International Business Management 9 (5): 771-783, 2015
ISSN: 1993-5250

Local Population Preferences Toward Restoring Ecosystem Services of a Wetland in Thailand

Mayula Chaikumbung
[1]Faculty of Liberal Arts and Management Science, Kasetsart University,
Sakon Nakhon Province Campus 47000, Thailand

Abstract: This study reports the findings of a choice experiment designed to explore local population preferences toward wetland ecosystem restoration of Bung Khong Long Wetland in Thailand. By addressing ecological, socioeconomic and cultural dimensions of ecosystem services, the findings provide policy-makers with a richer insight into the interconnections among ecological, socioeconomic and cultural systems in explaining the value of ecosystem services. Gaining an understanding of the trade-offs associated with different interests in ecosystem uses in this community has the capacity to promote wetland management and enhance land use planning. The choice experiment application entails selecting attributes and their levels and developing an experimental design to create the choice sets or hypothetical scenarios for welfare assessment via the questionnaire. The study is based on household level data collected from 780 randomly drawn respondents living around the lake and the data are analysed using the Random Parameter Logit Model with interactions. The findings indicate that the local population derives positive and significant values from the restoration of wetland ecosystem services, indicating caution is needed in the decision-making processes involving sensitive environments faced with competing uses. Socioeconomic and attitudinal characteristics of respondents are important factors influencing willingness to pay, implying community preferences are important in the effectiveness of environmental conservation efforts in this community. The cultural values associated with the wetland are significant suggesting that incorporating culture preferences may be a key factor in supporting wetland conservation.

Key words: Wetland valuation, ecosystem services, choice experiment, willingness to pay, welfare assessment

INTRODUCTION

Wetlands are highly productive ecosystems, providing many important services to human society (Bassi *et al*., 2014). Wetland systems directly support a large number of people and provide goods and services to the world outside the wetlands (Barbier *et al*., 1997).

However, wetlands are ecologically sensitive systems (Zhao *et al*., 2005). The need for conservation of natural wetlands has continually increased, leading to the creation of the Convention on Wetlands of International Importance-The Ramsar Convention in 1971 and- The Millennium Ecosystem Assessment in 2005 (Ghermandi *et al*., 2009). These initiatives notwithstanding, wetlands continue to be lost and persistently degraded throughout the world (Turner *et al*., 2000). The reason for this is that many wetland ecosystem services do not have a market value and thus, their benefits may not be considered in commercial development decisions and broader public policy initiatives (Edward Barbier, 2007). Wetlands also are generally open-access with ill-defined property rights, enabling rivalry and incentives for individual benefit.

Providing valuations of wetlands to policy-makers is a necessary step in the process of finding solutions to ecological problems. Economic valuations provide a means for measuring and comparing the various benefits of wetlands and of course, the costs associated with preservation. Hence, economic valuation can be a powerful tool to aid and improve wetland management.

This study focuses on Bung Khong Long wetland in Thailand. In one sense, there is a failure of the market to reflect the scarcity value of the wetland. This is in part, due to poorly defined and poorly assigned property rights leading to over exploitation and degradation of the wetland. This is the case even though the conservation of the wetland is supported by the Ramsar Convention and

WWW Greater Mekong Organization. The Bung Khong Long Wetland (BKL) is being disturbed and threatened by various factors such as extensive fishing, chemical pollutants draining from agricultural practices and household activities, illegal bird hunting and fishing, removal of vegetation to access fishing grounds and encroachment by ever expanding local communities (Ramsar, 2001). All these factors have led to a considerable alteration of BKL and reduction in the quality of its ecosystem services.

This study applies a choice experiment to address the question of the value to the local population of the ecosystem services of the various wetland attributes. The estimated Willingness to Pay (WTP) for improving the ecosystem and identification of the factors affecting respondents' willingness to pay for wetland ecosystem improvement provide guidance for future land use planning. Such estimates can help policy-makers and stakeholders to make informed decisions as to the trade-off between wetland conservation and economic development for sustainable use.

MATERIALS AND METHODS

BKL is one of the largest freshwater lakes in the North-Eastern part of Thailand. The lake covers 2,214 ha and lies on the floodplain of the Songkram River, into which water from the lake is discharged before being released into the Mekong River. It supplies water for the municipalities to produce tap water consumed in Bung Khong Long District (Ramsar, 2001). The surrounding land of the lake is forest, remnant forest and privately owned land for agriculture as well as being home to 18 villages (WWF Greater Mekong Thailand Country Programme, 2006) (Fig. 1).

BKL also provides numerous goods and services that have an economic value not only to the local people living in its periphery but also to communities living outside the wetland area.

Furthermore, it performs many ecosystem functions such as waste absorption, flood control and carbon sequestration. BKL supports a high diversity of aquatic plants and wetland wildlife (Ramsar, 2001). In particular, several species of threatened fish and birds are endemic to papyrus floodplain; moreover BKL is one of the most important wetlands for wintering birds in the North-Eastern part of Thailand. As a result, the site has been declared a Non-Hunting Area since 1982 (Suksri *et al*., 2005) and the international importance of the wetlands has been recognized with its classification as a Ramsar site since 2002.

BKL has been chosen as the study area for various fields of research, especially scientific research. There are no prior studies of the economic valuation of this wetland, although there have been several economic valuation studies conducted on wetlands in Thailand. Most studies have focused on valuing mangrove and coral reef ecosystem services (Sathirathai, 1998; Sathirathai and

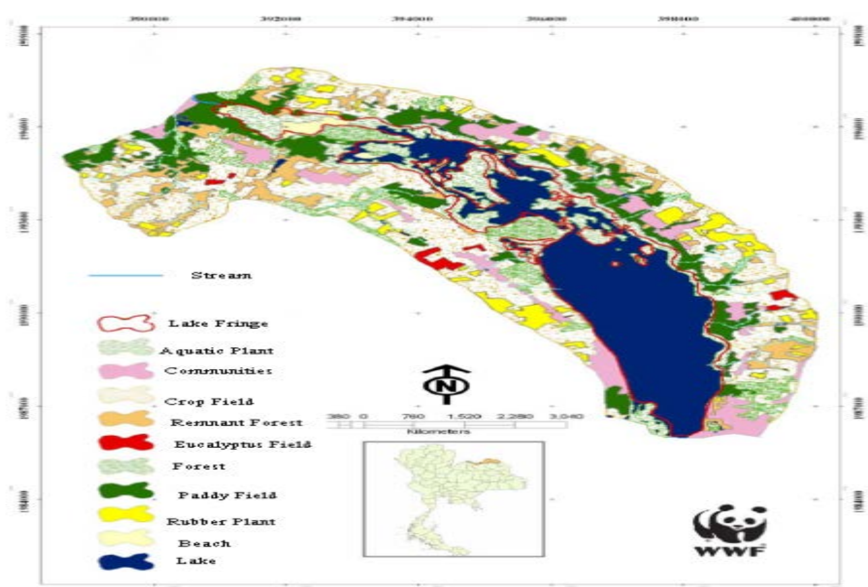

Fig. 1: Bung Khong Long wetland and surrounding area; WWF Greater Mekong Thailand Country Program (2006)

