ความเต็มใจจ่ายระบบแจ้งเตือนน้ำท่วมของแม่น้ำโขงที่ถูกกระทบจากโครงการผลิตไฟฟ้าพลังงานน้ำ

Willingness to pay for the Mekong River's Flooding Alert System Affecting by Hydroelectricity Generator Project

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บทคัดย่อ

การศึกษาวิจัยนี้มีจุดมุ่งหมายในการสร้างแผนการปรับตัวสำหรับลดความเสียหายที่เกิดจากโครงการผลิตไฟฟ้าพลังงานน้ำ วัตถุประสงค์ในการศึกษาคือการวิเคราะห์ความเต็มใจจ่ายสำหรับระบบแจ้งเตือนน้ำท่วมของแม่น้ำโขง (The Mekong River's Flooding Alert System (MRFAS)) เนื่องมาจากโครงการไฟฟ้าพลังงานน้ำ โดยการเก็บรวมข้อมูลจากกลุ่มตัวอย่างจำนวน 648 คน จาก 32 ตำบลในพื้นที่ 8 จังหวัดที่มีแม่น้ำโขงไหลผ่าน ได้แก่ จังหวัด เชียงราย หนองคาย เลย บึงกาฬ นครพนม มุกดาหาร อุบลราชธานี และอำนาจเจริญ วิเคราะห์ข้อมูลจากแบบสอบถามปลายปิด (single bounded closed- ended CVM question) โดยใช้แบบจำลองแบบนอนพาราเมตริก (Non-Parametric Model) และแบบจำลองการถดถอยโลจิสติก (Logistic Regression Model) ผลการศึกษาพบว่าความเต็มใจจ่ายเฉลี่ยซึ่งวิเคราะห์จากแบบจำลองนอนพาราเมตริกเท่ากับ 219.14 บาทต่อครัวเรือนต่อปี (6.10 เหรียญสหรัฐต่อครัวเรือนต่อปี) ความเต็มจ่ายทั้งหมดเท่ากับ 8,429,230.80 บาทต่อครัวเรือนต่อปี (234,539.46 เหรียญสหรัฐต่อครัวเรือนต่อปี) อาชีพ (Beta = -0.884, sig = 0.001) และ ระยะห่างจากบ้านถึงแม่น้ำโขง (Beta = -0.329, sig = 0.003) เป็นตัวแปรที่มีความสัมพันธ์เชิงลบกับความเต็มใจจ่าย

ABSTRACT

This research focused on mitigation plan to reduce damage cost from hydroelectricity Generator project. The objective of this study was analysing Willingness to Pay (WTP) for the Mekong River's Flooding Alert System (MRFAS) affecting from hydroelectricity Generator project by elicitation 648 households in 8 provinces located alongside of the river including Chiang Rai, Nong Khai, Loei, Bueng Kan, Nakhon phanom, Mukdahan, Ubon Ratchathani and Amnart Charoen, Thailand. The data was analysed by using single bounded closed- ended CVM question, Non-parametric Model and Logistic Regression Model. The result showed that the WTP by means of the Non-Parametric Model was 219.14 Bath per household per year (6.10 US$/hh/y) and its total value was 8,429,230.80 Bath per year (234,539.46 US$/y). This finding also revealed that the negative correlation of

household's willingness to pay include the occupation (Beta = -0.884, sig = 0.001) and the distance between home to Mekong River (Beta = -0.329, sig = 0.003).

คำสำคัญ: ความเต็มใจจ่าย แม่น้ำโขง ระบบแจ้งเตือนน้ำท่วม

Keywords: Willingness to pay**,** Mekong River, Flooding Alert System

INTRODUCTION

Energy is the important factors supported every life. In early 2016, the major energy resources in Thailand are oil, natural gas, coal and lignite (Department of alternative energy development and efficiency, 2014). Because of population and economic growth, every country including Thailand need more energy (The energy policy and planning office, 2013). Unfortunately, the major energy resources are non-renewable or exhausted resource that cannot increase in short term. From this reason, the best way to solve energy scarcity is finding renewable energy or in-exhausted resource for fossil substitution (Energy policy and planning office, 2015). Many researches try to purpose alternative energy to energy market, for example, biodiesel from agricultural residues (Kun et al., 2016), wind energy (Jiuping et al., 2016), wave energy (Bryson, 2016), solar cell (Cotfas et al., 2016) and methane from animal waste (Peymen et al., 2016). However, there are many optional resources the popular alternative energy resource is hydro power. Hydroelectricity is promoted because a lot of reasons including; 1) hydroelectricity use the energy of running water without reducing its quantity, 2) hydroelectricity make it feasible to utilize other renewable sources such as solar energy or a wind energy, 3) hydroelectricity promote guaranteed energy and price stability, 4) hydroelectricity contributed to the storage of drinking water, 5) hydroelectricity increased the stability and reliability of electricity systems and 6) hydroelectricity mean clean and cheap energy for future (Louis et al., 2014).

