ENVIRONMENTAL VALUATION:

AN ENTRANCE FEE SYSTEM FOR NATIONAL PARKS IN THAILAND

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ABSTRACT

In this study, the contingent ranking method is used to measure the value of environmental benefits of three recreational areas in northern Thailand: Doi Inthanon national Park, Doi Suthep and Mae Sa Waterfall. These recreational values are then used to determine new entrance fees for these recreational areas.

The study finds that it is easier for respondents to indicate their preferences in the contingent ranking format than in the open-ended Willingness-To-Pay (WTP) format. The parameter estimates from the indirect utility function are used to calculate the welfare gains derived from visiting these recreational areas. These welfare gains are then used to determine the entrance fees.

The study recommends that the entrance fee for Doi Inthanon National Park be increased from 5 baht (US12 cent) per person to 40 baht (US$1) per person. This would increase park revenue from 5 million baht (US$125,000) per year to 40 million baht (US$1 million) per year. Additional user charges should be applied at environmentally sensitive sites around Doi Inthanon. The entrance fee for Mae Sa Waterfall should be increased from 5 baht (US12 cents) per person to 20 baht (US50 cents) per person. This would increase park revenue from 2 million baht (US$50,000) per year to 8 million baht (US$200,000) per year. As for Doi Suthep, the entrance fee should remain at zero given the difficulty of assessing the predominantly spiritual value of the site.

The study also recommends that special consideration be given to low-income visitors. For instance, a total waiver or partial reduction of entrance fees should be applied to school children on educational tours and to senior citizens, as well as to the general public during some public holidays. Certain parts of Doi Inthanon (such as the lower section of the park) might charge a lower entrance fee to facilitate access to low-income families, while full entrance fee could be charged for the middle and upper sections of the park.

This systematic adjustment in the entrance fees, together with special entrance fee reductions, should help increase revenue from the national parks with minimal negative impact on low-income visitors. This increased revenue will be useful for recreational management and will help ensure the continuity of recreational services provided by national parks in Thailand.

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Exchange rate (August 29, 1998): US$1 = 41.26 baht
(week of August 24-28, 1998, The Bangkok Post)

manner, it would help increase revenue[1] which can be used for park management, especially recreational services.

As such, the objectives of this study are: 1) to measure the recreational values of three recreational areas in northern Thailand; and 2) to use these recreational values to determine the entrance fees. This study will focus on three public recreational areas which belong to two national parks in Chiang Mai province in northern Thailand. These recreational areas are Doi Inthanon National Park, Doi Suthep and Mae Sa Waterfall. This study will use the concept of a multi-park system which will allow the researcher to explore consumer preferences for recreational attributes and how consumers may substitute one recreational area for another. As these recreational areas are different in terms of recreational attributes, adopting a multi-park system will enable the researcher to learn about the consumer preference ordering for these recreational attributes, given that they are able to substitute one recreational area for another. This information on the consumer preference ordering will be used to calculate the appropriate entrance fee for each of the three recreational areas mentioned above.

The results of this study will be useful for the preparation of the master plans for Doi Inthanon National Park and Suthep-Pui National Park which are currently being drafted by forestry experts. These master plans will address many issues, including the management of human settlement inside the park, forest degradation, conservation of park ecosystems, land use planning, and recreation and tourism. Proper pricing can be an important component of the master plans as it would demonstrate how proposed recreational activities could be financed.

2.0 DESCRIPTION OF DOI INTHANON NATIONAL PARK AND SUTHEP-PUI NATIONAL PARK

The three recreational areas chosen in this study are located in Chiang Mai province, northern Thailand. They are Doi Inthanon National Park, Doi Suthep and Mae Sa Waterfall. Doi Inthanon is the largest of the three. Doi Suthep and Mae Sa Waterfall are technically parts of the same national park called Suthep-Pui National Park. However, as they are located rather far apart from one another, visitors usually consider them to be two different sites. This study will consider Mae Sa Waterfall and Doi Suthep as separate recreational areas.

2.1 Doi Inthanon National Park

Doi Inthanon National Park covers an area of 482 square kilometres and is located about 60 kilometres from Chiang Mai City. The travelling time from Chiang Mai City to Doi Inthanon is about two hours. From the entrance gate near the foot of the mountain, it is another 50 kilometres to the summit of Doi Inthanon.

[1] It will be assumed that the ratio of the visitor's expenditure on park recreation to their total expenditure is small, hence making the park recreation price inelastic. The percentage increase in the entrance fee will be smaller than the percentage decrease in the rate of visits. An increase in entrance fee will therefore ensure an increase in park revenue.

Doi Inthanon National Park is endowed with many features and recreational attributes which make it unique to Thailand. The following are some of its important attributes:

- *At 2,565 metres above sea level, the summit of Doi Inthanon is the highest point of Thailand. At the summit, the temperature can drop below 0° C and frost is frequently reported.*

- *The geography of Doi Inthanon is mountainous, with streams, waterfalls, caves, cliffs and meadows scattered throughout the area. These features make Doi Inthanon an attractive recreational area for both local and foreign visitors.*

- *Ecologically, Doi Inthanon is considered important for Thailand in terms of plant species, genetics and biodiversity. Many endemic plant species and animals of the temperate zone can be found at Doi Inthanon National Park. These biological attributes make Doi Inthanon an important classroom for scientists and researchers.*

With regard to recreational attributes, Doi Inthanon National Park comprises about nine waterfalls, hilltribe villages, caves, walking tracks, bird watching areas, cabin and camping areas, a tourist information centre and two pagodas. However, the feature that tends to attract distant travellers is the summit of Doi Inthanon.

Since 1991, the number of visitors to Doi Inthanon National Park has ranged from 600,000 to 800,000 per year. Currently, the national park charges an entrance fee of 5 baht per adult (local and foreign alike), with extra charges for vehicles. The revenue from entrance fees totalled around 5 million baht in 1995. At present, this revenue is not used directly for park management. It is instead transferred to the Royal Forestry Department, which decides on how to allocate the funds among national parks. Table 1 provides a list of the recreational features at Doi Inthanon.

2.2 Suthep-Pui National Park

Suthep-Pui National Park has two separate sections: Doi Suthep and Mae Sa Waterfall. Doi Suthep serves as a backdrop to Chiang Mai City while Mae Sa Waterfall is about 20 kilometres north of Chiang Mai City. These two sections are about 20 kilometres apart. Suthep-Pui National Park covers 261 square kilometres and has an elevation of between 330 and 1,685 metres above sea level.

Suthep-Pui has many important features, namely, a forest and watershed, the Royal Winter Palace, Suthep Temple, a hilltribe village (Doi Pui), creeks and viewing areas. In 1995, Suthep-Pui attracted about 1.9 million visitors and earned about 2 million baht from entrance fees (but only from the Mae Sa Waterfall section, which charges 5 baht per adult, as the Doi Suthep section does not charge an entrance fee).

Doi Suthep is situated on the western side of Chiang Mai City, making it very accessible to people from the city of Chiang Mai. Many local visitors take a short ride to various spots of Doi Suthep to enjoy a panoramic view of Chiang Mai City both during the day and at night. (However, Doi Suthep is sometimes closed off due to inappropriate uses.)

Table 1. Recreational Features at Doi Inthanon National Park

Recreational Feature	Local Name
- The Summit of Doi Inthanon	
- Old-growth forest	*Ang Ka Forest Ecology*
- Waterfalls	*Mae Ya Waterfall* *Mae Klang Waterfall* *Wang Pra Chao Waterfall* *Vichiratharn Waterfall* *Tan Noi Waterfall* *Siriphoom Waterfall* *Mae Pan Waterfall* *Pha Samran Waterfall* *Huai Sai Luang Waterfall*
- Caves	*Borichinda Cave* *Bupha Sawan Cave*
- Walking Track	*Kew Mae Pan Track*
- Pagodas	*Nopamathaneedon* *Nopponpoomsiri*
- Hilltribe Village	*Khun Klang Hilltribe Village*
- Bird Watching	
- Cabin and Camping Areas	
- Tourist Information Centre	
- Local Eating Booths	

Improvements to Doi Suthep should result in increased recreational possibilities. Possible improvements at Doi Suthep include walking or jogging trails, picnic areas, educational tours, improved public safety and proper law enforcement.

