

# Differences between Households and Commercial Water Users Willingness to Pay for Improved Water Supply: A Case in Calbayog City, Philippines

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**Abstract** - *The study explores the differences between households and commercial water user's willingness to pay (WTP) and their reasons for WTP for improved water supply. Random sample of water user from local water district were interviewed about their WTP. Meanwhile independent t-test and logit regression were used in determining the differences of two groups and predicting the variables that would affect the willingness to pay respectively. Independent sample t-test shows that the two groups' have no significant differences on awareness on Calbayog Pan-as Hayiban Protected Landscape (CPHPL), WTP, Bid Amount, and Income which theoretically would affect its perception on WTP. Meanwhile, Bid Amount and its Awareness on CPHPL showed to be a significant predictor of households and commercial water users WTP. However, it is unlikely that PES would be successful in the area since only 46.6% are willing to pay out of 445 respondents both household and commercial water users. Nevertheless, the analysis was able to estimate a value of Php 4,858,105.92 for the protection of watershed area. Awareness campaign about CPHPL in the city of Calbayog and its importance to water supply in general prior to implementation of watershed protection program and collecting user fees among water users. Likewise, if PES would be implemented, the incremental user fee should be studied carefully as this would affect the water users (e.g. direct beneficiary of watershed) likelihood to participate in the protection program of the CPHPL.*

**Keywords:** *willingness to pay, contingent valuation, payment for ecosystem services, domestic water use, protected area*

## INTRODUCTION

In the Philippines, domestic and industrial water and irrigation systems were supplied by the watersheds. However, the country is facing today its diminishing forest cover that give impact to the watersheds condition of the country. Of the country's total forestland area of 15.88 M hectares, only 5.4 M ha are covered with forests and fewer than a million hectares of these are left with old growth forests. Over-exploitation of the forest resources and inappropriate land use practices have disrupted the hydrological condition of watersheds, resulting in accelerated soil erosion, siltation of rivers and valuable reservoirs, increased incidence and severity of flooding, and decreasing supply of potable water [1].

For instance, in the case of Calbayog Pan-as Hayiban Protected Landscape (CPHPL), the CPHPL serves as a source of water supply in the whole Calbayog City particularly for household and

commercial use including irrigation and hydroelectric water. However, the CPHPL also faced threat among people who are unaware of its environmental services. As discussed in the study of Malabarbas and Celeste [2], there are still activities in the upland areas which are detrimental to the protected area like illegal quarrying and slash and burn farming.

CPHPL as a source of water supply in Calbayog City through the Calbayog City Water District (CCWD) has also faced problems like insufficient water supply among its concessionaires during dry season. It is widely observable that water supply is insufficient and cannot suffice the need of the households especially every morning. In addition, the growing population and economic development of Calbayog City can greatly affect the water supply distribution. In this case, water supply is both important to household and commercial establishments, however, given the current supply of water from CPHPL, there is

a looming water insufficiency or water poverty in the locality.

In order to have a sustainable water supply watershed protection is highly encouraged. In this regard a payment for ecosystem services (PES) can be explored. Accordingly, Whittington and Pagiola [3] mentioned that PES can provide raw data as inputs for policy making in collecting revenues for watershed protection. To circumvent proper implementation of watershed protection it needs a mechanism to generate funds for its program. Since it is hypothetical, a well-known method like contingent valuation (CV) can be used to elicit economic value which could be used for PES.

Many studies have been conducted to assess the WTP for improved water supply using contingent valuation study [4]–[7]. Most of these are geared towards the improvement of water supply services and better quality of water. Results though vary from each studies. In the above cited studies, most of respondents are willing to pay for improved water services. However, some people also gave different value towards water. For instance in Akulam village where water was the biggest problem in some communities. This scenario does not mean that people will directly pay for water utility system [8]. While studies have been conducted also to conserve watersheds using WTP [9]–[12].

The main purpose of their studies is to determine the willingness to pay for improved water supply by focusing on the domestic water use by households and commercial water users. It is important to note that these two groups have different water consumption levels and thus it is hypothesize that the two differs in their WTP. Hence, a contingent valuation method (CVM) using WTP was then conducted.

### **OBJECTIVES OF THE STUDY**

The study generally aimed to develop payment for ecosystem services in Calbayog Pan-as Hayiban Protected Landscape for improve water supply. More specifically, to determine the factors that affect the willingness to pay for improved water supply; determine the differences of households and commercial water user's willingness to pay; and estimate the value of watershed protection of the CPHPL for its sustainable water supply.

