The Insides of Outdoor Recreation Users towards Recreation Resource Impacts at Taman Negara Pahang, Kuala Tahan

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Abstract. One of the most popular activities in the natural environment is trail walking and hiking. In such necessity, the trail is considered key to the recreational amenity available for the outdoor recreation users with safe accessibility to appreciate the natural and scenic environment. Taman Negara Pahang is the largest park in Malaysia and is located at one of the oldest rainforests in the world. The park has excellent advantages in attracting outdoor recreation users but facing a substantial impact on its recreation resources. The impacts cause undesirable change and degrade the components of recreation resources such as soil, vegetation, wildlife and water resources. This issue threatens its integrity to maintain the benefits of recreation function and reduce the quality of the visitor experience due to the ecological impacts. Thus, it is crucial to assess the extent to which outdoor recreation users perceived recreation resource impacts in Taman Negara Pahang. This research has two objectives: 1) to identify the outdoor recreation users’ perceptions toward recreation resource impacts, and 2) to analyse the outdoor recreation users’ level of acceptance toward recreation resource impacts. There are four entrances, i.e. Kuala Tahan and Sungai Relau in Pahang, Kuala Koh in Kelantan dan Tanjung Mentong in Terengganu. This research chooses explicitly Kuala Tahan because it is the main gateway to the park with the most facilities and amenities for the users. The primary research method is a questionnaire survey on outdoor recreation users after completing their activity. They will be intercepted at Bukit Teresek Trail, Canopy Walkway Trail and Lubok Simpon Trail. The survey was conducted from the 4th until the 9th of September, with 60 respondents involved. The expected outcome of this research is to provide a baseline understanding of the designated trail and effectively facilitate targeted experiential opportunities of a respected environment.

Keywords: Recreation ecology, recreation resource impacts, level of acceptable, recreational experiences

1. Introduction
A protected area (PA) is one of the most preferred recreational destinations amongst outdoor recreation users. As the oldest and established PA in Malaysia, Taman Negara Pahang, Kuala Tahan (TNPKT) plays a crucial role in protecting its ecosystem and deliver recreational benefits for humankind. TNPKT is managed by the Department of Wildlife and National Parks (DWP). Arguably, providing enjoyment for outdoor recreation users and protecting the natural resources is two sides of the same coin. Thus, it is always a severe factor to consider in the achievement of establishing and managing PAs [1]. Before
the Covid-19 pandemic, TNPKT attracted roughly 80,000 visitations in 2018, representing a 16% increase compared to 2017 with 69,067 visitations throughout the year [2,3]. There is no doubt that this national park is one of Malaysia's most famous eco-tourism destinations.

Nevertheless, this fame has contributed to two crucial matters to the PA's management. First, undesirable changes towards the components of recreation resources of the natural area. Second, the lessening of quality on outdoor recreation users experiences due to exceeding recreational usage through visual implications of recreation resource impacts [4,5]. Recreation resources here are those compatible resources of terrestrial, aquatic, and wildlife accessible for outdoor recreation [6,7]. Meanwhile, recreation resource impacts occurred when undesirable changes such as vegetation loss and compositional changes, soil compaction, erosion, muddiness, exposure of tree roots, littering, water pollution and wildlife disturbance [8–12] due to the outdoor recreation activities. Unlike other forms of those changes, soil erosion is critical because it is not self-limiting. Vegetation also significantly indicates the type and degree associated with recreational trampling [13].

One of the responsibilities of a PA manager has always been to find ways to reduce the physical recreation impacts and adopt proven nationwide initiatives already taken by other respective agencies for efficient implementation. They are simultaneously preparing the best quality outdoor recreation opportunities for outdoor recreation users' appreciation as it is a significant component for them to understand their perceptions and experiences [14–16]. Perception refers to any outdoor recreation user's responses and information integration from an outdoor recreation setting where awareness and representation can be specified, especially in terms of needs and preference. Thus, they can function more effectively. Furthermore, outdoor recreation users commonly categorised perceptual understanding into liked or disliked patterns then later recognised their essential characteristics of recreation experience. Perceptions, sequentially, led to the judging of the outdoor recreation user's preference. These relationships between perception and experience are vital as the outdoor recreation users' preferences in outdoor recreation experience, including the chosen setting and the noticeable impacts within this experience, are strictly based on their perceptions.

