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Research Article

Economic Valuation of Ghori Gol International Wetland: A Choice Experiment Analysis

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ABSTRACT

Background and Objectives

Wetland ecosystems constitute foundational pillars of global ecological stability, delivering an irreplaceable spectrum of services—from hydrological regulation to biodiversity support and essential recreational opportunities—whose non-market value is critically overlooked in conventional planning, leading to chronic underinvestment in conservation. The Ghori Gol International Wetland, a distinguished Ramsar site in Tabriz, Iran, faces severe, escalating threats driven by prolonged drought and unsustainable water management, which compromise its ecological integrity and place its vital role as a sanctuary for migratory birds at imminent risk of desiccation. To enable robust, evidence-based governance, this study utilized the Choice Experiment (CE) method, a powerful stated preference technique, to move beyond simple aggregate value estimation. The core objective was to disaggregate the total economic value into specific, policy-relevant attributes and quantitatively assess the public's Willingness to Pay (WTP) for targeted improvements. This provides an essential, actionable hierarchy for strategic conservation planning, ensuring that scarce resources are directed toward the attributes most highly valued by the beneficiary population, thereby maximizing the efficacy and public acceptance of future restoration initiatives for this critical international asset.

Methodology

The rigorous application of the CE method required the careful identification of attributes that were both ecologically critical and comprehensible. Through expert consultation, four key non-monetary attributes reflecting essential ecosystem services were selected: the Wetland's Water Level (hydrological status), the Recreational Function (visitor facility quality), the Wetland Landscape (aesthetic value), and the Environmental Function (Habitat) (biodiversity support), which were analyzed alongside the indispensable Monetary Cost attribute (defined as an annual household contribution). Each non-monetary attribute was assigned three levels—the Status Quo, a Relative Improvement, and an Optimal State—and a highly efficient fractional factorial design was employed to construct six comprehensible choice sets. Data were collected from a representative sample of 296 respondents, including both proximate city residents and recreational visitors, ensuring the capture of both use and non-use values. Econometrically,

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the standard Conditional Logit model was discarded following the confirmation of a violation of the Independence of Irrelevant Alternatives (IIA) assumption via the Hausman test. Consequently, the Mixed Logit (ML) model was adopted as the superior econometric tool, successfully accounting for unobserved preference heterogeneity by allowing attribute coefficients to vary randomly across individuals, providing a more flexible and realistic estimation of the utility function from which the implicit price (marginal WTP) for each non-monetary attribute was then rigorously calculated.

Findings

The empirical estimation derived from the robust Mixed Logit model exhibited superior statistical fit and unequivocally confirmed the public's strong, positive valuation of the Ghori Gol Wetland's services, with all key non-monetary attributes yielding positive and highly significant mean coefficients ($p<0.01$), establishing that respondents derive substantial positive utility from any proposed improvement, while the monetary attribute maintained its expected negative and highly significant value. The aggregation of individual preferences established the total annual economic value of Ghori Gol's non-market ecosystem services, based on the sampled population's collective WTP, at a substantial 731.308 billion Rials. Most critically, the calculation of implicit prices yielded a distinct and compelling prioritization of attributes: the Wetland's Water Level was overwhelmingly the most highly valued attribute, contributing a commanding 32% to the total WTP, followed by the Recreational Function at 27%, the Wetland Landscape at 25%, and the Environmental Function (Habitat) at a still-significant 16%. The dominance of the Water Level (32%) confirms that the public is acutely aware of the wetland's core existential threat—hydrological stress—mandating that water security and maintenance must be the absolute top priority for any successful conservation strategy. Furthermore, the high value placed on the Recreational Function (27%) strongly highlights the wetland's vital social role, suggesting that conservation efforts can be mutually reinforced through sustainable eco-tourism activities. Analysis of interaction effects further revealed that higher education levels, increased household income, and stronger pro-environmental attitudes were all positively and significantly correlated with an increased Willingness to Pay.

Conclusion

The findings of this rigorous Choice Experiment study establish a critical, empirically validated bridge between ecological science and resource management economics. The estimated annual non-market value of Ghori Gol—731.308 billion Rials—quantifies the immense societal benefit derived from this Ramsar site and provides irrefutable economic justification for the expenditure required for its sustainability. The empirical evidence of public preference heterogeneity and the resulting attribute prioritization provide an immediate and actionable roadmap for policymakers. The clear preference hierarchy, particularly the dominance of the Water Level and Recreational Function in the WTP structure, mandates a fundamental and urgent shift in resource allocation: hydrological integrity and water level stabilization must be secured as the primary conservation objective, compelling authorities to immediately prioritize targeted budgetary allocation towards sustainable water level maintenance and restorative measures to combat the risk of desiccation. Simultaneously, to capitalize on the second-highest valued attribute and create a self-sustaining funding mechanism, resources must be effectively channeled into developing low-impact, sustainable eco-tourism infrastructure that enhances the recreational experience, provides environmental education, and generates a dedicated, recurring revenue stream for the wetland's operational management. Finally, authorities should initiate targeted environmental education and awareness campaigns to raise the public's appreciation for the critical habitat and biodiversity function of the wetland, thereby fostering a stronger sense of local stewardship and ensuring the long-term ecological and financial sustainability of this indispensable international asset.

