

Article

Push and Pull Factors for Ecosystem Services Among Visitors to a Constructed Wetland in Putrajaya, Malaysia

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Abstract

Urban wetlands are increasingly recognized for their ecological and cultural benefits, yet remain underutilized due to limited public awareness and environmental literacy. This study investigates how visitors' perceptions of wetland ecosystem services influence their motivations to engage with a constructed wetland in Putrajaya, Malaysia. By integrating the ecosystem services framework with push-pull motivation theory, the research aims to bridge knowledge gaps and inform sustainable wetland tourism planning. A structured questionnaire was administered to 420 visitors, with 385 valid responses (response rate: 91.7%). Data were analyzed using non-parametric tests (Kruskal–Wallis, Spearman correlation) and multiple regression analysis. Results show that cultural and regulating services are perceived most positively, while emotional restoration and aesthetic appreciation emerged as key motivational drivers. Regression findings reveal that push factors are stronger predictors of ecosystem service engagement than pull factors. These insights highlight the importance of emotional and psychological connections to nature, offering practical implications for urban wetland management, visitor education and environmental communication strategies.

Keywords: ecosystem management; ecosystem services; environmental management; urban wetland; urban ecosystem



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1. Introduction

The wide range of ecosystem services provided by wetlands especially cultural, regulating, and supporting functions contribute significantly to their appeal as recreational and educational destinations [1]. In urban contexts, constructed wetlands serve not only as ecological infrastructure but also as restorative spaces that fulfill human psychological, social, and informational needs. These benefits often shape the decisions of individuals and communities to engage with wetland environments. Recognizing that different visitors perceive and prioritize ecosystem services in varied ways, it becomes essential to explore the motivations that influence their behavior [2].

To explore these motivations, this study draws upon the push–pull theory of travel motivation, originally proposed by Dann [3]. The theory distinguishes between two sets of factors that influence destination choices: push factors, which are internal psychological drivers such as the desire for escape, relaxation, or self-fulfillment; and pull factors, which are external attributes of a destination such as scenic beauty, environmental quality, or available activities that attract visitors [4]. This framework has been widely applied in tourism studies but remains underutilized in ecosystem services research, particularly in

the context of urban wetlands [5]. By integrating the push–pull theory with the ecosystem services framework, this study seeks to uncover how different motivations align with visitors' perceptions of wetland benefits, offering insights that are valuable for conservation, environmental education, and the sustainable management of urban blue spaces [6].

Ecosystem services are broadly categorized into four main types: provisioning services (such as freshwater supply, food resources, and raw materials), regulating services (including climate regulation, water purification, and flood mitigation), supporting services (such as habitat provision, soil formation, and nutrient cycling), and cultural services (encompassing recreation, aesthetic appreciation, spiritual value, and environmental education) [7]. In the context of wetlands, these services are especially vital. Wetlands act as natural water filters, carbon sinks, and biodiversity reservoirs, while also contributing significantly to flood control and microclimate regulation. They support complex ecological processes and provide habitats for a wide range of species, including migratory birds and aquatic organisms [8].

Among these categories, cultural ecosystem services are particularly relevant to wetland tourism, as they shape visitor experiences and foster environmental appreciation and stewardship. Wetlands often serve as venues for recreation, education, and spiritual connection, making them key spaces for cultivating public engagement with nature. By integrating the ecosystem services framework with push–pull motivation theory, this study offers a novel analytical lens to examine the motivational dynamics of urban wetland visitors. This interdisciplinary approach contributes critical insights for conservation planning, sustainable tourism development, and policy interventions aimed at enhancing both ecological integrity and public participation [8,9].

Putrajaya, Malaysia, has undergone rapid urbanization, necessitating the integration of natural ecosystems into urban planning to enhance ecological sustainability [10]. The Putrajaya Wetland Area, one of the largest constructed wetlands in the region, was designed to fulfill both ecological and recreational functions. Despite its environmental significance, the full potential of the wetland as a hub for cultural ecosystem services remains underutilized. Public engagement with the wetland is hindered by multiple challenges, including limited awareness of ecosystem services, accessibility constraints, and gaps in infrastructure [11]. While some visitors are intrinsically motivated (push factors) to visit the wetland for relaxation and environmental appreciation, others are drawn by site-specific features such as well-maintained trails, guided educational programs, and biodiversity-rich landscapes (pull factors). However, managing the balance between increasing visitation and preserving ecological integrity is crucial, as excessive human activity may lead to habitat degradation and ecosystem disturbances [12]. Therefore, a comprehensive understanding of push and pull factors is essential for optimizing visitor engagement while ensuring the long-term sustainability of the wetland ecosystem.

Several studies have explored the relationship between ecosystem services and visitor engagement in natural areas. Research by Lee & Youn [13] highlights the role of cultural ecosystem services in promoting environmental awareness and visitor satisfaction in wetland tourism. Similarly, studies by Heagney et al. [14] and Baum et al. [15] emphasize the significance of recreational infrastructure and biodiversity as key pull factors influencing visitation patterns in protected areas. However, existing literature lacks a comprehensive analysis of how both push and pull factors simultaneously shape visitor engagement with wetland ecosystem services in an urban context. Previous studies have primarily focused on rural or natural wetlands, overlooking the complexities of urban wetlands that function as both ecological and recreational spaces. Additionally, while push–pull theory has been widely applied in conventional tourism studies, its integration with the ecosystem services framework in wetland tourism remains underexplored [16]. This study addresses

these gaps by investigating visitor perceptions of ecosystem services in an urban wetland setting, providing insights that bridge the fields of conservation planning and sustainable tourism development.

The primary objective of this study is to explore the push and pull factors influencing visitor engagement with wetland ecosystem services in Putrajaya, Malaysia. Specifically, the study aims to: (1) analyze visitors' perceptions of wetland ecosystem services and (2) assess the push and pull factors that shape visitor engagement with the wetland area. By identifying key motivations and constraints, this research will generate evidence-based recommendations for enhancing wetland tourism, fostering environmental stewardship, and supporting conservation initiatives.

