Willingness to Pay of Urban Households for the Conservation of Natural Resources and Cultural Heritage in a Neighboring Rural Area: A CVM Study

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Koronadal households benefit from Lake Sebu's natural resources (lakes, waterfalls, rivers and springs, forest land, agricultural land) and cultural heritage (arts and handicrafts such as *T'nalak* weaving, brass casting, beadwork, and wood carving; music and dances; festivals; and beliefs and traditions of the *T'boli* indigenous tribe) in terms of recreation, good image and sense of pride, tourism income generation, the supply of high-quality tilapia, agricultural products supply, potential hydroelectric power source, biodiversity, and climate change mitigation. These benefits are integrated into a single estimate using the contingent valuation method. In the study, a sample of 524 Koronadal households was asked for their willingness to pay (WTP) or contribute to natural resources and cultural heritage conservation efforts in Lake Sebu in the form of a lump-sum monthly amount collected together with their electricity bill payment. The mean WTP per month is estimated to be Php 52.42 (USD 1.04) using the probit regression estimates (parametric mean) and Php 64.39 (USD 1.27) using the Turnbull formula (non-parametric mean), both less than 1% (0.26–0.33%) of average monthly household income. Multiplying the annualized WTP by the number of households in Koronadal, total potential annual contributions from Koronadal City would range from Php 29.2–35.7M, about 3% of the City Government's 2019 total revenues of Php 932.6M (Koronadal City Government Budget Office). Even just a fraction of this potential collection can support essential conservation efforts in Lake Sebu, which – up to the present – have been inadequate due to financial constraints. Moreover, the results of the regression analysis reveal that households are more likely to support the conservation program if the amount of required contribution is smaller and household income is higher. Older and more educated respondents are, likewise, more likely to support the program.

Keywords: benefit valuation, contingent valuation method, cultural heritage, natural resources, willingness to pay

INTRODUCTION

The Municipality of Lake Sebu in the Province of South Cotabato, Philippines is endowed with abundant natural resources – including lakes (Lake Sebu being the biggest), waterfalls, rivers, springs and wells, and caves. These offer various captivating sights and exciting adventures like zip-lining, spelunking, mountain trekking, lake and river cruising, and bird watching for both residents and visitors. The municipality has the rich cultural heritage of the *T'boli* indigenous tribe – its handicrafts that include *T'nalak* weaving, brass casting, beadwork, and wood carving; music and dances; festivals (*Helobung* Festival, *Lemlunay*

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Festival); and beliefs and traditions (sacred grounds, burial grounds, ancestral homes, *etc.*). Its expansive freshwater bodies are areas for lucrative fish farming operations that produce good-tasting tilapia, attracting visitors for dining and special celebrations and satisfying protein requirements of neighboring cities and municipalities. About a third of its land area is used for rice, corn and other crops, fruits and vegetable farms (a couple of which are organic), and mostly native-breed livestock and poultry raising. Further, much of South Cotabato's remaining forest is confined in Lake Sebu with its Dipterocarp forests dominating its hills and mountains and covering about two-thirds of its land area (LSMPDO 2016).

The rich natural and cultural environment in Lake Sebu provides economic, historical, cultural, social, and environmental services not only to its residents but also to the inhabitants of the surrounding cities and municipalities, such as Koronadal – the capital city of the province of South Cotabato and the regional center of Region XII. There is a multitude of benefits that Koronadal residents derive from the natural resources and cultural heritage of Lake Sebu. One, Lake Sebu is a sight-seeing and vacation destination for many Koronadal residents during holidays, especially during the summer season. Its cool weather makes it the summer capital in Southern Mindanao. Lake Sebu is also fast-becoming to be the prime eco-tourism destination in the southern Philippines for foreigners and for Filipinos from other regions of the country. All tourists go to Lake Sebu via Koronadal. Hence, tourism in Lake Sebu also brings tourism income to Koronadal. Two, the municipality supplies Koronadal residents with high-quality tilapia. Lake Sebu and Lake Seloton are the two lakes in the municipality that are utilized for productive and profitable tilapia farming operations while Lake Lahit is devoted to open fishing. Three, Lake Sebu provides agricultural products – such as corn, cacao, coffee, root crops, fruits, and vegetables – to Koronadal. There are a number of organic farms in Lake Sebu providing healthy food options to Koronadal residents. Four, the culture and traditions of the indigenous *T'boli* tribe in Lake Sebu (accounting for the majority 55% of the municipality's population) provide an important cultural heritage for Koronadal and the whole of South Cotabato and the Philippines. Five, the waterfalls in Lake Sebu are potential sources of hydroelectric power for Southern Mindanao. Finally, the vast forest in Lake Sebu is home to a variety of flora and fauna and serves as a wildlife sanctuary for many rare, threatened, and endangered species – 19 species of birds (including the Philippine eagle, Philippine hawk-eagle, and Mindanao Lori keel), 17 species of mammals (tarsier, Philippine lemur, and Philippine brown deer), and three species of reptiles (water monitor lizard, phyton, and crocodile) (LSMPDO 2016). Its forests also sequester and store

enormous amounts of carbon, thus contributing to global warming mitigation.

