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Exploring Awareness and Public Perception towards the Importance of Visual Aesthetics for Preservation of Permanent Forest Reserve (PFR) in Malaysia

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Abstract: Malaysia has suffered a significant loss of forest cover over the years, mainly due to logging and land clearance for agriculture activities. Although the forest legislation has long been established and continuously enforced, it was not inclusive enough to protect the local natural resources. This study aims to identify public perception and awareness regarding values and essential aspects that affect the preservation of permanent forest reserves (PFR) in Malaysia. In particular, this study investigated the values of visual aesthetics to promote the preservation of Malaysian PFR within the existing legal framework. Results from the survey revealed that the public strongly perceived ecology and research education are the two most important aspects of preserving Malaysian PFR. The study also confirmed that visual aesthetic is considered a crucial aspect of forest classification and preservation beyond people's health, safety, recreational and economic functions.

Keywords: Visual Aesthetic; Forest Aesthetics; Forest Reserve; Preservation; Protection; Legislative Aspects

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1. Introduction

Deforestation is considered the main cause of climate change, reduced ecosystem services, biodiversity loss, soil degradation, and other problems affecting human health [1,2]. Besides excessive logging and extensive agricultural activities, another main reason for the loss of forest areas is due to sprawl of urbanization [2,3]. Driven by rapid population and economic growth, these factors have contributed to continuous land-use change, leading to the loss of green spaces, especially in urban areas [4-6].

Factors that cause deforestation can be classified into five categories: economic, social, political, technological, and cultural [7]. It does not surprise the absence of comprehensive policy, and legislation to protect forest areas remains a complex issue that is still unsolved [8-10]. The severity of deforestation could also be associated with a lack of participation by local communities or the public in forest management [8]. Researchers have shown that community involvement can correspond to or provide methods and justifications to increase the protection of forests and biodiversity conservation [2,11].

In Malaysia, deforestation based on the above reasons is also significant. Continuous threats from various human activities have caused tremendous pressure among the decision-makers to balance the need to preserve the natural forest and generate economic revenues. Unfortunately, although the Malaysian forest legislative policy has been es-

tablished for more than 40 years, it can be considered less inclusive. In particular, the policy only revolved within four main areas, which are ecological, economic, recreational, and research. Other aspects of forest preservation, such as visual aesthetics, remained vague and were not fully emphasized as a valuable factor, even though it has long been considered a strong motivator for protecting natural areas.

Therefore, this study investigates aspects of forest preservation within the current Malaysian policy and legislation for permanent forest reserves. Using a bottom-up approach, this study explored identifying public perception towards existing values and aspects of forest preservation besides including visual aesthetics as a potential factor that could affect the preservation of permanent forest reserves (PFR) in Malaysia (Figure 1). This formulates the basis of three objectives to determine the level of Malaysians' awareness of the permanent forest reserve system:

- RO1: To investigate the public awareness of the forest classification types within the Malaysian permanent forest reserve (PFR)
- RO2: To identify the public perception of important aspects affecting the preservation of Malaysian permanent forest reserve (PFR).
- RO3: To verify the hypothesis that aesthetic function is a strong motivator and persuasive reason to increase the preservation of the permanent forest reserve (PFR).

