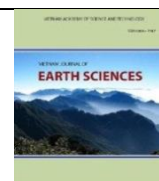




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Recreational and conservative valuation of Bien Ho landscape

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ABSTRACT

Bien Ho is one of the volcanic landscapes showing lava eruptions that occurred millions of years ago. It is a symbol of the volcanic landscapes in the Tay Nguyen, Vietnam, which keeps a lot of values. This article aimed to quantify recreational and conservative values. The travel cost and contingent valuation method were used to estimate the recreational and conservative value (existence, bequest, and option value) of Bien Ho, respectively. The results indicated that the recreational and conservative value of Bien Ho volcanic landscape was 1,436.9 billion VND and 38.6 billion VND, respectively. The average willingness to pay in the contingent valuation method was 39,388 VND and depended only on ethnicity and age. The study used different populations to define survey samples according to each estimating method to improve the confident accuracy of the results.

Keywords: Economic valuation; travel cost method; contingent valuation method; volcanic landscapes; conservative value; recreational value.

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1. Introduction

The volcanic landscapes are one of the most spectacular landscapes in Vietnam. Bien Ho is one example, which is a symbol of the volcanic landscape in the Tay Nguyen. It is situated in the plateau of Pleiku basalt, Gia Lai province on which hides many indirect values besides things could be observed directly as regulating, supplying water, and recreation (Fig. 1). It demonstrated the volcanic eruption of 0.3 million years ago (Hoang, 2005), is a typical volcanic crater morphology of the central eruption. It also is living

space of many species as such birds and fishes.

Bien Ho is a natural landscape and has both use and non-use value. The total economic value of Bien Ho landscape was described in Fig. 2 based on the ecological and economic foundations (ECEB) approach. Each value of landscape in form of money would be estimated by different methods (Fig. 2); especially some values could not be determined by the market. Consequently, natural capitals of a landscape could be quantified. Two values of Bien Ho that would be considered under the study are recreation and conservation. The recreational one was assessed

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by the travel cost method and the conservative value (existence, bequest, and option) was estimated by the contingent valuation one (TEEB, 2010).

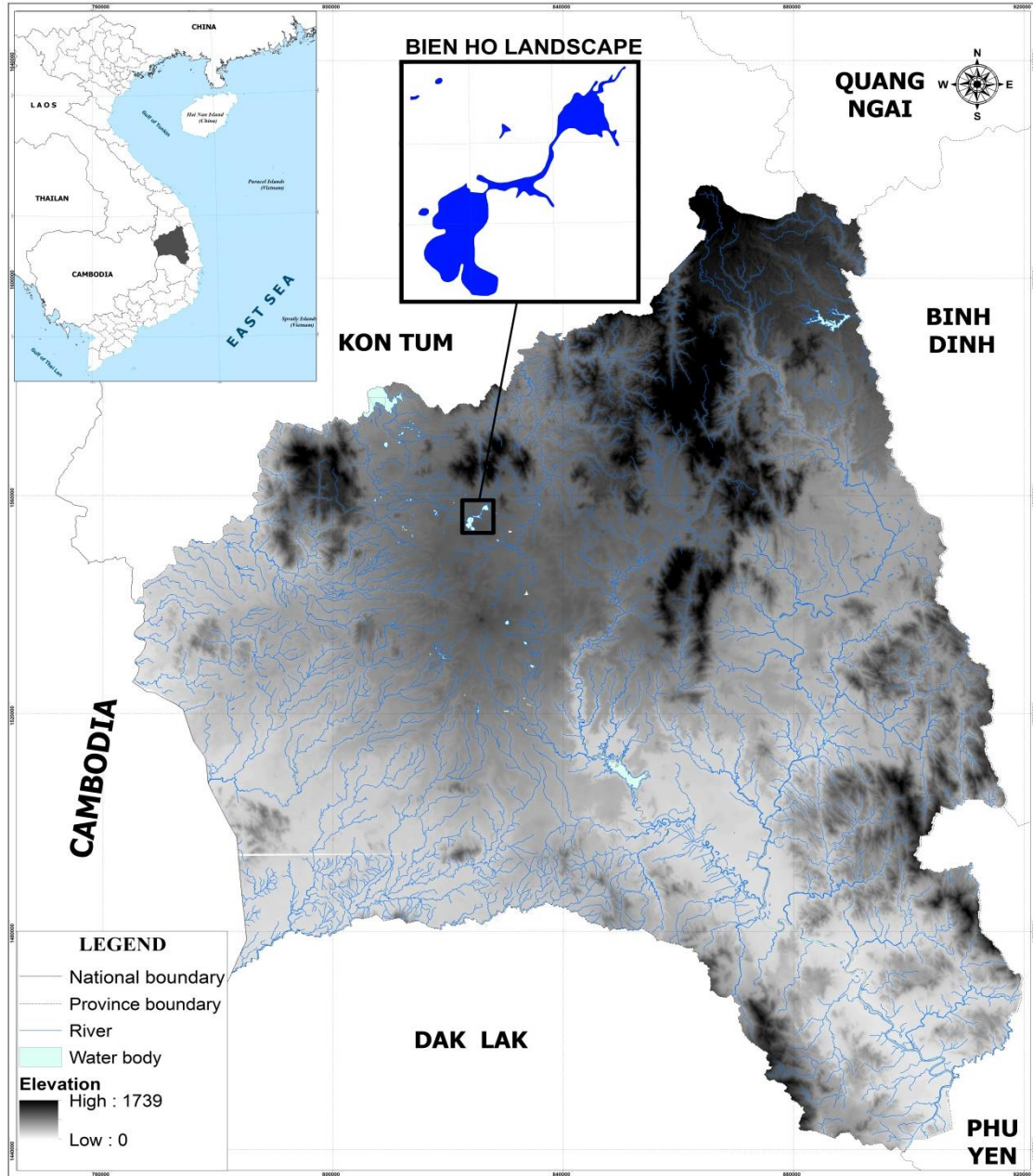


Figure 1. The site of Bien Ho, Gia Lai, Vietnam (data source: Luu The Anh, 2014)

The travel cost method was originally proposed by Harold Hotelling in 1947, although it was not widely used until the late 1960s. Ac-

ording to Hotelling, as people often travel great distances to parks they could differentiate net satisfaction or value based on them. Conse-

quently, the travel cost recreation demand model was suggested. This method was applied to determine the direct and indirect values as the recreational value of an island (Weiqi et al., 2004), of a lake (Christopher and Averil, 2008,

Jala and Nandagiri, 2015), of beaches (Fan et al., 2015), of urban open space (Merlin and John, 2017), the value of a fishing spot (Pokki et al., 2018), ecosystem services of national parks (Marius and Manuel, 2018).