To achieve these objectives, the study integrates the ecosystem services framework with push-pull motivational theory an approach that remains underexplored in wetland tourism literature. A structured questionnaire was administered to 385 visitors at the Putrajaya Wetland Park in Malaysia. The analysis includes non-parametric statistical techniques (Kruskal–Wallis test and Spearman correlation) and multiple regression analysis, supported by multicollinearity diagnostics (VIF). The study identifies significant differences in perceptions and motivations across demographic segments and explores the predictive relationship between ecosystem service valuation and visitor motivations.

2. Research Methodology

2.1. Study Area

Putrajaya Wetland Park (Figure 1), is a constructed wetland located in Precinct 13, spans 335.76 hectares, with 197 hectares dedicated to wetland ecosystems. As the largest constructed freshwater wetland in tropical regions and the first in Malaysia, it plays a crucial role in providing ecosystem services such as water purification, carbon sequestration, climate regulation, and biodiversity conservation. The wetland system, consisting of five wetland arms and 24 wetland cells, naturally filters water from surrounding rivers before it enters Putrajaya Lake. It also serves as a habitat for over 200 local bird species and 59 migratory species, making it a vital ecological site [17]. Constructed wetlands (CWs) are engineered systems designed to mimic the functions of natural wetlands, providing a range of ecosystem services while treating various types of wastewaters. These systems utilize natural vegetation, soils, and microbes to treat domestic wastewater, industrial effluents, and agricultural runoff [18].

The park was selected for this study due to its strategic role in ecosystem service provision and its status as an internationally recognized Operational Category Ecohydrology Demonstration Site by UNESCO's International Hydrological Programme (IHP). Despite its significance, limited academic research has been conducted on its ecosystem functions, particularly in urban wetland management. Studying its impact on water quality, biodiversity, and climate regulation will contribute to improving wetland conservation strategies and sustainable urban planning. Additionally, as a publicly accessible park, it offers an opportunity to explore community engagement and policy effectiveness in managing urban ecological resources [19].

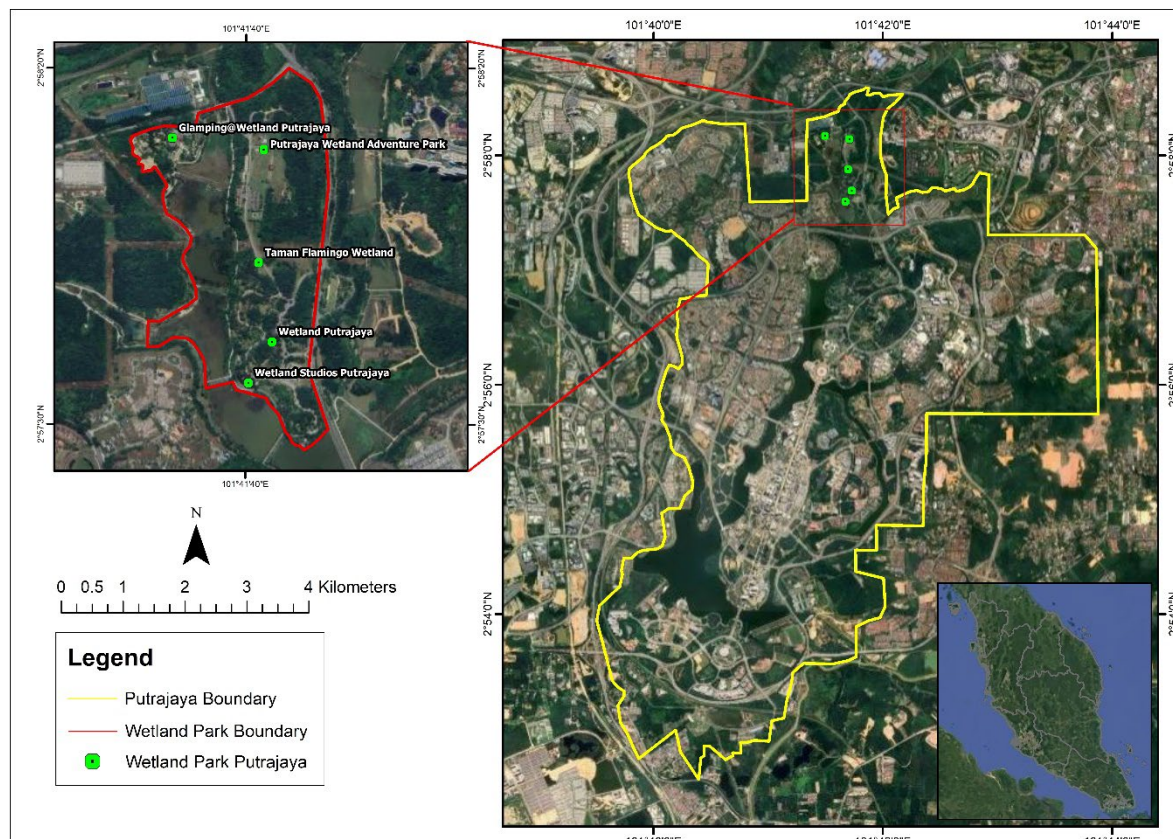


Figure 1. Map of Putrajaya Wetland Park.

2.2. Research Sample

This study used a simple random sampling technique to obtain feedback from respondents among visitors to Taman Wetland Putrajaya, which constitutes the study population. Simple random sampling was chosen for this study to ensure that every individual in the population has an equal chance of being selected as a sample, as stated by Lohr [20], who noted that simple random sampling does not require a specific sampling procedure, thereby making every visitor to Taman Wetland Putrajaya eligible to be included in the study sample. In this study, respondents' perceptions were evaluated based on their knowledge of the ecosystem services offered in the study area, which will determine the push and pull factors of ecosystem services that contribute to visitors' choice of the area as their preferred urban blue park to visit.

The sample size for this study was determined using the Krejcie & Morgan [21] table, who stated that this table is a commonly used method for determining sample size in social science research. According to the 2020 Annual Report of Putrajaya Corporation, the number of visitors to Taman Wetland Putrajaya was 444,993. Therefore, the minimum sample size required for this study is 384 respondents. This aligns with the sample size recommended for populations over 100,000, as stated in the Krejcie & Morgan [21] table.