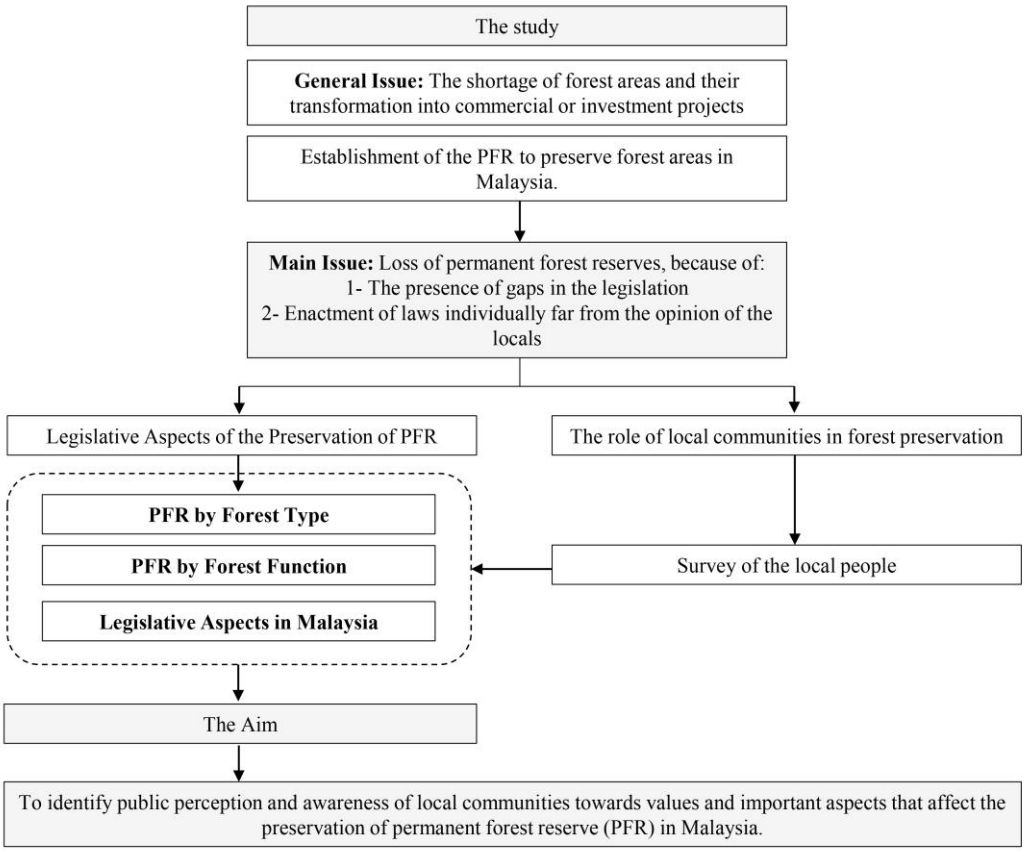


Figure 1. The framework of this study

1.1 The general importance of forest preservation

Natural forests are essential to be preserved because of their biodiversity richness, and complex ecosystem services, besides improving human health and well-being [8,12,13]. In addition to ecological and social importance, the beauty of the forest environment can also be a significant motivation for forest preservation, particularly as a tourist attraction that serves social and economic objectives [14-17]. For instance, a natu-

ral forest reserve within the urban environment can also support and protect wildlife habitat, natural landscape elements, and resources besides preserving local biodiversity [18,19]. It also promotes noise reduction, carbon sequestration, air purification, temperature management, healthy lifestyles, and flood control, which can lead to the creation of more sustainable cities [20,21].

People play a critical role in the transformation of land cover, and deforestation has been one of the primary causes of land-use change [22-25]. Such changes also contributed to existing climate change-related environmental problems such as air pollution, flooding, landslides, and increasing temperatures. As an example, in the early 1990s, the earth's surface temperature increased by 17%, and this was attributed mainly to the loss of 16 million hectares of forest per year [26-29]. Consequently, these problems continuously affect human life and the richness and existence of flora and fauna. Without serious intervention, the forest ecosystem and its long-term survival are continuously threatened [8,30,31]. Despite many advantages of forest preservation and widespread consequences of forest degradation, natural forests are still being cleared to accommodate the needs of urban expansion [32-33].

1.2 The role of local communities in forest preservation

Public perception of protected areas is crucial because they have more awareness of their local environment, which could reveal the essential aspects of preservation. Local concerns associated with forest ecosystems indicate that they have a vital role in the planning and execution of resource management activities if these activities are environmentally, socially, and economically sustainable [34]. It also enables adequate documentation of local understands and concerns that can be included in future forest management decisions and improve the preservation process's efficiency [35,36]. Nevertheless, the local communities also need continuous exposure to other essential environmental issues to be actively involved in environmental management decisions [37].

Although preservation policies could reduce deforestation, they could not be effectively enforced or implemented without active participation by local communities through forest management [8]. Most conservationists agree that protected areas are doomed to failure unless local communities engage to some degree in conservation efforts [38]. Thus, it is not surprising that local communities' role in managing forests and the surrounding areas has been recognized globally [34,39,40]. Such strategies of community engagement are known as "community conservation" or "participatory management" [35,41]. They aim to improve the relationship between protected areas and the local community by increasing the community's involvement in resource management and, at the same time, improving their economic status [36]. Finally, forest preservation is more than merely a technical issue that the local governments must address. There is also a need to understand a broader spectrum of community issues, such as people's knowledge of forest legislation, community participation in forest preservation and stewardship decisions, and community conduct toward forest preservation. It is crucial to note that such social issues significantly impact forest management decision-making. Hence, the preservation of forests based on ecological importance and the opinions of local communities provides a basis for decision-makers to develop more effective strategies for forest conservation and development [2,39,40] .

1.3 Legislative Aspects of the Preservation of Permanent Forest Reserve (PFR) in Malaysia

In Malaysia, the National Forest Policy (NFP) was initiated in 1977 and approved by the National Land Council in 1978. In order to reduce the significant loss of forest land, Malaysia's state governments are allowed to reserve (gazette) any forest area under the National Forestry Act 1984 [42]. Nevertheless, this protection was limited and not large-scale, which has led to the loss of many forest areas [4]. Consequently, forests in Malaysia, particularly natural forests in urban areas (including gazetted areas), contin-

uously receive threats from urban development [5]. Identifying and preserving more natural assets as a protected area such as PFRs is vital to increasing urban green coverage. Unfortunately, the PFRs in Kuala Lumpur had decreased by around 50% since they had been gazetted in the early twentieth century [4].

Consequently, several amendments to the legislation were made in 1992, the most important of which related to the conservation of biodiversity and the role of local communities in forest development and genetic resource management. One of the essential functions of the National Forest Policy is the declaration of permanent forest reserves in appropriate areas strategically located throughout Malaysia, based on the principle of rational land use [42]. Malaysia's Ministry of Energy and Natural Resources first surveyed the forest areas of Malaysia, by region, between 1990 and 2018 [43], as shown in (Table 1). In 2011, the Department of Forestry of Peninsular Malaysia also commenced the annual reporting of forest statistics to update areas and types of permanent forest reserves [42]. It is worth mentioning, underscoring the concern expressed in this study, that the Ministry reported a loss of 0.10 million hectares between 2011 and 2020, especially given that these lands are preserved under PFR, as shown in (Table 2).

