



XV WORLD FORESTRY CONGRESS

Building a Green, Healthy and Resilient Future with Forests

2–6 May 2022 | Coex, Seoul, Republic of Korea

Tourists' Willingness-to-Pay for Groundwater Conservation, Mt Makiling, Philippines

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Abstract

Mt Makiling is a dormant volcano that supplies hot water to springs and groundwater in Los Baños and Calamba City, Philippines, spurring the development of a resort-based tourism industry that is heavily extracting groundwater. The paper discusses the results of a contingent valuation survey that sought to evaluate the tourists' knowledge about the resorts' water source and use practices, reasons for visiting, willingness-to-pay for improved water conservation practices and the conservation of Mt Makiling as water source, and whether they would visit the resorts during the COVID-19 pandemic. About 50% of 492 respondents were aware of the resorts' water source, with about half saying that the source is hot springs, but only a few were aware of groundwater as the water source. The main reasons for visiting the resorts are for relaxation and the resorts' accessibility and affordability. The estimated mean WTP ranged from PhP75/visit (payment card) to PhP174/visit (dichotomous choice), and the respondents were willing to pay because they would like to contribute to the conservation of the groundwater resource of Mt Makiling and because groundwater is limited. On the other hand, some respondents were not willing to pay because they could not afford the additional amount and they perceive that they should not be made to pay for the cost of proper recycling of pool water. Most of the respondents said they would still consider visiting resorts during the pandemic to enjoy the pools and the environment and for the health benefits from the hot-water pools. A higher preference for private resorts was observed because these can be used exclusively by a group. The respondents who do not want to visit resorts during the pandemic said they would consider visits again if compliance with health and safety protocols would be assured. Finally, majority of the respondents recognize that the new health and safety standards for resorts will result in higher fees charged by resorts.

Keywords: Mt Makiling, Los Baños, Calamba, contingent valuation, water conservation

Introduction, scope and main objectives

The Mount Makiling Forest Reserve (MMFR) covers an area of 4,244-ha and is located 65 kilometers south of Metro Manila, Philippines, straddling parts of Los Baños and Calamba in Laguna and Sto. Tomas, Batangas. It is an important watershed that supports the domestic, agricultural, and industrial water requirements of these areas. Being a dormant volcano, hot springs and hot groundwater sources abound, which led to the establishment of numerous hot spring resorts in the area.

Over the years, the number of resorts has significantly increased. According to the resort inventory undertaken by this study, there are now 172 and 871 resorts in Los Baños and Calamba, respectively (total: 1,043, Fig 1). The number of resorts in Calamba was estimated at 193 in 1998 and 466 in 2014 (Jago-on et al. 2017). With the increase in the number of resorts came the attendant increase in the number of tourists.