2.3. Research Instrument

The study instrument, a structured questionnaire, was developed based on the frameworks of the Millennium Ecosystem Assessment [22] and The Economics of Ecosystems and Biodiversity [23]. These frameworks classify ecosystem services into four categories: provisioning, regulating, cultural, and supporting services. Additionally, the push-pull motivation theory [3] was incorporated to analyze visitor motivations and engagement with Putrajaya Wetland Park.

The questionnaire, designed using Google Forms, consists of nine sections (A–I). Section A covers demographic details, while Section B assesses respondents’ knowledge of key ecosystem-related terms. Sections C–F evaluate visitor awareness of ecosystem services using classifications from MEA and TEEB. Sections G and H, developed using push-pull motivation theory, analyze factors influencing visitor engagement, such as relaxation, learning, and accessibility. Section I collects recommendations for improving ecosystem services. The instrument was adapted from previous studies to ensure relevance and accuracy in assessing public perceptions of the park’s ecological and recreational value.

2.4. Data Collection

The questionnaire was distributed from 17 November 2023 to 15 January 2024 (59 days) for primary data collection. It was developed using Google Form and made accessible via a QR code displayed at the information counter in Taman Wetland Putrajaya. This method was visitor-friendly and time-efficient. The QR code was also distributed in the form of a flyer for convenience, while printed copies were provided for those less familiar with digital forms. Data collection took place on weekdays, weekends, and public holidays to capture a diverse range of visitors. The researcher was present on-site to assist those facing difficulties accessing the form. A total of 420 questionnaires were distributed to visitors at Putrajaya Wetland Park, of which 385 were returned and deemed valid, resulting in a response rate of 91.6%.

2.5. Data Analysis

The data obtained through the questionnaire was analyzed using IBM SPSS Statistics software (v 25). Frequency and percentages were calculated for socio-demographic data, whereas means and standard deviations were used for ordinal data on visitors’ perceptions of ecosystem services at Putrajaya Wetland Park. Specifically, the mean and SD are intended to identify the characteristics of the sample in this study. According to Hair et al. [24], mean values can be categorized into five; Very low, Low, Moderate, High and Very high as in the Table 1.

Table 1. Mean values.

Mean Score	Interpretation
1.00–1.80	Very Low
1.81–2.60	Low
2.61–3.40	Moderate
3.41–4.20	High
4.21–5.00	Very High

Source Hair et al. [24].

This study assessed data distributions using Shapiro–Wilk tests, along with skewness and kurtosis analyses. The test of normality indicated that data on ecosystem service assessment were not normally distributed; thus, non-parametric tests were applied for further analysis. A pairwise Kruskal–Wallis one-way Analysis of Variance (ANOVA) test with sequential Bonferroni correction was conducted at a 95% confidence interval, assuming as a null hypothesis that demographic factors (such as age, education and income) and preferred ecosystem services were independent of each other. Multiple regression analysis was conducted to evaluate the extent to which different categories of ecosystem services (provisioning, regulating, cultural and supporting) predict push and pull motivational factors among visitors. Prior to model estimation, we assessed multicollinearity among predictor variables using Variance Inflation Factors (VIF). All VIF values were below the threshold of 5, indicating an acceptable level of multicollinearity and supporting the

reliability of the regression estimates. This approach aligns with best practices for regression modeling in ecological and social science research, as outlined by Dormann et al. [25].

The regression model's assumptions of linearity, independence, and homoscedasticity were also tested and met. Separate models were constructed for push and pull factors, and model fit was evaluated using R^2 , adjusted R^2 , standard error of the estimate, and ANOVA F-values.

A cross-tabulation method was applied to examine the relationship between visitation frequency and the push-pull factors influencing visits to Putrajaya Wetland Park. This method, commonly used for questionnaire data analysis, allows for a more detailed examination of variable relationships beyond individual frequency counts [26]. Additionally, Chi-Square tests were used to determine whether the relationship between push-pull factors and visitation frequency was statistically significant. This analysis enabled us to identify which push and pull factors strongly influence visitors' perceptions and decision-making regarding the park's ecosystem services.

3. Results

3.1. Respondent Demographics

A total of 385 respondents participated in the survey. Based on Table 2, the sample comprised slightly more males (54.3%) than females (45.7%). In terms of age, the majority fell within the 26–40 years old (37.7%) and 19–25 years old (36.6%) categories, indicating that the respondents were predominantly young to middle-aged adults. An overwhelming majority were Malaysians (99.7%), with only one non-Malaysian participant. The educational background of respondents was notably high, with 58% holding a Bachelor's degree, followed by 23% with a Master's degree, and 3% with a Doctorate, while 16% had either school or college-level education.

Table 2. Respondent Demographic Profile.

Demography		Frequency (<i>n</i> = 385)	Percentages (%)
Sex	Male	209	54.3
	Female	176	45.7
Age	18 years old and below	10	2.6
	19–25 years old	141	36.6
	26–40 years old	145	37.7
	41–60 years old	82	21.3
	61 years old and above	7	1.8
Nationality	Malaysian	384	99.7
	Non-Malaysian	1	0.3
Level of Education	School	23	6
	College	40	10
	Bachelor Degree	223	58
	Master Degree	87	23
	Doctorate Degree	12	3
Job	Government	146	38
	Private	65	17
	Student	121	31
	Self-employed	31	8
	Unemployed	16	4
	Retiree	6	2

Table 2. *Cont.*

Demography		Frequency (<i>n</i> = 385)	Percentages (%)
Monthly Income	RM1500 and below	135	35
	RM1501–RM3000	68	18
	RM3001–RM5000	67	17
	RM5001–RM10,000	107	28
	RM10,001 and above	8	2
Area of	Within Putrajaya	100	26
	Outside Putrajaya	285	74
Visit Frequency	Less than 4 times	344	89
	4–12 times	34	9
	More than 12 times	7	2
Mode of Transportation	Public Transport	33	8
	Private Transport	310	81
	Carpool	23	6
	Others	19	5
Visit Companion	Family	204	53
	Friends	119	30
	Alone	42	11
	Colleagues	11	3
	Others	7	2
	Travel Agency	2	1
Repeated Visit	Yes	362	94
	No	23	6

Regarding employment status, the largest group worked in the government sector (38%), followed by students (31%), and those in the private sector (17%). Smaller proportions were self-employed (8%), unemployed (4%), or retired (2%).

