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Tourist and Local Resident Preferences for the Northern Yellow-Cheeked Gibbon (*Nomascus annamensis*) Conservation Program in the Bach Ma National Park, Central Vietnam

Le Thanh An[1,2], Janusz Markowski[1], Maciej Bartos[1], Trinh Quang Thoai[3], Tran Huu Tuan[4], and Agnieszka Rzenca[5]

Abstract

Successful biodiversity conservation is closely linked to the support received from society. Therefore, a better understanding of public preferences for conservation activities facilitates successful conservation efforts. The objective of the study is to determine the preferences of tourists and local residents regarding the proposed conservation program of the northern yellow-cheeked gibbon (*Nomascus annamensis*) and its economic value in the Bach Ma National Park, as well as to examine the factors that determine their willingness to pay (WTP) for the gibbon conservation. The WTP was estimated with the dichotomous choice contingent valuation method, and data were collected using face-to-face interviews with 710 participations, including 352 Vietnamese tourists and 358 local residents. The logistic regression model was applied to predict the probability of WTP for the program. A number of factors were found to be significant predictors of WTP that included bid level, visit, awareness, knowledge, distance, family size, and education. The mean WTP amount was estimated at about $US3.81/tourist and $US 2.93/household for one-time support of the gibbon conservation program. A significant difference was also found between the tourists and local residents in terms of the estimated WTP. Our findings suggest that there is a strong public support within Vietnamese society for the conservation of gibbons, which should be considered in the design of social policies for biodiversity conservation and natural resource management.

Keywords

tourists, local residents, willingness to pay, contingent valuation method, the northern yellow-cheeked gibbon, Bach Ma National Park, Vietnam

Introduction

National parks (NPs) comprise the highest percentage of all spatial forms of globally protected areas (ca. 24%) (Chape, Blyth, Fish, Fox, & Spalding, 2003) and are recognized as the most important core *units* for *in situ* conservation (Chape, Harrison, & Lysenko, 2005). In many countries on all continents, NPs are increasingly recognized as playing an important role in the fields of international conservation, research, education, and recreation, as well as national socioeconomic development (Gülez, 1992). Most NPs are situated in developing countries, whose high level of biodiversity results in greater emphasis being placed on further expansion of

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protected areas (Chape et al., 2003, 2005); however, evidence suggests that pressures on biodiversity and natural resources (e.g., deforestation) are growing in line with increasing human population and anthropogenic activity, particularly in developing countries (Czudek, 2001; Hackel, 1999; Sodhi, Koh, Brook, & Ng, 2004). Biodiversity conservation and protected area management require social problems to be taken into greater account in conservation plans (Brandon & Wells, 1992; Mishra, Badola, & Bhardwaj, 2009).

In the development and management of protected areas, there is an increasing realization that social factors are the primary determinants of conservation success (Mascia et al., 2003; Muhumuza & Balkwill, 2013), and changes in human attitude and behavior are required in order to promote conservation efforts (Ehrlich & Kennedy, 2005; Schultz, 2011). In this sense, environmental economics can inform policy makers about a range of associated factors, including the reasons why the conserved species are endangered, the opportunity costs of protection activities, as well as the economic incentives for biodiversity conservation (Shogren et al., 1999). To determine what people are willing to trade off to conserve natural resources, the expressed monetary value of biodiversity can be calculated; this refers to a total economic value (TEV) approach, which aims to cover all expressions of value, including use values and nonuse values of biodiversity and ecosystems (Bateman, Mace, Fezzi, Atkinson, & Turner, 2011; Fromm, 2000; Nunes & Van den Bergh, 2001; Pagiola, von Ritter, & Bishop, 2004; Pearce & Moran, 1994). In particular, the nonuse values are typically far more difficult to define with respect to existing markets but these social benefits may be considerable as well as nonmarket benefits can be measured approximately by preference methods such as contingent valuation method (CVM) using public willingness to pay (WTP; Bishop, 1999; White, Gregory, Lindley, & Richards, 1997). These measures were used in previous studies as the estimates of the benefits of biodiversity conservation (Loomis & White, 1996; White et al., 1997). The use of economic valuation is an attractive and important approach which enables nature to be accounted for in socioeconomic development and to support management decisions and policies to pursue conservation efforts and sustainable use of natural resources (Bateman et al., 2011; Pagiola et al., 2004), particularly when estimating the costs and benefits of biodiversity conservation projects (Shwiff, Anderson, Cullen, White, & Shwiff, 2013). This is a way to understand public preferences for conserving biodiversity (Christie, Fazey, Cooper, Hyde, & Kenter, 2012; Fromm, 2000).

The effectiveness of successful long-term management of protected areas depends on the funding allocated to them. Many areas suffer insufficient funding, which jeopardizes their ability to maintain biodiversity and the benefits that intact nature provides to society (Bruner, Gullison, & Balmford, 2004). Of an estimated total US$6 billion spent each year globally on managing protected areas at the beginning of the 21st century, less than 12% was spent in developing countries and less than 10% of the costs needed for effectively maintaining protected areas were met in the tropics (Balmford, Gaston, Blyth, James, & Kapos, 2003). A chronic lack of funding is hampering the effectiveness of natural resource management, and factors such as high public support are essential to the success of protected areas (Struhsaker, Struhsaker, & Siex, 2005). In this situation, the development of tourism in protected areas could be a particularly effective tool in the conservation and natural resource management and can bring direct and indirect benefits; for example, tourism not only generates funds for conservation but also shapes tourists' attitudes to the natural environment (Ballantyne, Packer, & Hughes, 2009; Balmford et al., 2009; Emerton, Bishop, & Thomas 2006).

Despite being ranked as the 16th most biodiverse country in the world (Butler, 2016), Vietnam faces threats to its biodiversity conservation activities, as well as its protection of natural resources. Funds for the country's protected areas are also inadequate, as they cover only operations and maintenance costs for protected areas (International Centre for Environmental Management, 2003; An, Markowski, & Bartos, 2018). In the protected areas of special use forests, including NPs, the Vietnam Administration of Forestry (2014) and An et al. (2018) have identified a range of pressures on biodiversity and natural resources, such as illegal hunting and the wildlife trade. Consequently, the state of biodiversity in protected areas continues to decline. For example, the number of endangered species in Tram Chim NP has fallen dramatically, from 1,057 in 1987 to 93 in 2005 (Do & Bennette, 2008).