An earlier study showed that visitors generally notice those recreation resource impacts and tend to be limited, particularly when equated to managers or experts [4,17]. They also rarely criticised the site's physical conditions and typically rated the resource conditions of recreation sites as 'good' or better with delighted trail conditions. Though, some trails were confirmed as severely eroded. For camping sites, the campers have valued ground cover conditions as 'satisfactory' to 'excellent' in areas where over three-fourths of the ground was bare or disturbed and labelled campsites with recreation resource impacts as pristine or even attractive. However, outdoor recreation users' most often perceived impact is litter compared to trail erosion, extension and widening, bare soil or muddiness, damage, and noise [12,18,19].

In addition, the increasing popularity of protected areas with too many visits has caused unacceptable impacts on fragile biodiversity. It may lead to social impacts, thereby reducing the experience of outdoor recreation users. In achieving acceptable levels, the anticipated state of the ecosystem must be revealed. However, a common failure was the inadequacy to define it precisely because many management programs' long-term goals and objectives are not specified [20,21]. Thus, deciding the best conditions of recreation resource naturalness and high-quality outdoor recreation users experience significantly depending on acceptable levels of changes in the settings [19]. This research emphasises outdoor recreation users' ecological and social perspectives because their thoughts regarding the acceptable conditions within PAs are essential findings for the managers. Eventually, they are required to identify the most critical conditions and their judgments on the acceptability as input to choices about standards in subsequent planning processes. Here, the term for standard referred to the collected perceptions of users and not the rigid standards that eventually appear in management plans of PAs [22].

Undoubtedly, the impacted recreation resources adversely affect the outdoor recreation user experiences and possibly conflicted with PA management to reach sustainability [23]. In maintaining the integrity to balance recreation resource protection and providing suitable enjoyment towards outdoor recreation users, managers should be open to opinions from the outdoor recreation users in prioritising...
their PA’s design, maintenance, or daily management activities. Bridging the gap between correctly observed physical conditions and the perceptions of outdoor recreation users might result in a reality check on PA managers' check and balance in achieving both mandates. Thus, a study was conducted to identify the outdoor recreation users perceptions of recreation resource impacts and explore the acceptable levels to which they noticed the impacts caused by the activities they involved in Taman Negara Pahang, Kuala Tahan.

2. Purpose of Study
The objectives of this study are 1) to identify the outdoor recreation users' perceptions toward recreation resource impacts; and 2) to analyse the outdoor recreation users' level of acceptance toward recreation resource impacts in defining their quality of experience.

3. Taman Negara Pahang, Kuala Tahan
Taman Negara Pahang National Park is the largest national park in Malaysia which borders three states, namely Pahang, Kelantan and Terengganu [24]. Gazetted in 1939 under the National Parks Enactment 1938, four entrances are open to outdoor recreation users, specifically Kuala Tahan and Sungai Relau in Pahang, Kuala Koh in Kelantan and Tanjung Mentong in Terengganu. This study focuses on TNPKT because of its location in the middle of Peninsular Malaysia (4 ° 23’U, 102 ° 24’T) and the largest area of 248,212 hectares which is 57% of the total area of Taman Negara, explicitly 430,453 hectares [25]. Significantly, the administrative centre of this national park is at TNPKT, which is also the main entrance. In addition, many complete facilities and amenities for outdoor recreation users such as accommodation, paid parking, unique footpaths, signage and rental needs for camping are available here compared to Kuala Koh and Tanjung Mentong. One of the popular activities offered here is walking on trails. In such necessity, the trail is regarded as a critical recreational facility that provides outdoor recreation users with secure access to experience the natural and picturesque surroundings while also observing wildlife.

