESH.COM, 2019). Millions of tourists (mostly locals) visit Patenga (OFFROAD BANGLADESH, 2017) every year due to its free accessibility and associated attractions like sunrises/sunsets, sea-food restaurants and street-side Burmese markets and it is a popular beach area in the country, third only to Cox's Bazaar and Kuakata. It is patrolled (and maintained, although not successfully), by the Bangladesh Navy and its shore-line is a narrow one made-up of beach sand and a few patches of rocks (OFFROAD BANGLADESH, 2017).

The sea water near the shore is polluted by the tourists; litter also lines the shore area. Small

shops and restaurants line the area beyond the shore and the vendors mostly kill and sell items collected from the sea/beach, like seashells, coral, fish, crabs, etc. The visitors, primarily lower and middle-class/income locals with moderate to low education and environmental awareness levels, litter the shores and throw away debris into the open sea, while the authorities do almost nothing to stop them (AMIN, 2019). Additionally, the rich and powerful often destroy open shores and coastal forests for profit-making endeavours like sea-side restaurants and hotels, which in turn are bolstered by the high-income and highly-educated cohorts visiting the beaches, badly damaging the land and associated ecosystem.

The travel and tourism industry in Bangladesh directly generated around 2.5% of the country's total employment in 2016 (TRAVEL AND TOURISM ECONOMIC IMPACT, 2017). Moreover, Bangladesh is expected to become a middle-income country by 2021 and has recently graduated to the lower-middle income status (THE WORLD BANK, 2016): these give Bangladesh the luxury to deviate resources, especially from funding schemes for Sustainable Development Goals to the conservation of species at important beaches like Patenga. These, along with the aim of mitigating further damage to Patenga, portray the need and timeliness for viewing beaches like Patenga as an environmental asset with non-market values, rather than a package of resources to be used, often exploited and depleted irreversibly, if economic and environmental sustainability is the goal. Hence, this research aimed to perform a never-done-before-valuation of Patenga Beach by employing the popular Travel Cost Valuation Method (TCVM) (HANLEY & SPASH, 1993), as a stepping stone for similar research and incorporation of their results into the conservation and management plans of such sites. Another aim was to tackle the underestimation issue often associated with the TCVM which stems from the lack of area mapping involved, by using a Geographic Information System (GIS) (BASHAR, 2018; MATTHEW ET AL., 2018). Additional aims included the collection and analysis of data from the research respondents on: (a) socio-economic indicators to associate them with the TCVM and (b) intention to pay an entry fee, via the use of the Willingness to Pay (WTP) approach (TAHZEEDA ET AL., 2018).

This research will add value to the existing literature as it attempted to understand how much of the beach area was actually enjoyed by the respondents (and the scenery/services associated with it) by generating a map of the area used by them from their responses and GIS

analysis. Consequently, only that area was considered and not the whole of Patenga whilst generating the travel cost value and proposing an entry fee. The expected outcome from the research included a reduction in the underestimation problem of the travel cost valuation method (WIELAND & HOROWITZ, 2007). The researchers believe that this will better justify the need for distributing finances for biodiversity conservation projects and the maintenance of scenic spots to the donors and policy-makers for places such as Patenga that possess immense natural riches (ADB VALIDATION REPORT, 2008). Dissemination of the valuation and degradation information and incorporation of this general value in terms of market prices will also force stakeholders (especially the tourists and people whose livelihoods depend on Patenga's natural resources) to be aware of their destructive behavior and may help to change their attitudes in the long run (ADB VALIDATION REPORT, 2008).

2. Literature review

Before delving in to analyze and calculate a value for Patenga beach, from the tourists' perspective, a look at relevant research and their findings are necessary. It is, however, important to note that the results of this research have not been consistent; in fact, in different cases and countries the results have been very dissimilar (HOUSTON, 2013). Most experts have attributed these differences to a disparity in the types of beaches, the premises related to the linkage between them and other habitats, the methods involved in their management and most importantly, the overall technique used to calculate their value (STRONGE, 2005; HOUSTON, 2013).