Barbier, 2001; Seenprachawong, 2001, 2002; Christiernsson, 2003; Tapsuwan, 2006; Edward Barbier, 2007; Wiwatthanapornchai *et al*., 2014). Most studies have also focused on a single or few ecosystem services. This approach may not be capable of supporting multi-objective approaches needed for ecosystem management (Tallis and Polasky, 2009). Without comprehensive value estimates, decision-makers risk overlooking a wide set of ecosystem services and ignoring the multitude of interconnections among components of natural, environmental and social systems. This may in turn result in an inefficient allocation of wetland resources which is a crucial reason why in several regions of the world, wetland ecosystems are still under threat in spite of growing conservation efforts (Ghermandi *et al*., 2009).

Choice Experiments (CE) may be suited for the valuation of wetland ecosystem services to deal with situations where changes are multidimensional and there are trade-offs of different interest in ecosystem uses (Hanley *et al*., 2001). This method evaluates the public's preferences by asking respondents to state their most preferred alternative among a set of alternatives, each described in terms of different attributes and levels, related with ecosystem services and different management options (Hoyos, 2010). Consequently, CE can be used to explore social preferences toward a wide set of ecosystem services for potential conflicts among stakeholders due to different needs and trade-offs among ecosystem services (Garcia-Llorente *et al*., 2012).

In recent years, CE application is likely become more prominent in valuing wetland ecosystem services (Morrison *et al*., 1999; Carlsson *et al*., 2003; Othman *et al*., 2004; Birol *et al*., 2006; Birol and Cox, 2007; Do and Bennett, 2009; Kragt and Bennett, 2009; Cerda, 2013; Khai and Yabe, 2014). Most studies have focused either on wetland ecological services (e.g., biodiversity conservation, habitat protection, water quality improvement and flood-storm protection) or on wetland socioeconomic services (e.g., recreation, water regulation, food production). Few studies, however have addressed cultural preferences toward ecosystem services from the perspective of human beliefs.

This study adds to the body of previous research by extending the non-market valuation approach. Using CE elicits local population preferences toward wetland ecosystem restoration by addressing ecological, socioeconomic and cultural dimensions of ecosystem services to perceive a wide set of values of wetland ecosystem services, trade-offs resulting from different interests in ecosystem uses and ecosystem service bundles. Hence, the CE study in the present study provides policy-makers with a richer insight into the interconnections among ecological, agricultural and social-cultural systems by explaining the value of ecosystem services and competing ecosystem uses of this community to promote wetland management and land use planning.

The Choice Experiment (CE) Method: The CE Method is founded on Lancastrian Consumer theory (Lancaste, 1966) and has its econometric basis in random utility theory (McFadden, 1974). The basic assumption in CE applications is that consumers derive utility from the attributes possessed by goods instead of the goods themselves (Birol and Cox, 2007). In this case, the utility respondents derived from the hypothetical ecosystem restoration program in BKL is equivalent to the summation of the utility derived from the attributes. In the CE application for this study, local people make choices relating to the ecosystem restoration of BKL and it is assumed that utility is based on choices made from a choice set including possible alternatives of the ecosystem restoration programs. Thus, each local person is assumed to have a utility function of the form:

$$U_{ij} = V(Z_j, S_i) + \varepsilon_{ij} \quad (1)$$

Where for any local person i (i =1, 2, 3,…n), utility is gained from choosing an alternative hypothetical ecosystem restoration program j (j = A, B and C). The local population is assumed to derive utility from the ecosystem restoration program depending on the attributes (Z) of the program and their socioeconomic and their attitudinal characteristics (S). The stochastic component (ε) is discussed below.

The choices made in CE are analyzed by using random utility theory. The utility function of a choice (U) is decomposed into two components:

- A deterministic component or the observable objective component of utility (V). V is a vector of attributes describing the ecosystem services which affect local peoples' preferences and complemented by socioeconomic and attitudinal characteristics of local people (S)
- A stochastic component or unobservable portion of utility (ε) as unobserved factors may influence local peoples' preferences. It is possible that some variables are omitted from this study, measurement errors arise and local people may be inattentive to the specific decision

In order to estimate the parameters and calculate welfare effects, it is generally assumed that the utility function takes a linear form. The attributes of ecosystem services can be entered into the individual's utility function (Ben-Akiva and Lerman, 1985). The probability that person i will choose alternative j over some alternative h within choice set R when the expected utility for person i (U_{ij}) is higher than expected utility (U_{ih}) for all alternatives or options, or policies can be represented as:

$$P_i(j) = \Pr\{U_{ij} \geq U_{ih}, \text{ s.t. } \forall_h \in R_i \text{ and } j \neq h\} \quad (2)$$

The utility of each option or policy can be divided into observable terms and unobservable elements (the error term). Hence, Eq. 2 can be rewritten as follows:

$$P_i(j) = \Pr\{V(Z_j, S_i) + \varepsilon_{ij} \geq V(Z_h, S_i) + \varepsilon_{ih}, \text{ s.t. } \forall_h \in R_i \text{ and } j \neq h\} \quad (3)$$

To estimate the choice probabilities and the observable parameters of the utility function in Eq. 3, it is necessary to make assumptions about the distribution of the error terms. Different econometric choice models can be derived from making different assumptions associated with the distribution of the error terms (Adamowicz *et al*., 1998). In Multinomial Logit (MNL), it is assumed that the stochastic components are independently and Identically Distributed (IID) with the implication that alternatives have independence from Irrelevant Attributes (IIA). In this sense, this model type assumes that choice situations are uncorrelated and preferences are homogeneous. For the purposes of this CE study, MNL estimated is:

$$V_{ij} = ASC_j + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + \ldots + \beta_k Z_k + \gamma_1 S_1 + \gamma_2 S_2 + \gamma_3 S_3 \ldots + \gamma_p S_p \quad (4)$$

where, ASC is the alternative specific constant representing the utility of zero payment option and in this study, defined as a 'status quo' β_1 to β_k are the coefficients of the attributes, γ_1 to γ_p are attached to vector of interaction terms (S). Socio-economic and attitudinal variables can not be directly entered into the estimated utility function because they are invariant across the alternatives in the choice set (Morrison *et al*., 1999). These enter as interaction terms with as the attributes and ASC.