Table 1. Forest statistics collected by the Ministry of Energy and Natural Resources between 1990 and 2018 in Malaysia, by region.

Year	Area (million hectares)			
	Peninsular Malaysia	**Sabah**	**Sarawak**	**Total**
1990	6.27	4.44	8.07	18.78
2000	5.91	4.42	7.62	17.95
2010	5.86	4.43	7.68	17.97
2018	5.75	4.76	7.74	18.25

Table 2. Forest statistics collected by the Department of Forestry of Peninsular Malaysia for 2011 and 2020.

Land Area of Peninsular Malaysia	Area (million hectares)	
	2011	**2020**
Forested Area	5.81	5.69
Non-Forested Area	7.37	7.53
Permanent Forest Reserve (PFR)	**4.91**	**4.81**
Permanent forest reserved by forest type		
Inland Forest	4.39	4.34
Peat Swamp Forests	0.24	0.25
Mangrove Forest	0.10	0.09
Plantation Forest	0.18	0.12
State Land Forest	0.31	0.28
National and Wildlife Forest	0.59	0.51
Permanent forest reserved by forest function		
Protection Forest	1.99	1.84
Production Forests	2.92	2.97
Amenity Forests	-	-
Research and Education Forests	-	-

The Department of Forestry of Peninsular Malaysia (FDPM) is responsible for the management, protection, planning, and development of PFRs. The PFR is typically classified into six types of forest: Inland Forest, Peat Swamp Forest, Mangrove Forest, Plantation Forest, State Land Forest, or National and Wildlife Forest. The PFR is also classified into four categories depending on its function. Protection Forests are forests for mitigating impacts of local/regional climatic conditions, water resource management; conserva-

tion of flora and fauna diversity; environmental quality; and flood damage mitigation. Work Forests are industrial forests producing forest products and supplying raw materials for agriculture, industry, and exports. Amenity Forests are intended to increase and attract tourists and provide recreational activities such as camping and mountain hiking. Research and Education Forests are areas of benefit for scientific research and education, especially to further knowledge of biodiversity and natural forest ecosystems. Based on these classifications, Malaysia's permanent forest reserve can be structured as shown in (Figure 2).

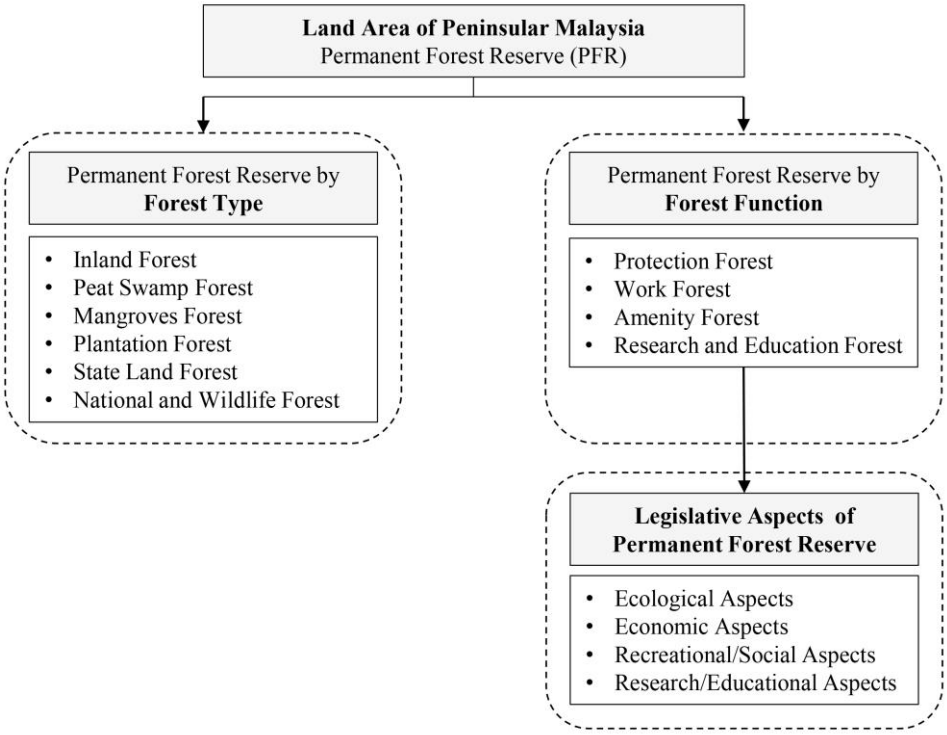


Figure 2. Classification of PFR by forest type, function, and legislative aspect in Peninsular Malaysia

2. Materials and Methods

Using the online Qualtrics Survey tool, the questionnaire was distributed using a snowball sampling (non-random) approach through various social media platforms. Over 14 days, 219 people participated in the survey, but 15 of the respondent's samples were finally excluded as they did not complete the survey. The survey was divided into two parts: (A) Questions that assess respondents' understanding of permanent forest reserves (PFRs) and (B) questions about each respondent's demographic.

Part A consisted of six questions designed to assess the public's knowledge of the permanent forest reserve system. In particular, respondents were asked to which extent they understood the PFR system and how frequently they visited this kind of forest reserve. Furthermore, a question was asked about their understanding of different forest types classified under the PFR definitions. We also asked about the most important aspects of preserving PFRs and probed on whether the aesthetics should be included as crucial aspects and values toward permanent forest reserves in Malaysia. Details of the questionnaire used in the online survey are shown in (Figure 3).