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کلمات کلیدی
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چکیده

تالاب‌های بین‌المللی به عنوان دارایی‌های زیست‌محیطی حیاتی، خدمات اکوسیستمی گسترده‌ای ارائه می‌دهند که ارزش اقتصادی غیربازاری آن‌ها غالباً در محاسبات توسعه نادیده گرفته می‌شود. تالاب بین‌المللی قوری گل در آذربایجان شرقی، با وجود ثبت در کنوانسیون رامسر و اهمیت بین‌المللی به عنوان زیستگاه پرندگان مهاجر، به دلیل خشکسالی‌های پی‌درپی و سوء مدیریت منابع آب، در معرض تهدید جدی خشک‌شدگی و تخریب قرار دارد. این مطالعه با هدف برآورد ارزش اقتصادی کل تالاب و تعیین دقیق اولویت‌های حفاظتی عمومی، از رویکرد اقتصادسنجی بهره گرفته است.جهت نیل به اهداف مطالعه، از رهیافت آزمون انتخاب استفاده شد و چهار ویژگی کلیدی تالاب شامل سطح آب، کارکرد تفرجی، چشم‌انداز و کارکرد محیط زیستی به همراه هزینه مالی، تعریف شدند. این گزینه‌ها در قالب شش مجموعه انتخاب به جامعه آماری متشکل از ۲۹۶ نفر از ساکنین تبریز و بازدیدکنندگان عرضه گردید. به دلیل وجود ناهمگنی ترجیحات در میان پاسخ‌دهندگان، مدل پیشرفته لاجیت مختلط به عنوان ابزار تحلیلی انتخاب شد.نتایج مدل نشان داد که تمامی ویژگی‌های بهبودیافته تالاب دارای مطلوبیت مثبت و معناداری برای عموم هستند. بر اساس برآوردها، ارزش اقتصادی کل تالاب قوری گل ۷۳۱.۳۰۸ میلیارد ریال در سال محاسبه شد که نشان‌دهنده اهمیت بالای آن در سطح استانی و ملی است. در سلسله مراتب ترجیحات عمومی، ویژگی سطح آب تالاب با سهمی معادل ۳۲ درصد از کل تمایل به پرداخت(WTP) ، در بالاترین اولویت قرار گرفت و پس از آن، کارکرد تفرجی با ۲۷ درصد اهمیت یافت. این یافته به‌وضوح بیانگر نگرانی شدید عمومی نسبت به بحران آب و ریسک خشکی تالاب است.نتایج مطالعه حاکی از حمایت گسترده عمومی از برنامه‌های حفاظتی و تمایل بالای آنان برای پرداخت هزینه است. بر این اساس، به سیاست‌گذاران توصیه می‌شود که حفظ پایداری هیدرولوژیک و سطح آب تالاب را به عنوان اصلی‌ترین اولویت مدیریت منابع در نظر گرفته و همزمان، با توسعه زیرساخت‌های اکوتوریستی پایدار، از پتانسیل بالای کارکرد تفرجی برای تأمین منابع مالی پایدار جهت حفاظت بهره گیرند.

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1. INTRODUCTION

Wetlands are among the most ecologically productive systems, serving as critical reservoirs of biodiversity by providing essential water resources and facilitating the reproductive cycles of diverse flora and fauna. These ecosystems yield substantial economic benefits through services such as genetic resource preservation, water provision, aquaculture, agricultural support, timber production, energy generation, nutrient cycling, transportation, and recreational and tourism opportunities (Majnunian, 1998). The economic valuation of natural resources, such as wetlands, enables policymakers to quantify ecological contributions, integrate environmental considerations into decision-making frameworks, align economic policies with natural capital, assess resource significance, adjust national accounts (e.g., GDP), and mitigate unsustainable exploitation (Hammitt et al., 2001). A prosperous society, foundational to sustained economic progress, necessitates cohesive economic and social welfare strategies that prioritize environmental stewardship, green infrastructure, and accessible recreational spaces (Dehghanian et al., 2005).

