Economic valuation Tasek Bera wetland conservation using contingent valuation

(Penilaian ekonomi pemuliharaan tanah lembap Tasek Bera menggunakan *contingent valuation*)

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Abstract
The main attributes of Tasek Bera wetland currently jeopardised by economic activities and other externalities. Both resource management and conservation options policy should be able to attain a sufficient sum of revenue in order to continuously managethe resources of Tasek Bera wetland efficiently. Hence, this study attempts to estimate the use value of the wetland. Dichotomous choice contingent valuation approach has been used in these exercises. Structured questionnaires have been developed and distributed to the respondents in targeted site of theTasek Bera wetland area specifically at the main entrance. A total of 600 questionnaires have been distributed conveniently among the visitors of Tasek Bera wetland area. Only 533 respondents were reliably selected for further analyses. Firstly, the study attempted to explore the underlying dimensions that affect the environmental perception among users towards Tasek Bera wetland area. In line with that, the study provided the surface responses and demands by users' subject to the needs of efficient resource management and development. The exploratory factor analysis (EFA) has been applied in order to identify the dimensions that affect the environmental attitudinal perception towards the wetland area. Further in CVM estimation, the reductions of agricultural activities have been found to be significantly raised the utility of the respondents towards the wetland. Willingness to pay for the improvement in resource management and conservation options of the wetland has been elicited through the logit model.

Introduction

Wide reports of losses on tropical environments should be seen as a vital sign of the concern of society towards its surroundings. The constituency and referendum from specific consumer segment translated into the implementation of conservation and restoration plans or efforts can be seen in environmental issues such as the deforestation of tropical rain forests and threatened marine ecosystems. Increasing public attention towards issues of environmental destruction has ignited the growth of efforts among policy makers and towards the management of natural resources (Segerson and Miceli

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1998; Bogner et al. 2000; Bamberg 2003; Churchman et al. 2002; Henle et al. 2008). Efficient exploitation of natural resources, consequently affects their future consumption and utilisation (Stern 2000; Turner et al. 2000; Schultz 2002).

Economic valuation in the definition can be explained as the effort to designate the quantitative values of resources provided by the environment, either the market prices were available or not. Environmental resources basically provide their products and services at no cost and then the willingness to pay by consumers could describe the value of the resource in providing such commodities (Blamey et al. 2000; Louviere 2001; Birol and Koundouri 2008; Do and Bennett 2009; Yacob and Shuib 2009; Pek and Jamal 2011; Kaffashi et al. 2012). The issues of deforestation in Malaysia were highlighted before in many discussions, either academic or non-academically. As natural forests constituted more than 1.5 million hectares (UNDP 2006) in Malaysia, mostly positioning the natural wetlands with its rich biodiversity and ecosystem functions, it is important to control not only the deforestations but it is also vital to alternatively implement sustainable management of the resources with the utilization of appropriate conservation options.

Tasik Bera is a freshwater marsh lake located in the middle of the watershed area of he south-central part of Peninsular Malaysia Pahang River basin. It is a unique lake and has been labeled as a watery refuge, freshwater swamps, a wetlands mysterious legendary lake, wetland forests or wetlands that are hidden in Malaysia. All this explanation is in recognition of its unique features as a wetland habitat in Malaysia and Asia and was gazetted as a RAMSAR site. RAMSAR Convention (Convention on Wetlands of International Importance, especially as a Waterfowl Habitat) is an international treaty that has been signed in the city of RAMSAR, Iran on February 2, 1971 between governments as a framework to conserve potential natural wetlands. The treaty was implemented on December 21, 1975.

There are 1,836 wetlands listed with an area of more than 171 million ha globally. To date, 159 countries had agreed to sign up for the treaty (Barbier et al. 1997; Prentice et al. 2002; Yeap et al. 2004). Wetlands include mangrove swamps, sea-grass, coral reefs and many other ecosystems. The status was granted to Tasik Bera in 1994 as stated by the Wetlands International – Asia Pacific, based on its biological diversity and its value of ecological and socio-economic potential. In line with this recognition, Tasik Bera and the surrounding forest were gazetted as a forest reserve by the Pahang state government with the aim of preserving and conserving the area which was full of natural treasures and valuable natural resources.

Tasik Bera with 6,870 ha of wetlands in the RAMSAR site consists of freshwater and peat swamp forest (5,440 ha, 79%), open transition swamp forest (510 ha, 7%), filled with *Pandanus* plants and *Lepironia helicopus articulata* (800 ha, 12%) and open water (120 ha, 2%). There is a very wide range of flora habitat communities consisting of algae and macrophytes. A total of 374 plant species has been recorded, of which 10 species are known to be endemic to Peninsular Malaysia, while 328 species of algae have been recorded during the research in the 1970s.

A diversity of vertebrate fauna in Tasik Bera wetlands and the surrounding forest is in line with the flora diversification. A total of 453 vertebrate species has been recorded consisting of 62 species of amphibians and reptiles, 94 species of fish, 230 species of birds and 67 species of mammals. Fish species diversity is also a key value for Tasik Bera, offering breeding, treatment and source of food for fish from the Pahang River (Furtado and Mori 2012; Lim et al. 1982; Mizuno and Furtado 1982; Syakirah et al. 2000). The local resident Semelai aborigines, with a population estimated at

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around 2,000 people can be found scattered throughout the area, but the majority of the village occupies an area called Pos Iskandar. The lake and forest environments are full of swamps and are largely occupied by lowland forests. This region is now greatly disturbed by shifting cultivation and illegal logging activities, as well as excessive exploitation by humans

Tasik Bera wetland deterioration issues
Apparently, the flora and fauna in Tasek Bera face threats to their survival in view of the large-scale deforestation of wetlands and the pollution of rivers, since certain species demand some specific habitats for survival. The destruction of the Tasek Bera has also been reported by Chong (2007), concerning the deterioration of water quality and quantity. The main source of degradation includes surface run-off containing nutrient rich water from nearby plantations, sewage from communities living around the lake, logging activities and oil discharges from motorboats (Sharip and Zakaria 2008).

