www.komyra.com

2022 02

Volume 9 No 1

ISSN 2383-6563 (Online)

The Myanmar JOURNAL

Co-published with Yangon University of Economics (YUE) and
Korea Myanmar Research Association (KOMYRA)

Letter from the Editor-in-Chief

Myanmar and Korea have many similarities and are complementary relationship. Therefore, we believe that research exchange will expand mutual understanding between Myanmar and Korea, and will be the cornerstone for mutual development.

KOMYRA and YUE have co-published The Myanmar Journal since August 2014. So far, many scholars have published numerous papers through the journal, and We are sure that this journal has helped many people understand Myanmar and Korea more clearly and closely.

The Myanmar Journal covers various issues in Myanmar and Korea. It covers various topics that can promote bilateral development and mutual understanding, not limited to specific topics such as economy, industry, society, education, welfare, culture, energy, engineering, healthcare, and agriculture.

We hope that this journal will continue to promote understanding of the current status and potential capabilities of Myanmar and South Korea and promote in-depth international exchange and cooperation.

We would like to express our deepest gratitude to the editorial board and YUE and KOMYRA for their valuable support in The Myanmar Journal publication.

February 28, 2022

Youngjun Choi *yj choi*

Editor-in-Chief of THE MYANMAR JOURNAL
Vice-President of KOMYRA
Email: yjchoi@khu.ac.kr
Office: +82-2-961-0485
Web address: komyra.com/doc/scope.php

EDITORIAL BOARD

INFORMATION ABOUT
The Myanmar Journal

The Myanmar Journal (ISSN 2383-6563) is the official international journal co-published by Yangon University of Economics (YUE) and Korea Myanmar Research Institute (KOMYRA).

This journal aims to promote the mutual cooperation and development of Myanmar and Korea through intensive researches in the entire filed of society, economy, culture, and industry.

It will cover all general academic and industrial issues, and share ideas, problems and solution for development of Myanmar.

Articles for publication will be on-line released twice a year at the end of February and August every year on the Myanmar Journal webpage (http://www.komyra.com/bbs/board.php?bo_table=articles).

An Analysis of Willingness to Pay for Water Quality Conservation in the Taung Thaman Lake

Yin Myo Oo*
Yangon University of Economics

ABSTRACT : Lakes involve an important one of the ecosystems, but are under threat in developing countries due to the increasing encroachment of humans &businesses. The aim of this study investigates the willingness to pay local people for water quality conservation activities and the factors influencing it in Taung Thaman Lake. A sample of 700 households from ten villages was surveyed from the 7 miles distance from the lake by using the sample random sampling method. The binary regression analysis result shows that households' mean willingness to pay for water quality conservation is 1,128 kyats/month/households and aggregate willingness to pay for the water quality conservation of the villagers of the Lake is 34.41 million kyats/year/ households in 2018-2019. The binary regression analysis results indicate that age, marital status, education level, occupation, monthly income, and attitudes in conservation activities positively affected villagers' willingness to pay and the bid amount has a negative effect on willingness to pay among villagers. This study suggests that the regional government and the environmental groups should intensify their activity about the ecological value, awareness, increase investment in education, income, employment opportunities, and establish a variety of ecological compensation payment vehicles, in order to conserve and improve the ecological environment of the Taung Thaman Lake.

Key words *: willingness to pay, mean willingness to pay, aggregate willingness to pay, water quality conservation*

I. Introduction

A lake is one of the ecosystems that supply numerous varieties of ecosystem

* Professor, Department of Economics, Yangon University of Economics

services. Lakes are among the world's most productive natural ecosystems that provide a wide range of benefits to local communities, as well as to global communities Lakes are naturally recognized as an important source of water for fishing, leisure, water transport, tourism, and the conservation of biodiversity and the preservation of the natural balance of resources (Ministry of the Environment, 1996).

Nowadays, the lakes are also known for significant conservation of ecological and biological diversity. But there are several factors that are threatening the worldwide survival of lakes. Climate change, water level rise, soil erosion, and drought constitute many of these natural causes. Man-made causes include resource over-use, rapid urbanization, and industrialization, the rapid growth of infrastructure, intensive agriculture, intensive mining, timber extraction, etc. A generally held belief is that the livelihoods of indigenous people living near the lakes are heavily dependent on their wealth. The risks of the latter causes are much more serious among natural and human causes and have an impact on water and various environmental resources. Therefore, its management is intended both for the sustainability of natural resources and for the support of livelihoods.