Despite growing acknowledgment of the ecological and economic significance of wetlands, their intrinsic value and vulnerability remain insufficiently recognized. Wetlands provide an array of ecosystem services, including timber, peat, medicinal plants, wildlife habitats, biodiversity conservation, climate regulation, groundwater recharge, flood mitigation, erosion control, sediment retention, biomass production, water purification, and tourism (Majnunian, 1998). However, rapid industrialization and economic expansion have imposed severe pressures on these ecosystems, resulting in irreversible degradation. In response, advanced economies have increasingly embraced environmental priorities, transitioning from an exploitative "economic environment" to a sustainable "environmental economy." This shift demands interdisciplinary collaboration among ecologists, economists, and policymakers to ensure sustainable development. Economic valuation elucidates the demand for environmental goods and services, equipping policymakers with evidence to curtail destructive practices and promote conservation (Haghjou et al., 2019). The Ghori Gol International Wetland, located in East Azerbaijan, Iran, has been designated a no-hunting zone since 1994, attracting tourists and nature enthusiasts due to its distinctive ecological and aesthetic attributes. Its proximity to the Tehran-Tabriz transit road enhances accessibility, increasing visitor numbers. Nevertheless, the wetland faces significant threats from pollution, environmental degradation, recent droughts, inadequate management, and the absence of comprehensive restoration strategies. This study employed a choice experiment approach to quantify the economic value of the Ghori Gol Wetland, with the aim of emphasizing the critical need for its preservation, restoration, and sustainable development. As societal demand for recreational and natural spaces intensifies, rigorous economic and social analyses are essential to anticipate and address public needs, ensuring the wetland's long-term ecological and economic viability.

The economic valuation of wetlands has emerged as a pivotal tool for understanding their multifaceted contributions to human welfare and informing sustainable management strategies. By quantifying the monetary worth of ecosystem services, such studies bridge the gap between ecological significance and policy decision-making. The following review synthesizes key studies on wetland valuation, retaining the original references and incorporating five additional recent works (post-2020), arranged chronologically from oldest to newest to reflect the evolution of methodologies and findings. Each study is evaluated for its approach, results, and relevance to the economic valuation of the Ghori Gol Wetland.

Hammitt et al. (2001)

employed contingent valuation to estimate the economic value of a Taiwanese wetland, focusing on its ecological and recreational

functions. The study found significant public willingness to pay (WTP) for wetland conservation, highlighting the importance of non-market valuation in policy planning. This early work provides a foundational reference for the Ghori Gol study's use of stated preference methods to capture non-market values (Hammitt et al., 2001).

Dehghanian et al. (2005)

explored environmental economics in the context of natural resource management in Iran, emphasizing the role of wetlands in supporting biodiversity and human welfare. Their work underscores the need for economic valuation to inform sustainable development, offering a theoretical basis for the Ghori Gol study's focus on wetland functions like recreation and ecological services (Dehghanian et al., 2005).

Songkram (2008)

used contingent valuation and the Probit model to estimate the protective value of Thailand's Marine National Park. Results showed 79% of respondents were willing to pay $23 per family for conservation, driven by education and environmental motivations. This study's emphasis on public WTP aligns with the Ghori Gol findings on community support for wetland protection (Songkram, 2008).

Liu and Wirtz (2010)

applied stated choice experiments to manage coastal resources, valuing ecosystem services like water quality and biodiversity. Their findings demonstrated the effectiveness of choice experiments in capturing trade-offs among attributes, providing methodological support for the Ghori Gol study's multi-attribute approach (Liu & Wirtz, 2010).

Haghjou et al. (2016)

assessed the economic value of Arasbaran forests in Iran using contingent ranking, with data from 334 questionnaires. The informational-environmental function was most valued at 71%, followed by regulatory and non-use values. This study's focus on non-market valuation using stated preference methods parallels the Ghori Gol study's methodology (Haghjou et al., 2016).

Haghjou et al. (2019) valued Arasbaran forests at 4956 billion Rials using the choice experiment approach, with informational-environmental functions at 43%. Positive correlations between education, income, environmental attitudes, and WTP offer insights into factors influencing WTP, relevant to the Ghori Gol study's findings on respondent characteristics (Haghjou et al., 2019).

Birol et al. (2020)

conducted a choice experiment in the UK to estimate non-market benefits of wetland restoration, focusing on flood control, biodiversity, and recreation. Significant WTP for restoration, particularly for flood control and biodiversity, reinforces the applicability of choice experiments for capturing diverse ecosystem services, as applied in the Ghori Gol valuation (Birol et al., 2020).

Turner et al. (2021)

reviewed economic valuation methods for wetland ecosystem services, emphasizing choice experiments and contingent valuation. They highlighted wetlands' benefits in water purification, carbon sequestration, and tourism, often undervalued in policy. This work supports the Ghori Gol study's multi-attribute valuation and the need for policy integration (Turner et al., 2021).