Such human impacts have destroyed the habitats because shifting cultivation, possible pollution, destruction of watershed, logging operations, erosion and siltation are known to have occurred to the detriment of many valuable species at Tasek Bera as mentioned by Norma-Rashid (2001). Even though it may look like both the direct and indirect human activities are the causes of the destruction, the former are the major contributors towards the degradation of the peat swamp forests. More importantly, human alterations by creating conversion of peat swamp forests to agriculture and rural settlement, as well as forestry uses and the other human activities, have recently led to the remarkable losses of wetland habitats.

The extensive programs of Federal Land Development Authority (FELDA) from 1970's until 1990's changed the landscapes of Tasek Bera forests area which converted 292.86 km^2 of original forest area into oil palm and rubber plantations. In between four decades, not less than 10 times of expansion

activities have been recorded as reported by Raj (2013) and Gharibreza et al. (2013). Deforestation, large scale conversion to agricultural plantation and forest fires were the common activities in phase of setting up an oil palm plantation which is economically agreed upon that time.

Furthermore, Wust and Bustin (2004) recorded the continuation of anthropogenic activities and encroachment specifically onto the Tasek Bera RAMSAR site area from 47.14 km^2 in 1994 to 340 km^2 in 2009 for the establishment of oil palm and rubber plantations resulted in cleared land increasing. It has been identified that this deterioration masterminded by local residents as they acknowledged the monetary benefits gained from running the oil palm plantations (Angelsen et al. 2001; Geist and Lambin 2001). Facilities and conveniences for undertaking the plantations since it had been surrounded by oil palm plantations and mills encouraged the locals to operate these activities. It has been reported that at least 20 ha of the wetland's reserved area has been converted to oil palm and rubber plantations in 2015 by the aborigines.

Deforestation and land clearing were carried out by FELDA between 1970 and 1975, 1976 and 1980, 1981 and 1985, 1986 and 1990, 1991 and 1995, whilst similar activities were carried by local residents between 1995 and 2000. A total forested area of 340 km^2 was clear-cut to provide land for oil palm and rubber plantations in the Bera Lake catchment (Chong 2007). Development of oil palm plantations typically involves five main stages, namely; (1) land clearing, (2) nursery establishment, (3) site preparation, (4) field establishment, (5) maintenance and harvesting and (6) replanting/abandonment (MPOC 2007). The total drainage area of Tasek Bera obtained is approximately 590 km^2, which more than 50% of the area has been converted into oil palm and rubber plantations. The morphology of the wetland area can be seen in *Figure 1* below.
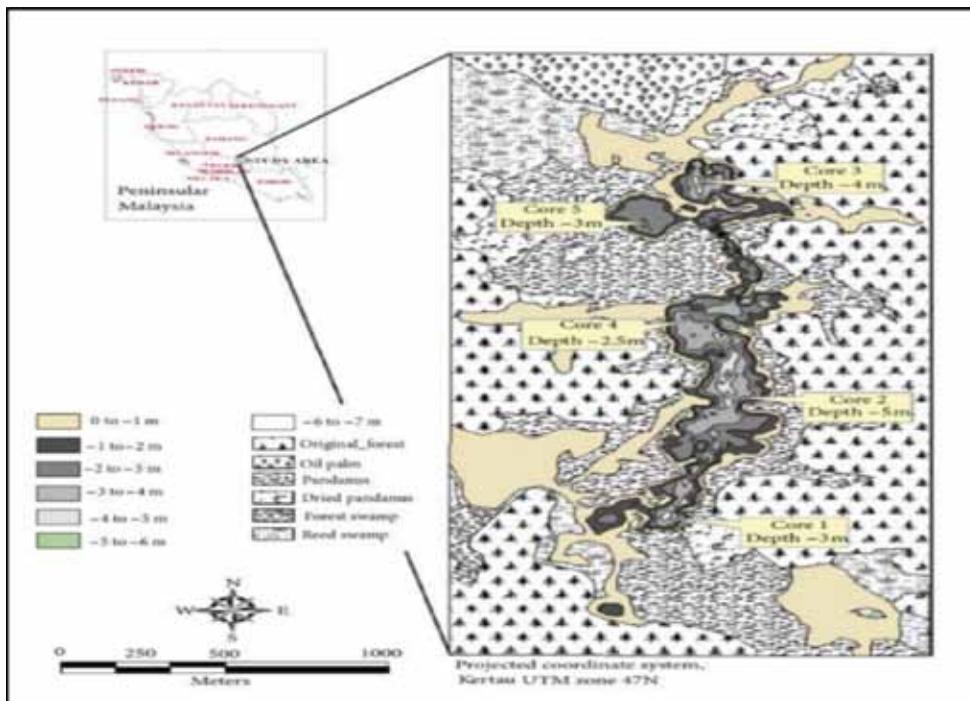
Figure 1. Oil palm plantation map surround of Tasek Bera wetland

Rubber and oil palm plantations covered almost half of the drainage area of the wetland as much as 300 km² from total 625 km². Due to the massive conversion, the regulative effect of forest canopy in lowering the evapotranspiration of water net loss has been decreased approximately half of its function. The dense canopy provides the microclimate that regulates and protects the soil and understory from drying out. Decreasing the forest inventories such as original trees and other plants also contributed to the loss in carbon sequestration function (Twilley et al. 1992; Schimel et al. 2001; Hofmann et al. 2006; Wust et al. 2007; Page et al. 2010).