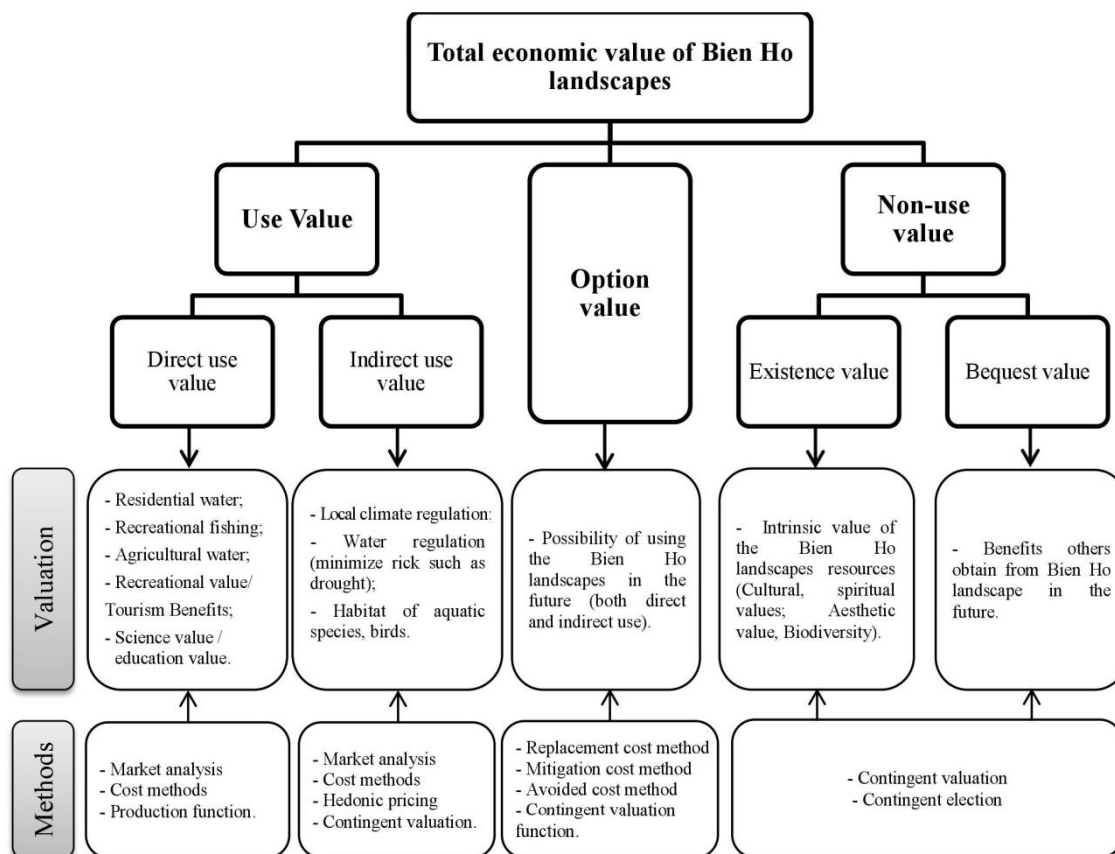


Figure 2. Total economic value of natural resources and evaluation methods (adapted from Mark, 2010 and TEEB, 2010)

The theory of contingent sampling was first proposed by Ciriacy-Wantrup (1947), who argued that the prevention of soil erosion would generate some additional benefits in the market, which is called "public goods", and therefore, can be estimated. They could be valued by suggesting individuals willing to pay for them through a survey method. However, only when environmental economics recognized that existence value and option value were a part of the total economic value

in the 1960s, the contingent valuation method began to be widely applied and developed. This approach identifies both use and non-use value, widely implemented in cost-benefit analysis as the value of forest survival (Hamid et al., 2006), the project on urban regeneration on waste management (Sandra and Rui, 2015), evaluating historical and cultural ruined properties (Vincenzo and Pierfrancesco, 2016), infrastructure projects on railways (Kiyohito, 2018).

The above-mentioned studies identify the individual values of a landscape, however, the report on “Economic value of protecting the Great Lakes” proposed by Marbek et al. (2010) was a typical case study of a total economic value approach that quantified most of the values of the Great Lakes by different methods.

In Vietnam, quantification of natural resources has been practiced since 1997 by using the travel cost method as such Nguyen Thi Hai (1997), Tran Vo Hung Son and Pham Khanh Nam (2001), Do Nam Thang and Jeff Bennett (2005). However, Nguyen Thi Minh Huyen (2009) and Dinh Duc Truong (2010) applied the economic resource valuation methods to quantify the total values of some coastal typical ecosystems and wetlands in Vietnam. This was not done before in Vietnam.

Estimating some Bien Ho landscape values in form of money which have no price in the market is a new approach to quantify the non-use ones. The results are very informative for planners to wake up the hidden resources of Bien Ho. This article aims to quantify the recreational and conservative value (existence, bequest, and option value) of Bien Ho landscape by using the travel cost and contingent valuation method.

2. Methods and materials

2.1. Materials

Materials are divided into two types: (1) Published articles and reports on values of Bien Ho, reports and data collected during the field trip in 2018; (2) The questionnaires obtained by interviewing tourists and people living in the plateau. The questionnaire forms

were shown in Appendix 1, 2. They included the information on personal, travel, food and drink and accommodation cost, time to travel...).

2.2. Travel cost method (TCM)

There are three ways to carry out the travel cost method: Zonal TCM (ZTCM), Individual TCM (ITCM) and Random Utility TCM (Mike, 2012; Saúl et al., 2018). ZTCM determines the relationship between the ratio of visitors to a landscape and the total their costs to travel to there. As applying the ZTCM, regions around the destination are divided into zones corresponding with different distances. Therefore, its observation units are these zones. It is appropriate for estimating a landscape value in which visitors do not often arrive (Saulet al., 2018). Meanwhile, ITCM uses individual survey data. Thus, it is necessary to have more data and analysis but is more accurate. Random Utility TCM quantifies values for many landscapes. The ITCM is applicable for investigating landscapes where a visitor arrives frequently during a year such as parks, zoos, botanical gardens (Saulet al., 2018). Therefore, ZTCM is the most suitable for quantifying the recreational value of Bien Ho. The procedure of ZTCM which was applied for the study is shown below (Fig. 3).

The total travel cost could be summarized by food and drink, accommodation, opportunity, transport costs and other ones as entrance fee (Tran Vo Hung Son and Pham Khanh Nam, 2001; Weiqi et al., 2004).

The money value for individual zones on landscape recreation could be measured by consumer surplus. The recreational value is the difference between the willingness to pay for a trip to the landscape and total trip cost (the area of the dark triangle - A) (Fig. 4) (ACIL, 2006).