In addition to endangered species conservation, Vietnam's gibbon species and their status, including the northern yellow-cheeked gibbon in Bach Ma NP, can be considered as an indicator for the general status of the country's biodiversity; however, gibbon populations are declining mainly due to the ongoing threats of hunting and habitat loss (Rawson et al., 2011), which may indicate negative trends in wildlife populations within the country in general. Such examples of ecosystem degradation and biodiversity loss are alarming, and there is a need for effective policies as well as conservation programs to address the issue (Le, Lee, Kim, & Lee, 2016).

Little information is available regarding the value of biodiversity in Vietnam, specifically estimating WTP for nonuse values from public preference studies. The total

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value of wetland biodiversity protection at Tram Chim NP has been estimated to range from US$2.54 million to US$3.15 million (Do & Bennett, 2008). Based on the CVM, Hoa and Ly (2009) estimated the households' WTP to preserve Lo Go-Xa Mat NP at about US$6.6 million/3 years. Khai and Yabe (2014) calculated the total annual contribution of urban residents' WTP to conserving biodiversity in U Minh Thuong NP to be US$10.97 million. In a recent study, Le et al. (2016) estimated the total value of conserving biodiversity in Tam Dao NP at US$1.63/year. These studies focused on the contributions of urban residents or local residents; however, tourists' contributions visited protected areas have not yet been considered. Unfortunately, due to the paucity of studies related to benefits of biodiversity conservation, it is not possible for policy makers and protected area managers to conclusively determine whether changes in current management practices would generate net social benefits (Khai & Yabe, 2014). Although the design of biodiversity policy and benefits could be estimated by studying public preferences regarding conservation programs, this approach is complicated by the generally low level of public awareness and understanding of the meaning of biodiversity (Christie et al., 2006). In addition, public preferences for biodiversity conservation have been found to vary considerably, with this variation being found to be associated with socioeconomic characteristics, such as education level (Hoa & Ly, 2009; Le et al., 2016). Exploring public preferences for biodiversity conservation programs and their economic value has become an input for policy makers in biodiversity conservation and natural resource management; for example, information on nonuse values of biodiversity provides inputs for policy makers so that the policies they develop reflect the relative values of resources in their alternative uses (Do & Bennett, 2008). Human attitudes toward biodiversity play an important role in financial support for public conservation (Martin-Lopez, Montes, & Benayas, 2007a); particularly in the context of developing countries, whose governments have cut budgets for protected areas by more than half and international aid for biodiversity conservation has declined (Saporiti, 2006).

The aim of this study is to explore the preferences of tourists and local residents regarding the conservation program of gibbons taking place in the Bach Ma National Park (BMNP), using the CVM. The study examines financial contributions that different respondents are willing to pay for the protection of gibbons in one of the most important biodiversity conservation areas in Vietnam—the Bach Ma NP. More specifically, the study explores the awareness and attitudes of tourists and local residents toward gibbon conservation and its economic value and investigates the factors that determine the respondents' WTP.

Methods

Study Area

The study area is BMNP, which was established in 1991 to conserve the center of the last corridor of forest stretching from the coast of the South China Sea to the Annamite Mountain Range. The Bach Ma NP is one of 31 NPs in Vietnam and is situated in the middle of a narrow strip in Central Vietnam, 40 km southeast of Hue City (Thua Thien Hue Province) and 65 km northwest of Da Nang City (Figure 1); it is also located in the Greater Annamite ecoregion (Minh, 2013; Thien An & Ziegler, 2001). The total area of the park comprises 37,487 ha of the core zone and 58,676 ha of the buffer zone (Government of Vietnam, 2008). There are about 64,600 people (ca. 12,450 households) living in the buffer zone (Minh, 2013) and 14,852 tourists visited the park in 2015 (BMNP, 2017).

The Bach Ma NP is one of the highest priority biodiversity conservation areas in Vietnam; more specifically, the park is home to a diverse range of species, including 2,373 species of plants and fungi and 2,115 species of animals (Keo & Thien An, 2011). Thirty-nine species of mammals living in the park were ranked at the highest positions in the 2007 Vietnam Red Data Book, constituting ca. 50% of the total number of species (Keo & Thien An, 2011). However, the park faces various threats to its biodiversity conservation activities and natural resource management, the greatest being the pressure of population growth, and those associated with resource use, land-use policy, the illegal wildlife trade, and illegal hunting and logging (Minh, 2013; Thiha, Webb, & Honda, 2007). In addition to natural resource management problems, the park suffers from a lack of funds for biodiversity conservation (Minh, 2013).

At the time of the study, the Bach Ma NP (BMNP) lies within the habitat of the northern yellow-cheeked gibbon (*Nomascus annamensis*), which is one of six gibbon species found in Vietnam (Rawson et al., 2011). The northern yellow-cheeked gibbon (see Figure 2), as a new species to the genus *Nomascus*, was recently distinguished from two other endangered gibbon species, that is, the southern yellow-cheeked gibbon (*N. gabriellae*) and southern white-cheeked gibbon (*N. siki*), by Thinh, Mootnick, Thanh, Nadler, and Roos (2010) on the basis of genetic and vocal characters. *N. annamensis* occurs only in Central Vietnam, southern Laos, and northern Cambodia. The status of this species has not yet been updated, but it is likely to be listed as Endangered or Critically Endangered by the IUCN Red List (Rawson et al., 2011; Thinh et al., 2010). Of an estimated total 171 individuals in 71 groups of *N. annamensis*, the BMNP is home to 34 individuals (15 males and 19 females) in

