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Assessing The Willingness To Pay For Conservation And Management Of Ghodaghodi Lake Wetland In Kailali District Of Nepal

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Abstract
Wetlands are one of the most productive and at the same time most notorious ecosystems especially in developing countries where human pressure continues to push the ecologies towards increasing degradation. Another sustainable approach to the conservation of these ecosystems has been the creation of community-based conservation through mobilisation of the local residents in the management of these ecosystems. The current research explores how local communities are willing to pay (WTP) to conserve Ghodaghodi Lake which is among the Nepal Ramsar-listed wetlands and which variables of socio-economic and perceptions are the determinants of such support. The study faces the wider challenge of safeguarding environmental resources which, although of ecological and cultural importance, are underestimated and they are often misused due to being non-commercial and public goods. The first goal is to measure the amount of the economic contribution that the local community makes to the conservation of the wetlands by evaluating their WTP. Data were gathered through the Contingent Valuation Method (CVM) in order to reduce the hypothetical bias by having 530 respondents complete a structured, closed-ended questionnaire with the use of follow-up questions.
Descriptive and econometric analysis depict that the average WTP in conservation activities is NPR 265 every month. The results of logistic regression show that age, education, household income, respondent category, type of activity, perceived value of the lake, and beliefs regarding responsible managing bodies have a significant effect in increasing the likelihood of expressing WTP. On the contrary, distance to the lake and bigger family size have negative relationships with WTP.
These results highlight the imperative need to incorporate the socio-economic determinants in the wetland management plans. They show that conservation policies need to be based on the priorities of the community, the perceived benefits, and the ability to give. Therefore, the paper can provide evidence-based information to government agencies and policymakers interested in designing effective, participatory and locally responsive conservation programmes to Ghodaghodi Lake and similar wetland ecosystem in developing regions.
Keywords: *Wetland conservation, ecosystem services, willingness to pay, contingent valuation method, Ghodaghodi Lake, community-based management.*

INTRODUCTION

Wetlands, and especially lake wetlands, are some of the most productive ecosystems in the world, which offer vital ecological services, including food supply, clean water, climatic control, control of floods, nutrient cycling, soil formation and recreational values (Barbier et al., 1997). Regardless of their great ecological and socio-economic importance, wetlands are systematically underestimated due to the fact that most of their advantages are non-market oriented and therefore are hard to measure using the traditional economic tools. Their total economic worth has been underestimated, thereby leading to the widespread degradation particularly in the developing nations where saving them is in competition with urgent needs to earn livelihood. According to recent scholarship, there is a great necessity to realise the multi-dimensional value of wetlands in order to manage them. Valizadeh et al. (2021) maintain that cultural, spiritual, and recreational provisions of wetland are oftentimes ignored in the process of development planning, which results in poor conservation performance. On the same note, however, Costanza (2020) points out the usefulness of large-scale valuation instruments, e.g. the Global Wetland Survey, in reflecting the overall economic value of wetland ecosystems. The Millennium Ecosystem Assessment (MEA, 2005) and Leitch and Hovde (1996) also emphasize that economic evaluation should be incorporated into the environmental choices in order to create sustainable and publicly agreed conservation policies. However, with the global developments, the wetlands in Nepal are still experiencing

degradation as a result of pollution, over exploitation of the resources, agricultural encroachment, and a declining water table- threats that directly affect the integrity of ecosystems and human livelihood (Joshi, 2015; Khatri and Baral, 2013).

An example of such challenges is the Ghodaghodi Lake, a 2 563-hectare wetland in far-western Nepal, which is a Ramsar listed wetland. The lake sustains a high biodiversity level and has extremely critical ecosystem services such as water, food, medicinal plants, grazing grounds, and revenue to local inhabitants. However, it is very susceptible to land use alteration, agricultural discharge and unsustainable harvesting. Although the ecological importance of this ecosystem has been reported, little empirical studies on the economic worth of its ecosystem services or the willingness of local communities to pay (WTP) to preserve it have been conducted, an important aspect of formulating management plans that are financially viable.

The Nepal wetland policies acknowledge the necessity of conservation without the working mechanisms to convert ecological value into working financing policies. This leads to the creation of "paper-protected spaces," as observed by Aryal et al. (2021), which are conservation areas defined in law but not effectively enforced. Failure to provide economic valuation also indicates a larger gap in governance: despite playing the most important role in benefiting and being the main custodians of wetland ecosystems, little has been done to measure that the local communities could contribute to conservation by paying, supplying labour or community-based funding structures (IUCN, 2004). In the absence of this knowledge, the policymakers would not be able to make policies that would strategize the conservation interests and objectives of the people.

This paper fills such gaps by doing a rigorous economical valuation on the Ghodaghodi Lake using the Contingent Valuation Method (CVM). CVM is specifically applicable to estimating the value of non-market ecosystem services and to the determination of how the population is in support or opposed to conservation measures. In this study based on the results of survey conducted on 530 people, the mean WTP of lake conservation is estimated and the socio-economic and perceptual factors that lead to support have been determined. The logistic regression is used to examine the differences in the willingness of the respondents to give their contributions based on the age, education, income, proximity, household size, and perceived value of the lake.

This study has serious academic and policy implications in addition to methodological innovation. It is one of the earliest large-scale CVM implementations on a Ramsar site in Nepal, which provides scalable valuation procedures which can be applied to other regions with limited data. The quantification of economic values and community preferences enables the study to offer the lack of economic rationale behind conservation investments that the Nepal Wetland Policy (MoFE, 2018) requires and align with national biodiversity conservation pledges and the Sustainable Development Goals. Furthermore, the results can be used in formulating participatory conservation frameworks that help to integrate both the community willingness and capacity in conservation with the ecological priorities, addressing the old governance dilemmas.

By so doing, the present study does not only add to the existing body of knowledge on the topic of wetland valuation and ecosystem services but also offers an effective framework of sustainable wetland management in Nepal and other socio-ecological settings within the developing world.

MATERIALS AND METHODS:

1. Study Area

The current study was conducted in Ghodaghodi Lake wetland complex which covers the territory of Ghodaghodi Municipality of Kailali District in the far-western Nepal. The lake is located on the shore of 205 m above the mean sea level, with the latitude of 28°42´066˝ N and the longitude of 80°56'44˝ E (Lamsal et al., 2014). It is enclosed by Wards 1, 4 and 8 of the municipality and is intermingled with a mosaic of tropical forests and shrublands typical of the lower Siwalik Hills. The wetland is geographically situated between two large protected areas, Shuklaphanta National Park (south) and Bardiya National Park (east), hence, forming a very important ecological corridor in the Nepali landscape of the Terai (Lamsal et al., 2014). Ghodaghodi wetland system is a network of 14 lakes, which are interconnected and cover an area of around 2,563. The largest is Ghodaghodi Lake, whose area is 138 ha, and the others are Nakharodi Lake (70 ha) and Bhainswa Lake (10 ha) (Lamsal et al., 2016). The landscape is even enriched by other smaller satellite lakes and marshes. Ghodaghodi Municipality has a population of 16,141

households (Central Bureau of Statistics, CBS, 2011) most of which rely directly or indirectly on the wetland as a source of water, food, fodder, fuelwood and income generating activities. Ghodaghodi Lake was declared a Ramsar Site in 2003 as a consequence of its outstanding ecological, cultural and hydrological value. A diverse range of flora and fauna, comprising a variety of threatened and endemic species, are found in the place, hence highlighting its significance on global conservation (Kafle & Savillo, 2009). The ecological services that the wetland provides, together with its environmental livelihood support, make it an important natural resource that requires a high-quality and efficient management.