The Taung Thaman Lake is a freshwater lake situated in Amarapura Township in the Mandalay region. The lake creates as many things as fishing, planting of crops, and other ecosystem services. Over the past few years, due to nature and many human factors, Taung Thaman Lake has degraded. Climate change, drought, and floods, which also influence the water level of the lake, can be natural causes. In

addition, the over-fishing of tilapia in the lake and the storage of water have had a major effect on the migration of winter birds and the high pressure on the farming sector. The most extreme negative externality of production (water pollution) is the consequence of the expansion of industrial estates along the Panyandaw Creek near the industrial sector. Without any treatment, this industrial zone disposes of polluted wastewater into the lake. Much of the wastewater comes from the textile industry, which uses ammonium peroxide for the manufacture of textiles, and one-tenth of the area in the lake is filled with industrial rice ashes that have a negative impact on the lake. The drainage of wastewater from the construction area along the irrigation canal at Sedawgyi Dam, which is widely used for business and residential construction, has exacerbated this. Many die-offs occurred in the lake in 2014 and 2015 as a result of wastewater.

The Taung Thaman Lake is currently undervalued and threatened by man-made causes such as visitor development, the increased establishment of various kinds of businesses (food stalls, souvenir shops, street stalls) surrounding the lake, and the landfill causes larger amounts of waste to be disposed of into the lake in some part of the lake. As a result, Lake Ecosystem is being unsustainably damaged due to population growth and economic development. Taung Thaman Lake, as in other

developing countries, is experiencing depletion as a result of a wide range of human and environmental threats. All these variables reduce the habits and capacity of the lake and reduce the quality of the lake and cause negative effects. Moreover, not only for the livelihoods of people living in the area but also for the tourism industry and biodiversity, the negative environmental impact on the Taung Thaman Lake is significant. If it is not possible to minimize all these negative effects in time, adverse results can occur in the area. As a result, the monetary values of willingness to pay for the regulating services provided by the lake have been estimated and the contribution to the local people assessed is necessary to be done. Therefore, the objective of this study is to estimate the willingness to pay villagers for the conservation of water quality and factors influencing their WTP for the conservation of the Lake.

II. Research Area

A major attraction for both local tourists and foreigners in Amarapura Township is the Taung Thaman Lake and U Bein Bridge. A large body of freshwater bordering the western side of the city of Amarapura is the Taung Thaman Lake. The 12-kilometer-wide lake with a length of around 1200 meters is one of the most famous landmarks of the city; especially the most beautiful scene is the sunset view. It is used by local people as an important passageway and has also become one of the most popular tourist attractions and most photographed features in the area. Not only is Taung Thaman Lake renowned for its structure, but also for being a vital part of the city. It can provide its profits to local farmers, suppliers, and other tourism-based businesses for a living.

The Amarapura Township is located in N 21˚ 54' and 22˚ 46' and E96˚ and 96˚3'. It has an area of 51268 acres in total. The range is 14 miles from east to west and 5.71 miles from north to south. The township is surrounded by Tadaoo townships and the Dotehta Wady River in the west, Chanmyathazi Township in the north, Pathein Gyi and Pyigyidagon townships in the east, Sint Kaing Township, and the ancient capital of Inwa in the south. Amarapura became a township of Mandalay City due to urbanization in the past century. The Amarapura Township is composed of both urban and rural areas.

An urban area includes two towns, Amarapura and Myintnge including nine wards. Within the rural area of Amarapura, there are forty-two village tracts and one hundred and seventy villages. Among them, 10 villages were randomly selected 10%

of villages from 100 villages which are the sampling frame of 7 miles distance

from the Taung Thaman Lake. Ten villages are Oh Bo, Semihtun, Htantaw, Taungthaman, U Yin Taw, Shan Ka Lay Kyun, Tat Gyi, Hpa Ye Kyun, Souk Taw Wa, and Ba Naw. Among these villages, four villages (Oh Bo, Semihtun, Htantaw, Taungthaman) are located a 1furlong distance from the Lake. The other six villages (U Yin Taw, Shan Ka Lay Kyun, Tat Gyi, Hpa Ye Kyun, Souk Taw Wa, and Ba Naw) are located within 7 miles of the Taung Thaman Lake. Therefore, this study focuses on the non-market approach to estimate the value of water quality conservation of ten villages on the Taung Thaman Lake in terms of regulating services. The study period was between 2018 and 2019.