Part B contained seven general questions on citizenship, gender, age, ethnicity, educational level, marital status, and home address. Results from the survey were analyzed using SPSS for statistical analysis to determine the final mean and test the reliability of the selected aspects and values. In addition, the Independent-Samples Kruskal-Wallis Test was used to validate the aesthetic hypothesis and comprehend the variances in reactions among demographic groupings.

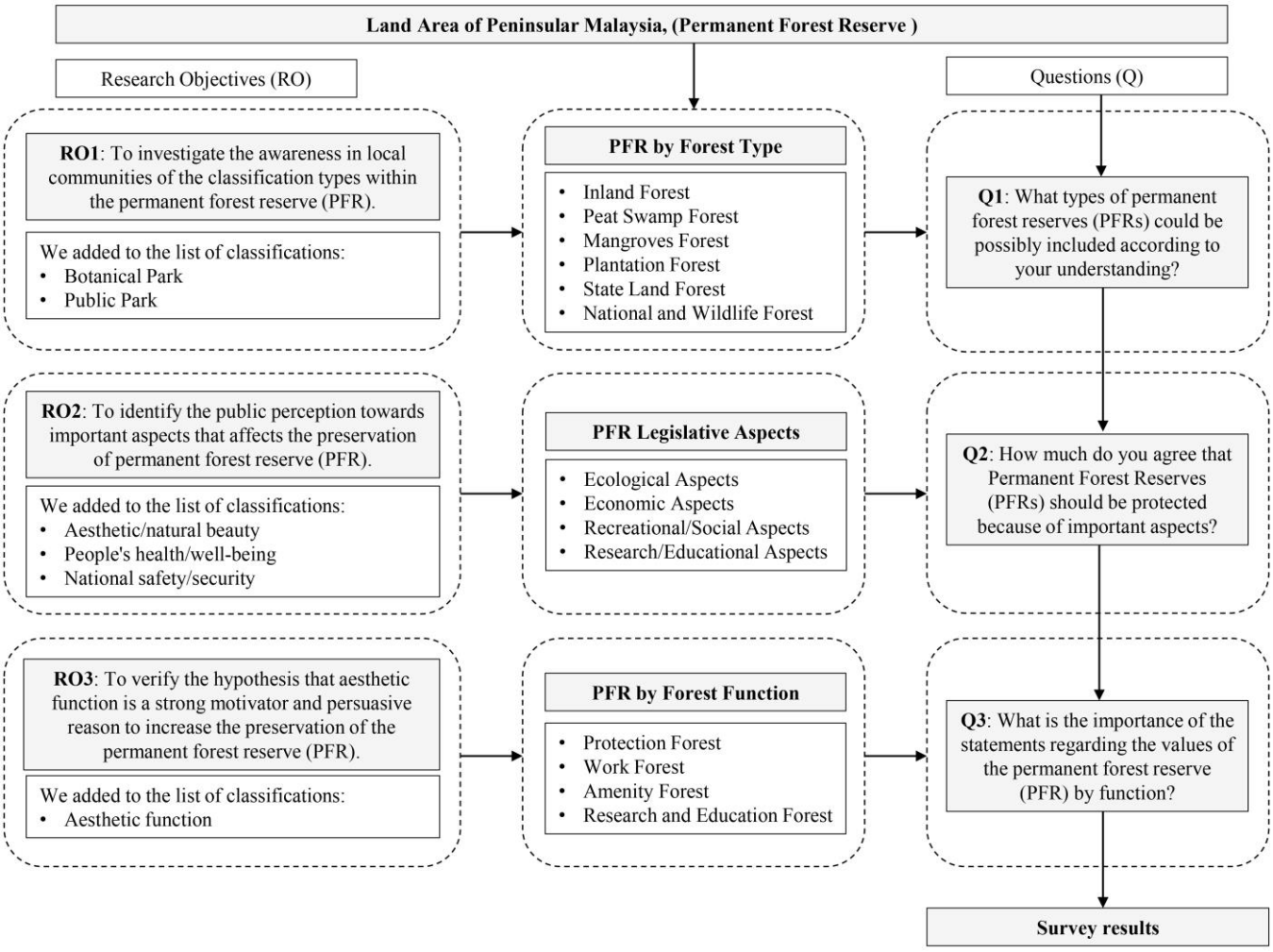


Figure 3. Formulation of survey questions based on the research objectives

3. Results

3.1 Descriptive statistics for demographic results

A total of 204 respondents were surveyed, of whom (97.04%) were Malaysian citizens; of these, (59.31%) identified as Malay ethnic origin, reflecting the demographic composition of the Malaysian community as a whole. It is worth noting that the proportion of female participants (58.82%) was slightly higher than that of male participants (41.18%). The majority of participants (62.25%) were single. Half of the respondents were younger than 30 years of age. Regarding the highest education level achieved, (85.29%) of the participants had completed education at a bachelor's degree and postgraduate level. Furthermore, about half (50.98%) of the respondents lived in urban areas. In general, this study found that most respondents were Malaysian citizens, most of whom had completed university studies, and their ages represented a mix between young and the most experienced, as shown in (Table 3).

Table 3. Background of respondents.