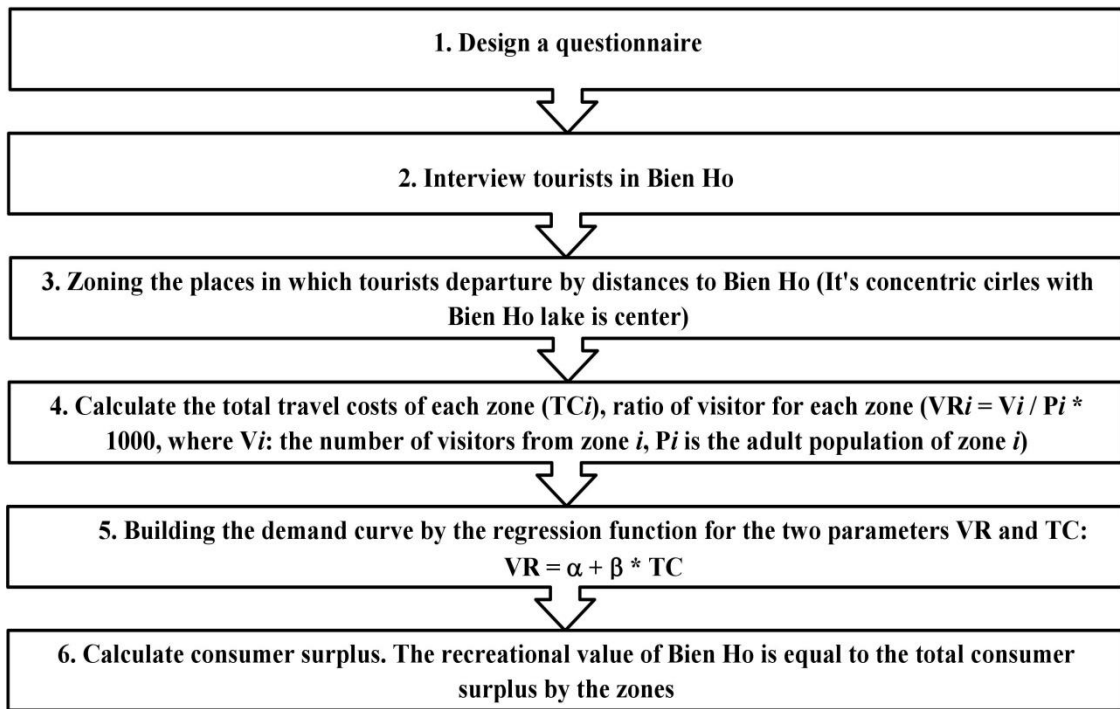


Figure 3. The steps to quantify the recreational value of Bien Ho by using TCM

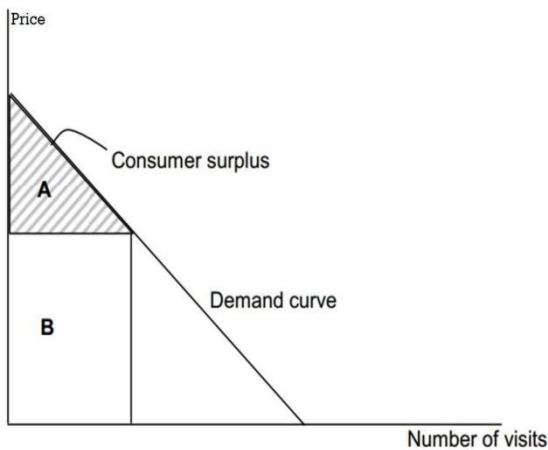


Figure 4. The relationship between the recreation demand curve and consumer surplus (ACIL, 2006)

2.3. Contingent valuation method (CVM)

The contingent valuation method (CVM) is often used to estimate the economic value of natural landscapes called "public goods". It is used to quantify both the use and non-use value, but it usually is applied to determine the

non-use value of public goods. By building a virtual market, the demand for public goods was determined by the willingness of the people to pay or the willingness to accept when they lose the goods in a supposed situation (Venkatachalam, 2003).

CVM is a method estimating directly willingness to pay (WTP). WTP was defined as the maximum amount of money a person is willing to acquire or come into a certain good or service which he/she desires (Hans et al., 2007). Thus, TCM allows calculating an individual's consumer surplus by integrating the demand curve, while directly CVM collects consumer surplus by WTP from an individual through her/his answer.

Theoretically, TCM only determines use value as recreation, while the CVM can take into account the total economic value (TEV) of natural landscapes including use and non-use value. Use value is composed of the utility obtained from direct interaction with the good (natural landscape), while some non-use ones

can be mentioned as optional (the landscape preservation for direct use in the future), the bequest (the landscape protection options for future generations), and the value of existence (the one of knowing a landscape existence) (Karen et al., 2007).

In order to obtain the conservation value, the WTP's question has to show the optional, bequest and existence one. They need to explain in the landscape profile and questionnaire. The WTP value represents a willingness to pay for the conservation of Bien Ho landscape by people, although they may or may not obtain direct benefits from Bien Ho in the present time, but next generations can be acquired in the future. There are three scenarios that lead to these values: (a) a willingness to pay to preserve the landscape for future use, such as for recreational purposes. This value is called the option one; (b) a person willing

to pay for conservation it, even if he/she does not use or intend to use it. His/her desire is that his/her children or the next generation has the opportunity to use it. This is called as the bequest value. (c) a person who is willing to pay for preserving it because he/she simply wants the lake to continue to exist. The desire is also very different, from the real value of the lake to the spiritual value, and the right of other living creatures in the lake or depending on its existence. It is called as existence value (Vu Tan Phuong, 2006). In the study, the conservative value was considered as consisting of the optional, bequest and existence. The WTP procedure was applied for quantifying the conservative value of Bien Ho consists of five steps (Fig. 5). Software that supports data storage, processing and analysis is Excel 2010 and IBM SPSS Statistics 20.

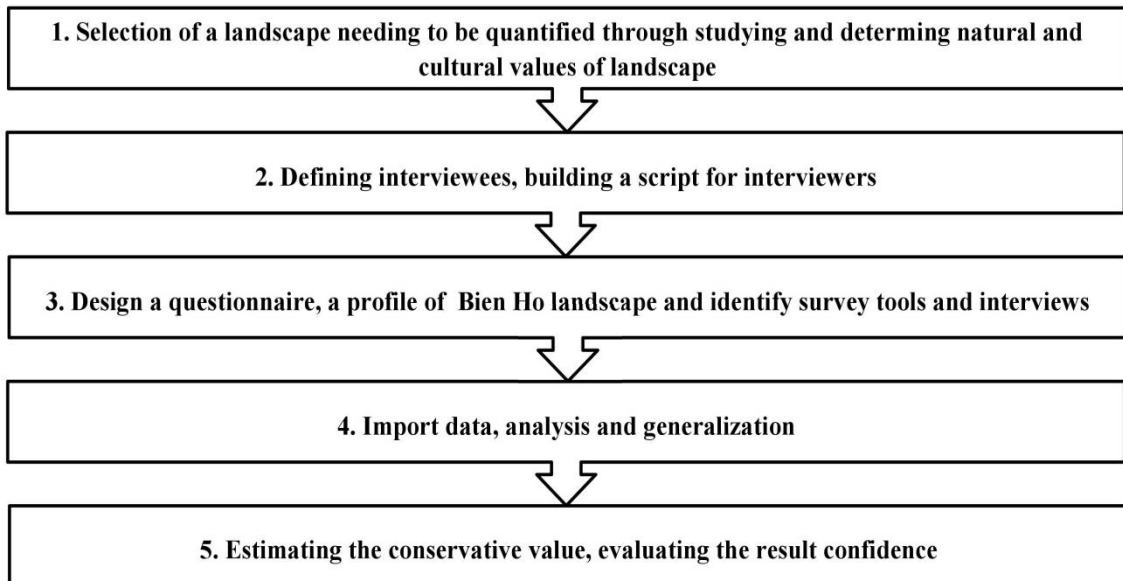


Figure 5. The steps to quantify the conservative value of Bien Ho by using WTP

2.4. Linear Regression Analysis Method

The travel cost method requires the construction of a demand function from two variables: the tourist rate and the travel cost to calculate the surplus value. It is necessary to analyze factors affecting WTP. This requires

the development of a dependency function between WTP with independent variables, such as age, sex, ethnicity, marital status. The study was selected the linear regression analysis to find the relationships (Eq. 1).