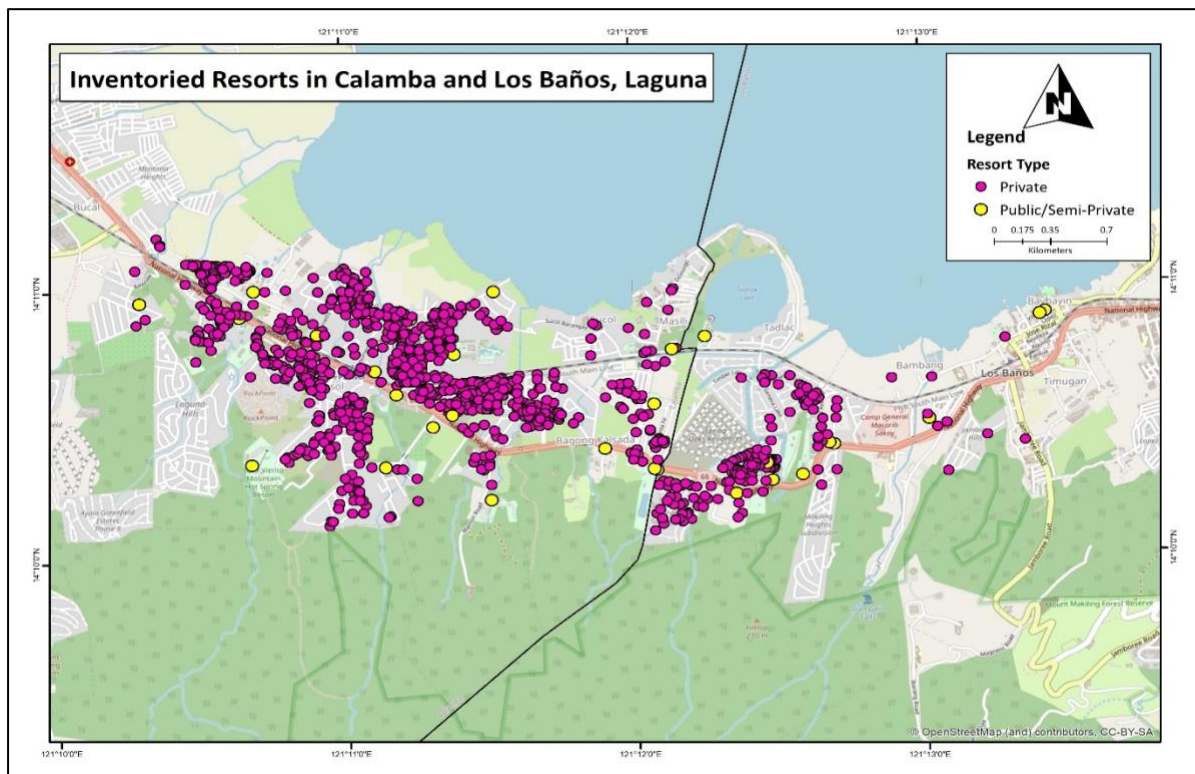


Fig 1: Distribution of resorts in Los Baños and Calamba, Laguna

One problem brought about by the burgeoning resort-based industry is the wasteful use of hot groundwater pumped by resorts for their pools and other uses. Resorts are required to have a water permit issued by the National Water Resources Board (NWRB) and permits issued by local government units, but there appears to be no regulation on groundwater utilization. Almost all resorts pump groundwater, which is cheaper than the water district. Water is commonly drained from pools into the roads, especially by smaller resorts. Because groundwater is almost free, resorts offer their services at low prices, with public resorts charging as low as PhP50-200¹/visitor, while rental fees of smaller private resorts range from PhP1,800-30,000 for an exclusive 12-hour use depending on the resort size, amenities, time of use, and season.

As the driver of excessive and wasteful groundwater use is the resorts' desire to offer low entrance and use fees, this paper explores the visitors' willingness to pay for improved water conservation practices by resorts and the conservation of MMFR to secure water services. Specifically, the paper discusses visitors' knowledge about the resorts' water use practices, estimates their willingness to pay for improved water conservation practices by resorts and the conservation of MMFR, explains the reasons why they are willing or not willing to pay, and if they will consider resort visits during the COVID-19 pandemic.

¹ 1US\$=PhP50

Methodology

The study employed the contingent valuation method (CVM) to estimate the tourists' WTP for the conservation of water from MMFR that resorts use. The following steps in conducting a CV study were employed (Champs, Boyle and Brown 2003):

- *Identify the change in the quality to be valued*, i.e., improved conservation of water from MMFR used by resorts.
- *Identify whose values will be estimated*, i.e., the WTP of tourists visiting resorts in Los Baños and Calamba.
- *Select a data collection method*. Originally, the data for the CV survey was supposed to be collected through personal interviews but was redesigned for online implementation due to the COVID-19 pandemic.
- *Choose a sample size*. The sample size of 500 survey respondents was determined using G*Power (Faul et al., 2007) at 95% confidence level.
- *Design the information component of the survey instrument*, which included the source of water of resorts; current practices in water use and disposal; a hypothetical water conservation program to be funded by visitors' payments for resorts to enhance water conservation practices and provide payments to a fund for the conservation of MMFR; and the payment vehicle, among other things.
- *Design the CV question*, using the single-bound dichotomous choice format and payment card elicitation methods.
- *Develop auxiliary questions*, the data of which were used to analyze CV responses (e.g., socio-economic data, knowledge, practices), effect of COVID19 on resort visits, and follow-up questions to ensure respondents' understanding of questions.
- *Pre-test and implement the survey*, done online through Facebook to address problems in the survey questionnaire and generate bid amounts for the dichotomous-choice question.
- *Data analysis*. Maximum likelihood estimation techniques were used to estimate the log likelihood WTP function and parameters, which yielded an estimate of visitors' willingness to pay of tourists for the improved management of MMFR and water conservation by resorts.