This article contains an overview of the three main methods/tools, namely TCVM, WTP and GIS and the validation of their use for this research to reach a non-market value for Patenga from the tourists' perspective, to propose an entry fee according to these and to define the area they visited, respectively, by highlighting other similar works. For this, it was necessary to realize the gaps and flaws in previous research work in order to propose ways to mitigate them. It was also necessary to utilise relevant highlights from other valuation research performed on similar and dissimilar beaches around the world, with a special focus on developing countries, particularly Bangladesh, in order to understand and implement such an application on Patenga.

2.1. Validation of using the Travel Cost Valuation method

The TCVM records the actual behaviour observed of the visitors/participants from the past literature (HANLEY & SPASH, 1993). Apart from acquiring data on the socio-economic status and demography of the visitors, it also captures the opportunity cost (in monetary terms) of the time lost due to travelling to a particular destination and the mode of transportation. Generally, when there is no direct market for the resources from a place, but a market for the place itself, for example paying an amount of money to enjoy the resources/scenery, which was the case while valuing Patenga, TCVM is preferred (HANLEY & SPASH, 1993). In addition to it being a more reliable method for valuation in this aspect, it also assists policy-making authorities to fix maximized entry fees to gain the best revenues and also, to control the number of tourists into the site, which was partially what the authors aimed to do here (ANNING, 2012).

The non-market valuation of beaches, like Patenga, is, firstly, made difficult by the fact that the area being valued is immensely large (BANGLADESH.COM, 2019) and hence, encompasses innumerable plant and animal species. Employment of TCVM, fortunately, decreases the extent of the issue by a few notches, because it extracts from the visitors their valuation of the place for their visit, which in turn is evaluated as the value of the tourist destination itself (BASHAR, 2018). Another issue that arises whilst evaluating beaches is their accessibility or rather the ease and difficult-to-monitor-access characteristics of the place. Beaches can be accessed via a number of entry points; so, it is difficult to capture all the respondents' replies during the survey; some access points are always overlooked and in turn, so are some types of responses. A third issue (and the one that this research attempted to address and resolve) is that although respondents' travel cost valuation assumes that the value generated is for the whole of the scenic place, it is, in reality, only for that part of the beach that they can enjoy during that visit and not the other regions that they did not get to see in the limited time that they were there (TURNER, 1993). This leads to the underestimation problem and can be solved, according to the authors, with an additional section in the survey questionnaire that tries to capture the area the respondent will enjoy during that particular visit and then utilising GIS to map out the area they selected (BASHAR, 2018). However, the issue of variability in tourists' characteristics (and hence, responses)

make it difficult to map out an 'averaged' or general area to be valued. Fortunately, this issue can also be solved if questions are asked technically during the surveys and maps are plotted accordingly, which was attempted during this research.

Beach tourism is regarded as the most important contributor to the total tourism industry (BLAKEMORE & WILLIAMS, 2008) and hence, keeping these natural sites maintained is also monetarily beneficial. Unsurprisingly, valuing it, as mentioned earlier, is not an easy task and choosing a suitable valuation method is a task of difficult proportions. However, TCVM, according to the authors, is suitable in this case and this choice is supported in DHARMARATNE & BRATHWAITE (1998) where they established this via a similar study at Barbados. In the paper, preference of this method over the stated ones was also explained: stated methods often produce initial estimations and lower, final payoffs, but trends and past data never lie and so, can be relied upon to provide efficient results. These validations are re-emphasized by TURNER (1993).

2.2. Validation of the Willingness to Pay approach

The WTP approach is a stated preference method used to extract information on how much stakeholders are willing to pay to enhance the quality of, or conserve, a particular place, or a few important resources, of the selected site (REYNISDOTTIR ET AL., 2008; TAHZEEDA ET AL., 2018). It has successfully been used to introduce conservation programs for land and marine resources at many parks and beaches, including those in India (BAL & MOHANTY, 2014), Barbados (SCHUHMAN ET AL., 2019), Iceland (REYNISDOTTIR ET AL., 2008) and uncountable developing and developed countries. Such conservation programs have seen success, because they are supported, and partially built, according to the preferences of the locals, who had been causing/cause the damage in the first place. Hence, this method is applicable to find out what the respondents of this research found fit to be an entry fee to Patenga Beach. this fee's introduction will benefit the beach in two ways – it will become exclusive to and consequently, accessible to, lower numbers of tourists and the revenue generated can be used to better monitor and manage the resources of the beach by introducing bins, cleaning debris from shoreline and the sea and hiring policing teams to fine 'polluters'.