$$f(x) = \alpha + \beta * x_1 + \dots + \omega * x_n \text{ (Eq. 1)}$$

where α , β and ω are coefficient, x_1, \dots, x_n are independent variables.

In order to analyze the confidence of the functions, some below coefficients and tests were calculated.

- Multiple Correlation Coefficient is a measure of how well a given variable can be predicted using a linear function of a set of other variables.

- Adjusted R Square reflects the degree of influence of independent variables on the dependent variable.

- Durbin-Watson (DW) test is used to test the autocorrelation of contiguous errors (the so-called first-order correlations) with values ranging from 0 to 4.

- The F test verifies whether this linear regression model is generalized and applicable to the whole below 0.05 is signification.

- VIF (variance inflation factor), this value is used to check the multi-collinear phenomenon. According to many writing theories, VIF below 10 will not have multicollinearity.

2.3. Defining the sample size for each method

2.3.1. The travel cost method

The surveying population was defined as the number of domestic tourists to Gia Lai in 2017 and the number of adults in both Gia Lai and Kon Tum provinces because a number of domestic tourists have not often counted the

number of tourists from Gia Lai, Kon Tum province. The number of domestic tourists was calculated by 20% total tourists coming to Gia Lai because there were only 20% total tourists coming to Gia Lai which were tourists in the true sense (PCGP, 2016). Additionally, foreign tourists arriving Gia Lai were not remarkable. The sample size to interview was defined by Slovin's equation (Eq. 2).

$$n = N/(1+N*e^2) \text{ (Eq. 2)}$$

Where: n: sample size; N: the population; e: marginal error (=10%)

The convenient sampling method was used and visitors were interviewed at Bien Ho.

2.3.2. The contingent valuation method

The surveying population was defined as people who benefit from Bien Ho. They are ones living in the Pleiku basalt plateau and the number of 20% total domestic tourists arriving Bien Ho. There were 8 districts in the plateau. Therefore the sample size of each district population should be assigned random stratification according to the below equation to obtain the representative sample.

$$n_h = (n/N)*N_h \text{ (Eq. 3)}$$

where, n_h : sample size of each district; n = sample size; N: Population; N_h : Population for each district.

The sample size of each district was divided into one half of urban residents and one half of rural residents to enhance the result confidence (Table 1).

Table 1. Population of the 8 districts in the plateau and the sample size

District	Population in 2017 (person)	Sample size/No. of questionnaire	No. of questionnaire in fact
Pleiku	234,254	24	30
Iagrai	98,014	10	15
Mang Yang	64,567	7	8
Dak Đoa	111,473	11	13
Chu Pah	73,821	7	8
Duc Co	70,627	7	9
Chu Prong	110,808	11	15
Chu Se	118,536	12	13
Tourists	98,070	10	28
SUM	980,170	100	139

3. Results

3.1. Bien Ho’s recreational value

The sample size

According to statistic data, there were 490,350 tourists arriving Gia Lai in 2017 (Gia Lai Province Cultural, Cinema and Tourism Center-GCCTC, 2018). The number of domestic tourists was defined as 98,070 (20%). Additionally, the number of adults in both Gia Lai and Kon Tum provinces were 1,356,431. The expected surveying population was 98,070 and the sample size to interview was 100, which is the minimum sample size.

Visitors to Bien Ho travel were divided into 9 zones

The field survey data showed that visitors to Bien Ho from 27 provinces in Vietnam (Table 2). Eight concentric circles were built based on the central point as Bien Ho (Fig. 6). There were 9 zones figured out, each zone was defined by the distance from the starting sites of visitors to Bien Ho (Table 2).

The province with the closest distance to Bien Ho is Gia Lai and Kon Tum (below 100 km), and the farthest is Lao Cai (above 1300 km).

Table 2. Zoning by distance from the starting sites of visitors to Bien Ho

Departure place of visitors	Distance (km)	Zones
Gia Lai, Kon Tum	< 100	1
Binh Dinh, Dak Lak, Phu Yen	100-200	2
Quang Ngai, Quang Nam	200-300	3
Khanh Hoa, Da Nang, Lam Dong	300-400	4
Binh Phuoc, Hue, Binh Thuan	400-500	5
Ho Chi Minh City, Dong Nai, Quang Binh, Ba Ria-Vung Tau	500-600	6
Soc Trang, Ha Tinh, Nghe An	600-700	7
Thanh Hoa, Ninh Binh, Nam Dinh	900-1100	8
Hai Phong, Ha Noi, Lang Son, Lao Cai	>1100	9

Visitation Rate (VR)

In order to define the rate a number of adults in each zone (Pi) and an average number of tourists in each zone arriving Bien Ho (Vi) need to be determined. According to the Gen-

eral Statistics Office, the Vietnam number of adults were 69,3% in 2017 (GSO, 2016; Dan-So, 2018). Consequently, the number of adults for each zone were defined based on total population and percentage of adults (Table 3).

Table 3. Visitation rates to Bien Ho

Zones	Number of observations	Ratio (%)	Average tourist (person): $V_i = 214,452 * (3)$	Adult population of origin zones (1000 person): P_i	Visitation rates on 1000 person: $VR_i = (V_i/P_i) \times 1000$
(1)	(2)	(3)	(4)	(5)	(6)
1	28	28	60,046	1,356.519	44.27
2	15	15	32,168	3,000.395	10.72
3	3	3	6,434	1,907.809	3.37
4	14	14	30,023	2,490.697	12.05
5	5	5	10,723	2,325.587	4.61
6	13	13	27,879	9,363.121	2.98
7	8	8	17,156	3,951.15	4.34
8	6	6	12,867	4,409.653	2.92
9	8	8	17,156	7,578.619	2.26

It is very important for determining the number of visitors to Bien Ho. It affects hugely the visitation rate, especially the demand

function, which leads to the accuracy of the landscape recreation valuation. Total tourists to Bien Ho consist of 20% of 490,350 domes-

tic tourists and tourists coming Bien Ho from Gia Lai and Kon Tum provinces. The results of surveying questionnaires indicated that there was 0.06% and 0.03% of tourists as pupils coming from Gia Lai and Kon Tum, respectively; 0.03% of tourists as students com-

ing from Gia Lai as well as Kon Tum; 0.11% and 0.02% of tourists as adults from Gia Lai and Kon Tum, respectively. Consequently, total visitors from Gia Lai and Kon Tum in 2017 were 116,381 people. As a result, total visitors to Bien Ho in 2017 were 214,452.