This study aims to estimate the value of the benefits that Koronadal residents derive from the natural resources and cultural heritage of Lake Sebu using the contingent valuation method (CVM). CVM is used extensively in environmental and cultural resource valuation as it integrates into a single estimate the different components of the resource's total economic value – namely, direct benefits from the use of the resource, indirect use values (benefits from secondary goods and services provided by the resource including non-consumptive uses), option value (future direct and indirect uses), existence value (non-use value), and bequest value (value of the resource for future generations).

Over the past few decades, policy-makers have been increasingly inclined towards the integrated resource management (IRM) approach as they recognize that competing uses and various benefits from resources as well as responsibilities to conserve resources cut across political boundaries. In the case of Lake Sebu, benefits from its natural resources and cultural heritage are not confined to its own people and, hence, conservation costs that also include opportunity costs of residents for forgoing destructive livelihood activities [such as overcrowding fish cages, overfeeding of fish, destructive farming activities such as slash and burn (*kaingin*), excessive use of fertilizers, poaching, illegal cutting of trees, land reclamation near the lakes, *etc.*] must be shared by those outside the municipality.

The estimate of the benefits that Koronadal residents gain from Lake Sebu's natural resources and cultural heritage provides a basis for the amount of contribution that the neighboring urban city of Koronadal has to allocate for the conservation of the resources and culture of the largely rural municipality of Lake Sebu. A systematic procedure in coming up with the estimate is a necessary first step for successful collaboration among stakeholders, an important element in the IRM approach (Carlson and Stelfox 2009).

Apart from this public policy objective, this paper aims to contribute to the still scant, albeit growing, literature on the economic valuation of natural and cultural resources using the contingent valuation method in developing countries. The study looks at the WTP for both the natural ecosystem and cultural heritage that can be found in Lake Sebu. So far, most existing studies deal on either just natural resources [see, for instance, Subade (2007) and Palanca-Tan *et al.* (2018)] or just cultural heritage (Tran and Navrud 2008; Sanyakamdhorn and Seenprachawong 2018). Further, in the case of cultural heritage valuation studies, there is a need for studies on non-built cultural heritage (Wright and Eppink 2016), which is the case in

Lake Sebu where cultural heritage is not in the forms of temples, monuments, *etc.*, but in the non-built art of weaving, language, songs and dances, and traditions.

METHODOLOGY

Study Sites: Koronadal and Lake Sebu
South Cotabato, a province in the southern Philippines, is made up of one city – Koronadal (also known for its old name Marbel) and 10 municipalities, one of which is Lake Sebu (Figure 1). Koronadal, which is largely urban, is the provincial capital of South Cotabato and the regional center of Region XII. Lake Sebu, on the other hand, is the largely rural and elevated municipality comprising the few hills and mountains of the generally flat province of South Cotabato. Koronadal and Lake Sebu are approximately 40 km away from each other separated by the municipalities of Banga and Surallah. Table 1 presents comparative data for Koronadal and Lake Sebu. While Koronadal's land area of 277 km² occupies only 7% of the total land area of South Cotabato, Lake Sebu's 702 km² occupies 18%. Nonetheless, Koronadal's population is double that of Lake Sebu, and its population density is more than five times that of Lake Sebu. In recent years, due to its growing tilapia aquaculture industry and as it emerges to be a prime eco-tourism destination in the southern Philippines, Lake Sebu's population has been growing at a higher rate than Koronadal as well as the whole province of South Cotabato due to migration. A substantial 59% of Lake Sebu's area is still covered by forest, agriculture use accounts for a third, and built-up area (residential, commercial, industrial, infrastructure, *etc.*) is merely 1%. In Koronadal, on the other hand, agricultural land covers 49%, forests cover 29%, and a substantial built-up area spans 17%. The poverty index in Lake Sebu in 2015 was 64%, compared to only 22% in Koronadal.
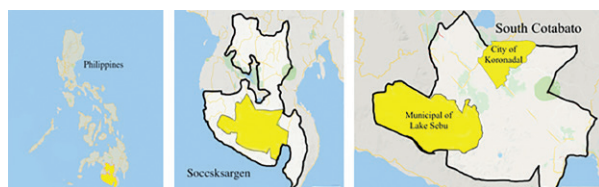

Figure 1. Study sites: City of Koronadal and Municipality of Lake Sebu.

Contingent Valuation Method
The concept of WTP in economics is a measure of the benefits that an individual perceives to derive from a good. WTP is the price that the individual pays for the good if the good is traded in a market. In the case of goods that have no markets – such as environmental

Table 1. Comparative profile of Koronadal City and Lake Sebu Municipality.