Most of Taman Negara Pahang terrain is classified as lowland dipterocarp forest with an altitude of below 300 meters to cover an area of mountain forest with an altitude of about 1,000 meters above sea level. The highest mountain in Peninsular Malaysia is located here, Mount Tahan, with the highest peak at 2,186 meters. The oldest tropical rainforest in the world is estimated to be 130 million years old, which is also inhabited by indigenous people from the Bateq tribe, one of the ten indigenous minority subgroups in Peninsular Malaysia. Due to its uniqueness and biodiversity, the primary purpose of establishing the National Park is to conserve natural resources. These include biodiversity conservation, development of areas for research, economic improvement of local communities, appreciating aesthetic values, meeting the need for recreation, and increasing public support for the importance of biodiversity conservation [3]. Therefore, a clear understanding of outdoor recreation users' perceptions of recreation resource impacts is significantly valuable for TNPKT management in their future planning for properly providing enjoyment for outdoor recreation users while protecting the resources.

4. Methodology
The primary data source is a questionnaire-based survey conducted in TNPKT. The questions were divided into three (3) sections focusing on the essential background of outdoor recreation users, perceptions of outdoor recreation users' recreational experience, and the outdoor recreation user's determination of acceptable level on recreation resource impacts.

The questionnaire was designed using the Likert Scale with two different categories of scale: agreement and acceptance. The Likert Scale for agreement uses 1=Strongly disagree; 2=Disagree; 3=Neither agree or disagree; 4=Agree and 5=Strongly agree. Meanwhile, level of acceptance uses 1=Totally unacceptable; 2=Unacceptable; 3=Neutral; 4=Acceptable, and 5=Perfectly acceptable been used to measure different kinds of variables. In measuring the central tendency, this observation used the median (Md) for each variable in this study [26,27]. The survey will only start when the enumerator notifies each potential respondent regarding the survey through a reading statement and guarantees the
data will be analysed anonymously. The survey proceeded once it received verbal consent from the respondents to participate.

Based on previous studies, the method of exploring outdoor recreation users perceptions and experiencing recreational resources could be done whether through on-site participation or just viewing an image of the resource, which might directly affect an individual's preference for an evaluation of those resources [28,29]. The researchers proceeded with an on-site questionnaire survey since the Movement Control Order was lifted in June 2020 and the park re-opens. The on-site survey was an excellent opportunity to meet the respondents face to face (Figure 1).

**Figure 1.** Face to face on-site questionnaire survey at Bukit Teresek Trail and Canopy Walkway Trail

**Figure 2.** Taman Negara, Taman Negara Pahang Kuala Tahan and selected areas for data collection
A total of 60 respondents completed the questionnaire survey, conducted from the 4th until the 9th of September 2020. Random sampling was conducted by selecting respondents at Bukit Teresek Trail, Canopy Walkway Trail, and Lubok Simpang Trail (Figure 2). The researchers approached all respondents involved in this survey to obtain the information to ensure the validity of data collection.