Results

1. Socio-economic characteristics of respondents

Initially, there were 500 respondents to the online survey but eight respondents were invalidated, leaving 492 qualified respondents. There were more female (65%) than male (37%) respondents and more single (71%) than married (23%) respondents. For education, 64% of the respondents were college graduates while 21% were college undergraduates. The respondents' mean age was 29 years while the average family size was 5.6 members. The average monthly personal and household incomes were PhP29,967 and PhP48,650, respectively.

2. Visitors' knowledge about resorts' water-use practices

When asked if they knew about the resort's water source, 52.6% answered "yes", with 26% saying the water source was hot springs, Mt Makiling (14.8%) and groundwater (7.3%). Contrary to the respondents' knowledge, many of the resorts no longer source their water from naturally flowing

water from hot springs but instead pump the hot groundwater. Interestingly, when the respondents were asked how the pools are filled with water, 40.7% said water is pumped from the ground, while 34.1% believed that water flows naturally and diverted to fill the pools.

The respondents were first informed about the operational definitions of a public resort² and a private resort³ as used in this study before they were asked about their knowledge and attitude about the resorts' pool water usage. For public resorts, 45.5% and 38.4% of the respondents thought that pool water is changed daily and weekly, respectively. Less than 10% of respondents thought the pool water was changed monthly (9.6%) or every few months (6.5%). On the other hand, 27% of respondents desired that the water in public pools be changed just before a group of customers uses it, while 39% of respondents wanted daily water change. However, 17.9% of respondents said that the pool water did not need frequent changing if water is treated following swimming pool standards.

For private resorts, 42.5% and 19.3% of the respondents perceived the pool water is changed daily or every 12 hours, respectively. On the other hand, 46.5% of respondents wanted the pool water to be changed just before a group of customers used a pool, while 23% said the water should be changed daily. Furthermore, 16.3% of respondents believed that the water need not be changed frequently if standards are observed. During the peak season, private pools are rented twice a day, usually from 6AM to 6PM and from 6PM to 6AM.

3. Visitors' willingness to pay for improved water conservation

3.1. Dichotomous choice

The responses to the WTP question are shown in Fig 2, grouped into original responses and reclassified responses based on the respondents' WTP certainty. For the second group, "yes" and "no" responses with certainty of ≤ 3 on the Likert scale were reclassified as "no" and "yes" responses, respectively. Under the original classification, 83.5% of the respondents answered "yes" to the bid amounts presented to them, with the highest proportion at Php30/visit (10.2%) and the lowest proportion at the highest bid amount of Php300/visit (6.3%). With reclassification, the number of "yes" responses decreased to 41.3%.

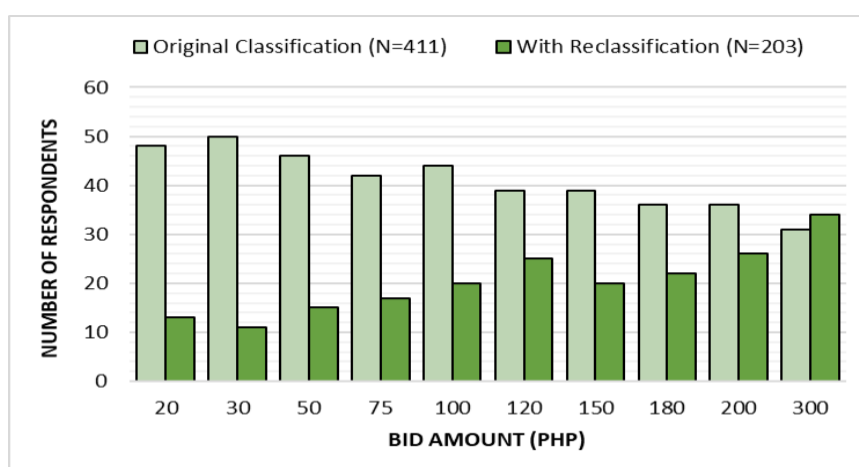


Fig 2: Respondents' WTP an additional fee on top of current entrance fee for improved water conservation, dichotomous choice