However, there are many benefit from hydroelectricity project, there is dramatic environmental impact that effected local people. Flooding due to irregular flow is the major environmental problem (Metteo et al., 2016). In case of Thailand, local people who live in 8 provinces which the Mekong River flow through the city encounter with irregular flooding. The main cause of this situation is hydroelectricity generator which located upper part of the Mekong River released amount of water to mainstream for generating electricity. Unluckily, the hydropower is not located in Thailand the owner country is Laos that located north of Thailand. Because Thailand do not have property right on this project, local people understand this circumstance, they do not need the owner do anything but they need Thai's government support flooding alert system for them.

The flooding alert system is the best mitigation plan for local people to reduce damage cost on their agricultural products and they realize that they have to pay for special expenses to operate this system. Although this system is not market price, it is necessary to evaluate as market price to set standard fees for sustainable operation (Mahan, 1997).

The objective of this research is analyzing Willingness to Pay (WTP) for Mekong River's flooding alert system (MRFAS) affecting from hydroelectricity Generator project by elicitation 800 households in 8 provinces located alongside of the Mekong River including Chiang Rai, Nong Khai, Loei, Bueng Kan, Nakhon phanom, Mukdahan, Ubon Ratchathani and

Amnart Charoen which have the Mekong River flow through the city. The data is analyzed by using single bounded closed- ended CVM question, Non-parametric Model and Logistic Regression Model. The results of this research could be used for decision making of the policy makers to invest Mekong River's flooding alert system that can reduce flooding damage cost and maintain sustainability system.

RESEARCH METHODOLOGY

Study area: The Mekong River

The Mekong River is the important trans-boundary river, it start from China and run through Myanmar, Vietnam, Laos, Thailand and Cambodia, respectively. Because the Mekong River is the international river, there are about 12 hydropower projects reached the Mekong river mainstream that caused uncertainly flow. In Thailand, there are 8 provinces including Chiang Rai, Nong Khai, Loei, Bueng Kan, Nakhon phanom, Mukdahan, Ubon Ratchathani and Amnart Charoen encounter with irregular flooding problem. The study areas were 8 provinces in Northeast of Thailand and its holds about 38,465 households in only 5,031 km^2 of land. The area consists of a plateau with medium fertile land used for agricultural purpose. The major products of these communities are rice, tobacco, chili and lettuce. Because their major occupation is agriculture, water is very important factor for their life. They actually use water from the Mekong River to grow their products and cook their foods. Unfortunately, this area encounter with flood several times due to the fact that the electricity dam locate upper part of Mekong River, outside Thailand, released a lot of water to produce electricity. Flooding destroy agricultural products that they plant and increased their annual expenditure. However, they know that government or other organizations cannot prevent flood for them due to out of control, they need flooding warning system to help them to plan cultivation period and reduce damage cost.

Sampling and data collection

This research used Mitchell and Carson concept (Carson and Hanemann, 1989) to select 800 samples from the total population in 32 villages by purposive sampling. The target group was adults between 18 to 65 years old and each questionnaire was collected on face-to-face basis by trained interviews who described the meaning of each questionnaire and available choices to participants in order to avoid response bias. In order to assess willingness to pay, demographics, socio-economic variables, environmental training experience and contingent valuation were assessed.

The questionnaire had three parts, the first part of the questionnaire contained demographic questions including gender, age, marriage status, education, occupation, distance between home to Mekong River, environmental training experience and environmental organization. The second part was socio-economic status such as monthly household income, monthly household expenditure and family size. The third part contained the contingent valuation survey including Willingness to Pay (WTP) and the amount of the payment.

Statistical Analysis

This study used descriptive analysis such as means and standard deviation to analyze demographics, socio-economic and participant's opinion on the Mekong river flow, Non-parametric Model to calculate Willingness to Pay (WTP) for the Mekong River's flooding alert system and Logistic Regression Model to identify variables affecting the

respondent's decision on Willingness to Pay (WTP) (Pakkantorn, 2005).

Theory

Non-parametric Model

This model was used for calculating Willingness to Pay (WTP) for the Mekong River's flooding alert as follow:

1. The percentage of respondent on start bid in each group.

$$S(Bj) = nj/Nj \quad (1)$$

Where

S(Bj) = The percentage of respondent on start bid in each group

nj = The number of respondent on bidding in each group

Nj = All of respondent in each group

J = respondent group (j=1,...,J)

2. The total willingness to pay of all respondents.

$$\text{WTP total} = \sum_{j=0}^{j}(\boldsymbol{S(Bj) - S(Bj+1) * N * Mj}) \quad (2)$$

Where

WTP total = The total willingness to pay of all respondents

N = The total samples (N = 648).