5. Results and Discussion

5.1. Respondents Demographic

Table 1. Demographic profile of outdoor recreation users

| Items                        | Frequencies | Percentage |
|------------------------------|-------------|------------|
| **Age**                     |             |            |
| < 20 years old              | 1           | 2          |
| 21 to 30 years old          | 13          | 22         |
| 31 to 40 years old          | 23          | 38         |
| > 41 years old              | 23          | 38         |
| **Gender**                  |             |            |
| Male                        | 20          | 33         |
| Female                      | 40          | 67         |
| **Race**                    |             |            |
| Malay                       | 57          | 95         |
| Chinese                     | 0           | 0          |
| Indian                      | 1           | 2          |
| Others                      | 2           | 3          |
| **Frequency of visitation** |             |            |
| First time                  | 14          | 23         |
| 2 to 4 times                | 35          | 58         |
| 5 to 7 times                | 3           | 5          |
| 8 to 10 times               | 1           | 2          |
| > more than ten times       | 7           | 12         |
| **Education level**         |             |            |
| Primary school              | 0           | 0          |
| Secondary school            | 20          | 33         |
| College/Institute/Polytechnic | 3         | 5           |
| University – Undergraduate  | 26          | 44         |
| University – Postgraduate   | 11          | 18         |
| No formal education         | 0           | 0          |
| **Employment**              |             |            |
| Government sector           | 12          | 20         |
| Private sector              | 21          | 35         |
| Self-employed/Own business  | 17          | 28         |
| Student (College/University)| 0           | 9          |
| School student              | 5           | 0          |
| Pensioner                   | 4           | 7          |
| Others                      | 1           | 1 (housewife)|
| **The main purpose of visitation** | 19 | 32 |
| Education/Interpretation    |             |            |
| Research                    | 0           | 0          |
| Recreation/Leisure          | 39          | 65         |
| Others                      | 2           | 3 (holiday) |

Table 1 showed the valid survey responses of 60 respondents, 67% female and 33% male, in which the gender-biased was caused by the willingness of the respondents to be part of the survey conducted. 38% of respondents comprise '31 to 40 years old' and 'more than 41 years old', with an incredible amount of visitation among the Malay (95%). In terms of academic qualification, most of the respondents completed their undergraduate (44%) and primarily worked in the private sector (35%), which is slightly higher (about 7%) than self-employed (28%). Furthermore, frequencies of visitation to natural areas in a year disclosed about 58% for two to four times and those who are the first time (23%). With such regular visitation, most of the respondents stated their main purpose of the visit is to fulfil recreation/leisure requirements (65%), gaining knowledge through environmental interpretation (32%).
and enjoying their holidays (3%). Other than TNPKT, respondents also have been to Penang National Park, Royal Belum State Park, Kuala Selangor Nature Park, Perlis State Park, EcoCare Terengganu, Kinabalu Park, Johor National Park Tanjung Piai and Gunung Senyum Recreational Forest.

5.2. The perceptions of outdoor recreation users' recreational experience

| Impact | Variables | Median |
|--------|-----------|--------|
| **Outdoor recreation users experience** | I feel solitude here | 3 |
| | I am free to choose here | 4 |
| | I gained self-confidence here | 4 |
| | I can encounter other visitors here | 4 |
| | I feel safe here | 4 |
| | I gained quality experience here | 5 |
| | Recreational conflict occurs with a different mode of visitor's movement | 4 |
| | Recreational conflict occurs with different sizes of the group | 4 |
| | Recreation resource impact occurs beyond expectation | 4 |
| | The amount of noise from other visitors can affect the recreational experience | 4 |
| | The presence of trash and litter can affect the recreational experience | 4 |
| | The presence of human waste can affect the recreational experience | 4 |
| | Illegal poachers' camps are visible can affect the recreational experience | 4 |

| Impact | Variables | Median |
|--------|-----------|--------|
| **Outdoor recreation users behaviour** | Visitors trampled on vegetation | 2 |
| | Tracking birds to their natural habitat | 2 |
| | Use flashlight/torchlight directly against wildlife during a night walk | 2 |
| | Contribute to trail widening when seeking a way to circumvent muddy or badly eroded sections | 2 |
| | Raking at the campsite, not for safety purposes | 2 |
| | Vandalism towards recreation resources and infrastructures | 1 |
| | Graffiti towards recreation resources and infrastructures | 1 |
| | The displacement of rocks or other unique elements | 1 |
| | Purchased goods made from threatened natural resources | 1 |
| | Foreign plants and wildlife were brought into the National Park | 1 |

| Impact | Variables | Median |
|--------|-----------|--------|
| **Accessibility and Facilities** | Infrastructure facilities are available here | 4 |
| | Clean water supplies are available here | 4 |
| | Medical facilities are available here | 4 |
| | Accessibility in case of emergency is available here | 4 |