Category		Sub-category	Percentage (%)	Frequency (n)
Malaysian citizen	1	Yes	97.06%	198
	2	No	2.94%	6
Gender	1	Male	41.18%	84
	2	Female	58.82%	120

Age	1	29 and below	50.00%	102
	2	30–39	30.39%	62
	3	40 and above	19.61%	40
Ethnicity	1	Malay	59.31%	121
	2	Chinese	24.51%	50
	3	Indian	7.84%	16
	4	Others	8.33%	17
Education level completed	1	High school certificate	5.88%	12
	2	Diploma	8.82%	18
	3	Bachelor's degree	54.90%	112
	4	Master's degree	25.00%	51
	5	Doctorate	5.39%	11
Marital status	1	Single	62.25%	127
	2	Married	37.75%	77
Living area	1	Urban area	50.98%	104
	2	Semi-urban area	38.73%	79
	3	Rural area	10.29%	21

3.2 Descriptive statistics for public perception towards permanent forest reserves (PFRs)

The survey found that the level of awareness regarding PFR among the respondents can be considered high. To our surprise, (66.18%) answered "yes," (9.80%) stated "no," and (24.02%) answered "maybe," as shown in (Figure 4). Most of the respondents refer to (Table 4) identified Wildlife Forest, Inland Forest, Mangrove Forest, Peat Swamp Forest, and Forest plantations as major types of PFR. They also stated that Botanical and Public Parks do not form types of permanent forest reserve (PFR), which confirmed our earlier assumption. The public is generally familiar with PFR, its forest classification, and its types, though there was a slight difference in their understanding of Timber Production Forests. One likely explanation is that they possibly believe PFRs are dedicated only to forest preservation rather than purposely preserving to manufacture wood products.

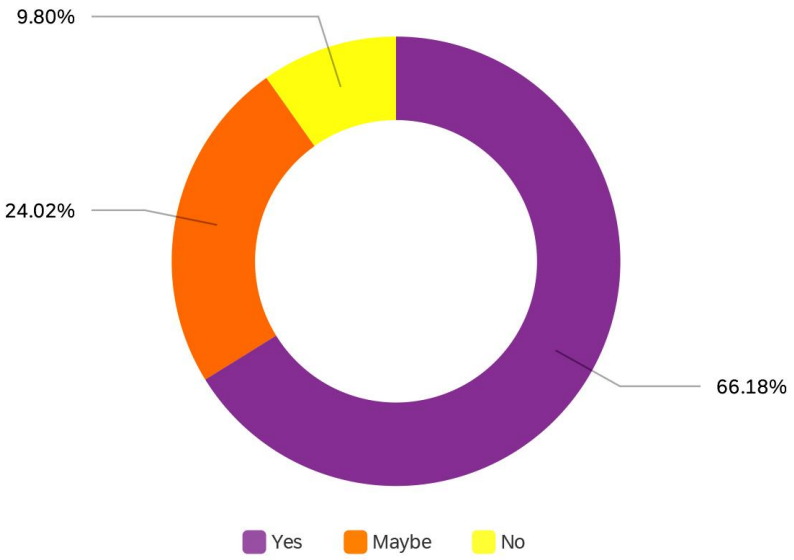


Figure 4. Level of respondents' knowledge about a permanent forest reserve system in Malaysia

Table 4. Levels of knowledge of permanent reserved forests by type

	PFR by type	Yes	Qty	Maybe	Qty	No	Qty
1	Wildlife forest	**90.20%**	184	6.37%	13	3.43%	7
2	Inland forest	**87.75%**	179	10.78%	22	1.47%	3
3	Mangrove forest	**84.80%**	173	11.27%	23	3.92%	8
4	Peat swamp forest	**75.49%**	154	16.67%	34	7.84%	16
5	Forest plantation	**70.10%**	143	15.20%	31	14.71%	30
6	Timber production forest	44.12%	90	21.08%	43	34.80%	71
7	Botanical Park	36.76%	75	20.10%	41	43.14%	88
8	Public Park	16.67%	34	18.63%	38	**64.71%**	132

Besides, nearly two-thirds (66.18%) of the respondents confirmed that they had visited a PFR, more than half (58.33%) had visited a PFR two to three times a year, and (6.86%) respondents stated they visited at least one or more PFRs monthly. The results revealed that the respondents had good sense and vision to respond to important aspects of protecting permanent forest reserves. Although the survey respondents asserted that all aspects were significant in preserving forests, they prioritized the aspects of ecological importance, research/educational importance, aesthetic/natural beauty importance, and human health/well-being importance. While respondents generally underestimated the value of economic importance compared with other aspects, the overall rating of the last aspect scored higher than the average. The reliability of the statistical analysis on all aspects was tested using Cronbach Alpha SPSS, and the results were >0.8, indicating high reliability. These results are shown in (Table 5).

Table 5. The opinions of the respondents on the important aspects of the preservation of PFRs in Malaysia

	Important aspects of the preservation of PFRs in Malaysia	Mean*	Reliability Statistic (Cronbach Alpha) **
1	Ecological importance	**4.64**	0.831
2	Research/educational importance	**4.42**	0.822
3	Aesthetic/natural beauty importance	**4.39**	0.826
4	People's health/well-being importance	**4.19**	0.813
5	National safety/security importance	3.88	0.846
6	Recreational/social importance	3.78	0.832
7	Economic importance	3.60	0.857
	Total		**0.853**

(*) The mean is between 1.00 and 5.00, where the minimum is 1.00 = strongly disagree, the middle is 3.00= neither agree nor disagree, and the maximum is 5.00 = strongly agree.