### **METHODS**

#### **Study Area**

The study was conducted in Calbayog City on August 2017- January 2018 where Calbayog Pan-as Falls Hayiban Protected Landscape (CPHPL) is

located. CPHPL is one of the proclaimed protected areas in the Philippines that was proclaimed in 1998. It has a total land area of 7,832 hectares that is situated at between the two political districts of Tinambacan and Oquendo. The Calbayog Pan-as Falls Hayiban Protected Landscape served as the major watershed area of Calbayog City and the nearby municipality of Sta. Margarita, Samar. This protected landscape has two major river basins such as the Hamonini River and Hibatang River. It comprises of two parcels, Parcel I (Pan-as) has an area of 2,680 has ranges from 20 to 620 meters above sea level, while Parcel II (Hayiban) with an area of 2,387.92 ha ranges from 60 to 460 meters above sea level; characterized by rolling to very steep terrain, with slope category of 40 to 50%. Calbayog Pan-as Falls Hayiban Protected Landscape is part of the Samar Island Natural Park (SINP). The Samar Island Natural Park is a protected area established by virtue of Presidential Proclamation No. 442 in August 2003 which is under the NIPAS Act of 1992 [13].

### **Respondents of the Study**

The respondents of the study were household and commercial water users with connection to Calbayog City Water Districts (CCWD). There were 13,498 water concessionaires comprising of household water users and commercial/industrial water users as of August 8, 2017. The selection and sampling of respondents used Slovin's Formula with 5% margin of error. More specifically, the researchers used random numbers generated from [www.randomizer.org](http://www.randomizer.org) to select the list of water users to be included in the survey.

### **Elicitation of Bid Amounts**

Focus group discussions (FGD) was conducted among household and the industrial water users to elicit the bid amounts used in the determination of WTP. Bid amounts ranges from Php 5, 10, 15, 30, 40 and 50 and were assigned randomly among the respondents.

### **Survey Instrumentation and Design**

Dichotomous-choice referendum format was used and adopted from the study of Calderon [12]. Two sets were used: First CV question only covered the respondent's willingness to pay for watershed protection, without stating that other watershed users were obliged to contribute. Second CV question (CV II), on the other hand, stated that all watershed beneficiaries were to contribute for payment for environmental services for watershed protection. These questionnaires were designed to avoid any

misinterpretation in the respondents' valuation of the environmental good [14].

The questionnaires were composed of four parts, namely: 1) background of the study particularly the details of the respondents' water sources, uses and expenditures, and awareness about watersheds; 2) assessment of the respondents' WTP for improved watershed management, presentation of the information of their water supply situation in their municipality, the role of forests and watersheds in sustainable water supply, the proposed trust fund, and WTP elicitation; 3) assessment of the respondents' payment vehicle, or institutional arrangements, including the appropriate mode of payment; and 4) socioeconomic characteristics of the respondents.

Then, these questionnaires were translated into local dialect (e.g. Waray) for the easy understanding of the respondents. Prior to the conduct of the survey, two rounds of pre-test were conducted to facilitate the validity of the questionnaire being used.

#### Data Gathering Procedure

Prior to the survey, request letter to the villages involved in the study was secured. Training of enumerators and face-to-face simulation using the CV questionnaire was conducted. It was emphasized during the training that watershed pictures should be shown to the respondents to be fully aware of the contingent question to be posed later in the WTP question. Personal interview was conducted to these water users in Calbayog City for two months. Meanwhile, key informant interviews (KIIs) were conducted to water district manager.

#### Data Processing, Coding and Analysis

Excel and SPSS 21 was used in data processing. Descriptive analysis were used to describe the profile of the respondents. Meanwhile logit regression and t-test were used to answer the factors affecting WTA and

the differences of households and commercial water users.

#### RESULTS

Basic to valuation studies is to describe the socioeconomic profile of respondents in order to have a thorough analysis and interpretation of the variables under surveyed. In this study, the researchers determined the characteristic of the two (2) categories of respondents namely the household and the commercial establishments. There were 274 household respondents and 171 from the commercial establishments.

#### Socioeconomic Profile of Respondents

Age determines the level of maturity of individual in their decision on WTP. As presented in Table 1, for the household respondents, the mean age of the household respondents is 50.95 years old, while the commercial establishment respondents belong to middle age for its mean age posted is 44.40 years old.