If the IIA is violated in MNL model, then it is necessary to estimate a more complex model (Suh, 2002). To resolve this issue and further investigate heterogeneity in respondents' preferences, Random Parameter Logit (RPL) is estimated. The model allows the coefficient of observed variables to vary randomly with a specific probabilistic distribution across individuals (Yang, 2005). In the RPL Model, individual heterogeneity can be formed by varying the parameters in the population (Lee *et al*., 2003). The utility function in the RPL Model estimated is:

$$V_{ij} = ASC_j + \beta'_j Z_{ij} + \eta'_j Z_{ij} \quad (5)$$

Where:

- β' = The vector of the mean population coefficients explaining attributes
- $\beta' Z_{ij}$ = Observed attributes of alternatives within a choice set
- η' = The vectors of individual deviation coefficients capturing random, unconditional and unobserved type of taste heterogeneity of each random parameter (Grosjean and Kontoleon, 2009)
- $\eta' Z_{ij}$ = Known as a stochastic component that reflects individual heterogeneity

Taste variation among respondents is explored through socioeconomic and attitudinal variables interacted with either the ASC or attributes. This results in the following extended linear utility function of RPL Model for j programs:

$$V_{ij} = ASC_j + \beta'_1 Z_1 + \beta'_2 Z_2 + \beta'_3 Z_3 + \ldots \beta'_k Z_k + \eta'_1 z_1 + \eta'_2 z_2 + \eta'_3 z_3 \ldots + \eta'_k z_k + \gamma_1 S_1 + \gamma_2 S_2 + \gamma_3 S_3 + \ldots \gamma_p S_p \quad (6)$$

where, γ is a vector of coefficients of the interactive terms with either ASC or attributes. There are j ecosystem restoration program in the choice sets, k attributes and p socioeconomic and attitudinal variables in this extended linear utility function.

Choice experiment design and administrating the survey

Choice experiment design: To elicit villagers' preferences and to provide welfare estimates for specified ecosystem restoration of the BKL, the CE entails selecting attributes and their levels and developing an experimental design to create the choice sets or hypothetical scenarios for welfare assessment via the CE questionnaire.

Selecting attributes and assigning their levels: This CE study defined the ecosystem goods and services to be valued in terms of attributes based on the relevant reports and literature, discussions with the local villagers in four focus group discussions and consultation with university scientists and management staff who are knowledgeable about BKL ecosystem and the restoration effort. The following attributes were found to be of the most interest to both potential villagers and management staff: cropping area, fish catch, bird species, healthy aquatic

Table 1: Attributes and levels used in choice sets

Attributes	Notation	Description	Levels
Cropping area	Crops	Increasing the rice cultivation area surrounding the lake during the dry season	0, 5, 15 (%)
Fish catch	Fish	Total quantity of fish,crab and shrimp catch	80,000, 90,000, 100,000 (kg)
Healthy aquatic plants	Aquatic plants	Density of healthy aquatic plant species without invasive species	310, 375,450 (kg rai^{-1})
Bird species	Birds	The number of bird species	136, 200, 300 (species)
Temples restored	Temples	The number of ancient Buddhist temples restored and Don Plo Island on Don Sawan Island	0, 1, 2
Time delay	Time	Years when fish, bird species and healthy aquatic plants increase	0, 1, 2 ,3, 4, 5 (year)
Cost		Cost A donation to Wetlandnongkhai organization fund	0, 500, 1,000 (Baht year^{-1})

plants, ancient Buddhist temples restored, the time delay before ecosystem improvement begins and the cost options. The levels of these attributes were determined in the relevant reports and literature and consultation with university scientists and management staff. The attributes and their levels are summarized in Table 1.

The cropping area and fish catch attributes were included to capture socioeconomic wetland characteristics or wetland use. However, there is some conflict between environmentalists and farmers (These farmers were willing to lose their cultivated land to join the dyke construction of His Majesty the King's Royal project in 1982. The objective of this project is to increase water reservoirs for consumption and irrigation) in the wetland communities over property rights to land and water. It is difficult to stop settled poor farmers from encroaching on the wetland for growing paddy rice during the dry season because their livelihood is dependent upon it.

Healthy aquatic plants and bird species were selected to reflect ecological wetland characteristics or wetland conservation. Healthy aquatic plants are among the indicators used by wetland managers and researchers in assessing the health of wetlands as they play an important role in the physical and chemical environments of wetlands (Cronk and Fennessy, 2001).

This study includes cultural values in the CE analysis, since traditional Northeast Thai culture and Buddhism beliefs influence water utilization and conservation. The cultural belief is that lakes and rivers are dwellings of Nagas believed to be protectors of the Mekong community. In order not to disturb Nagas, Buddhists should not directly clean, wash or throw waste into the water body. Also dwellings and housing adjacent to or in the river and lake are forbidden. To protect wetlands via conservation of the local traditional culture and Buddhist beliefs, restoration of ancient Buddhist temples on Don Plo and Don Sawan Islands is one way to estimate the value that local people place on local culture, including conforming to local traditional culture and Buddhist beliefs. Hence, restoring ancient temples was selected as an attribute to exhibit cultural ecosystem services.

All projects require a payment vehicle to raise funds to implement the proposed program. Carson and Groves (2007) point out that the payment vehicles used for environmental valuation should be a compulsory payment methods such as income tax, water bills or electricity bills.

A voluntary once-off donation payment method could encourage respondents to exaggerate their WTP (Ivehammar, 2009). However, although there are limitations associated with voluntary payment vehicles, we considered voluntary payments to be the most appropriate payment vehicle for this study. Most farm households have low incomes and are not familiar with income tax. Furthermore in some villages, drinking water is freely available. We therefore, determined a voluntary donation fund to be the most suitable payment vehicle as almost all local people are Buddhists who are familiar with monetary donations.

Non-market values are an integral aspect of assessing policy alternatives using cost-benefit analysis. A critical decision in a cost benefit study is the timing of costs and benefits as when values are discounted this influences the relative weighting of future and present values. In this study, the time delay before ecosystem improvement begins has been included to estimate rates of time preference for policy choices.

