Protection Value of Maasin Watershed in Iloilo, Philippines

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Abstract

This study ascertained the dependency of people's Willingness To Pay (WTP) for the protection of Maasin Watershed. The people' WTP aims to ensure the provision of a reliable water supply for the households and implement measures protecting the Maasin Watershed. A total of 400 respondents who were the direct beneficiaries and stakeholders were interviewed using the Contingent Valuation Method (CVM). Majority of the respondents showed a WTP for the protection of the Maasin Watershed, with the computed mean annual WTP of Php 221 per household. Data were analyzed using multiple linear regression analysis. Findings further showed that parameters of income, household perceived groundwater as main source of water, and alternative water source were found to be statistically significant. In the same way, predictors of religion, water availability and water safety were found to be statistically significant. Household income, alternative source of water, and religion have a positive relationship with WTP. Its positive coefficients indicate that as the independent variable increases, the dependent variable also increases. Conversely, significant negative coefficients indicate that as the independent variable increases, the dependent variable decreases. However, there was an inverse relationship between WTP and household perceived groundwater as main source, water availability and water safety, due to the lack of awareness of the respondents about the source of raw water supply that comes from the Maasin Watershed that reduces the WTP for Maasin Watershed reservation.

Keywords: contingent valuation method, Maasin Watershed, willingness to pay

The Maasin Watershed reservation was declared by the government as a critical watershed (Salas, 2004) since it was the source of drinking water of the residents of Iloilo City and the neighboring towns. The 6,738.52 hectares occupied by the Maasin Watershed reservation serves as the source of water of the Metro Iloilo Water District (MIWD). Such was mandated through Proclamation No.16 dated February 12, 1923 by Governor General Leonard Wood. Accordingly, this covers the municipalities of Maasin, Cabatuan, Santa Barbara, and Pavia. It also served the National Irrigation Administration system in the municipalities of Pavia and Santa Barbara to irrigate agricultural lands.

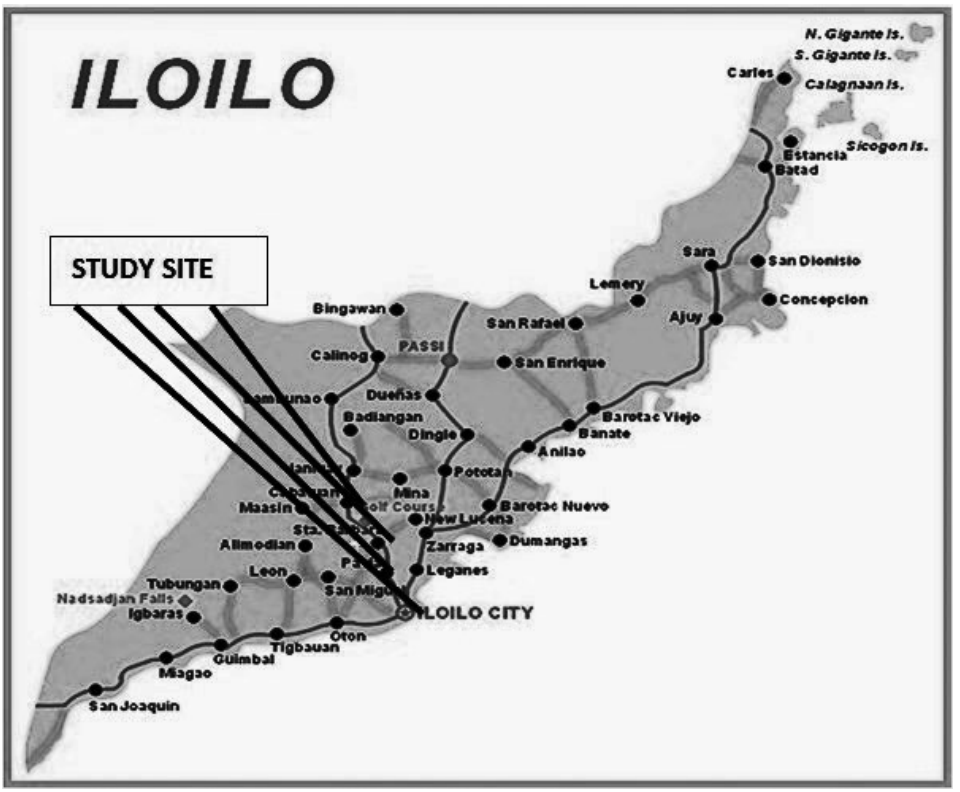

Figure 1. Map of Iloilo showing the city and municipalities benefited by the Maasin Watershed. (Source: Local Government of Iloilo Province Map)