Outdoor recreation users were asked to give truthful judgement on their perceptions of recreational experience while visiting TNPKT (Table 2). A total of 27 statements has been recognised comprises 13 statements for outdoor recreation users' experiences, ten statements for outdoor recreation users behaviour, and four representing the respondents' perception of the accessibility and facilities provided at the park. Results on the outdoor recreation users' experiences have indicated that the respondent 'Strongly Agree' that they gained quality recreational experiences by enjoying the natural environment while participating in all the activities provided with a professional nature guide. It is proven that those outdoor recreation users usually sought the natural environment with some aspects of adventure and limited accessibility in fulfilling their needs and satisfaction [30]. This result also reflected the primary purpose visitation of respondents to TNPKT, which was for recreation or to pursue leisure (Table 1). Next, firmly agreement of feeling free to make choices because respondents are not restricted to participating in any of the activities offered. Even adjustments can be made as long as it is suitable for them. The respondent's self-confidence also increased, and not facing any problems if encountering other outdoor recreation users while feeling safe with the surroundings providing not beyond the law.
Furthermore, they are becoming more tolerant of any recreational conflicts, such as those arising from a different mode of visitor movement or different group sizes. The result significantly contradicts from previous studies, highlighting that litter was the most perceived impact among the outdoor recreation users’ [12, 18, 19]. In many studies, solitude is one of the valuable variables for the PA managers but is frequently not regarded as critical in ensuring recreational experiences. Solitude was understood for its originality and freedom types of recreation, where to the extend represented the meaning of being alone with no disturbances from others [5, 31]. Unfortunately, the respondents stated feeling solitude as 'Neutral', and the selection of trails could contribute to the result because it was relatively high use areas with heavy traffic of outdoor recreation users after TNPKT re-opened.

The inspirations of quality recreational experiences can trigger human behavioural responses by perceiving the natural setting surrounding them [29]. Incredibly, all the ten statements outline by the researcher are stated at the disagreement scale. The division of result represented 'Strongly Disagree' with the following statement: vandalism and graffiti activities towards the recreation resources and infrastructure, collecting natural ingredients as souvenirs, displacement of rocks or other unique elements, and purchasing any goods made from threatened natural resources and brought in unintentionally foreign flora and fauna into TNPKT. The respondents understood that all of the behaviours listed above could become the triggering factors for environmental degradation. Once it happens, it could disturb the management effort in achieving sustainability [32-34]. While trampled on vegetation, tracking birds to its natural habitat, using flashlights directly against wildlife during the night walk, circumventing muddy and eroded areas contributed to widening trails and racking at the campsite but not for safety purposes are those 'Disagree' statements from the respondents.

The last heading was the respondents’ perspective towards their experiences while using the accessibility and facilities provided at the park. The rest four statements asked, such as the availability of infrastructure facilities, clean water supply, medical facilities and apparent accessibility in case an emergency happens, were received straight 'Agree' from the outdoor recreation users. The result compliment TNPKT as the main entrance to the national park and was provided by complete facilities and amenities for outdoor recreation users such as accommodation, gated parking areas, comfortable footpaths, signage, and rental needs for camping are available here compared to the other two entrances (Figure 3). Besides, one of the vital requirements for outdoor recreation users is to get a permit to enter the national park and hire a nature guide while engaging with any favourable activities offered. If an emergency happens, the Kuala Tahan Health Clinic could play a role as the first responder, and it is located just across the river.

Figure 3. Examples of accommodation, footpaths and signage in TNPKT
The variables to analyse the level of acceptance towards impacts on recreation resources based on outdoor recreation users' perspectives were divided into four: soil (nine variables), vegetation (ten variables), wildlife and water (four variables), respectively, as indicated above (Table 3). The variables were developed from prominent assessment of recreation resource impacts [35–38].