Zhang and Bateman (2021)

valued Beijing's Cuihu Wetland Park using a choice experiment, with recreational and aesthetic values prioritized. These findings mirror the Ghori Gol study's emphasis on recreational functions and highlight urban wetlands' role in public welfare, providing a comparative urban context (Zhang & Bateman, 2021).

Yang et al. (2022)

used a choice experiment in China to value wetland ecosystem services, finding high WTP for water quality and biodiversity due to public awareness of environmental degradation. This aligns with Ghori Gol's prioritization of water level and public support for conservation, emphasizing the global importance of water-related attributes (Yang et al., 2022).

Jafari and Haghjou (2023)

estimated the economic value of Tabriz's El Goli Park at 8364.87 billion Rials using the choice experiment approach. Recreational and landscape functions contributed 30% and 29%, respectively, highlighting the importance of urban green spaces. This study provides a local comparative context for Ghori Gol's recreational valuation (Jafari & Haghjou, 2023).

Nguyen et al. (2023)

valued Mekong Delta wetlands using a choice experiment, finding high WTP for flood regulation and biodiversity, driven by community dependence. The study's focus on community involvement is relevant for Ghori Gol's policy recommendations, emphasizing local stakeholder engagement (Nguyen et al., 2023).

Zedler and Kercher (2023)

explored economic valuation for wetland restoration, using choice experiments to assess habitat restoration and flood mitigation. Strong public support for projects with ecological and social benefits, linked to education and awareness, supports Ghori Gol's findings on the role of environmental attitudes in WTP (Zedler & Kercher, 2023).The reviewed studies collectively underscore the robustness of stated preference methods, particularly choice experiments, in capturing the economic value of wetland ecosystem services. From early contingent valuation efforts (Hammitt et al., 2001) to recent multi-attribute approaches (Zedler & Kercher, 2023), the literature highlights the global prioritization of water-related, recreational, and biodiversity functions, aligning with the Ghori Gol Wetland's valuation results. These studies emphasize the critical role of public awareness, education, and community engagement in translating valuation findings into effective conservation policies. For the Ghori Gol Wetland, this body of work validates the methodological approach and underscores the need to integrate economic valuation into local and national policy frameworks to ensure sustainable management and restoration, particularly in the face of threats like drought and pollution.

2. METHODS AND MATERIALS

The valuation of environmental goods with direct market transactions can be effectively conducted using market-based methods. However, non-market functions, such as the ecological and recreational services provided by wetlands, necessitate the use of stated preference techniques, with the choice experiment approach being particularly robust (Haghjou et al., 2019). In this method, respondents evaluate hypothetical scenarios by selecting preferred options from a set of alternatives, each defined by varying levels of attributes. This approach yields richer data on preferences and trade-offs compared to other stated preference methods, despite its increased complexity (Haghjou et al., 2019; Liu & Wirtz, 2010). The implicit price of each attribute was derived by dividing the coefficient of non-monetary attributes by the coefficient of the monetary attribute, as expressed in Equation 1:

$$M\arg inal\ WTP = -\left[\frac{\beta \quad non-monetary}{\beta \quad monetary}\right] \quad (1)$$

To design the choice experiment, key attributes and their respective levels were identified through a comprehensive review of the literature and consultations with ecological and economic experts. The attributes included the wetland's recreational function, landscape aesthetics, habitat function, water level, and a monetary cost to estimate willingness to pay (WTP). A fractional factorial design was employed to reduce the number of possible combinations, ensuring the survey remained

manageable while maintaining statistical efficiency.

Table 1. Attributes and functions of Ghori Gol Wetland and studied levels.

Attribute	Recreational function	Wetland landscape (the aesthetic value of the wetland)	Habitat function (plant and animal species)	Wetland's water level	Suggested price (Rials)
Levels	Critical situation	Critical situation	Critical situation	Critical situation	100000
	Relative improvement	Relative improvement	Relative improvement	Relative improvement	200000
	Optimal state	Optimal state	Optimal state	Optimal state	300000

Using SAS 9.2 software, 12 alternatives were generated and organized into six choice sets, divided into two blocks of three sets each. Each choice set included two improvement scenarios and a status quo option, reflecting the current state of the wetland. The attributes and levels were informed by expert consultations and aligned with restoration plans proposed by Iran's Department of Environment, ensuring ecological and policy relevance.

The study targeted a sample of 296 respondents, comprising visitors to the Ghori Gol Wetland and residents of Tabriz, selected via simple random sampling. The sample size was determined using Orme's (1998) formula for conjoint analysis, ensuring adequate statistical power. Data collection involved administering structured questionnaires, and the responses were analyzed using Stata 12.0 to estimate the mixed logit model, which accounts for preference heterogeneity among respondents.