Mae Sa Waterfall is about 20 kilometres from Chiang Mai City. Although there are three waterfalls in the Mae Sa section, Mae Sa Waterfall is the best known. However, Mae Sa Waterfall is limited in terms of recreational activities compared to Doi Inthanon. Visitors to Mae Sa Waterfall generally spend about two to three hours there during each visit. They usually engage in some form of relaxation near the waterfall such as swimming, dinning or picnicking. There are also food stalls located adjacent to the waterfall. This culinary service may be an added attraction of Mae Sa Waterfall as ready access to food and drinks is an important part of the recreation of many local visitors.

Table 2 provides a list of the recreational features at Suthep-Pui National Park.

Table 2. Recreational Features at Suthep-Pui National Park

Recreational Feature	Local Name
Doi Suthep Section	
- Suthep Temple	*Wat Prathat Doi Suthep*
- Monument	*Kru Ba Srivichai Monument*
- Waterfall	*Hui Keaw Waterfall (currently dried up)* *Wang Bua Barn Pond* *Monthon Tarn Waterfall*
- Cave	*Rusi Cave*
- Royal Winter Palace	*Phu Ping Winter Palace*
- Hilltribe Village	*Doi Pui Hilltribe Village*
- Viewing Areas	*Viewing areas along the road overlooking Chiang Mai City*
Mae Sa Waterfall Section	
- Waterfall	*Mae Sa Waterfall* *Tard-Mog Waterfall* *Mae Yim Waterfall*

3.0 LITERATURE

There are many environmental valuation studies in Thailand but few have adopted the economic approach to calculate welfare measurement.[2] The Lumpinee Park study by Grandstaff and Dixon (Grandstaff and Dixon 1986) and TDRI/HIID study on Khao Yai National Park (Kaosa-ard, Patmasiriwat, Panayotou and Deshazo 1995) are two studies which used economic valuation methods. Both studies combined the travel cost method together with the open-ended contingent valuation method to assess willingness to pay (WTP).

Grandstaff and Dixon (1986) used the zonal travel cost method and found the consumer surplus of Lumpinee Park use value to be 132 million baht. When using the contingent valuation method, this use value turned out to be 130 million baht. The nonuse value is derived from the nonusers (referred to as social hypothetical value) and is reported to be 1,166 million baht.

TDRI/HIID used the travel cost method to measure the Khao Yai National Park use value and the contingent valuation method to measure its nonuse value. Following are their major findings.

[2] For detailed discussion of environmental valuation methods, see Braden and Kolstad (1991), Brookshire, Ives and Schulze (1976) and Freeman (1993).

The travel cost method estimates the direct benefit of 1,420 baht per visit, of which 870 baht is the consumer surplus. The average WTP for entrance fees is 22 baht per person. The average WTP for entrance fees after some improvements is 44 baht per person. The average nonuse value for Thais is 730 baht per person per year. The average nonuse value for non-Thais is 183 baht per person per year. These findings indicate that the value of Khao Yai National Park is certainly positive and is of reasonable magnitude. After some improvements, the WTP for each park visit increases from 22 to 44 baht per person, which suggests some positive marginal benefit of park improvements. When compared to the marginal cost, it indicates that park improvements would yield a net gain to society (Kaosa-ard, Patmasiriwat, Panayotou and Deshazo 1995).

Even though the two studies above carefully measured the environmental benefits, there are two aspects which make the present study different. First, both studies above focus on a single park and did not include park substitutability in their analysis. This limitation is due to the lack of substitutes for Lumpinee Park and Khao Yai National Park. However, when it is possible for visitors to substitute one park for another, taking into consideration the degree for substitutability will allow the recreational value to be determined more appropriately. As the recreational areas chosen in this study are located close to each other, the issue of substitutability will be important and in fact will be a focus point in this research.

Second, both studies above used the open-ended contingent valuation method which can be less appropriate in the context of a developing country where people are used to enjoying recreational amenities either free of charge (Lumpinee Park) or at a very low cost (Khao Yai). When people are not familiar with the notion of having to pay for amenities, asking an open-ended WTP question may not be an appropriate way to elicit the true WTP. In this regard, one may prefer to adopt other contingent valuation formats which do not force respondents to express an exact value. These may include close-ended contingent valuation formats, such as the referendum format or contingent ranking format. Our study used the contingent ranking method in valuing the recreational services at Doi Inthanon, Doi Suthep and Mae Sa Waterfall.

4.0 METHODOLOGY

In modelling consumer behaviour towards environmental goods, it is often important to consider the possible substitutes to the environmental goods in question. This study will assume that there exists a multi-park system where a number of recreational areas are located not too far apart from one another. The consumers will make a choice from among these sites. Specifically, the consumers (visitors) will face a choice among three different recreational areas, each endowed with different recreational services or attributes. With the information on the preference ordering of the consumers regarding these recreational attributes, one can measure the value of each attribute by calculating the marginal rate of substitution between each attribute and money. The value of each visit to a recreational area is obtained by adding up the value of all the recreational attributes at each area.

This study employs the contingent ranking method, which asks the respondents to rank a set of hypothetical recreational trips which vary over five

selected recreational attributes. Adopting the contingent ranking method is useful for two reasons. First, it allows the researcher to model park recreation as a multi-park system where the consumers will consider substitutability among recreational areas as they express their preferences (ranking) among different hypothetical trips. Second, the contingent ranking method is simpler than the open-ended WTP format. Contingent ranking does not force the respondent to report an exact number: it only requires the respondent to rank among the available options. For comparative purposes, the open-ended WTP format was used as well.

Equation (1) shows the probability function of an individual i whose ranking among H choices indicates that he/she prefers trip 1 to trip 2, and so on. Assuming independence of alternatives, the product of (1) yields equation (2), which indicates the probability of a complete ordering of choices, $r_1 \ldots , r_H$, where j represents all the other alternatives (Lareau and Rae 1989). For N independent individuals, equation (3) is the log likelihood representation of this probability function.

$$\pi(R_i) = prob[V_{r1} > V_{r2} > \ldots . V_{rH}] \quad (1)$$

$$\pi(R_i) = \prod_{h=1}^{H} \{\exp(V_h) / [\sum_{j=h}^{H} \exp(V_j)]\} \quad (2)$$

$$L(\beta) = \sum_{i=1}^{N} \log \pi(R_i)$$

$$L(\beta) = \sum_{i=1}^{N} \sum_{h=1}^{H} (V_h) - \sum_{i=1}^{N} \sum_{h=1}^{H} [\log \sum_{j=h}^{H} \exp(V_j)] \quad (3)$$

Lareau and Rae (1989) showed that if the indirect utility function V is written linearly such as equation (4),

$$V = \alpha e_j + \mu c + \theta[c/I] + \Sigma \gamma_k e_i S_k \quad (4)$$

where e_j = recreational attributes j
c = trip expenses
I = income
S_k= social characteristic k

the WTP for each recreational attribute e_j can be obtained by calculating the marginal rate of substitution between the recreational attribute e_j in question and cost c, that is

$$\text{WTP for } e_j = MRS_{ej\,c} = - [\partial V/\partial e_j \,|\, u=u_o] / [\partial V/\partial c \,|\, u=u_o]$$

$$\text{WTP for } e_j = -(\alpha + \Sigma \gamma_k S_k)/(\mu + \theta/I).$$

In this study, four recreational attributes were chosen and valued. They are: the highest point of Thailand, waterfall, hilltribe village and temple. Trip expenses is included as a money measure attribute (price or cost) which provided the link to the parameter weights of the recreational attributes (highest point of Thailand, waterfall, hilltribe village and temple).

