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Evaluation of the Villagers' Willingness to Work or Pay for the Promotion of Community-based Marine Protected Areas in Cagayan Province, Philippines

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This study was conducted to investigate the villagers' willingness to work (WTW) or willingness to pay (WTP) to promote community-based marine protected areas (MPAs) as a way of ensuring sustainability of coastal conservation initiatives. Results confirmed that in general, local residents are willing to voluntarily provide labor or money to help in patrolling and monitoring to maintain the ecological balance of the coastal and marine resources. The quantitative values and the determining factors that influence the WTW and WTP derived from this study can provide insights to resource managers and policy makers in coastal resource management.

Key words: marine protected area, willingness to work or pay, coastal resource management, Cagayan

1. Introduction

Marine ecosystems have been drastically deteriorating due to destructive fishing techniques, high extraction rates and deviations on ocean properties brought mainly by climate change. The establishment of marine protected areas (MPAs) is a popular strategy for fisheries management and marine ecosystem conservation as it limits the uses of a specific area to protect the resources by giving it a chance to recover from earlier damages, thereby providing long-term benefits for the environment and local communities. An MPA is any specific marine area that has been reserved by law and is governed by precise guidelines to manage activities and protect part or the entire enclosed coastal and marine environment (Miclat and Ingles, 2004).

In the Philippines, MPAs are established either nationally through the National Integrated Protected Areas System (NIPAS) Act or through local (municipality or city) government ordinance (White *et al.*, 2006). Nationally-initiated MPAs are managed by the national government through a multi-sectoral management board, Protected Area Management Board (PAMB), led by the Department of Environment and Natural Resources (DENR) while locally-initiated MPAs are generally small MPAs, managed directly by the local government units (LGUs) or people's organizations or combination of both. Consequently, funds to support MPA implementation comes from the national government (DENR-Biodiversity Management Bureau) and LGUs' internal revenue allotment respectively. MPAs customarily depend on several sources of funding, including government allocations, donations and trust funds, but all are subject to unpredictable fluctuations (Depondt and Green, 2006). The sustained support of the national or local government on the monitoring, patrolling and enforcement of regulations is essential to MPA sustainability. For that reason, one of the most crucial factors in managing effective MPAs is ensuring the availability of continuous financing.

To ensure long-term support and sustainability of MPA, a promising approach is to strengthen the community-based co-management. Community-based co-management is a scheme participated by the residents and external agents (e.g. government, academe, non-government organization) working together in the planning and implementation phases (Christie and White, 1997). Since the villagers are the main users of the coastal areas, they can be encouraged to enforce the fisheries laws to support the means of their sustenance and income.

Using stated preference methods such as contingent valuation method (CVM) and contingent behavior (CB), this research tried to disclose the economic values attached in the continued existence of community-based MPAs by asking the villagers hypothetical questions on their possible behavior. This study used CVM to asked respondents for their willingness to pay (WTP) and CB to measure their willingness to work (WTW). The monetary value of the opportunity cost of that behavior was further estimated to investigate the value of resource and environmental conservation from the perspectives of the villagers. Studies have utilized CVM to measure the recreational and

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conservation benefits of marine ecosystem particularly coral reefs in the Philippines using tourists as respondents (Arin and Kramer, 2002; Ahmed *et al.*, 2007) while CB were usually used in the evaluation of trip behaviors in recreational demand modelling (Englin and Cameron, 1996). While previous studies focused on tourists' valuation on MPAs, this study evaluates the villagers' WTW or WTP to support the existence of community-based MPAs in Cagayan Province, Philippines. Further, this study aims to contribute to the existing literatures on community-based management of MPAs and to generate information which is useful for the resource managers and policy makers in coastal resource management (CRM).

2. Study Sites and Methodology

1) Study sites

Cagayan Province is located in the northern Philippines with its coastal areas facing the Babuyan Channel and the Pacific Ocean making its economy to be basically capture-based fisheries and farming. To guarantee the conservation and protection of the marine resources, the national government and LGUs established MPAs. This study takes the case of a nationally-established MPA with a flourishing ecotourism and a locally-established MPA with emerging ecotourism activities.