Experimental design: An efficient design created the unlabeled CE with three alternatives: status-quo, Option A and Option B. Efficient designs can be used which generate parameter estimates with as small as possible standard error and maximize the information from each choice situation (Rose, *et al.*, 2008). We created the choice sets for this study by using

Table 2: Example of a choice set

Attributes	Option A	Option B	Option C status Quo
Increased cropping area	5%	15%	No change (2,663 ha)
			
Quantity of fishing (kg year^{-1})	100,000	90,000	80,000
			
Density of healthy aquatic plants (kg rai^{-1})	375	450	310
			
No. of bird (species)	300	200	136
			
No. of temples restored (temples)	2	1	0
			
Years when ecosystem restoration begins	2 years from now	3 years from now	No change
			
Donation (Baht year^{-1}) for 5 years	500	1,000	0
			
Your preference?	_	_	_

the efficient design procedure in Ngene 1.1. An optimized fractional design was used to select a subset of 24 possible combinations for each alternative. These 24 choice sets were randomly assigned to three blocks, so each respondent was given eight choice sets. Hence, there were three versions of the questionnaire.

Questionnaire design: The final questionnaire, developed by experimental design and pilot survey contained two sections which were translated into Thai language. The first section of the questionnaire collected data on the socioeconomic characteristics of respondents and information regarding respondent attitudes about the environmental conservation of BKL. The second section briefed respondents about disturbances and threats to BKL, the proposed plan for wetland ecosystem restoration and the likely outcomes of different management alternatives. It was indicated to respondents that any restoration plan would require a donation fund to cover activities such as; the costs of sewage treatment, building new draining systems, establishing a center for promoting multi-storey cropping, monitoring illegal fishing and illegal bird and egg hunting, controlling wetland encroachment and restoring temples. An example of a choice set is presented in Table 2.

Administrating the survey: In this study area, most of the local population has a low level of education. They are also not familiar with the exercise of selecting a preferred alternative in a hypothetical scenario. This situation does not favor the drop-off pick-up method of data collection, thus face-to-face interviews based on the questionnaire were conducted (Bennett and Birol, 2010). Prior to the pilot and main survey, a training course for six interviewers was organized at Kasetsart University, Thailand. The training course was given to the interviewers prior to data collection in order to minimize biases due to misinterpretation of questions by the interviewers. The training course consisted of a careful explanation and discussion of all questions and potential issues.

A random survey of 780 households drawn from 18 villages closer to the lake was carried out by using a standard questionnaire format exclusively designed for this purpose. Three teams of interviewers conducted the face-to-face interviews in February 2012. The questionnaires were sorted into bundles of version 1, 2 and 3. Enumerators were advised to maintain this order in interviews and record the version which was used in each household. Due to the complexity of the CE questionnaire the interviewers described the choice scenarios with colorful cards. Respondents were asked to select the best option for them. Each household answered eight choice sets.

RESULTS AND DISCUSSION

Respondents' socioeconomic and attitudinal characteristics: The choice data set was analyzed using NLOGIT 5.0 LIMDEP 10. Follow up questions were used to further understand respondents' decision-making strategies and heuristics (Carlsson *et al*., 2010). Of the total 780 household interviewed, there were 768 usable responses. Twenty-two respondents (~2.86% of the total) always chose the status quo (Option C). Protest respondents indicated a view that wetland management was the responsibility of the government and staff from WWF Greater Mekong and they did not believe that funds would be used correctly. The socioeconomic and attitudinal characteristics of respondents are presented in Table 3. The proportion of men and women who answered the questionnaire was similar. The average age of respondents was 47 years. The annual household income of respondents ranged between 2,500-300,000 Baht (US$83-US$10,000). Most respondents were farmers and fishermen (73%) and most did not have a university degree (88%). The mean family size of respondents was five, with an average of one child per household. On average, respondents had lived in the Bung Khong Long community for ~34 years.

We designed the attitudinal questions to explore the personal views of respondents on environmental issues and reveal their underlying attitudes to the ecosystem restoration of BKL. Most respondents agreed that everyone has a duty to contribute to the protection of BKL and that it is not solely the responsibility of government and/or the WWF Greater Mekong Organization. Most respondents considered degradation in water quality to be the most important issue to address, followed by depletion in fish stock, illegal hunting and fishing and encroaching of the wetland by development, respectively. It is likely that most respondents understood the environmental issues facing BKL, the need to protect the wetland and the significant environmental problems in this community. This indicates that local people had an underlying support for an environmental conservation program for improving the environmental quality of BKL.

Model selection

Multinomial Logit (MNL): The MNL Model was estimated including socioeconomic and attitudinal characteristics interacting with the ASC and selected attributes to examine the variations in effects of wetland ecosystem restoration program presented in Table 4. Only the significant interactions between socioeconomic and attitudinal variables and the attributes have been included. A Haussmann test was performed to confirm the

Table 3: Socioeconomic and attitudinal definitions and descriptive statistics

Variable name	Variable description	Notation	Mean	SD	Min.	Max.
Socioeconomic variables						
Gender	Gender of respondent; BD =1: respondent is male	Gen	0.49	0.49	0.00	1.00
Age	Age of the respondent (year)	Age	47	14	18	89
Income	Household income (Baht year^{-1})	Inc	13,378	9,502	2,500	300,000
Career	Career of respondent; BD =1: respondent is farmer or fisherman	Carr	0.73	0.44	0.00	1.00
Education	Education levels of respondent; BD =1: education is less than bachelor degree	Edu	0.88	0.33	0.00	1.00
Family size	Number of members living in the same house	Fam	5	2	2.00	8.00
No. of children	The number of children under 18 years living in the same house	Kid	1	1	0.00	5.00
Years of living	Years respondent living in Bung Khong Long community	Liv	34	17	1	89
Attitudinal variables						
Wetland protector	The people have a duty to protect wetland; BD =1: Study is everyone	Ev	0.54	0.48	0.00	1.00
Concern water quality problem	The problems considered to be the most important to address; BD =1: Study is water quality degradation	Wq	0.45	0.49	0.00	1.00
Concern fish stock problem	The problems considered to be the most important to address; BD =1: Study is fish stock depletion	Fs	0.41	0.49	0.00	1.00
Concern encroaching wetlands	The problems considered to be the most important to address; BD =1: Study is encroaching wetland	En	0.05	0.17	0.00	1.00
Concern illegal hunting and fishing	The problems considered to be the most important to address: BD =1: Study is illegal hunting and fishing	Il	0.09	0.24	0.00	1.00