The *Proto Malay*, Semelai aborigines has occupied Tasek Bera in the last 600 years. This tribe lived along the banks of and also deep in the forest surrounding the Tasek Bera. The indigenous people of Tasek Bera before, heavily depended on the natural resources existed in the lake and its surround. In the pre-colonial era, Semelai people practiced the shifting cultivation, especially for the rice cultivation. After independence, part the indigenous people from a total of 1,400 in population migrated back into the forest area while half of them permanently stayed at Pos Iskandar area. Semelai today are mostly reliant on oil palm or rubber cultivation and out-migration to the nearest town to make a living rather than continuing their rice cultivation. The expansion of oil palm plantations by FELDA indirectly affected the indigenous people, jeopardizing the original resources of the wetland area and insufficiently provides the tribe.

Furthermore, Semelai community dependency upon forest plant has decreasing as 70% of secondary forest area (Mohamad 2010) embracing the Semelai traditional lands has been converted to intensive rubber and oil palm plantations. Those environments encouraged the Semelai to open the oil palm plantations illegally and exploited by outsiders, to cope with the

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needs for their livelihood and pressure from modernization of the surround that fundamentally driven by monetary benefits.

Ecosystem function and wildlife eradication

Water and lake ecosystem are not exceptionally affected. The development phases in the establishment of oil palm plantations, especially from land clearing activities and maintenance procedures which heavily uses fertilizers and pesticides contribute to the deterioration of water ecosystem at Tasek Bera. The open water area of Tasek Bera calculated to be 112 ha which are located in the northernmost part of the catchment area. It was a sanctuary for more than 200 bird species, 50 mammal species and 94 fish species.

Comprehensive cleanup efforts for the lake and sustainable land use scheme are needed for this wetland area as a large amount of sediments from metallic elements have been recorded in the Tasek Bera's water ecosystem (Raj 2013). Intense chemical weathering of rock units has been reported to contribute to the sandy mud supply in the lake during the land development phases of oil palm plantations. In addition the mature oil palm plantations with high organic matter productivity deposited moderately organic-rich sediments into the water system (Zhao et al. 1991; Hitzhusen 1993; Posthumus et al. 2008; Furtado and Mori, 2012).

Currently the extensive riparian areas are established in the lake water system covered with Rassau *(Pandanus* sp.) of dry land vegetation. It is a matter of time that the catchment area would change to the dry land area if the frequencies of the organic rich sediments and material are still increasing (Pimentel et al. 1997; Scott 1980; Zhao et al. 1991; Furtado and Mori 2012). Parts of the open water area have been covered by Kercut (Cyperaceae) while large parts of the lake have been dominated by Rassau (*Pandanus* sp.). Wüst and Bustin (2004) have presented the transition phase

to a pandan-dominated due to increase in mineral water.

Wildlife species eradications in Tasek Bera are mostly due to indirect and indirect environmental issues. Deforestation of the wetlands in large scale and pollution of the water catchment areas has been identified as the main factors that contributed to the wildlife species, deterioration (Norma, Mohd-Sofian and Zakaria-Ismail 2001). Such human impacts have destroyed the habitats as the shifting cultivation, possible pollution, destruction of watershed, logging operations, erosional and siltation known to have occurred to the detriment of many valuable species at Tasik Bera. The assessment of species status deduced from the total number of individuals collected from Tasek Bera.

Furthermore, the otter's population has been significantly decreased over the time as reported by Syakirah et al. (2000). This was due to the fact that the otters were being eliminated by fishermen because of the fishing nets and/or fish traps and the apparatus usually destroyed by them. Easiest way in protecting the tools was by eliminating the source of the problems faced by the fishermen, otters. In addition, five species recorded in the peat swamp forest were not recorded at the two lowland forest sites and 21 species recorded in lowland forest were not recorded in peat swamp forest, supports the view that conservation of both these habitats is necessary.
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Tasek Bera current management.

Tasik Bera wetland area currently managed by Tasik Bera RAMSAR Site Management Unit under Department of Wildlife and National Parks (DWNP) as the leader together with other agencies such as Department of Forestry, Department of Fishery, Department of Environment and Society Development Department. Inter-agency cooperation under one management should be efficient for the implementation of various which are legal and enforced differently by each agency.

However, enforcement functions are not clearly defined between the responsible agencies or bodies. Tasik Bera RAMSAR Site Management Unit is a body established by the Department Wildlife and National Parks (DWNP) which has been categorized as a federal law enforcement unit, while the Department of Forestry is responsible for the state of Pahang. The status quo for the administration of Tasik Bera Forest Reserve is based on the fact that the Tasik Bera has been gazetted as a forest reserve and is under the jurisdiction of the state government. However, currently it is administered by the federal enforcement unit which then creates inconsistencies in the enforcement objectives and approaches.