Palaui Island Protected Landscape and Seascape (PIPLS) is a nationally-established MPA located in Palaui Island, *Barangay* San Vicente in the municipality of Sta. Ana.[1)] It can be reached in 25 minutes by boat from the San Vicente Port. The *barangay*, as a result, is composed of island and mainland residents. Representatives from 15 organizations formed the PAMB that acts as the policy and decision-making body of the PIPLS while a Protected Area Superintendent supervises the Palaui Environmental Protectors Association in the implementation of regulations in the island. The Visitor Center recorded a total of 7,250 visits from local and international tourists in 2015.

On the other hand, the San Jose MPA is a locally-based MPA established through municipal ordinance located in *Barangay* San Jose, Gonzaga. The MPA is managed by the San Jose Fisherfolk Association with the support of the local government. Loss of fishing opportunities for generating daily income for living is expected to be experienced by the villagers so the government established alternative livelihood projects to provide diversified and supplemental means of support to the community. The tourism activities are still emerging with its reef ecosystem periodically visited by a number of local tourists.

Table 1. *Barangay* profile and socio-economic characteristics of residents

Parameters/Barangay	San Jose	San Vicente	
		Island	Mainland
A. Barangay profile[a]			
Number of household	322	127	714
Total population	1408	728	3473
Land area (ha)	9914	2439	1261
Coastline (km)	14	30	12
B. Socio-economic characteristics of households[b]			
Average age of HH head	48	42	42
Average years in the village	38	31	33
Average years of fishing experience	24	19	20
Average HH size	4-5	5-6	4-5
Average annual HH income	121,000	35,000	80,000
Sources of income (% from annual HH income)			
Fishing & related activities	23.24	50.85	34.93
Agriculture	28.82	1.83	1.13
Tourist-related activties	0.00	25.39	4.48
Overseas remittance	9.85	0.00	1.73
Regular Job/Employee	20.86	18.85	25.86
Pension	0.00	0.00	3.20
Others	17.24	3.07	28.67

Source: [a]Municipal Coastal Environmental Profile; [b]authors' survey.

The *barangay* and socio-demographic profile of the study sites is shown in Table 1. Households in both study areas were highly dependent on the coastal resources, however, management of the resources is done voluntarily by the community members and so some villagers rather free-ride to those who willingly participate.

2) Methodology

The sample respondents used in this study were randomly selected from the 480 sample which was chosen through two stage sampling, both used a probability proportional to size (PPS) sampling, from an earlier socio-economic assessment carried out by the authors in the same study sites. A total of 300 and 100 respondents from San Vicente and San Jose respectively were selected for this study. Since the San Vicente is composed of island and mainland residents and to assess the difference in the elicitation method, the

1) *Barangay* is the smallest administrative division in the Philippines and is the native Filipino term for a village

mainland residents were divided such that one group was asked on WTW and another on WTP.

Using a well-designed questionnaire, face-to-face interviews were conducted by trained enumerators to individual respondents. To provide a comprehensive explanation in eliciting the WTW or WTP, interviewer used brochures showing the present condition of the area and a hypothetical scenario presenting a better condition of the marine resources and coastal environment if MPA is effectively managed through their participation in its monitoring and patrolling. Respondents were encouraged to truly think about the situation and ascertain the state of their time and monetary valuation as it entails opportunity costs.

To circumvent overestimation and bias common to CVM studies, the trichotomous choice was used as value elicitation format as it reduces the number of yes responses and produces a statistically significant decrease in WTW or WTP avoiding overestimation common to CVM studies (Loomis *et al.*, 1999). Using this format, the WTW or WTP question has choices of "yes", "no" or "no, but willing to work/pay less." The third option minimize the warm glow effect or polite rejection which is common in the culture of rural residents in the Philippines. The reasons for unwillingness to work or pay were also asked to verify the validity of answers and motives behind a negative response. Reasons that do not reflect people's welfare change from the services considered were classified as protest votes (Bateman *et al.*, 2002). Protest votes were considered as non-zero value response and were not included in further analysis (Loomis *et al.*, 1999).