(**) Cronbach's alpha reliability coefficient ranges typically between 0 and 1, where the closer the coefficient is to 1 indicate the presence of high reliability, and the closer the coefficient is to 0 indicates the absence of reliability.

Respondents confirmed the validity of their important aspects of the preservation by assessing the importance of statements for the protection of permanent forest reserves. The highest values reported were "Preserve Forest biodiversity," "Source of freshwater," "Conserve large diversity of flora and fauna," and "Influence local/regional climatic conditions." On the other hand, it was found that the lowest values were given to "Provide raw materials for furniture products," "Timber supply for building materials," and "A place for a picnic with the family." The reliability statistics were measured for these aspects also, using Cronbach Alpha SPSS and the results were >0.8, indicating the reliability of the statistical tests. These results are shown in (Table 6).

Table 6. Means and reliability statistics for values of the preservation of PFRs in Malaysia

	The item on PFR values in Malaysia	Mean*	Reliability Statistics (Cronbach Alpha) **
1	Preserve forest biodiversity	**4.76**	0.821
2	Source of fresh water	**4.69**	0.821
3	Conserve large diversity of flora and fauna	**4.63**	0.822
4	Influence local/regional climatic condition	**4.61**	0.826
5	Contain unique formation of forest species (e.g., size, shape)	4.49	0.821
6	Mitigate flood	4.47	0.817
7	Educate people about the natural biodiversity	4.44	0.815
8	Vast potential for scientific research	4.42	0.818
9	Field laboratory for teaching and learning	4.26	0.814
10	Various hierarchies of landforms (e.g., ridges, valleys)	4.25	0.816
11	Offer iconic natural viewpoints and features (e.g., waterfall, cliff)	4.24	0.811
12	Present varieties of natural color composition	3.88	0.806
13	Opportunity to conduct bird watching	3.45	0.801
14	Production of agriculture products	3.45	0.813
15	Provide jungle trekking or mountain hiking experience	3.38	0.814
16	It can be turned into a forest plantation	3.20	0.816
17	Conducive space for outdoor camping	3.15	0.805
18	Provide raw materials for furniture products	**2.72**	0.810
19	Timber supply for building materials	**2.70**	0.808
20	A place for a picnic with family	**2.56**	0.818
	Total		**0.823**

(*) The mean is between 1.00 and 5.00, where the minimum is 1.00 = not important, the middle is 3.00= moderately important, and the maximum is 5.00 = highly important.

(**) Cronbach's alpha reliability coefficient ranges typically between 0 and 1, where the closer the coefficient is to 1 indicate the presence of high reliability, and the closer the coefficient is to 0 indicates the absence of reliability.

Data were also collected based on groups that define the protection of the permanent forest reserve by function. These included the four functions already set out in the Malaysian PFR legislation (Protection, Research & Education, Amenity, Work Forest / Economic) and the Aesthetics function as a fifth protection aspect. The results from the survey responses confirmed the value of the existing classification of the important aspects mentioned above. These results are shown in (Table 7).

Again, based on the findings of this survey, one of the most important aspects of preserving permanent forest reserves is aesthetic/natural beauty. As seen in Tables 6 and 7, this was confirmed by adding the aesthetic function as an important aspect of enhancing the preservation of the permanent forest reserve. The results support our assertion that the hypothesis is reliable and suggest that adding the aesthetic/natural beauty aspect to the PFR evaluation criteria would enhance the PFR legislation.

Table 7. The preservation group of permanent forest reserves by function.

	PFR by function	The item on PFR values in Malaysia	Individual mean	Average mean*
1	Group A (Protection)	Source of fresh water	4.69	**4.60**
		Conserve large diversity of flora and fauna	4.63	
		Influence local/regional climatic condition	4.61	
		Mitigate floods	4.47	
2	Group B (Research &	Preserve forest biodiversity	4.76	**4.47**
		Educate people about the natural biodiversity	4.44	

	Education)	Vast potential for scientific research	4.42	
		Field laboratory for teaching and learning	4.26	
3	Group C (Aesthetic)	Contain unique formation of forest species (e.g., size, shape)	4.49	**4.22**
		Various hierarchies of landforms (e.g., ridges, valleys)	4.25	
		Offer iconic natural viewpoints and features (e.g., waterfall, cliff)	4.24	
		Present varieties of natural color composition	3.88	
4	Group D (Amenity / Recreational)	Opportunity to conduct bird watching	3.45	**3.14**
		Provide jungle trekking or mountain hiking experience	3.38	
		Conducive space for camping	3.15	
		A place for a picnic with family	2.56	
5	Group E (Work / Economic)	Production of agriculture products	3.45	**3.02**
		It can be turned into a forest plantation	3.20	
		Provide raw materials for furniture products	2.72	
		Timber supply for building materials	2.70	

(*) The mean is between 1.00 and 5.00, where the minimum is 1.00 = not important, the middle is 3.00= moderately important, and the maximum is 5.00 = highly important.