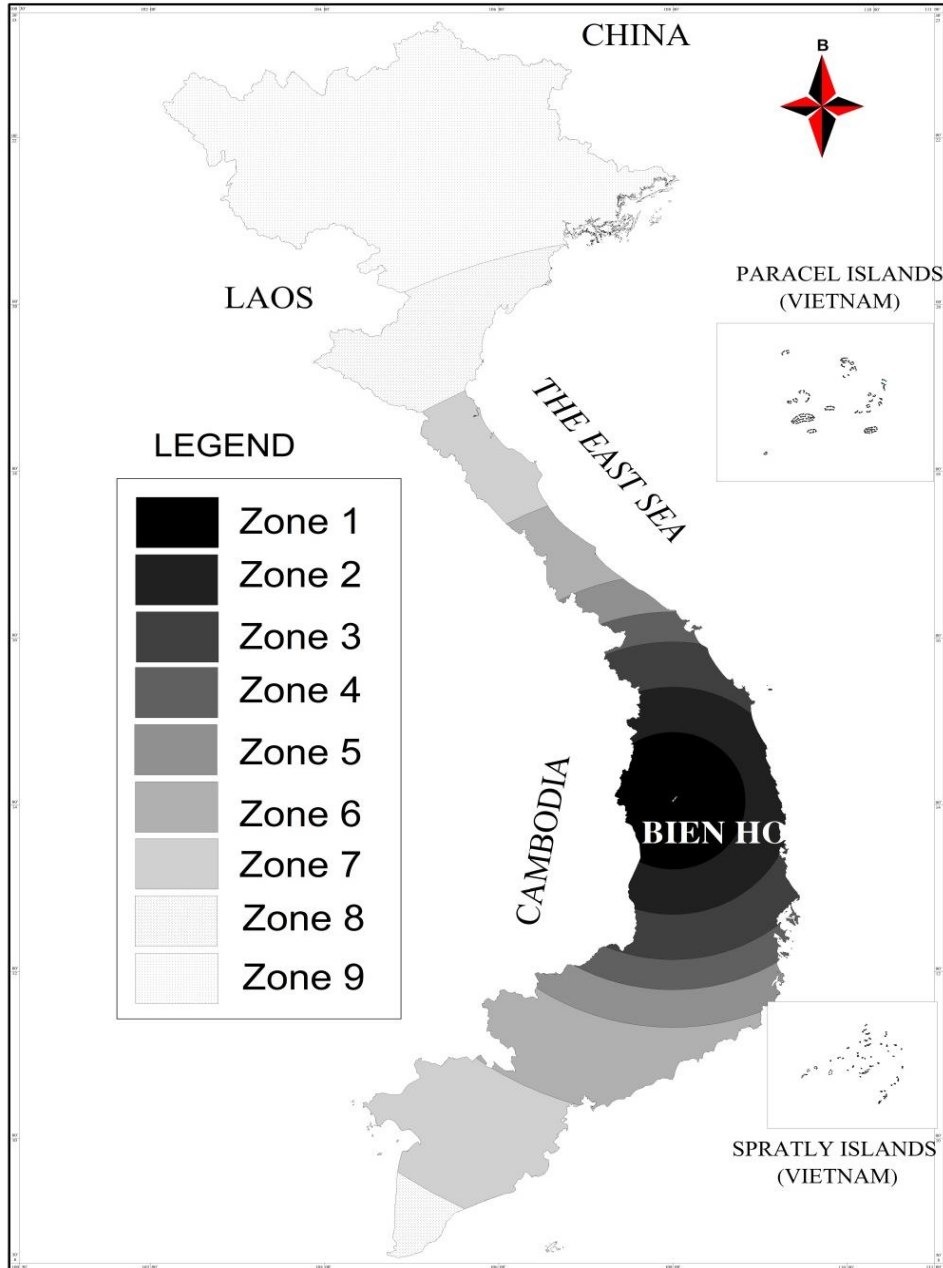


Figure 6. Zoning by distance from the starting sites of visitors to Bien Ho

Travel costs of each zone

The travel costs of tourist in each zone to Bien Ho include travel, accommodation and opportunity ones. The travel cost occupies a large proportion of the total ones of the lake. Bien Ho is the symbol of the Tay Nguyen, located at a good location with convenient transportation network including both road and airway. Hence, there were 100 tourists interviewed come from 27 provinces/cities scattering throughout the north and south of Vietnam. With respect to zone 1, the cost mainly was gasoline due to the small distance from the zone to Bien Ho and tourists arriving there by motorbikes. With respect to zone 9, tourists moved to Bien Ho by airplane and/or bus and/or taxi because of the farthest distance to destination. Finally, the cost increased dramatically compared to other zones. The tourists coming from the remaining zones arrived at the destination by bus, thus moving cost was defined by the bus price. The exception to zone 1, with respect to the remaining zones the cost was considered for the one-way trip because there is only sightseeing activity in the landscape and tourists often move to other destination after 2–4 hours stopping

there. Table 4 also indicated that this cost increased with the distance from the zones.

The exception to zone 1, tourists coming from other zones must be kept overnight. Only one night cost. Tourists from zone 2 and zone 7 must be kept overnight however most of them accommodated at their relative’s houses to reduce the cost. Up to 15% of the total number of visitors to the lake selected “accommodating at the relative’s house”. The opportunity cost was calculated by the traveling time, the accommodating time multiplied by per capita income of each zone. This data resulted in the living standards survey 2014 (GSO, 2014). Accommodation and travel costs are dependent on distance and tourist’s accommodation option. There were significant differences in zone 9, which was the eating and accommodating and opportunity cost reduction while traveling cost increase. The reason was that tourists arriving the lake by airplane, consequently the traveling time was short but the high price of airplane ticket led to increasing traveling cost, while the accommodating time reduced and the remaining cost decreased. The total cost of visitors from each zone as shown in Table 4.

Table 4. Total travel cost of visitors from each zone

Unit: VND

Zones	Accommodation and opportunity cost	Travel cost	Total cost of each zone TC_i
1	138,944.29	60,000	198,944.29
2	197,957.10	104,000	301,957.10
3	759,201.19	150,000	909,201.19
4	636,230.73	207,100	843,330.73
5	669,035.92	256,600	925,635.92
6	803,203.11	325,200	1,128,403.11
7	278,480.87	470,800	749,280.87
8	745,132.49	581,030	1,326,162.49
9	359,548.81	1,350,000	1,709,548.81

Building demand curve and estimation of landscape recreation value

The demand function was constructed by the dependent and independent variable. The former is the visitation rate of each zone (VR_i), while the latter is the total travel cost of each zone (TC_i). The correlation regression

analysis with the demand function model was run. The results were shown in Table 5.