2.3. Using GIS with TCVM, the underestimation problem and other issues

Using GIS in conjunction with valuations of natural resource-rich sites, including beaches, started in the late 1990s; [LOVETT ET AL.](#) (1997), for instance, applied mapping at several sites in England to better analyse benefit transfer demand functions of certain tourist groups. One of the most relevant researches was perhaps performed by [WIELAND & HOROWITZ](#) (2007) at three forests in Maryland State that were popular tourist spots. This research used Google Maps to calculate distances from which the tourists travelled, which is in accordance with this research when proposing to use GIS; however, the difference is that while the 2007 research used maps prior to visitors gaining access to their destination, this research will do the opposite. A further similarity of this research to that of the authors' is the fact that they acknowledged the under-estimation problem, also highlighted in [BASHAR](#) (2018), of using travel costs to assign a value to a whole tourist spot and declared that the values they found for each of the forests "...only represent the value of access to the site". However, the Maryland forests research was easier to do for the authors as most data were readily available, due to the forests being situated in a developed nation like the United States. Furthermore, several developed nations today use GIS in association with a hedonic pricing method to better predict land prices in the real estate sector ([CAVAILHÈS ET AL.](#), 2009). In more recent times and in developing countries too, like at a tourism-based place like Malaysia's Langkawi, GIS was applied with Poisson regression to extract a comprehensive economic value of a popular geoforest park in a more efficient manner ([MATTHEW ET AL.](#), 2018). Hence, ample literature and the lessons learnt can be applied (and have been) to this research to associate mapping to a travel cost evaluation of a beach in a developing country to improve efficiency and avoid underestimations.

An issue faced by the authors was that of converting the sample data to the real data of the number of visitors and to solve this, the 1999 travel cost valuation article by SHAMMIN for the International Union for Conservation of Nature (IUCN) proved useful by presenting the factor method that has been employed in the pilot and final study of this research. Lastly, the decision of the authors to quote the final value as being larger than the travel cost value obtained via survey data had been further supported by [RAYBOULD ET AL.](#) (2011).

2.4. Valuation of beaches: developed vs. developing nations

The valuation of beaches is not a new concept; in most developed nations; biologists, botanists, conservationists, environmentalists, zoologists and even economists and locals who understand the value of these biodiversity-rich places in both monetary and non-monetary terms for the short and long-term sustainability of the larger ecosystems, have always pushed policy makers and visitors to mitigate damaging practices ([FISCHER](#), 1990; [STRONGE](#), 2005; [HOUSTON](#), 2013). For instance, [ANNING](#) (2012) and [ALVES ET AL.](#) (2015) have used economic evaluation methods to propose ways for policy-makers to conserve the rare species of Australian and Spanish beaches, respectively. However, the same cannot be stated for beaches of most developing nations. Also, even though there has been research in developing countries concentrating on marketable products and even impacts on these due to coastal zone degradation and climate change, not much work has been done on the non-market evaluation of the beaches' goods and services. However, a good example of a beach's tourism value being overtaken by the need for ecosystem conservation in a developing nation has been recently seen via the closing of Maya Bay in Thailand ([CRIPPS](#), 2018).

Furthermore, [NDE](#) (2011) performed a travel cost evaluation of Ngoé Beach of Kribi, Cameroon; lessons from this were used to improve this research as it had several similarities including the methodology employed and type of place and nation the tourist location is situated in. The most important aspect from this research was the need to analyze the relationships between socio-economic and demographic data and travel costs. However, instead of [HENRY & SPASH'S](#) methodology (which was used by this research), [NDE](#) (2011) used the consumer surplus technique, which caused the authors some confusion on which one to choose to arrive at a travel cost. The research by the [UNIVERSITY OF HAWAII'S ECONOMIC RESEARCH ORGANIZATION](#) (UHERO) (2013) helped to curb this confusion as the UHERO article employed different sets of methodologies and found results from seven case studies of seven different beaches in Hawaii, one of the most successful of which was that of [HENRY & SPASH'S](#) (1993).

