

# Willingness to Pay for Conserving Layawan Watershed for Domestic Water Supply in Oroquieta City, Philippines

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## ABSTRACT

*The sustainability of domestic water supply from the Layawan Watershed in Oroquieta City critically depends on past and present conservation activities and the availability of funds from stakeholders such as households, communities, non-government organizations, private entities and government agencies. This study determined the willingness to pay (WTP) particularly of households in Oroquieta City to finance conservation projects in Layawan Watershed to ensure the sustainability of domestic water supply. A household survey of randomly selected 278 respondents was conducted using the dichotomous choice referendum format.*

*The Heckman's two-stage analysis for the parametric estimation of mean WTP yielded the values of PhP 4.00, PhP 6.00 and PhP 7.00 per month for mandatory, voluntary and pooled data sets, respectively.*

*The households are willing to contribute funds for conserving Layawan Watershed as supported by the total WTP of Oroquieta City's population that ranges from PhP 117,845.00 (from lower bound estimate of PhP 2.00) to PhP 471,380.00 (from upper bound estimate of PhP 8.00) in five years, discounted at 6 %.*

**Key words:** watershed conservation, willingness to pay, contingent valuation, Mount Malindang Range Natural Park

## INTRODUCTION

The Mount Malindang Range Natural Park (MMRNP) is an extensive natural forest in the Zamboanga peninsula. It is rich in biodiversity and source of ecosystem services supporting an estimated population of one million people in three provinces namely Misamis Occidental, Zamboanga del Norte, and Zamboanga del Sur. The forest cover in Mount Malindang has steadily declined over a number of years due to various stressors. This continued despite the passage of Republic Act 6266 setting the area aside as a National Park and Watershed Reserve in June 19, 1971 and Proclamation Number 228 proclaiming it as a natural park in August 2, 2002. The Layawan Watershed, which is drained mainly by Layawan River, is a part of the extensive Malindang landscape, being one of 15 major sub-catchments draining MMRNP.

This study on the economic valuation of Layawan Watershed looked into the willingness to pay (WTP) of stakeholders in Oroquieta City to assess the potential of raising locally sourced funds for community-based conservation projects that will be implemented in order to ensure sustainability of the city's domestic water supply. Sustainability pertains to securing both the quantity and the quality of water for the present and future generations.

While a number of researches on the biodiversity and

the indigenous communities have been conducted in the MMRNP, economic valuation of its natural resources remains relevant because of its potential for payments for ecosystem services. The specific objectives of the study are:

1. To determine if the nature of the payment scheme (mandatory and voluntary) and the provision of a money-back-guarantee significantly affected the willingness to pay of the respondents; and
2. To assess the consistency of relationships observed between independent variables and WTP with relevant economic theories.

## MATERIALS AND METHOD

A survey was conducted in Oroquieta City, the administrative capital of the province of Misamis Occidental. Oroquieta City is a fourth class city by income classification. It is bounded by the municipality of Lopez Jaena on the north, Aloran on the south, Concepcion on the southeast, and Sapang Dalaga on the northwest. The city covers a total area of 23,788 ha and has a population of 68,945 (*National Statistical Coordination Board 2010*) in 47 barangays.

A total of 278 households were selected using the

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simple random sampling without replacement. The sample was divided into two subsamples – 144 households for the mandatory payment scheme and 134 for the voluntary payment scheme, distributed across the lowland where

piped water distribution systems and payment mechanisms for water use are present. The interviews were administered only to household heads (i. e. husband, wife or an adult member that earns income and is involved in decision-



Figure 1. Location map of Oroquieta City, Misamis Occidental (Source: Department of Environment and Natural Resources, <https://www.mt.malindang.mu.edu.ph>).

making on finances). Technically, the household head is defined as an adult member of the family who contributes to the household income and who can decide on financial matters in behalf of the household (Indab et al. 2008).