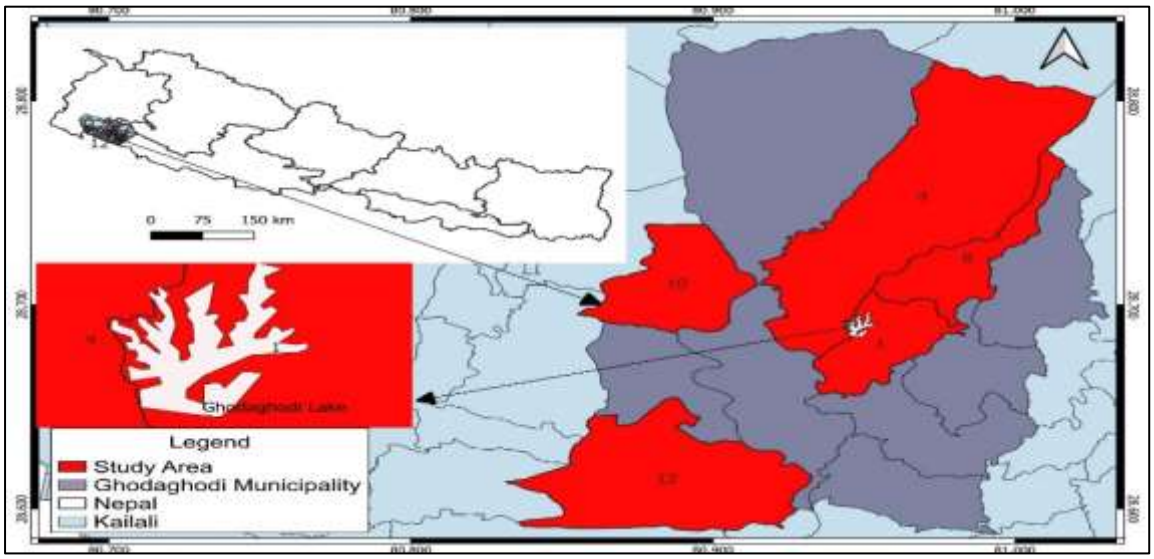

Figure 2.1 *Map of Ghodaghodi Municipality and Study Area*

2. Data collection

In this research, the researcher used purposive sampling strategy to identify the respondents that would be used to come up with the willingness to pay (WTP) on conserving the Ghodaghodi Lake and the wetlands surrounding the lake. This method enabled taking into consideration ecological and socio-economically varied regions and maintained systematic rigor in the selection of households. Ghodaghodi Municipality was purposely chosen to select five wards namely 1, 4, 8, 10, and 12 to achieve heterogeneity in: geographic location, location near the lake and reliance on the wetland ecosystem services. This narrow selection allows increasing the analytical significance of the research by making sure that those communities are represented, which have both direct and indirect contacts with the wetland ecosystem (Oduor et al., 2018). The household list was obtained fully by collecting it at the respective ward offices. The chosen wards represented 2,536; 1,915; 1,805; 1,500 and 715 households respectively, making 8,471 households. According to this population, a final sample of 530 households was calculated according to the standard formula of finite population sampling (Bekele & Asrat, 2020). The formula by Yamane to compute the sample size has a 5 per cent margin of error and 95 per cent confidence level (Bekele, 2020; Ashim, 2018):

$$n = \frac{N}{1 + Ne^2}$$

Where in this equation, the sample size which is required is denoted as n, the total population can be denoted as N and the acceptable margin of error denoted as e, the maximum amount of sampling error which the researcher is prepared to accept. This choice is in line with the recommendation of Arrow et al. (1993), who indicate that 200 to 2,500 is the general sample size that should be used in contingent valuation research because it is reasonable and reliable to achieve the desired result.

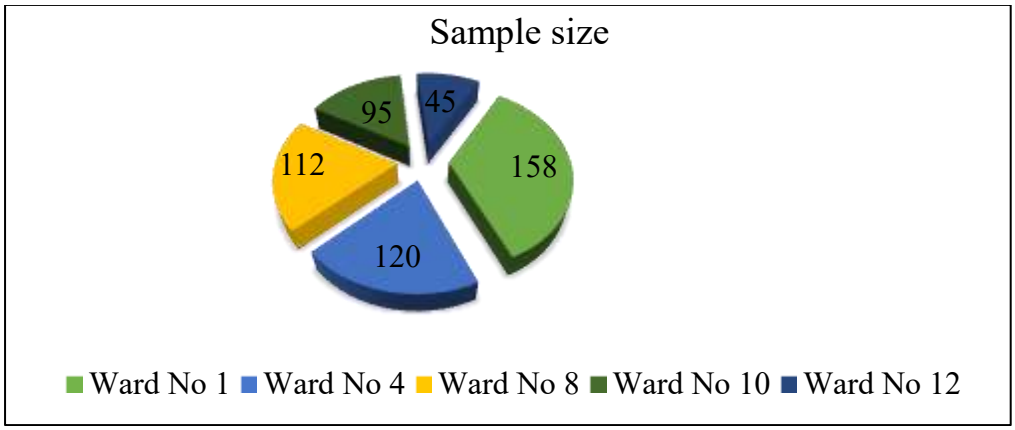

Fig 2.2: *Sample Size*

Pilot Study and Research Design

The questionnaire was pre-tested with a pilot study comprising 10 percent of the estimated sample size in order to test the questionnaire in terms of its clarity, reliability, and effectiveness. It is in this light that the pilot survey was specifically directed at determining an appropriate entrance fee of Ghodaghodi Lake, which is the contingent valuation (CVM) fee elicitation component. According to the answers, NPR 25 per month was proposed as an entrance charge, which is comparable to the charges in other parks of a similar nature in Kailali District. The average willingness to pay (WTP) was another value produced by this value. In order to measure the internal consistency of the questionnaire, Cronbach alpha was estimated. The reliability coefficient of the 28-item scale was 0.706, which means that it is an acceptable internal consistency as recommended by Taber (2018) that a reliability coefficient of above 0.70 is appropriate in social science research tools. Granted, a research methodology is a procedural map, which directs data collection procedures and analysis, as well as presentation of data to provide reliable and valid answers to any research question (Gran and Osanloo, 2014). A deductive research method was used in the study; whereby, a cross-sectional survey design and quantitative analysis tools were employed to evaluate WTP determinants. The study was carried out using a structured questionnaire which was based on the theoretical constructs. To discuss the relationships between the socioeconomic and demographic predictors of the dependent variable (WTP) and the dependent variable, an explanatory research design was chosen. This design provides strength to the validity, reliability, and feasibility of the study as highlighted by Rahi (2017) and builds a better understanding of the economic value of the ecosystem services of the Ghodaghodi Lake to make a sound conservation policy decision.