III. Method of the Study

1. Data Sources

The primary and secondary data were based on this analysis. In this analysis, the two-stage sampling design was performed for the primary data, and both stages also used simple random sampling without substitution (SRSWOR). Villages were treated as first-stage units (FSUs) and households were treated as second-stage units in the chosen villages (SSUs). Villages were randomly selected from the sampling frame 7 miles away from Taung Thaman Lake during the first-stage sampling. The sampling frame is a complete list obtained from Amarapura Township's General Administration Department. The SRSWOR method was used in the first-stage sampling to choose 10 percent of villages (10 villages) from 100 villages. In the second stage of sampling, a household listing operation was carried out in the selected villages in order to provide the most up-to-date sampling system for the data collection period for household selection. In the second stage of sampling, the household lists acted as the sampling frame for the collection of households, where households in each selected village were randomly selected. In the second stage, the number of households in the selected villages is 5048 and the number of households selected (sample size) is 784. To compute the final sample size, Cochran's (1977) formula was used. Therefore, the needed sample size is 700 households. Among the 700 households, 71 from Oh Bo, 24 from Semihtun, 113 from Htuntaw, 29 from Taungthaman, 101 from U Yin Taw, 117 from Shan Ka Lay Kyun, 41 from Tat Gyi, 37 from Hpa Ye Kyun, 128 from Souk Taw Wa, and 39 from Ba Naw were asked for the protection of the Taung Thaman Lake.

Secondary data were collected from the General Administrative Department, Ward and Village Tract Administration Office, Department of Agricultural Land Management,

and Statistics. The empirical method was used in calculating the willingness to pay approach. The questionnaire data mainly involve a survey questionnaire to assess the socioeconomic, economic, and environmental characteristics of the household, a process by which the survey produces the expectations of the respondent with regard to the good and a follow-up question. In the face-to-face interview, a questionnaire was managed. In this analysis, the villagers around the lake only take into account their knowledge, attitudes, and ability to pay for conservation.

2. Contingent Valuation Method (CVM)

The Contingent Valuation Method (CVM) is a method of estimating the economic value of non-market commodities based on surveys. It creates a hypothetical market in which respondents are asked to express monetary bids for different items based on the information provided to them. The fundamental assumption is that people can convert a wide variety of environmental requirements into a single numerical amount that reflects the overall value of a given resource to them, and the more they value it, the more they are willing to pay for it. Consequently, contingent valuation can potentially calculate both the usage and non-use values of an environmental resource (White & Lovett 1999.) Also, state that CVM's usage depends on the assumption that hypothetical consumer responses represent the choices and values that would be disclosed if an actual market existed. CVM has provided the opportunity for both usage and non-use values to be estimated. This means that all the components together or in other words, the combination of components of the total economic value (TEV) can be determined using CVM (Carson, et al. 1992). As the purpose is to estimate non-market benefits, the CVM is the technique of choice and is used for this study as a package for non-market components of TEV.

A structured and commonly used survey tool for estimating WTP or Willingness to Accept (WTA) resource compensation is the Contingent Valuation (Loomis, 1996). In a contingent valuation (CV) survey, a WTP query is used in calculating the non-market values of an environmental policy in order to achieve a conservative benefit calculation and to optimize the legitimacy of the valuation problem for the respondent. For this reason, in this analysis, the option of measure of welfare is the WTP of the household, rather than WTA, for environmental quality improvement calculated from the contingent valuation survey. The critics' point is that responses obtained through hypothetical scenarios are subject to several prejudices that render them invalid as the value of the resources in question (Cummings, et al. 1995).

Theoretical and empirical research has progressed to the degree that it is not only possible to discover CVM-related biases, but also to take corrective steps to resolve these biases (Smith, 1994). Angelsen, et al. (1994) proposed that CVM be

recommended based on its potential prejudices. CVM's shortcomings involve difficulties in validating the estimates, unfamiliarity among respondents with environmental goods and services, and overvaluation of the ability of respondents to pay because of its hypothetical existence.

3. Willingness to Pay (WTP) Approach

Under the stated preference strategy, use and non-use values can be promoted using the contingent valuation method (CVM) with a willingness to pay (WTP) format that uses hypothetical markets to estimate the benefits of environmental changes. Mitchell & Carson (1989) explored that CVM uses a CV questionnaire to create a hypothetical market and to enable the respondent to show their willingness to pay (WTP) for the non-market good in question.