However, no published work was found that used GIS to pinpoint the exact regions being valued to address the issue of underestimation, which means that this research is unique. What is more interesting, although unsurprising, was that tourist perspective-based beach valuation is

a rarely-heard-of research arena in Bangladesh, but such works are quite popular in its neighbouring developing nations like India (GOPALAKRISHNAN, 2009) and Sri Lanka (KOMAHAN & GUNARATNE, 2017), which further portrays this research's need and timeliness.

2.5. The need and timeliness of a valuation research at Patenga

The authors found almost no information available about this very famous beach of Bangladesh, except in travel guides and in reference to cyclone warnings. These sources mentioned more about how the local flora, fauna and landscapes are important not for non-use values, but due to their importance to the stakeholders' economic gains. This lack of information and advertisement of such a biologically diverse and important place are the main reasons why this research is so important. It is also timely, because the Bangladeshi government is now equipped with funds and expertise to conserve such places and to look beyond forests and water bodies. Such research, which highlights the high value that only tourism generates, can further pave the way for identification of Patenga's flora and fauna and landscape preservation projects, as they are the main attractions of the place and which, if lost, will lead to the loss of money generated from visitors.

3. Methods and materials

TCVM is a popular method and generally uses the premise that the costs faced by a tourist for a trip to a recreational place (like Patenga) can be used as a substitute for its recreational value as perceived by them. ISLAM & ISLAM (2011) put it perfectly when they said, "It is his minimum demand price for the recreational service the site is seen to possess." The function used in this work is that of HANLEY & SPASH (1993) which states that the total cost of each visitor 'i' to visit the particular site 'j' can be written as –

$C_{ij} = C (DC_{ij}, TC_{ij}, E_j)$, where $i = 1 \dots n$,
where,
 C_{ij} is the total cost for visitor 'i' to visit the site 'j';
 DC_{ij} is the distance cost for individual 'i' which is again a function of the distance from origin of the visitor to the site and the cost per mile of travelling;
 TC_{ij} is the time cost (includes the value of the visitor's time and the time spent inside the place);
 E_j is the entry fee to the place (if it does not exist then = 0, which is the case for Patenga).

To summarize the methodology of this research in a few words, it can be said that the study will depend on the primary analysis of the survey questionnaires as completed by tourists who visited Patenga during the survey period. Secondary research, for a comprehensive literature review and background check, used relevant websites, articles, papers from famous authors and/or journals and environmental textbooks. In-depth interviews to understand the topic and some short talks with Patenga's monitoring unit, Bangladesh Navy officials, were also in the books to get an idea of the prevalent political, social, managerial and tourist situations and also, to find out the total number of visitors in a year. In addition, this research emphasized the fact that apart from travel costs, the social and economic conditions of the tourists played significant roles in the determination of such an evaluation; this part employed statistical and graphical analyses via the software package R. The research further extracted such socio-economic determinants and mathematically approximated their effect on the recreational demand. The main aim of the research was an efficient evaluation of the area surveyed, based upon responses. The research attempted to suggest a better future for the management and restoration of Patenga beach's by proposing and estimating a revenue-maximizing entry fee, using the willingness to pay approach of the respondents surveyed.

3.1. Uniqueness of the research

The research will be of great value to the travel cost and valuation literature, because it went further than its predecessors and tried to solve the underestimation problem characteristic of the travel cost method which arises due to the fact that although a respondent only gets to visit and enjoy some portion of the tourist region, their answers are evaluated to generate a value for the whole tourist destination. Hence, when per unit area's valuation in monetary terms is calculated, the value is, very often, oddly low. To address this issue, the final, structured questionnaire played the first key role by asking the visitors how much of the beach they will be expecting to see from the entry point, assuming they will all walk. The distance covered along the road was used to identify how much of the surrounding scenery and services they enjoyed. The next key role was played by GIS. A global positioning system (GPS) and Google Maps were used to collect area data of the region that the respondents would actually enjoy (and not the whole area) and then,

using ArcGIS 10 software (BEACH LANDING, 2019), maps of that region were generated. The final valuation was attached to the region displayed in the map only, which the authors believe helped to generate a 'truer' value of the per unit area valuation than the traditional method.