Table 3 shows the selected recreational attributes at the four recreational areas. These four recreational areas were arranged into four hypothetical trips for the respondents to elicit their ranking preferences. This information indicates the relative importance of these recreational attributes relative to money. The ordered logit model was used to analyse this ranking data and the unknown parameters will be estimated by maximising the likelihood function (3). The parameter estimates obtained from the ordered logit estimation represent the unknown parameters in the indirect utility function (4). This information is then used to calculate the value of each recreational attribute, which is essentially the marginal rate of substitution between recreational attribute and money. The sum of the values of these recreational attributes are then used to derive the appropriate entrance fee for each recreational area. The social characteristics of the respondents are included in the estimation and enter the estimating equation interactively.

Table 3. Summary of Important Recreational Attributes at Each Recreational Area

Hypothetical Trip	Highest Point	Waterfall	Hilltribe Village	Temple	Trip Expenses (baht)
A. Doi Inthanon	1	0	1	0	300
B. Doi Suthep	0	0	1	1	100
C. Mae Sa Waterfall	0	1	0	0	150
D. Doi Inthanon	1	1	0	0	400

Beggs, Cardell and Housman employed the contingent ranking method in analysing and forecasting the consumer demand for electric cars (Beggs, Cardell and Housman 1981). They asked the consumers to rank 16 car designs which differed over nine attributes. The ordered logit model was estimated over 200 respondents. They found that people placed a high negative value on the limited travel range of electric cars (i.e. maximum distance travelled once fully charged, e.g. 50 to 100 miles).

Lareau and Rae also adopted the contingent ranking method to value WTP for diesel odour reduction (Lareau and Rae 1989). A survey of 140 people was conducted and the respondents were asked to rank four alternatives which differed over three attributes. The first two attributes were two levels of diesel odour, each with a different frequency of diesel odour contact per week. The last attribute was the increase in cost to households with reduced diesel odour contact per week. They concluded that odour exposure and cost variable proved to be significant determinants of indirect utility. They also found that adopting the discrete choice format was helpful in estimating environmental values which the consumers often find difficult to quantify in response to direct open-ended WTP questions. The calculated average WTP per person for complete diesel odour reduction was approximately US$75 per year.

There are other studies that use contingent ranking in valuing environmental goods. Rae and Reddy (1986a), for example, used this method to estimate the WTP for visibility improvement in Mesa Verde and Great Smoky Mountain National Parks, and Desvousges, Smith and McGivney (1983) used ranked survey data to value water quality. Both studies concluded that the ranking method can measure WTP for environmental goods successfully. However, Rae and Reddy (1986a) cautioned that statistical significance is sometimes weak, and Desvousges, Smith and McGivney (1983) found that the sign on income or price variable is sometimes incorrect.

5.0 EMPIRICAL RESULTS

A survey was conducted in February/March 1997 at all three recreational areas (Doi Inthanon—42 samples, Doi Suthep—46 samples and Mae Sa Waterfall—48 samples) and at some other public places (night bazaar shopping area—68 samples, railway station—76 samples, and bus depot—15 samples). A total of 295 samples were collected. Table 4 shows some of the descriptive statistics of the 295 respondents interviewed. The survey questionnaire is given in Appendix A.

Table 4. Descriptive Statistics of the Respondents

Variable	Mean	Std. Dev.	Min.	Max.
Number of recreational trips	4.49	5.37	1.00	40.00
Rec. spending (baht/year)	7,516	18,698	50	180,000
No. of trips to Doi Inthanon	0.69	1.48	0.0000	50.00
No. of trips to Doi Suthep	1.61	2.93	0.0000	20.00
No of trips to Mae Sa	0.59	1.44	0.0000	10.00
Age	32.98	11.00	17.00	76.00
Household size	4.40	1.68	1.00	10.00
Monthly income (baht)	14,184	14,564	1,250	65,000
Sex				
Male	*56 %*			
Female	*44 %*			
Vehicle of Payment Preferred				
Raise entrance fee	*33 %*			
Government budget	*39 %*			
Donation fund	*22 %*			
Others	*6 %*			
Marital Status				
Single	*47 %*			
Married	*53 %*			
Occupation				
Civil servant	*21 %*			
Owner of business	*15 %*			
Private employee	*20 %*			
Labourer	*0 %*			
Student	*24 %*			
Retired	*1 %*			
Non-working spouse	*3 %*			
Others	*16 %*			
Education				
None	*0 %*			
Primary	*8 %*			
Secondary	*16 %*			
Technical Diploma	*16 %*			
Bachelor's Degree	*53 %*			
Graduate Degree	*7 %*			
Residence				
Chiang Mai province	*36 %*			
Other provinces	*64 %*			

5.1 Descriptive Statistics

On average, the respondents interviewed visit nature-based recreation about 4.49 times per year. Their average monthly income is 14,184 baht and their average annual spending on nature-based recreation is 7,516 baht or about 4.5 % of their annual income. The average age of the respondents is 32. About 56 per cent of the respondents are male and 44 per cent are female. Some common occupations are: civil servant, owner of business, private employee and student. About half of the respondents have a bachelor's degree, 16 per cent have completed secondary education and another 16 per cent hold a technical diploma. Respondents who are residents of Chiang Mai province account for 36 per cent while the remaining 64 per cent are from other provinces of Thailand. No foreigners were interviewed.

On the question about how more resources should be allocated for national park management -- the payment vehicle -- 33 per cent of the respondents prefer an increase in entrance fee, 39 per cent choose reallocation of government budget, 22 per cent prefer voluntary donations towards a park management fund and six per cent indicate no particular preference.

5.2 Implementing Contingent Ranking

In general, it was found that implementing the contingent ranking method has advantages and disadvantages compared to asking open-ended WTP questions. Designing hypothetical trips was somewhat difficult as one has to ensure that recreational attributes were properly scattered among different hypothetical trips. Assigning prices to each hypothetical trip was a crucial step. If prices assigned are too high, the ranking order obtained will be dictated by prices rather than recreational attributes, and vice versa. For these reasons pre-testing the contingent ranking questionnaire is very important.

Once the questionnaire was set, it was found that the respondents did not have any difficulty ranking the four hypothetical trips. It is, however, important to ensure that when asking the respondents for their ranking, the respondents are making choices after considering the recreational attributes of each hypothetical trip together with their prices, and not just recreational attributes alone or prices alone.

On the other hand, there were some difficulties when asking the open-ended WTP question. Protest bids were found, particularly with Doi Suthep (28%), because respondents reasoned that people should not have to pay when visiting Doi Suthep Temple. Protest bids for Doi Inthanon were 12 per cent and Mae Sa Waterfall 14 per cent. With the contingent ranking method, only one respondent out of 295 samples reported that he could not provide a ranking.

In implementing the open-ended WTP question it became evident that monitoring the execution of the survey was difficult. Data collectors often used different wordings which could result in unreliability in the WTP response. For example, "What is your maximum WTP for entrance fee?" vs. "What do you think should be the appropriate entrance fee?" It was found that answers to the WTP question tend to cluster at some convenient numbers, such as, 5, 10, 20 or 50 baht.

This study discovered, too, that while open-ended WTP questions may be subject to strategic responses, this problem can be prevented by implementing the contingent ranking method. For this reason, welfare measures obtained from the

contingent ranking method will tend to reflect the true value of the resource while those obtained from open-ended WTP questions may over- or underestimate the true value depending on the sensitivity of the environmental issue being studied, the design of the questionnaire, and the implementation of the survey. If a researcher does not have much experience with field survey and questionnaire design, this study recommends the contingent ranking method as a better choice for valuing resources as it will help to reduce strategic responses and survey error.

5.3 Contingent Ranking Method

Ranked data were analysed by ordered logit estimation. The dependent variable is the ranking of the four hypothetical trips and the independent variables are the highest point of Thailand (HIGH), waterfall (FALL), hilltribe village (VILL), temple (TEMP) and trip expenses (COST). The social characteristic variables used are monthly income (INC), age (AGE), family size (FAM) and education (EDU). These social characteristic variables enter the estimation interactively with the waterfall variable (FALL). FALL is used to interact with all the social characteristic variables (except INC) because waterfall seems to be a good representation of nature-based recreation. Five dummy variables experimented with are IBN, SBN, MBN, SMS and DIFF. These dummy variables also enter the model interactively. The list of variable names and their descriptions are given in Table 5 and the results of the ordered logit estimation are reported in Table 6.