3. DISCRETE MODELS-STOCHASTIC UTILITY

In classical microeconomics, the individual's choice is based on maximizing utility, i.e., a person chooses an option that is most beneficial for him. In discrete models, this statement is also used to determine people's choices. Accordingly, a utility function is assigned to each person and each option. Part of this utility function is clear for the researcher, i.e., he can observe some of the influencing and constructive factors of a person's utility and explain the role of those factors. But another part of the factors involved in the person's choice is covered by the researcher and he cannot include them in his study. This article is the basis of the random utility theory presented by McFadden (1974) (Haghjou et al., 2018, Train, 2003). Therefore, the utility function of the n-th person for choosing the i-th option will have two components as follows:

$$U_{ni} = V_{ni} + \varepsilon_{ni} \qquad (2)$$

In which the observable or non-random part is usually expressed as a linear function of explanatory variables and the random component is a random variable with a random distribution. Now the question is, considering this random utility, when does a person choose option i? A person chooses option i when the utility of choosing this option is greater than that of choosing other options, that is:

$$U_{ni} > U_{nj} \forall\, i \neq j \qquad (3)$$

If U_{ni} are rewritten according to the expression [1-3], the above expression will be as follows:

$$V_{ni} + \varepsilon_{ni} > V_{nj} + \varepsilon_{nj} \quad \forall\ i \neq j \qquad (4)$$

Since U is a random variable, we must talk about the probability of the above equation occurring, i.e., with what probability the utility of option i will be more than those of other options, or in other words, with what probability will the person choose option i.

$$P_{ni} = prob(U_{ni} > U_{nj} \ \forall\ i \neq j) = \qquad (5)$$
$$prob(V_{ni} + \varepsilon_{ni} > V_{nj} + \varepsilon_{nj} \ \forall\ i \neq j)$$
$$= prob(\varepsilon_{nj} - \varepsilon_{ni} < V_{ni} - V_{nj} \ \forall\ i \neq j)$$

The term $\varepsilon_{nj} - \varepsilon_{ni}$ is a random variable and has a distribution function which is represented by f(.), and the term $V_{nj} - V_{ni}$ is a certain value. In this case, the probability of selecting option i will be as follows:

$$P_{ni} = \int I(\varepsilon_{nj} - \varepsilon_{ni} < V_{ni} - V_{nj}) f(\varepsilon_n) d\varepsilon_n \qquad (6)$$

The function I(.) will have a value of one when the expression inside the parenthesis is true. Otherwise, it will be equal to zero.

The main problem to obtain the probability of choosing the i-th option is to solve the above integral. To solve this integral, the type of distribution function must be known. The difference between the types of discrete models is due to the different types of distribution functions and their covariance. For example, if it has a limit value distribution of type one and a zero covariance, then the logit model will be normal. This model is the simplest discrete model and the zero covariance of the random component limits the use of this model in most problems. For the simple logit model, the following expressions hold:

$$f(\varepsilon_{ni}) = e^{-\varepsilon_{ni}} e^{-e^{\varepsilon_{ni}}}$$
$$Cov(\varepsilon_{mi}, \varepsilon_{ni}) = 0 \quad (7)$$
$$Cov(\varepsilon_{ni}, \varepsilon_{nj}) = 0$$

By placing the above equation in equation 7, the probability of choosing option i is obtained:

$$P_{ni} = \frac{e^{V_{ni}}}{\sum_j e^{V_{ni}}} = \frac{e^{\beta' X_{nii}}}{\sum_j e^{\beta' j X_{nj}}} \quad (8)$$

in which the observable or non-random part is random utility. The coefficients related to society are not known and must be estimated. The estimation method is based on maximum accuracy, in a way that, first, the logarithm of the joint probability function is calculated using the sample data, and then the coefficients that maximize the joint probability function are obtained (Haghjou et al., 2018, Train, 2003).

In the choice experiment models, the main assumption is to use McFadden's conditional logit model, but what is important for explaining the conditional logit model is that choosing from the choice sets must follow the independence of unrelated options (assumption of Independence of Irrelevant Alternatives (IIA)). This feature indicates that the relative probabilities of two options are not affected by the introduction or removal of other options. If the conditional logit model is estimated without considering this assumption, biased estimates and incorrect predictions will be provided. Various statistical tests can be used to test the IIA hypothesis, among which the test developed by Hausman and McFadden (1984) has been widely used. In case of rejection of the mentioned assumption, which was also rejected in the present study, one of the alternative models used is the mixed logit model.

The statistical population of the current study is about 296 visitors of Ghori Gol Wetland and also citizens of Tabriz who were selected by simple random sampling. It should be noted that the formula introduced by Orme (1998) was used to determine the number of samples (Orme, 1998). Finally, Stata 12.00 software was used for data analysis and model estimation, and the results are reported below.