3.2. Study design and tools

The actual beach can be accessed and enjoyed via a number of points, the two most popular being the Naval Beach and Taxi-Drop off points. The area leading up to the former is the focal point for the primary analysis of this research. The research's primary analysis was done in two stages, namely – pilot and final. From the pilot study survey performed by the researchers it was found that most people walk an average of 1 kilometre from the Naval Beach drop-off point, in one visit. The distance walked is low because most tourists just sit along the road on a narrow raised platform and enjoy the sunset/view and eat street-food. The pilot survey was conducted during the last week of December 2017 and was analyzed in order to identify flaws and to create a more structured questionnaire for the final stage. A total of sixty randomly selected respondents were surveyed from the Naval Beach drop-off point at this stage. The range of entry fee that could be put into the final survey was also evaluated by using results from this stage.

Later, using the results and lessons learnt from the pilot study, the final, structured questionnaire was prepared in the local language of Bangla. It was divided into five parts – demographic information, test of knowledge of respondents on environmental resources and conservation, valuation data (time costs, travel costs, dependency, etc.), distance to be walked (to find out the area enjoyed by the respondents during the visit) and a proposed entry fee (if any). In March 2018, a total of 277 responses (23 were discarded due to lack of clarity in the responses) were recorded in the final survey which were conducted in the same week's Sunday and Thursday (weekdays) from 11AM – 1PM and again from 4PM – 6PM and on Friday (weekend) from 5AM – 6AM, 11AM – 1PM, 4PM – 6PM and 8PM – 10PM. This variance in days and timings were undertaken to capture a variety of visitors, for example students, nature-lovers, couples, office-workers, parents, etc. A week later, after the average area enjoyed by the respondents was calculated – which was found to be 1 kilometer – two surveyors were also charged with capturing the coordinates of

the area covered so as to generate the map of the area being valued.

The actual number of visitors per day was calculated by using a factor equal to Total no. of visitors during the survey period (obtained from BD Navy officials)/No. of days survey was conducted/Total no. of days place is accessible in a year, and multiplying it by the recorded responses of visitors. The total valuation was plagued by the fact that during the time of the final survey, the weather was hot and hence, only the visitors with no other options (often low income or less environmentally aware) visited Patenga and consequently, responded to the surveyors. Also, the total number of visitors included several who were not first-timers. Hence, using information from the key informants, the total number of visitors were divided by an educated guess of 3, as the informants believed that only 33.33% of the visitors were first-timers. The conversion rate was taken as 84BDT = USD1.

4. Data analysis

4.1. Pilot study

The data collected from the secondary and primary analyses of the pilot study yielded certain findings and helped identify flaws which were addressed during the preparation of the structured questionnaire for the final survey. The first important finding from the pilot study survey was the identification of the range of kilometres that respondents walked from the Naval Beach drop-off point. It was found to be 1 kilometre (Table 1) from the responses of the 60 visitors surveyed.

Table 1. Average distance walked by respondents (source: pilot study)

Distance walked from Naval Beach drop-off (km)	No. of respondents (/60)
0	0
0.5	2
1	52
1.5	5
2 or higher	1
Average (in km)	1.04 $\approx$ 1.00

This helped in being more specific in the questions associated with the mapping of the regions covered by the visitors during the final survey and hence, arriving at a more efficient value. Also, the fact that the entry point was correctly chosen as the Naval Beach drop-off was also

validated via the responses of the respondents who agreed that it was the most popular. The alternative one (the taxi drop-off) was partially closed due to ongoing construction.

A limitation that arose during the literature review of the pilot study was the seasonal variation. November, December and January (the cooler months) experience more visitors in Patenga and hence, the high number of visitors witnessed during the pilot survey is not reflective of the other months. The factor method highlighted in the methodology and the Navy officials having the data on the total number of visitors from 2017 played vital roles to mitigate the extent of this issue. Another issue was that of mapping as different respondent responded differently, as to the amount of distance they walked. This was solved through averaging the distance walked by all the respondents, but remained a flaw in the methodology. To compensate for this, as many respondents and as many timings and survey days as was possible were considered during the final survey period, as the mean then got closer to the true value as the number of responses increased.

Lastly, it is important to declare that not all of the environmental services were captured by the travel cost, because none of the respondents, or any environmental experts for that matter, can truly understand and account for all the linkages of Nature enough to place a direct (or in this case an indirect) value on it; furthermore, this research was not able to capture all the values associated with the travel of the tourist however efficient the authors were. Hence, the conclusion, that is, the number/monetary value generated, has been presented somewhat like this, "...the value is much higher than 'USD Z' per year that has been obtained by the research," as many of the recreational values, and even parts of the specific area, have not been included in the scope of the research (WIELAND & HOROWITZ, 2007).