3.3 Verification of the hypothesis and perceptual differences between demographic groups

We investigated the premise that beauty is a powerful motivation and compelling cause to improve Malaysia's conservation of Permanent Forest Reserves (PFRs). From the analysis using Shapiro-Wilk and Kolmogorov-Smirnov tests, the data deviated from the normal distribution, i.e., the null hypothesis for all demographic data was significant ($p<0.05$). Thus, it could be concluded that the data were not normally distributed, and non-parametric analytical tests needed to be used. The same test was done for Group C (Aesthetic), and the results were almost identical to the above, where all data were significant ($p<0.05$) except for some of the sub-category data. Namely, in the division of ethnicity, the p-value was higher for the group Indians and Others (Kolmogorov-Smirnov = 0.105, 0.200; Shapiro-Wilk test, W = 0.321, 0.113). Differences in the p-value were also found in the education level, specifically for those whose highest educational attainment was a high school certificate and those with a doctorate (Kolmogorov-Smirnov = 0.200, 0.186; Shapiro-Wilk= 0.539, 0.267). However, none of the demographic data indicated a total acceptance of the null hypothesis. As a result, we concluded that the data were not normally distributed and that a non-parametric analytical test was required.

For the non-parametric test, independent samples were conducted to investigate the statistical significance of perceptual differences between different demographic groups. Responses to questions were tested by grouping them into respondents' demographic attributes based on gender and marital status, living area, education, age, and ethnic group.

The results were tested using the Independent-Samples Kruskal-Wallis Test, and descriptive statistics tables of responses pertaining to the survey questions were established ("How much do you agree that Permanent Forest Reserves (PFRs) should be protected because of important aspects?") We tested the aesthetic/natural beauty importance aspect. An analysis of the results indicated a statistical difference between the four ethnic groups (Malay, Chinese, Indian, and Other) in their responses to aesthetic/natural beauty importance. A p-value of 0.004 indicated that the null hypothesis was rejected. A significant difference was found between the group's "Others" and "Malay" ($p = 0.001$) in their rating of aesthetic/natural beauty importance. This indicates that respondents in the "Malay" group agreed more strongly that PFRs should be protected based on the importance of their aesthetic/natural beauty, as shown in (Table 8) and (Figure 5).

Table 8. The difference in responses to aesthetic/natural beauty importance between ethnic groups.

Null Hypothesis	Test	Significance	Decision
The distribution of responses to Aesthetic/natural beauty importance is the same across categories of ethnicity.	Independent-Samples Kruskal-Wallis Test	0.004*	Reject the null hypothesis
Pairwise comparisons of ethnic groups			
Dependent Variable	**Sample 1–Sample 2**	**Std. Test Statistic**	**Significance**
Aesthetic/natural beauty importance	Others–Malay	3.293	0.001*

Note: (*) the asterisk indicates the significance level is 0.05.
Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

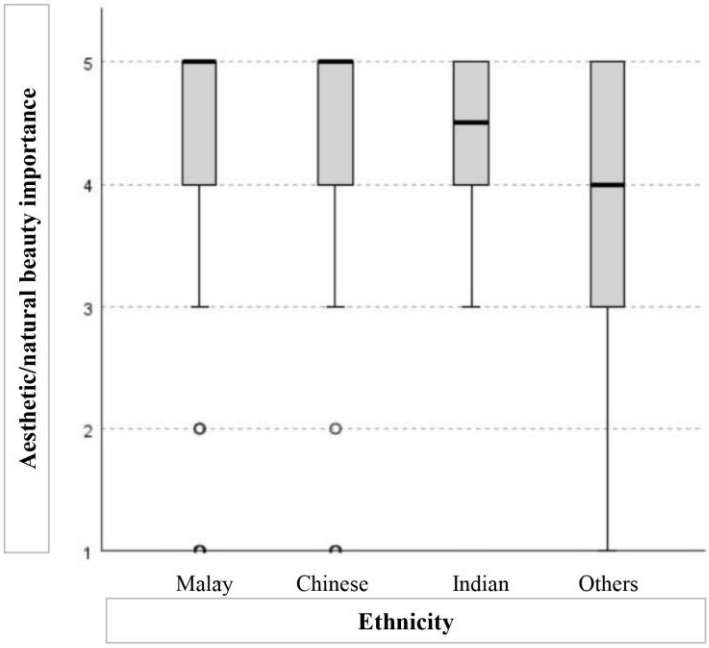


Figure 5. Independent-Samples Kruskal-Wallis Test between aesthetic/natural beauty importance and ethnic groups.

Similarly, the Independent-Samples Kruskal-Wallis Test was conducted to understand perceptual differences between demographic groups' responses to the questions ("How do you rate the importance of the statements regarding values of permanent forest reserve PFR in Malaysia, toward forest function?"). When we tested the Aesthetic Function, the analysis results indicated a statistical difference between the three living areas (Urban Area, Semi-urban Area, and Rural Areas) in the responses toward the Aesthetic Function; a p-value of 0.003 indicated that the null hypothesis should be rejected. The significance was found between Urban area and Semi-urban Area (P = 0.018), and between Urban Area and Rural Area (P = 0.003), in the importance values for the aesthetic function. This indicates that people living in rural and semi-urban areas are more likely to agree on the importance of the aesthetic function in protecting PFRs than those living in urban areas, as illustrated in (Table 9) and (Figure 6).

Table 9. The difference in responses to aesthetic function between living area groups.