Five specifications of the ordered logit models are experimented. Model I is the basic model which includes only the recreational attributes, trip expenses and income. Model II contains all the variables in Model I plus three social characteristic variables, namely age, family size and education. Model III extends Model II by including three dummy variables to test whether the respondents' ranking might be influenced by the fact that they are being interviewed while they are visiting these recreational areas. Model IV adds two more dummy variables: SMS is the protest bids for Doi Suthep and DIFF tests whether their ability to differentiate between recreational attributes would affect their ranking. Lastly, Model V eliminates two variables from Model IV which have a low t-ratio.

The results of ordered logit estimation across all 5 models seem consistent. Three of the four recreational attributes, HIGH, FALL and VILL have positive signs as expected. This means that the highest point, waterfall and hilltribe village, have positive contributions towards indirect utility. Trip expenses (COST) have a negative impact as expected. This means that consumers prefer to take a lower cost recreational trip. Income (INC), when interacted with COST as an inverse, has a positive sign as expected. The only variable whose sign is puzzling is temple (TEMP).

Temple (TEMP) was expected to have a positive sign, like the other three recreational attributes, but the sign on TEMP is consistently negative throughout the five models. This implies that visiting the Suthep Temple gives dissatisfaction to the visitors. To test if this outcome may relate to the fact that people tend to have a different perception towards temple as indicated by the high rate of protest bids at Doi Suthep, a dummy variable SMS was experimented in Model IV. However, even after SMS was included, TEMP continues to have a negative sign.

Table 5. List of Variables used in Ordered Logit Model and WTP Functions

Name of Variable	Description
Recreational Attributes	
HIGH	*The highest point of Thailand*
FALL	*Waterfall*
VILL	*Hilltribe village*
TEMP	*Temple*
COST	*Cost of taking the trip, such as travel expenses*
Social Characteristics of the Consumer	
INC	*Monthly income*
AGE	*Age*
FAM	*Family size*
EDU	*Years of education*
SITEXP	*Actual expenses for the trip*
Dummy Variables	
IBN	*= 1 if the consumer was interviewed at Doi Inthanon* *= 0 if not*
SBN	*= 1 if the consumer was interviewed at Doi Suthep* *= 0 if not*
MBN	*= 1 if the consumer was interviewed at Mae Sa Waterfall* *= 0 if not*
SMS	*= 1 if the consumer gave a protest bid for Doi Suthep* *= 0 if not*
DIFF	*= 1 if the consumer can differentiate between areas and give different WTPs for each site* *= 0 if not, that is, WTP for all three areas is the same*
VISIT	*= 1 if the consumer was interviewed at one of the areas* *= 0 if not, that is, interviewed at other public places*

The t statistics on many of these estimated parameters are somewhat weak. However, this poor statistical outcome is also observed by other studies which adopted the contingent ranking method to value environmental goods. Desvousges, Smith and McGivney (1983) found that the contingent ranking method can measure WTP successfully but the sign on prices and on income is sometimes incorrect. Rae and Reddy (1986a and 1986b) also found that statistical significance is at times weak.

From these results, parameter estimates from Model V will be used to calculate the value of each recreational attribute. The parameter estimates (coefficients) from the ordered logit model represent the unknown parameters in the indirect utility function for individual i, that is:

$$\begin{aligned} Vi = {} & 1.482HIGH + 3.1843FALL + 2.2038VILL - 0.6032TEMP - 0.0108COST \\ & + 0.811COST/INCi + 0.0076FALL*AGEi - 0.0302FALL*FAMi \\ & - 0.155\ FAM*IBNi + 0.0906FALL*SBNi - 0.0426FALL*SMSi \\ & - 0.049FALL*DIFFi \end{aligned}$$

Table 6. Parameter Estimates from Ordered Logit Model

Variable	Model I Coefficient (t-ratio)	Model II Coefficient (t-ratio)	Model III Coefficient (t-ratio)	Model IV Coefficient (t-ratio)	Model V Coefficient (t-ratio)
HIGH	1.0167	1.1755	1.5322	1.4291	1.4820
	(0.140)	(0.162)	(0.212)	(0.198)	(0.206)
FALL	2.9416	2.8571	3.1298	3.1335	3.1843
	(0.675)	(0.653)	(0.717)	(0.720)	(0.736)
VILL	2.1042	2.1416	2.2139	2.1931	2.2038
	(1.445)	(1.474)	(1.528)	(1.518)	(1.528)
TEMP	-0.6942	-0.6646	-0.5932	-0.6137	-0.6032
	(-0.474)	(-0.454)	(-0.407)	(-0.422)	(-0.416)
COST	-0.0089	-0.0096	-0.0110	-0.0106	-0.0110
	(-0.305)	(-0.331)	(-0.382)	(-0.368)	(-0.377)
COST/INC	0.2997	0.7009	0.8086	0.8229	0.8110
	(0.535)	(1.173)	(1.327)	(1.344)	(1.341)
FALL*AGE	-	0.0080	0.0078	0.0077	0.0076
	-	(2.124)	(1.989)	(1.944)	(1.949)
FALL*FAM	-	-0.0312	-0.0309	-0.0299	-0.0302
	-	(-1.221)	(-1.209)	(-1.167)	(-1.187)
FALL*EDU	-	0.0061	-0.0018	-0.0019	-
	-	(0.346)	(-0.101)	(-0.105)	-
FALL*IBN	-	-	-0.1498	-0.1555	-0.1550
	-	-	(-1.055)	(-1.092)	(-1.124)
FALL*SBN	-	-	0.0679	0.0874	0.0906
	-	-	(0.539)	(0.664)	(0.698)
FALL*MBN	-	-	-0.0009	-0.0117	-
	-	-	(-0.006)	(-0.082)	-
FALL*SMS	-	-	-	-0.0444	-0.0426
	-	-	-	(-0.374)	(-0.370)
FALL*DIFF	-	-	-	-0.0501	-0.0490
	-	-	-	(-0.501)	(-0.491)
Iterations completed	13	17	19	21	19
Log likelihood function	-1524.8020	-1522.3100	-1521.4880	-1521.3460	-1521.3560
Restricted log likelihood	-1635.8170	-1635.8170	-1635.8170	-1635.8170	-1635.8170
Chi-square	222.0298	227.0146	228.6580	228.9429	228.9229
No. of Obs.	295	295	295	295	295

The value of each of the recreational attributes is obtained by adopting the concept of utility- constant welfare measurement. This concept simply calculates the amount of money required to compensate for a one unit change in the level of the attribute, holding the level of utility constant. This is essentially the calculation of the marginal rate of substitution between each of the attributes and money (COST). Because the resulting marginal rate of substitution depends on the level of social characteristics, the values of these recreational attributes will differ from consumer to consumer. The values of these four attributes have thus been calculated for each consumer and Table 7 reports the average value of the four attributes.

Table 7. Average Values of Recreational Attributes

Recreational Attribute	Marginal Rate of Substitution of Consumer i	Average Value (baht)
HIGH (Highest Point)	-(1.482/(0.0108+(0.811/*INCi*)))	136.49
FALL (Waterfall)	-(3.1843+0.0076*AGEi*-0.0302*FAMi*	
	-0.155*IBNi*+0.0906*SBNi*-0.0426*SMSi*	
	-0.049*DIFFi*/(0.0108+(0.811/*INCi*)))	297.11
VILL (Hilltribe Village)	-(2.2038/(0.0108+(0.811/*INCi*)))	202.97
TEMP (Temple)	-(-0.6032/(0.0108+(0.811/*INCi*)))	-55.55

Welfare calculation in Table 7 shows that the average value of visiting the highest point of Thailand (HIGH) is about 136.49 baht per person per visit. Visitors in the sample place the highest value on waterfall. Visiting a waterfall (FALL) generates, on average, 297.11 baht to the visitor. The average value of visiting a hilltribe village (VILL) is about 202.97 baht. And, as mentioned earlier, the negative sign on TEMP is unexpected. This means that an average visitor experiences dissatisfaction from visiting a temple (TEMP). This dissatisfaction is worth about 55.55 baht per person per visit.