4.2. Final study

The primary data obtained was used to evaluate the relationships between the demographic information of the respondents and their corresponding travel costs and willingness to pay an entry fee (as there is not one currently). It was also used to map out the area that was in the respondents' line of site and hence, to which the valuation obtained was attached. Additionally, the final value and a proposed entry fee were also obtained from this analysis.

4.2.1. Demographic scenario

The first step was to understand whether the particular respondent knew about the managerial and conservation status of Patenga, so as not to get understated values. This was done simply by first asking all 277 respondents how much they knew and later, by testing them with a simple relevant question. Most respondents (almost 95%) were aware (Very Aware: 52; Aware: 86; Slightly Aware: 125) of the existing situation at Patenga; some were less aware (Not at All Aware: 14) and these respondents were intentionally kept in the sample to lessen the positive bias. Most of these visitors were males (almost 81%), as this area is not deemed safe for females to visit alone, or even in groups, without male companions. Next, a limitation of the travel cost method came to light when an overwhelming number (107 out of 278) stated that they did not pay themselves to get to Patenga i.e. they were dependents such as female homemakers, students and drivers who did want to visit, but went there using money received from husbands, parents and employers, respectively. However, as all of them wanted to visit and used the money allocated to them to do this activity, their valuation was taken into account.

A drawback of publicly accessible places like Patenga also came out from the responses; most did not have to be educated to visit the place. A huge number (almost 200 i.e. almost 72%) just had/were going to have school degrees. This was unsurprising as most visitors were not highly-educated individuals visiting from the nearby city centre, but workers and their partners living close by, or students visiting with friends. However, this did lower the travel cost value and could not reflect their original valuation which could have been much higher (or less if the higher transportation cost had discouraged them to visit at all). Furthermore, to eliminate the problem of multi-purpose trips, almost all (251 out of 277) respondents were taken to be the ones who visited just for pleasure/touring and not other reasons like jobs or research (which would lead to the surveyors having to separate how much of the value was for which purpose). This shows that most visitors had certain opportunity costs in terms of time while they visited the area (meaning a higher valuation possibility).

Next, the ages and occupations of the respondents were recorded. The ages of visitors ranged from 16–60+; most (170/61%) were under 30, re-emphasizing the finding that most were either students or young adults who had just started their careers and were looking for an

inexpensive place to pass the time (hence, the lower income levels). The number of visitors went down as age went up, which is unsurprising: however, an anomaly was seen in the 30 - 49 age range (around 35%). There were several visitors from this age range as they were the parents of children/students visiting. Furthermore, most of the visitors (75 out of 277) were small-scale businessmen and road-side hawkers, while the rest included medium-level businessmen (27%), students (26%) and service holders (25%); there were also a few female homemakers and drivers.

4.2.2. Demographic information vs. travel cost and entry fee

When the age parameter was plotted against distance travelled (Fig. 1), it was found that as age went up, initially, the distance walked remained the same (upto the age of 29). After that, as age went up further, the distance walked stayed the same, or went down. Two anomalies existed around 42 and 70 year olds, as 42 year olds had children who were not happy sitting around, and the 70-year-

old was a fit retired army personnel who went there daily for brisk walks to keep fit. This yielded that most people walked around 1 kilometre, which has been represented as a map in Fig. 5 for the area valued.

Again, when the age was plotted against the travel cost, the young age range (below 18) were seen to have very low travel costs (around 0–500BDT/person on average), which is attributable to the fact that they did not have enough income to take expensive modes of transportation. However, as the age increased, so did the travel cost between the age range of 19–49 ranging from a low of 1000BDT/person (or USD11.83/person) to a high of 4000BDT/person (or USD47.3/person) (Fig. 2). Most of these people travelled by public transport e.g. buses or private ones like taxis, cars or minibuses, which increased their travel costs. Also, the youngsters were visiting during their leisure time, which brought down their time costs to zero or close to zero, whereas, the middle-aged visitors were giving up time at university, or office, or business, to visit, increasing their time costs.