An interview schedule was used for the survey so that interviewers would be able to clearly explain the questions and provide clarifications when necessary. Interviews are more likely have a higher response rate compared to the approach of self-administered questionnaires.

A Focus Group Discussion (FGD) was conducted in order to get relevant useful information and stakeholders' perception regarding the status of the watershed and water supply of the city. Information was used as input in the development and finalization of the questionnaire. Pretesting of questionnaire was conducted prior to the formal survey to assess the appropriateness and soundness of the institutions that were involved, the appropriate timing of payment, the technical and political feasibility of the program, and the clarity of the scenario and questions used (Indab 2008). Pretesting enabled the researcher to determine sections of the questionnaire which some respondents found vague or difficult to understand. Necessary revisions were made prior to the actual survey. All questionnaires were translated to Visayan language.

Referendum format was used where the respondents were asked how they will vote for a program for watershed conservation for a given monthly bid price for the next five years so that necessary activities will be implemented to avert the degradation of the watershed and to ensure its sustainability. The activities in the hypothetical scenario were reforestation, forest patrol and monitoring, and introduction of alternative livelihoods to upland watershed dwellers. Different bid prices were presented to the respondents and each time they reply "Yes", they were presented with a higher bid price until they respond with "No". The payment vehicle used was the water bill of the households since it is directly related to the ecosystem service that is being valued. The mandatory payment scheme meant that monthly water bill will have a monthly premium of a fixed price for the next five years. Hypothetically, the collected amount will be remitted to a non-government organization (NGO) that implements the projects. The organization will work in cooperation with the Protected Area Management Board (PAMB), the local government unit (LGU), and the community. The willingness to pay survey added a provision point mechanism (PPM) using money back guarantee (MBG) to determine if this will significantly affect the stated values.

### Statistical Analysis

Parametric and non-parametric analysis were used to estimate mean and median willingness to pay. Estimates

were done for three sets, namely: mandatory, voluntary, and pooled data.

The Kaplan-Meier estimator was used for the non-parametric analysis. Heckman's two-stage approach was used for the parametric analysis to identify variables that have a significant relationship with the WTP. The parametric estimation of mean WTP follows an approach similar to selection model using Heckman (1979) as cited by Khodaverdizadeh (2009). It is a two-step procedure to account for endogeneity and selectivity bias in evaluating the impact of bid price on WTP. First, a model of WTP as a function of income and socio-economic characteristics was estimated using a binary probit model that obeys the following latent model (Heckman 1979):

$$A_i^* = z_i' \gamma + \varepsilon_i, \quad \varepsilon \sim N(0,1)$$

$$A_i = 1 \quad \text{if} \quad \varepsilon > -z_i' \gamma \quad (1)$$

$$A_i = 0 \quad \text{if} \quad \varepsilon \leq -z_i' \gamma$$

where vector  $z_i$  represents variables associated with self-selection mechanism and vector  $\gamma$  denotes coefficients to be identified. Using equation (1), individual probit scores for each observation were computed and these were used to compute the "Inverse Mills Ratio" (IMR), an indicator of the latent characteristics of WTP.

Following the estimation of a WTP equation, ordinary least squares regression was used to measure correlates with bid price, incorporating the IMR as additional regressor, and using only the observations in the truncated sample with  $A_i=1$ :

$$y_i = \alpha + x' \beta + \sigma \hat{\lambda}_i + \omega_i \quad (2)$$

where  $y_i$  denotes maximum bid price per month;  $x'\alpha$  is a vector of socio-demographic variables;  $\alpha$ ,  $\beta$  and  $\sigma$  are parameter estimates; and  $\omega$  is the error term. The Heckman two-stage method is based on two assumptions, namely: (1) that the bid price effects of WTP decision are potentially correlated with unobserved characteristics of households who are willing to pay for water conservation program, or with unobserved characteristics of their households (referred to as latent characteristics), and (2) that WTP decisions have the potential to influence bid level. The first assumption results in estimates of bid price differences obtained from WTP of individuals. On the other hand, the second assumption results in the problem of error in the estimation (Khodaverdizadeh et al. 2009) in which the bid price estimates obtained under the assumption of homoskedastic error will be inefficient. The Heckman two-step method helps to avoid the selection bias by removing the part of the error which is correlated with the latent characteristics of households.