5.4 Open-Ended WTP Question

For reasons of comparison, an open-ended WTP question for entrance fees was also asked during the survey. The results show that the average WTP for entrance fee for Doi Inthanon is 27.46 baht, for Doi Suthep is 21.29 baht and for Mae Sa Waterfall is 18.38 baht. WTP functions are also estimated with ordinary least squares and the results are reported in Table 8. In all three WTP functions, the income (INC) variable has a positive sign and is significant as expected. Many of the social characteristic variables and dummy variables experimented did not perform well. However, dummy variable DIFF performed well in the Doi Inthanon and Doi Suthep WTP functions. This suggests that visitors who have knowledge about the areas and are able to recognise differences between recreational areas tend to have a higher WTP for the entrance fee.

The performance of WTP functions could be improved if the survey was carried out more carefully. It was found that well-trained data collectors would help raise the credibility of the survey results. Providing more information to the visitors about the attributes of the recreational areas would probably improve the WTP functions.

Table 8. Parameter Estimates of the WTP Functions

Variable	Doi Inthanon Coefficient (t-ratio)	Doi Suthep Coefficient (t-ratio)	Mae Sa Waterfall Coefficient (t-ratio)
Constant	24.6338	13.0412	17.1536
	(1.644)	(1.268)	(1.844)
INC	0.0003	0.0003	0.0001
	(1.673)	(2.205)	(0.827)
SEX	-3.9311	-0.9711	-2.4645
	(-0.784)	(-0.296)	(-0.782)
AGE	-0.2646	-0.2895	-0.1390
	(-1.123)	(-1.871)	(-0.952)
FAM	1.1195	1.8420	0.8801
	(0.694)	(1.803)	(0.875)
EDU	-0.3728	0.2683	0.2397
	(-0.36)	(0.383)	(0.381)
SITEXP	0.0117	0.0077	0.0061
	(0.953)	(0.973)	(0.801)
DIFF	14.7217	6.5878	0.9092
	(2.634)	(1.848)	(0.26)
IBN	-0.1822	-	-
	(-0.023)	-	-
SBN	-	-3.8935	-
	-	(-0.755)	-
MBN	-	-	2.1630
	-	-	(0.474)
VISIT	-10.5754	-2.4372	-5.3918
	(-1.656)	(-0.512)	(-1.283)
Mean WTP	27.4615	21.2958	18.3819
No.of Observations	260	213	254
Std.Dev.	39.3253	23.2412	24.4809
R-square	0.0563	0.0734	0.0222
F-test	1.66	1.79	0.61

6.0 DETERMINING THE ENTRANCE FEES

The parameter estimates from the contingent ranking method were used to determine new entrance fees for all the three recreational areas. From the contingent ranking method the value or net benefits from a visit to a recreational area is calculated by summing up the value of the recreational attributes at each recreational area and then subtracting from it the actual trip expenses to each area. This calculation was carried out for each individual surveyed. The average trip expenses of

the three recreational areas are 369.30 baht for Doi Inthanon, 239.02 baht for Doi Suthep and 257.68 baht for Mae Sa Waterfall. Table 9 shows the average recreational value of each recreational area. Although the questionnaire contains only four hypothetical trips (A, B, C and D), two additional hypothetical trips (E and F) are added here for illustration.

The first column of Table 9 can be interpreted as follows: The recreational value (benefits minus trip expenses) obtained from the contingent ranking method represents the maximum amount an average person would gain from visiting each area. This would then represent the maximum amount a person would be willing to pay if an entrance fee were to be collected. The second column of Table 9 shows the average WTP for the entrance fee obtained directly from the open-ended WTP question of the survey.

Before determining the entrance fee for each recreational area, it is appropriate at this stage to note that the procedures adopted from the beginning of the study until the computation of recreational values in Table 9 should be considered the *science* aspect of the study. The *art* aspect begins from this point on, when these recreational values are used to determine the entrance fee for each recreational area.

Although the recreational values obtained by the contingent ranking method and those obtained from the open-ended WTP question should theoretically be the same, the empirical results presented in Table 9 suggest that they differ. For this reason, this study interprets the recreational values obtained from the contingent ranking method as the maximum amount an average person *truly gains* from visiting each recreational area. The study will interpret the recreational value obtained from asking the open-ended WTP question as the average amount a person would *want* to pay for visiting each recreational area. These two types of numbers will be useful, since one would want to set the entrance fee according to the true value of each recreational area (using information obtained from the contingent ranking method). At the same time, one would want to make sure that these entrance fees are socially acceptable (using information obtained from the open-ended question).

Table 9. Comparison between Recreational Values Calculated from the Contingent Ranking Method and the Open-ended WTP Question

Hypothetical Trip	Contingent Ranking Method (baht)	Open-ended WTP Question (baht)
A. Doi Inthanon (HIGH + VILL-EXPS)	-31.37	27.46
B. Doi Suthep (TEMP+VILL-EXPS)	-92.45	21.30
C. Mae Sa Waterfall (FALL-EXPS)	35.12	18.38
D. Doi Inthanon (HIGH+FALL-EXPS)	50.48	27.46
E. Doi Inthanon (FALL+VIL-EXPS)	117.45	27.46
F. Doi Inthanon (HIGH+FALL+VILL-EXPS	254.94	27.46

6.1 Entrance Fee for Doi Inthonon National Park

Determining an entrance fee for Doi Inthanon is less straightforward, since the value that people obtain from visiting Doi Inthanon ranges from minus 31.37 (trip A) to 254.94 (trip F) baht per person per trip. These numbers suggest that people receive different levels of satisfaction from visiting Doi Inthanon depending on the number of recreational activities they engage in. The more recreational activities they engage in, it seems, the higher the value of the trip. For example, while a person taking the hypothetical trip A makes a net loss of 38.65 baht, that same person can make a net gain of 250.49 if he/she only makes one more stop at a waterfall.

The recreational values computed for the hypothetical trips E and F in Table 9 may exaggerate the true value for two reasons. First, when people are engaged in more activities, the total value or benefit obtained may not increase in a linear manner as suggested in this model. The marginal value for an additional activity or additional attribute they visit should exhibit a diminishing marginal utility instead of a linear trend as shown in Table 9. Second, in addition to trip expenses there will also be opportunity cost of time when a person makes more stops at various sites at Doi Inthanon. This would reduce the net value of the trip and hence of the entrance fee.

However, from the survey it was found that a typical trip to Doi Inthanon would generally involve a visit to the highest point of Thailand and a visit to a waterfall. This configuration would coincide with hypothetical trip D where the recreational value calculated from the contingent ranking method is 50.48 baht. Although this value is higher than that obtained from the open-ended WTP question (27.46 baht), it is still within a reasonable range. It is also important to recognise that strategic bias could lower the WTP from open-ended questions. Based on these two numbers, this study suggests a *basic* entrance fee of 40 baht (US$1) for Doi Inthanon. However, extra user charges should be adopted when visitors receive additional services from the variety of recreational features offered at Doi Inthanon.

This new entrance fee is about eight times higher than the current rate of 5 baht (US12 cents) per person. Assuming that the demand for park visits is perfectly price inelastic, this new entrance fee of 40 baht (US$1) per person should increase revenue from 5 million baht per year (US$25,000) to 40 million baht per year (US$1 million).

Having found that Doi Inthanon provides numerous recreational experiences to the visitor, it would be possible for the park to impose user charges for some special and fragile recreational sites. A user charge should be collected when visitors make special visits to other exotic sites besides the highest point and some waterfalls. For instance, after having paid the *basic* entrance fee of 40 baht the park can impose an extra fee if the visitor chooses to take the Kew Mae Pan Track or to walk through the Ang Ka Forest Ecology. This user charge would help raise additional revenue for the park by transferring surpluses from high-end consumers, leaving low-income visitors unaffected. At the same time, charging additional fees at some fragile recreational sites would help reduce the number of visitors and so reduce negative pressure on the environment. Moreover, these user charges can be channelled to the local community.