Willingness to Pay (WTP) is the maximum amount of money; one would give up buying a certain good. The concept of WTP is derived from the compensating variance and the equivalent variation of the Hicksian welfare measures (Ahlheim &

Buchholz. 2000). In economic analysis, willingness to pay can be found with the use of the demand curve. WTP has a direct relationship with a demand curve for goods and services. This demand curve shows how much a consumer is willing to pay for an additional unit good which price of the good affects individual preference (Turner, et al. 2004). In economic theory, WTP has the usual assumption of a downward sloping demand curve, meaning that the percentages of 'yes' response often decrease as the offered price increases (Hartwick & Olewiler 1998). This is referred to as compensating variation or the willingness to pay or measure the transfer of an individual to keep his utility constant (Alberini & Cooper 2000). Willingness to pay (WTP) represents the maximum amount of money on a good that is willing to give up gaining more of another good.

Several studies have been performed in developing countries in which the commonly used eliciting technique has been used to value non-marketed products and services using CVM (Alberini & Cooper 2000). WTP is the method of dichotomous selection using a different bid value for different respondent social spaces. Contingent valuation is useful for two main reasons. First, environmental attitudes have been shown to be not good indicators of actual conservation behavior (Fridgen, 1994). As contingent evaluations include a scenario that is unique to the environmental good of the respondent and ask the respondents to report that they are willing to contribute each month or year, the WTP tests environmental stewardship more substantiated than environmental values alone. Second, local conservation groups and politicians will measure how much their common environmental value is worth by the combined WTP of all environmental consumers.

The cost and benefit of the introduction or forgoing conservation policies can then be calculated by using this calculation (Whitehead, 2006). When using CVM in the conservation of lakes, people place a value on them, although lakes are non-marketed. The CVM is a questionnaire-based valuation technique. Questions are directly interviewed to people about how much WTP would be for specific environmental services or improve environmental services. Major steps in analyzing Contingent Valuation involve describing the environmental quality attributes to be changed or estimated, outlining a questionnaire that makes the situation comprehensively and meaningful to respondents for the purpose of providing applicable values, classifying respondents to acquire unbiased sample, implementing the survey, and estimating average WTP from the sample and aggregating to the entire group affected.

4. Factors Influencing Willingness to Pay

The economic valuation literature contains several types of research that have been conducted to establish the WTP's influencing factors. Several CVM studies have shown broad literature on independent socioeconomic factors that can influence the option of the willingness of the respondents to pay for environmental conservation. It is necessary to monitor all relevant factors that could affect the WTP of a respondent for the conservation of the lake in order to help achieve the best-specified model. Broadly, this implies that the model must include the characteristics of households (socio-economic and demographic) and the perceptions of respondents of the current Lake status.

The relative importance of factors likely to influence the WTP was evaluated by the estimation of a model that allows the inclusion of respondents' socio-economic factors as independent variables into the WTP function. The independent variables are bid amount, age, gender, marital status, household size, main occupation, education level, household income, attitude, visit/ distance from residence to the lake. The independent variable bid amount was to negatively influence the magnitude of WTP. From economic theory, considering a real market situation, when a bid of a good

rises, the demand for those goods decreases. There are some people who are positively influencing the amount of WTP for the conservation of the Lake.

Recent contingent valuation (CV) studies of lake water quality have studied a wide variety of determinants of WTP. The most common categories of explanatory variables are demographic characteristics, perceptions of lake water quality, and environmental attitudes. Del Saz-Salazar, et al (2009) estimate that income, gender, employment, number of children, and average annual river visits all have positive and statistically significant effects on WTP. Additionally, studies present a negative

relationship between age and WTP and a positive relationship between low water quality perceptions and WTP.

5 Binary Logistic Regression Analysis

For measuring the willingness to pay for conservation of water quality improvement for conservation program of villagers, WTP is a dependent variable, and (11) independent variables are bid amount, age, marital status of household head, education level, household size, main occupation, monthly income, distance/visit time, and attitudes concerning five government future plan; (1) the Government intends to raise more funds to deal with environmental programs, (2) the Government plans to collect taxes to pay for environmental conservation, (3) endangered species conservation is a priority concern of the government, (4) the Government will invest in helping people before it spends money on conservation, (5) breaking rules for environmental conservation will be punishable by law. Attitudes with concern to five public awareness are: (1) there are other more important environmental concerns than Lake conservation, (2) it is everyone's concern to ensure that sustainability of plants and animals are important for the future, (3) Lakes are important even if there is no human connection, (4)citizens should contribute to Lake Conservation by making cash donations, (5) households who earn more income should contribute more to Lake Conservation and the perception of willing to vote for the conservation program; protect the Lake environment, prevent encroachment of human and businesses, preserve cultural heritage sites in the Taung Thaman Lake, and manage sustainable development in the Lake environment.