Issues surrounding the water shortage in the dam of the Tigum River escalated, and the cessation of water supply to the city since 2000 following dry seasons due to non-existent flow in the Tigum River near the city's off-take has generated controversy and arguments over who and/or what has been responsible for the water shortage and what could improve the situation (Alexander, Miller, Jovanovic, & Moglia, 2009).

Iloilo City and the neighboring towns of Maasin, Cabatuan, Sta. Barbara, Pavia, San Miguel, Leon, Oton, and Alimodian, with a population of more than 806,315 (National Statistic Office, 2010), have been experiencing problems in supplying water to the residents and industries. The problem is especially pronounced during the dry season when water rationing becomes common in many areas in the metropolis. Rapid population growth, increasing incomes, industrialization, commercialization, and urbanization have all contributed to the increase in the demand for municipal and agricultural water uses (Tabios & David, 2002). Unfortunately, the increase in demand did not have a parallel increase or improvement in the quantity and quality of water available for these uses.

The Maasin Watershed reservation is presently confronted with interrelated problems (Francisco & Salas, 2004). The major problem faced is the denudation of the watershed. It is triggered by specific problems such as presence of stakeholders who earn their livelihood through upland farming, illegal encroachment, and presence of stray animals that destroy the planted trees. Also a threat to the successful management of Maasin Watershed is the difference and "turfing" mentality. This is the lack of interest on the part of the key actors of the program.

Given this growing demand for water, and with the deterioration of water facilities and the hydrological limitation of groundwater extraction, it is expected that there will be higher costs of maintenance and extraction of water or fast depletion of groundwater supply. Given this scenario, assessing peoples' valuation of the Maasin watershed protection is important.

In addition, the study probed to estimate the value for the protection of Maasin Watershed reservation in Iloilo that looked into the WTP of respondents to assess the potential of raising locally sourced funds for community-based reservation projects that will be implemented in order to ensure sustainability of the city's domestic water supply. Specifically, it sought answers to the following questions:

1) What is the status of the Maasin Watershed reservation?
2) What are the socio-economic characteristics of the respondents in the protection of Maasin Watershed?
3) What is the awareness, behavior, and attitudes of the respondents toward watershed protection?
4) How much is the WTP of the respondents for the protection of the Maasin Watershed reservation?
5) What are the factors affecting respondents' WTP for the improved management of the watershed?

Thus, a reliable estimate of the value for protection of Maasin Watershed is needed for water resource management and protection. These are also useful for program and budget justification and are needed for budget allocation, land management planning, resolution of policy conflicts, and project investment analysis.

Methodology

This study was conducted in the three municipalities of Iloilo: Cabatuan, Sta. Barbara, Pavia, and Iloilo City as direct stakeholders of the Maasin Watershed. This study tried to capture and estimate the WTP for the Maasin Watershed protection value. Primary data were taken from 400 randomly selected respondents through personal interview using a validated structure interview schedule from October until December 2013. Descriptive statistics were computed to generate distribution of responses of the respondents. To determine the factors affecting WTP bids, WTP model was specified and estimated with R-squared procedure of multiple linear regression analysis. Correlation analysis was used to examine the occurrence of multicollinearity among explanatory variables. Linear regression model was used to test significance of WTP difference between locations. All statistical computations were availed through the Statistical Package for the Social Sciences (SPSS) software.

Respondents

The sampling frame for the household survey was composed of all the respondents in the different impact areas of the Maasin Watershed reservation. Impact areas were classified as flood prone areas, irrigation, and domestic water supply beneficiaries. A random sampling was observed during the entire survey. Informed consent was obtained by affixing signatures of every participant in the study after giving adequate information about the purpose of the study.