	Koronadal	Lake Sebu
Land area (km²)	277	702
Population (2015)	174,942	87,442
Population density (2015, per km²)	630	120
Annual population growth rate (2010–2015)	1.92%	2.66%
Proportion of urban population	50.38%	9.12%
Land use (in proportion to total land area)		
Forest	28.50%	58.92%
Agricultural	49.37%	33.26%
Built-up	17.48%	1.31%
All other uses	4.65%	6.51%
Poverty index	22.41%	64.00%

Sources of data: PSA 2015 Census of Population for population data, LSMPDO 2015 for Lake Sebu land use data, and KCPDO 2013 for Koronadal land use data.

amenities, ecosystems, cultural heritage, public goods, and programs – non-market valuation techniques are utilized. One of these techniques is the CVM, a survey-based approach that is now used increasingly in both developed and developing countries to incorporate values of non-marketed services and amenities in public policy and program assessments [please see Carson (2011) for the history and comprehensive bibliography of CVM studies].

In a CVM survey, respondents are asked to state their WTP for a good, service, or public program. The stated WTP is the monetary estimate of all the benefits – tangible and intangible plus present and future use and non-use values – that are derived from the good, service, or public program. The WTP question can be in the form of an open-ended question ("How much are you willing to pay?") or a dichotomous-choice (DC) question ("Are you willing to pay XXX pesos/dollars?"). The open-ended format has been progressively abandoned by CVM researchers due to large non-response rates and generally unreliable responses (Mitchell and Carson 1989). The DC format, on the other hand, simplifies the cognitive task of respondents as market transactions in which they participate in daily life usually involve deciding whether or not to buy goods at given prices, rather than stating WTP (Bateman *et al*. 2002). Hence, the DC format was used for this study.

Survey Instrument and Implementation
The instrument used for the CVM survey was finalized after a series of key informant interviews (KII), focus group discussions (FGD), and pre-tests. KIIs were conducted

with local government officials and sector leaders of both Lake Sebu and Koronadal to obtain background information on the conditions of the ecosystem and cultural heritage in Lake Sebu and their importance to the people in Koronadal. An FGD with representative segments of the target population of respondents – the households in Koronadal – was conducted to test the first draft of the questionnaire; determine the relevant range of questions and categorical answers on the socio-economic status, awareness, and attitudes of target respondents; and obtain additional inputs for the formulation of the valuation scenario. Several rounds of pre-tests were conducted to determine bid levels.

The 10-page questionnaire consisted of four parts. Part A included a brief introduction to the purpose of the survey as well as basic information questions about the respondent and household members. Part B asked questions to gauge respondents' exposure to Lake Sebu – its natural resources, cultural heritage, fishing, farming, and other economic activities. It also asked awareness and attitudinal questions on the conservation of resources and the culture of Lake Sebu. Part C contained the CVM scenario and the WTP question together with follow-up questions to the "Yes" and "No" responses to the WTP question. Finally, Part D asked socioeconomic questions about the respondents and their households. These questions were asked last to ensure that respondents' interest did not fade early on in the survey. All questions were provided with answers or ranges of values (except for age) from which respondents could choose to make the task manageable for the respondents and the responses to all questions quantifiable. Respondents were informed at the start of the interview that the survey would take about 30–45 min.

The valuation scenario and the WTP question, the most crucial part of a CVM questionnaire, occupied more than three pages (a third) of the whole instrument. The valuation scenario gave the respondents detailed information about the natural resources and cultural heritage in Lake Sebu, and the benefits these resources can offer to Koronadal residents, which include:

- lakes (Lake Sebu, Lake Seloton, and Lake Lahit): recreational value and source of good-tasting tilapia

- waterfalls (Seven Falls and two other smaller falls): recreational value and a potential source of hydroelectric power for Southern Mindanao

- forest lands: wildlife sanctuary for many rare, threatened, and endangered species (biodiversity); carbon sequestration (global warming mitigation)

- culture, art, and traditions of the *T'boli* indigenous people – handicrafts (*T'nalak* weaving, brass casting, beadwork, and wood carving), music and dances, festivals (*Helobung* Festival, *Lemlunay* Festival), and

beliefs and traditions (sacred grounds, burial grounds, ancestral homes, *etc.*): a sense of identity and pride for South Cotabato and for the whole Philippines

The scenario also discussed factors that have led to depletion and degradation of Lake Sebu's natural resources and to the gradual disappearance of the arts and traditions of the *T'boli*. It also explained the need for conservation programs such as:

- effective monitoring programs to prevent destructive activities like overcrowding fish cages and overfeeding of fish, *kaingin*, poaching, illegal cutting of trees

- aquaculture training programs (*e.g.* proper and sustainable feeding)

- agricultural training programs (alternatives to *kaingin*, organic farming)