The bids used for WTW were 0.5, 1, 3, 5, and 10 days/month while the bids used for WTP were 50, 100, 200, 300 and 500 pesos/month. Workdays and monetary bids used were decided based on the earlier household socio-economic surveys, key informant interviews and pre-testing of the questionnaire. The five bids of the WTW and WTP were equally distributed to questionnaires which were randomly used in interviewing the respondents.

For the statistical analysis, the WTW and WTP response data were designed as binary: 1 designated to yes responses and 0 to no or no but willing to work/pay less. The non-parametric method using the survival function was applied to estimate the mean and median values of WTW and WTP. The Logrank test was used to test the null hypothesis that there is no difference between the populations in the probability of acceptance at any bid in the survival function. The monetary values of WTW was calculated using the average daily income of respondents. The aggregated WTW and WTP were computed based on the number of households in the area.

For the parametric method, the voluntary work and payment behavior equations were estimated using the probit model. The dependent variable, acceptance of proposed bid, was first regressed to basic exploratory variables such as proposed bids, income and fishers dummy. After the regression diagnostic procedures, other important predictors were added and those not making significant effect at pre-assigned level of significance were deleted. The sign conditions of the factors specified to influence the WTW and WTP were examined.

3. Results and Discussions

After regulating the protest responses, the final number of responses considered in the analysis was 377; 288 for WTW and 89 for WTP.

1) Nonparametric estimation of acceptance probability curve

The internal validity of the behavior response confirms the overall pattern of the survivor function which showed a decreasing tendency of acceptance as the proposed bid in terms of voluntary patrol days or monetary amount is increased (Figure 1). Table 2 shows the result of nonparametric estimation of the acceptance probability.

San Jose residents have a mean WTW of 5 days per month which is comparable with San Vicente having a WTW of 4.5 days, though, there is no significant difference between them (Table 3). The almost the same WTW of the two *barangays* can be attributed to their direct jurisdiction on the MPA. Nevertheless, San Jose displayed higher median WTW which implies that most respondents accept bids higher than average. This further denotes that San Jose has relatively higher WTW. The intact population in San Jose could be the possible reason for this.

Similarly, there is no significant difference on the WTW of the island and mainland residents of San Vicente. However, the island survival curve is generally above the mainland which suggests greater WTW for island residents compared with the mainland. This reveals that residents within the MPA showed a higher disposition to support enforcement costs.

For the WTP, the mean is estimated at ₱187.50 (3.95US$/month at ₱47.43 = 1US$ average exchange rate

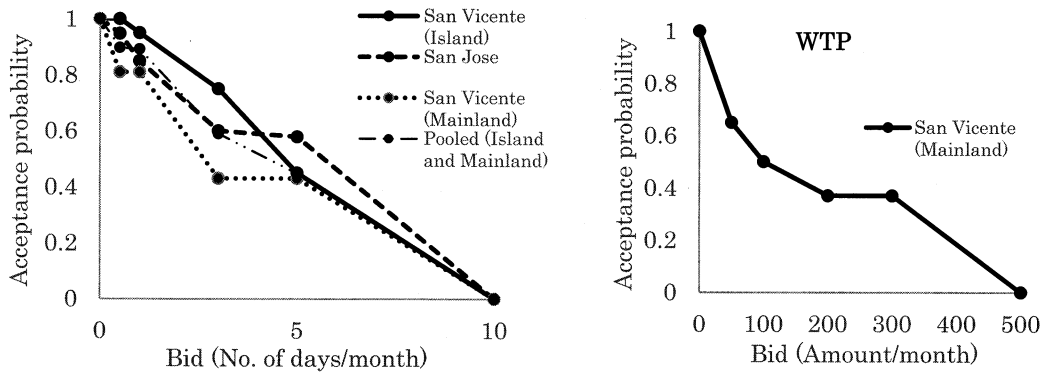

Figure 1. Nonparametric estimation of acceptance probability curve of WTW and WTP