3. Contingent Valuation Method (CVM)

The given research utilizes the Contingent Valuation Method (CVM) which is a stated preference approach that is commonly used to estimate willingness to pay environmental goods that are not available in the conventional markets (Tolera, 2022). Household WTP about wetland protection was analyzed using the analytical framework that was developed by Hanemann (1984). CVM is based on the theory of utility maximization that states that people obtain satisfaction not only with goods that are sold in the market but with the quality of the environment.

A household's utility maximization problem is expressed as:

$$\text{Max } \boldsymbol{V(X,Q)} \text{subject to } \boldsymbol{P \cdot X = Y, Q = q_0 (1)}$$

Where:

- X = quantity of market goods
- Q = state of lake quality
- P = price of market goods
- Y = household income
- q_0 = current level of lake quality

This establishes that demand for market goods depends not only on prices and income but also on environmental quality. Thus, the utility function becomes:

$$\boldsymbol{X(P, Q, Y) = V_0}$$

If a conservation project improves lake quality from q_0 to q_1, and individuals contribute financially to this improvement, the indirect utility function is expressed as:

$$\boldsymbol{V(p, q_0, y) = V(p, q_1, y - CS) = V_0 (2)}$$

The difference between the two utility levels yields the consumer surplus (CS):

$$\boldsymbol{CS = V(p, q_0, y) - V(p, q_1, y - CS) (3)}$$

CS represents the WTP for improved lake quality. As stated by Adhikari et al. (2017), WTP captures the value individuals place on enhanced environmental conditions. Data were coded and analyzed using STATA 17, which offers robust tools for environmental and socioeconomic research (Fox, 2021). Descriptive statistics summarized key respondent characteristics—age, gender, education, income, distance to lake, participation, perceived ecosystem value, and responsibility. Inferential analysis employed binary logistic regression to examine the influence of socioeconomic variables on WTP, providing relevant policy insights (Mamboleo & Adem, 2022).
The general functional form of the WTP model is:

$\boldsymbol{WTP_i}$
$= \boldsymbol{f}$(Age, Education, Household Size, Income, Distance, Category, Activities, Perceived Value, Responsible Body)

CVM follows utility theory and recognizes unobservable preference components that are treated as random variables (Bateman & Turner, 2002).

4. Econometric Model

Given that WTP is expressed as a binary decision (1 = willing to pay, 0 = not willing), the study employs binary logistic regression, which is appropriate for analyzing probability outcomes bounded between 0 and 1 (Suprapto et al., 2015). The objective is to identify (i) the mean WTP value associated with the highest likelihood of payment, and (ii) socioeconomic predictors influencing WTP (Sun et al., 2023).
The logistic model is expressed as:

$$\boldsymbol{Pr(WTP_i = 1 \mid X) = F(\beta X_i) = \frac{e^{Z_i}}{1 + e^{Z_i}} (4)}$$

Where:

$$\boldsymbol{Z_i = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_n X_{ni}}$$

The probability of *not* being willing to pay is:

$$\boldsymbol{1 - P_i = \frac{1}{1 + e^{Z_i}} (5)}$$

Thus, the odds ratio becomes:

$$\boldsymbol{\frac{P_i}{1 - P_i} = e^{Z_i}}$$

Taking the natural logarithm yields the log-odds (logit):

$$\boldsymbol{L_i = \ln \left(\frac{P_i}{1 - P_i} \right) = Z_i (6)}$$

The final empirical model estimated in this study is:

$$\boldsymbol{WTP_i = \alpha + \beta_1}(\text{Age}) + \boldsymbol{\beta_2}(\text{Education}) + \boldsymbol{\beta_3}(\text{HH Size}) + \boldsymbol{\beta_4}(\text{Income}) + \boldsymbol{\beta_5}(\text{Distance}) + \boldsymbol{\beta_6}(\text{Category}) + \boldsymbol{\beta_7}(\text{Activity}) + \boldsymbol{\beta_8}(\text{Lake Value}) + \boldsymbol{\beta_9}(\text{Responsibility}) + \boldsymbol{\varepsilon_i}$$

Previous studies (Sun et al., 2023; Feyisa & Bersisa, 2019) highlight that demographic and socioeconomic factors significantly shape household engagement in wetland conservation.

Table .1: A summary of the variables included in the model:

Variable Type	Variable	Description	Measurement / Coding	Expected Sign
Dependent Variable	WTP	Willingness of respondents to pay for lake protection	1 = Yes; 0 = No	—
Independent Variables	Age	Age of the respondent	Years	+
	Education	Educational status of the respondent	0 = Non-formal (Base); 1 = Formal	+
	Household Size	Number of members in the household	0 = Less than 3 (Base); 1 = 3–5; 2 = Above 5	±
	Household Income	Monthly household income of the respondent	0 = Less than Rs15,000 (Base); 1 = Rs 15,000– Rs 45,000; 2 = Above Rs 45,000	+
	Distance	Distance of respondent's residence from the lake	Kilometres (Km)	–
	Respondent Category	Social category of the respondent	0 = Others (Base); 1 = Local residents	+
	Activity	Primary activity associated with the lake wetland	0 = Water-related (Base); 1 = Forest-related; 2 = Recreation; 3 = Religious	±
	Value Perception	Perceived benefits derived from the lake	1 = Recreation (Base); 2 = Source of income; 3 = Future conservation value; 4 = Existence value	±
	Responsible Body	Perception regarding the primary authority responsible for lake protection	1 = Government (Base); 2 = Local community; 3 = NGOs/INGOs; 4 = Tourists	±

RESULTS AND DISCUSSION

This chapter is an in-depth examination of social-economic, demographic and wetland-related influences on the willingness to pay (WTP) of the conservation of the Ghodaghodi Lake among the respondents. It includes descriptive statistics, WTP estimates, critical determinants of decision-making, reasons as to why people may or may not be willing to contribute, and the findings of the logistic regression model which was used to confirm findings that were made in the study. The descriptive statistics indicate that an average age of the household heads was 42 years with an average age of married respondents being a little bit higher with 43 years. Gender wise, 42 per cent of the respondents were males and 58 per cent of female. The central role of women in making decisions on household livelihood and use of wetland resources is evidenced by the high rate of female household heads (58.11%) of which majority are involved in rural farming. The data on marital status also reveal that 94 percent of the respondents were married and the remaining 6% were single or not married hence a family-oriented community set up. In terms of

educational levels, 58.11% were basic literate, 32.45% completed secondary and 9.43% had a bachelor degree and above. This implies that there is moderate yet skewed distribution of formal education among households.