² One where people pay an entrance/swimming fee

³ A resort that people rent as a whole place

The succeeding discussion is for the model using reclassified bid amounts. The results of the binomial logistic regression reveal that the p-value of likelihood ratio chi-square test of the binomial logit model is 0.000, showing that the overall model is significant at 1% significance level, and that the independent variables of bid amount, age, sex, civil status, education, household income, and other factors influence the visitors' WTP for improved water conservation (Table 1). The mean WTP is PhP175.40/visit and is significant at 1% significance level. The variables that were found to be significant are bid amount, civil status, and education. The bid amount coefficient has the expected negative sign and shows an inverse relationship between the probability of a "yes" response and bid amount. The probability of saying "yes" to the WTP question was found to increase among single respondents and as educational attainment increased. The marginal effect of bid amount is -0.002, showing that the probability of a "yes" response decreases by 0.002 for a marginal increase in bid amount. The marginal effects of civil status and education, the other significant variables, are positive at 0.103 and 0.106, which show that the probability of a "yes" response increases by 0.103 and 0.106 for respondents who are single and as educational attainment increases, respectively.

Table 1: Results of the logistic regression, dichotomous choice model

Variable name	Coef.	Std.Err.	Marginal effect (dy/dx)
bidamt	-0.01***	0.00	-0.002
age	0.01	0.01	0.002
sex	-0.16	0.20	-0.036
cs	0.47*	0.27	0.103
educ	0.49**	0.22	0.106
hh_inc	0.00	0.00	0.000
members_no	-0.06	0.04	-0.014
know_forest	0.78	0.79	0.170
know_groundwater	-0.19	0.21	-0.042
behave1	0.24	0.41	0.052
_cons	-0.56	1.05	-0.002

Notes:*=significant at 10%; **=significant at 5%; ***=significant at 1%

Number of observations=492

LR chi2(10)=51.53

Log likelihood=-307.70678

Pseudo R2=0.0773

Constant=-0.56

Prob>chi2=0.0000

3.2. Payment card

Fig 3 shows the amounts selected by respondents to represent their true WTP. About an equal proportion of respondents selected PhP50/visit (25%) and PhP100/visit (25.81%), followed by PhP20/visit (11.2%). Only 4 respondents revealed zero (0) WTP, while 8.1% chose the highest bid amount of PhP200/visit. None of the respondents revealed a WTP greater than PhP200/visit, which may imply that the highest WTP was captured by PhP200/visit, or the respondents were limited by the amounts presented and did not consider the >PhP200/visit choice.

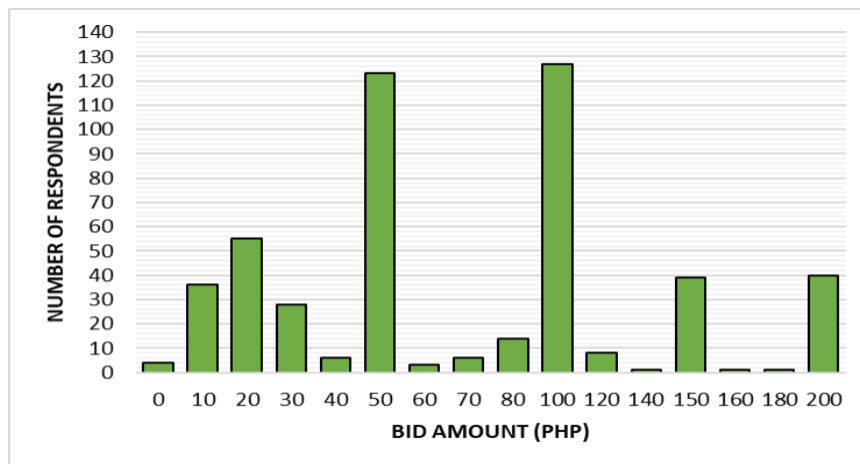


Fig 3: Amounts selected by respondents representing their true WTP, payment card

The results of the interval regression show that explanatory variables age and water conserving behavior were significant at 5% significance level (Table 2). Age is inversely related to WTP, implying that younger people have a higher WTP likelihood. The respondents' behavior regarding water use is also inversely related to WTP, which means that respondents who do not practice water conservation consistently have a higher likelihood to pay an additional amount. This implies that respondents who already practice water conservation have lower WTP probably because they may already have incurred costs for their practices. Furthermore, the marginal effect of age is -0.802, indicating that the WTP decreases by 0.802 as age increases. Furthermore, the marginal effect of behavior implies that the WTP decreases by 27.23 for those who practice water conservation consistently.