In terms of residency, the household respondents obtained a mean year of 30.03, while, commercial establishments respondents have a mean years of residency of 27.50 years. Based on this data, majority of the respondents are residing for more than 25 years in their community/house. It shows that many of the respondents are high school graduates. Meanwhile, the average income of the two groups does not greatly vary. Unlike with the average bill of the commercial users which is far greater than the household users. Same with the average water consumption of commercial compared with the household users. However, in the average bid amount, the two groups have almost the same value of their WTP.

Majority of the respondent both from household (138 or 61.9%) and from commercial establishments (108 or 63.2%) were women, whereas 85 or 38.1 % from household respondents and 63 or 36.8 % from commercial establishments are men.

Table 1. Socioeconomic profile of respondents in Calbayog City

Profile	Households		Commercial	
	Mean	s. d.	Mean	s. d.
Age	50.95	13.80	44.21	14.75
Number of Years Residency	30.03	19.26	27.50	20.29
Educational Attainment	5.54	2.27	5.97	2.028
HH Income *	11,233.99	16,200.9	12,374.93	16,149.25
Average Bill*	956.74	4,801.60	1,906.00	3,418.074
Average Consumption (cm3)	15.02	7.89	50.17	91.65
Average Bid Amount *	24.79	15.72	24.44	15.16

Note: \* - HH income, average bill, average bid amount is expressed in pesos (Php)

Meanwhile most of the respondents both from household (149 or 71.3%) and from commercial establishments (116 or 69%) are married. It implies that wives are available during the conduct of the study hence the data shows that mostly married female were interviewed. Also, many of the household respondents are unemployed (42.5%) compared to the commercial users (25.5%). A valid observation also is that 51.5% are self-employed for commercial users while only 26.4% are self-employed among household's users.

### Water Use, Source and Expenditure

#### Source of Water

Almost half of the respondents both from household (114 or 48.7%) and commercial (18 or 69.85%) choose Calbayog City Water District (CCWD) as their highest source of water; 96 or 41 percent for household and 41 or 24.3 percent perceived that the water supply came from CPHPL. It implies that respondents have an idea that their source of water were taken through their connection in the CCWD, but not totally aware that CCWD main water source is significantly provided by the CPHPL.

#### Alternative Water Sources

Most of the household respondents (52.9 %) have no alternative source of water. It means that households are dependent from the CCWD as their water source. While for the commercial establishment majority of them respondents have alternative water sources. It can be concluded that commercial establishments other sources of water and can access water aside from CCWD. Those who have water sources rely on water vendor (49.2%), deep well (31.9%) and rain water (13.3%). From the survey it appears that commercial water users have more access to water vendor compared to household water users. While rain water is most common among household users than commercial users. It can be conjectured that household users cannot afford water from vendors unlike to commercial users.

### Availability of Water

With regards to water availability, there are 116 or 48.9 percent of the household respondents responded that the water supply is highly available within 24 hours in their household; 99 or 41.8 percent were moderately available (16 hours). As assessed by the commercial establishments, they don't have problem on the availability of the water and they affirmed that they access water daily from 8 hours to 24 hours.

### Respondents General Attitude, Behavior, Awareness of Watershed

As can be gleaned in Table 2, only 23.6% of the respondents are aware of the environmental programs and projects that is initiated by the government. It means that majority of the respondents have no awareness or not aware about CPHPL as compared to those who are aware. Then, most of the respondents are not also knowledgeable (214 or 58.6%) about watershed as compared to those respondents who knows about watershed (41.4%). However, 132 or 51.8% of these respondents have knowledge that CPHPL is a watershed reserved area while the rest are not aware. Likewise, majority of the respondents are also aware that forest and watershed are important to water supply (95.8%), while only 24 or 4.2% have no knowledge about this. Then, 209 or 54.7% of them have read books about environment, while, 173 or 45.3% haven't read books about environment. As to the membership to environmental organization, majority (84.3%) of the respondents have no any membership and only 57 or 15.7 percent of them are involved and members to environmental organization.

Both of the respondents agreed that it is managing watershed is importance to sustainable water supply (95.2% for the household respondents and 91.8% for the commercial establishment respondents). It can be concluded that the respondents believing so much that watershed in Calbayog City should be given importance for its sustainable water supply.