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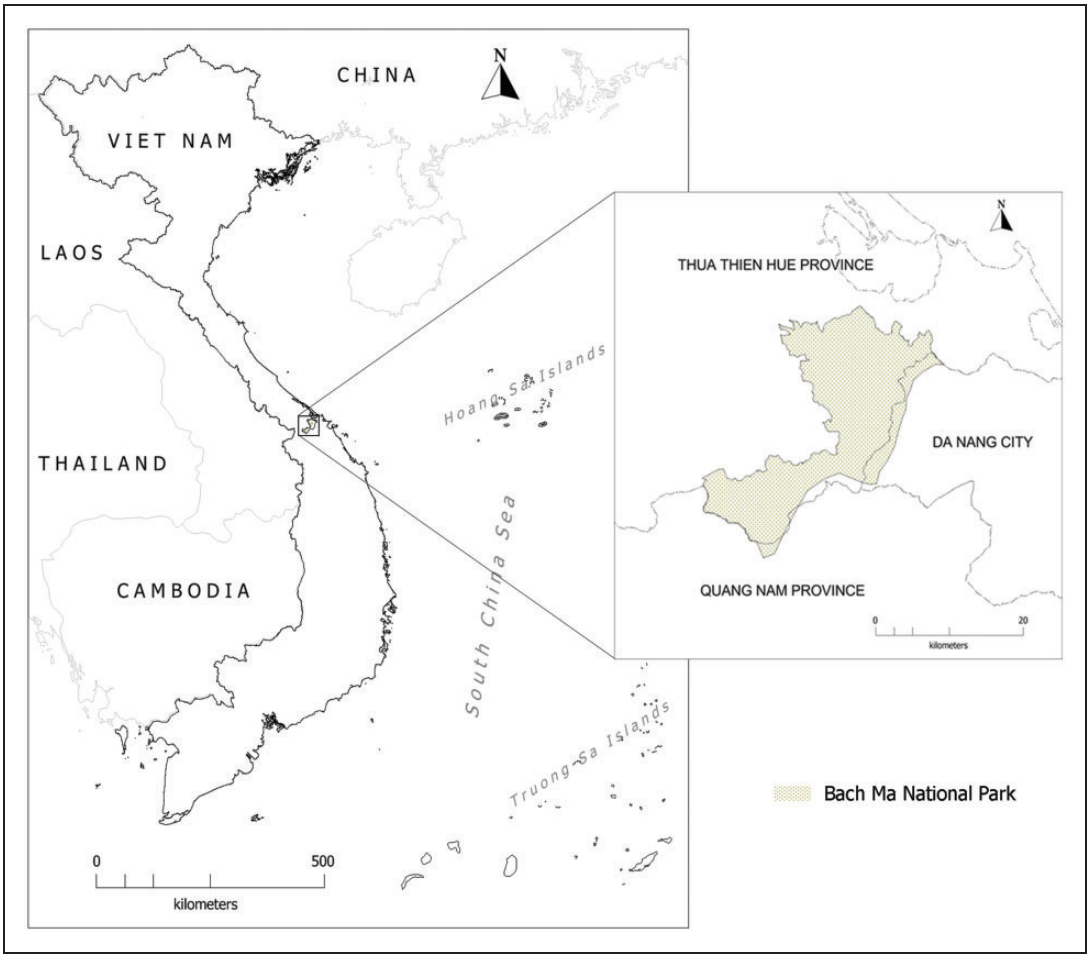


Figure 1. Location of Bach Ma National Park, Thua Thien Hue province, Central Vietnam.

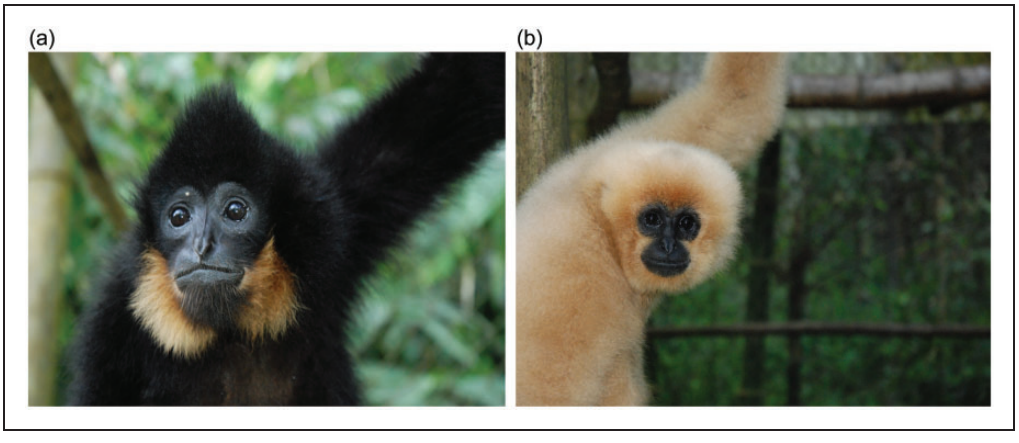


Figure 2. Northern yellow-cheeked gibbon (*Nomascus annamensis*): (a) male and (b) female.
Photos: ©Tilo Nadler.

13 groups, which is the largest group of the species found within eight protected areas within Central Vietnam (Thien, Anh, Thinh, Khoi, & Roos, 2017). However, the species is threatened by illegal hunting, loss of habitats due to illegal logging and firewood collecting, illegal nontimber forest product collecting, and the conversion of forest into agricultural land, roads, and hydropower stations (Rawson et al., 2011, Thien et al., 2017).

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Concerning gibbon conservation in the Bach Ma NP, the study proposed a special fund for a conservation program to increase the numbers of the northern yellow-cheeked gibbon or at least to keep the population from declining every year. The fund would be managed by the BMNP's management board, and the money raised by the fund would be used for the following conservation activities: (a) establishing the conservation and management plan of gibbons, protecting and controlling the gibbon population and its habitat through research activities, and the formation of gibbon protection groups and guard stations; (b) conducting education and training activities to raise the awareness of local residents and tourists, among others, regarding the conservation of wildlife as the habitat of gibbons, and improve the professional skills of the management group staff; (c) developing captive breeding programs for gibbon species and proposing a package tour with sighting gibbons; and (d) establishing the Association for the Conservation of Gibbons in Vietnam.

The CVM and the Dichotomous Choice Question

The theoretical concept of the TEV of biological resources incorporates both use and nonuse values, as reported by other researchers (Nijkamp, Vindigni, & Nunes, 2008; Pearce & Moran, 1994). Use values can be subdivided into direct (e.g., recreation) and indirect uses (e.g., nutrient cycles). In addition to TEV, a special category (i.e., option value) was created, referring to potential direct and indirect use values which will be available in the future. Nonuse values are associated with derived benefits, that is, those which humans derive from an awareness of the existence and maintenance of the resources, including biodiversity, cultural heritage, and bequest values. Therefore, the Bach Ma NP provides a range of goods and services referring to a variety of both use and nonuse values. In this sense, the change in biodiversity, that is, the loss of the gibbons, could affect the welfare of many people, for example, those who may derive satisfaction from knowing that there is an improvement in the species population for present and future generations, even if they would not directly benefit from it. In other words, the conservation of a species population incorporates nonuse values that cannot be commercially evaluated based on a reductionist approach of TEV.