Monthly income varied, with the highest percentage earning below RM1500 (35%), and a notable portion earning between RM5001–RM10,000 (28%). Only 2% reported earnings exceeding RM10,001. A majority of respondents (74%) resided outside Putrajaya, while 26% lived within the city. In terms of frequency of visits to the park, most (89%) had visited fewer than four times, suggesting occasional park usage. The most common means of transportation was by own vehicle (81%), followed by public transport (8%), carpooling (6%), and other methods (5%). When visiting the park, over half (53%) came with family, 30% with friends, while a smaller proportion visited alone (11%), with colleagues (3%), others (2%), or through a travel agency (1%). Lastly, 94% of respondents indicated that they were repeat visitors, underscoring the park's appeal and continued engagement among users.

3.2. Visitors' Perception on Wetland Area

3.2.1. Normality and Reliability of the Data

Normality testing was conducted for all independent and dependent variables. The analysis results showed that all components for the Kolmogorov–Smirnov test had $p = 0.00$ and for the Shapiro–Wilk test had $p = 0.00$ (Table 3). Both p -values are less than $\alpha = 0.05$, indicating that the data are not normally distributed. Based on this finding, all tests and analyses should be conducted using non-parametric tests.

Table 3. Normality Test.

	Kolomogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
C	0.118	385	0.000	0.955	385	0.000
D	0.188	385	0.000	0.841	385	0.000
E	0.243	385	0.000	0.825	385	0.000
F	0.264	385	0.000	0.784	385	0.000
G1	0.215	385	0.000	0.803	385	0.000
G2	0.255	385	0.000	0.760	385	0.000
G3	0.311	385	0.000	0.716	385	0.000
G4	0.220	385	0.000	0.766	385	0.000
G	0.160	385	0.000	0.825	385	0.000
H1	0.244	385	0.000	0.795	385	0.000
H2	0.215	385	0.000	0.849	385	0.000
H3	0.236	385	0.000	0.846	385	0.000
H	0.154	385	0.000	0.916	385	0.000
CDEF	0.127	385	0.000	0.966	385	0.000

The Cronbach’s Alpha reliability test was also conducted for all dependent and independent variables. The analysis results show that the Cronbach’s Alpha (α) value for the study data is at an excellent level, with a score of $\alpha = 0.97$.

3.2.2. Visitor’s Knowledge on Environmental Terms

Based on Table 4, the data reveal a very low level of knowledge among respondents for all three environmental terms assessed. The mean scores for each term “Ecosystem” ($M = 1.04$, $SD = 0.21$), “Urban Green Park” ($M = 1.04$, $SD = 0.19$), and “Ecotourism” ($M = 1.04$, $SD = 0.20$)—are nearly identical, suggesting a consistent pattern of limited understanding. The total mean score is also 1.04 with a standard deviation of 0.22, further confirming the overall lack of familiarity with these terms.

Table 4. Visitor’s Knowledge on Environmental Terms.

Term	Mean	SD	Mean Level
Ecosystem	1.04	0.21	Very Low
Urban Green Park	1.04	0.19	Very Low
Ecotourism	1.04	0.20	Very Low
Total	1.04	0.22	Very Low

All mean values fall within the “Very Low” category, indicating that the respondents either have no knowledge or only a very minimal understanding of key environmental concepts. The low standard deviations suggest relatively uniform responses across the sample, with little variation in knowledge levels among participants.

3.2.3. Provisioning Ecosystem Services

The results (Table 5) indicate that respondents rated provisioning ecosystem services positively overall ($M = 3.52$, $SD = 1.09$). Among the specific services assessed, food supply and nutritional value received the highest ratings, suggesting that visitors strongly associate

wetlands with basic sustenance and dietary benefits. Conversely, more utilitarian uses such as timber and daily oil were rated moderately, indicating either limited perceived relevance or awareness of these services within the context of an urban constructed wetland.

Table 5. Provisioning Ecosystem Services.

Item/Question	Mean	SD	Mean Level
Water as a source of drinking	3.60	1.03	High
Forest as a source of food supply	3.83	0.90	High
Forest resources as forest/timber products	3.07	1.37	Moderate
Forest resources as a source of nutrition	3.86	0.94	High
Forest resources as a source of daily oil	3.23	1.23	Moderate
Total	3.52	1.09	High

3.2.4. Regulating Ecosystem Services

Respondents exhibited a very high appreciation for regulating ecosystem services ($M = 4.39$, $SD = 0.63$), with strongest agreement on statements related to air quality improvement and local heat reduction (Table 6). The recognition of trees and green infrastructure as vital for climate moderation, air purification, and soil fertility highlights public understanding of the ecological functionality of urban wetlands. Services such as flood mitigation and noise reduction were also rated highly, though slightly less than others, possibly reflecting variation in direct experience.

Table 6. Regulating Ecosystem Services.

Item/Question	Mean	SD	Mean Level
Urban blue spaces reduce landslides	4.25	0.71	High
Urban blue spaces reduce flooding	4.27	0.65	High
Trees reduce air pollution	4.48	0.62	Very High
Urban blue spaces improve air quality	4.52	0.57	Very High
Urban blue spaces reduce the heat of the local area	4.49	0.57	Very High
Trees increase soil fertility	4.39	0.62	Very High
Urban blue spaces as air purification agents	4.46	0.57	Very High
Urban blue spaces help reduce noise pollution	4.22	0.74	High
Urban blue spaces help regulate local area temperatures	4.44	0.58	Very High
Total	4.39	0.63	Very High

3.2.5. Cultural Ecosystem Services

Cultural ecosystem services were rated very highly overall ($M = 4.45$, $SD = 0.73$), underscoring the importance of wetlands as spaces for recreation, learning, and psychological restoration (Table 7). Leisure and relaxation received the highest mean scores, followed closely by educational and aesthetic dimensions. This highlights the dual role of urban wetlands as both emotional and intellectual resources for visitors.