Table 2. General Attitude, Behavior, and Awareness of Watershed

Statements	Response	Household		Commercial		Over-all Perception	
		f	%	f	%	f	%
1. Knowledge on environmental programs and projects from the government	Yes	52	22.2	42	25.5	94	23.6
2. Aware about CPHPL	Yes	73	31.5	56	38.6	129	37.8
3. Know what a watershed is	Yes	96	42.3	55	39.9	151	41.4
4. Aware that CPHPL is watershed reserved area.	Yes	81	48.5	51	58.0	132	51.8
5. Forest and watershed are important to water supply.	Yes	211	94.6	145	92.4	364	95.8
6. Read books about environment	Yes	120	56.10	89	53.0	209	54.7
7. Member of environmental Organization	Yes	33	16.3	24	14.19	57	15.7

Table 3. Reasons for Willingness and Non-Willingness to Pay

Indicators	Respondents				Total	
	Household		Commercial		f	%
<b>Not WTP</b>	f	%	f	%	f	%
I cannot afford to pay any amount to what I am currently paying.	51	27.1	41	38.7	92	31.3
<b>WTP</b>						
I want more reliable water supply.	46	38.7	41	58.6	87	29.6

### Reasons for Willingness to pay and Non-willingness to pay

As can be gleaned in Table 3, both household and commercial establishment respondents have the same responses on their non-willingness to pay for the protection of CPHPL. One of the main reason is “cannot afford to pay any amount to what they currently paying” (31.3%). Thus, it could be inferred that concessionaries are not willing to pay for additional water tariff for they don’t have budget for the payment ecosystem services of the CPHPL as the headwater water source of the locality. On the other hand, the main reason of the respondents on their willingness to pay for CPHPL is “they want more reliable water supply” as shown in table 3.

Furthermore, the data imply that concessionaries’ topmost reason for their willingness to pay is they are concern for the continuous supply of water supply for drinking, domestic and commercial purposes. They are also looking for the ecological services will be continued for the benefits of human and environmental condition.

When asked if they are “willing to pay for CPHPL for improved water supply,” both the household and commercial establishment respondents are not willing to pay for the CPHPL for an improved water supply for it obtained a frequency response of 220 (53.4%) while, only 192 (46.6%) are willing to pay. It means that more respondents are not willing to pay as compare to those who are willing. This is less than half of the total respondents which indicates a low for the possibility of developing PES in the area.

### Payment Mechanism

Both the household (55.8%) and the commercial (29.9%) perceived that the most appropriate mechanism in collecting the watershed management and protection fee is the addition of this amount to their water bill and the management of this by the council (158 or 46.2%). Only a little percentage (7.3%) responded that PAMB should managed the fund. This

is favorable for the water consumers since it will be automatically added to their monthly bill and less hustle. With the provision that based on the survey, volume of water used (46.9%) should be the basis too. The second option would be fixed rate regardless of volume of water used (26.6%). Only a few have accepted that number of members of household (8.9%) should be the basis.

### Differences between household and commercial water users WTP

Since there were two groups of water users in the study, the researchers also assessed if this would be a significant predictor to WTP. It is hypothesized that commercial water users would be more likely to pay than household water users because of the income disparity. The model passed the multicollinearity and heteroskedasticity test. In addition, their knowledge on CPHPL would affect their WTP. From the table below, it appears that there are many household and commercial users who are willing to pay if they are aware of the CPHPL as watershed area.

Table 4. Awareness of CPHPL and WTP of water users

Indicator	Households WTP		Commercial WTP		Both		
	NO	YES	NO	YES	NO	YES	
Aware that CPHPL is protected area	NO	50	36	21	16	71	52
	YES	39	42	23	28	62	70
<b>Total</b>		<b>89</b>	<b>78</b>	<b>44</b>	<b>44</b>	<b>133</b>	<b>122</b>

Thus, to distinguish WTP between the two groups, independent sample t-test was also conducted using the following variable (e.g. Bid amount, type of water user (HH and Commercial), Aware towards CPHPL and income). The results show that there is no significant difference between households and commercial water users in terms of their WTP, bid amount, income, awareness about CPHPL.

Table 5. Differences in WTP of water users

Indicators	Group						95% CI for Mean Difference		t	df
	Household			Commercial			Upper	Lower		
	M	s. d.	n	M	s. d.	n				
WTP	.456	.499	241	.479	.501	171	-0.121	0.075	-0.46 <sup>ns</sup>	410
BID	24.79	15.71	241	24.44	15.160	171	-2.696	3.392	0.22 <sup>ns</sup>	410
Income	11,234	16,200	241	12,374	16,149	171	-4,594.09	2,312.20	-0.65 <sup>ns</sup>	347
Aware CPHPL	.485	.501	241	.579	.496	171	-0.224	0.035	-1.44 <sup>ns</sup>	253

Note: ns @  $p - value > .05$

Table 6. Logit model of two water users with their perception of CPHPL.