In terms of TEV, various valuation methods have been discussed in previous studies, including those based on monetary and nonmonetary techniques for goods and services provided by natural resources (Bishop, 1999; Christie et al., 2006, 2012; Nijkamp et al., 2008; Pearce & Moran, 1994). Adopting the monetary technique, the present study applies the CVM to value the WTP for the gibbon conservation program in the BMNP. The CVM has become one of the most popular approaches to valuing environmental components and biodiversity attributes (Carson, 2011). Based on a hypothetical market, the CVM is a survey-based approach (Mitchell & Carson, 1989), in which an individual independently states his or her WTP for avoiding a reduction in utility (e.g., biodiversity) under various assumed conditions in a particular location. The total monetary value of the biodiversity conservation program can be calculated by aggregating WTP based on the total number of consumers. Over the past decades, CVM has been widely used for measuring WTP for social projects in developing countries, such as Vietnam (Do & Bennett, 2008; Hoa & Ly, 2009; Khai & Yabe, 2014; Le et al., 2016). CVM has been found to be an appropriate tool for monetary measures of natural and environmental resources, particularly biological resources (Loomis & White, 1996; Stevens, Echeverria, Glass, Hager, & More, 1991).

The dichotomous choice contingent valuation (CV) question is most widely adopted approach to (CV) studies because other types of question suffer from incentive compatibility (Carson, 2001). The question is analyzed using a random utility model (see Appendix).

Logistic Regression and Estimation of WTP

The WTP question in the study presented a dichotomous choice response in which the respondents were asked if they would or would not be willing to pay a given bid amount of money. The WTP for the gibbon conservation is a compensating surplus and is influenced by various variables such as attitudinal questions, as well as by the respondents' demographic information. The present study uses logistic regression to model the relationship of the probability of a *yes* answer for the WTP to the independent variables. The correlation coefficients between independent variables were checked: There is no possibility of multicollinearity phenomenon among the variables used in the model. A detailed description of the variables is given in Table 1. We hypothesized that higher bid levels, larger household size and greater distance from the park will have negative impacts on the WTP. Respondents, who are older, who are male, who have higher levels of education, who have previously visited the park, who consider biodiversity conservation as important, who have knowledge of gibbons, who have shorter distances from the park to the resident location, are assumed to have higher probability of saying *yes* for the WTP than other respondents. The regression equation can be written as:

$$\begin{aligned}\Pr(\text{yes}) = \alpha &+ \beta_1 \text{Bid} + \beta_2 \text{Age} + \beta_3 \text{Gender} + \beta_4 \text{Education} \\ &+ \beta_5 \text{Family} - \text{size} + \beta_6 \text{Distance} + \beta_7 \text{Visit} \\ &+ \beta_8 \text{Awareness} + \beta_9 \text{Knowledge}\end{aligned}$$

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Table 1. A Summary of Variable Used in the Logistic Regression Model.

Variables	Description	Value	Expected sign
Odd ratio (yes)	Probability of the respondent willing to pay for the gibbon conservation program	1 = Yes WTP, 0 = No WTP	
Bid	The bid level presented to the respondent (1 000 VND)[a]	10, 30, 50, 80, 100, 150, 200	−
Age	Age of the respondent in years	Numeric variables	+
Gender	Sex of the respondent: If the respondent is male or female	1 = Male, 0 = Female	+
Education	The respondent's education: If the respondent was educated to graduate level or higher	1 = Some college education and more, 0 = High school graduate and less	+
Family size	Family size of the respondent: number of members of respondents' household	Numeric variables	−
Distance	Distance from the place of residence of the respondent to the Bach Ma National Park (km)	Numeric variables	−
Visit	Visited the Bach Ma National Park before	1 = Yes, 0 = No	+
Awareness	If the respondent's awareness of biodiversity conservation is important	1 = Yes, 0 = Otherwise	+
Knowledge	If the respondent has known or heard about gibbons	1 = Yes, 0 = Otherwise	+

[a]At the time of the survey, US$1 was approximately equal to VND 21,860.

where α is the constant and β_j are the coefficients of the explanatory variables.

The mean WTP estimate was calculated by using both parametric and nonparametric models (see Appendix).

Questionnaire Development

The CV questionnaire was carefully designed to clarify the hypothetical market situation and obtain the correct WTP. To construct the questionnaire properly, mixed methods were employed, including key informant interviews, focus group discussions, discussions with staff and managers of the BMNP, and pretest survey questionnaires. Discussions were held with the staff and managers to acquire information used for developing a proposed gibbon conservation program in the NP. In addition, focus groups discussions and key informant interviews with four to eight participants, including the NP staff and managers, local residents, and Vietnamese tourists visiting the park, were held to identify the current threats to gibbons, further plans concerning the program, and the payment vehicle and timing of payment. Before the questionnaires were distributed, a pretest of the survey was performed on interviewees from 39 households and 56 tourists in order to guarantee that all questions were answerable and all information was available to respondents. After several pretests and discussions, the following seven bid levels were set at thousands of Vietnamese Dong (VND): 10, 30, 50, 80, 100, 150, and 200. A mandatory one-time payment through a trust fund was set up, and the amount raised by the fund would be only used for the conservation of the gibbon.

The questionnaire included four sections (see Supplementary Material). The first section introduced the value of the BMNP, the current state of biodiversity, as well as issues on biodiversity conservation and NP management. The second section included general questions regarding participant knowledge and awareness of gibbons, as well as their attitudes and perception toward the gibbons, and toward the NP and environmental issues. The third section was developed with questions related to a special fund for the gibbon conservation program, the mechanism of payment collection, as well as the implementation of the program as mentioned earlier. In this section, the respondents can state a WTP in cash (through bid amount). The respondents were asked to choose from a list of reasons to state why they are willing, or not, to pay for the gibbon conservation program. Finally, the fourth section was used to collect the demographic characteristics of the respondents.

The Survey

The questionnaire survey was conducted by random face-to-face interviews with local residents (i.e., households) living around the BMNP and tourists visiting the park. All respondents were informed that the survey would be used for academic purposes to examine the economic

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value of the gibbon conservation program, not for actual prices to respondents. In addition, anonymity and confidentiality were assured. This allowed the respondents to feel comfortable in revealing their true WTP and reduced the possibility of their giving misleading responses or rejecting the survey.

To determine a statistically viable sample size for the study, the following formula was used:

$$n = \frac{N}{1 + Ne^2}$$

where n is the required sample size, e and N are the designed margin of error and population size, respectively (Yamane, 1967).