Local participation can be part of managing these special and fragile recreational sites. As tourism provides additional income to the villagers, it will reduce the need for the local community to encroach upon the forest. More importantly, it will provide an incentive for the local community to help preserve the park, since they

would see that preserving nature would help attract more visitors and hence increase their income.

For Doi Inthanon, one also needs to consider the distributional impact of imposing a higher entrance fee (40 baht per person). It was found that many low-income local residents living near Doi Inthanon visit the park regularly for recreation. For convenience, these frequent visitors generally spend time at the waterfall nearer to the foot of the mountain and rarely make trips into the main section of the national park. This study suggests that some recreational sites near the foot of Doi Inthanon should charge a lower entrance fee -- an entrance fee just sufficient to cover the operating cost of these sites, such as the cost of garbage collection and security.

The park may also consider adopting other provisions related to the distribution aspect of entrance fees. For instance, children below 16 years of age and senior citizens may be charged half price. School children or university students who visit the park as part of school activities should be exempted from the entrance fee. Entrance fee exemption may also be granted during special holidays such as Labour Day or Children's Day. These provisions should help ensure that while the new entrance fee increases park revenue, it will not become a burden for low-income visitors.

6.2 Entrance Fee for Doi Suthep

As reported earlier, a trip to a temple generates dissatisfaction. The calculation obtained from the contingent ranking method shows that the value of a Doi Suthep trip is minus 92.45 baht per person per trip. Although the open-ended WTP question shows that on average a person is willing to pay 21.30 baht to visit Doi Suthep, as many as 25 per cent of the people surveyed respond with protest bids for the reason that a temple visit should not be priced. Since visiting a temple may not generate recreational value (suggested by the contingent ranking method), and many people also feel that they should not pay when visiting a temple (from the open-ended WTP question), this study recommends that Doi Suthep continue with a zero entrance fee as is the current practice.

A discussion on the temple effect is worthwhile at this stage. This study finds that including a temple as a recreational attribute of national parks may not be appropriate and this inappropriateness may explain why the contingent ranking method reports the negative value of temple (when in reality visiting a temple is certainly a valuable activity). This study hypothesises that temples are of positive value to society, but these values may be spiritual rather than recreational. The high protest bids for Doi Suthep may partly support this hypothesis. Even if one can successfully measure the spiritual value of a temple, this information may still be insufficient for pricing Doi Suthep because society may decide that spiritual services should not be allocated a value via the price mechanism.

6.3 Entrance Fee for Mae Sa Waterfall

As for Mae Sa Waterfall, the net value calculated is 35.25 baht per person per trip, comparable to the open-ended WTP question of 18.38 baht. It was also found that many private recreational areas near Mae Sa Waterfall, such as the Rose Garden, also charge around 20 baht per person per visit. Unless further improvement takes place, this study suggests an entrance fee of 20 baht for Mae Sa Waterfall.

This new entrance fee for Mae Sa Waterfall is about four times higher than the current rate of 5 baht (US12 cents) per person. Assuming that the demand for park visits is perfectly price inelastic, this new entrance fee of 20 baht (US50 cents) per person should increase the revenue from 2 million baht per year (US$50,000) to 8 million baht per year (US$200,000).

Lastly, the concept of adopting a discriminatory pricing scheme where local and foreign visitors are charged different entrance fees can help increase the total revenue for national parks. The rationale for charging foreigners higher entrance fees are: 1) foreigners do not pay income tax or business tax to the local government; and 2) foreigners tend to have a higher WTP for park visits. However, imposing higher entrance fees on foreigners could unnecessarily create silent resentment among foreign tourists and consequently affect the image of the tourism industry of the host country negatively. For this reason, this study suggests that foreign and local visitors be charged the same entrance fees. National parks should instead adopt other strategies in transferring surpluses from foreigners, such as offering special package tours inside the park or operating souvenir shops.

7.0 CONCLUSION

This study successfully employed the contingent ranking method to value three recreational areas around Chiang Mai City: Doi Inthanon National Park, Doi Suthep and Mae Sa Waterfall. This method has proven useful for two reasons. First, the concept of substitutability between recreational areas could be addressed through the analysis. Second, the recreational value and hence entrance fees for these three recreational areas could be determined systematically, that is, the entrance fee for national parks will reflect the level of recreational services of each recreational area. Recreational areas which offer more recreational amenities to the visitor can charge a higher entrance fee than those which offer less.

The contingent ranking method makes the contingent valuation survey simpler. Respondents find ranking their preferences in the contingent ranking format easier than having to respond with an exact amount to open-ended WTP questions. The contingent ranking method also helps prevent strategic responses and enables researchers to gain direct access to the consumers' preference ordering of the environmental goods. For further research, one might adopt a non-linear indirect utility function and hence capture the diminishing marginal utility from any increase in consumption of environmental goods.

On entrance fees, the study recommends that the entrance fee for Doi Inthanon National Park be increased from 5 baht (US12 cents) per person to a *basic* entrance fee of 40 baht (US$1) per person. This would increase park revenue from 5 million baht (US$125,000) per year to 40 million baht (US$1 million) per year. Additional user charges should be applied to environmentally sensitive sites or environmentally fragile sites around Doi Inthanon. For example, a user charge may be imposed for a visit to Ang Ka Forest Ecology or Kew Mae Pan Tract. The entrance fee for Mae Sa Waterfall should be increased from 5 baht (US12 cents) per person to 20 baht (US50 cents) per person. This would increase park revenue from 2 million baht (US$50,000) per year to 8 million baht (US$200,000) per year. As for Doi Suthep, the

entrance fee should remain at zero given the difficulty of assessing the predominantly spiritual value of the site.

In addition to establishing new entrance fees, special consideration should be given to low-income visitors. This study recommends that children below 16 years of age and senior citizens be charged half price. School children or university students who visit the park as part of school activities should be exempted from entrance fees. Entrance fee exemption may also be granted during special holidays such as Labour Day or Children's Day. Furthermore, certain parts (such as the lower section) of Doi Inthanon might charge a lower entrance fee to facilitate access to low-income families, while the full entrance fee should apply to the middle and upper sections of the park. These provisions should help ensure that while the new entrance fee increases the park's revenue, it will not become a burden for low-income visitors.

Lastly, it is recommended that the Royal Forestry Department adopt a systematic approach in determining the entrance fees for all the national parks in Thailand. National parks or recreational areas which provide more recreational services should charge higher entrance fees than those which provide less recreational services. This study demonstrates how such a formula may be applied and how the system of entrance fees can be established. This innovation should raise revenue for park management and help ensure that park recreation will continue its contribution to society.

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APPENDICES

APPENDIX A — Questionnaire

Entrance Fee Survey
for the Project
Entrance Fee System for National Parks
Conducted by the
Faculty of Economics, Chiang Mai University
and the
Thailand Development Research Institute Foundation

January-February 1997

Instruction:

Introduce yourself to the respondent: " I am conducting a tourist survey on behalf of the Faculty of Economics, Chiang Mai University and the Thailand Development Research Institute Foundation. Your opinion and the information provided will be used to improve the quality of national parks in Thailand. Therefore, your honest response is essential for the success of this research project for the future of national parks in Thailand."

Name of Interviewer: _____ **Date:**____/____/ 1997__

Reviewed by: _____

Sampling Point:
- ❍1. Doi Inthanon
- ❍2. Doi Suthep
- ❍3. Mae Sa Waterfall
- ❍4. Night Bazaar
- ❍5. Chiang Mai Airport
- ❍6. Railway Station
- ❍7. Bus Depot
- ❍8. Others _____

Valuation Method: Contingent Ranking

I. Visitor's Recreational Behaviour

1. During 1996 how often did you visit national parks or nature-based recreation in Thailand? (e.g. Khao Yai, Phu Kradung, Doi Inthanon, Doi Suthep or Mae Sa Waterfall)

❍1. About _____Times Per Year ❍ 2. Never or Hardly Ever

2. During 1996 how much did you spend on nature-based recreation? _____ baht

3. During 1996 how many times did you visit the following places? Over the past 3 years, have you ever visited the following places?