Observations made of household structure indicate that 30 per cent of families reside in joint/extended households, most of whose household contained 11 members, thus demonstrating the level of shared residence in the study area. Economically, the percentage of households having a low income is high: 56.42% earn less than Rs 15,000 per month, 37.73% earn up to Rs 45,000, and only 5.09% earn above Rs 45,000. These levels of income mean that they offer the necessary background of understanding the variation of WTP among respondents.

The gender breakdown of the survey respondents (41.9% of men and 58.1% of women) might affect the WTP, as the previous studies have reported gender-based variations in environmental preferences. Individually, Nielsen -Pincus et al. (2017) discovered that women tend to have lower WTP to conservation projects than men do, which holds true to the trends in the current study.

Regarding the interaction with the wetland, there is significant difference in terms of visitation frequency data:

- 11.13% of the respondents visit the lake infrequently,
- 21.13 % visit sometimes,
- 35.47 % visit frequently, and
- 32.26 % visit very frequently.

These findings show that almost two out of every three citizens engage with the lake regularly thus having the potential of affecting their conservation orientations.

1. Age of the Respondent:

Age also has come out as a significant factor of environmental concern. Recent researches by Haile and Slangen (2009) and Ren et al. (2020) indicate that the elderly are more likely to be knowledgeable about environmental degradation and its consequences in the long-term. Equally, Zydroń et al. (2021) found that WTP was more in older groups. These findings are supported in the current research study as younger respondents tend to be less willing to make contributions towards conservation activities when compared to older individuals, yet older respondents have stronger pro-conservation attitudes.

In general, the survey established that 474 out of 530 respondents (89.43-10.57) were willing to pay to conserve the lakes whereas 56 (10.57-10.57) were not willing. This strong percentage of willingness is an indicator of strong community awareness with regard to protecting wetlands despite the prevailing socio-economic barriers.

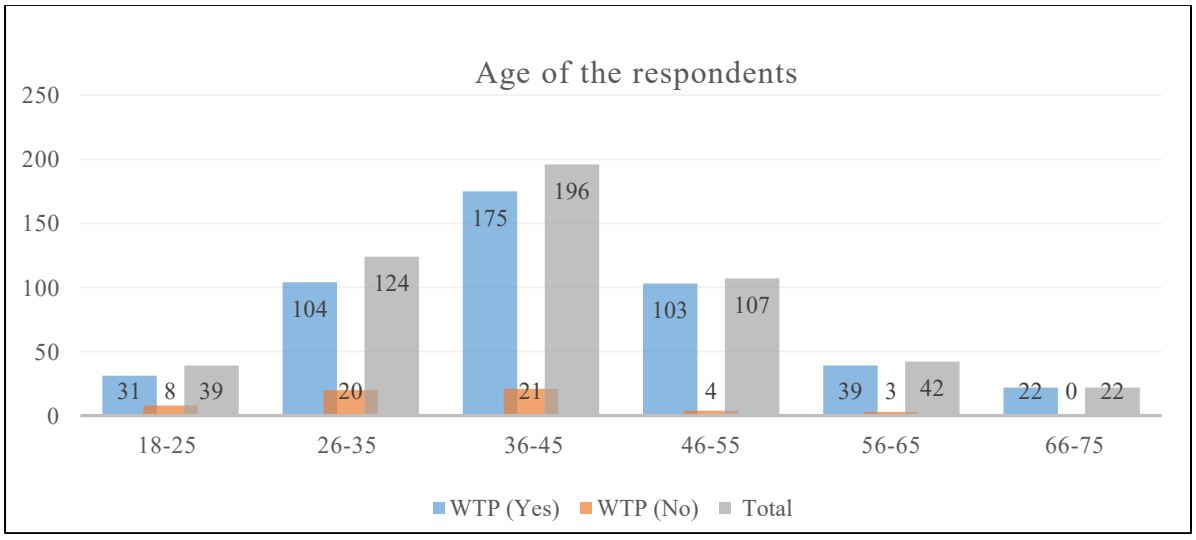

Fig .1: *Age and WTP of the Respondents*

2. Marital Status

The distribution of the marital status shows that 497 respondents (93.77%) were married, and 33 respondents (6.23%) were unmarried or single. Both groups showed a strong desire to take on a part in giving financial support to the conservation of the lake, hence indicating a feeling of collectivity (Clough, 2013).

3. Household Size

The average household size was 5.39 people, 49.25% of the households had 3-5 members, and 41.13% had 6 or more family members. The increased consumer pressures are likely to force bigger households to face a greater financial burden, which will limit their ability to finance conservation efforts (Bekele & Asrat, 2020).

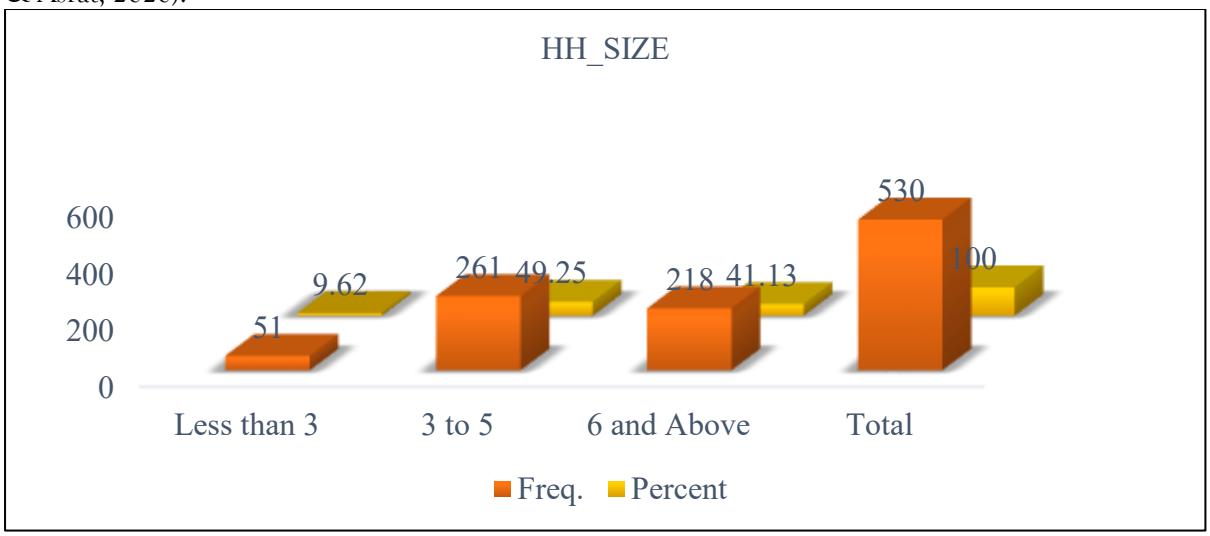

Fig .2: *Household size of the Respondents*

4. Educational Status

The education history showed that 308 respondents (58.11%) had not been through formal school but had a basic literacy level; 172 respondents (32.45%) received a secondary level education; and the other 50 respondents (9.40%) had a bachelor degree or above qualification. Since education is regarded as one of the key determinants of environmental awareness and attitudes towards conservation, the most common event is that with increased education there is an increased willingness to pay to protect natural resources (Dias, 2011).