Table 2. Result of nonparametric estimation of survival curve

Statistic	WTW (days/month)				WTP (₱/month)
	San Jose	San Vicente (Pooled island and mainland)	San Vicente (Island)	San Vicente (Mainland)	San Vicente (Mainland)
Median	5.68	4.26	4.67	2.63	100
Mean	5.01	4.56	5.01	4.03	187.5
Number of Household	322	841	127	714	714
Aggregated WTW/WTP	1614	3835	636	2879	133,875
Average Daily Income	195.5	224.67	144.3	251.3	-
Converted WTW in Monetary Term: Median	1110.8	957.2	673.9	660.9	-
Converted WTW in Monetary Term: Mean	979.9	1024.2	722.9	1012.7	-

Table 3. LogRank test on the difference of WTW acceptance probability curve

	Between San Jose and San Vicente	Between Island and Mainland
Test Statistic (Chi-square)	0.3	2.1
5% Critical Value of Chi-square (d.f. = 1)	3.84	3.84
Test result	accept	accept

in September 2016). Converting the WTW in monetary term and comparing it with the WTP estimates showed that the equivalent value of WTW is 3.9 to 5.4 times higher. This condition can be attributed to the insufficient labor market in the area and indicate the respondents' preference for money over time. This result manifests the phenomenon known as the endowment effect where respondents tend to overvalue something because they own it (Thaler, 1980).

Based on the villages' household population, the aggregated monthly WTW for San Jose is 1,290 days and 636 days for the San Vicente island. This means that it is possible to assign 40 residents from San Jose and 20 from San Vicente island for the daily patrolling. For the WTP, the aggregated value is estimated at ₱1.6 million (US$ 33,870) per year for San Vicente. If this amount is used solely for patrolling and considering the present average minimum daily agricultural wage in the province which is ₱280/person (₱6,160/month at 22days/month), this value is enough to pay 21 persons per month.

The average annual budget allocated for locally-established MPAs such as San Jose MPA is around ₱50,000 to 150,000 (US$1,000 – 3,000) while the PIPLS received budget from the national government depending on the proposed activities and from the generated user's fee which are primarily used for infrastructure and ecoutourism development.

2) Estimation of volunteer labor equation (WTW) and payment behavior equation (WTP)

To estimate the WTW and WTP equations using probit model, the loglikelihood ratio-Chow (LR-Chow) test was

initially used to evaluate the consistency of the coefficients in different regressions on different data. Based on 5% significance level, we rejected the null hypothesis that the coefficients of variables are equal among equations of the three data sets (San Jose, San Vicente-island and San Vicente-mainland). Table 4 shows the estimated probit model of the three data sets for reference.

The coefficient sign condition of proposed bid variable is negative and highly significant in all models implying that the probability to accept the proposed bid decreases as the bid level increases which is consistent with the welfare economic theory.

For the WTW model of San Jose data set, dummy variables on membership to fishers' association, gender and perception on the effect of a better environment to ecotourism showed positive sign conditions which suggest higher tendency to accept the proposed bid. A positive sign conditions on the dummy variables fishers and benefits from ecotourism were observed for San Vicente island data sets while fishers, membership to fishers' association and the number of years in the *barangay* were the determinants for San Vicente mainland data sets.