❍1. Doi Inthanon _____Times
❍2. Doi Suthep_____Times
❍3. Mae Sa Waterfall_____Times

4. How did you come to this national park?

❍1. By tour bus ❍2. By mini bus ❍3. By private car
❍4. By motorcycle ❍5. By public bus ❍6. Others _____

5. From Chiang Mai City to this national park, how much did you spend on the following?

1. Transportation_____baht
2. Food_____baht
3. Total_____baht

6. What type of improvements would you like to see at this national park?

Recreational Sites _____
Bird/Butterfly Watching _____
Relaxation _____
Places _____
Walking Tracks _____
Waterfal _____
Hilltribe Village _____
Temple _____

Information about National Park _____
Maps _____
Information Signs _____
Precaution Signs _____
Tourist Information Centre _____
Traffic _____
Road Condition _____
Traffic Safety _____
Traffic Signs _____
Parking _____
Waste Disposal _____
Lavatory _____
Food Services _____
Accommodation _____
Others _____

II. Visitor's Attitude towards Entrance Fees

4. If national parks need more income to provide better services for visitors, such as more recreational sites, improved cleanliness, greater traffic safety, public safety and forest fire protection, how should these recreational services be financed?

❍ 1. Raise the entrance fees ❍ 2. Raise government budget
❍ 3. Donation to Park Fund ❍ 4. Others _____

Instruction:

A. The interviewer will now show the PHOTOGRAPHS to the respondents.
B. The respondents should have ENOUGH TIME to look through the pictures before answering the following questions.

5. What is Your MAXIMUM Willingness To Pay for the Entrance Fee to the following places?

Doi Inthanon		baht per Adult per Day
Doi Suthep		baht per Adult per Day
Mae Sa Waterfall		baht per Adult per Day

III. Visitor's Ranking and Valuation

Instruction:

A. The interviewer will now show the PHOTOGRAPHS to the respondents.
B. The respondents should have ENOUGH TIME to look through the pictures before answering the following questions.

7. Assume that all the park services remain unchanged as shown in the photographs. Please rank these trips according to your preference.

(1 = Most Preferred and 4 = Least Preferred)

	RANKING
A. Doi Inthanon: 300 baht - *Highest Point of Thailand* - *Hilltribe Village*	
B. Doi Suthep: 100 baht - *Hilltribe Village* - *Suthep Temple*	
C. Mae Sa: 150 baht - *Waterfall*	
D. Doi Inthanon: 400 baht - *Highest Point of Thailand* - *Waterfall*	

IV. General Information About the Visitor

8. Gender of the respondent
   ❍ 1. Male ❍ 2. Female

9. Age _____

10. Marital Status
    ❍ 1. Single ❍ 2. Married ❍ 3. Widower/ Divorced

11. Occupation
    ❍ 1. Civil Servant ❍ 2. Own Business ❍ 3. Private employee
    ❍ 4. Labourer ❍ 5. Student ❍ 6. Retired
    ❍ 7. Non-working spouse ❍ 8. Others (specify) _____

12. Number of members in the household: _____ people

13. Education
    ❍ 1. None ❍ 2. Primary ❍ 3. Secondary
    ❍ 4. Technical Diploma ❍ 5. Bachelor's Degree ❍ 6. Graduate Degree
    ❍ 7. Others (specify) _____

14. Monthly Income (if student or unemployed, indicate parents' or spouse's income)
    ❍ 1. 0 - 2,500 baht (US$0 - 100)
    ❍ 2. 2,501 - 5,000 baht (US$101 - 200)
    ❍ 3. 5,001 - 7,500 baht (US$201 - 300)
    ❍ 4. 7,501 - 10,000 baht (US$301 - 400)
    ❍ 5. 10,001 - 15,000 baht (US$401 - 600)
    ❍ 6. 15,001 - 20,000 baht (US$601 - 800)
    ❍ 7. 20,001 - 25,000 baht (US$801 - 1,000)
    ❍ 8. 25,001 - 50,000 baht (US$1,001 - 2,000)
    ❍ 9. 50,001 baht (US$2,001) and above

15. Present address: City_____Country_____

APPENDIX B — Contingent Ranking Method: An Instruction

The contingent ranking method can be applied to many resource valuation situations but the example used here will relate very much to the topic of this research, that is, valuation of recreational attributes. This section provides a step-by-step instruction for implementing the contingent ranking method with reference to valuation of recreational resources.

STEP 1: WHAT IS THE CONTINGENT RANKING METHOD?

The contingent valuation method (CVM) can be subdivided into the open-ended format and the close-ended format. While the open-ended format asks the respondent to state an exact value for the resource (WTP or WTA), the close-ended format asks the respondents to make only a choice from given alternatives or hypothetical choices. There are three major classes of close-ended CVMs: the referendum format, the random utility model (RUM) and the contingent ranking method.

The referendum format simply offers the respondents a choice and asks the respondents if they would accept or reject it. "Would you accept US$50 and let the beach deteriorate?" is an example of the questions asked in the referendum format CVM. The answer will be either a "yes" or a "no". The RUM extends the referendum format by offering many choices to the respondents and asking them to choose the one they like best. The contingent ranking method extends the RUM further by offering many choices to the respondents and, this time, asking them to make a ranking of these choices. For instance, four hypothetical recreational trips are offered to the respondents and they are asked to rank these trips from the one they like most to the one they like least. These orderings or rankings will be used to calculate the value of the resources in question.

Researchers sometimes prefer to adopt one of the three close-ended CVM formats to open-ended CVM (WTP or WTA) because respondents sometimes find it easier to respond to close-ended CVMs than to report an exact monetary value in an open-ended CVM.

STEP 2: EXAMPLES OF APPLICATION OF THE CONTINGENT RANKING METHOD

The contingent ranking method is often useful when one wants to find the value of the attributes of the resource. For example, one may use the contingent ranking method to value the quality attributes of water as a resource, namely, clarity, odour or taste. In this case, a researcher will need to prepare some hypothetical samples of water in which each sample has a different level of clarity, odour, taste and price. The price attribute is included to indicate that high quality samples will be more expensive. The respondents will then rank these hypothetical samples by choosing between water quality on the one hand and the price they have to pay on the other. The value of water quality is essentially the trade-off between improved water quality and the increase in price.

The value of an automobile can be obtained from the market price of each automobile, but the value of each attribute of the automobile is often unknown. The contingent ranking method can be used to value various safety properties (attributes) of an automobile, such as air bag, seat belt, ABS brakes, side impact safety and so on.

In this case, some hypothetical cars are created. Each car has a different combination of safety properties and prices. Cars with more safety equipment will be priced higher than those with less safety equipment. The respondents will then rank these hypothetical cars by choosing between safety equipment they get on the one hand and the increase in the price on the other. The value of each item of safety equipment is essentially the trade-off between improved safety and the increase in the price of the car.

In this study, the contingent ranking method is used to value the recreational attributes of various national parks. The chosen recreational attributes are waterfall, highest point of Thailand, hilltribe village and temple. Four hypothetical trips are arranged with different combinations of these recreational attributes and the prices of the various trips. Trips which feature more recreational attributes are priced higher than those which feature only a few recreational attributes. The respondents are asked to rank these hypothetical trips according to their preference, that is, whether taking a trip which features more recreational attributes is worth the higher price tag. The value of each recreational attribute (waterfall or hilltribe village) is obtained by calculating the trade-off between that recreational attribute and the increase in the price of the trip. With this application, the study uses the value of these recreational attributes to calculate the entrance fee of each recreational area. Recreational areas which feature many recreational attributes will be priced higher than those with only a few.