- regular training sessions on *T'nalak* weaving and culture schools

For reasons stated earlier, the DC format was used for the WTP question of this study. After several rounds of bid pre-tests, the following seven bids were used for the survey: Php 10, 20, 50, 70, 100, 200, and 300. As a common approach for public policy and program assessments, the WTP question was framed within the context of a referendum as follows:

Now, we would like to know if your household will be willing to contribute to the program to conserve the Lake Sebu natural resources and cultural heritage so as to ensure that you will continue to enjoy the benefits they provide. The program entails continuing funding requirements. Your contribution to the Lake Sebu conservation program – a fixed sum of money every month – will be collected together with your monthly electricity payment. SOCOTECO (South Cotabato Electric Cooperative) is only the collecting agent. All collections will be turned over to a multisectoral Lake Sebu Conservation Council that will collaborate with government and non-government agencies in implementing the conservation program.

Let us suppose that before the program is implemented, there would first be a referendum in Koronodal. The purpose of the referendum is to determine how many households in Koronadal would support the program through an additional charge in their monthly electricity bill. Should the majority of the households vote to support the project, the program will be implemented.

The survey you are participating in today is only to find out your opinion about this matter. It is not an actual referendum, but we are interested in finding how you would vote if an actual referendum did take place. So, please consider that voting yes and paying when the project is implemented would leave you less money available for your household needs and other things such as contribution to other programs. In other words, we request you to answer exactly as you would vote if you were really going to face the consequences of your vote.

Would you vote in favor of the implementation of the Lake Sebu conservation program and be willing to pay an amount of Php XX [each respondent is randomly assigned one of the seven bids] together with your monthly electricity bill payment as your contribution to the program?

_____*YES*   _____*NO*

The short "cheap talk" script reminding respondents to consider their budget constraints and to answer in accordance with what they would really do if the referendum were actually to take place was inserted to minimize hypothetical bias. The monthly electricity bill was chosen as the payment vehicle because the 100% service coverage of SOCOTECO in Koronadal ensures that contributions from all households can be collected, thus further minimizing hypothetical bias.

The WTP question was followed by two sets of debriefing questions. One set, addressed to "Yes" respondents, consisted of two items: (1) the three most important reasons for the "Yes" answer, and (2) the degree of certainty of the "Yes" answer. "No" respondents, on the other hand, were first asked if they would be willing to pay any amount (smaller than the bid) for the Lake Sebu preservation program. A "No" response to this question was followed by a question as to the reasons why they would not be willing to contribute any amount at all.

A total sample of 524 respondents was generated for this study. CVM practitioners consider a sample size of around 500 to be suitable and adequate for the DC WTP question format in terms of requirements of the binary probit regression procedure and the costs of survey implementation. All 27 *barangays* of Koronodal were included in the sampling frame. The number of respondents in each *barangay* was set in proportion to the share of the *barangay* in the total city population. The systematic sampling procedure was employed in selecting the respondents in each *barangay*. The seven bid levels were randomly assigned to respondents in all survey sites.

The survey was conducted through personal interviews with the household head or the member making expenditure decisions in the family during the month of November 2019. Enumerators were given a two-day training course prior to the pre-tests following the guidelines in Whittington (1996, 2002). The first day of training gave an overview of the objectives of the study, resource valuation, and the contingent valuation approach. On the second day, enumerators were trained on the survey instrument, with the meaning and the reasons for each question and statement in the questionnaire discussed. The training included role-playing exercises.

Analytical Framework

The yes-no response to the DC CVM question was analyzed using the framework developed by Hanemann (1984) based on the random utility model. Indirect utility (u), depends on h (which takes on the value 1 if the respondent is voting for the Lake Sebu natural resources, and cultural heritage conservation program; 0 if otherwise), household income (y), a vector of the respondent and his/her household's characteristics (m),

and a component of preferences that are known only to the respondent and not to the researcher (ε_h). This utility function is specified as additively separable in deterministic (v) and stochastic preferences (ε):

$$u(h, y, \boldsymbol{m}, \varepsilon_h) = v(h, y, \boldsymbol{m}) + \varepsilon_h \qquad (1)$$

As the random part of preference is unknown, only probability statements about yes and no responses can be made. The probability that a bid price B for the preservation program is accepted can be expressed as:

$$
\begin{aligned}
Pr(yes) &= Pr[v(1, y - B, \boldsymbol{m}) + \varepsilon_1 \geq v(0, y, \boldsymbol{m}) + \varepsilon_0] \\
&= Pr[v(1, y - B, \boldsymbol{m}) - v(0, y, \boldsymbol{m}) \geq \varepsilon_0 - \varepsilon_1] \\
&= F_\varepsilon(\Delta v)
\end{aligned}
\qquad (2)
$$

$F_\varepsilon(\Delta v)$, the probability that the random variable ε will be less than Δv, represents the cumulative density function of the respondent's true maximum WTP.