In this way, a binary logistic regression analysis is performed and P-value is also calculated to determine the regression coefficient. This analysis is appropriate when the means of two groups are to be compared. For this study, one group is the dependent variable and another group is the independent variable. Therefore, binary logistic regression is analyzed between the dependent variable (WTP) and the independent variable each using SPSS Statistical Software. In this study, the willingness to pay for a change in environmental quality can be stated by the following empirical binary logistic model.

1) WTP for Conservation of Water Quality of Villagers

$$\text{Log}\left(\frac{\Pr(WTP=1)}{1-\Pr(WTP=1)}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_{7+} \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \varepsilon_i$$

where: WTP = the dependent variable, 1 is equivalent to the "yes" response, and willingness of respondents to pay for conservation program.

X1 = Bid Amount, X2 = Age, X3 = Marital Status, X4 = Education Level, X5 = Household Size, X6 = Main Occupation, X7 = Income, X8 = Distance, X9 = Attitude concerning government future plan, X10= Attitude concerning public awareness, and X11 = Perception of Conservation program are the independent variables. i is error term.

2) Mean Willingness to Pay (MWTP)

The logistic regression analysis is used to estimate the Mean Willingness to Pay (MWTP). Mean willingness to pay is the average amount a consumer is willing to pay for service. The computation of the model to elicit Mean (WTP) is represented in the formula:

Mean WTP = β0/β1

Where β0 is a constant value and acts as a coefficient of the dependent variable (WTP) and β1 is the coefficient of the independent variable (bid amount). This function considered the bid variable as the only determinant factor.

3) Aggregate Willingness to Pay

The Aggregate WTP is calculated from the result of Mean WTP. Aggregate WTP is calculated from the total number of households (HH) / respondents in the target population. The total number of households from the respondents was used in the formula;

Aggregate WTP = M (WTP) × % HHPV × NHH

where: M (WTP) = expected mean willingness to pay

% HH PV = percentage of respondents with the positive valuation or those who answered 'yes'.

NHH = total number of respondents

For this determination of willingness to pay for conservation programs, dependent variables (WTP) and (11) independent variables are examined.

IV. Results

Mean Willingness to Pay (MWTP) and Aggregate Willingness to Pay of villagers can be used to estimate the value of water quality conservation of the Lake regulating service.

1. Estimation of Mean Willingness to Pay for Water Quality Conservation of Villagers

Table-1 shows the result of the regression where the probability of voting 'yes' (yes = 1) or 'no' (no = 0) was regressed with the bid prices only. The bid variable was found to be significant at the 1% level and the negative coefficient was consistent with economic expectations with the highest bid price.

Table 1. Variables in the Equation for Villagers

	B	S.E.	Wald	Sig.	Exp(B)
Bid amount	- .001***	.000	9.600	.002	0.999
Constant	1.128	.175	41.628	.000	3.090

Source: Survey Data (2018-19)

According to the formula, the mean WTP of villagers is calculated as constant (β0) divided by the bid amount (β1).

MWTP of Villagers= β0 / β1 = 1.128/.001 = 1,128 Kyats

This means that the villagers mean willing to pay for water quality conservation is 1,128Kyats/ month/ household.

2. Estimation of Aggregate Willingness to Pay for Water Quality Conservation of Villagers

The MWTP estimated by using the parametric method was used to multiply by 50% of the total number of respondents in each. The average ratio of 50% of the number of households in each used was based on the results of the follow-up certainty percentage of 'yes' responses.

Aggregate Willingness to Pay of villagers =Mean WTP × % of the total number of households who answered 'yes'.