Table 7. Cultural Ecosystem Services.

Item/Question	Mean	SD	Mean Level
Urban blue spaces as a place for leisure and recreation	4.54	0.52	Very High
Urban blue spaces as a place of research, learning and education	4.41	0.59	Very High
Urban blue spaces as a place of calm and peace of mind	4.53	0.53	Very High
Urban blue spaces as an aesthetic place	4.38	1.37	Very High
Urban blue spaces as a tourist destination	4.39	0.63	Very High
Total	4.45	0.73	Very High

3.2.6. Supporting Ecosystem Services

Supporting services also received strong endorsement ($M = 4.46$, $SD = 0.55$), especially in their role of maintaining biodiversity, ecosystem functionality, and providing habitats for flora and fauna (Table 8). The consistency of high scores across all items in this category suggests a broad public awareness of the foundational ecological contributions of wetland systems, even if these processes are less visible than direct provisioning or cultural benefits.

Table 8. Supporting Ecosystem Services.

Item/Question	Mean	SD	Mean Level
Urban blue spaces provide indirect benefits to humans	4.50	0.51	Very High
Urban blue spaces maintain biodiversity	4.42	0.56	Very High
Urban blue spaces help ecosystem's function	4.47	0.55	Very High
Urban blue spaces provide habitat for flora and fauna	4.44	0.58	Very High
Total	4.46	0.55	Very High

3.2.7. Kruskal Wallis Test

The Kruskal Wallis test results (Table 9) indicate how different demographic factors influence perceptions of four categories of ecosystem services: provisioning (C), regulating (D), cultural (E), and supporting (F). When grouped by age, significant differences were found in the perception of regulating ($p = 0.001$) and cultural ($p = 0.008$) services, suggesting that individuals from different age groups value these services differently. While the results for provisioning ($p = 0.066$) and supporting services ($p = 0.056$) were not statistically significant, they were close to the threshold, indicating potential marginal differences worth further exploration.

Table 9. Kruskal-Wallis Test for Independent Variables.

(i) Grouping Variable: Age				
	C	D	E	F
Kruskal-Wallis (H)	8.824	18.302	13.930	9.199
df	4	4	4	4
Asymp. Sig. (p)	0.066	0.001	0.008	0.056
(ii) Grouping Variable: Level of Education				
	C	D	E	F
Kruskal-Wallis (H)	3.382	11.760	10.659	5.282
df	4	4	4	4
Asymp. Sig. (p)	0.496	0.019	0.031	0.260
(iii) Grouping Variable: Employment Status				
	C	D	E	F
Kruskal-Wallis (H)	25.291	11.199	18.031	7.114
df	5	5	5	5
Asymp. Sig. (p)	0.000	0.048	0.003	0.212

Table 9. Cont.

(iv) Grouping Variable: Monthly Income				
	C	D	E	F
Kruskal-Wallis (H)	23.141	3.725	9.783	8.872
df	4	4	4	4
Asymp. Sig. (<i>p</i>)	0.000	0.445	0.044	0.067
(v) Grouping Variable: Visiting Frequency				
	C	D	E	F
Kruskal-Wallis (H)	7.745	2.474	0.601	0.314
df	2	2	2	2
Asymp. Sig. (<i>p</i>)	0.021	0.290	0.740	0.855

C: Provisioning Ecosystem Services; D: Regulating Ecosystem Services; E: Cultural Ecosystem Services; F: Supporting Ecosystem Services.

For level of education, significant variations were observed in the perception of regulating ($p = 0.019$) and cultural services ($p = 0.031$), implying that education level influences how people understand and value these types of ecosystem services. However, no significant differences were detected in provisioning ($p = 0.496$) and supporting ($p = 0.260$) services, suggesting a more uniform perception across educational levels for these services.

When considering employment status, it was found to significantly influence perceptions of provisioning ($p = 0.000$), regulating ($p = 0.048$), and cultural services ($p = 0.003$). These results highlight the importance of socioeconomic roles in shaping people's interaction with and valuation of ecosystem services. However, supporting services did not show significant variation based on employment status ($p = 0.212$).

In terms of monthly income, significant differences emerged for provisioning ($p = 0.000$) and cultural services ($p = 0.044$), indicating that income levels affect how these services are perceived. Perceptions of regulating ($p = 0.445$) and supporting ($p = 0.067$) services were not significantly influenced by income, although the latter is near the significance threshold.

Lastly, the analysis based on visiting frequency revealed a significant difference only for provisioning services ($p = 0.021$), suggesting that those who visit more frequently may place higher value on direct, tangible benefits from the ecosystem. No significant differences were found for regulating ($p = 0.290$), cultural ($p = 0.740$), or supporting ($p = 0.855$) services, indicating stable perceptions across different levels of visitation.

Overall, the results suggest that cultural ecosystem services are the most consistently influenced by demographic factors, followed by provisioning and regulating services. Supporting services, in contrast, appear to be the least affected by demographic variation. These findings underscore the need for targeted environmental management and communication strategies that consider the diverse backgrounds and experiences of different community segments.

3.3. Push and Pull Factor

3.3.1. Push Factors

The findings in the Table 10 on Push Factors highlight the internal motivations that drive individuals to engage in nature-based or ecotourism activities. Overall, the mean score of 4.46 with a standard deviation of 0.64 indicates a very high level of agreement among respondents across all listed factors, suggesting strong intrinsic motivations. Among the items, "Taking a break from daily routines" recorded the highest mean score of 4.54, indicating that the most significant push factor is the desire for relaxation and temporary

escape from everyday responsibilities. This suggests that nature tourism is highly valued as a form of stress relief and mental rejuvenation.

Table 10. Push Factors.

Item/Question	Mean	SD	Mean Level
Family togetherness and learning about the environment	4.47	0.64	Very High
Appreciating natural resources and health	4.48	0.64	Very High
Taking a break from daily routines	4.54	0.63	Very High
Adventure and building friendships	4.36	0.67	Very High
Total	4.46	0.64	Very High

Closely following are “Appreciating natural resources and health” (mean = 4.48) and “Family togetherness and learning about the environment” (mean = 4.47), both also rated as very high. These results reflect that respondents not only seek personal benefits such as well-being and education but also value shared experiences with family and the opportunity to foster environmental awareness. The item “Adventure and building friendships” had the lowest mean among the four (4.36), though still within the very high range. This suggests that while social and adventurous aspects are important, they are slightly less prioritized compared to relaxation, environmental appreciation, and family bonding.