BD denotes a binary variable, US$1~31 Baht

Table 4: Results of MNL and RPL Models

Variables	Model MNL	PRL
ASC	-0.022 (0.028)	-0.022 (0.031)
Crops	0.039 (0.003)***	0.043 (0.004)***
Fish	0.00004 (0.000003)***	0.00005 (0.000005)***
Aquatic plants	0.003 (0.0004)***	0.003 (0.0005)***
Birds	0.002 (0.0003)***	0.0016 (0.0005)***
Temples	0.281 (0.030)***	0.310 (0.037)***
Time delay	-0.139 (0.018)***	-0.148 (0.021)***
Cost	-0.002 (0.0002)***	-0.002 (0.0002)***
ASC*education	0.705 (0.168)***	0.757 (0.180)***
ASC*income	0.00004 (0.000007)***	0.00004 (0.000007)***
ASC*years of living	0.010 (0.004)**	0.011 (0.004)**
ASC*concern water quality	0.765 (0.173)***	0.758 (0.178)***
Cost*age	0.000008 (0.000004)**	0.000009 (0.000004)**
Cost* education	0.0007 (0.0002)***	0.0007 (0.0002)***
Cost*gender	0.0002 (0.00009)**	0.0002 (0.0001)**
Fish* concern fish stock	0.00002 (0.00005)***	0.00002 (0.000005)***
Crop* concern encroaching wetlands	-0.028 (0.012)**	-0.030 (0.013)**
Standard deviations of random parameters		
Bird	-	0.007 (0.002)***
Summary statistics		
Log-likelihood	-4,515	-4,513
McFadden Pseudo-ρ^2	-	0.331
Constants only ρ^2	0.111	0.112
Number of respondents/observations	768/6,144	768/6,144

Figures in the brackets are standard errors. *, **, ***, denote statistical significance at the 10%, 5% and 1% levels, respectively

IIA/IID condition. It was found that these datasets do not support the test in that a non-positive definite matrix error is returned. To this end, a RPL Model was estimated. It accounts for heterogeneity among individuals, incorporates correlation in the utility between choices and allows for random preference variations between respondents (Birol and Cox, 2007).

Random Parameter Logit (RPL): The RPL Model estimation in this study follows the steps recommended by Hensher *et al*. (2005), with all parameters of attributes except the cost parameter initially considered as random parameters. Then, the model was re-estimated with parameters which had statistically insignificant standard deviations included as non-random parameters. The model was estimated numerous times assuming different distributions and their combinations. The RPL Model was estimated by selecting 1,000 random draws and normal distributions for the random parameters. Results of the RPL Model are presented Table 4.

The RPL Model fits with a McFadden Pseudo-ρ^2 of 0.331. A model with a value of McFadden Pseudo-ρ^2 between 0.2 and 0.4 is considered to have an extremely good fit (Hensher and Johnson, 1981). The negative sign of the ASC which is coded with 0 for the status quo, indicates that there are some local people who prefer to live with the current situation. The statistically significant derived standard deviation for the bird attribute indicates that respondents have heterogeneous preferences over this attribute.

Table 5: Estimated implicit price and confidence intervals

Attributes	Baht/annum (at price 2012)
Crop	20.43*** (15.17-25.68)
Fish	0.021*** (0.017-0.028)
Healthy aquatic plants	1.61***(1.07-2.14)
Bird	0.77***(0.44-1.06)
Temples	145.56***(102.15-189.59)
Time delay	-69.59*** (-94.96 to -44.23)

Figures in brackets are 95% confidence intervals, calculated using the Krinsky and Robb (1986) bootstrapping procedure. *, **, ***, denote statistically significant at the 10%, 5% and 1% levels, respectively, US$1~31 Baht

In line with both MNL and RPL Models, all attribute parameters are highly statistically significant. This implies that respondents prefer more cropping area, greater fish catch, higher density of healthy aquatic plants, more bird species, more temples restored, lower cost and a shorter waiting time associated with wetland ecosystem restoration to commence. The respondents who have higher income, don't have a bachelor degree and have lived a longer time in Bung Khong Long community were more likely to select "wetland ecosystem restoration options moving away from the status quo". Also, respondents who have "concern about degradation in water quality" more frequently chose an alternative to change over the current situation. Older male respondents with less education were more concerned about the payment to a donation fund. Respondents who have "concern about depletion in fish stock" were likely to prefer the options with more fish catch. Villagers who have "concern about encroaching wetlands" were not likely to prefer the options with increasing areas of paddy rice cultivation during the dry season.

To compare model superiority between the MNL and RPL Models, a Swait-Louviere log-likelihood ratio test was carried out following Rolfe *et al.* (2000) for the test of the significance of log likelihood values and pseudo R^2 change. The Log-Likelihood (LL) decreases from -4515 in the MNL Model (LL_1) to -4513 in the RPL Model (LL_2). The calculated statistics $\chi^2 = -2\ (LL_1\text{-}LL_2) = 4$ was greater than a statistic χ^2 of 3.84 at one degree of freedom which is the difference in the number of parameters estimated in the two models. This indicates that the RPL Model provides a significant improvement in model fit over the MNL Model. Hence, this model was used for further analysis and discussion.

Estimation of Willingness to Pay (WTP): Implicit prices from a public policy perspective, estimates of the marginal value of wetland conservation are necessary in order to design policies that result in optimal levels of conservation and development. The marginal value for each wetland ecosystem restoration attribute can be calculated from the ratio of the coefficients between the attributes of interest and the cost attribute. Confidence intervals for each wetland ecosystem restoration attribute were estimated using parametric bootstrapping from the unconditional parameters estimates using 1,000 replications (Krinsky and Robb, 1991). The implicit prices and confidence intervals are presented in Table 5.

Ceteris paribus, respondents would be willing to pay about 20.43 Baht (US$0.66) per annum for a one per cent increase in cropping area; 0.02 Baht (US$0.001) per annum for a one kilogram increase in fish catch; 1.61 Baht (US$ 0.05) per annum for one kg/rai additional density of healthy aquatic plants, 0.77 Baht (US$0.02) per annum for an extra bird species and 145 Baht (US$4.68) per annum for an additional restored temple. However, households derived negative value from waiting 1 year for ecosystem improvement to commence.

Following Morrison *et al.* (1999) and Birol and Cox (2007), marginal rates of substitution can be used to calculate the relative importance respondents place on each of the wetland ecosystem restoration attributes. For instance, the local population would make the following trade-offs between the nonmonetary outcomes: increasing in 1 temple restored = 7.2% of extra cropping area = 6,931 kg of extra fish catch = 91 kg rai^{-1} of extra density of healthy aquatic plants = 189 of extra bird species.

Compensating Surplus (CS): In order to estimate the respondents' Compensating Surplus (CS) for improvements in the wetland ecosystem program, we considered two scenarios over the status quo.

Table 6: CS for wetland ecosystem restoration program

Policy/scenario	Baht/annum/household (at price 2012)
The high ecosystem improvement policy/scenario 1	1,731*** (1,297-2,164)
The low ecosystem improvement policy/scenario 2	882*** (584-1,180)

Figures in brackets are 95% confidence intervals, calculated using Krinsky and Robb (1986) bootstrapping procedure. *** denotes statistically significant at the 1% level, US$1~31 Baht

Status quo scenario: 136 bird species, 310 kg rai^{-1} of healthy aquatic plants, 0% increase of cropping area, 80,000 kg of fish catch and no temples restored.