## RESULTS AND DISCUSSION

The Layawan Watershed consists of the Layawan sub-watershed, the Manimatay sub-watershed and the Panobigon sub-watershed. The watershed covers an area of 11,717.92 ha (*CARE Philippines 2004*). Layawan River is the main river that drains Layawan Watershed. Its headwaters originate at Brgy. Sebucal, Oroquieta City which is inside the core protection zone of the Mount Malindang Range Natural Park (*Hansel et al. 2006*). The study of *Hanselet al. (2005)* indicated that the main Layawan headwater stream up to the convergence point has a length of about 4,775 m. A study assessing the headwaters of the Layawan River found that there were 14-29 morphospecies of aquatic macroinvertebrates that are indicators of good water quality. The same study found that headwater streams have low ion concentration with total hardness values from 50-158 ppm, total alkalinity of 48-156 ppm and total dissolved solids of 89-240 ppm. The water quality is within the standards for recreational purposes. However, the presence of coliform in the sites sampled indicates that surface water is unfit for drinking. For information on the biodiversity of the Layawan riparian habitats, the reader is referred to *Hansel et al. (2005)*. Comprehensive studies covering the natural and social systems of MMRNP are available in the compendium of papers, *The Mount Malindang Experience (SEARCA-BRP 2005)*.

The Oroquieta City Water District (OCWD) which is the biggest water concessionaire in the city previously derived water from the Layawan River. However, the river was vulnerable to turbidity during heavy rainfall which resulted to the delivery of turbid water to the consumers. Due to this, the water district shifted sourcing to groundwater using electric pump. The OCWD employs chlorination for its treatment process. Water quality monitoring to detect the presence of coliform and to assess other parameters is daily conducted. Daily reports have consistently shown that there is no coliform contamination in the water supply (*personal correspondence with Ravacio 2010*). The water district charges households a fee of PhP 220.00\* for 10 m<sup>3</sup> consumed at minimum per month, translating to PhP 22.00 m<sup>-3</sup>.

Several barangays in the city have developed their own water systems using electric pump to draw up groundwater. Similar to the water district, the barangay water providers have their own piping system for distribution and meter to measure the amount of water consumed. However, the barangay-based water systems do not undertake regular coliform tests. Water bills are also lower and vary by barangay. Some charge a minimum rate of PhP 30.00, PhP 40.00, PhP 80.00 or PhP 100.00 m<sup>-1</sup>.

\*US\$ 1.00 = PhP 44.00

## Socio-demographic Profile of Respondents

Majority of the respondents are females and married. The average age is 49 years and the household size ranges from 1-14 members. The mean household size is five. A greater percentage of the respondents are Catholics and were educated with a degree or units earned in the college level (**Table 1**). Most have experienced giving donations for a cause. In addition, only a few are members of an environmental organization. The average monthly water bill of the households in Oroquieta City is PhP 306.00. Average monthly income is at PhP 10,074.00 which is higher than the estimated PhP 7,017.00 (*Virola 2011*) that a family of five in the Philippines needs in order to stay out of poverty.

Ninety-seven percent accepted the information provided in the survey while 3% did not, of which most rejected the provided scenario and declined to give a willingness to pay value. In the same vein, 73% of the respondents believed that if implemented, the proposed program will be effective in ensuring the sustainability of the water supply in Oroquieta City. A smaller percentage of 27% believed otherwise. This observation is consistent with the percentage of respondents who answered that they will vote positively for a referendum earlier described in the methodology section (**Table 1**).