Aggregate WTP = MWTP × % NHH

AWTP of Villagers = 1,128Ks × (50% of 5084) = 1,128Ks × 2,542

= 2,867,376Ks = (2.8) million Ks/month/households

AWTP of Villagers (2018-2019) = 2,867,376 Ks × 12 month= 34,408,512 Ks
= (34.41) million kyats/year/households

Therefore, the aggregate economic value of the water quality conservation of the Lake regulating service in 2018-2019 was (34.41) million Kyats/year/households. In this study, 5084 households in 10 villages were considered in its regulating service value assessment. If the average ratio of 50% of the number of total households in 100 villages of 7 miles distance from the Taung Thaman Lake is calculated, regulating service value assessment would be greater.

3. Influencing Factors of Villagers' Willingness to Pay

The factors which affected the WTP of the villagers were analyzed. To evaluate the relation between the socio-economic, distance, bid amount, and attitudes of the villagers and their willingness to pay, cross-tabulation and the Chi-square test were performed. The binary logistic regression model was provided to explore the influence of socioeconomic, spatial, attitudes factors, and bid amount on willingness to pay among villagers. It was categorized into two groups; yes and no. The summary result of socioeconomic, spatial, attitudes factors and bid amount of willingness to pay among villagers in the Binary Logistic Model are shown in Table -2.

According to the results, the bid amount has a negative effect on the willingness to pay among villagers. The coefficients of villagers' bid amount are statistically significant at the 1% level. A villager who pays an amount (above 1000) is about 0.91 times less likely to have a willingness to pay as compared to a villager who pays money (500-1000) (reference category).

Age has a positive effect on the willingness to pay among villagers. The coefficients of age are statistically significant at 1% and 5% levels. A villager with age 30-40 years is 2.71 times more likely to have a willingness to pay as compared to a villager with age 30 years and below (reference category). A villager with age 40-50 years is 4.02 times more likely to have a willingness to pay as compared to a villager with age 30 years and below. A villager with age 60 years and above is 9.8 times more likely to have a willingness to pay as compared to a villager with age 30 years and below. In the elderly villagers, it is found that villagers' willingness to pay has increased.

Marital status has a positive effect on the willingness to pay among villagers. The coefficient of marital status is statistically significant at the 5% level. A married villager is 3.29 times more likely to have a willingness to pay as compared to a single villager (reference category).

Table 2. Results of Logistic Regression of Villagers' Willingness to Pay

	B	S.E.	Wald	Sig.	Exp(B)
Constant	-4.744	0.942	25.343	0.000	0.009
Bid amount					
500-1000 (ref)					
Above 1000	-2.449***	0.404	36.820	0.000	0.086
No	0.184	0.375	0.241	0.623	1.202
Age					
30 and below (ref)					
30-40	0.996**	0.474	4.421	0.036	2.708
40-50	1.392***	0.470	8.765	0.003	4.024
50-60	2.145***	0.481	19.889	0.000	8.545
60 and above	2.282***	0.547	17.439	0.000	9.799
Marital Status					
Single (ref)					
Married	1.190**	0.471	6.393	0.011	3.286
Education Level					
Primary (ref)					
Middle	0.989***	0.348	8.058	0.005	2.688
High	0.859*	0.475	3.272	0.070	2.360
Graduate	1.039**	0.508	4.177	0.041	2.827
Household size					
1-3 (ref)					
4-6	-0.439	0.332	1.743	0.187	0.645
7 and above	0.741	0.586	1.599	0.206	2.098
Main Occupation					
Agriculture/fishery (ref)					
Government staff	0.951*	0.506	3.535	0.060	2.588
Private staff	2.590***	0.518	24.989	0.000	13.334
Own business	2.071***	0.424	23.856	0.000	7.936
Monthly Income					
200000 and below (ref)					
200001-400000	0.538*	0.300	3.211	0.073	1.712
400001-600000	0.852	0.568	2.249	0.134	2.345
above 600000	1.988***	0.651	9.329	0.002	7.302
Distance					
Below 1 miles (ref)					
1-3 miles	0.475	0.326	2.120	0.145	1.608
above 3 miles	0.384	0.375	1.046	0.306	1.468
Attitudes concerning government future plan					
Low (ref)					
High	0.633**	0.296	4.559	0.033	1.883
Attitudes concerning public awareness					
Low (ref)					

High	0.001	0.292	0.000	0.996	1.001
Perception of conservation program					
To protect lake environment (ref)					
To prevent encroachment of human & businesses	1.368**	0.557	6.026	0.014	3.928
To preserve cultural heritage site in Taung Thaman Lake	1.036**	0.485	4.562	0.033	2.818
To manage sustainable development in lake environment	1.811***	0.477	14.414	0.000	6.117

***, **, * Statistically significant at 1%, 5%, and 10% level
Source: Survey Data (2018-2019)

In addition, education level has a positive effect on willingness to pay among villagers. The coefficients of the education level of villagers are statistically significant at 1%, 5%, and 10%. A villager with middle education is 2.69 times more likely to have a willingness to pay as compared to a villager with primary education (reference category). A graduate villager is 2.83 times more likely to have a willingness to pay as compared to a villager with primary education. It is found that villagers' willingness to pay has increased among villagers who have higher education.