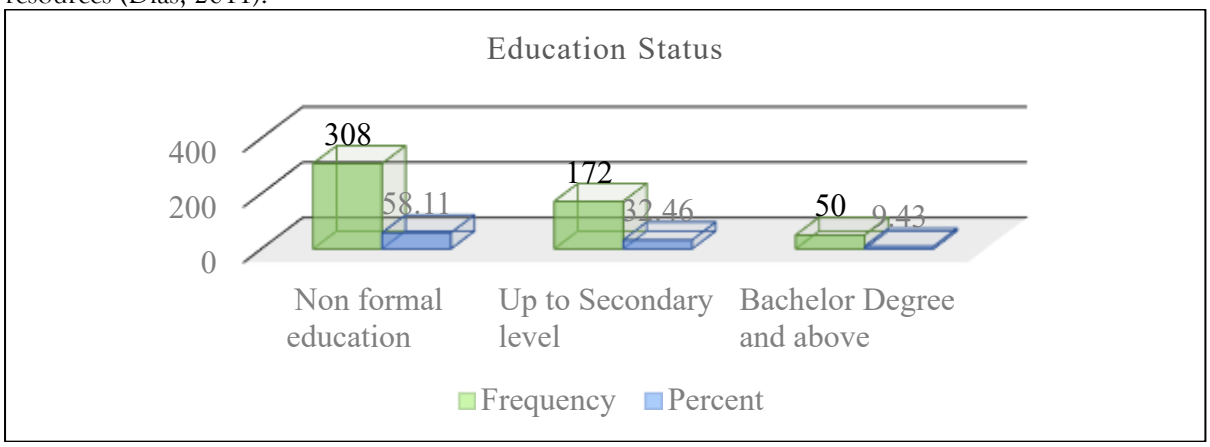

Fig .3: *Education status*

5. Occupation of the Respondent

The occupational data showed that they were self-employed (452, 85.28%) and mostly in farming and other forms of related agriculture, and 78 respondents (14.72%) occupied the government service. Occupational status has a tremendous impact both on the ability and readiness to contribute towards the conservation of the lake since willingness to pay is influenced in a negative way by income constraints (Ghosh and Mondal, 2013).

6. Distance from lake

Proximity to the lake was another determinant that proved to be influential on the preference of the respondents to pay towards the protection of Ghodaghodi Lake and its related wetlands. The mean residential distance was 2.33km. The distribution on the categories of distance is summarized as follows:

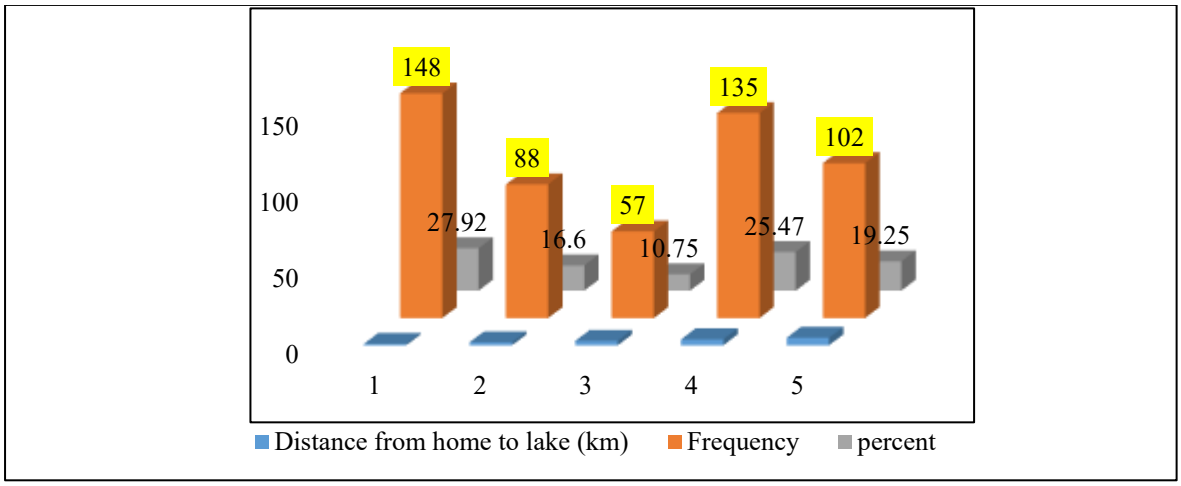

Fig .4: *Distance from Lake*

7. Household Income:

Household income turned out to be a very important factor of readiness to pay on lake conservation. Surprisingly, 56.4% of respondents have monthly earnings less than Rs 15,000, with only 5.8 per cent of respondents having over Rs 45,000 as their monthly earnings. In line with previous research, improved levels of income tend to increase the ability and the willingness to finance environmental conservation efforts (Bekele and Asrat, 2020; Al-Assaf et al., 2021; Jo et al., 2021). These data support the perception that financial capacity is one of the most significant factors as it affects WTP outcomes in the Ghodaghodi Lake scenario.

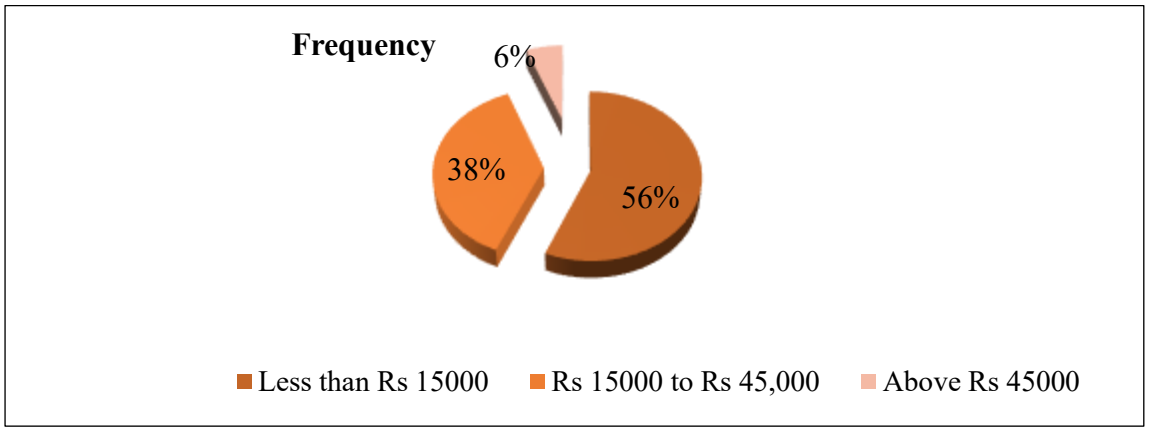

Fig .5: *Household Income status*

8. Municipality's Role

The research also found out that 337 respondents (63.58%) saw the role of the local government in the conservation of Ghodaghodi Lake as poor. Conversely, 171 respondents (32.26%) rated the performance of the municipality to be satisfactory, with 22 respondents (4.15%) rating the performance as excellent. These attitudes point to the overall lack of trust in local governments on the issue of wetland management and protection.