The multiple correlation coefficient was 0.69 is close to 1. It means that there was a close relationship between the visitation rate and the total travel cost. Besides, adjusted R square was equal to 0.401, thus the total travel

cost affected 40.1% changes in the visitation rate because the adjusted correlation coefficient reflects the influence of independent variables on the dependent variable. The significance value of the F-test was 0.04, it was less than 0.05. Therefore, the linear regression model which was constructed was consistent with the population. The Durbin-Watson test and VIF parameter showed no autocorrelation

and multicollinearity. Signification value of each coefficient α and β was less than 0.05. It meant that the model results made sure significant confidence.

Based on the regression analysis two coefficients α and β of the regression model were defined. The function was shown in equation 4 (Fig. 7).

$$VR = 27.457 - 1.972 \cdot 10^{-5} \cdot TC \text{ (Eq. 4)}$$

Table 5. Results of correlation regression analysis

Multiple Correlation Coefficient = 0.69 Adjusted R Square = 0.401			Significance value of F-test = 0.04 Durbin-Watson = 1.709	
Coefficient	Value	Standard error	Significance value	VIF
α	27.457	7.843	0.01	
β	$-1.972 \cdot 10^{-5}$	0	0.04	1

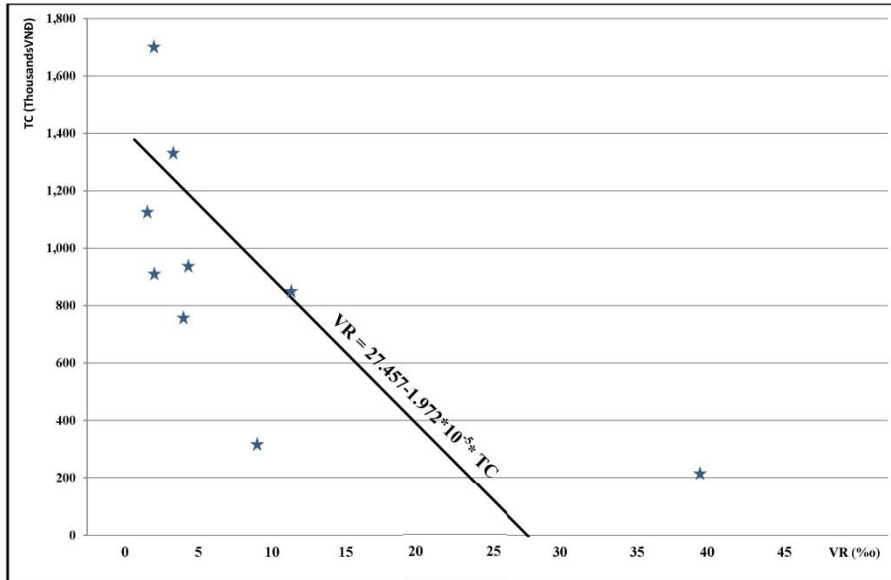


Figure 7. Graph of demand function of the Bien Ho tourists

Surplus value of each zone is the recreational one, which each visitor coming from the zone receives after spending an amount of money. The demand is linear, so the surplus of each zone is equal to the area triangle and formula (Wikipedia, 2018):

$$CS_i = \frac{1}{2} (TC_{max} - TC_i) \cdot VR_{TC_i} \text{ (Eq. 5)}$$

Where, CS: Average consumer surplus of zone i ; TC_{max} : the total travel cost at which the visitation rate purchased would fall to 0; TC_i :

the total cost of zone i ; VR_{TC_i} : The visitation rate at TC_i . In this case $TC_{max} = 1,392,262.41$.

From the average consumer surplus of each zone, the total consumer surplus of each zone was calculated (Table 6). The table indicated that there was no consumer surplus coming from tourists in zone 9 due to the high cost. Finally, the total consumer surplus of Bien Ho was 1,436.9 billion VND. It means that recreational value of Bien Ho landscape is 1,436.9 billion VND.

Table 6. Total consumer surplus of zones

Zones	Average tourist (person) (V_i)	Consumer surplus of each zone (VND) = $CS_i * V_i$
1	60,046	843,134,052,654.24
2	32,168	377,068,620,383.54
3	6,434	14,804,218,276.73
4	30,023	89,205,319,552.59
5	10,723	23,022,642,024.31
6	27,879	19,139,124,888.11
7	17,156	69,937,986,189.58
8	12,867	554,343,834.79
9	17,156	0
Total	214,452	1,436,866,307,803.89

Unit: VND

3.2. Conservation value of Bien Ho landscape

- The sample size: The expected surveying population was 980,170 (including 98,070 tourists - 20% total domestic tourists arriving Bien Ho and 882,100 people who live in the plateau), hence the sample size to interview was 100, which is the minimum sample size.

- The average willingness to pay of the Gia Lai people and the tourists to preserve and embellish the Bien Ho volcanic landscape as a symbol of tourism in the Tay Nguyen and for next generations is 39,390 VND with the standard error of 4,267 VND. The median value is 20,000 VND, and the mode value is 10,000 VND (Table 7).

Table 7. The statistics value of the willingness to pay
Unit: VND

Observation numbers	139
Mean	39,388
Standard error	4,267
Median	20,000
Mode	10,000
Standard deviation	50,304
Min	0
Max	200,000

Thus, the total conservation value of Bien Ho volcanic landscape is 38,607,414,113 VND. The correlations between WTP with influencing factors: ethnicity, age, sex marital status, urban, rural, distance from home to the lake, income, education shown that WTP was only correlated with ethnicity and age (Table 8).

The results of regression analysis between dependent variable (WTP) and independent ones including ethnicity (DT), age (TUOI) were defined the below function.

$$WTP = 24.785 * DT + 1.118 * TUOI - 20.778$$

The statistic parameters: Adjusted R Square = 0.116 (reflected that the ethnicity and age variables influenced 11.6% to WTP), the significant value of F-test = 0, the significant of coefficients before the independent variables are less than 0.05.

The result was figured out the Kinh was willing to pay more than 24,785 VND to the non-Kinh, while a person with age $t + 1$ would be willing to pay more than 1,118 VND the age t .

Table 8. Results of the correlation analysis between the WTP of Bien Ho and the influencing factors

		Ethnicity	Age	Sex	Urban/rural	Marital status	Education	Income	Distance from home to the lake
WTP	Pearson Correlation	0.197*	0.278**	0.085	-0.075	0.109	-0.149	0.008	-0.033
	Sig. (2-tailed)	0.020	0.001	0.319	0.380	0.203	0.080	0.925	0.704
	N	139	139	139	139	139	139	139	139

** . Correlation is significant at the 0.01 level (2-tailed); * . Correlation is significant at the 0.05 level (2-tailed)

4. Discussions

Quantification of recreation and conservation value was often carried out by the travel cost and contingent valuation methods based on only one questionnaire in the previous studies. It means that the interviewees were the same. They were either tourists (Nguyen Thi Hai, 1997; Tran Vo Hung Son and Pham Khanh Nam, 2001; Weiqiet al., 2004; Christopher and Averil, 2008; Fan Zhang et al., 2015; Jala and Nandagiri, 2015) or local people (Karen et al., 2007; Pirikiya et al., 2016; Kiyohito, 2018). In this study to estimate the recreational value the interviewees were tourists, while to quantify the conservative value the ones were local people acquiring benefits from Bien Ho and tourists. It makes the conservative value of Bien Ho approaching to real conservation.