The occupation has a positive effect among villagers on willingness to pay. The coefficients of occupation of the villagers are statistically significant at 1% and 10% levels. A villager who serves in government staff is 2.59 times more likely to have a willingness to pay as compared to a villager who serves in agriculture/fishery (reference category). A villager who works as the private staff is 13.33 times more likely to have a willingness to pay as compared to a villager who serves in agriculture/fishery. A villager who serves in a private-own business is 7.94 times more likely to have a willingness to pay as compared to a villager who works in agriculture/fishery.

Monthly income also has a positive effect on willingness to pay among villagers as well. The coefficients of income of the villagers are statistically significant at 1% and 10% levels. A villager with an income level (200001- 400000) is about 1.71 times more likely to have a willingness to pay as compared to a villager with an income level (200000 and below) (reference category). A villager with an income level (above 600000) is about 7.3 times more likely to have a willingness to pay as compared to a villager with an income level (200000 and below).

Attitudes concerning government future-plan have a positive effect on willingness to pay among villagers. The coefficient of the villagers' attitude concerning governmental future-plan is statistically significant at the 5% level. A villager who has

a high level of attitudes concerning governmental future-plan is about 1.88 times more likely to have a willingness to pay as compared to a villager who has a low level of attitudes concerning governmental future plan (reference category).

Perception of conservation programs has a positive effect on willingness to pay among villagers. The coefficients of villagers' perception of conservation programs are statistically significant at 1% and 5% levels. A villager who prevents encroachment of humans and businesses is about 3.93 times more likely to have a willingness to pay as compared to a villager who protects Lake Environment (reference category). A villager who preserves cultural heritage sites in the Taung Thaman Lake is about 2.82 times more likely to have a willingness to pay as compared to a villager who protects the Lake Environment. A villager who manages sustainable development in Lake Environment is about 6.12 times more likely to have a willingness to pay as compared to a villager who protects the Lake Environment.

Therefore, age, material status, education level, main occupation, monthly income, and attitudes (government future-plan and perception of conservation program) have positive effects and significant meaning that these are positive and significantly influencing the willingness to pay. These variables are consistent with hypothesized factors from literature because these villagers were more aware of their willingness to pay for the conservation of the Lake. As hypothesized, the bid amount is expected to influence willingness to pay with a negative effect. This suggests that the higher the bid amount the lower will be the villagers' willingness to pay for conservation. Household size, attitudes concerning public awareness, and distance are not significant and do not directly affect villagers' willingness to pay

V. CONCLUSION

Villagers support programs that they believe will provide a sense of belongingness and contribute to their livelihood. This study estimated the willingness to pay local people for water quality conservation programs. It also recognized factors that influence the level of WTP. In 2018-2019, the Binary Logistic Regression results due to the water conservation value of in 10 villages regarding the Lake regulating services indicated that the mean WTP and aggregate WTP for water quality conservation were 1,128Kyats/month/household and 34.41 million kyats/ year/ household respectively. The Binary Logistic Regression analysis also proved that the cross-tabulation and the Chi-square tested were significant at 1% and 5% levels. Besides, model fitting criteria (Omnibus test of model coefficient, Hosmer and Lemeshow test, -2 Log Likelihood, Cox & Snell R square, and Nagelkerke R square)