At the current situation land surrounding the lake is mostly used for rubber plantations which intensively use chemical fertilizers and pesticides. This allows agricultural chemical pollutants to easily run off into the water body. Reservoir resource uses involve extensive fishing and harvesting of aquatic plants. Moreover, the lake is disturbed and threatened by various factors such as waste water from household activities, illegal bird hunting and fishing and community expansion. These have led to degradation in the water quality, reduced fish stocks, declines in biodiversity and negative impacts on households and overall quality of life.

Hypothetical mechanisms for improving wetland ecosystem services including enriching the quality of life of the local people are: treating of sewage to a high standard, building a new drainage system, establishing a center for promoting multi-storey rubber plantations, monitoring for control of illegal bird hunting and fishing, developing systems to control wetland encroachment and restoring the temples in the community. Two possible ecosystem improvement options, Scenario 1 and 2 are outlined below.

- Scenario 1; high ecosystem improvement policy: 300 bird species, 450 kg/rai of healthy aquatic plants, 15% increase of cropping area, 100,000 kg of fish catch, 2 temples restored and 1 year-delay
- Scenario 2; low ecosystem improvement policy: 200 bird species, 375 kg rai^{-1} of healthy aquatic plants, 5% increase of cropping area, 90,000 kg of fish catch, 1 temple restored and 5 year-delay

CS for changes in wetland ecosystem improvement attributes from the RPL Model can be calculated by using the following formula (Hanemann, 1984):

$$\text{CS or mean WTP} = \frac{1}{\beta_c}(V_1 - V_0) \quad (7)$$

Where:

CS = The compensating surplus
V^1 = The utility of the change scenario

V^0 = The utility from the status-quo
β_c = The coefficient of the annual donation fund (cost)

The CS, reported in Table 6 and associated with differences between the welfare measures under the status quo and the two scenarios measure the WTP of respondents for an improvement of wetland ecosystem services relative to the current situation. The results revealed that, on average, local people were willing to contribute 1,731 Baht (US$56) per household per annum (~12% of household annual income) to a trust fund for the high ecosystem improvement policy of BKL. The mean WTP of respondents for the low ecosystem improvement policy of BKL was 882 baht (US$28) per household per annum (~6% of household annual income).

The local population in the Bung Khong Long community is willing to support a wetland ecosystem improvement program. They see significant economic benefit involved with wetland ecosystem services which increase; the rice cultivation area surrounding the lake during the dry season, the quantity of fish catch, the density of healthy aquatic plants, the number of bird species and the number of temples restored in communities. However, caution is needed in the decision-making processes involving sensitive environments faced with competing uses and the trade-off between wetland conservation and economic development. In particular, local people need more areas for paddy rice cultivation during the dry season. Hence, policy change could lead to conflict in water use in this community.

Other factors influencing WTP include income, education and years of living in the Bung Khong Long community. Among these factors, only the variable 'education' was found to have a different result from that in previous CE studies. In this study, less educated respondents have a higher WTP than more educated respondents. In contrast, Morrison *et al.* (1999), Carlsson ***et al.*** (2003), Othman ***et al.*** (2004), Birol ***et al.*** (2006), Birol and Cox (2007), Do and Bennett (2009) and Khai and Yabe (2014), reported that higher educated respondents had higher WTP for wetland improvement. This might be because of cultural and context differences. One possible explanation is that less educated villagers' livelihood may depend directly on the provision of wetland ecosystem services, thus, they observe changes of the natural resource stock and environmental quality more than educated villagers who have returned to the community after previously moving to another province for studying university degree and/or getting a better job. This supports the argument of Franco and Luiselli (2014) regarding the importance of shared ecological knowledge.

Similar to previous findings by Morrison *et al.* (1999), Carlsson ***et al.*** (2003), Othman ***et al.*** (2004), Birol ***et al.*** (2006), Birol and Cox (2007), Do and Bennett (2009), Kragt and Bennett (2009) and Khai and Yabe (2014), wealthier respondents more frequently chose a wetland ecosystem improvement plan over the status quo option than poorer respondents. Respondents who have lived in Bung Khong Long community for longer were more likely to support a wetland ecosystem improvement plan. It is possible that respondents, who have lived in the Bung Khong Long community longer have witnessed the decline in the environment and natural resources and therefore they would prefer to restore the ecological conditions of BKL.

Respondents who have "concern about degradation in water quality" are more likely to support a wetland ecosystem improvement plan. Possible explanations for this result might be that changes in water quality directly and indirectly affects the lives of local people. Respondents who have "concern about depletion in fish stock" show their preference for more fish catch. This is possibly explained by the fact that less fish population might affect their livelihood and household economy. Respondents who have "concern about encroaching wetlands" show their preference for less areas of paddy rice cultivation during the dry season. This indicates that some of the local population would prefer to conserve the wetland, instead of the wetland being used for cropping. Hence, caution is needed in the policy-making processes involving sensitive conflicting interests in ecosystem use among different stakeholders.

The main purpose of non-market valuation is to estimate social benefits. This can be derived by aggregating households' WTP. The social benefits of the wetland ecosystem restoration were calculated using the following equation:

$$\text{Aggregate}\,WTP = \sum WTP \times H \times R \qquad (8)$$

Where:

Aggregate WTP = Total social benefits
WTP = The mean household WTP
H = Households in the Bung Khong Long community
R = The proportion of respondents willing to pay

The estimated WTP for the Bung Khong Long community was 5,707,159 Baht (US$184,102) per annum for the high ecosystem improvement policy and 2,907,980 Baht (US$93,806) per annum for the low ecosystem improvement policy presented in Table 7.

Table 7: Aggregate WTP for wetland ecosystem restoration program (at price 2012)

Policies	Mean WTP (Baht/annum/ household)	No. of households	Proportion of WTP	Aggregate WTP (Baht/annum)
The high ecosystem improvement policy	1,731 (1,297 to 2,164)	3,399	0.97	5,707,159 (4,276,248-7,134,773)
The low ecosystem improvement policy	882 (684-1,180)	3,399	0.97	2,907,980 (1,925,466-3,890,495)

US$1~31 Baht

Although, most of the local population in the Bung Khong Long community supports the proposed wetland ecosystem restoration plan, at first blush, the total social benefits may appear to be lower than the total cost of the proposed project. However as already noted, the social benefits are likely to be lower bound estimates. First, total benefits from the ecosystem restoration plan are likely to be greater than only those accruing to respondent in the Bung Khong Long Area. Second, there are other ecosystem services that flow from BKL, e.g., carbon sequestration, water supply, raw materials, flood control and recreation. Including these values into the calculus may result in the total benefits being greater than those identified in this study.