The stochastic terms ε are assumed to be independently and identically distributed following a normal distribution with a mean of 0 and standard deviation of σ, and the indirect utility function is specified to be a linear function such that the probit regression procedure can be used to evaluate Equation 2. The parameter estimates from the binary probit model are used to calculate mean WTP $E(B)$ with the formula:

$$E(B) = -\frac{\left(\dfrac{\beta}{\sigma}\right)X}{\dfrac{\beta_B}{\sigma}} = -\frac{\beta X}{\beta_B} \qquad (3)$$

β is a vector of estimated coefficients of all explanatory variables except bid price (vector X) and β_B is the estimate for the bid price coefficient.

Non-parametric mean WTP for the preservation program is calculated using the lower bound Turnbull formula (Haab and McConnell 2002):

$$E_{LB}(B) = \sum_{j=0}^{M} B_j (F_{j+1} - F_j) \qquad (4)$$

M is the number of bids, B_j is the bid level, F_j is the proportion of no responses to bid price B_j, $F_0 = 0$, and $F_{M+1} = 1$.

Empirical Model

The empirical model specifies the yes-no response to the CVM question as a function of the following covariates: bid (monthly contribution to the conservation program),

household income, respondent characteristics (age, gender, education), awareness and attitude questions about natural resources and cultural heritage in Lake Sebu, and memberships in organizations as measures of social capital. The list of specific variables included in the binary probit regression is presented in Table 2.

RESULTS AND DISCUSSION

Socio-economic Profile of Household Respondents
Table 3 gives a summary profile of the respondents and their households. The majority (57%) of the respondents in the survey are the spouse of the household head and, accordingly, just a little over a fourth (26%) are male. The average respondent is 44 years old and has lived in Koronadal for 32 years. About 13% of respondents had gone up to elementary school, 50% up to high school, 5% up to vocational school, and 31% up to college level. Only very few had no formal education or had pursued graduate studies. More than half (54%) are working and/or running a business. The substantial majority (68%) belong to the Hiligaynon-Ilonggo group, the dominant migrant group in the province.

The average household has five members. The mean monthly household income of respondents is Php 19,444 (min = 2,500, max = 105,000), and the mean monthly electricity bill is Php 1,067 (min = 30, max = 9,800). Most (85%) of the respondent households own the house where they live. Almost 15% of respondent households are members of cooperatives, nearly three-fourths (72%) of which are in credit cooperatives. Only women's organizations, church organizations, and senior citizens' associations (the 'other' category is mostly senior citizens' groups) are fairly common in the city. Very few or none of the households have members in environmental, indigenous people, culture, and labor groups.

Respondents' Awareness and Attitudes about Lake Sebu's Natural and Cultural Resources
Table 4 presents answers to survey questions that can be indicative of the degree of familiarity of Koronadal households with Lake Sebu. The majority of respondents have visited Lake Sebu, most of whom for dining and enjoying the sights in the Seven Falls. Almost half brought home souvenir items. About a third of respondents have friends in Lake Sebu, about a fifth have relatives, and a mere 1% have work or business in or related to Lake Sebu. A substantial number (28%) has a firm preference for tilapia grown in Lake Sebu, while a much less proportion (11%) own an item made of *T'nalak*.

Respondents were asked to agree or disagree using a scale of –2 (strongly disagree) to 2 (strongly agree) with each of the ten statements in Table 5 to gauge their perception and opinions about the benefits that they can derive from the

Table 2. Probit regression analysis variables.

Variable	Definition
Dependent variable	
WTP	Respondent's answer to the WTP question =1 for Yes answer =0 for No answer
Explanatory variables	
Bid	Amount of monthly contribution to the conservation program; a value from the seven bid levels (10, 20, 50, 70, 100, 200, or 300) is randomly assigned to a respondent at time of interview
Household income	Total monthly income of all household members (in Php)
Age	Age, in number of years, of respondent
Gender	Gender of respondent =1 if male, =0 if female
Education	Education of respondent =0 if the respondent had no formal education =1 if the respondent had reached elementary =2 if the respondent had reached high school =3 if the respondent had reached vocational =4 if the respondent had reached college/university =5 if the respondent had reached graduate school
LSVisit	=1 if the respondent has visited Lake Sebu for recreation =0 if otherwise
LSBusinessWork	=1 if the respondent has business or work in Lake Sebu =0 if otherwise
LSRelative	=1 if the respondent has relative/s in Lake Sebu =0 if otherwise
LSFriend	=1 if the respondent has friend/s in Lake Sebu =0 if otherwise
Statements pertaining to awareness and attitude about natural resources and cultural heritage in Lake Sebu and their conservation (the different statements are in Table 4 of the following section on Results)	=–2 if respondent strongly disagrees with the statement =–1 if respondent somewhat disagrees, =1 if respondent somewhat agrees, =2 if respondent strongly agrees, and =0 if the respondent is neutral or doesn't know.
MemberIPOrg	=1 if any member of the household is a member of an indigenous people's organization =0 if otherwise
MemberEnvironmentOrg	=1 if any member of the household is a member in an environment-related organization =0 if otherwise

Table 3. Respondent and household characteristics.