All listed push factors strongly influence respondents’ motivations, with personal well-being, environmental learning, and family bonding emerging as the most dominant internal drivers for nature-based tourism experiences.

3.3.2. Pull Factors

The findings in the Pull Factors table illustrate the external attributes or features of a destination that attract visitors (Table 11). Overall, the total mean score of 4.27 with a standard deviation of 0.76 reflects a high level of agreement among respondents regarding the importance of these external motivators in influencing their decision to visit. The item “Main source of tourism” received the highest mean score of 4.49 and is categorized as very high, indicating that the destination’s reputation or prominence as a key tourist site is the most influential pull factor. This suggests that respondents are strongly drawn to well-established and recognized tourism sites. In contrast, “Information and facilities” (mean = 4.18) and “Accessibility” (mean = 4.13) were both rated as high rather than very high. While still important, these factors are perceived as slightly less critical than the destination’s main appeal or uniqueness. This implies that while the availability of facilities and ease of access do contribute to the attractiveness of a destination, they may not be the primary considerations for visitors.

Table 11. Pull Factors.

Item/Question	Mean	SD	Mean Level
Main source of tourism	4.49	0.60	Very High
Information and facilities	4.18	0.84	High
Accessibility	4.13	0.84	High
Total	4.27	0.76	High

This suggest that the destination’s core tourism appeal is the strongest external motivator, while supporting infrastructure and accessibility are still valued but play a more complementary role in influencing visitor decisions. These insights can help tourism plan-

ners prioritize efforts in maintaining a destination's distinct appeal while continuing to improve facilities and access.

3.4. Influence of Pull and Push Factors on Wetland Ecosystem Services

The findings from the Spearman's Rho Correlation Test (Table 12) examine the strength and direction of the relationship between different types of ecosystem services (provisioning, regulating, cultural, and supporting) and the push and pull motivational factors influencing visitors. All correlations reported are positive and statistically significant, indicating that as motivation (push or pull) increases, so does the perceived importance or value of the respective ecosystem service. Starting with provisioning services, the correlation with push factors is relatively weak ($r = 0.109$, $p = 0.033$), suggesting a slight but significant relationship between internal motivations (e.g., relaxation, family bonding) and appreciation for tangible benefits like food, water, and raw materials. However, provisioning services have a stronger correlation with pull factors ($r = 0.244$, $p < 0.001$), indicating that external features of a destination (e.g., facilities, accessibility, main attractions) play a more notable role in influencing how visitors value these services.

Table 12. Spearman's Rho Correlation Test between Ecosystem Services and Push and Pull Factors.

Ecosystem Services		Symmetric Measures			
		Value	Asymptotic Standard Error	Approximate T	Approximate Significance
Provisioning	Push Factors	0.109	0.055	2.138	0.033
	Pull Factors	0.244	0.052	4.919	0.000
Regulating	Push Factors	0.623	0.039	15.600	0.000
	Pull Factors	0.387	0.052	8.205	0.000
Cultural	Push Factors	0.647	0.038	16.593	0.000
	Pull Factors	0.457	0.047	10.063	0.000
Supporting	Push Factors	0.673	0.035	17.788	0.000
	Pull Factors	0.453	0.047	9.943	0.000

For regulating services, a strong positive correlation is observed with push factors ($r = 0.623$, $p < 0.001$), showing that intrinsic motivations such as environmental appreciation and wellness are strongly aligned with the perception of ecosystem functions like climate regulation and air quality. A moderate correlation is also found with pull factors ($r = 0.387$, $p < 0.001$), indicating that destination features also moderately influence this perception. The correlation between cultural ecosystem services and push factors is also strong ($r = 0.647$, $p < 0.001$), reflecting those internal motivations such as seeking meaningful experiences, learning, and spiritual enrichment are closely tied to the appreciation of cultural values, heritage, and aesthetics provided by the ecosystem. The correlation with pull factors is slightly lower but still moderate ($r = 0.457$, $p < 0.001$), emphasizing that while destination features do play a role, personal motivations remain dominant.

Similarly, supporting services show the strongest correlation with push factors ($r = 0.673$, $p < 0.001$), suggesting that intrinsic drivers greatly influence how visitors perceive fundamental ecological processes like nutrient cycling and habitat support. The correlation with pull factors is also moderate ($r = 0.453$, $p < 0.001$), highlighting that external destination characteristics also contribute meaningfully to this perception.

In summary, the findings indicate that push factors (internal motivations) are more strongly associated with the appreciation of regulating, cultural, and supporting ecosystem services, while pull factors (external attributes of a destination) have a moderate influence,

particularly on provisioning services. This suggests that while the physical appeal and accessibility of a site matter, visitors' internal values and expectations are more influential in shaping their recognition of ecosystem benefits.

3.5. Regression Analysis

The regression analysis presented in the Model Summary table (Table 13) evaluates how well the four categories of ecosystem services (provisioning, regulating, cultural, and supporting) predict the motivational factors specifically push and pull factors. For the push factors, the model shows a correlation coefficient (R) of 0.634, indicating a strong positive relationship between ecosystem services and internal motivations to visit nature-based destinations. The R Square value of 0.403 reveals that approximately 40.3% of the variance in push factors can be explained by the combination of the four ecosystem services. The adjusted R Square of 0.396 confirms that even after accounting for model complexity, the explanatory power remains strong. The standard error of the estimate (0.41845) suggests a moderate level of residual variability in predicting push motivations.

Table 13. Model Summary.

	Model	R	R Square	Adjusted R Square	Std Error of the Estimate
Push Factors	1	0.634 ^a	0.403	0.396	0.41845
Pull Factors	1	0.512 ^a	0.262	0.254	0.47282

^a Predictors: (Constant), Provision Ecosystem Services, Regulating Ecosystem Services, Cultural Ecosystem Services, Supporting Ecosystem Services.