Selection of Survey Respondents

The computation of sampling size followed the formula by Cochran (1977 in Bartlett, Kotrlik, & Higgins, 2001) used for the household survey.

$$n = \frac{t^2 pq}{d^2}$$

Where: n= total sample size

t = value for selected alpha level of .025 in each tail =1.96 (the alpha level of .05 indicates the level of risk the researcher

is willing to take that true margin of error may exceed the acceptable margin of error

pq = estimate of variance

d = acceptable margin of error =.05, error that the researcher is willing to accept

p = maximum possible proportion of stakeholders

$q = 1-p$, produces the maximum possible sample size

The proportion of household beneficiaries was estimated at 50% from the three municipalities and one city, but it turned out to be 77.08% (Table 1). This was used to derive the maximum variance which will also produce maximum sample size (Bartlett et al., 2001).

Table 1

Summary of Household Beneficiaries by Location

Municipality	Total Population of Barangays Served along the Maasin Watershed	No. of Household Beneficiaries	% to Total Household	% to Total Household
Cabatuan	19,098	4,017	21.03	21.03
Sta. Barbara	25,525	4,280	16.77	16.77
Pavia	25,198	4,381	17.38	17.38
Iloilo City	113,039	24,755	21.90	21.90
Total	182,860	37,433	77.08	77.08

Specification of Willingness to Pay Model

The value for the protection of Maasin Watershed reservation was hypothesized as a function of the socio-economic characteristics of households, awareness of and attitudes toward watershed preservation, and other variables. The model was specified as follows:

WTP = f (AGE, SEX, CSTAT, RELIG, EDUC, RESIDYEAR, HHSIZE, INCOME, MAASINAWARE, VISITTO, READBOOK, MEMORG, PERWAT, AGRIUSE, FLOODEX, ALTWAT, AVWAT, WATQUAL, SAFWAT)

The definition of variables used among the respondents' WTP for the protection of Maasin Watershed are summarized in Table 2.

Table 2

Definition of Variables Used in the Willingness to Pay for the Protection of Maasin Watershed

Variable	Description
Dependent Variable	
Willingness to pay (WTP)	Willingness to pay of household for the protection of Maasin watershed for water: 1 if yes, 0 otherwise
Independent Variable	
A. Socioeconomic Characteristics	
AGE	Age of respondent (years)
SEX	A dummy variable for sex: 1 if female, 0 otherwise
CSTAT	A dummy variable for civil status: 1 if single, 0 otherwise
RELIG	A dummy variable for religion: 1 if Roman Catholic, 0 otherwise
EDUC	Number of school years of household head or representative
RESIDYEAR	Number of years the household is residing in the area
HH SIZE	Number of household members
INCOME	Household monthly income (Php)
B. Awareness, Behavior and Attitudes of the Households toward Watershed	
MAASINAWARE	A dummy variable of respondents' awareness about Maasin watershed: 1 if aware, 0 otherwise
VISITTO	A dummy variable of visit to Maasin watershed of respondent: 1 if yes, 0 otherwise
READBOOK	A dummy variable if household or household representative read nature books or listen to environmental news: 1 if yes, 0 otherwise
MEMORG	A dummy variable if household or representative is a member of environmental groups: 1 if yes, 0 otherwise
C. Water Use, Source and Expenditure	
PERWAT	A dummy variable if household perceived ground water as main source of water: if yes, 0 otherwise
AGRIUSE	A dummy variable of water used for agricultural purposes: 1 if yes, 0 otherwise
FLOODEX	A dummy variable if household affected by floods: 1 if yes, 0 otherwise
ALTWAT	A dummy variable of alternative water source of household: 1 if used only water districts, 0 otherwise
AVWAT	A dummy variable of water availability of household: 1 if less than 24 hours of hours of water supply, 0 otherwise
WATQUAL	A dummy variable of water quality of household: 1 if highly accepted, 0 otherwise
SAFWAT	A dummy variable of water safety of household: 1 if safe, 0 otherwise
D. Other Variable	
BID AMOUNT	

Statistical Data Analysis

Descriptive analysis was used in the study using the SPSS software. Descriptive statistics such as frequency counts, percentage, means, standard deviations, cross tabulation, and F-test were computed to generate a distribution of responses of the respondents. To estimate an overall monetary valuation, the researcher calculated a total WTP for respondents.

Using WTP as the dependent variable, the researchers used multiple linear regression. Univariate analyses were performed between each of the possible predictor variables (gender, marital status, level of education, employment, annual household income, etc.) and the dependent variable using ordinary least-squares linear regression.