The result confirmed that fishers or members of fishers' associations showed a higher probability to accept WTW questions. This result opposes the findings that greater dependence leads to an increased likelihood of not conforming with marine resource conservation (Fox *et al.*, 2012) but supports the remarks which pointed that the more important the occupation of fishing is to the community, the more interested and committed they are in supporting conservation programs (Pollnac *et al.*, 2001). The result also validated the importance of securing benefits from ecotourism activities as an influencing factor to increase the tendency to accept proposed bid for WTW. In San Jose, where ecoutourism is still in infancy stage, perception that an improved environment increases number of tourist and tourism activities appeared to be significant factor affecting probability to accept WTW proposal. Similarly, income coming from tourism activities is a significant determinant for San Vicente island, where the MPA is located with

Table 4. Result of probit estimation

Variables	Explanation of variables	Volunteer Labor Equation (WTW)			Payment Behavior Equation (WTW)
		San Jose	San Vicente		San Vicente
			Island	Mainland	
Constant	Constant term	-0.1265(-0.222)	1.0198* (1.745)	-1.4192* (-1.782)	-7.9349** (-2.470)
BID	Proposed bid (days or amount)	-0.4568***	-0.5523***	-0.4379***	-0.0044***
		(-4.647)	(-4.275)	(-4.129)	(-3.813)
logHHinc	Natural logarithm of annual HH income	-	-	-	1.6822*** (2.612)
dsex	Sex of respondents (dummy: 1 = male; 0= female)	1.2118** (2.627)	-	-	-
yrsbrg	Number of years in the *barangay*	-		0.03101**(1.984)	-
dfis	Fisher (dummy: 1= yes; 0 = no)	-	1.1381** (2.458)	2.0146***(4.095)	-
dFA	Member of fishers' association	1.9566***	-	1.3577***	0.611*
	(dummy: 1 = yes; 0= no)	(2.560)		(2.868)	(1.746)
dIncTou	Received income from tourism	-	0.9388**	-	-
	activities (dummy: 1 = yes; 0= no)		(2.071)		
dTourism	Believed that better environment	0.9435* (1.837)	-	-	-
	increase number of tourist and tourism activities (dummy: 1 = yes; 0= no)				
	Number of observations	96	100	92	89
	Log-likelihood	-27.5468	-24.4204	-28.3874	-43.7413
	McFadden's R Square	0.5725	0.6294	0.5545	0.261
	AIC	65.094	56.84	66.78	95.48

Note:1) ***Statistically significant at the 1% level or better; **at the 5% or better, * the 10% level or better.

2) Value in parenthesis is z-value.

thriving ecotourism activities. In addition, male respondents have a higher probability of accepting the WTW question in San Jose which is anticipated considering the physical demand of MPA patrolling and maintenance. The longer years of residency in the *barangay* also contributed to the WTW of San Vicente mainland residents which can be attributed to their sense of belongingness in the area. For WTP, income and membership to fishers' association were significant variables with positive sign conditions. This suggests that higher income respondents and members of fishers' associations are more likely to accept the WTP questions. With the same trend on the effect of income, Ahmed *et al.* (2007) concluded that high income respondents put a premium on environmental conservation compared with the lower income and thus conservation value is intensely related to capacity to pay.

4. Conclusions and Implications

This study confirmed that in general, local residents (in both nationally and locally established MPAs) are willing to voluntarily provide labor or money to support the patrolling and monitoring for the sustainable use of the coastal and marine resources. Notwithstanding the difference in governance level, villagers who are directly managing the MPA have higher WTW than those who have less participation on patrolling. This is confirmed by the results: $WTW_{San\ Jose} = WTW_{island} > WTW_{mainland}$. Prospects on ecotourism, which is seen as a possible source of income, increase the tendency of villagers to accept volunteer labor bids while income is an important factor in signifying payment behavior. Meanwhile, the aggregated WTP is huge enough to cover the prevailing cost of maintenance and patrolling of the PIPLS. While this research is informative about the potential of patrolling activities, the quantitative values can only serve as guide to resource managers and policy makers in the management of MPAs (i.e budgetary support for the conservation of the resources). In relation to this, the following are implications for the advancement of CRM: (1) promotion of community-based co-management; (2) acceptability of money or labor contributions and (3) development of ecotourism can boost WTW of villagers within the MPA.

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