## Willingness to Pay for Conserving Layawan Watershed

Seventy-four percent or 207 respondents declared that they would vote positively in a referendum for the establishment of a Layawan Watershed Community Conservation Fund that will finance conservation programs such as reforestation, community-based watershed monitoring and patrolling, and development of alternative livelihood programs for the upland dwellers (**Table 2**). On the other hand, 71 respondents or 26 % of the sample said they will vote otherwise.

If a referendum of the same kind will actually take place, the proposed program for watershed protection and conservation would be passed, implying the potential for raising funds from the water users of the city to promote the sustainability of the water resource.

The same observed trend is true if the subsamples for the two schemes are analyzed separately. For both the mandatory and voluntary payment schemes, more than half of the sample size agrees to support the implementation of the program.

For the mandatory subsample, the number of respondents that are willing to pay decreases with an increase in the bid price in increments of PhP 5.00. Those who responded with a 0 WTP value comprise only a quarter

Table 1. Socio-demographic characteristics of sample.

Characteristics		Frequency	Percentage (%)
Gender	Females	193	69
	Males	85	31
Civil Status	Married	208	75
	Single, separated, widowed	70	25
Age	10-20 years old	3	1
	21-30 years old	40	14
	31-40 years old	49	18
	41-50 years old	52	19
	51-60 years old	59	21
	61-70 years old	47	17
	71-80 years old	25	9
	81-90 years old	2	1
Household size	1-3	99	36
	4-6	136	49
	7-9	34	12
	10-12	8	3
	13-16	1	0*
Religious Affiliation	Roman Catholics	170	61
	Protestants	24	9
	Aglipay	42	15
	Mormons	8	3
	Seventh Day Adventists	7	3
	Iglesia Filipina Independente	7	3
	Others	20	7
Educational Attainment	No Education	1	0*
	Elementary	26	9
	Secondary	78	28
	Vocational/Technical	14	5
	Undergraduate	152	55
	Masteral	6	2
	Doctorate	1	0*
Gave donations the previous year	Yes	152	84
	No	28	16
Membership to an environmental organization	With membership (present or past)	72	26
	Without membership (present or past)	206	74
Water bill for the month before the survey	P0-100	60	22
	P101-200	45	16
	P201-300	72	26
	P301-400	37	13
	P401-500	30	11
	P501-600	16	6
	P601-700	6	2
	P701-800	2	1
	P801-900	2	1
	P901-1000	5	2
	P1001-1500	2	1
	P1501-2000	1	0*

\* - The percentage of zero is lesser than 1% rounded off.

of the sample. At the lowest bid price of PhP 5.00, majority of the respondents are willing to pay, comprising 38 % of the sample. The percentage value decreases at 30 % and 8 % for the bid prices of PhP 10.00 and PhP 15.00, respectively. Nearly similar to that of the mandatory subsample, 26 % of

the respondents for the voluntary sample gave a 0 WTP. The lowest bid price of PhP 5.00 comprises the highest percentage of 62 %. This is followed by 10 % for those who responded "Yes" to the bid of PhP 15.00. The lower bid of PhP 10.00 has the lowest percentage of only 2 %.

Table 2. Frequency and percentage of votes for the referendum.

	YES		NO	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Mandatory	108	75	36	25
Voluntary	99	74	35	26

### Results for Non-parametric Analysis

The willingness to pay values were subjected to non-parametric analysis (**Table 3**). Non-parametric analysis is an important component in the analysis of any contingent valuation study. The use of the non-parametric survival function allows for the estimation of mean and median willingness to pay values without depending on an ad hoc parametric assumption. This approach provides the lower bounds for the statistics and gives guidance for the choice of which parametric specification to use to obtain best estimates (*Bateman et al. 2007*).

### Results for Parametric Analysis

The Heckman two-stage approach was used for the parametric analysis of the data to determine the independent variables that significantly affect the WTP of the respondents, and based on these variables, to establish the function that determined the mean WTP values of the mandatory and voluntary subsamples. The estimates indicate coefficients and standard errors (**Table 4**). Significant 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.