	Mean
Household role (proportion of respondents, %)	100.00
Head	29.96
Spouse of head	57.25
Others	12.79
Age (number of years)	43.99
Gender – male (proportion of respondents, %)	25.95
Education (proportion of respondents, %)	100.00
No formal education	0.19
Elementary	13.19
High School	50.10
Vocational	5.16
College	31.17
Graduate	0.19
Work (proportion of respondents, %)	100.00
Not working	45.61
Worker (daily wage)	5.92
Employee (monthly salary)	12.79
Own business	35.11
Employee and own business	0.57
Ethno-linguistic group (proportion of respondents, %)	100.00
Hiligaynon/Ilonggo	69.47
Ilocano	11.45
Cebuano	8.02
Bisaya/Binisaya	3.63
B'laan	2.48
Tagalog	1.53
Maguindanao	0.95
T'boli	0.57
Others	1.90
Number of years in Koronadal (number of years)	31.83
Household size (number of household members)	5.04
Monthly household income (Php/USD)	19,444.55/384.20
Monthly electricity bill (Php/USD)	1,067.39/21.09
Housing (proportion of respondents, %)	100.00
Own	85.47
Renting	7.84
Living with relatives	6.31
Provided by employer	0.38
Membership in organizations (proportion of respondents, %)	
Cooperative, of which	14.48
Credit cooperative	72.37
Agricultural cooperative (including irrigation cooperatives)	11.84
Other types of cooperatives	15.79
Environment-related groups	0.38
Indigenous people protection-related groups	2.10
Culture-related groups	0.00
Women's organizations	21.33
Church-related organizations	14.48
Labor-related	0.57
Other organizations (senior citizen associations)	10.10

Note: exchange rate used: USD 1 = Php 50.61 (December 2019)

Table 4. Lake Sebu knowledge and exposure.

Respondents which	Proportion (%)
Have visited Lake Sebu for leisure	53.44
Done the following activities (proportion of those who have visited):	
Visited Seven Falls	65.83
Ziplining	18.35
Dining	80.22
Lake cruising	27.70
Fishing	13.36
Bought souvenir items	47.12
With work/business in Lake Sebu	1.34
Has relatives in Lake Sebu	18.70
Has friends in Lake Sebu	31.11
Owns something made of t'nalak	11.45
Only buys and eats tilapia grown in Lake Sebu	28.05

Table 5. Opinion and attitudes concerning Lake Sebu's natural resources and cultural heritage, benefits, and conservation.

Statement	Score*
a) Too many fish cages in Lake Sebu is causing pollution in the lake.	0.61
b) When tourism in Lake Sebu is booming, tourism in Marbel is also booming.	0.96
c) If the forest area in Lake Sebu gets smaller, the quantity and quality of water supply in Marbel will be affected.	0.28
d) The condition of the natural resources in Lake Sebu does not have anything to do with my family.	0.20
e) The history and culture of the *T'boli* must be part of the curriculum in South Cotobato and Mindanao high schools.	1.40
f) Deforestation in Lake Sebu can cause flooding in Marbel.	0.63
g) The government of Marbel must allocate part of its tax collections for the preservation of *T'boli* culture.	0.86
h) It is the provincial government of South Cotobato, not the city government of Koronadal, which is responsible for the protection of the natural resources (waterfalls, forest, lake, *etc.*) in Lake Sebu	1.26
i) I am willing to donate money for the preservation of *T'boli* culture.	0.82
j) All Filipinos must contribute to the preservation of *T'boli* culture.	1.06

*Score is computed by assigning the values: –2 (strongly disagree), –1 (somewhat disagree), 1 (somewhat agree), 2 (strongly agree), and 0 (neutral or don't know).

natural and cultural resources of Lake Sebu and the need to conserve them. A positive average score implies that, on average, the respondents agree with the statement. The nearer is the score to 2, the stronger the respondents agree with the statement. Statements (b) to (f) pertain to the likely impact of the conditions of the natural resources and cultural heritage

of Lake Sebu on Koronadal residents. Statement (e) on the need to teach *T'boli* history and culture in South Cotabato and Mindanao high schools gets the highest approval rating, reflecting the importance accorded by Koronadal residents to *T'boli* heritage in their region. Respondents also appear to recognize the contribution of Lake Sebu to tourism activities and revenues in Koronadal [statement (b)'s 0.96 score]. Statements (c) and (d) have scores very close to 0, which reflects that respondents are somehow knowledgeable about the impreciseness of the two statements. Koronadal is not part of the Allah Valley Watershed (to which Lake Sebu belongs) and, thus, the water supply situation in Koronadal is not directly affected by the conditions of the forest in Lake Sebu. It is also noteworthy that Koronadal residents are aware that the natural resources of Lake Sebu have a consequence on them. Statement (a) requires some detailed knowledge of what is happening with regard to tilapia farming in Lake Sebu lakes and, hence, a score of 0.61 is fairly reasonable. The last four statements relate to how the Lake Sebu resource conservation program can be financed. It appears that respondents feel that the responsibility of preserving natural and cultural resources of Lake Sebu lies in the broader community of South Cotabato [statement (h) and even the whole Philippines (j)]. The scores for statements (g) and (i), which are close to 1, reflect some belief among residents that Koronadal also has to contribute to the program.