Variables associated with WTP with a $p<0.10$ and $p<0.05$ in the univariate analyses were considered in the multiple linear regression model. Two-sided p values were reported for all analyses. A p value of less than 0.10 and 0.05 is be considered statistically significant.

Results and Discussion

The Maasin Watershed, located 30 kilometers from Iloilo City, is composed of brush lands, forest vegetation, rice fields, and other agricultural land (Francisco & Rola, 2004). The land covered by the watershed regulates the water flowing through the rivers, controls the rates of recharge and discharge from the aquifer, and provides natural resources such as branches, firewood, herbs, and fibers to upland communities. Because the Maasin Watershed is the main source of water for Iloilo City and as irrigation source of 2,900 hectares of riceland, it was declared a reserved area in 1923. Historically, it has been managed by different governmental institutions such as the Department of Environment and Natural Resources (DENR), the MIWD, and the Local Government Unit (LGU). These governmental institutions are responsible for maintaining the dynamics of the Watershed to secure the provision of ecosystem services (Salas, 2005).

Status of the Maasin Watershed Reservation

The Maasin Watershed reservation is situated in Maasin, Iloilo, a municipality located in the western part of Iloilo Province. The watershed lies along the geographical coordinates of 10” 56’ to 11” 55’ latitudes and 122” 26’ to 122” 27’ longitudes (Figure 1). The Maasin Watershed reservation has an area of 6,738.52 hectares and bound by the municipality of Alimodian on

the southwest. It is surrounded by 16 barangays and 80 sitios (sitio is a local term for zones which are the smaller units of a barangay or village).

A matrix to analyze resource management (Table 3) during the various periods in the Maasin Reserve history was constructed to clarify the resource condition, the management conditions, and the institutions at work.

Demographic and Socio-economic Profile of the Respondents

Majority of the respondents are females and married. It is part of the Filipino culture for the wives to stay at home and attend to household needs while the husbands financially provide for the family. Thus, it is not surprising that the survey covered more women than men. The average age is 42 years old and the mean household size is composed of 5 members and the greater percentage of the respondents are Catholics and were educated with a degree or units earned in the college level. Their average annual income is at Php 341,573.00. When compared to the annual per capita poverty threshold of the Philippines, it is only Php18, 935 in 2012 released by the National Statistical Coordination Board (NSO, NCSB, 2012), Iloilo in Region VI has the annual per capita poverty threshold of Php18,827. Therefore, the household income on the average of the respondents' was relatively much higher.

Awareness, Behavior, and Attitudes toward Maasin Watershed Reservation

Respondents gave a high level of importance to protect and preserve the Maasin Watershed reservation. More than half (54.8%) of the respondents considered preserving and protecting the Maasin Watershed reservation as very important.

With increasing recognition of the contribution of watershed services to water security, more and more emphasis has been placed on determining the value of these services. People have started to realize that they need to invest in the maintenance of watershed services, just as they invest in the maintenance of other types of infrastructure. Without such investments, specific watershed services that are beneficial to downstream users are likely to be degraded (Smith, de Groot, Perrot-Maître, & Bergkamp, 2006).

Table 3

Resource Management in the Historical Periods of the Maasin Watershed

Periods of Historical \ Transect	Resource Situation Maasin Reserve	Resource Management Situation	Institutions at Work
Pre-exodus	Lower portion utilized by town as residential and agricultural area w/ agri- industrial facilities. Upper portion stayed as old growth forest.	Benefits accrued locally. Resource managed by those who benefited from the resource.	User-management Local government municipal and provincial.
No Man's Land	Delineated watershed was for potable water use of the City.	Benefits and cost accrued remotely. Resource managed remotely.	Local administration of a central policy and a quasi-public corporation – the water district.
War Time	Area became an open access space as safe refuge of the population.	Benefits accrued locally: both original occupants and migrants.	User management.
Economic Adjustments	Resources utilized: Land and water.	Conflict of resource use. Upland and locals needing the land; lowland and city folks needing water.	Local administration and its quasi-government franchisee. Local government municipal and barangay.
Rehabilitation and Another Virtual No Man's Land	Rehabilitation for Water utilization. Replanting of land with fast growing tree species. There was a temporary loss of water in 2000 to 2002.	Downstream civil society intervened. Upstream civil society co-opted/ organized by local administration not to utilize land. Water distribution franchisee upgraded water utilization facilities due to increased demand. society still administration's organized people's	Central policy implemented. Local government established multi- sector body for the whole river basin. Civil society upstream and downstream participated in multi-sector body. Upstream civil controlled by local organizations (PO).
2000 and Beyond	30% of the reserve still cultivated by upper barangays. 40% of the area covered by stable tree plantation, 20% covered by fruit trees with stunted growth and unpalatable areas 10% old growth	A fresh look into the land-use conflict. Opportunity for the provincial multi-sector body of the local government to forge new agreement on land use and experiment mechanisms for environmental service payment. Opportunity for local administration to experiment a new partnership with local government with rationalized responsibilities and new roles.	LGU Civil society Local administration in a multi-sector body.