The population size of the study is defined as the local residents of Phu Loc and Nam Dong Districts, Thua Thien Hue Province, and tourists visiting the BMNP. In 2015, approximately 163,940 people (ca. 31,567 households) were living in the two administrative units (Thua Thien Hue Statistics Office, 2016), and the park welcomed a record 14,852 tourists. With a designed margin of error of 5%, a total sample size of 395 households and 390 tourists was planned to be sampled in the survey, and the total number of respondents to be targeted for the interview was about 800 people. The sample of local residents was proportionally allocated in communes or wards of the two districts using the total of households per commune or ward as the basis of allocation. The survey was conducted between July and November 2016. After excluding no-response and incomplete questionnaires, 710 responses, including 352 Vietnamese tourists and 358 households, were accepted from a total of 794 respondents.

The responses were checked and entered into STATISTICA 12, STATA 11.0 for analysis. The independent samples t test and Mann–Whitney U test were employed to compare differences between the two groups of respondents (McCrum-Gardner, 2008). These tests are applicable to our data because they allow for comparison of two independent groups with different sample sizes. The Mann–Whitney U test was carried out for attitude scores, while the independent samples t test was used for an interval-scale variable.

Results

Respondents' Demographic Characteristics

Of the 710 respondents (352 tourists and 258 local residents), 55% were male and 45% were female (Supplementary Table 1). The largest group of respondents (32%) was high school graduates, with an average age of 40 years. The sample of tourists was biased toward young and better-educated respondents. The largest group of local residents was high school graduates (31%), and the average age was 41 years. The mean distances from the Bach Ma NP to the resident location of the local residents and tourists were about 9 km and 343 km, respectively.

Respondents' Awareness Toward the BMNP and Gibbons

The awareness of the respondents toward the BMNP was explored to understand their levels of concern in this regard: They were asked to rate their awareness and concerns using a 5-point Likert scale from 1 (*low*) to 5 (*high*; Supplementary Table 2). The majority of the 710 respondents (91%) regarded their awareness of the importance of the park in nature protection as being relatively high, while over half (60%) were concerned about sustainable management practices. This proportion is similar for both tourists and local residents, who rated their awareness and concerns as relatively high. On average, nature-based tourism and recreation appeared to be the most important to tourists (an average score of 4.29), while for local residents, the most important were the livelihoods of the local communities (an average score of 3.70). Significant differences were detected between tourists and local residents in terms of awareness and concerns (Supplementary Table 2).

With regard to the knowledge of gibbons, over half of the respondents (54%) answered that they had known or heard about gibbons. However, no statistically significant difference was found between tourists and local residents with respect to the knowledge of the species. Moreover, most participants (94%) thought that gibbons should be protected.

Respondents were asked about prospective reactions toward the illegal actions against gibbons. Of the 710 respondents, about 3% said that they would do nothing when seeing someone who sells or exchanges gibbons, hunts or keeps gibbons illegally. On the other hand, many respondents would report them to the local authorities (35%), NP rangers (25%), or Education for Nature—Vietnam free hotline number 1800 1522 (22%), while others would prevent them (10%) or take other action (6%), such as calling the police.

WTP for Gibbon Conservation

Concerning the WTP question, the respondents justified their WTP for the gibbon conservation program (Table 2). Over half (52%) were willing to pay the bid amount specified in the surveys. Among the motivations for WTP, most respondents (48%) who said *yes* to the program indicated that they were concerned about the loss of biodiversity. However, about 57% of 298 respondents were not willing to pay because they thought that it

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was the responsibility of the park and the Vietnamese government.

In addition, it was found that the probability of answering *yes* to the WTP question toward the gibbon conservation program in the BMNP decreases as the bid level increases (Figure 3 and Supplementary Table 3).

Table 2. A Summary of Responses to the Willingness to Pay Question.

Descriptions	%
Respondents' reasons for willing to pay ($n = 412$)	
I think the gibbon conservation program is a good one	11.75
I am concerned about the loss of biological diversity	47.70
This initiative contributes to the common good of society	6.98
This initiative can lead to endow future generations with natural resources	29.81
I and my family have benefit(s) of conservation of gibbons	3.75
Respondents' reasons for not willing to pay ($n = 298$)	
I have no spare income but would otherwise contribute	16.43
I do not feel I should contribute to nature conservation	5.31
It is the responsibility of the national park and the Vietnamese government	56.52
I feel that the conservation of gibbons is unimportant instead of having other important activities	7.73
The donations are not used for the right purpose, unless I will pay	13.04
The donations are not enough to the conservation of species	0.97

Applying the nonparametric model for estimating the value of the gibbon conservation program, the mean WTP value of all respondents was about VND 74,382 per person (Supplementary Table 3). The mean WTP estimate was higher for tourists (VND 84,176/tourist) than for local residents (VND 64,706/household). This figure was then multiplied by the total number of tourists, and local households in the study site to achieve a total output of VND 1.25 billion (US$57,910), and VND 2.04 billion (US$93,439) for the conservation program, respectively.

Concerning the parametric method, the results showed that the logistic regression model was quite a good fit to the data, correctly classifying 67% cases ($\chi^2_9 = 142.94$, $p < .001$, Table 3). The marginal effect also indicated the strength of the effect of endogenous variables on the probability of paying for the gibbon conservation. Out of the nine variables, seven were significant

Table 3. Factors Affecting Respondents' Decision of Paying for the Gibbon Conservation in the Bach Ma National Park.

Explanatory variables	Coefficients	Marginal effect
Constant	1.3483***	–
Bids	−0.0153***	−0.0038***
Education	0.4366**	0.1070***
Knowledge	0.4144**	0.1018**
Family size	−0.1520**	−0.0376**
Distance	0.0007**	0.0002**
Awareness	0.3754**	0.0917**
Visit	0.3296*	0.0815*
Age	−0.0105	−0.0026
Gender	−0.1899	−0.0469

Note. Log-likelihood = −418.61, Likelihood-ratio $\chi^2_9 = 142.94$, $p < .001$, Pseudo $R^2 = 0.15$, Correctly classified = 67.18%, Number of observations = 710. ***, **, * indicate statistical significance $p = .01$, .05, and .1, respectively.