STEP 3: PREFERENCE ORDERING FUNCTION

The contingent ranking method is based on consumer behaviour theory. In estimating the value of the resource, the method attempts to learn about consumer behaviour towards the environmental goods in relation to other goods, in this case money. Consumer behaviour can be revealed through many types of consumer preference ordering functions. In the contingent ranking method, two types of preference ordering functions commonly used are the direct utility function $U(e, Q; S)$ and the indirect utility function $V(p, I; e, S)$. Since the environmental goods in this study involve travel expenses to recreational areas, adopting the indirect utility function here seems appropriate. Travel expenses to the recreational area will represent the "price" variable in the indirect utility function. The estimated parameters in the indirect utility function will allow for the calculation of the marginal rate of substitution (MRS) between the environmental goods and money or price. This MRS is essentially the value of the environmental good in question.

This study adopts a simple linear functional form for the indirect utility function. There are advantages and disadvantages to using a linear functional form. Linearity makes the estimation simple but may not represent the true relationship. Further research should experiment with estimating the indirect utility function with non-linear indirect utility function.

STEP 4: DESIGNING HYPOTHETICAL CHOICES

Once a preference ordering function and its functional form are determined, the researcher needs to prepare hypothetical trips for the respondents to rank. These choices can be real or hypothetical or a mixture of real and hypothetical. The number of choices should be large enough to allow the respondents to reveal their preferences but not so large that ranking becomes cumbersome. This study pre-tested the questionnaire by experimenting with six hypothetical choices and found that the

respondents had difficulty ranking. Consequently, only four choices were used in the actual survey.

The table below illustrates how this study specified the four hypothetical trips (trips A to D). Each trip comprises a different combination of recreational attributes and price. For instance, trip A is a visit to Doi Inthanon featuring the highest point of Thailand (denoted 1) and the hilltribe village (denoted 1). The price of trip A is 300 baht. Other recreational attributes which are not part of trip A are denoted with zeros. The other trips feature different recreational attributes and prices.

Recreational Attributes at each Recreation Area

Hypothetical Trip	**Highest Point**	**Waterfall**	**Hilltribe Village**	**Temple**	**Trip Expenses (baht)**
A. Doi Inthanon	1	0	1	0	300
B. Doi Suthep	0	0	1	1	100
C. Mae Sa Waterfall	0	1	0	0	150
D. Doi Inthanon	1	1	0	0	400

The combination of attributes of each trip, including the price, should differ sufficiently to generate variation. The price assigned to each trip should be realistic and should closely resemble the true cost of taking such a trip.

After these hypothetical trips had been arranged, photo albums were made featuring these four hypothetical trips and their prices. The pre-test of the questionnaire and photo albums indicated that the photographs of the recreational attributes of the four hypothetical trips should be arranged on one full double page so as to allow the respondent to make comparisons between the trips. Arranging each trip on a different page requires the respondent to turn over the pages and this makes it difficult for the respondent to provide the ranking.

STEP 5: DATA ENTRY

Many statistical packages can be used to analyse the rank data. This study uses the LIMDEP statistical package to run the ordered logit estimation. With LIMDEP, the data has to be entered in stack form where each observation takes four lines (because there are four hypothetical trips). The following example shows how the data of observations 1 and 2 are entered into a data file and is read by LIMDEP.

X1	X2	X3	X4	X5	X6	X7	X8	X9	X10
1	1	1	0	1	0	300	2	15000	25
1	2	0	0	1	1	100	1	15000	25
1	3	0	1	0	0	150	4	15000	25
1	4	1	1	0	0	400	3	15000	25
2	1	1	0	1	0	300	3	20000	31
2	2	0	0	1	1	100	2	20000	31
2	3	0	1	0	0	150	1	20000	31
2	4	1	1	0	0	400	4	20000	31

X1 = Observation number
X2 = Trip choice number
X3 = Highest point
X4 = Waterfall
X5 = Hilltribe
X6 = Temple
X7 = Travel expenses (price)
X8 = Ranking
X9 = Income
X10= Age

Observation 1 occupies the first four lines, as indicated by X1 = 1 for the first four lines. For each observation (except the first one), the four values of the variables X3-X7 duplicate the matrix in the preceding observation and remain the same for all the other observations, that is, all the four lines for variables X3-X7 for observation 2 are the same as those of observation 1. The difference occurs in variable X8, the order of ranking given by the respondent. For observation 1 the respondent stated that he/she likes trip 2 the most, hence the value of X8 in line 2 takes the value of 1. He/she likes trip 1 second, hence the value of X8 in line 1 takes the value of 2, and so on. Variables X9 and X10 are the income and age of the respondent respectively. Therefore, each stack of four lines has the same values. For instance, respondent number 1 has an income of 15,000 baht per month and he is 25 years old.

STEP 6: STATISTICAL CALCULATION

LIMDEP is capable of computing the parameter estimates using ordered logit procedure. Special caution is needed for the social characteristic variables such as income and age because they have the same value for every four lines. To overcome this problem, social characteristic variables have to enter the model interactively, either by multiplication or by division. For instance, income (X9) can interact (by division) with price (X7), and age (X10) can interact (by multiplication) with waterfall (X4). Hence the final estimation equation used to estimate the unknown parameters in the indirect utility function $V = \alpha e_j + \mu c + \theta[c/I] + \Sigma \gamma_k e_i S_k$ becomes:

RANK = HIGH + FALL + VILL + TEMP + COST + COST/INC + FALL*AGE

or

$X8 = \beta_1 X3 + \beta_2 X4 + \beta_3 X5 + \beta_4 X6 + \beta_5 X7 + \beta_6 (X7/X9) + \beta_7 (X10*X3)$

Testing for the significance of parameter estimates and goodness of fit follows the standard statistical procedure.

STEP 7: CALCULATING THE VALUE OF THE RESOURCE AND ENTRANCE FEE

The value of recreational attributes is obtained by calculating the marginal rate of substitution between each recreational attribute and the cost (see section 4 in main text for full explanation). If the estimating function is assumed to be linear, as shown in STEP 6, the estimated indirect utility function becomes:

$$V = \beta_1 X3 + \beta_2 X4 + \beta_3 X5 + \beta_4 X6 + \beta_5 X7 + \beta_6 (X7/X9) + \beta_7 (X10*X3)$$

The value or WTP for each recreational attribute or the marginal rate of substitution between each recreational attribute and cost becomes:

WTP for Highest Point	=	$MRS_{X3X7} = - [\partial V/\partial X3 \mid u=u_o] / [\partial V/\partial X7 \mid u=u_o]$
	=	$-(\beta_1 / (\beta_5 + (\beta_6/INCi)))$
WTP for Waterfall	=	$MRS_{X4X7} = - [\partial V/\partial X4 \mid u=u_o] / [\partial V/\partial X7 \mid u=u_o]$
	=	$-((\beta_2 + \beta_7 AGEi) / (\beta_5 + (\beta_6/INCi)))$
WTP for Hilltribe Village	=	$MRS_{X5X7} = - [\partial V/\partial X5 \mid u=u_o] / [\partial V/\partial X7 \mid u=u_o]$
	=	$-(\beta_3 / (\beta_5 + (\beta_6/INCi)))$
WTP for Temple	=	$MRS_{X6X7} = - [\partial V/\partial X6 \mid u=u_o] / [\partial V/\partial X7 \mid u=u_o]$
	=	$-(\beta_4 / (\beta_5 + (\beta_6/INCi)))$

Because the value of each recreational attribute depends on the level of social characteristics, namely income or age, it has to be calculated separately for each respondent i in the survey and the average is usually reported as shown in the main text (see Table 9).

The entrance fee for each recreational area is calculated by adding up the value of the recreational attributes at each area and subtracting the cost of taking the trip. This value represents the visitor's net gain from visiting a certain recreational area. For instance, by visiting Doi Inthanon an average visitor's itinerary would feature the highest point of Thailand and a waterfall. The value of net gain or surplus is obtained by adding the recreational value of the highest point plus the recreational value of waterfall minus the trip expenses (cost). This value is the maximum amount the person would be willing to pay for the entrance fee. This study suggests that the actual entrance fee charged should be a little below this amount so as to leave some surplus to the visitor. (For a detailed discussion, see section 5.3 in main text.)