were also used. This indicated that the data was able to explain well using the model. Among the hypothesized 11 independent (explanatory) variables, only 8 of them were found to be statistically significant in explaining the WTP at different significance levels (1%, 5%, and 10%). The Binary Logistic Regression has shown that bid amount is a significant factor affecting willingness to pay with a negative coefficient. This shows that it is necessary for respondents to be able to pay for environmental conservation using payment systems that are convenient for them. Age, marital status, education level, occupation, monthly income, attitudes concerning government future-plan, and perception of conservation program are significant factors affecting willingness to pay with positive results. These variables are consistent with hypothesized factors from literature because these villagers were more aware of their willingness to pay for the conservation of the Lake. Household size, attitude concerning public awareness, and distance are not significant and do not directly affect villagers' willingness to pay. Based on the review, this study suggests that Mean WTP and aggregate WTP payment through education, income, and awareness-raising must be made known to the local people that this is for ecological compensation. The authorities concerned should also take this into serious consideration. Moreover, the regional government and environmental group should intensify its activity about the ecological value, awareness, increase investment in education, income, employment opportunities, and establish a variety of ecological compensation payment vehicles, in order to conserve and improve the ecological environment of the Taung Thaman Lake.

Acknowledgements

First and foremost, I wish to extend my sincere gratitude to my Professor Dr. Tin Win, Rector, Yangon University of Economics, and my deep appreciation and special thanks to Professor Dr. Ni Lar Myint Htoo, Pro-rector, Yangon University of Economics. I would like to express my special appreciation to all the people at the Taung Thaman Lake in Amarapura Township, Mandalay Region.

REFERENCES

Ahlheim, M., & Buchholz, W. 2000. WTP or WTA-Is that the question. Zeitschrift für Umweltpolitik & Umweltrecht, 23(2), 253-271.

Alberini, A., & Cooper, J. 2000. Applications of the contingent valuation method in developing countries: A survey (Vol. 146). Food & Agriculture Org.

Angelsen, A., Fjeldstad, O. H., & Sumaila, U. R. 1994. Project appraisal and sustainability in less developed countries. Report-Christian Michelsen Institute, (1).

Carson, R. T., Mitchell, R. C., Hanemann, W. M., Kopp, R. J., Presser, S., & Ruud, P. A. 1992. A contingent valuation study of lost passive use values resulting from the Exxon Valdez oil spill (No. 6984). University Library of Munich, Germany.

Cochran, W. G. 1977. Sampling techniques. 3rd edition John Wiley & Sons. Inc. New York. pp.

Cummings, R. G., Harrison, G. W., & Rutström, E. E. 1995. Homegrown values and hypothetical surveys: Are the dichotomous choice approach incentive-compatible? The American Economic Review, 85(1), 260-266.

Del Saz-Salazar, S., Hernández-Sancho, F., & Sala-Garrido, R. 2009. The social benefits of restoring water quality in the context of the Water Framework Directive: A comparison of willingness to pay and willingness to accept. Science of the Total Environment, 407(16), 4574-4583.

Fridgen, C. 1994. Human disposition toward hazards: Testing the environmental appraisal inventory. Journal of Environmental Psychology, 14(2), 101-111.

Hartwick, J. M., & Olewiler, N. D. 1998. The Economics of Natural Resource Use, 2nd Addison-Wesley. Reading, Massachusetts.

Loomis, J. B. 1996. Measuring the economic benefits of removing dams and restoring the Elwha River: results of a contingent valuation survey. Water Resources Research, 32(2), 441-447.

Ministry of the Environment. 1996. State of Japan's Environment at a Glance: Japanese Lake Environment - The Importance of Lakes.

Mitchell, R. C., & Carson, R. T. 1989. Using surveys to value public goods: the contingent valuation method. Resources for the Future.

Smith, V. K. 1994. Lightning rods, dart boards, and contingent valuation. Natural Resources Journal, 121-152.

Turner, R. K., Bateman, I. J., Georgiou, S., Jones, A., Langford, I. H., Matias, N. G. N., & Subramanian, L. 2004. An ecological economics approach to the management of a multi-purpose coastal wetland. Reg Environ Change. 4:86–99.

White, P. C. L., & Lovett, J. C. 1999. Public preferences and willingness-to-pay for nature conservation in the North York Moors National Park, UK. Journal of Environmental Management, 55(1), 1-13.

Whitehead, J. C. 2006. A practitioner's primer on the contingent valuation method. Handbook on contingent valuation, 66-91.

The Myanmar JOURNAL

– Volume 9 Number 1 February 2022

28 February 2022

Yangon University of Economics (Myanmar)
Korea Myanmar Research Association (Korea)
2014~, Semiannual
ISSN : 2383-6563(Online)

Co-published with **Yangon University of Economics (YUE)** and
Korea Myanmar Research Association (KOMYRA)
http://www.komyra.com/doc/submission.php