The study brought promising results for valuation of recreation and conservation of natural landscapes, especially public goods. It is an important base for developing effectively conservative and exploiting plans and strategies of the landscape in the future. It approaches quantification of total natural capitals in form of money including use and non-use values, which are scientific bases for determining green GDP.

This study resulted in improvement of accuracy, especially the conservative value. However, there still occur some limitations.

First, with respect to tourist travels far from a destination visitors often go on tour and/or arrive many tourist sites, but as estimating the travel cost only one site was done. Therefore there is difficulty for dividing total costs of a visitor to the concerning site. This might make the results not truly reflect the values (Mike, 2012). In this study the travel cost was considered under one way trip because there is only sightseeing activity in the landscape and tourists often move to other destination after 2–4 hours stopping there.

Secondly, calculation of opportunity costs was based on per capita income. The study was used average income per capita in 2017 of each zone, which was calculated relied on the average income of each province. It affects the results, too.

Thirdly, with respect to the travel cost method, it is difficult to determine the travel costs of people living nearby the landscape because they can usually walk to there.

With respect to the contingent valuation method, one of the limitations is definition of the population size. The limitation was mentioned by Tom Ndebele (2009) as studying restoration and conservation value of Pekapeka swamp. He stated that the average WTP of a public good depends on the geographic distance. The farther from the location of the goods is, the lower the WTP is. In addition to, the average WTP also depends on the influence level of the goods as at local, national and international. The population size was decided by it. In order to overcome the limitation, the population size which was determined was people living in the Pleiku basalt plateau, who benefits directly from tourism activities originating in Bien Ho, and domestic tourists who benefit directly from sightseeing Bien Ho.

One question is how to increase spending in each zone? This is also a question not only of Gia Lai cultural and sports tourism department but also a general question of Vietnam's tourism. Theoretically, increasing travel cost per zone is also increasing the recreational value and the conservation value of Bien Ho. Thus to increase the total travel cost, it is necessary to have more ecosystem services associated with Bien Ho such as fishing, yacht, watching the sunrise, food, festivals, cultural activities associated with Bien Ho.

5. Conclusions

As estimating the recreational value of a landscape/site by the TCM, the travel cost could be considered under the one-way trip to

calculate total costs. As applying the CVM, the population size was decided by people who benefit directly from the landscape/site (local people and tourists). This allows enhancing the accuracy of recreational and conservative valuation of a landscape/site.

The study was used two methods: travel cost method and contingent valuation method to quantify the recreational and conservative value of Bien Ho volcanic landscape, respectively. Recreation plays a key role in the total economic value of the lake and was valued at 1,436.9 billion VND. The conservation value of Bien Ho was 38.6 billion VND. The average willingness to pay was 39,388 VND. This value only depends on two elements: the age and ethnicity.

The results show Bien Ho has great recreational and conservative value, making significant contributions to the national economy through the travel costs of visitors. However, the survey data collected from tourists also showed that the total cost of tourism for Bien Ho has still been low (the time to stay in Bien Ho was short, there were no other costs such as the cost for entertainment services in Bien Ho). Managers and decision-makers need to develop conservative and embellishment plans to exploit effectively the landscape.

The study brought promising results for valuation of recreation and conservation of natural landscapes, especially public goods. It contributes to the improvement of quantification of total natural capitals in form of money, which approaches to determining green GDP.

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References

Luu The Anh, 2014. Researching on soil degradation and desertification in Tay Nguyen and proposing sustainable land use solutions (in Vietnamese). Code: TN3/T01. Tay Nguyen 3 Program.

- ACIL Tasman Pty Ltd (ACIL), 2006. Harvey water bulk water pricing: Recreational value of the dams. <https://www.erawa.com.au/cproot/4870/2/ACIL%20Tasman%20Paper%204%20%20Recreational%20Value%20of%20the%20Dams.pdf>.
- Christopher M.F., Averil C., 2008. The recreational value of Lake McKenzie, Fraser Island: An application of the travel cost method. *Tourism Management*, 29(6), 1197–1205.
- DanSo, 2018. Vietnam Population. <https://danso.org/viet-nam>.
- Dinh Duc Truong, 2010. Assessment of economic value for managing natural resources in SE - applied in the estuarine area of Ba Lat river, Nam Dinh province. Economic doctoral thesis. Hanoi.
- Fan Z., Xiao H.W., Paulo A.L.D.N., Chunbo M., 2015. The recreational value of gold coast beaches, Australia: An application of the travel cost method *Ecosystem Services*, 11, 106–114.
- Gia Lai Province Cultural, Cinema and Tourism Center (GCCTC), 2018. Pleiku to develop tourism into spearhead economic sector. <http://dulichpleiku.gialai.gov.vn/vn/tp-pleiku-phat-trien-du-lich-thanh-nganh-kinh-te-mui-nhon.html> (in Vietnamese).
- General Statistics Office Of Vietnam (GSO), 2016. Area, population and population density by province. https://www.gso.gov.vn/default_en.aspx?tabid=774.
- General Statistics Office Of Vietnam (GSO), 2014. Result of the Vietnam household living standards survey 2014. <https://gso.gov.vn/default.aspx?tabid=460&idmid=5&ItemID=18410>(in Vietnamese).
- Nguyen Thi Hai, 1997. Determining the recreational value of Cuc Phuong National Park by travel cost method. Workshop of Environmental Economy, 29/8/1997, Ho Chi Minh city. (in Vietnamese).
- Hamid A., Sadegh K., Mohammad H.A., Majid A., 2006. Estimating the existence value of north forests of Iran by using a contingent valuation method. *Ecological Economics*, 58 (4), 665–675.
- Hans F.B., Stephen J.H., Barbara Z., Alberto L., 2007. Design tools related to socio-economics. *Environmental Design Guidelines for Low Crested Coastal Structures*. Elsevier Science, 448. eBook ISBN: 9780080555829.
- Nguyen Thi Minh Huyen, 2009. To study the application the method of assessing of the economic resources