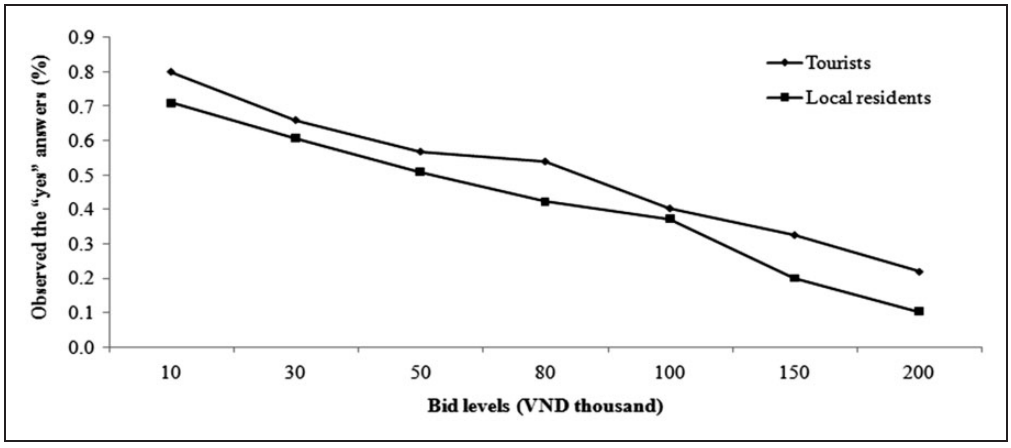


Figure 3. Distribution of the percentage of *yes* answers of WTP by tourists and local residents.

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predictors of WPT: the bid level, awareness, knowledge, education, family size, and distance.

As estimated from the parametric model, the mean WTP values are presented in Table 4. The mean WTP of all respondents is estimated at about VND 73,561 per person. The mean WPT estimate of tourists and local residents were about VND 83,198/tourist ($US3.81//tourist) and VND 64,095/household (US$2.93/household), respectively. In particular, a significant difference was detected between tourists and local residents with respect to the mean WPT value (Table 4). The calculations based on the parametric method found the total value of the gibbon conservation program to be about VND 2.02 billion (US$92,557) from local residents and VND 1.24 billion (US$56,526) from tourists.

Discussion

A large proportion of the funding available for protected areas in Vietnam is currently dependent on the state budget, which is unstable (Vietnam Administration of Forestry, 2014). Even in some Vietnamese NPs, funds only cover full operations and maintenance costs for protected areas (International Centre for Environmental Management, 2003). Therefore, finding ways to fund biodiversity conservation represents a critical challenge. Successful biodiversity conservation efforts and protected area management should gain support from stakeholders (Charles & Wilson, 2009; Dovers et al., 2015; Thomas & Middleton, 2003), with one example being the local communities (Holmes, 2013). It is also important to considering tourist preferences for biodiversity and the biological attributes of species when supporting biodiversity conservation (Di Minin, Fraser, Slotow, & MacMillan, 2013).

The present study explores the preferences of tourists and local residents for the gibbon conservation program in the Bach Ma NP with regard to their WTP. The results not only contribute to a deeper understanding of the attitudes and perceptions of tourists and local residents toward biodiversity and NP management but also provide information on the economic value of gibbon conservation. The results of the study highlight the factors influencing the respondents' decision to vote for the conservation program.

Regarding the awareness and attitudes of respondents toward the BMNP, it was found that the majority of respondents rated their awareness level as relatively high (Supplementary Table 2). This might stem from education level and the efforts made by the staff of the park. For example, environmental education for tourists and local people is an important mission of the BMNP. In addition, local communities living in the park's buffer zones signed agreements in promoting forest protection (Minh, 2013), which encouraged the role of local people in biodiversity conservation and natural resource management. However, the majority of local residents (65%) were concerned about livelihoods of local communities. Although the BMNP prohibits the extraction of forest products or natural resources, such practices as the extraction of nontimber forest products form the basis of much of the livelihoods of local residents living around the park (Minh, 2013).

Furthermore, tourists (94%) and local residents (65%) expressed strong interest in recreation and nature-based tourism. This highlights the importance of managing protected areas to meet recreational demands. Tourism, or more specifically, nature-based tourism, could have a considerable potential to generate funds for conservation, alternative livelihoods of local people, and for shaping people's attitudes to the environment and nature protection (Ballantyne et al., 2009; Balmford et al., 2009; Rinne & Saastamoinen, 2005). In Vietnamese NPs, the development of nature-based tourism has contributed to supporting the financial resources of parks and enhancing local socioeconomic development (Ministry of Natural Resources and Environment, 2011; Rugendyke & Son, 2005; An et al., 2018). However, the Vietnamese government views nature-based tourism as one of the key tourism products for the country's development (Government of Vietnam, 2013) and suffers from a lack of the development of national nature-based tourism plan, particularly for protected areas. Unlike Vietnam, nature-based tourism in Thailand's protected areas is important to the national tourism development with key contributions to the sustainable tourism and has been regarded as one of the major sources of national income toward the expansion of both domestic and international tourism markets (Sangpikul, 2010). This approach raises some key questions: How to motivate local communities to protect biodiversity, how to effectively engage those people in the process of sustainable development, how to compensate for the loss of their business opportunities (e.g., timber acquisition, farming), and how to build socioeconomic potential while maintaining a high level of biodiversity, taking into consideration the expectations of different groups of stakeholders. Although the precise answers to

Table 4. Estimated Values for the WTP of the Respondents (VND Thousand).

	Overall of respondents	Tourists	Local residents	p[a]
Mean WTP	73.561	83.189	64.095	<.001
SD	33.195	33.520	30.040	–

Note. Statistical significance was assumed below $p = .01$. WTP = willingness to pay; *SD* = standard deviation.

[a]p was calculated using the independent samples t test between tourists and local residents.

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these questions remain unclear, the approach taken in the present study allows the value of different resources and the costs of their protection to be estimated, which is a crucial step in providing these answers, as well as for planning and implementing effective development policy.

Although local residents have a geographically stronger relationship with the park, both in terms of their proximity to the park and interaction with the environment and nature, their levels of awareness and concern are lower than those of the tourists (Supplementary Table 2). In this sense, if detailed communication policies regarding the gravity of the current status of biodiversity conservation can be adopted which focus on raising awareness of the severity of biodiversity loss, local residents can be expected to adopt more responsible attitudes regarding the evaluation of biodiversity, thus influencing their behavior toward nature protection. However, in the context of protected areas such as NPs, issues of conservation and natural resource management involving various stakeholders and remedial programs should not only recognize differences in attitudes but also develop an approach strategy that would involve all key stakeholders: Many policies and projects have previously failed because they gave inadequate attention to the interests, concerns, priorities, and characteristics of stakeholders (Brandon & Wells, 1992; Czudek, 2001; Grimble & Wellard, 1997; Holmes, 2013; Muhumuza & Balkwill, 2013).