Reserve forest areas rich in biodiversity are not spared from facing this misfortune. Tasik Bera is currently facing a critical threat range and damages. Among them is the illegal agricultural activity performed on a large scale: deforestation for oil palm and rubber cultivation. Illegal encroachment is done by those who do not care about the negative impact on the environment and are driven by business profits alone. Additionally, waste and chemical streams are also flowing into the catchment forest reserves regularly and continuously, a consequence of the agricultural activities around the forest territory.

These activities rapidly modify the ecosystem, frequently in an irrecoverable fashion. Unsustainable interventions quickly affect the environmental system and often invite negative and harmful effects to the flora and fauna community and not to mention the people living in the environment. Damaged groundwater tables cause significant nutrient production for plants not produced in line with existing plant requirements. Over extraction of timber sources has deteriorated natural rich of wetland biodiversity. Furthermore, it contributes to the soil compaction, which eventually altering the natural habitats and natural regeneration function in the ecosystem. Therefore, it is vital to plan and implement sustainable management and conservation since uncountable benefits can be gained from a well-managed Tasek Bera, the largest natural wetland in Malaysia, especially the lake and the peat swamp forest.

Exploitation of environmental resources is a necessity in the development of human civilization and the survival of economic activities. The main question that has dominated the managers' minds is to what extent the exploitation of resources can be done so that environmental resources are not tapped or swallowed into development. Is it worth for these valuable natural resources to be sacrificed for economic progress and development, or is conservation actions needed to retain these resources for future generations to enjoy? The importance of natural resources, particularly the forest reserve of Tasek Bera, to the survival of surrounding communities and human life is something that cannot be defined on an individual basis even though there has been no formal information underpinning the knowledge. It is undeniable that the issues and problems that overlap the matter of national biodiversity assets have sparked some concern and negative perception, even though they are not in a critical stage as yet.

It is also important to change the perception if negative; towards Tasek Bera among the society in the attempt to change the environmental attitude and their behavior. The efficient management of the resources needs to be undertaken to articulate that this wetland is capable of providing the ecosystem functions and beneficial to the people still. The changes in environmental attitude initiated by the changes in perception would help to develop the self-conscious responsibility towards environmental conservation since the efforts cannot be done alone by the resource manager. People need to understand that Tasek Bera wetland area is a public good in which need to be taken care by all levels and stages in society.

The purpose of this study is to assess the value of related resources in the development of wetlands in Malaysia using the environmental economic approach to help in their management. This study gives the options that can enhance the economic opportunities that are sustainable in the development of a wetland area. The evaluation and assessment of wetland area development are very important in order to realize that it fulfills the requirements of visitor preferences through the understanding of the concept of a wetland area.

The general objective of the study is to evaluate and determine the management of the resource and conservation options of the Tasik Bera wetland area.

Specific objectives are to determine the perception towards environmental issues existing at the Tasek Bera wetland area and to determine the value of resource management and conservation options of the wetland.
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Methodology.
The methodology of the study consists of the design of the contingent valuation approach used in the study and the procedures in attaining data through appropriate sampling method and size. The data of the study will be analyzed using Exploratory Factor Analysis (EFA) and Contingent Valuation Method (CVM) estimating.

Contingent Valuation Design
Theoretical framework suggested by Cameron et al. (2002) has been adapted to obtain the welfare estimates of WTP through the CVM question. The benefits of resource management and conservation options of Tasek Bera wetland can be measured by a compensating surplus of WTP. The assumption would be there are linear relationships between an individual's WTP and explanatory variables:

$$WTP = [\beta 0 + (\beta 2X2) + (\beta 3X3) + ... + (\beta kXk)]/\beta 1$$

Where $\beta 0$ is estimated constant, $\beta 1$ is estimated coefficient of bid, Xk to βk are the estimated parameters of coefficient and Xk are mean values of independent or explanatory variables. Fitted values for willingness to pay and the bid amount of various numbers should be produced among the responses by implementing this method. The WTP will be obtained through dividing the accumulation of all of the coefficients including the constant term by the bid amount absolute value of the coefficient. According to Loomis (2005), this method allowed the transformed coefficients to be interpretable with an ordinary least squares estimation.

The study basically implemented the dichotomous choice format in the question structure. The efficiency of the WP results is much better since the format will avoid the biases in the estimation. In a study by Cameron et al. (2002), dichotomous choice format will evade biases that occurred in other elicitation methods of contingent valuation, although it also has an issue of starting biases when the sample size of responses was too large. The dichotomous choice technique has been used widely in many CV studies as it provides convenience in the data collection procedure. Either in single or double bounded elicitation techniques, respondents are only required to answer YES or NO to the given amount. It avoids the complexity in responding to the willingness to pay an amount for a particular public good such as when using the open-ended elicitation or bidding game approaches.

The advantage of using the dichotomous choice elicitation approach would be pre-interview information on the interval values can be attained as it were, bound by the bidding limit given for the whole willingness to pay distribution. In case of single bounded approach, the upper limit is considered as the interval whenever the answer is a positive and lower limit otherwise.

Data collection procedure

Structured questionnaires have been developed and distributed to the respondents in targeted site of the Tasek Bera wetland area, specifically at the main entrance using convenience sampling by six trained enumerators. Every single respondent got a brief explanation from interviewers about the study purposes or objectives and guidelines in answering the questionnaires. Five hundred and thirty-three sets of questionnaires were used after data screening processes and proceeded to perform the exploratory factor analysis. Respondents were asked to use a structured questionnaire which implies both Malay language and English language. Revision and pilot study indicated no discrepancies between the English and Malay version of the questionnaire. The content and items of the questionnaire also have been discussed extensively among the researchers and the reliabilities of the collected data were also evaluated by Cronbach's Alpha Coefficient, indicating their high validity.