Fig. 1. Relationship between age and distance walked

Fig. 2. Relationship between age and travel cost

Over 60% of the visitors sampled were from low/middle income backgrounds (below 5,000BDT/USD59.17 income per month). This is the scenario for the population of visitors throughout the year according to the respondents and key informants. This is not a surprise as firstly, most are students having no income of their own, and secondly because most visitors are locals who are looking for a place to sit for free and enjoy a good view, as they can not afford expensive places, farther away. It was also found that there existed no particular relationship (as shown in Fig. 3) between the travel cost and income parameters. Three reasons were attributable to this: (a) students paid high amounts to get to the place, but stated their income as zero (used pocket money from parents), (b) lower income people from nearby places walked there or used a cheap mode of transport like bus/tempu (small, semi-open buses), (c) those with incomes higher than 5,000BDT/month were

only a few and so, a relationship for their range could not be obtained.

Next, the relationship between montly income and entry fee was analyzed. First, the categories were divided from 1–5 as follows: 1=0BDT, 2=10-25BDT, 3=26-50BDT, 4=51-75BDT, 5=76-100BDT. As most of the respondents fell under the 5,000BDT/month income range, most relationship points are seen in Fig. 4 for those respondents. It seemed that those with lower incomes were willing to pay higher entry fees, which is an anomaly. However, this can easily be attributable to the fact that most respondents were students or young adults and hence, very aware of the need to manage and conserve Patenga’s many resources and so, even with lower (or no) incomes they were willing to pay money (even upto 100BDT) as the entry fee, which they thought would discourage several people who litter from visiting and generate money for maintainence.

Fig. 3. Relationship between monthly income and travel cost

Fig. 4. Relationship between monthly income and entry fee

4.2.3. Mapping the area covered by visitors

A further and unique step of this research was to use the distance travelled information from the respondents to determine how much of Patenga was actually visited (and enjoyed) by the respondents with the travel cost they experienced so as to evaluate a more efficient valuation of the select areas of Patenga. A little more than 1 kilometre was the distance walked on average by the visitors. Correspondingly, their line of vision was the 360 degree sight that they received while walking the area with a 2 kilometre range of sight (key informant interview and [WOLCHOVER, 2012](#)). This information was used, along with Google Map images, GPS coordinates obtained by surveyors and later, the ArcGIS 10 software to obtain Fig. 5. The figure shows the full view of the study area and the smaller maps underneath it show how much of the whole of Patenga was actually under the valuation scope of this research.

The area covered by the study was found to be around 2 square kilometres (taken to be a rectangle with length = 1 kilometre and width = 2 kilometres). Later, from secondary sources, Patenga was found to cover 22.34 square kilometres ([TRAVEL AND TOURISM ECONOMIC IMPACT, 2017](#)). So, the area valued was around 9% ((Area of Study/Total Area of Patenga) x 100% = 8.95%) of the total of Patenga.

Fig. 5. Study area and location

4.2.4. Travel Cost Valuation and proposed entry fee

The surveyors noted down buses, autorickshaws, private cars, horse carriages and taxis as the modes of transportation of the respondents. The respondents were asked about their transportation costs to reach the research area and helped by the surveyors to evaluate it quickly and efficiently. They were also asked about their opportunity costs of visiting and how much money they had lost (in terms of time). Such opportunity costs included classes bunked, or office time sacrificed; several mentioned a time cost of zero as they had nothing else to do. These two costs were then added to evaluate the travel cost of each of the 277 individuals in the sample.

From key informants (officials of Bangladesh Navy) it was cross-checked that around 500,000 visitors had visited Patenga in 2017, only 1 out of 3 of whom were visiting for the first time. So, the total number of first-time visitors were taken to be 166,666 (500,000/3) in 2017; hence, 3205 in the survey period (166,666/52 weeks). It was also found that Patenga is open 365 days a year and the number of days the survey was carried out was 7. Then, the factor (as explained under Methodology sub-section) was found to be around 1.65 (3205/7/365). Hence, the total (actual) numbers of visitors in the final seven days that the survey took place was around 458 (277 x 1.65=457.88). The average travel cost of the 277 sampled people was found to be 601.74BDT/USD7.12 (Total travel cost, 166,683BDT/Sample, 277). Hence, the travel cost evaluated for the final seven days of the survey which took place for 9% of Patenga (study area) was found to be at least 275,597BDT/USD3261.5 (Average travel cost, 601.74BDT x Actual no. of visitors during the survey week, 458) as summarized in Table 2. If it is assumed that this value is an average for the rest of the year, then the total travel cost will be at least 14,331,044BDT or around USD1.70 million for 2018. However, the value is supposed to be much higher as many components could not be taken into account due to time and/or knowledge constraints. It is also important to note that this value should not be multiplied by 100% to find the value of the total of Patenga, as all of the area is not visited by tourists nor possess the same amenities.