CONCLUSION

This study contributes to the limited literature on the estimation of economic values of wetlands. By using a choice experiment it provides the opportunity to elicit a wide set of values for ecological, socioeconomic and cultural wetland characteristics. The results indicate that the local people in the Bung Khong Long community are willing to support a wetland ecosystem improvement program. Socioeconomic and attitudinal characteristics are important factors influencing WTP suggesting that the attitudinal characteristics of respondents are important in the effectiveness of environmental conservation efforts for this community.

The most important attributes for the community are temples restored, followed by cropping area, aquatic plants, bird species and fish catch. This suggests that Buddhist beliefs and local culture may be key factors in supporting wetland restoration and management efforts and the development of a land-use management strategy that focuses on increasing the land area devoted paddy rice cultivation during the dry season and improving the water quality of lake, conserving biodiversity and increasing the fish population. However, caution is needed as the decision-making processes involve sensitive environments and a complex socioeconomic situation of competing uses and conflicts among different stakeholders. The decision-making processes should consider the marginal rates of substitution of each of the wetland ecosystem restoration attributes to design policies that result in optimal levels of wetland conservation and utilization. Due to the complex ecosystems of the wetland, changes in agricultural production systems and the pressure of human activities, it is necessary to integrate natural and social science approaches for wetland management. Therefore, in BKL context, policy-makers could harness Buddhist beliefs and local culture for water resource conservation together with ecology, biology, agriculture and environmental sciences for maintaining balanced wetland ecosystems.

LIMITATIONS

However, this CE study has some limitations. Due to the complexity in questionnaire design and using face-face-interviews, respondents had to maintain eye contact with the interviewers while explaining the choice sets. It was possible that respondents might feel pressure to complete the questionnaire. This might lead to respondents rushing to complete the choices without considering what the best alternative is for them. In this case, 87 respondents always chose the alternative with the highest level of one attribute based on their self-interest and 62 respondents chose always selected the alternative with the 500 baht payment. Although, these genuine lexicographic preferences in a choice are not a problem, they provide little information in the analysis (Alpizar *et al*., 2001). Nevertheless, caution is suggested in employing complex choice tasks for further research in choice experiment design.

REFERENCES

Adamowicz, W., J., Louviere and J. Swait, 1998. Introduction to Attribute-Based Stated Choice Methods. In DAC final report to resource valuation branch, NOAA, US Department of Commerce. And January Alberta Eds.

Alpizar, F., F. Carlsson and P. Martinsson, 2001. Using choice experiments for nonmarket valuation. Economic Issues, 8 (1): 83-109.

Barbier , E., M. Acreman and D. Knowler, 1997. Economic valuation of wetlands: a guide for policy makers and planners: Ramsar Convention Bureau.

Bassi, N., M.D. Kumar, A. Sharma and P. Pardha-Saradhi, 2014. Status of wetlands in India: A review of extent, ecosystem benefits, threats and management strategies. Journal of Hydrology: Regional Studies, 2: 1-19. DOI: http://dx.doi.org/10.1016/j.ejrh.2014.07.001.

Ben-Akiva, M.E. and S.R. Lerman, 1985. Discrete Choice Analysis: Theory and Application to Travel Demand: MIT Press.

Bennett, J. and E. Birol, 2010. Choice Experiments in Developing Countries: Implementation, Challenges and Policy Implications. Cheltenham: Edward Elgar Publishing.

Birol, E., and V. Cox, 2007. Using choice experiments to design wetland management programmes: The case of Severn Estuary Wetland, UK. J. Environ. Planning Manage., 50 (3): 363-380. DOI: 10.1080/0964056070126 1661.

Birol, E., K. Karousakis, and P. Koundouri, 2006. Using a choice experiment to account for preference heterogeneity in wetland attributes: The case of Cheimaditida wetland in Greece. Ecological Economics, 60 (1): 145-156. DOI: http://dx.doi.org/10. 1016/j.ecolecon.2006.06.002.

Carlsson, F., P. Frykblom and C. Liljenstolpe, 2003. Valuing wetland attributes: An application of choice experiments. Ecological Economics, 47 (1): 95-103. DOI: http://dx.doi.org/10.1016/j.ecolecon.2002.09.003

Carlsson, F., M. Kataria and E. Lampi, 2010. Dealing with Ignored Attributes in Choice Experiments on Valuation of Sweden's Environmental Quality Objectives. Environmental and Resource Economics, 47 (1): 65-89. DOI: 10.1007/s10640-010-9365-6.

Carson, R. and T. Groves, 2007. Incentive and informational properties of preference questions. Environmental and Resource Economics, 37 (1): 181-210. DOI: 10.1007/s10640-007-9124-5.

Cerda, C., 2013. Valuing biodiversity attributes and water supply using choice experiments: A case study of La Campana Penuelas Biosphere Reserve, Chile. Environ Monit Assess, 185 (1): 253-266. DOI: 10.1007/s10661-012-2549-5.

Christiernsson, A., 2003. An Economic Valuation of the coral Reefs at Phi Phi Island, Thailand. Master degree Lulea University of Technology, Lulea, Sweden.

Cronk, J.K. and S. Fennessy, 2001. Wetland Plants: Biology and Ecology: Taylor and Francis.

Do, T.N. and J. Bennett, 2009. Estimating wetland biodiversity values: A choice modelling application in Vietnam's Mekong River Delta. Environment and Development Economics, 14 (2): 163-186. DOI: 10. 1017/S1355770X08004841.

Edward, B. Barbier, 2007. Valuing ecosystem services as productive inputs. Economic Policy, 22 (49): 177-229. DOI: 10.1111/j.1468-0327.2007.00174.x.

Franco, D. and L. Luiselli, 2014. Shared ecological knowledge and wetland values: A case study. Land Use Policy, 41: 526-532. DOI: http://dx.doi.org/10. 1016/j.landusepol.2014.04.007.

Garcia-Llorente, M., B. Martin-Lopez, P.A.L.D. Nunes, A.J. Castro and C. Montes, 2012. A choice experiment study for land-use scenarios in semi-arid watershed environments. J. Arid Environ., 87: 219-230. DOI: ttp://dx.doi.org/10.1016/j.jaridenv.2012.07.015.

Ghermandi, A., J. Bergh, L. Brander, H.D. Groot and P. Nunes, 2009. The Values of Natural and Constructed Wetlands: A Meta-Analysis (Vol. TI 2009-080/3, pp: 24). Amsterdam, Netherlands: Tinbergen Institute Amsterdam.

Grosjean, P. and A. Kontoleon, 2009. How Sustainable are Sustainable Development Programs? The Case of the Sloping Land Conversion Program in China. World Development, 37 (1): 268-285. DOI: http://dx.doi.org/ 10.1016/j.worlddev.2008.05.003.