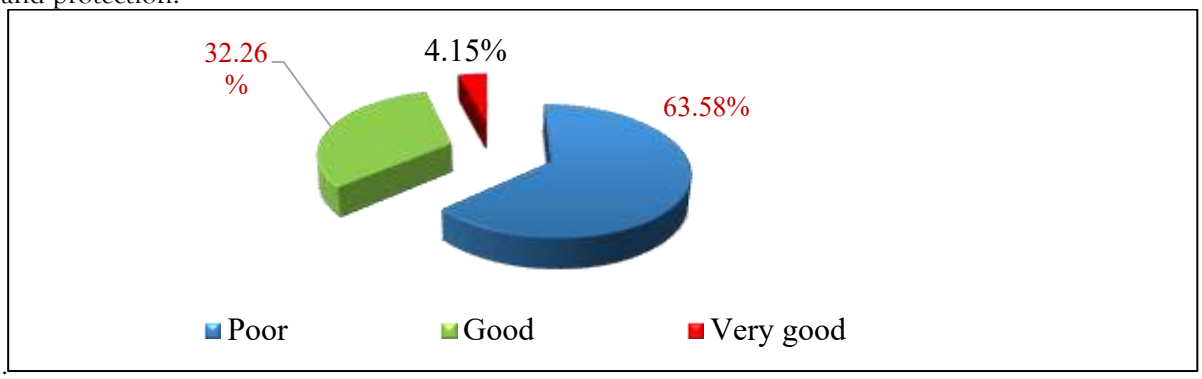

Fig .6: *Municipality's Role*

9. Value Orientations

Value orientations also were surveyed with 42.45% of the respondent's perceiving recreation as the major value of the lake, and 38.30% of them referring to the significance of the lake to future generations. Another 13.02% considered the lake as a source of income and 6.23% of value was derived exclusively on the presence of the lake. In the regression analysis, the recreation was taken as the reference category upon which the other value category categories were put in comparison to establish the influence of the varying value orientations on the willingness to pay by the respondents.

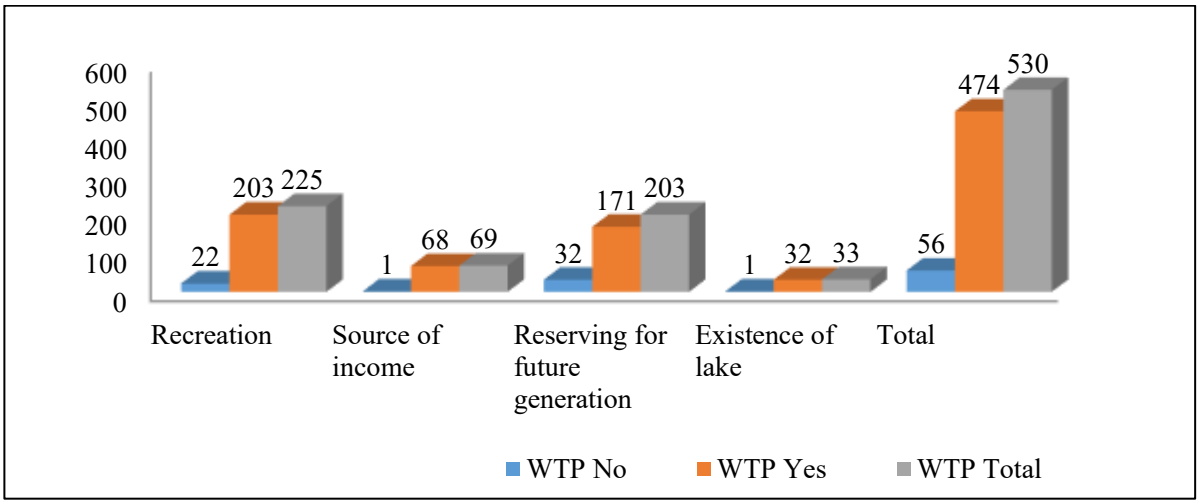

Fig .7: *Values and WTP*

Problem observed by respondents:

A vast majority of those surveyed 498 of 530 (93.96%) decided that the lake has a major importance to their households and that it is necessary to establish a systematic protection strategy to ensure its survival in the long run. On the other hand, 32 (6.04%) respondents considered such protective steps as unnecessary. The general evaluation of the existing state of the lake is not quite optimal: 61.32% of the respondents claimed that the lake does not have a positive effect on the visitors, and 38.68% of participants were not satisfied with the current examples of tourism-related activities. The lake protection was viewed differently on the responsibility. The largest percentage (44.91%) thought that government should be the first party to be held accountable, then 40.57 was given to the local residents, after which 10.38% was given to tourists and 4.15% was given to international and national NGOs. Such varying views highlight the range of expectations that determine the attitude of communities towards conservation efforts. It is clear that 63.58% of the dissatisfaction was with the performance of local government, with 32.26% rating in the high-performance category and 4.15% as very positive, showing that there is a dire need of better performance of the local government and better institutional involvement in the management of the lake. In spite of these issues, 93% of the respondents indicate that they use the lake, and that they perform various activities such as recreational activities (26.42%), water-based activities (8.49%), forest activities (20.19%) as well as religious activities (44.91%). The respondents ranked recreation (42.45%), future generational importance (38.03%), income generation (13.02%), and existence value (6.23%) in perception of value. The respondents cited several threats causing the degradation of lakes. The most commonly mentioned issue was the spread of water hyacinth (39.43 %), then fish stock reduced (23.58%), wetland has been covered with cultivation (20.00%), and water agrochemicals (16.98%). The mentioned issues demonstrate the urgency of specific ecological intervention and the adoption of sustainable management practices.