In contrast, for the pull factors, the model yields a correlation coefficient (R) of 0.512, which reflects a moderate positive relationship between ecosystem services and external motivators such as destination features and accessibility. The R Square value of 0.262 indicates that only 26.2% of the variance in pull factors is explained by the ecosystem services, and the adjusted R Square of 0.254 shows a slight reduction after adjusting for the number of predictors. The higher standard error (0.47282) compared to the push factor model suggests more variability and less precision in predicting pull motivations using ecosystem services as predictors.

In summary, the regression results demonstrate that ecosystem services are stronger predictors of push factors (internal motivations) than pull factors (external destination attributes). This implies that visitors' intrinsic values such as the desire for learning, relaxation, and emotional connection with nature are more closely aligned with their perception of ecosystem services compared to their reactions to external tourism infrastructure.

The ANOVA (Analysis of Variance) test results (Table 14) presented in the table assess the overall significance of the regression models used to predict push and pull factors based on the four types of ecosystem services (provisioning, regulating, cultural, and supporting). For the push factors, the ANOVA shows a regression sum of squares of 44.836 with 4 degrees of freedom, and a mean square value of 11.209. The F-value is 64.014, with a significance level (*p*-value) of 0.000, indicating that the regression model is statistically significant. This means that the combined influence of the four ecosystem services significantly predicts the push motivations of visitors. The low residual mean square of 0.175 supports the model's accuracy and consistency.

Similarly, for the pull factors, the regression model has a sum of squares of 30.135, with the same degrees of freedom (*df* = 4), and a mean square of 7.534. The resulting F-value is 33.699, and the *p*-value is also 0.000, signifying that the model is statistically significant. Although the model explains less variation in pull factors compared to push factors (as also seen in the *R*² values), the result still confirms that the four ecosystem services

jointly contribute meaningfully to explaining external motivations like destination appeal and infrastructure.

Table 14. ANOVA Test.

	Model		Sum of Squares	df	Mean Square	F	Sig.
Push Factors	1	Regression	44.836	4	11.209	64.014	0.000 ^b
		Residual	66.538	380	0.175		
		Total	111.374	384			
Pull Factors	1	Regression	30.135	4	7.534	33.699	0.000 ^b
		Residual	84.954	380	0.224		
		Total	115.089	384			

^b Predictors: (Constant), Provision Ecosystem Services, Regulating Ecosystem Services, Cultural Ecosystem Services, Supporting Ecosystem Services.

The ANOVA test confirms that both regression models for push and pull factors are statistically significant. However, the model for push factors demonstrates a stronger explanatory power and better fit, reinforcing earlier findings that ecosystem services more strongly influence internal motivations than external destination-based factors.

4. Discussion

4.1. Visitor Perceptions of Ecosystem Services

This study provides compelling evidence that visitors to Putrajaya Wetland Park place high value on multiple categories of ecosystem services, with cultural, regulating, and supporting services receiving consistently high mean scores (e.g., cultural: $M = 4.45$, $SD = 0.73$; regulating: $M = 4.39$, $SD = 0.63$). Cultural ecosystem services particularly recreation, aesthetic enjoyment, and psychological peace emerged as dominant contributors to the visitor experience. These findings affirm that urban green–blue spaces are perceived not only as leisure sites but as emotionally resonant environments crucial for stress relief, self-reflection, and family bonding. This aligns with global research highlighting the therapeutic, identity-forming, and social roles of nature exposure in urban contexts [27,28].

Regulating services such as air purification, urban heat mitigation, and noise reduction also garnered strong support, suggesting that visitors recognize and value the ecological functions performed by wetlands [29]. The high mean scores in this category ($M = 4.39$) indicate a growing public awareness of the protective role of urban wetlands in mitigating environmental stressors. Supporting services, such as biodiversity maintenance and habitat provision, though less visible to the average visitor, were also rated positively ($M = 4.46$), underscoring a latent ecological consciousness among urban populations [30].

However, a critical paradox emerges. Despite this strong appreciation for ecosystem services, respondents exhibited limited understanding of foundational environmental terms such as “ecosystem,” “urban green–blue park,” and “ecotourism” as evidenced by low scores in knowledge-based questions. This cognitive dissonance between appreciation and comprehension reveals a superficial level of environmental literacy, potentially limiting more engaged or stewardship-oriented behaviors [31]. To address this gap, the findings point to the urgent need for place-based education, improved interpretive signage, and experiential programs that translate appreciation into ecological understanding and action.

4.2. Influence of Push and Pull Factors on Visitor Engagement

The analysis further reveals that push factors internal motivations such as stress relief, family bonding, and emotional well-being exert a significantly stronger influence on visitor engagement with ecosystem services compared to pull factors like facilities, accessibility,

or branding. Regression results support this conclusion, with push factors explaining a greater proportion of variance in ecosystem service valuation ($R^2 = 0.403$) than pull factors ($R^2 = 0.262$). This suggests that visitors are primarily driven by psychological and emotional needs, reinforcing the central role of wetlands as restorative spaces in urban environments [32].

These findings challenge prevailing assumptions in urban tourism planning, which often emphasize physical infrastructure over emotional experience. Instead, the results advocate for a strategic pivot toward designing experiences that align with internal motivations such as mindfulness trails, interactive educational programs, and intergenerational environmental workshops [33,34]. This not only increases visitation but also fosters deeper personal connections to place, which are essential for sustained public support for conservation.

Interestingly, the study also uncovered a nuanced distinction: provisioning services (e.g., food, water) were more closely associated with pull factors, whereas regulating, cultural, and supporting services correlated more strongly with push factors. This layered insight underscores the need for tailored engagement strategies that align with the specific service types being promoted [35]. For example, promoting food-related activities (e.g., edible plant tours) may benefit from infrastructure and marketing, while fostering appreciation for regulating services may require emotional framing and guided interpretation.

4.3. Demographic Influences on Ecosystem Service Perception

Demographic variables including age, education level, employment, income, and visitation frequency were found to significantly shape how visitors perceive and value ecosystem services. Cultural services were the most sensitive to demographic variation, with older and more educated respondents exhibiting greater appreciation, particularly for regulating and cultural functions. This pattern suggests that life experience and educational background contribute to a more nuanced understanding of environmental benefits [36].