Variables	B	S.E.	Wald	df	Sig.	Exp(B)
HH Income	0.000	0.000	1.421	1	0.233	1.000
Type of Water User (if HH)	-0.013	0.320	0.002	1	0.968	0.987
Aware about CPHPL	0.881***	0.316	7.796	1	0.005	2.414
Constant	0.722	0.392	3.391	1	0.066	2.059

Note: \*\*\* - significant at  $p < .01$

Logit analysis was then conducted to see if these variables would predict their WTP. From the variables presented above, the following equation was derived:

$$\text{Logit (WTP=1)} = \beta_0 + \beta_1 \text{Bidamount} + \beta_2 \text{TypeofWaterUser} + \beta_3 \text{AwareofCPHPL} + \beta_3 \text{Income} \quad (\text{eq. 1})$$

It appears in Table 10, bid amount and being aware of CPHPL explains their WTP. The analysis showed that for any increase in bid amount, their WTP would decrease by 5.8% and the odds would increase by 94%. On the other hand, for any increase unit in awareness about CPHPL, WTP would increase by 88% and the odds would be 2.4 times more likely to pay.

From the descriptive analysis of the previous discussion, only 51 % of the total respondents were aware of CPHPL as watershed reserved area. This validates the results in our regression analysis as significant predictor. Furthermore, this situation posed us to suggest that information dissemination and awareness campaign is important in the WTP of these two groups.

#### Estimation of Watershed Protection for CPHPL

Based on the logit analysis, the following predictors were used to estimate the mean WTP per month using the equation:

$$\text{Logit (Y=1)} = .722 + .881 \text{AwareCPHPL} - 0.058 \text{bidamount} \quad (\text{eq. 2})$$

For the aggregate WTP, the computation was done using the population of Calbayog City as of 2017 which is 37,000. After which it was multiplied by the percentage of respondents who were willing to pay (46.6%) in the survey. Results shows that at least Php

281.76 per year was the respondents WTP for improved water supply and an aggregate of Php 4,858,105.92. The result would also be used as the conservative estimate of the economic value of the CPHPL.

#### DISCUSSION

The study explored the possibility of developing payment for ecosystem services in CPHPL through a contingent valuation method using WTP approach. Based on the results, the factors affecting water users WTP were bid amount, and awareness of CPHPL. It was found out that there were no differences in the WTP for both household and commercial water users. In this sense, it is concluded that the two groups have the same impression on the watershed protection program regardless of their socioeconomic status (i.e. income). This would mean that their income does not affect WTP regardless of the amount of money they have. In like manner, this would suggest that money is not an issue on their case. Unlike many other valuation studies disclosed that income justifies the WTP. But rather, its information about the watershed area. If the people would be informed about such programs and also about the CPHPL, most likely the WTP to participate will increase. This claim is supported with the positive results in the regression analysis.

On the one hand, the estimated Mean WTP per year is Php 4,858,105.92 or Php 23.48/month. This can be

considered as a safe estimate on the watershed protection program if there is such a need to implement this. Moreover, below this estimate would mean underestimating the value of watershed areas from the perspective of the two groups. Although economist argues that WTP estimates are underestimate compared to real market values. But since we are selling hypothetical goods, these estimates are valid in this case.

Nevertheless, the estimated WTP should not be an end itself, but also a means to benchmark the possible water user's fee or increments in the water bill intended for the watershed protection program and for the sustainability of water supply.

### CONCLUSION AND RECOMMENDATION

Since both household and commercial water users were not in favor of the watershed protection program, other agencies directly benefiting from water supply should spare an amount for the ecosystem user's fee. This could come from NIA and SAMELCO (local electric company). As much as the watershed protection is concern, lobbying between the two groups of water users will not be difficult as long as proper information dissemination is conducted ahead of time. Unfortunately, based on results of the study, the two groups were not willing to pay. This number of votes is below to what is expected of, as such the possibility of developing water user fee in Calbayog City for sustainable water supply is definitely not advisable.

Intense information dissemination about the CPHPL as protected area should be strengthened and environmental campaigns be mainstreamed in the City of Calbayog.

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