Mj = Mean of bidding in each group

3. The average willingness to pay

$$\text{Mean WTP} = \text{WTP total} / N \quad (3)$$

Logistic Regression Model

This model was used for identifying variables that affected the respondent's decision on WTP. The positive WTP was the dependent variable and independent variables were gender, age, marriage status, family size, occupation, education, the distance between home to the Mekong River, environmental training experience, environmental organization, monthly household income and monthly household expenditure.

RESULTS

Demographic profile

In this study, 648 (81%) of questionnaires were retrieved during period, The independent variables including gender, age, marriage status, occupation, education, environmental training experience, environmental organization member and income as shown in Table 1

The willingness to pay for the Mekong River's flooding alert system

In the community sample, 648 (81%) of the 800 valid participants reported being willing to pay for the Mekong river's flooding alert system. The percentages of the amount of WTP for 100,200,300, 400 and 500 Baht accounted for 68%, 45%, 29%, 8% and 19%, respectively (Table 2). A little less than a haft of the sample population (21%) expressed their unwillingness to pay because they did not enough money to pay for system. The willingness to pay by means of the Non-Parametric Model was 214.14 Bath per household per year (6.10 Us/hh/y) and its total value was 8,429,230.80 Bath per year (234,539.46 Us/y).

Factors affecting willingness to pay for the Mekong River's flooding alert system.

The estimated Logistic Regression Model for WTP for the Mekong River's flooding alert system was presented in Table 3. Only variables that had a significant impact on WTP at 0.05 levels were included base on systematic search procedure. The model was highly significance base on the Wald chi-square statistic (83.74). This finding also revealed that the negative correlation of household's willingness to pay

include the occupation (Beta = -0.884, sig = 0.001) and the distance between home to Mekong River (Beta = -0.329, sig = 0.003). The Logistic Regress Model for the Willingness to Pay for the Mekong River's flooding alert system as follow:

$$WTP = -0.884\ X_1 - 0.329\ X_2$$

Where

WTP = Willingness to pay of respondent

X_1 = The occupation (1= contractor, 2= farmer, 3= government officer, 4= private employee, 5= retirement, and 6= other)

X_2 = The distance between home to the Mekong River (Km)

Table 1 Descriptions of independent variables.

Variables		Percentage (%)
Gender		
	Male	92.3
	Female	7.7
Marital status		
	Marriage	84.6
	Single	15.4
Occupation		
	Farmer	64.3
	Fisherman	28.6
	Contractor	7.1
Education level		
	Primary school	78.6
	Graduate school	12.4
Environmental relevance		
	Environmental training experience	66.6
	environmental organization	20.4

Table 2 Descriptions of dependent variables.

Respondent Group (j)	Number (Nj)	Bidding (bid)	Yes (nj)	Percent in group (nj/Nj)	WTP in group (Baht/year/hh)
0	0	0	0	1	10,184.21
1	133	100	91	0.68	22,697.37
2	129	200	58	0.45	26,060.00
3	125	300	36	0.29	47,240.41
4	127	400	10	0.008	- 32,536.89
5	131	500	25	0.19	67,700.38
Total	645				141,345.48
				Mean	219.14
				Total	8,429,230.80 (Baht/year)

DISCUSSION

The willingness to pay for the Mekong River's Flooding Alert System of this research was 219.14 Bath per household per year. This value was lower than the willingness to pay for preventive flood system of Changkhlan sub-district, Mueang District, Chiang Mai province, Thailand (Puttipiriya, 2009). Estimated mean of WTP to prevent flooding was 410.54 baht per household per year. However both research used same technique and sample size to reduce flooding problem, the willingness to pay was pretty different because of community characteristic. Changkhlan sub-district Mueang District, Chiang Mai province was urban area and people who lived in this area had high income and education level. Urban community was higher willingness to pay than Mekong river communities who was agricultural occupation (Hoka, 2017). This research showed that the occupation and the distance between homes to Mekong River were the important factors determining WTP because the major occupation of this research was farmer and fisher who very concerned about water level affecting their live (Arega and Tewodros, 2017). Moreover, this finding could be meant that flooding alert system could be purpose as mitigation plan for promoting alternative energy resource from hydropower.

CONCLUSION

The energy from hydroelectricity generator was popular alternative energy resource in the other hand it could be point source of flooding problem that effecting quality of life. Flooding alert system was the best way to protect damage cost o of the local people. However flooding alert system was importance, this system was non-market service that nobody known the real price. This research used Willingness to pay to indicate the real price of flooding alert system. The objective of this study was to analyze WTP for the Mekong River's flooding alert system fees by elicitation 800 household in 8 provinces. The result showed that the willingness to pay by means of the Non-Parametric Model was 219.14 Bath per household per year (6.10 US$/hh/y) and its total value was 8,429,230.80 Bath per year (234,539.46 US$/y). This finding also revealed that the negative correlation of household's willingness to pay include the occupation (Beta = -0.884, sig = 0.001) and the distance between home to Mekong River (Beta = -0.329, sig = 0.003).

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