Note: Adapted from Francisco and Salas (2004).

The Maasin Watershed reservation has various functions and uses of varying economic and ecological importance. Respondents considered the Maasin Watershed reservation important for its ecological balance and hydrological function. The Maasin Watershed reservation is perceived to be useful to ecological balance and local water cycle that improve or maintain regular flows of water throughout the year and maintain water quality and quantity for downstream users. As population grows, demand for water and watershed services will increase. This shows that respondents perceived that the watershed should be maintained, preserved, and protected.

Analysis of the Contingent Valuation Method

The study found that majority (90.2%) of the respondents are willing to pay a specified bid amount for watershed protection. To determine what motivates people's willingness to pay, respondents who were willing to pay the bid price were asked to identify their reasons for their willingness to pay for watershed protection. Bautista (2003) also provided possible explanations on willingness to pay of beneficiaries for watershed protection services. Beneficiaries would likely be willing to pay if there are threats to their present water supplies if future supplies are uncertain and they would like to guarantee their future needs, if there is an explicit policy mandating users to pay and the government is capable of enforcing such a rule, thus, discouraging free-riding, if utility of the service to their economic activities is clearly realized, and if there is confidence in the proper use of funds. For the study, 87.8% of the respondents specified that they would like a more reliable water supply.

For the study, the main motive given by those non-willing to pay is inability to pay any additional amount to what is currently being paid by the household which is considered to be a valid "no" response or zero bid. Bautista (2003) offers various conditions on why beneficiaries of watershed protection services would not be willing to pay; non-willingness to pay may be associated with communities recognizing their rights to good water quality and that access to it has no constraints; users are already used to obtaining services for free; there is no existing law requiring them to pay; inability or lack of income to pay; and, high resistance from powered entities.

Respondents Who Are Willing to Pay

Majority of the respondents (90.2%) said they were willing to pay to protect the Maasin Watershed reservation. The high percentage of positive

response means that the study was able to obtain the appropriate respondents and explained clearly the scenario. Some respondents were aware of the Maasin Watershed reservation but they were constrained from paying. A small number of the respondents (9.8%) were not willing to pay.

The finding of this study is comparable to other studies; Bulayog (1998) found out that 52.90% of the households were willing to pay for the preservation of Mount Pangasugan in Leyte. Choe, et al. (1996), conducted a study in Davao City, found out that 85% of the households were willing to pay for the city-wide water quality improvement.

Reasons for Giving Zero Bids

Only 39 respondents (9.8%) said they were not willing to pay for the protection of the Maasin Watershed reservation. Those respondents were classified as "valid" zero bidders. "Valid" zero bidders are those in favor of the protection program but are constrained from paying because they cannot afford to pay or are incapable of paying.

Factors that Influenced the Respondents' Decision to Pay

Several factors contributed to the decision of the respondents to pay to protect the Maasin watershed reservation. Generally, 87.8% of the respondents were willing to pay because they wanted to have more reliable water supply and to make the watershed continue to produce other environmental services like flood control, biodiversity conservation, recreation, and carbon sequestration.

Mean Values of Contingent Valuation Bids

The average value quoted by the respondents for the protection of the Maasin watershed reservation was Php221 (Table 4). However, statistical analysis showed no significant differences in the bids, which implied that the WTP format used was reliable.