The present study applies a CVM approach for estimating the WTP value of tourists and local residents voting for the gibbon conservation program. However, Venkatachalam (2004) indicates some drawbacks that might arise during the application of CVM, these being hypothetical bias, information effect, scope effect, elicitation effect, question order bias, and strategic bias. With this in mind, the present study took measures to avoid these obstacles. Hypothetical bias was avoided by testing and revising the scenario before the main survey was conducted; this ensured that respondents fully understood the questions and were able to provide the corresponding answers according to their preferences. In addition, the survey design aimed to convince respondents that their answers would affect something that they care about. Similarly, Loomis, Brown, Lucero, and Peterson (1996) found that innovations in survey design are used for mitigating hypothetical bias. Information and scope effects were not included in the description of the site study or the conservation program. Respondents were provided with detailed information on the scenario and proposed conservation program. Question order bias was prevented by using a pretested and revised questionnaire that was developed based on key informant interviews, focus group discussions (i.e., 11 focus group discussions with four to eight participants per group were held), and discussions with staff and managers of the NP. The starting point bias in the bid levels relating to elicitation effect was also negated by conducting discussions including local residents and tourists and NP staff and managers. Bid designs were not neutral stimuli and should not be randomly assigned to respondents (Boyle, Johnson, & McCollum, 1997). In addition to reducing the elicitation effect, the respondents were asked to bid for the program by using the card related to previously assigned bid levels.

The single-bounded dichotomous choice of WTP question format was used in this study to reduce strategic bias and elicitation effect. As the format is easier to implement at the data collection and estimation stages, it supports the respondents through the valuation process, thus avoiding systematic bias in responses (Calia & Strazzera, 2000). It had been used previously in CV studies in Vietnam (Hoa & Ly, 2009; Le et al., 2016; Thuy, 2007), and it was possible to reduce some biases in responses, such as outliers (Organisation for Economic Co-operation and Development, 1995). Strategic bias in WTP values associated with free-riding and over-pledging (Throsby & Withers, 1986) was limited by convincing the respondents that the information will be used for the purposes of the study. Despite its limitations (Venkatachalam, 2004), CVM is widely used in estimating the economic value of natural resources (Loomis & White, 1996; Stevens et al., 1991; White et al., 1997) and is capable of providing useful information to support decision making in environmental and natural resource management (Carson, 2011; Fisher, 2000; Fromm, 2000; Whittington, 1998).

The WTP for the gibbon conservation program in the Bach Ma NP varies according to the nature of the respondents. A number of factors influencing the WTP were evaluated by a logistic regression approach (Table 3). Apart from the distance variable, the coefficients of the variables were found to be consistent with expectations: The coefficients for bid level and family size are statistically significant and negative, indicating that an increase in the bid amount, or the number of household members could reduce the probability of a *yes* answer. In line with the economic theory of demand, previous CV studies (e.g., Hoa & Ly, 2009; Khai & Yable, 2014; Thuy, 2007; White, Bennett, & Hayes, 2001) have indicated that an increase in bid level could also reduce the *yes* response.

Our study also confirms that respondents who demonstrate greater awareness of the importance of biodiversity conservation are more likely to be willing to contribute more for species conservation. The respondents who had known or heard about gibbons were more willing to contribute to their conservation than those who had not. Knowledge about a species affects its perception by individuals and this in turn influences financial support for

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biodiversity conservation (Wilson & Tisdell, 2005). In many cases, the physical appearance of a species and an awareness of the general and species-specific threats facing it, especially mammals (e.g., see Figure 2), were significant factors affecting WTP (Samples, Dixon, & Gowen, 1986; White et al., 2001). Thereby, conservation concerns, as well as focal species and surrogate species, should be designed in the context of the practical objectives of biodiversity management.

Respondents who had visited the park have a higher WTP than those who had not. In this regard, knowledge about protected areas might be enhanced by previous visits to the park. Unexpectedly, it was found that the probability of answering *yes* to the WTP question was directly proportional to the distance variable, that is, respondents who lived further from the park were more willing to pay than those who were closer. The results are in line with those reported by Do and Bennett (2008), who also found that distance has a positive correlation with WTP. This suggests the aggregation problem reported by Martin-Lopez, Montes, and Benayas (2007b) considering a distance-decay approach in WTP for values provided by biodiversity and ecosystem. In other words, the distance and WTP relationship is complex in the context of CV and CV applications, as preferences are not likely to be stable over space (see Concu, 2007). In this context, further research in various directions (e.g., comparative aspects of tourists and their attributes such as tourists' trip characteristics and motivation, which are divided into domestic and foreign tourists) is necessary with respect to the geographical distance and WTP relationship.

The results of the study indicate that the WTP of respondents was significantly influenced by demographic factors. For example, successive higher levels of education led to higher probabilities of declaring WTP. The results suggest that support for biodiversity conservation, as a common concern of mankind, is dependent on socioeconomic background. Contrary to Thuy (2007), socioeconomic variables, such as education and family size, were found to be significant factors affecting WTP. Our findings were consistent with those of Le et al. (2016), who confirm that educational background is positively correlated with WTP: that is, those with higher levels of education tend to demonstrate higher WTP. The present study also found that age and gender were negatively correlated with WTP, and the factors were not significant. The negative relationship between age and WTP is likely to be a result of the fact that younger people are more environmentally aware than older generations (White et al., 2001).

Parametric and nonparametric approaches were employed to estimate the WTP results. Based on the logistic regression model, the mean WTP estimate was significantly found to be higher for tourists than for local residents (Table 4). This was consistent with the outcome obtained by using the nonparametric measure (Supplementary Table 3). It was similar to the findings reported by Loomis and White (1996) who indicated that tourists have a higher WTP than households. It is understandable that tourists may indicate greater awareness and concern toward the BMNP than local residents. In the present study, the parametric method returned a lower mean WTP estimate than the nonparametric one, which is in contrast to the findings of other authors (e.g., Hoa & Ly, 2009; Thuy, 2007); however, the difference between the two models is not statistically significant.

The tourists and local residents involved in the study reported different motivations for being willing to pay for the gibbon conservation program in the BMNP, of which the loss of biodiversity was the most common. Loss of biodiversity is one of the most critical current environmental problems (Dirzo & Raven, 2003). Our findings indicate that respondents who were concerned about loss of biodiversity might support intensified efforts in biodiversity conservation and natural resource management. In the group of respondents who said *yes* to the program, 4% were those who derived benefits from gibbon conservation, and 12% thought the conservation program was good one. This supports the view that the popularity of a species is of overriding importance in determining WTP and is an important reason for the wider application of WTP approaches in nature conservation policy (White et al., 2001).