Hanemann, W.M., 1984. Welfare Evaluations in Contingent Valuation Experiments with Discrete Responses. Am. J. Agric. Economics, 66 (33): 332-341.

Hanley, N., S. Mourato and Wright, 2001. Choice Modelling Approaches: A Superior Alternative for Environmental Valuatioin? J. Economic Surveys, 15 (3): 435-462. DOI: 10.1111/1467-6419.00145.

Hensher, D.A. and L.W. Johnson, 1981. Applied Discrete-choice Modelling: Croom Helm.

Hensher, D.A., J.M. Rose and W.H. Greene, 2005. Applied Choice Analysis: A Primer: Cambridge University Press.

Hoyos, D., 2010. The state of the art of environmental valuation with discrete choice experiments. Ecological Economics, 69 (8): 1595-1603. DOI: http://dx.doi.org/ 10.1016/j.ecolecon.2010.04.011.

Ivehammar, P., 2009. The payment vehicle used in CV studies of envirenmental goods does matter. J. Agric. Resource Economics, 34 (3): 450-463.

Khai, H. and M. Yabe, 2014. Choice modeling: assessing the non-market environmental values of the biodiversity conservation of swamp forest in Vietnam. Intl. J. Energy Environ. Eng., 5 (1): 1-8. DOI: 10.1007/s40095-014-0077-5.

Kragt, M.E. and J. Bennett, 2009. Using Choice Experiments to value River and Estuary Health in Tasmania with Individual Preference Heterogeneity (Vol. Research Report No. 16). Canberra: Australian National University.

Krinsky, I. and A.L. Robb, 1991. Three methods for calculating the statistical properties of elasticities: A comparison. Empirical Economics, 16 (2): 199-209. DOI: 10.1007/bf01193491.

Lancaste, K.J., 1966. A New Approach to Consumer Theory. [Article]. J. Political Economy, 74 (2): 132-157.

Lee, B.J., A. Fujiwara, J. Zhang and Y. Sugie, 2003. Analysis of Mode Choice Behaviours based on Latent Class Models. Paper presented at the International Conference on Travel Behaviour Research Lucerne.

McFadden, D.L., 1974. Conditional Logit Analysis of Qualitative Choice Behavior. New York: Academic Press.

Morrison, M., J. Bennett, and R. Blamey, 1999. Valuing improved wetland quality using choice modeling. Water Resources Res., 35 (9): 2805-2814. DOI: 10. 1029/1999wr900020.

Othman, J., J. Bennett and R. Blamey, 2004. Environmental values and resource management options: a choice modelling experience in Malaysia. Environment and Development Economics, 9 (6): 803-824. DOI: 10. 1017/S1355770X04001718.

Ramsar, 2001. Information Sheet on Ramsar Wetlands (RIS) Bung Khong Long. Bangkok: Ramsar, pp: 1-5.

Rolfe, J., J. Bennett and J. Louviere, 2000. Choice modelling and its potential application to tropical rainforest preservation. Ecological Economics, 35(2): 289-302. DOI: http://dx.doi.org/10.1016/S0921-8009(00)00201-9.

Rose, J.M., M.C.J. Bliemer, D.A. Hensher and A.T. Collins, 2008. Designing efficient stated choice experiments in the presence of reference alternatives. Transportation Research Part B: Methodological, 42 (4): 395-406. DOI: http://dx.doi.org/10.1016/j.trb. 2007.09.002.

Sathirathai, S., 1998. Economic valuation of Mangroves and the role of Local Communities in the in the Conservation of Natural Resource: Case Study of Surat Thaini, South of Thailand Bangkok: EEPSEA.

Sathirathai, S. and E.B. Barbier, 2001. Valuing Mangrove Conservation in Southern Thailand. Contemporary Economic Policy, 19 (2): 109-122. DOI: 10.1111/j.1465-7287.2001.tb00054.x.

Seenprachawong, U., 2001. An Economic Analysis of Coral Reefs in The Andaman Sea of Thailand. Nonthaburi, Thailand: EEPSEA, pp: 1-50.

Seenprachawong, U., 2002. An Economic Valuation of Coastal Ecosystems in Phang Nga Bay, Thailand. Nonthabur: EEPSEA, pp: 1-64.

Suh, J., 2002. Estimation of Non-market Forest Benefits Using Choice Modelling ENVIRONMENT. Brisbane: The University of Queensland.

Suksri, S., S. Pronchareon, C. Thawatphan and S. Sangthongprow, 2005. Ethnobotany in Bung khong Long Non-Huinting Area, Northeast Thailand. Kaketsart J.(Nat. Sci), 1 (39): 519-533.

Tallis, H. and S. Polasky, 2009. Mapping and Valuing Ecosystem Services as an Approach for Conservation and Natural-Resource Management. Annals of the New York Academy of Sciences, 1162 (1): 265-283. DOI: 10.1111/j.1749-6632.2009. 04152.x.

Tapsuwan, S., 2006. Valuing the Willingness to Pay for Environmental Conservation and Management:A Case Study of Scuba Diving Levies in Mu Koh Similan Marine National Park, Thailand. Ph.d thesis, The University of Queensland Brisbane, Australia.

Turner, R.K., J.C.J.M. van den Bergh, T. Soderqvist, A. Barendregt, J. van der Straaten, E. Maltby and E.C. van Ierland, 2000. Ecological-economic analysis of wetlands: scientific integration for management and policy. Ecological Economics, 35 (1): 7-23. DOI: http://dx.doi.org/10.1016/S0921-8009(00)00164-6.

Wiwatthanapornchai, S., P. Chucheep and S. Boonyawat, 2014. The Economic Value of Laem Phak Bia Mangrove Ecosystem Services in Phetchaburi Province, Thailand. Modern Applied Science, 8 (9): 36-44. DOI: 10.5539/mas.v8n5p3.

WWF Greater Mekong Thailand Country Programme, 2006. Collaborative research of Socio-Econ Land and Natural Resource Utilization around Goot Ting and Bueng Khong Long. Bungkarn, Thailand: WWF Greater Mekong Thailand Country Programme, pp: 1-36.

Yang, C.W., 2005. Modeling Multiple Sources of Heterogeneity in Mode Choice Model Journal of the Eastern Asia Society for Transportation Studies, 6: 2031-2045.

Zhao, B., B. Li, Y. Zhong, N. Nakagoshi and J.K. Chen, 2005. Estimation of ecological service values of wetlands in Shanghai, China. Chinese Geographical Science, 15 (2): 151-156. DOI: 10.1007/s11769-005-0008-8.