Education is highly and positively correlated with the WTP. There is ninety-five percent certainty that respondents educated up to the college level are more likely willing to pay for the sustainability of the water supply than those who are not. This maybe because a higher education attainment could mean a better understanding of the functioning of ecosystems and the importance of protecting these ecosystems to ensure the delivery of ecosystem services. Respondents with higher educational attainment maybe more critical of the status of

natural ecosystems. For the effect of religion, there is a 90 % certainty that Catholics are more likely willing to pay for the good than those affiliated with other religions. A possible explanation for this can be gleaned from the answers of the respondents in the interviews conducted. Most Catholics conveyed that in the church, they are given occasional opportunities to engage in activities concerning the environment such as clean-up drives which allow them to exercise their concern for the environment. Respondents who are married are 90% more likely to be willing to pay than those who are not married. In all three sets of the analysis, the result showed that there is a 99 % certainty that those who agree to the payment vehicle or agree that their contribution are added to their monthly water bill for the next five years are more likely to have a positive willingness to pay. Those who are against adding a specific amount to their monthly water bill are more likely to be not willing to pay. Respondents who are members of environmental organizations are 95 % more likely to be willing to pay. However, environmental organizations in Oroquieta City are not necessarily concerned with forest protection. Previous experience in making donations to other causes is negatively correlated with the WTP. This indicates that those who have made donations to other causes in the past years are less likely willing to pay. This maybe because these respondents feel that another donation will exact an additional cost from their available income or it maybe because previous experiences show that their contributions have not been put to good and honest use.

Moreover, age was observed to be negatively correlated with WTP implying that the older the respondent, the lesser is the likelihood that he would be willing to pay. Environmental awareness was also seen as another factor that significantly affected WTP. The level of environmental awareness was determined by presenting a series of questions to the respondents and by scoring the answers based on the number of correct choices. The score for every question was then summed. Estimates suggest that the higher the environmental awareness of the respondent, the greater the likelihood that he would be willing to pay. However, when the respondent is aware that Mt. Malindang is the only remaining representative natural forest in the Zamboanga peninsula, the respondent is less likely willing to pay, as indicated by the negative coefficient. Two reasons maybe useful to explain this observation. First,

Table 3. Non-parametric estimation of mean and median WTP for unadjusted data.

	WTP (in PhP)		Standard Error		95% Confidence Interval	
	Mean	Median	Mean	Median	Mean	Median
Mandatory	10.00	7.00	1.25	-	8.00-12.00	-
Voluntary	13.00	5.00	4.39	0.10	5.00-22.00	4.80-5.20**
Pooled	12.00	5.00	2.24	0.11	7.00-16.00	4.78-5.22**

\*\* indicate significance at the 5%.

Table 4. Estimation of Heckman two-stage method data.