The target population for this study focused on wetland visitors, which get through the Tasek Bera RAMSAR Site Management office. Every visitor has to get through a guarded gate in front of the office to access the lake territory. The convenience sampling procedure has been applied in distributing the questionnaire at the main gate of the entrance. There are few other entrances to enter the wetland area, including small road of an aborigine village in north and south of the wetland. Those entrances also included in the data collection phase by mandating two trained enumerators for each entrance. The aborigines have given the full support and cooperation for interviewers in completing the task for questionnaire distributed to the visitors. A total 600 questionnaires have been distributed. However, 67 of the respondents were discarded as they did not fully complete the questionnaire given to them. Convenience sampling procedure (non-probabilistic sampling method)

adopted for the study have been recognized to potentially lead to the sampling bias and less reliable to represent the entire population. These big disadvantages need to be addressed in this study. The sampling bias commonly related to the systematic bias in which resulting to the constant difference occurrences between the sample results with the theory as it reflected from the failure in internalizing the entire population to be represented. Skewed results may occur as the study progressed. These problems consequently affect the expectation of a study to be able to generalise the results by considering the entire population.

Suggestion from Louviere et al. (2000) in a study stated that the most applicable sampling method implemented in most valuation studies favouring the simple random sampling approach. Various opinions point out the advantages of using the simple random sampling method, especially the capability in representing the larger size of the population if not the entire population. Acharya et al. (2013) in a review of sampling methodologies, comparison stated that it is compulsory for a study to have at least the minimum information of the targeted population to use this sampling technique. In addition, the implementation of the sampling technique requires an expensive cost to be conducted. The descending or ascending design from a list of targeted sample size is demanded as the principle in choosing the respondent should be based on the equal chance of them to be selected. Without replacement in the choosing design, the simple random sampling, the technique also will potentially vulnerable to the sampling errors.

In this study, the convenience sampling method has been selected due to several reasons. Firstly, the limitations of the financial condition faced by the study have obstructed it to be conducted using simple random sampling. Furthermore, the non-availability of the targeted population information (visitation records) has not allowed the use of it since it is necessary

to have those kinds of data. The use of convenience sampling method also minimizes the duration time of collecting the data through structured questionnaires. Certain criteria also implemented during the data collection procedure in which respondents with determined requirements would be allowed to put their responses to the study. In rectifying the sampling errors that may occur, a large sample size was taken as suggested by Etikan et al. (2015) in reducing the errors and increasing the statistical power.

Face to face interviews have been implemented in collecting the data using the structured questionnaire. The determination of respondents was referred from the significant assessment of the appropriate sample size (Sudman 1976; Sudman et al. 1988) and the exploratory factor analysis used in this study was determined according to Hair at al. (2006). Furthermore, Krejcie and Morgan (1970) suggested 380 respondents are required in representing the total 40,000 visitors that came to a particular area. In this study it has been identified that less than 30,000 visitors have visited Tasek Bera wetland and the sample size of the study surpassed the sample size requirement. Another important point is the probability of inappropriate number of respondents, particularly because of their unusable answers can be reduced if the data collected are more than the minimum requirement stated.

In this study, the original targeted responses were 600 but discarded to 533 usable responses in screening and cleaning stages. Five groups of bidding prices have been structured separately in five sets of questionnaires (120 questionnaires each). Five different bids have been imposed starting with RM3 for the first set followed by RM4, RM6, RM8 and RM10. These initial bids will be used in the single bounded estimation. In the single bounded estimation, listed potential variables that will be investigated whether they put an influence towards WTP have been shown in *Table 1* below.

The bid amount offered is expected to be negative based on the theory. It represents the maximum willingness to pay of the respondents towards improvement in resource management and conservation options of the Tasek Bera wetland area. The age, education level, working status and household income are expected to have positive relationships on willingness to pay. On the other hand, the gender of the respondents has been assumed to either have positive or negative relationships towards willingness to pay, same with the components of environmental issues that would be derived from the factor analysis.

Table 1. Potential variables Investigated in CVM estimation model

Variable	Description	Expected sign
BID	Bid amount for entrance fee offered	-
AGE	Age of respondents	+
GEN	Gender of respondents (1 = male, 0 = otherwise)	+/-
EDU	Education level of respondents (1 = university, 0 = otherwise)	+
WRK	Working status (1 = employed, 0 = otherwise)	+
INC	Household income of respondents	+
Others	Components of environmental issues derived from factor analysis	+/-

Results and discussions
Respondents' characteristics
Almost 46% of the respondents', aged between 26 – 35 years. The average age of respondents is about 35 years old with a standard deviation of 10.547. Second highest proportion of age is between 36 – 45 years old as 22.5% of respondents fall between these ranges. This study also found that 16.1% of respondents are below the age of 25 while 5.1% of them are above 55. Only 10.1% of respondents were categorised between 46 – 55 years old. More than half of the respondents are male (63.4%) while the female respondents are 36.6% of the total. This discrepancy ratio may due to the fact that male visitors dominantly visits the wetland area with the intention of doing the activities that related to the income generation by tapping the natural resources existed such as fishing and forest products collection.