The mean WTP was predicted using linear prediction, conditional expected value method and truncated method, resulting in mean WTP of PhP75/visit, PhP75/visit and PhP74.1/visit, respectively.

Table 2: Results of interval data model

Variable name	Coef.	Std.Err.	Marginal effect (dy/dx)
sex	0.18	5.57	0.185
age ^a	-0.80**	0.38	-0.802
cs	7.19	7.25	7.193
educ	5.82	6.09	5.820
members_no	-1.66	1.10	-1.661
hh_inc	0.00	0.00	0.000
know_forest	-16.49	21.43	-16.487
know_groundwater	0.50	5.75	0.502
behave1 ^b	-27.23**	11.22	-27.230
_cons	105.20	28.23	
/lnsigma	4.07	0.03	
sigma	58.37	2.01	

Notes:**=significant at 5%

LR chi2(9)=25.31

Log likelihood=-1487.1694

Constant=105.20

Prob>chi2=0.0026

^aAge: Age(in years) of the respondent

^bBehaviour: 0=respondent does not practice water conservation consistently; 1=respondent practices water conservation consistently

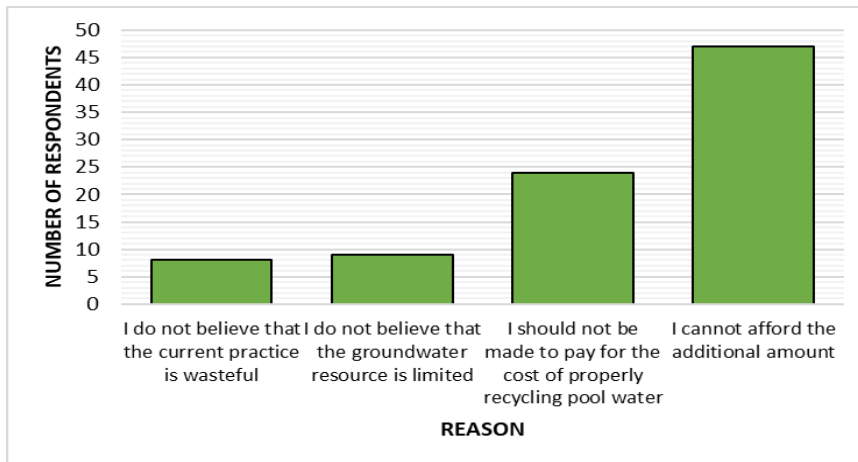


Fig 4: Reason/s for willingness to pay additional amount (YES to WTP question)

4. Reasons why visitors are willing or not willing to pay for water conservation

The main reason why 411 respondents answered “yes” to the WTP question was because they would like to contribute to the conservation of the groundwater resource of Mt Makiling (82.2%), followed by their belief that the groundwater resource is limited (52.3%) (Fig 4). Only 28.2% of the respondents considered the current practice of water utilization by resorts to be wasteful.

On the other hand, the main reason given by the 81 respondents who answered “no” to the WTP question was they could not afford the additional amount (58%), and the perception that they should not be made to pay for the cost of properly recycling pool water (29.6%) (Fig 5). Relatively fewer respondents said they do not believe that the groundwater resource is limited (11.1%) or that the current practice is wasteful (9.9%).