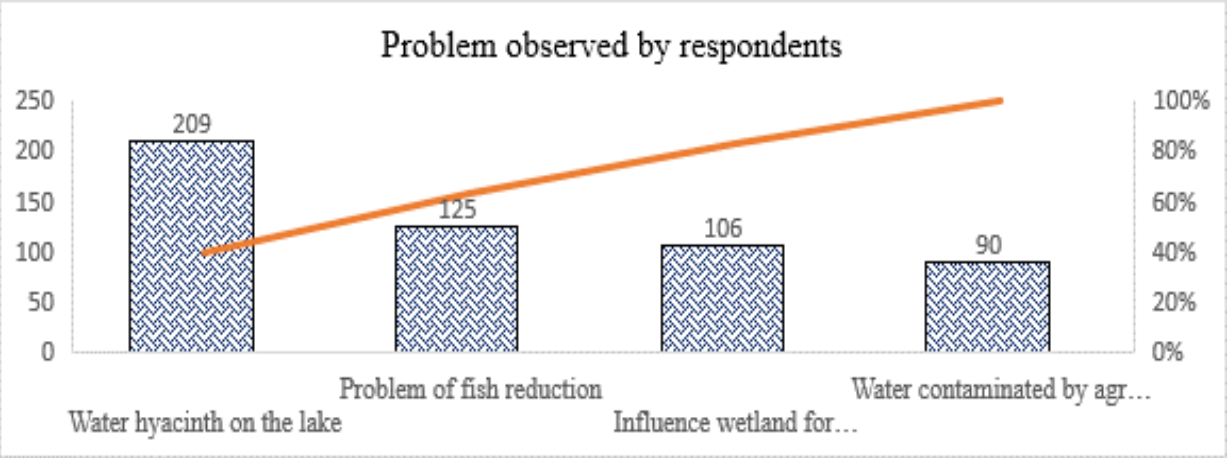

Fig .8: *Problem observed by respondents*

Willingness and Unwillingness to Pay for Lake Protection

According to the empirical study, it is found that 89.43% of respondents were willing to invest in protecting the lake, which highlights the fact that the community members strongly supported conservation efforts (Makwinja et al., 2022). Out of the 10.57%. who did not want to contribute, the main reasons were:

- Mistrust in fund use (35.71%),
- Belief that government should bear full responsibility (33.93%),
- Lack of interest (25%), and
- Financial inability (5.36%).

These results portend that there is an apprehension towards governance, transparency and financial ability- all of which have a cumulative impact on the participation of communities in conservation financing. In terms of certainty of payment, 84.81% of households said that they were definitely sure they would pay, and 13.08% were sure. Only a minor percentage (2.11%) had to say that they were uncertain, which was most often the result of household decision-making (e.g., a spouse has to be consulted). In order to deal with this uncertainty, the study refcoded the not sure into no, thus lowering the proportion of respondents who are finally willing to contribute by 84.81% to 82.70%. This change makes the WTP estimates stronger and more conservative**.**

Estimation of Mean Willingness to Pay (WTP)

Among the 474 respondents willing to pay, the average contribution amount was:

- Mean WTP = Rs 264.962
- Standard Deviation = Rs 515.022
- Minimum = Rs 25
- Maximum = Rs 5,100

Such broad range, such as small tokens of symbolic contribution and large sums, represents the differences in financial abilities and different tastes on conservation of lakes.

Table .2: Mean Willingness to Pay (WTP)

Variable	Obs.	Mean	Std. Dev.	Min	Max
Max WTP	474	264.962	515.022	25	5100

Inferential Analysis and Model Diagnostics

The inferential statistical methods (logistic regression, hypothesis testing, and diagnostic procedures) were used to examine the relations between WTP and the important socio-economic, demographic, and wetland-associated variables. Variables were combined into the categories of demographic, socio-economic, wetland-use, and perception-based variables, in order to increase the interpretive clarity. The dependent variable (WTP) was binary (0 = Unwilling, 1 = Willing). The independent variables included age, gender, education, occupation, distance to lake, household size, income, perceived value, visit

frequency and perceptions about responsibility. The model became reliable because of diagnostic checks like summary statistics, correlation analysis and parameter estimation.

Multicollinearity

Multicollinearity was assessed using the Collin command in STATA and the Variance Inflation Factor (VIF) method. All variables had VIF values below 10, with an average VIF of 1.22, indicating no multicollinearity issues (Fox, 2021; Oduor et al., 2018).

Specification Error Test (Linktest)

Table .3: Specification Error Test (Linktest Results)

Variable	Coef.	Std. Err.	z	P > z	[95% Conf. Interval]
_hat	0.991	0.170	5.820	0.000	0.657 – 1.324
_hatsq	0.055	0.045	1.210	0.225	-0.034 – 0.143
_cons	-0.230	0.397	-0.580	0.561	-1.008 – 0.547

The large hat (p= 0.000) and small hat sq (p= 0.225) serve as the indicator that the model is specified in the appropriate way, and there are no unaccounted variables (James, 2008). Other model-fit results, such as the Hosmer Lemp good-fit (p=1.000), likelihood-ratio tests, AIC BIC, and pseudo-R 2, also show a very strong performance of the model (Cavanaugh Neath, 2019; Paul et al., 2013).

Heteroscedasticity

The heteroscedasticity test indicated that the variance was not constant (χ^2= 99.47; p= 0.000). In order to curb this problem, strong standard errors were used so that the accuracy of the regression estimates may be guaranteed.

Model Performance and Predictive Strength

The logistic regression model exhibited exceptional predictive power:

- Overall accuracy: 98.1%
- Sensitivity: 99.2%
- Specificity: 89.3%
- AUC (Area Under ROC Curve): 0.995
- McFadden's R^2: 0.429
- Cox & Snell R^2: 0.875

These values indicate an outstanding level of discrimination and explanatory capacity. The model effectively captures key determinants of WTP for lake protection and demonstrates strong alignment between predicted and observed outcomes (Ndebele, 2009).

Table .4: Logistic Regression Model Fit Measures:

Model	AIC	BIC	McFadden R^2	Cox & Snell R^2	Nagelkerke R^2	Model χ^2	df	p-value
Model 1	92.20	161.00	0.832	0.429	0.875	297.00	15	< 0.001

Table .5: Logistic Regression Estimates:

Variables WTP	Logit Coeff.	Odds ratio	Marginal Effects
Intercept	-5.429** (2.9037)	0.00439	
Age	0.132*** (0.0472)	1.14088	0.00217*** (0.000729)
Education	1.643** (0.7637)	5.17117	0.0271** (0.0117)

HH size	-0.478*** (0.2145)	0.6203	-0.00787** (0.00342)
HH Income	1.90e-04** (8.50e-05)	1.00019	3.12e-06** (1.32e-06)
Distance	-0.981*** (0.3337)	0.37509	-0.0162*** -0.00503
Category	4.859*** (1.0069)	128.88062	0.0800*** (0.0116)
Activity			
Forest Related	0.155 (0.9972)	1.16728	0.00451 (0.0294)
Recreation	3.432*** (1.4368)	30.93102	0.0732** (0.0321)
Religious	2.569** (1.1524)	13.05278	0.0586* (0.0305)
Value			
Source of income	3.997*** (1.3194)	54.42954	0.0674*** (0.0193)
Resv. for future gen	1.94 (1.3151)	6.95571	0.0349 (0.0239)
Existence of lake	4.208** (1.7338)	67.24694	0.0709*** (0.0249)
Responsible Body			
Local People	3.206** (1.4083)	24.67403	0.0672** (0.0317)
NGOs / INGOs	3.198*** (1.1672)	24.47234	0.0671** (0.0263)
Tourists	2.72** (1.1724)	15.17315	0.0588** (0.0255)

p<0.01**, p<0.05***, p<0.1**
Log pseudo likelihood = -30.115788
Number of obs = 530
Pseudo R2 = 0.8316
Wald chi2 (15) = 66.01
Prob> chi2 = 0.0000