The segregation of respondents based on their education level resulted where at least 48.6% of them attended the secondary school, 25.3% graduated from university and 19.1% had the diploma certificate. Only 6.9% of the total respondents had only graduated from primary education. This study also found that almost 45% of respondents had completed higher educational level with a minimum achievement of a college diploma certificate. The findings also indicated that majority of the respondents, 82.4% is currently secured full time employment while only 5.6% of them are unemployed or seeking a job. Another 7.7% of them are in charge of home duties or housewife and 3.4% are currently enrolled as students. The rest of 0.9% of total respondents are already retired.

The highest proportion of household income per month with the range between RM1,001 to RM2,000 is 33.8% of total respondents. This is followed by the RM2,001 to RM3,000 household income earners (20.3%). This study classified 19.5% of the respondents earned below RM1000 per month of household income.

The findings also indicated that 9.8% of them had household income in the range of RM3,001 to RM4,000 while 5.8% earned between RM4,001 to RM5,000 monthly. Only 10.9% of total respondents had surpassed RM5,000 per month as household income. This situation happened probably due to the proportion of the local visitor's amount to almost half of the total respondents. Local visitors are most likely come from the villagers close to the wetland area. From a total of 533 respondents, 44.1% are local visitors and 55.9% are from other districts of Pahang state or other states of Malaysia. The highest proportion of respondents are from local which implies that Tasek Bera is not very popular to non-local visitors especially from other states (*Table 2*).
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Dimensionality using exploratory factor analysis.
Six factors have emerged from the extraction of exploratory factor analysis with eigenvalues above 1.0 and the total variance explained of 61.042 percent. Eigenvalue is the column sum of squares for a factor; it also represents the mount of variance accounted for by a factor (Hair et al. 2006). The components emerged from the dimensionality were tagged with suitable names based on the items included in each component (*Table 3*).

Willingness to pay estimation using CVM
This section presents the results for willingness to pay analysis using the Contingent Valuation method (CVM). Approximately 53% of the respondents are willing to trade off some amount of monetary value for the sustainable development of Tasek Bera wetland. 'Yes' responses from respondents are the study expectation to hear when the question was given to them. 'Yes' saying is a condition in which it can be assumed that if a majority of the respondents are not willing to contribute to the sustainable development of the wetland, it is being considered that the study

Table 2. Socioeconomic profiles of respondent

Profiles (n = 533)	Percentage (%)
Age	
<25	16.1
26 – 35	45.8
36 – 45	22.5
46 – 55	10.5
>55	5.1
Gender	
Male	63.4
Female	36.6
Education level	
Primary school	6.9
Secondary school	48.6
College diploma	19.1
University degree	25.3
Work status	
Employment full time	82.4
Unemployment/looking for job	5.6
Home duties	7.7
Full time student	3.4
Retired	0.9
Household income	
<RM1000	19.5
RM1,001 – RM2,000	33.8
RM2,001 – RM3,000	20.3
RM3,001 – RM4,000	9.8
RM4,001 – RM5,000	5.8
>RM5000	10.9
Origin	
Bera	44.1
Other districts of Pahang	25.7
Other states of Malaysia	30.2

Source: Primary data

is not aligned with the project's vision and vice versa (*Table 4*).

Single bounded model estimation.
The empirical result in this study was based on econometric techniques using logit models. Based on the economic theory and previous related assumptions, few independent variables were internalised in the model estimation. These explanatory variables were evaluated and tested for the statistical significance to explain the variation in the dependent, bid variable. Repeated exercises have been implemented in order to determine the final estimation model for a potentially significant list of independent variables to be included in the final estimation. The final regression model was scrutinised with few independent variables in model 2 as shown in *Table 5*.

The preliminary regression has been shown in model 1 and repeated estimation procedures will eventually conclude the final model. Finally, after repeated test of

Table 4. Probability of Willingness to Pay using CVM

Response	Frequency	Percent (%)
No	251	47.1
Yes	282	52.9
Total	533	100

Source: Primary data

Table 3. Dimensionality on environmental attitude

Component factor	Number of items		Coefficient
	Initial	Excluded	Alpha (0.895)
Wetland Function (WEF)	10	0	0.868
Agricultural Activities (AGA)	6	0	0.856
Efficient Management (EFM)	3	0	0.848
Society Benefit (SOB)	4	4	0.669
Information Provided (INP)	3	0	0.709
Salient Belief (SAB)	3	0	0.756

Notes: Factor loading >0.40, eigenvalue >1 and total variance explained >60%

Table 5. Single bounded CVM model

Variable	Model 1		Model 2	
	B	S.E	B	S.E
BID	–0.109	0.038***	–0.110	0.038***
AGE	–0.011	0.011	–0.012	0.010
GEN (1=male,0=otherwise)	–0.156	0.207	–0.170	0.203
EDU (1=university,0=otherwise)	0.392	0.239	0.396	0.216*
WRK (1=employed,0=otherwise)	0.445	0.276	0.458	0.270*
INC	0.000	0.000	–	–
WEF (Component 1 perception)	0.054	0.094	–	–
AGA (Component 2 perception)	–0.159	0.096*	–0.156	0.096*
EFM (Component 3 perception)	–0.216	0.095	–	–
SOB (Component 4 perception)	–0.035	0.093	–	–
INP (Component 5 perception)	–0.011	0.093	–	–
SAB (Component 6 perception)	–0.142	0.094	–0.142	0.094
CONSTANT	0.934	0.475	0.938	0.470
	–2 log likelihood 651.836		–2 Log likelihood 657.562	
	Cox and snell R^2 0.052		Cox and snell R^2 0.041	
	Nagelkerke R^2 0.070		Nagelkerke R^2 0.055	

Note: *** Significant at 1%, ** 5% and * 10%

assumption models, the best fit model for CV was finalized with few inserted variables that are significant at 1% and 10% level. Other variables that are not significant such as AGE, GEN, INC, WEF, SOB, INP, EFM and SAB were omitted from the model as these variables have no effects on the willingness to pay. Hence, only EDU, WRK and AGA were considered to have significant effects on the visitors' WTP for the entrance fee of Tasek Bera wetland to be imposed.