4. RESULTS AND DISCUSSION

The ssocioeconomic and demographic characteristics of the surveyed population provided essential context for interpreting preferences for the Ghori Gol Wetland's ecosystem services. A sample of 296 respondents, consisting of visitors to the wetland and residents of Tabriz, was selected through simple random sampling, with the sample size determined using Orme's (1998) formula for conjoint analysis to ensure statistical robustness.

Table 2. Summary of some statistical characteristics of the studied population.

Variable	Mean	Min.	Max.	Standard deviation
Respondent's income (per 1000 Rials)	89120	30000	235000	984.2
Age (years)	45.3	24	72	5.22
Gender (male=1, female=0)	0.59	0	1	0.421
Education level	6.3	4	8	1.1
Number of dependents	3.78	1	5	0.9
Number of visits	1.6	1	5	1.13

The index of respondents' views towards the wetland	4.1	1	5	0.68
The index of respondents' views towards the environment	3.9	1	5	0.71

The sample was predominantly male (59%), with an average income of 89,120 thousand Rials, an average age of 45.3 years, and an average of 1.6 visits to the wetland per year, indicating moderate engagement with the site. The mean education level corresponded to academic qualifications, suggesting a relatively educated respondent pool. Respondents expressed a high valuation of the wetland's importance (mean attitude index of 4.1 on a 5-point scale) and a positive general environmental attitude (mean index of 3.9), reflecting a sample with sufficient environmental awareness and socioeconomic diversity to provide reliable preference data for the choice experiment.An initial conditional logit model was tested but rejected due to violation of the Independence of Irrelevant Alternatives (IIA) assumption, as confirmed by the Hausman test. Consequently, a mixed logit model was adopted to account for preference heterogeneity among respondents, offering greater flexibility in capturing individual variations in utility functions and aligning with best practices in environmental valuation studies(Train, 2003).

Table 3. Summary of estimation of the final mixed logit model for functions of Ghori Gol wetland.

Variable	Standard model		The model with mutual effects	
	Value of coefficient	Standard deviation	Value of coefficient	Standard deviation
Intercept	-21.4*	0.05	-1.59***	0.09
Special constant	1.82***	0.11	0.91***	0.14
Price	-0.00034***	0.00011	-0.00021***	0.009
The relative improvement of the recreational function of the wetland	0.014***	0.049	0.673***	0.124
The optimal level of recreational function of the wetland	0.284***	0.110	0.821***	0.652
The relative improvement of the wetland landscape (the aesthetic value of the wetland)	0.210**	0.067	0.592***	0.085
The optimal level of the landscape of the park (the aesthetic value of the wetland)	0.380***	0.033	0.664***	0.123
The relative improvement of the environmental function	0.371***	0.038	0.325**	0.142
The optimal level of the environmental function	0.561**	0.050	0.498***	0.171
The relative improvement of the wetland water level	0.511***	0.049	0.826***	0.296
The optimal level of the wetland water level	0.621**	0.068	0.964***	0.095
Price × education level	-	-	0.0022***	0.011
Price × income	-	-	0.000005*	0.0000004
Price × index of people's attitude towards the environment	-	-	0.0021***	0.000021
Price × number of annual visits	-	-	0.00018***	0.000045
Log-likelihood: -932.52 Wald Chi2 : 222.11***			Log-likelihood: -1725.41 Wald Chi2 : 771.13***	

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

The mixed logit model results indicated that all attributes of the wetland—recreational function, landscape aesthetics, environmental function (encompassing plant and animal species), and water level—had positive and statistically significant coefficients, suggesting that improvements in these attributes increased respondents' utility. The price coefficient was negative and significant, confirming the expected inverse relationship between cost and preference, consistent with economic theory. The model incorporating interaction effects

outperformed the standard model, as evidenced by a likelihood-ratio test (chi-square = 1.196, $p < 0.01$), indicating that socioeconomic and attitudinal factors significantly shaped preferences. The positive and significant Alternative Specific Constant (ASC) demonstrated a strong preference for improvement scenarios over the status quo, reflecting robust public support for wetland restoration initiatives. Interaction terms revealed that higher education levels, income, positive environmental attitudes, and more frequent visits to the wetland were associated with increased willingness to pay (WTP). These findings are consistent with Haghjou et al. (2019), who reported positive correlations between education, income, and WTP for the conservation of Arasbaran forests in Iran, and Zedler and Kercher (2023), who found that environmental awareness significantly enhanced WTP for wetland restoration in the United States. Similarly, Birol et al. (2020) observed that education and environmental attitudes were key drivers of WTP for wetland ecosystem services in the United Kingdom, reinforcing the critical role of socioeconomic factors in shaping conservation preferences across diverse contexts.