Among the respondents giving reasons for not paying, our findings were consistent with findings from CV studies in Vietnam, such as Hoa and Ly (2009) and Le et al. (2016), that the majority of respondents answering *no* to the WPT question thought that nature protection or biodiversity conservation should be the responsibility of the government. In the case of special-use forests in Vietnam, including NPs, the government has diversified agencies involved in protected area management, and the final decisions of nearly all issues concerning protected areas are taken at the national and provincial levels (KimDung, Bush, & Mol, 2017).

Although every effort was made in the present study to account for the limitations of CVM application, sampling bias can appear. For example, data were collected for the study between July and November, particularly during the peak season from July to September, when the number of tourists visiting the BMNP is the highest. However, the estimated values for households can be extrapolated across different geographic populations because the survey in this study was administered to local residents living around the park. Thus, further research can be conducted with a variety of collecting

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samples, focusing on various tourist seasons and different geographic locations, so as to eliminate possible sampling bias and allow for the generalization of the result.

Implications for Conservation

Our findings suggest that policy makers and NP managers in Vietnam would be able to raise funds for the protection of biodiversity by using the concept of model species, such as flagship and iconic or charismatic species, which all stand for a wider portion of biodiversity for different usages. The results also provide useful information by providing an economic valuation of the gibbon conservation program for natural resource management in the Bach Ma NP. This could be compared with the costs of conserving the northern yellow-cheeked gibbon in the park, as well as other gibbon conservation programs in Vietnam. An analogy can be drawn with the case of tourists whose benefit attained from the gibbon conservation is higher than the BMNP's use value, that is, the park's revenue from entrance fees in 2016 was VND 0.62 billion (US$28,362; BMNP, 2017), which is lower than the amount that tourists are willing to pay for the gibbon conservation program.

Moreover, the public valuation of biodiversity conservation can provide useful information for decision makers and NP managers to allocate funds for biodiversity conservation projects (Khai & Yabe, 2014; Thuy, 2007), as well as to help society make sensible and politically inclusive choices (Christie et al., 2006). The results of this study may help to underline the importance of involving tourists and local residents so that they could contribute economically to biodiversity conservation and nature protection. This is particularly important in the context of tourist brand building and the promotion of locations with unique nature potential and a certain economic value. Promoting nature-base tourism development in NPs may not only have considerable potential to generate funds for conservation and shape attitudes to the environment (Balmford et al., 2009) but would also contribute to increasing estimated WTP value by increasing tourist flows to protected areas.

In addition, our findings confirm that the WTP of the respondents toward biodiversity conservation was significantly influenced by demographic characteristics. If appropriate communication policies and strategies are developed to raise public awareness of the importance of biodiversity conservation and the knowledge of species, it will contribute to increasing the WTP of individuals for biodiversity conservation programs.

Furthermore, the findings of the study could be useful for CVM applications in biodiversity conservation and natural resource management in the context of Vietnamese society, particularly in mammal studies.

Appendix. Applying Parametric and Nonparametric Approaches for Estimating the Mean Willingness to Pay

Concerning the dichotomous choice contingent valuation question, according to Haab and McConnell (2002) and Bateman et al. (2002), the utility function of respondent j is:

$$u_{ij} = u_i(y_j, z_j, \varepsilon_{ij})$$

where $i = 0$ is the status quo, and $i = 1$ is the state that the program is implemented. Utility is a function of income y, a vector of the respondent's characteristics z, and ε_{ij} is the unobservable component. Respondents are willing to pay or say *yes* to the payment t_j if the utility with the program after the payment exceeds the utility of the status quo, or:

$$u_{1j} = u_1(y_j - t_j, z_j, \varepsilon_{1j}) > u_0(y_j, z_j, \varepsilon_{0j})$$

Because of the unobservable component, one can only estimate the probability of a *yes* or *no* response:

$$\Pr(yes_j) = \Pr(u_1(y_j - t_j, z_j, \varepsilon_{1j}) > u_0(y_j, z_j, \varepsilon_{0j}))$$

Assuming the utility function is linear: $v_{1j}(y_j) = \sum_{k=1}^{m} \alpha_{1k} z_{jk} + \beta_1(y_j)$

The probability statement becomes: $\Pr(yes_j) = \Pr\left(\sum_{k=1}^{m} \alpha_k z_{jk} - \beta t_j + \varepsilon_j > 0\right)$

The parametric method was used to estimate the WTP by using logistic regression, in which the dependent variables comprise a respondent saying *yes* or *no* to pay for the t_j bid level. The list of independent variables was subjected to a regression analysis, which is used to estimate the effect of each variable to the WTP of each respondent including the bid levels, socioeconomic characteristic, and awareness and attitude of respondents. The mean WTP is calculated using the following formula:

$$Mean\ WTP = E(WTP|\alpha, \beta, z_j) = \frac{\alpha z_j}{\beta}$$

The use of nonparametric techniques is receiving increasing interest for estimating the dichotomous choice valuation format because of the concern associated with incorrect specifications of functional forms and distributions in parametric estimation approaches (Cooper, 1994). There is greater confidence in using parametric results if they can be validated through nonparametric techniques (Salazar & Marques, 2005). We applied a nonparametric approach to obtain the mean WTP (Bateman et al., 2002; Haab & McConnell, 2002), and nonparametric estimation of WTP was used to estimate total WTP based on the lower bound of payment ladder responses. The payment ladder (bid) used in the study is given in units of thousands of VND, that is, 0 to 10, 11 to 30, 31 to 50, 51 to 80, 81 to 100, 101 to 150, and 151 to 200. Using the lower bound method of payment ladder, lets N denote the number of respondents in the sample and t_j the level of bid ($j = 0$ to J, where J is the highest level of bid and t_0 is zero). The probability of a respondent answering *yes* is equal to the number of respondents who have

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confirmed their WTP per total number of respondents in each bid level. Let h_j be the number of respondents with a WTP higher than or equal to t_j. The total number of respondents in the sample with WTP higher than or equal to t_j is: $n_j = \sum_{k=j+1}^{J} h_k$. The mean WTP is calculated as:

$$Mean\ WTP = \sum_{j=0}^{J} S(t_j)[t_{j+1} - t_j]$$

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Supplemental Material

Supplementary material for this article is available online.

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