The education level variable is positively significant as presented in model 2 with a coefficient sign of 0.396. It means that the higher education level of the respondents has the higher willingness to pay for the fees of Tasek Bera wetland. The work status variable was also statistically significant at the 10% level with positive coefficients of 0.458.

On the other hand, the agricultural activities which statistically significant at the 10% level has a negative coefficient sign (–0.156). It is expected as the increase of agricultural activities will significantly decrease the willingness to pay for the entrance fee for Tasek Bera wetland. In reverse, the reduction of these kinds of activities implies the increasing of the utility of the respondents.

The –2 times the natural log of the likelihood is commonly referred and this measurement has been used as the measurement of model fit in the estimation. The Cox and Snell R^2 and Nagelkerke R^2 measure range from 0 to 1 which gives 0.041 and 0.055 respectively. The improved measurements through repeated exercises were finally produced the best model with few selected significant as well as insignificant explanatory variables.

The BID variable in the final model was negative statistically significant at the 1% level, in line with the suggested theory of demand. The theory indicated that as the offer of the bid amount increasing, the reaction would be followed by the decreasing in willingness to pay. Negative sign of the BID variable has affirmed the assumption as the variable affects negatively on the agreement of entrance

fee contribution towards sustainable development of Tasek Bera wetland among the visitors (*Table* 6)**.**

Willingness to pay estimation
The mean increase in willingness to pay estimates derived from the following equations:
Single bounded:

$$WTP = [\beta0 + (\beta EDU * EDU) + (\beta WRK * WRK) + (\beta AGA * AGA) + (\beta AGE * AGE) + (\beta GEN * GEN) + (\beta SAB * SAB)]/\beta BID$$

Where, $\beta0$, βEDU, βWRK, βAGA, βAGE, βGEN, βSAB and βBID are estimated parameters for constant term, education level, work status, agricultural activities, age, gender, salient belief and bidding amount offered in the single bounded estimation model. The estimated increase in WTP for model 2 from *Table 7* is RM21.65 as the entrance fee in contribution to the sustainable management of Tasek Bera wetland. Aggregate results were estimated by multiplying individual WTP by the number of households in the study area. In 2010, there were 86,690 households (MDB 2010) recorded in the study area.

Translating the CVM mean WTP to the study area resulted in RM1,876,838.50 from one-time donation. Assuming a more pessimistic scenario in this study (that nobody would contribute to donating to the Tasek Bera wetland area on an annual basis), the value of the net benefits would be equivalent to the one-time payment. If, however, one assumes a more optimistic scenario (annual contribution), then the value people receive from the wetland would be for a one year (monthly basis) or more time horizon. Therefore, translating this result in a monthly base contribution would give RM22,522,062.

The results of the study would be very useful for the resource manager and related stakeholders as well as to be the guideline in the determination of the relevant attributes that most likely preferable by visitors. The proposed funding derived from the entrance fee and the conservations charge of wetland can be justified through the study in which the study should be set the appropriate levels of fees with visitors' preferences also have been accounted for. The purposes of this study were to assess the value of the related resources in the development of wetland using environmental economic approaches to help the wetland management. This study gives them the options that can enhance the economic opportunities, but sustainable

Table 6. Frequency of responses to bidding prices (single bounded)

Bid Price	No	Yes	Total	No. response (%)
RM3	23	58	81	28.4
RM4	35	57	92	38.0
RM6	65	56	121	53.7
RM8	79	46	125	63.2
RM10	49	65	114	43.0

Table 7. Willingness to pay for sustainable development of Tasek Bera

WTP (RM)	Single bounded	Use value (RM)
WTP Mean	RM1.65	RM1,876,838.50
Population	One-time donation	RM1,876,838.50
(86,690) *	Monthly basis for a year	RM22,522,062

Note: *Referred assumption in determining use value of Tasek Bera wetland area

in the development of the wetland area. The valuation and assessment of wetland area development are very important in order to realize that development fulfills the requirements of the visitor preferences through the understanding concept of wetland area.

The first objective of the study was to determine the perception towards environmental issues existed in the Tasek Bera wetland area. The responses were identified using Exploratory Factor Analysis (EFA) and visitors' attitudinal perception towards environmental issues of the wetland has been structured by six factors, namely 1) wetland function, 2) agricultural activities, 3) efficient management, 4) society benefit, 5) information provided and 6) salient belief. The second objective then was to determine the value of resource management and conservation options of Tasek Bera wetland. In CVM estimation, the study was able to determine the value of resource management and conservation options. In Contingent Valuation Method (CVM) estimation, the study found that 52.9% of the visitors are willing to pay the hypothetical entrance fee to the wetland area. With the assumption of more optimistic scenario (monthly contribution), the value people receive from the wetland would give RM22,522,062. Furthermore, the study also found that the reduction of agricultural activities will increase the utility of the respondents as derived from the CVM estimation model as well as age and education level.