- of some coastal ecosystems in Vietnam and proposing solutions for sustainable use, VAST (in Vietnamese).
- Hoang N., 2005. Source characteristics and melting conditions of Cenozoic basalts from Pleiku, south-central Vietnam. *Journal of Geology, Series A*, 286, 15–22 (in Vietnamese with English abstract).
- Jala and Nandagiri, L., 2015. Evaluation of Economic Value of Pilikula Lake Using Travel Cost and Contingent Valuation Methods. *Aquatic Procedia*, 4, 1315–1321.
- Kiyohito U., 2018. The value of local railways: An approach using the contingent valuation method. *Research in Transportation Economics*. In press, corrected proof. Available online 6 June 2018. *Resources, Conservation and Recycling*, 99, 111–117.
- Karen M., Sue S., Richard S.J.T., 2007. Comparing the Travel Cost Method and the Contingent Valuation Method-An Application of Convergent Validity Theory to the Recreational Value of Irish Forests. www.esri.ie. Working Paper, 190.
- Marbek, Steven R., Diane D., Jim B., 2010. Economic value of protecting the Great Lakes, Literature Review Report. Submitted to Ontario Ministry of the Environment, www.marbek.ca.
- Marius M., Manuel W., 2018. Assessing and valuing the recreational ecosystem services of Germany's national parks using travel cost models. *Ecosystem Services*, 31(C), 371–386.
- Merlin M.H., John R., 2017. Valuing urban open space using the travel-cost method and the implications of measurement error. *Journal of Environmental Management*, 198(2), 50–65.
- Mike C., 2012. *Valuation Methods Theory & Practice*. Regional workshop: Mainstreaming Ecosystem Services Approaches into Development. <http://www.ecosystemassessments.net/support/training-events/regional-workshop-mainstreaming-ecosystem-services-approaches-into-development>.
- Vu Tan Phuong, 2006. Values of Forest Environment Goods and Service. <http://www.mekonginfo.org/assets/midocs/0002538-environment-values-of-forest-environment-goods-and-services.pdf> (in Vietnamese).
- People's Committee of Gia Lai province (PCGP), 2016. Comprehensive planning for tourism development of Gia Lai province to 2020, vision to 2030. (in Vietnamese).
- Pirikiya M., Amirnejad H., Oladi J., Ataie Solout K., 2016. Comparing the Travel Cost Method and the Contingent Valuation Method – An Application of Convergent Validity Theory to the Recreational Value of Irish Forests. *Journal of forest science*, 6(2), 399–406. Doi: 10.17221/12/2016-JFS.
- Pokki H., Artell J., Mikkola J., Orell P., Ovaskainen V., 2018. Valuing recreational salmon fishing at a remote site in Finland: A travel cost analysis. *Fisheries Research*, 208, 145–156.
- Saúl T.O., Rubén P.A., Pedro D.S., Julio M.L., Felipe P.G., 2018. Economic Valuation of Cultural Heritage: Application of Travel Cost Method to the National Museum and Research Center of Altamira. *Sustainability* 2018, 10, 2550. Doi:10.3390/su10072550. <https://www.mdpi.com/2071-1050/10/7/2550/pdf>.
- Sandra F., Rui C.M., 2015. Contingent valuation method applied to waste management. *Resources Conservation and Recycling*.
- Tran Vo Hung Son, Pham Khanh Nam, 2001. Using the travel cost method to analyze recreational value of Hon Mun coral islands, Khanh Hoa province. University of Economics Ho Chi Minh. (in Vietnamese).
- Do Nam Thang, Jeff Bennett, 2005. Estimating Direct Use Values of Wetlands: a case study in Ca Mau-Vietnam, Occasional Paper 08, Environmental Management and Development, Australian National University, Canberra, Australia.
- The Economics of Ecosystems and Biodiversity (TEEB), 2010. The economics of valuing ecosystem services and biodiversity. In: Kumar P ed. *The economics of ecosystem and biodiversity: ecological and economic foundations*. London, Routledge.
- Tom Ndebele, 2006. Economic Non-Market valuation techniques: Theory and Application to ecosystems and ecosystem services. A case study of the restoration and Preservation of Pekapekas Swamp: an Application of the contingent valuation method in measuring the economic value of restoring and preserving ecosystems services in an impaired wetland.
- Venkatachalam L., 2003. The contingent valuation method: a review. *Environmental Impact Assessment Review*, 24(1), 89–124.
- Vincenzo D.G., Pierfrancesco D.P., 2016. The Contingent Valuation Method for Evaluating

Historical and Cultural Ruined Properties. Procedia - Social and Behavioral Sciences, 223, 595–600.	application of travel cost method for Xiamen Island. China Economic Review, 15(4), 398–406.
Wei qi C., Huasheng H., Yan L., Luoping Z., Mark R., 2004. Recreation demand and economic value: An	Wikipedia, 2018. Economic surplus. https://en.wikipedia.org/wiki/Economic_surplus .

Appendix 1:

QUESTIONNAIRE
(For tourists)

I. Information of interviewees:

Full name:..... Ethnic:..... Year of Birth:..... Sex: Male <input type="checkbox"/> ; Female <input type="checkbox"/>
Current residence (place of departure):
Phone No.:
Marital status: Married <input type="checkbox"/> , No. people in household.....; Single <input type="checkbox"/>
Education:..... Job:.....
Income (VND/month): Spending (VND/month):

II. Information related to the Bien Ho volcanic landscape:

How often you go here (Bien Ho) this year: Last year:.....						
How far from your departure place to here:.....						
How many time you spend for moving?:.....						
How long you spend time in here (Bien Ho) and the total time you spend for this trip? :.....						
Purpose of this trip: Leisure, entertainment <input type="checkbox"/> ; Discover, learn <input type="checkbox"/> Study <input type="checkbox"/> ; Go on business <input type="checkbox"/> ; Others <input type="checkbox"/>						
Your knowledge of Bien Ho volcanic landscape: :.....						
The vehicle which you use:						
Airplane <input type="checkbox"/>	Motorbike <input type="checkbox"/>	Passenger cars <input type="checkbox"/>	Private car <input type="checkbox"/>	Cars of the agency <input type="checkbox"/>	Taxi <input type="checkbox"/>	Tourism car <input type="checkbox"/>
Round trip ticket price:		Ticket price/ times:	No. of seats: people in a car:.....	No. of		Price for a tour:
			Road fee:.....			Schedule:
Entrance ticket:..... Other costs (for photographer, guide ...):.....						
Food and drink cost for: Breakfast; Lunch: Dinner:.....						
Others for food:..... for drink:..... Buy souvenirs:.....						
Accommodation costs:						

Time....., date..... 2018, interview point:.....
 Interviewer Interviewee
 (Sign, write your full name) (Sign, write your full name)

Appendix 2:

QUESTIONNAIRE

(For local people)

I. Information of interviewees:

Full name:.....Ethnic:..... Year of Birth:..... Sex: Male <input type="checkbox"/> ; Female <input type="checkbox"/>
Current residence (place of departure):
Phone No.:
Marital status: Married <input type="checkbox"/> , No. people in household.....; Single <input type="checkbox"/>
Education:..... Job:.....
Income (VND/month): Spending (VND/month):

II. Question about WTP for Bien Ho volcanic landscape:

How much are you willing to pay to preserve and embellish the Bien Ho volcanic landscape so that Bien Ho will be forever be a tourist symbol of both the Tay Nguyen and future generations?.....

Time....., date..... 2018, interview point:.....
Interviewer Interviewee
(Sign, write your full name) (Sign, write your full name)