The mean annual WTP bid is more or less the similar to the findings of other related studies conducted in the Philippines. Predo (1995) found out that households are willing to pay an amount of Php104.84 for the preservation of Lake Danao National Park in Ormoc City, Leyte. Choe, Whittington, and Lauria (1996) obtained a WTP bid of Php120.00 from households for the water quality improvement in Davao City. On the other hand, Bulayog (1998) obtained a lower WTP bid at Php65.31 for the preservation of Mount Pangasugan in Leyte.

Table 4

Mean Values of the Respondents' Willingness to Pay to Protect the Maasin Watershed Reservation by Location

Location	Number of Respondents	Mean Value Per Year (Php)	F-value (Pr>F)
Cabatuan	42	223.10	2.336 ^{ns}
Sta.Barbara	46	160.87	
Pavia	47	200.00	
Jaro District	265	236.42	
Total	400	221.00	

Note: ns = not significant, WTP means across different location categories are not significantly different at 0.05 level

Factors Affecting Respondents' Willingness to Pay

Using multiple linear regression method, the researchers investigated one dependent variable (WTP) and nineteen independent variables. The relationships between WTP and the nineteen independent variables are shown in Table 4. The multiple linear regression shows the estimated coefficients, *t*-statistics, *p*-values, and a 0.05 and 0.10 significant levels.

The WTP Regression Model

There were 23 explanatory variables which were originally included in the model to estimate the respondents' WTP for the protection of the Maasin watershed reservation. These variables were based on the review of literature of factors affecting WTP bids for the watershed protection. Of these variables, only 19 variables were finally considered in the model. Multiple linear regression analysis was used to predict the value of one or more responses from a set of predictors. It is used to estimate the linear association between the predictors and responses. As indicated by signs, significant coefficients, and t-ratio, the linear regression analysis model performed well in explaining variations in response to the contingent valuation equation.

Thus, the WTP model:

$$Y = f(X_i)$$
$$Y = 133.53 + 0.001\ INCOME - 13.38\ PERWAT + 13.39\ ALTWAT + 27.05\ RELIG - 14.07\ AVWAT - 11.41\ SAFWAT$$

Table 5 shows that the WTP for the protection of the Maasin Watershed reservation was significantly affected by the household income, religion, households perceived ground water as main source of water, alternative water source, water availability, and water safety. The rest of the variables were not significantly different from zero, which implies that they did not affect the respondents' WTP for the protection of the Maasin Watershed reservation.

Household income was found to be highly and positively correlated with WTP, being significant at 0.05 level. This finding is consistent with the computed mean values of the amount quoted, which vary across different income groups. Its positive sign indicated that the higher the income, the higher the amount the respondents are willing to pay. As those respondent annual income increased by Php1,000, the amount quoted by those respondents is increased by Php1.00 These results conform to the studies of Bulayog (1998), Choe, et al. (1996), Predo (1995), Pope and Jones (1990); and Bennett (1984), who found that WTP was larger on the average for households with larger income.

The findings showed that households perceived groundwater as main source of water was statistically significant at 0.05 level and had a negative effect on the household's WTP for Maasin Watershed protection. This implies that respondents were not fully aware that their source of raw water supply for domestic consumption comes from the Maasin Watershed. Studies of Choe, et al. (1996), and Lee (1997) observed similar findings on groundwater and WTP for the improvement of water quality and for estimating the ability of water users to pay for the water supply improvements and protection of the natural good and the benefits that would be generated by these improvements.

The alternative source of water (used water district connection and water vending) is another key determinant of WTP with positive relationship at 0.05 significant level. It shows that when water district and vendors charge higher prices for water, the welfare levels of the households deteriorate, as they divert resources from the consumption of other goods to water. The welfare of the people could be improved if there is improvement in the supply of water so as to make consumers of water maintain the existing level of utility they are used to. Closely connected with this is the average expenditure of the households on water vending and on water district connection. Since expenditure on water from water district and vendors takes a part of the households' income, the implication is that higher expenditure on water from this source reduces the utility and increases the WTP on the Maasin Watershed protection for water supply. These results conform to and are evident in the studies of Hensher,

Rose, and Greene (2005); Adenike, and Titus (2009); Moffat, Motlaleng, and Thukuza (2011); and Wendimu, and Bekele (2011). These studies were informed that WTP was larger on the average by the recognition of the importance that proper management of water resources has on global socio-economic development.