Null Hypothesis	Test	Significance	Decision
Group C – Aesthetic Function distribution is the same across Living Area categories.	Independent-Samples Kruskal-Wallis Test	0.003*	Reject the null hypothesis

Pairwise comparisons of ethnic groups

Dependent Variable	Sample 1–Sample 2	Std. Test Statistic	Significance
Group C Aesthetic Function	Urban area-Semi-urban area	-2.376	0.018*
	Urban area-Rural area	-2.951	0.003*

Note: (*) the asterisk indicates the significance level is 0.05.
Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

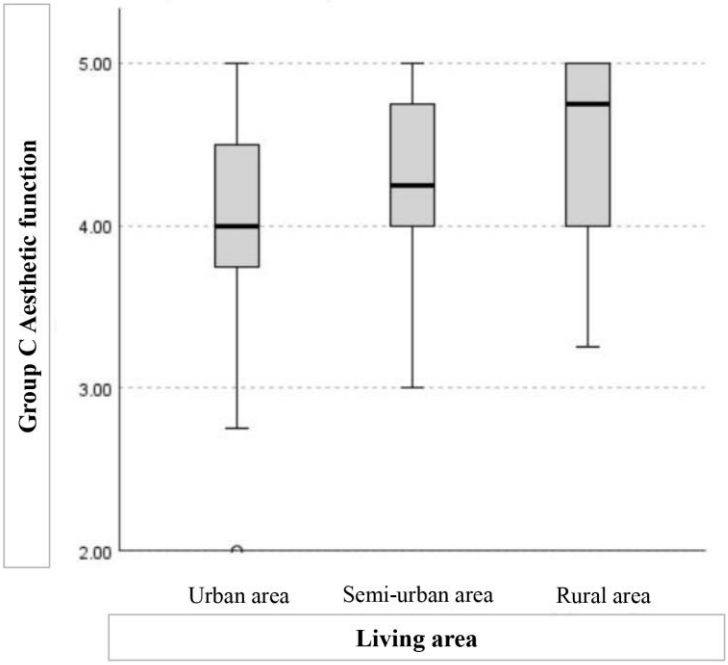


Figure 6. Independent-Samples Kruskal-Wallis Test between aesthetic function and living area groups

4. Discussion

This research has revealed three major aspects that need to be considered in the discussion and should be explored in detail. First, data from previous research and government statistics on Malaysia's permanent forest reserve have shown that forest reserve areas are declining despite being protected under legislation. The same trend can also be observed for forest areas not subject to the same legal protection as permanent forest reserves. Unlike the Sabah and Sarawak regions (East of Malaysia-Borneo Island), Peninsular Malaysia is the only region that suffers from a lack of forest areas due to continuous urban development and the reduction of large areas of forests for economic purposes, particularly in the urban areas. Statistics reported by the Forestry Department of Peninsular Malaysia (FDPM) indicate a shortage of 0.10 million hectares of permanent forest reserve area between 2011 and 2020. The decline of permanent forest reserves appears to be continuing for several reasons, the most important of which are the gap in forest protection laws and the difficulty of implementing these laws [4,5].

Second, the study proved there is awareness of PFRs in the community and that the public favors preserving PFRs in Malaysia. The results of this study show that the respondents understand and are aware of different types of forests classified under permanent forest protection laws in Malaysia. Their answers to the forests' classification are identical to those provided by the Department of Forestry of Peninsular Malaysia. We also concluded that the respondents had two concerns: first, regarding forests being cleared and converted into consumer products, such as furniture and construction materials, which is the main reason for rating the economic aspect as being of lower importance than other aspects, and this runs contrary to the preservation of the permanent

forest reserve. The second explanation is the fear of visiting the family and the children. Their fear for children may be attributed to the nature of the terrain, which necessitates a significant deal of effort for a picnic, which reduces their social aspect perspective in the forest area. This indicates that Malaysians are generally aware of the issue of forest protection in Malaysia. It confirms the validity of the statement that the adoption of the views of local communities provides a basis for decision-makers to develop strategies for forest conservation and management [2].

Third, the natural beauty of forests offers a significant incentive to protect the environment. Beauty is a quality that gives pleasure to the senses and is studied as part of aesthetics. In some countries, aesthetic values are included in the decision-making process for forest management [14]. The findings confirmed that the aesthetic aspect of natural forests is an important incentive for preserving permanent forest reserves. It was rated as one of the most important aspects of preserving a permanent forest reserve with ecological function, research and education, and human health and well-being. Finally, this study showed that the aesthetic aspect of forests had been demonstrated to be an important aspect that can be added to the current legislation to enhance forest protection.

5. Conclusions

The continuing shortfall in the permanent forest reserve in Malaysia can be attributed to a lack of inclusiveness in forest protection policies. This study revealed that aesthetics are important aspects of forest preservation besides the importance of ecological and research/educational and human health/well-being. On the other hand, respondents downplayed the economic aspect's role in preserving forests. They believed that the economic needs caused deforestation, leading to other problems affecting various aspects of people's lives. Findings of this research suggest that adding the aesthetic aspect to the classification of PFR functions in Malaysia could benefit the continued protection of these forest areas. Hopefully, it will enhance the preservation of the permanent forest reserves in Malaysia and aid the policymaker's understanding of aesthetics as a catalyst for the protection of the natural areas.

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