The table shows the respondents 'Totally Unaccepted' if any disturbance or quality changes happen to the wildlife and water resources in TNPKT. These resources portray an essential connection with outdoor recreation users as recreational resources and enhance the quality of their experience [39]. The results included harvested wildlife for hunting and fishing, whereas for notification, whoever wanted to fish inside the national park must get permitted by DWNP. Increasing concern of respondents on the dependency of wildlife on visitors as a food source because these attitudes could change the behavioural of the wildlife. Next, modification or loss of wildlife habitat was due to the activities carried out by the outdoor recreation users, such as walking in the forest, camping, and off-road vehicle use [40]. However, it could also be initiated by surrounding activities of development and plantation. Water resources are indeed one of the significant elements of attraction for outdoor recreation users. The well-known Sungai Tembeling is the main river passing through the park, transporting the local community and visitors from one area to another (Figure 4). Impacts on water resources were likely due to swimming to kayaking activities or concentrated in a campsite area because of the distance to water bodies, water consumption for washing dishes and additional nitrogen or phosphorus, and lastly, the possibility of black water discharges [41].
Among the ten variables for impact on vegetation, four of them has been stated by the respondent as 'Totally Unaccepted', which are loss of groundcovers, shrubs and mature trees, damages to vegetation (breaking, tearing and crushing), loss of unique and endangered species, and due to mechanical damage of mature trees (cutting of tree trunks, cutting the tree's bark to lighten the bonfire and making the tree fall like a log fire). Hence, still 'Unacceptable' for variables such as root exposure, percentage of canopy coverage decline, the presence of tree stumps, fallen trees and spindly trees, and decreases in vegetation density and composition (Figure 5). These outcomes are contradicted by the previous findings where the respondents hardly criticised the ecological conditions of the environment and stereotypically rated it as acceptable even some of the resource conditions were severely impacted [12,18,19].

In terms of soil, the level of acceptance recorded the lowest for 'Unacceptable' included the trail is muddy, gully and slippery, soil erosion, soil drainage decline, loss of organic layer, exposure of mineral soil and lastly, short soil profile (Figure 6). Interestingly, three interconnected variables were rated 'Neutral' represented as trail width increase, trail depth increase and soil compaction. The outdoor recreation users might not realise the contributor to the disturbance along the nature trail they created when they excessively used it. However, the determination level of acceptance commonly faces the shortcoming of defining it because many variables will be considered. The result clearly shows that the outdoor recreation users are very concerned about how they behave while participating in their favourite activities. They gained meaningful hence quality kinds of experiences. Notably, the respondents were 'Totally Unaccepted' with any damages related to the national park precious resources and willing to ensure it could be sustained for future generations.
6. Conclusion
In conclusion, this study describes the understanding of outdoor recreation users perceived and their level of acceptance towards recreation resource impacts in the natural environment. The availability offered here has been directed to recreation resources impacts in compacted and erosion of soil, root exposure and damages to vegetation, and wildlife hunting and contaminated water sources. Hence, outdoor recreation users are more sensitive in recognising it. While not delaying the particular unacceptable state, the choices and other qualities significantly regularly accompanying with experiences in PA could assist the managers in making decisions on the most acceptable approach for alleviation. Based on the findings, undoubtedly, all the unpleasant attitudes contributed to severely recreation resource impacts, as stated in the questionnaire, accumulated the most at the scale of disagreement. However, the outdoor recreation users' standards of acceptable conditions within the natural environment vary considerably but, in many cases, are not as obstructive as expected. As long as their experiences are sustained at a high level and contributed back to society's absolute satisfaction, there is developing a public appreciation in supporting the conservation of recreation resources.

TNPKT is known as one of the renowned destinations for outdoor recreation users. Optimistically, the management could intensively counter the resource and social impacts based on this study. It is ideal for merging the social considerations with a scientific understanding of the ecological aspects to establish an acceptable level. Further studies such as this are essential in maintaining quality standards to ensure the sustainability of the natural environment in accommodating visitation to meet the user's expectations. This achievement will reflex their memories and experience while enhancing the natural resource protection at Taman Negara Pahang, Kuala Tahan.