Independent Variable	First Stage Probit			Second Stage Linear Regression		
	Mandatory	Voluntary	Pooled	Mandatory	Voluntary	Pooled
Log of income	0.1176 (0.23)	0.3233 (0.25)	0.0867 (0.15)	0.1626*** (0.05)	0.4431*** (0.09)	0.2822*** (0.05)
Log of age	0.4830 (0.40)	-0.5949 (0.51)	0.0487 (0.30)	-0.3420*** (0.12)		-0.3505** (0.12)
Sex (1 if male; 0 if female)	-0.1762 (0.38)	-0.2771 (0.39)	-0.2520 (0.24)			
Education (1 if college level; 0 if otherwise)	1.0373** (0.41)	0.0089 (0.40)	0.5101** (0.25)			
Religion (1 if Catholic; 0 if otherwise)	0.1864 (0.37)	0.7154* (0.37)	0.4502* (0.24)			
Civil Status (1 if married; 0 if otherwise)	0.8129* (0.42)	-0.2745 (0.43)	0.1634 (0.26)			
Household Size	-0.0173 (0.07)	-0.1425 (0.10)	-0.0426 (0.06)			
Agreement to Payment Vehicle	3.6187*** (0.61)	2.7431*** (0.41)	2.7156*** (0.26)			
Environmental Organization	0.7481 (0.52)	1.0458** (0.50)	0.73** (0.31)			
Experience in Making Previous Donations	-1.1718** (0.58)	-0.1502 (0.53)	-0.4083 (0.31)			
Environmental Awareness	0.0013 (0.07)	0.0818 (0.06)	0.0206 (0.04)	0.0048* (0.03)		
Knowledge of the Importance of the Watershed for the Water Supply				0.3958* (0.22)		
Knowledge that Mt. Malindang is the only remaining representative natural forest in the Zamboanga peninsula				-0.3620** (0.13)		
Money Back Guarantee	-0.09	-0.34	-0.25			
Inverse Mill's Ration from WTP probit				-0.1654 (0.23)	-0.3305 (0.2272)	-0.3526 (0.1495)
Constant	-5.2663* (2.75)	-1.9014 (2.71)	-2.5604 (1.72)	1.2715* (0.66)	-2.0198** (0.80)	0.8351 (0.65)
R-squared	0.63	0.57	0.54	0.22	0.22	

\*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% levels, respectively.

Numbers in parentheses are standard errors.

this knowledge may have the effect of making the respondents in Oroquieta City feel confident about the status of the natural forest surrounding them, and consequently, the lack of grave urgency for its protection. It is a short-term view that does not look into how activities in the present may cause the degradation of the resource over time. Another possible reason is that, since it is the only remaining forest in the Zamboanga peninsula, the respondents feel that it is also the responsibility of other provinces to bear the costs of conservation. For this reason, respondents at Oroquieta City are less likely to pay to indicate that beneficiaries on a larger geographical scale must also pay to share conservation costs

equitably. In the actual study, the data was subjected to protest and certainty adjustment based on the responses for follow up questions on protest and certainty. The variables with income, bid price, and education as the significant variables.

Income is highly and positively correlated with WTP. This is consistent with standard economic theory. The higher the income, the greater is the ability of the person to purchase a particular good or service, and consequently, the higher is the likelihood that the person would be willing to pay. As income increases, demand for the good also increases. The



opposite is true for bid price as the independent variable. As bid price increases, the willingness to pay or the demand decreases. On the other hand, the provision of a money back guarantee does not significantly affect the WTP of the respondents.

For the parametric analysis, the  $R^2$  value is 0.63 for the first stage probit and 0.22 for the second stage linear regression which presents a good fit. Based on significant variables observe, **Table 5** shows the estimated mean WTP.

Table 5. Mean estimates from parametric analysis.

Mean WTP (in PhP*)		
Mandatory	Voluntary	Pooled
4.00	6.00	7.00
(LB**) 2.00	(LB) 5.00	(LB 7.00)
(UB***) 6.00	(UB 8.00)	(UB 8.00)
s. e. 1.07	s. e. 0.60	s. e. 0.43

\* - PhP 1.00 is equivalent to US\$43.

\*\* - LB means lower bound estimates

\*\*\* - UB means upper bound estimates

The overlapping values in the lower bound and upper bound estimates above indicate that significant difference between WTP for mandatory and voluntary payment schemes.

The estimated mean from the parametric analysis are PhP 4.00, PhP 6.00 and PhP 7.00 for the mandatory, voluntary and pooled sets, respectively. Annual values from these estimates discounted at 6 %  $\text{yr}^{-1}$  are PhP 235,690.00 for mandatory scheme, PhP 353,535.00 for the voluntary scheme and PhP 412,458.00 for the pooled set.