These demographic trends point to the importance of differentiated communication and engagement strategies. For instance, messaging aimed at younger or less educated visitors might benefit from gamified tools, social media engagement, or interactive kiosks. In contrast, strategies for older or higher-income groups could emphasize heritage narratives, legacy framing, or ethical responsibility, which are more resonant with their values and life stage [37]. By acknowledging the diversity of visitor profiles, wetland managers and planners can implement targeted interventions that not only increase ecological literacy but also strengthen conservation support across demographic lines.

4.4. Practical and Policy Implications

From a policy perspective, the study supports a strategic reorientation toward enhancing intrinsic motivations in wetland tourism design. Park authorities and tourism managers should develop interventions that fulfil visitors' psychological and emotional expectations. Programs that highlight nature therapy, intergenerational learning, and community-led conservation could significantly boost both engagement and stewardship.

At the same time, infrastructure should not be neglected. Although secondary in motivational influence, features like clear signage, rest areas, guided trails, and accessibility measures still contribute significantly to the overall visitor experience. Their presence can enhance the satisfaction derived from push-based motivations, creating a synergistic effect.

Importantly, this study supports the positioning of Putrajaya Wetland Park within broader national frameworks, including Malaysia Madani's agenda for sustainable development and civic consciousness. As a multifunctional ecological and recreational

space, the park can serve as a benchmark for other urban regions in Malaysia and across Southeast Asia.

4.5. Contextual Relevance to Malaysia and Southeast Asia

Putrajaya Wetland Park stands out as a pioneering case in the integration of ecological engineering with urban recreation in Southeast Asia. Its recognition by UNESCO as an Ecohydrology Demonstration Site underlines its global significance. However, this study highlights a paradox common in the region: high public use of ecological amenities coupled with low ecological literacy.

This disconnect calls for a rethinking of how urban ecological spaces are communicated and managed. While infrastructure and aesthetics draw people in, long-term engagement and stewardship depend on deeper understanding. Thus, the park should not only serve as a leisure site but also evolve into a living classroom, offering immersive educational experiences that elevate environmental consciousness across demographic segments.

Given rapid urbanization in many Southeast Asian cities, the lessons from Putrajaya have broader applicability. Governments and planners can replicate such models with adaptations to local socio-cultural contexts, ensuring that blue infrastructure contributes not only to environmental goals but also to social cohesion and public health.

4.6. Study Limitations

As with any empirical research, this study is bounded by several limitations. First, its cross-sectional design offers a snapshot view that does not account for seasonal variations or long-term shifts in perception and behavior. Second, reliance on self-reported data introduces the risk of social desirability bias, where respondents may overstate their ecological concern.

Third, the study is geographically limited to a single constructed urban wetland. Findings may not be generalizable to rural wetlands, mangroves, or natural freshwater systems, which may evoke different patterns of motivation and perception. Additionally, the quantitative approach, while robust, may miss the rich context and narratives that qualitative methods could capture.

4.7. Future Research Directions

To address these gaps, future research should adopt longitudinal designs that track changes in visitor motivations and perceptions over time. Comparative studies across different wetland types and geographic contexts could also yield insights into how ecological, cultural, and infrastructural variables interact.

Moreover, mixed-method approaches that include in-depth interviews or participatory observation would allow researchers to explore the emotional and cultural dimensions of wetland visitation. These narratives could enrich our understanding of place attachment and environmental ethics.

Finally, investigating the role of digital tools, such as mobile applications and augmented reality, in enhancing environmental education and engagement would be particularly valuable in urban contexts where technological uptake is high. These tools could personalize the visitor experience and transform passive appreciation into informed advocacy.

5. Conclusions

This study examined the interplay between push and pull motivational factors and visitor engagement with ecosystem services at Putrajaya Wetland Park, Malaysia. The findings provide robust empirical evidence that internal motivations particularly the desire for psychological restoration ($\beta = 0.57, p < 0.001$), environmental appreciation, and family

bonding exert a stronger influence on visitors' perceptions of ecosystem services than external destination attributes. Regression analysis confirmed that push factors explained 40.3% of the variance in ecosystem service valuation ($R^2 = 0.403$), compared to 26.2% for pull factors ($R^2 = 0.262$). These insights suggest that urban wetland tourism strategies should shift from an overreliance on infrastructure upgrades toward fostering meaningful, experience-based engagement that taps into visitors' intrinsic psychological and emotional needs.

The integration of push–pull motivation theory with the ecosystem services framework offers a novel analytical lens that advances theoretical discourse in both environmental planning and tourism studies. By situating ecosystem services within the context of human behavior and lived experience, this approach emphasizes the co-production of value between ecological systems and urban populations.

Crucially, while visitors expressed high appreciation for regulating ($M = 4.39$), cultural ($M = 4.45$), and supporting services ($M = 4.46$), the study also identified a significant environmental literacy gap. Many respondents lacked familiarity with basic ecological terms such as “ecosystem services” or “urban green–blue space,” revealing a disjunction between valuation and understanding. This paradox underscores the need for targeted, place-based environmental education, capable of transforming passive appreciation into active stewardship.

From a policy standpoint, the findings affirm the potential of urban wetlands to function as multifunctional spaces that simultaneously support biodiversity, promote psychological well-being, and cultivate civic ecological consciousness. The case of Putrajaya Wetland Park serves as a replicable model for urban areas in Malaysia and across Southeast Asia, demonstrating how ecological infrastructure can be embedded within cityscapes to deliver co-benefits for both environmental sustainability and human development.

Looking forward, future research should build upon this foundation by addressing key limitations. First, longitudinal studies are needed to capture how visitor motivations and perceptions evolve over time. Second, mixed-method approaches combining surveys, interviews, and behavioral observations would provide a deeper understanding of how motivations influence behavior beyond self-report. Third, comparative studies across different wetland types or socio-cultural contexts would help generalize the findings and uncover location-specific dynamics. By aligning ecological infrastructure development with social and psychological investments, urban planners and conservationists can better support sustainable tourism, environmental education, and the long-term resilience of urban ecosystems.

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