Logistic Regression Results and Interpretation

The logistic regression model identifies the determinants that mediate Willingness to Pay (WTP) by the respondents in conservation of the lake. Data provides the approximate coefficients, odds ratios and the statistical significance of each predictor. The findings summarize the two odds ratios - that are characterized by the multiplicative effect of the predictors on the likelihood of WTP - and marginal effects - an example of which is the effect that change in one variable will have on the likelihood of a change in the predicted probability of WTP. Predictors with p -values less than 0.05 are considered to be statistically significant. Among the significant positive predictors are age, education, household income, type of respondent, recreational and religious activities, perceived value of the lake (income-generation and existence value), and the responsibility the local residents, NGOs/INGOs, and tourists have. In comparison, it was established that household size and distance to the lake had negative and statistically significant effects to WTP.

1. Age

The age factor has positive and significant impact on WTP (coef. = 0.132; SE.= 0.0472; p.= -0.005). The odds ratio value of 1.141 reveals that an increase in the number of years of age increases the probability of the expressiveness of WTP by 14.1 percent, all other variables remaining constant. Some studies have

found that younger people are more environmentally aware (Saha et al., 2021), whereas other researches (Xiaohan et al., 2023; Ren et al., 2020) note the opposite; older people might be more concerned due to their years of life experience and the wish to preserve the resources to be used by future generations. The contrasting evidence indicates that the correlation between age and environmental issue is non-linear with rather a socio-cultural process that influences the relationship between age and issues of environmental concern instead of risk perception and life-stage priorities.

2. Education

The positive impact of education is very high (coef. = 1.643; SE = 0.7637; p = 0.031). The respondents who are more educated are more willing to pay, and the corresponding odds ratio is 5.171. This observation corresponds with empirical results that education enhances awareness, environmental attitudes, and awareness of conservation imperatives (Xiaohan, et al., 2023; Dias, 2011).

3. Household Income

Household income is also a meaningful positive predictor of WTP (coef. = 1.90e−4; SE = 8.50e−5; p = 0.026). Though odds ratio (1.00019) is near unity the direction is positive which indicates that incremental income is with respect to a slight, but steady, increase in WTP. Income has traditionally been considered one of the key motives of WTP in contingent valuation literature (Halkos & Matsiori, 2012; Barbier, et al., 1996) because people trade off the benefits of the environment with their financial means.

4. Household Size

The number of people living in the household has a negative and significant effect on WTP (coef. = -0478; p=0.026). The larger the household size, the more the probability of WTP gets reduced by about 0.620 units. The presence of larger households leads to an increase in financial strain and subsequently reduces their ability to contribute toward environmental discretion (Bekele & Asrat, 2020).

5. Distance to Lake

The location in relation to the lake has an adverse effect on WTP (coef. = –0.981; $p < 0.001$). The further one is in kilometres off the lake, the greater the attenuation effect of the WTP probability (odds ratio ≈ 0.375). The finding aligns with the theory that the closer a person gets to a natural resource, the greater the emotional, cultural, and economical attachment, which facilitates the increase of WTP (Endalew et al., 2020).

6. Respondent Category

The local people versus other groups respondent level variable displays a strong significance (coef. = 4.859; SE = 1.0069; $p < 0.001$). The likelihood of expressing WTP among the local residents is 128.881 times higher than that of the non-locals, which indicates that the locals directly rely on the lake as a source of livelihood, culture, and leisure.

7. Activity Participation

Activities influence WTP differently based on the type of interaction with the lake:

- Recreational activities: coef. = 3.432 → 30.931 times more likely to show WTP
- Religious activities: coef. = 2.569 → 13.053 times more likely
- Forest-related activities: coef. = 0.155 → *not statistically significant*

Compared to the reference category (water-related activities), those who use the lake for recreational and religious purposes demonstrate stronger WTP, likely due to higher perceived benefits.

8. Perceived Value of the Lake

Perceived value significantly shapes WTP:

- Source of income: coef. = 3.997 → 54.429 times more likely
- Existence value: coef. = 4.208 → 67.247 times more likely

These results highlight that households who recognize the lake's economic or intrinsic ecological value are much more likely to invest in its conservation.

9. Responsible Body

Compared to the Nepal Government as the reference category:

- Local people: 24.674 times more likely to show WTP
- NGOs/INGOs: significant positive effect
- Tourists: significant positive effect

This aligns with Brandli et al. (2015), who emphasize that shared responsibility across multiple stakeholders enhances environmental stewardship.

10.Model Fit and Diagnostics

Robustness tests confirm the validity and reliability of the logistic regression model.

- Wald Chi² = 66.01
- Pseudo R^2 = 0.8316
- Log likelihood = –30.1156
- Constant = –5.429

Diagnostic link-tests (sign, 2 insignificant) show that there is no specification error. Multicollinearity is insignificant (mean VIF=1.22). Although, heteroscedasticity is found, the robust standard errors are applied to eliminate the impact, and this increases the consistency and accuracy of model. An exemplary performance is predictive:

Predictive power is exceptional:

- Overall accuracy: 98.1%
- Sensitivity: 99.2%
- Specificity: 89.3%
- AUC = 0.995
- McFadden's R^2 = 0.429; Cox & Snell R^2 = 0.875

These statistics confirm that the model offers excellent explanatory capacity and predictive strength.

SUMMARY AND CONCLUSION

Goods like wetlands are not directly priced by the markets though they provide ecological and socio-economic services that cannot be priced in markets, as they provide invaluable ecological and socio-economic services such as climate control, flood control, habitat of biodiversity, recreation and cultural enrichment. The growing menace of anthropogenic actions makes valuation studies invaluable in evidence-based conservation policy. This study determined the Willingness to Pay (WTP) of the local inhabitants towards the conservation of the Ghodaghodi Lake, which is a Ramsar site in Nepal, using the Contingent Valuation Method (CVM). The data were collected through face-to-face surveys of 530 people who provided information that reflected their socioeconomic conditions and demographics in terms of lake values and threats.

Policy Recommendations

- Strengthen ecological monitoring and invasive species control (e.g., water hyacinth removal).
- Promote community-led conservation committees.
- Implement transparent fund management to increase public trust.
- Integrate tourism development with biodiversity protection through eco-friendly facilities.

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