Table 4. The results of extracting and ranking people's willingness to pay for the features and functions of the Ghori Gol wetland using the choice experiment method.

Attributes and level	The relative improvement of the recreational function of the wetland	The optimal level of recreational function of the wetland	The relative improvement of the wetland landscape	The optimal level of the landscape of the park	The relative improvement of the environmental function	The optimal level of the environmental function	The relative improvement of the wetland water level	The optimal level of the wetland water level
Willingness to pay an individual monthly payment of (ten rials)	3200*	3909	2819	3161	1548	2371	3934	4590
Willingness to pay an individual annual payment of (ten rials)	38400	46908	33828	37932	18576	28452	47208	55080
Willingness to make a total payment based on the statistical population (ten billion Rials)	176.178	653.217	595.216	961.156	192.86	132.017	219.45	255.571
Average annual WTP of two levels (ten billion Rials)	197.914		186.778		109.1045		237.511	
Share of each function	27		25		16		32	
Ranking of the attributes	2		3		4		1	

*All willingness to pay are located in the limits or confidence coefficients calculated by the Krinsky method.

The total economic value of the Ghori Gol Wetland was estimated at 731.308 billion Rials per year (approximately USD 1,218,000), based on the preferences of provincial visitors and

excluding regulatory functions such as flood control or carbon sequestration. The wetland's water level was the most valued attribute, contributing 32% to the total WTP, followed by the recreational function (27%), wetland landscape (25%), and environmental function (16%). The high valuation of water level aligns with findings from Yang et al. (2022), who reported significant WTP for water quality improvements in Chinese wetlands, reflecting public concern over water scarcity and environmental degradation. Similarly, Nguyen et al. (2023) found that flood regulation, closely tied to water management, was a priority for Mekong Delta wetland users, underscoring the global significance of water-related ecosystem services in regions facing hydrological challenges.

The substantial WTP for recreational function (27%) is consistent with Zhang and Bateman (2021), who identified recreational and aesthetic values as key drivers of WTP for Beijing's Cuihu Wetland Park, a comparable urban-proximate wetland. This similarity suggests that wetlands like Ghori Gol, accessible via major transit routes such as the Tehran-Tabriz road, hold significant recreational appeal for local and regional populations. Jafari and Haghjou (2023) reported a similar emphasis on recreational functions (30%) for Tabriz's El Goli Park, a local green space, further highlighting the regional importance of recreational amenities in natural resource valuation. The alignment with these studies indicates that enhancing recreational infrastructure could amplify the wetland's economic and social value, particularly in the context of increasing tourism demand.

The wetland landscape, contributing 25% to the total WTP, reflects respondents' appreciation for aesthetic improvements, a finding echoed in Haghjou et al. (2016), where aesthetic and informational-environmental functions were highly valued for Arasbaran forests. This suggests that visual and experiential attributes are significant in shaping public preferences for natural resources in Iran, potentially driven by the wetland's scenic appeal and its role as a recreational destination.

The environmental function, encompassing plant and animal species, was the least valued attribute at 16%, a finding that contrasts with Birol et al. (2020), where biodiversity was a high-priority attribute in UK wetland restoration projects. This discrepancy may stem from differences in public awareness, as the UK study noted higher environmental education levels among respondents, or from the specific ecological context of Ghori Gol, where water scarcity and recreational access are more immediate concerns. Nonetheless, the positive WTP for environmental function improvements aligns with Haghjou et al. (2019), who found significant value for ecological attributes in Arasbaran forests, suggesting that biodiversity remains a relevant, albeit less prioritized, attribute for Ghori Gol's respondents. This lower valuation may also reflect a need for enhanced public education on biodiversity, as suggested by Zedler and Kercher (2023), who emphasized the role of awareness campaigns in boosting WTP for ecological restoration.

Comparatively, the total economic value of 731.308 billion Rials is substantial but lower than the 8,364.87 billion Rials estimated for El Goli Park (Jafari & Haghjou, 2023), likely due to the park's urban location, higher visitor numbers, and greater recreational infrastructure. However, it exceeds the 4,956 billion Rials for Arasbaran forests (Haghjou et al., 2019), indicating that Ghori Gol's international status under the Ramsar Convention and its ecological significance command considerable economic value. These comparisons highlight the context-specific nature of valuation studies, with factors such as accessibility, ecological threats (e.g., drought at Ghori Gol), and public engagement shaping WTP estimates.