Table 2. Summary of travel cost evaluation result

Days	Area (%)	In BDT	In USD
7	9	around 2.75 lac	3,261.5

The entry fee was found by taking the average entry fee from each range, multiplying them with the number of respondents who chose that range under the WTP approach, adding up the multiplied value and then dividing it by the total sample. It was found to be 13.50BDT/USD0.16 (Table 3) which is low, but still a good value, because, as of yet, there is no entry fee and also

because most respondents were very low (many-a-times negligible) income earners. Their willingness to pay something to visit a public site shows their wish to see its quality enhancement. Also, an average entry fee of 13.5BDT means it will produce an extra revenue of 6,750,000BDT/USD79,882 around the year from the 500,000 visitors.

Table 3. Summary of proposed entry fee

Entry Fee in BDT (EF)	No. of respondents (R)	Total (EFxR)
0	135	0
9-25 (17)	99	1,683
26-50 (38)	30	1,14
51-75 (63)	9	567
76-100 (88)	4	352
<100	0	0
	Total	Average
	277	≈ 13.50BDT/USD0.16

5. Summary of findings

Performing a non-market valuation (from a visitors' perspective) on a beach is difficult due to its vastness, presence of multiple entry points, diverse species of organisms and lack of monitoring which is applicable to the beaches in almost all developing nations. However, it is quite well-established that a revealed preference valuation approach like TCVM is the most suitable to perform such a task, with the application of GIS for mapping the specific area being valued, making the process/result more efficient and use of the WTP approach for estimating an entry fee. Also, both secondary sources and the primary analysis of this research revealed that whatever the value obtained will be an underestimation and that using GIS will solve the issue. Underestimation resulted due to the inability of many respondents to place true values via their travel costs due to their lower incomes, occupation (example: students), lack of knowledge and the methodological error of the TCVM, where only the revealed part of the travel cost up until reaching the place equates the respondents' perspective on the place's worth: its worth might go up in his/her eyes after the visit; the opposite may also be true occasionally. Another flaw might have been that a lot of the visitors did not possess much knowledge about the place's conservation value and managerial background, but as the method used revealed a preference that was not stated, this did not pose a problem.

Next, most visitors were young adults (students/ young professionals) and the middle-aged (fathers/ mothers of small children). Furthermore, the distance walked went down as the age increased, only with a few anomalies. Willingness to pay an entry fee (and a good amount) was mostly seen among the youngsters and relatively richer respondents as they are more aware of its positive impact on conservation efforts than their older counterparts, which shows promise for tomorrow. Lastly, a general analysis yielded that Patenga's tourist-based valuation was lower than the bigger and more popular Kuakata beach (e.g. HOSSAIN & ISLAM, 2016) of Bangladesh and much lower than those in the developed nations (e.g. ANNING, 2012), but still high enough to be looked into with conservation aims.

6. Conclusion

The research concluded with a calculated estimation of at least 14,331,044BDT, or around USD1.70million, for 2018 via the TCVM for only 9% of Patenga (as displayed in the map generated via the GIS technique). The proposed entry fee, estimated with the WTP approach, is a rounded value of 15BDT/USD0.18 from the analyzed and estimated value of be 13.50BDT/USD0.16, which would yield a revenue of more than 6,750,000BDT/USD79,882 around the year from the 500,000 visitors. This could be used to better maintain and conserve the natural goods and services of Patenga. A better socio-economic situation of the locals will lead to mitigation of degradation by

them and enhanced conservation efforts at Patenga. However, such efforts will need the attention of policy makers and funds to cover deficits.

Note: This is a collaborative project which was performed independently by researches from North South University and East Delta University and its students.

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