WTP

A total of 210 out of 524 respondents indicated they would vote for the conservation program and be willing to pay the specified monetary amount (Bid) as a monthly contribution. All except for six of these "Yes" respondents (1%) indicated they are sure of their answer. The proportion of "Yes" answers by bid is shown in Figure 2. It appears that the bid levels – Php 10 and Php 20 – are considered by respondents as fairly equivalent in terms of a monthly financial burden. The same can be said of the bid levels Php 50, Php 70, and Php 100. Nonetheless, it is evident that the proportion of respondents who are willing to pay for the Lake Sebu conservation
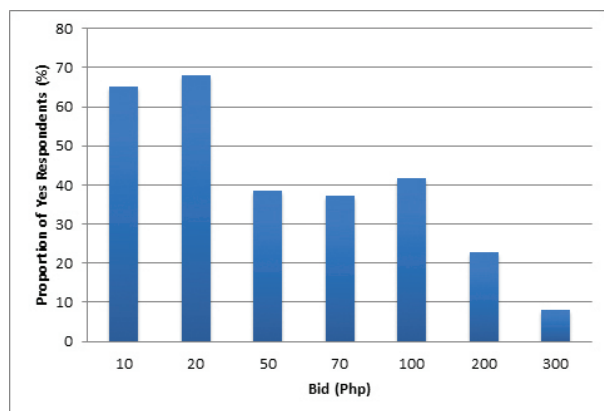
program tends to be smaller if the bid is significantly higher. Respondents have varying reasons for being willing to contribute to the conservation program. Overall, the top three reasons are its recreational value, maintenance of good air and water quality in Koronadal, and climate change mitigation. These reasons can be interpreted as the main benefits that respondents perceive to derive from Lake Sebu's natural and cultural resources. Other top three reasons cited are the cultural heritage of the *T'boli*, biodiversity, tourism revenues, good quality agricultural products, and the potential for hydroelectric generation.

Of the 314 who answered "No" to the WTP question, 115 indicated they would be WTP a lower amount while 199 indicated they are not WTP any amount at all because they cannot afford to pay (60 respondents), they have other more important and urgent financial concerns (85), they believe they are not responsible for Lake Sebu natural and cultural resources conservation (43), they believe that the conservation program is the government's responsibility (5), they don't care about Lake Sebu (3), and they are afraid the money collected will not be used for the conservation program (1).

Table 6 shows descriptive statistics of the variables used in the regression while Table 7 presents the results of the binary probit regression conducted to identify the factors that influence the respondent's WTP. The sign of the

Figure 2. Bid function.

Table 6. Descriptive statistics.

Variable	Min.	Max.	Mean	Std. Deviation
Bid	10	300	107.16	98.42
HouseholdIncome	2,500	105,000	19,444.55	17,821.05
Age	19	84	43.99	11.61
Gender	0	1	0.26	0.44
Education	0	5	2.54	1.08
LSVisit	0	1	0.53	0.50
LSBusinessWork	0	1	0.01	0.11
LSRelative	0	1	0.19	0.39
LSFriend	0	1	0.31	0.46
Statement b	–2	2	0.96	1.15
Statement d	–2	2	0.20	1.40
Statement e	–2	2	1.40	0.94
Statement f	–2	2	0.63	1.44
Statement g	–2	2	0.86	1.22
Statement h	–2	2	1.26	1.06
Statement i	–2	2	0.82	1.18
Statement j	–2	2	1.06	1.13
MemberIPOrg	0	1	0.02	0.14
MemberEnvOrg	0	1	0.00	0.06

Table 7. Binary probit regression results.