Conclusion

It is important to bear in mind that specific improvement of attribute-levels and other related factors that contribute to the sustainable improvement of Tasek Bera need an important consideration from policy makers. This reflected with the determination of the best investment involved, cost and benefits obtained, together with the outcomes of changes in biodiversity conservation and ecotourism facilities and services arrangements

discretion. Hence this study provides the costs of providing the improvements in attributes-level, which is beneficial in drawing the specific improvement plan. Furthermore, respondents declared clear preferences in biodiversity conservation improvements and obvious demand in the enhancement of ecotourism facilities and services. The information came with a clear willingness to pay value for each specific improvement.

Wetlands provide free natural resources either for goods or services in which most of them has been managed by related government agencies. Same as Tasek Bera, the government spends a lot of allotment through the resource manager Tasik Bera RAMSAR Site Management Unit under DWNP in managing this valuable wetland. In addition, the RAMSAR status portrayed a high importance of the wetland contribution to the community and biodiversity in international level. The findings of the study can be a useful guideline for resource manager in prioritizing the necessities in a sustainable development program for Tasek Bera. First, the determination of attribute-levels ranks in biodiversity conservation and ecotourism facilities and services would be a help to resource manager in really tackling the marketing problem in promoting the wetland. As a product, whether goods or services enhanced, it forms a marketing strategy in promotion aspect indirectly.

In return, the benefits gained from the enhancement not only can be consumed in term of monetary value through a conservation charge or entrance fee, it also consequently affects to the increasing environmental quality of the wetland as a whole. Continuous funding system generated by the charge or fee system setting up the independent organised funding system for resource manager in efficiently manages the wetland. The efforts of sustainable development would contribute to the restructuring of society attitudinal-perception and educated them to appreciate the resources available in the wetland.

After that, the efforts will become easier as the community would engage in mutual conservation efforts since they become aware and concern with the degradation or deterioration problems of the wetland. Furthermore, as the visitation rate increases, local communities will obtain more benefits through economic multiplying effect instead of the direct exploitation of the natural resources of wetland which in the long run if beyond the capacity could be harmful to the wetland environment and diversity.

There are at least two angles of views can be obtained from this case. First, the important economic value of the wetland which previously has been mistaken and underappreciated can be rectified as the benefits shown through this study. The enhancement of public knowledge regarding the benefits that can be derived from wetland ecosystem shall restructure the attitudinal-perception towards the deterioration problems occurred at Tasek Bera. In addition, the translation of wetland characteristics of the total economic value will support the investment program plans that eventually benefit the society in return. Secondly, the conventional idea that puts the total burden to the government in further enhance the purpose of wetland area can be corrected whereas the responsibility is for everyone. The study has translated it to the form of monetary value of entrance fee and conservation charge. In parallel, the public need to be educated about the specific value and benefits that they may enjoy if the biodiversity conservation with ecotourism facilities and services of the wetland are to be enhanced.

However, people should aware that their utility would be affected if the entrance fee or the conservation charge implemented by the resource manager since they have to allocate amounts of money in order to enter the wetland area whereas previously there is no need. In a way, this will be resulted in the increasing of public consciousness towards wetland benefits which in the long run advantageous to the community

surrounded in Tasek Bera and future generations.

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Abstrak

Ciri-ciri utama tanah lembap Tasek Bera kini terancam oleh aktiviti ekonomi dan factor luaran. Kedua-dua dasar pengurusan sumber dan pilihan pemuliharaan harus mampu mencapai jumlah pendapatan secukupnya untuk terus mengurus sumber-sumber tanah lembap Tasek Bera secara efisien. Oleh itu, kajian ini cuba untuk menganggarkan nilai penggunaan tanah lembap. Kaedah penilaian kontinjen pilihan dikotomi telah digunakan dalam eksesais ini. Soal selidik berstruktur telah dibangunkan dan diedarkan kepada responden di kawasan sasaran kawasan lembah Tasek Bera khususnya di pintu masuk utama. Sebanyak 600 soal selidik telah diedarkan dengan menggunakan persampelan mudah di kalangan pelawat kawasan tanah lembap Tasek Bera. Seramai 533 responden telah dipilih untuk analisis selanjutnya. Pertamanya, kajian ini cuba untuk meneroka dimensi asas yang mempengaruhi persepsi persekitaran di kalangan pengguna ke kawasan tanah lembap Tasek Bera. Selaras dengan itu, kajian ini memberikan respons dan permintaan permukaan oleh pengguna yang tertakluk kepada keperluan pengurusan dan pembangunan sumber yang cekap. *Exploratory Factor Analysis* (EFA) telah digunakan untuk mengenal pasti dimensi yang mempengaruhi persepsi persekitaran terhadap kawasan tanah lembap. Dalam anggaran CVM, pengurangan aktiviti pertanian didapati meningkatkan utiliti responden ke arah tanah lembap. Kesediaan untuk membayar untuk peningkatan dalam pengurusan sumber dan pilihan pemuliharaan tanah lembap telah didapati melalui model logit. Pelawat yang dikenal pasti dalam kajian dari senarai peringkat atribut yang dikaji akan menjadi maklumat yang berguna untuk pengurus sumber. Oleh itu, maklumat ini akan membantu dalam mendapatkan garis panduan dalam pengurusan pembangunan tanah lembap yang lebih cekap.