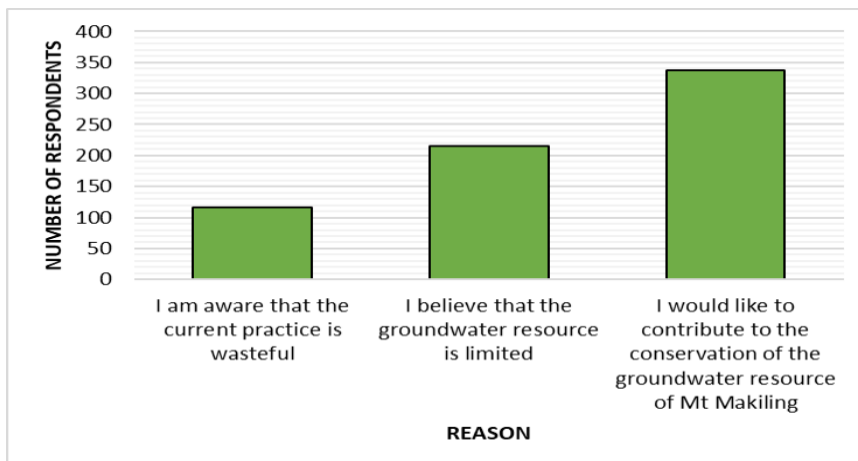


Fig 5: Reason/s for non-willingness to pay additional amount (NO to WTP question)

5. Resort visits during COVID 19

Most of the respondents said they would still consider visiting resorts in Calamba or Los Baños during the pandemic, but there is a higher preference for private resorts than public resorts because these can be used exclusively by a family or group. The respondents who do not want to visit resorts during the pandemic said they will consider visits again if the pool water will be cleaned using industry standards after each use in the case of private pools and allow the pool to be used only

once per day to allow sufficient time for the resort to be cleaned and sanitized. Finally, majority of the respondents recognize that the new health and safety standards for resorts will result in higher fees charged by resorts.

Discussion

The potential benefits of passing an ordinance that will require the collection of a water user fee for the proper maintenance of pool water quality (50% of the water user fee), and the conservation of Mt. Makiling (50% of the water user fee) were computed using the mean WTP estimates of PhP175/visit (dichotomous choice) and PhP75/visit (payment card). The average number of resort visitors in Calamba and Los Baños were multiplied by the two mean WTP estimates, and the corresponding results were used as the range of estimated benefits from the program.

The three-year average number of visitors of Calamba is 2,015,124, and the estimated benefits range from PhP151.13 million/year to PhP352.65 million/year. For Los Baños, the average number of visitors is 111,821 visitors/year, translating to potential benefits of PhP8.39 million/year to PhP19.57 million/year. In sum, capturing the WTP of visitors to resorts in Calamba and Los Baños can raise PhP79.76 million/year to PhP186.11 million/year for the improved management of Mt Makiling and the same amounts can be generated to promote pool water conservation practices among resorts.

Conclusions

Based on the results of the study, the following conclusions are drawn:

- Only 7.3% of respondents were aware that most resorts pump ground water for their pools and other uses.
- The mean WTP estimated under the dichotomous choice (PhP175.40/visit) is higher than the WTP estimates under the payment card method (PhP74.1/visit to PhP75/visit). Respondents are willing to pay mainly because they would like to contribute to the conservation of the groundwater resource of Mt Makiling and believe that the groundwater resource is limited. On the other hand, some respondents are not willing to pay mainly because they could not afford the additional amount and perceive that they should not be made to pay for the cost of properly recycling pool water.
- Respondents are willing to visit resorts in Calamba and Los Baños if these are cleaned to industry standards, generally prefer private resorts than public resorts, and recognize that the new health and safety standards for resorts will result in higher fees.
- Capturing the WTP of visitors to resorts in Calamba and Los Baños can raise PhP159.52 million/year to PhP372.215 million/year, which can be used for the improved management of Mt Makiling, and by resorts to conserve water and maintain pool water quality to international standards to avoid unnecessary and wasteful water disposal.

The study recommends 1) an enhanced information, education and communication program directed at resort owners, the public, and local government and national government agency officials about the growing scarcity of groundwater in Mt Makiling and other areas in the country; and 2) crafting policies that will capture the willingness to pay of visitors to resorts for improved groundwater conservation.

Acknowledgements

The authors thank the Foreign Assisted and Special Projects Service (FASPS) of the Department of Environment and Natural Resources (DENR) for funding this project; and the Local Governments of the Calamba City and Los Baños, DENR Region IVA, and the Makiling Center for Mountain Ecosystems for their support.

The views expressed in this information product are those of the authors and do not necessarily reflect the views or policies of FAO.

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