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References
[1] Deng J, Qiang S, Walker G J and Zhang Y 2003 Assessment on and Perception of Visitors' Environmental Impacts of Nature Tourism: A Case Study of Zhangjiajie National Forest Park, China. Journal of Sustainable Tourism 11:529–48.
[2] PERHILITAN 2017 Laporan Tahunan PERHILITAN Annual Report.
[3] PERHILITAN 2018 Laporan Tahunan PERHILITAN Annual Report.
[4] van Riper C J, Manning R E and Reigner N 2011 Perceived Impacts of Outdoor Recreation on the Summit of Cascade Mountain, New York. Adirondack Journal of Environmental Studies 16.
[5] Manning R E 2012 Frameworks for Defining and Managing the Wilderness Experience. *USDA Forest Service Proceedings* 158–76.

[6] Sieh L G 2008 The Policy Path to the Great Outdoors: A History of the Outdoor Recreation Review Commissions.

[7] Dudley N 2008 Guidelines for Applying Protected Area Management Categories. *IUCN Vol.* 46.

[8] Tyser R W and Worley C A 1992 Alien Flora in Grasslands Adjacent to Road and Trail Corridors in Glacier National Park, Montana (U.S.A). *Conservation Biology* 6.

[9] Leung Y-F and Marion J L 1996 Trail Degradation as Influenced by Environment Factors: A State-of-the-Knowledge Review. *Journal of Soil and Water Conservation* 51:130–6.

[10] Hammitt W E and Cole D N 1998 Wildland Recreation: Ecology and Management. Wiley-Interscience (605 Third Avenue, New York NY, USA) ISBN 0-471-87291-1, 1987, ix + 341 pp (photographs, index) $37.50 (cloth). Ann Tour Res 15:290.

[11] Marion J L 2006 Guidance for Managing Informal Trails 12.

[12] Moore R L, Leung Y-F, Matisoff C, Dorwart C E and Parker A 2012 Understanding Users' Perceptions of Trail Resource Impacts and How They Affect Experiences: An Integrated Approach. *Landscape and Urban Planning* 107:343–50.

[13] Atik M, Sayan S, Karagüzel O and Emrah Y 2011 Trail Impact Management Related to Vegetation Response in Termessos National Park, in Turkish Mediterranean. *Perspectives on Nature Conservation – Patterns, Pressures and Prospects*.

[14] Dorwart C E, Leung Y-F and Moore R 2004 Managing Visitors' Perceptions. *National Recreation and Park Association* 24–31.

[15] Dorwart C E, Moore R L and Leung Y-F 2007 Visitor Employed Photography: It's potential and Use in Evaluating Visitors' Perceptions of Resource Impacts in Trail and Park Settings. *Proceedings of the 2006 Northeastern Recreation Research Symposium* 9–11.

[16] von Ruschkowski E, Burns R, Amberger A, Smaldone D and Meybin J 2013 Recreation Management in Parks and Protected Areas: A Comparative Study of Resource Managers Perceptions in Austria, Germany, and the United States. *Journal of Park and Recreation Administration* 31.

[17] Verlič A, Amberger A, Japelić A, Simončič P and Pirnat J 2015 Perceptions of Recreational Trail Impacts on an Urban Forest Walk: A Controlled Field Experiment. *Urban Forestry and Urban Greening* 14:89–98.

[18] Lynn N A and Brown R D 2003 The Effect of Recreational Use Impacts on Hiking Experiences in Natural Areas. *Landscape and Urban Planning* 64:77–87.

[19] Roggenbuck J W, Williams D R and Watson a. E 1993 Defining Acceptable Conditions in Wilderness. *Environmental Management* 17:187–97.

[20] Wimpey J and Marion J L 2011 Formal and Informal Trail Monitoring Protocols and Baseline Conditions: Great Falls Park and Potomac Gorge. *USDI, U.S. Geological Survey*.

[21] Smyth R L, Watzin M C and Manning R E 2007 Defining Acceptable Levels for Ecological Indicators: An Approach for Considering Social Values. *Environmental Management* 39:301–15.