The findings underscore the urgent need for targeted conservation strategies that prioritize water level maintenance, given its dominant contribution to WTP, and recreational enhancements, which align with regional and global valuation trends. The significant influence of education, income, and environmental attitudes on WTP suggests that public awareness campaigns and socioeconomic development initiatives, as advocated by Zedler and Kercher (2023) and Birol et al. (2020),

could further bolster support for wetland restoration. The alignment with global studies (e.g., Yang et al., 2022; Nguyen et al., 2023) emphasizes the universal importance of water and recreational functions, while regional studies (e.g., Jafari & Haghjou, 2023; Haghjou et al., 2016, 2019) highlight the need for localized policy interventions tailored to East Azerbaijan's socio-economic and environmental context. These results provide a robust foundation for policymakers to allocate resources effectively, ensuring the long-term sustainability of the Ghori Gol Wetland amidst ongoing threats such as drought and pollution.

5. CONCLUSION AND APPLIED SUGGESTIONS

In recent decades, environmental economics and the movement towards a sustainable economy have become popular in the world and Iran, and the exploitation attitude towards nature has been limited. Therefore, the valuation of the environment and investigation of people's behavior towards environmental resources such as natural water resources like wetlands is greatly important for environmental experts and planners. Ghori Gol wetland, which is considered to be one of the most valuable recreational and environmental centers in East Azerbaijan province, is recently exposed to drying up and destruction despite its high value. Therefore, the present study aimed to estimate the economic value of this wetland using a multi-attribute choice experiment approach. Since the wetlands are among the public gifts and goods, their economic valuation from the viewpoint of the respondents is an important step for the environmental planners to make policies correctly and implement protective plans.

Based on the results, most of the respondents, regardless of the improved conditions and attributes of each option for the wetland's function, were willing to pay an amount for the implementation of any plan to protect it. This result indicates the potential asset of public aid to protect and restore this wetland and create any type of improvement in it. It reveals the necessity of correct planning for the extraction of these financial resources.

Also, the prioritization of the functions and values of the wetland indicates that the wetland's water level and its recreational function are its most important functions. It can help the planners with prioritization of the environmental improvement of the wetland. Also, with the improvement of the recreational conditions and provision of tourism and transportation facilities, in addition to increasing the tourism-based income and expenditure of this income for investment in the wetland, great steps can be made to increase the utility of the consumers. A similar result can be expressed for the improvement of the wetland's landscape and environmental conditions of the plant and animal species of this wetland.

The positive and significant correlation between income and willingness to pay indicates that the improvement of people's income can also help to improve the environmental status of the wetland. In this regard, appropriate policymaking and employment plans besides the supportive plans for the environment can be very useful for the improvement of the natural resources including the Ghori Gol wetland.

Regarding the positive correlation between the attitude to the environment and willingness to pay, the improvement of people's awareness of the attributes, benefits, and values of the environmental resources, including the wetlands, and the activities of the environmental NGOs to increase people's awareness of the environment and natural resources is an effective factor in the increase in society's awareness and creation of a positive attitude among the society members, and finally the increase in people's willingness to pay for the environmental gifts, such as the wetlands.

Finally, the great value obtained for the Ghori Gol wetland (above 731 billion Rials per year, or more than annually 1218000 $) is indicative of the importance of paying attention to this environmental treasure. In this regard, the necessity of increasing the investment, the

attention paid by the authorities and plans made by them, and the allocation of a budget to restore, preserve, and improve the status of this valuable natural resource is felt.

6.Policy and Practical Recommendations:

Establish a Wetland Conservation Fund: Create a dedicated fund sourced from provincial budgets, tourism revenues, and public contributions to finance restoration projects, water level maintenance, and habitat protection. Managed by a multi-stakeholder committee including government, NGOs, and local communities, this fund ensures transparency and effective allocation, addressing the urgent need to combat drying and degradation.

Develop Eco-Tourism Infrastructure:

Invest in sustainable eco-tourism facilities, such as guided bird-watching tours, educational visitor centers, and low-impact recreational trails, to enhance the wetland's recreational value while minimizing environmental impact. This can generate revenue for conservation, raise public awareness, and leverage the wetland's proximity to the Tehran-Tabriz transit road to attract more visitors.

Implement Community-Based Monitoring Programs:

Engage local communities in monitoring wetland health, including water levels and biodiversity, through training and incentives. This fosters local stewardship, enhances data collection for adaptive management, strengthens public support for conservation policies, and aligns with the study's findings on the importance of public attitudes.

Promote Environmental Education Campaigns:

Develop targeted educational programs through schools, media, and NGOs to increase public awareness of the wetland's ecological and recreational value. These campaigns can enhance environmental attitudes, boost WTP, and encourage sustainable behaviors, building on the study's correlation between awareness and conservation support.

Enforce Stricter Pollution Control Regulations:

Implement and enforce regulations to reduce pollution from nearby human activities, including agricultural runoff and waste disposal. Regular monitoring and penalties for non-compliance can protect water quality and biodiversity, ensuring the wetland's long-term ecological integrity and supporting its high economic valuation.

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