Considering results from non-parametric and parametric analysis, the highest estimate generated is the mean WTP (voluntary scheme) from non-parametric estimation. Using this value, the funds that will be generated is PhP 679,966.20, discounted at a rate of 6 % annually within 5 years, assuming the discount rate remains constant. These values are relatively lower compared to the findings of *Amponin et al. (2007)* indicating a PhP 15.00  $\text{mo}^{-1}$  WTP of water users for watershed protection in Tuguegarao City. The mentioned study estimated potential monthly revenue of PhP 312,240.00  $\text{mo}^{-1}$  and PhP 3,746,880.00 annually. The study of *Calderon et al. (2004)* for water user fee for the households in Manila using contingent valuation method yielded a WTP estimate of PhP 29.00  $\text{mo}^{-1}$ , significantly higher than the findings of this study. This is due to differences in the attributes of the respondents and the context within which the researches were conducted.

This study is premised on the essential link between upland and lowland communities and the management of

this link to improve the efficiency and effectiveness of conservation programs especially in the upland. Conservation experiences in various contexts in the Philippines have shown that effective natural resource management programs are never detached from the values, needs and participation of the local communities. The upland communities who directly depend on watershed resources for their subsistence and economic needs will largely benefit from assistance that will serve to organize, educate, and empower them to undertake sustainable resource utilization practices and to serve as the social fence for watershed protection.

## CONCLUSION AND RECOMMENDATION

Majority of respondents are willing to pay to finance conservation activities in the upland of the Layawan Watershed to ensure the sustainability of the domestic water supply on which the population depends. Estimated mean values vary between non-parametric and parametric results. The non-parametric approach determined that the mean willingness to pay (unadjusted) is PhP 10.00, PhP 13.00, and PhP 12.00 for the mandatory, voluntary and pooled sets, respectively. Estimates of the parametric approach are lower at PhP 4.00, PhP 6.00 and PhP 7.00 for the mandatory, voluntary and pooled sets, respectively. These differences however, are not significant.

Using the lower bound estimate of mean value (mandatory) from parametric analysis and the upper bound estimate (pooled set), both providing the lowest and highest estimates, annual values discounted at 6 %  $\text{yr}^{-1}$  were computed for the household beneficiaries of the city. When extrapolated to the population, collected funds in five years can reach PhP 117,845.00 at the most conservative estimate and PhP 471,380.00 for the highest estimate, basing only on parametric results. Using the mean estimate for mandatory (PhP 4.00), voluntary (PhP 6.00) and pooled (PhP 7.00), the discounted values within 5 years are PhP 235,690.00, PhP 353,535.00 and PhP 412,458.00, respectively.

Oroquieta City is only a parcel of the landscape within and depending on the services of MMRNP. Estimates from Oroquieta City present a potential to locally raise funds for the conservation of Layawan Watershed. Other municipalities and cities in the three provinces surrounding the natural park present opportunities for studies for an equitable sharing of conservation costs among the stakeholders of the landscape.

## Recommendations

In order to tap into the potential of generating funds for watershed conservation, it is important that the institutional arrangements are in place, and mechanisms for collection, utilization and monitoring are specified. The study suggested that the collection be done through a premium in



the water bill to be collected by the Oroquieta City Water District. The collection will then be turned over to a non-government organization that will serve as the implementing organization of interventions specified in the earlier part of this paper. The Protected Area Management Bureau (PAMB) will partner with the organization through the provision of technical guidance and expertise. While this arrangement was specified in the survey, there is a real need for an entity to take the lead in watershed conservation and to be willing to invest resources to initiate the formation of effective partnerships of the above-mentioned organizations. This partnership can then form the pool of expertise and capacities to design the program. Relevant issues such as delineation of tasks of implementing agencies and partners need to be clearly specified, as well as mechanisms for ensuring that the implementation is carried out to achieve targeted outcomes. PAMB plays a crucial role in providing technical expertise, facilitating the entry of activities to the protected area, and ensuring that program design runs parallel with the government's strategic plan in the utilization and protection of natural resources.

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