Explanatory variables	Base model		Full model	
	Coefficient	Std. error	Coefficient	Std. error
Bid	−0.0057***	0.0007	−0.0062***	0.0007
Household Income	8.69e–06***	3.25e–06	7.38e–06**	3.63e–06
Age			−0.0125**	0.0055
Gender			0.0388	0.1434
Education			0.1424**	0.0640
LSVisit			0.0925	0.1385
LSBusinessWork			0.6308	0.5864
LSRelative			0.1828	0.1574
LSFriend			0.2032	0.1434
Statement b			−0.0127	0.0544
Statement d			−0.0337	0.0448
Statement e			0.0935	0.0741
Statement f			−0.0243	0.0447
Statement g			0.0347	0.0558
Statement h			0.0465	0.0588
Statement i			0.1943***	0.0610
Statement j			0.0520	0.0641
MemberIPOrg			−0.4062	0.4437
MemberEnvOrg			−0.2054	0.8716
Constant	0.1298	0.1056	−0.1837	0.3336
LR chi2	85.90		134.62	
Prob > chi2	0.0000		0.0000	
Log likelihood	−309.36		−284.09	

coefficient of each explanatory variable indicates only the direction (not the magnitude) of the impact of the variable on the likelihood of the respondent voting for and being willing to pay for the conservation program. The significant negative coefficient of the variable Bid implies that respondents are more likely to vote for the preservation program if the contribution that they will have to make is lower. The significant positive coefficient of Household Income, on the other hand, means that respondents with higher monthly incomes are more likely to be WTP. These outcomes are consistent with the economic theory of demand. The regression results further reveal that older and more educated respondents are more likely to vote and be willing to contribute to the conservation program. Gender does not turn out to be a significant factor. Answer to statement (i) – "I am willing to donate money for the conservation of *T'boli* culture" – is significantly positive, which adds credence to the WTP response. No other variable, including exposure to and knowledge of Lake Sebu as well as membership in environmental and culture-related organizations, is found to have a statistically significant influence on WTP.

The parametric mean WTP using the results of the basic model where only Bid and Household Income are used as explanatory variables is calculated to be Php 52.42 (USD 1.04). Using the Turnbull formula, the non-parametric mean monthly WTP is calculated to be Php 64.39 (USD 1.27).

CONCLUDING REMARKS

Using CVM, the mean WTP of Koronadal households for the conservation of Lake Sebu's natural resources and cultural heritage is estimated to range between Php 52.42– 64.39 (USD 1.04–1.27) per month or Php 630.08–772.68 (USD 12.45–15.27) per year, merely 0.26–0.33% of the mean household income. Multiplying the annualized WTP by the total number of households in Koronadal of 46,414 (based on 2019 *barangay* data), total potential annual contributions from Koronadal City would range from Php 29,244,533–35,863,170 (USD 577,841–708,618),

about 2.71–3.33% of the City Government's 2019 total revenues of Php 932,582,329 (based on Koronadal City Government Budget Office Report).

Even just a small fraction of this potential collection can support essential conservation efforts in Lake Sebu. Currently, conservation efforts are minimal in Lake Sebu. For the lakes where tilapia aquaculture is undertaken, ongoing activities include regular clearing and removal of water hyacinth, occasional seminars on proper feeding methods, and activities to promote sustainable and organic farming. Slash and burn or *kaingin* farming leads to soil erosion (in view of the sloping farmlands) and increasing deposits of sediments in the lakes, and the consequent reduction in water depth and water surface area of the lakes. Efforts to discourage, monitor, and police this destructive farming method appears to be inadequate and ineffective. Further, limiting the fish cage areas to the mandated maximum of 10% of total lake surface area has been strictly enforced and complied with only recently after the massive fish kills that occurred in 2017 and 2018. In the case of cultural heritage, projects are mainly done for tourism purposes, such as the showcasing of the arts and culture of the indigenous *T'boli* as part of its tourism attractions. There is no ongoing activity at all towards preservation. In *T'nalak* weaving, for instance, the designs conceived and passed on by Lang Dulay (a National Living Treasures awardee for her *T'nalak* designs) to her followers are slowly being forgotten and are not passed on to the younger generations. The same can be said of the *T'boli* language, music, and arts. The younger generations are becoming less and less familiar with their indigenous culture and history. For both natural resources and cultural heritage, there is yet no comprehensive conservation and management plan. The major constraint in this endeavor is the lack of financial resources (LSMPDO 2016).

The WTP amount estimated in this study may or may not be actually collected from Koronadal residents. If collected, it will be in line with the payment for ecosystem services, a scheme where people deriving benefits (Koronadal residents) from an ecosystem (Lake Sebu natural resources and cultural heritage) contribute financial resources to reward local (Lake Sebu residents) initiatives to forego resource-destructive income-generating activities and to undertake projects to restore and conserve the natural resources and cultural heritage so as to ensure continuing enjoyment of benefits (Greiber 2009). Alternatively, the contribution may be sourced from Koronadal's local government coffers. In this way, Koronadal residents are indirectly making contributions through their tax payments and shares in the city's revenues and internal revenue allocations from the national government.

There are many communities or groups of people that benefit from the natural resources and cultural heritage of Lake Sebu. Koronadal households comprise just one of these groups. The benefits of all the other groups must likewise be estimated and aggregated to come up with total benefits that can be compared with the total costs of a conservation program to fully assess its viability. These tasks warrant further research.

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