Religion has a positive significant impact on WTP for the protection of Maasin Watershed reservation since almost all of the respondents were Roman Catholics. The tradition of Catholic social teaching offers a developing and distinctive perspective on environmental issues and are integral dimensions of ecological responsibility.

The results of the study revealed that the water availability of household was statistically significant at 0.10 level, but with a negative sign when regressed on WTP for the protection of Maasin Watershed reservation. The negative sign means that the more a household consumes water with less than twenty-four (24) hours of water supply, the less that the household is WTP to have improved water availability in terms of quantity. This finding conforms to the studies of Ogunniyi, Sanusi, and Ezekiel (2011); and Kaliba, Norman and Chang (2003) on estimating WTP on water availability.

The study showed that water safety of household has a negative impact and statistically significant at 0.10 level on WTP for the protection of the Maasin Watershed reservation. This implies that at any stage of budget allocation of the households for safe drinking water and/or reducing the risk for contamination, holding other things constant, the fee is deducted from household's income, thus reducing the WTP for Maasin Watershed reservation. Akter (2008), and Horonto and Harahap (2007), had similar findings on estimating willingness to pay for improved drinking water quality.

Table 5

Factors Affecting Willingness to Pay for the Protection of the Maasin Watershed Reservation

Variable	Coefficient	T-statistic	p-value
(Constant)	133.533	2.564	0.011
AGE	0.028	0.055	0.956
SEX	-8.283	-0.714	0.476
CSTAT	-13.551	-1.014	0.311
RESIDYEAR	-0.216	-0.587	0.558
EDUC	0.740	0.379	0.705
RELIG	27.054	1.657	0.098*
HHSIZE	-1.319	-0.582	0.561
INCOME	0.001	13.367	0.000**
MAASINAWARE	-12.211	-0.949	0.343
BEENTO	-2.593	-0.191	0.849
PERWAT	-13.378	-2.015	0.045**
AGRIUSE	2.872	0.213	0.832
FLOODEX	12.973	1.206	0.228
READBOOK	-5.579	-0.568	0.571
MEMORG	-12.300	-0.946	0.345
ALTWAT	13.386	2.281	0.023**
AVWAT	-14.073	-1.687	0.092*
WATQUAL	10.127	1.068	0.286
SAFWAT	-11.406	-1.748	0.081*

Note. Linear Regression model; R-squared = 0.370
** Significance at 0.05 level
* Significance at 0.10 level

Test for Multicollinearity of the Model

A single correlation analysis was used to test for multicollinearity of the variables included in the model. To determine the severity of multicollinearity, correlation coefficient values between the two variables should not exceed 0.8 or 0.9. If it existed, then multicollinearity is a severe problem. The variance inflation factors were also determined in the regression analysis. The Variance Inflation Factor ("VIF") provides a measure of how much the variance for a given regression coefficient is increased compared to an event when all predictors are uncorrelated. The VIF were the diagonal of $(X' X)^{-1}$. If any variable is orthogonal to all other explanatory variables, then its

inflation factor is 1.0. Multicollinearity exists when degree of the values of the inflation factor is greater than 1.0., implying that the variable in question is not orthogonal to the rest. A value of 5.0 or more is used by some as an indicator of severe multicollinearity (Judge, Hill, Griffiths, Lutkepohl, & Lee, 1988). The correlation coefficients and VIF indicated no problem in the existence of multicollinearity in the model.

The study also tested for the existence of multicollinearity using the Pearson's correlation test. The presence of one or more large bivariate correlations with rho coefficient of 0.8 and 0.9 are commonly used cut offs which indicate strong linear associations, and suggesting collinearity may be a problem (Mason & Perreault, 1991). The results rule out the presence of severe multicollinearity in the model as the coefficients of correlation (rho or ρ) were below the established rule (ρ<0.8 and ρ<0.9) for all other variables. Again, the VIF calculation also justified the absence of severe multicollinearity in the model. Now, the model from the perspective of an entire bundle of independent variables as well as individual independent variable demonstrates its ability to predict the outcome variable.