[22] Moore S A and Polley A 2007 Defining Indicators and Standards for Tourism Impacts in Protected Areas: Cape Range National Park, Australia. *Environmental Management* 39:291–300.

[23] Bookhari S N, Abdullah S A and Hussein M K 2020 Recreation Resource Impacts of Pantai Kerachut Trail in Penang National Park. *IOP Conf. Series: Earth and Environmental Science* 501 012018 501:1–10.

[24] Isa S S and Aziz A 2014 Preliminary Study on the Role of Creativity in Outdoor Recreation Activities towards Enhancing Visitors' Experience in Malaysia. *International Journal of Social Science and Humanity* 4:508–12.

[25] PERHILITAN 2011 Laporan Tahunan PERHILITAN Annual Report.

[26] Garland R 1991 The Mid-Point on a Rating Scale: Is It Desirable. *Marketing Bulletin* 2:66–70.

[27] Sullivan G M and Artino A R 2013 Analysing and Interpreting Data From Likert-Type Scales.
Journal of Graduate Medical Education 5:541–2.

[28] Fyhri A, Jacobsen J K S and Tommervik H 2009 Tourists' Landscape Perceptions and Preferences in a Scandinavian Coastal Region. Landscape and Urban Planning 91:202–11.

[29] Leung Y-F, Smith J W, Seekamp E, Conlon K, Mayer J, Guo T, et al. 2016 The Effects of 2D and 3D Imagery and An Educational Message on Perceptions of Trail Impacts. Natural Areas Journal 36:88–92.

[30] Pettebone D, Newman P and Theobald D 2009 A Comparison of Sampling Designs for Monitoring Recreational Trail Impacts in Rocky Mountain National Park. Environmental Management 43:523–32.

[31] Cole D N 2012 Wilderness Visitor Experiences: A Selective Review of 50 Years of Research. Park Science 28:66–70.

[32] Marion J L and Leung Y-F 2011 Indicators and Protocols for Monitoring Impacts of Formal and Informal Trails in Protected Areas. Journal of Tourism and Leisure Studies 17:215–36.

[33] Eker Ö 2008 Recreational Carrying Capacity of Belgrad Forest: A Case Study. KSU Journal of Science and Engineering 11:77–80.

[34] Passold A J, Magro T C and Couto H T Z 2004 Comparing Indicators Effectiveness for Monitoring Visitor Impact in Intervales State Park, Brazil: Park Ranger-Measured Versus Specialist-Measured Experience. Conference on Monitoring 52–7.

[35] Stankey G H, Cole D N, Lucas R C, Petersen M E and Frissell S S 1985 The Limits of Acceptable Change (LAC) System for Wilderness Planning. U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station.

[36] Mohamed J, Yasin Z, Abdullah A L and Hwai A T S 2010 Limits of Acceptable Change as Alternative Approach for Managing Small Marine Protected Area: A Case Study on Pulau Payar Marine Park. Proceedings of the 7th IMT-GT UNINET and The 3rd International PSU-UNS Conferences on Bioscience p. 204–6.

[37] Manning R E 2001 Visitor Experience and Resource Protection: A Framework for Managing Carrying Capacity of National Parks. Journal of Park and Recreation Administration 93–108.

[38] Bhat I N and Nabi F 2016 Visitor impact assessment and management of Gulmarg tourist area. Asian Journal of Environmental Science 11:72–7.

[39] Nuruddin 2013 Nature Tourism Planning Using River-Based Resources and Recreational Assessment for Sungai Dinding, Perak, Malaysia. Journal of Social Sciences 9:127–35.

[40] Marzano M and Dandy N 2012 Recreationist Behaviour in Forests and the Disturbance of Wildlife. Biodiversity and Conservation 21:2967–86.

[41] Barros A, Pickering C and Gudes O 2015 Desktop Analysis of Potential Impacts of Visitor Use: A Case Study for the Highest Park in the Southern Hemisphere. Journal of Environmental Management 150:179–95.