Measures of Goodness of Fit of the Model

Linear regression calculates an equation that minimizes the distance between the fitted line and all of the data points. Technically, ordinary least squares (OLS) regression minimizes the sum of the squared residuals. Statistically, this is denoted by:

$$Y = b_0 + b_1X_1 + b_2X_2 + \ldots + b_pX_p + e$$

In general, a model fits the data well if the differences between the observed values and the model's predicted values are small and unbiased. R-squared is a statistical measure of how close the data are to the fitted regression line. It is also known as the coefficient of determination. R-squared tests the goodness-of-fit of the model. R-squared value of 0.370 shows how the model explains 37% of variations in the dependent variable. By this, it is said that the model fits the set of observations. According to Mitchell and Carson (1989 in Amoah, 2011), the R-squared of 31% is quite reasonable in that, the reliability (reproducibility and stability) of CVM can be tested most easily by obtaining a respectable coefficient of determination (thus R2 ≥0.15 or 15%). This shows how the WTP variable is influenced by a set of independent variables (Arlinghaus & Mehner, 2004).

This implies that the expected value of WTP bid was explained by the significant explanatory variables under consideration, rejecting the null hypothesis.

Conclusions

In view of the findings, the following conclusions were drawn: Iloilo and the City Government had a great interest in preserving the main source of water for the City and the Maasin municipality wanted support to manage the watershed reserve. Degradation of the watershed was seen as the cause of increasing water scarcity and frequent floods. Three issues need to be addressed in discussing water scarcity problems, namely: (a) managing water supply, (b) managing water demand, and (c) establishing supportive social, legal, and institutional support systems for effective water management.

The economic valuation of environmental goods such as watershed using the CVM performed well in this study since probable biases were eliminated. It is also manifested by the respondents in the CV questions asked in the study. Thus, it is not surprising that the data on the socio-economic characteristics of the respondents revealed had reached collegiate (tertiary) education or completed a vocational 2-year course.

Since most of the respondents were aware of the watershed but unable to link reliable water supply with good watershed management, activities geared towards informing and educating the public must be carried out. A well-managed watershed and a change in the attitude among downstream users toward water that is recognized as a commodity that must be paid for contribute significantly to sustainable water supply management.

The presence of water problems and the recognized threats to water supply may be indicative of people's WTP to be certain of good water supply. A majority of the water users have expressed their willingness to support a watershed management program ensuring reliable water supply in the coming years not just for themselves but also for future generations.

The study revealed that the aggregate social WTP per year of all the stakeholders for the protection of Maasin Watershed reservation was Php 8 million when extrapolated to the total number of household beneficiaries of the Maasin Watershed. If properly planned, watershed protection program is presented to the different stakeholders. The government could generate financial support for the protection of Maasin Watershed reservation.

The results of the econometric analysis indicated that there is a systematic association between various socio-economic variables and the quoted WTP. Observing consistency of signs of coefficients of explanatory variables presents an indication of the theoretical validity of the model (Whitehead, Blomquist, Ready, & Huang, 1998).

Recommendations

Based on the results of the study, recommendations were drawn, and which would serve as important inputs to design future policies for watershed protection. An agency such as (DENR) may adopt an integrated, holistic approach in addressing the inherently interrelated issues of water supply planning and operation, demand management, pollution control, and watershed protection. The roles of LGUs must be strong in the environmental protection and hurt seek the collaboration and participation of both public and private sectors in a broad range of eco-governance initiatives.

On the methodological issues, the study showed that CVM is applicable and works well in a developing country setting. However, there is a need to validate the results of the study with other valuation methodologies.

Higher education of the populace may lead to mobilization of volunteerism in support of watershed conservation. Greater awareness of the link between watershed protection and water supply could convince the beneficiaries of watershed protection to pay the needed amount. If water consumers are targeted to provide payments for watershed protection, the cooperation of water districts or water providers must be sought. This is needed since these agencies are tasked to collect water bills. Obtaining broader support for the collection of watershed payments, requires strong political support, where an agency, fully supported by legislation, and with corresponding budget allocations, will be created specifically to handle environmental service payments. Payments for watershed protection can form part of the water bill. Such protection happens to be one of the environmental services being provided by upland farmers, who deserve to be compensated. All of these measures, once implemented, should lead to an efficient integrated water resource management in Iloilo and the country in general.

The study focused only on the protection value of the Maasin Watershed reservation. However, for land use options and budget allocation, policymakers need to know the optimum WTP for the different levels of watershed protection. Thus, it is recommended that a study should be conducted in the Maasin Watershed reservation that focuses on estimate, benefits, and costs from different levels of watershed protection.

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