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## **THE IMPACT OF TOURISM ACTIVITIES ON THE ENVIRONMENT OF MOUNT KINABALU, UNESCO WORLD HERITAGE SITE**

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### **Abstract**

Tourism contributes to the conservation and protection of mountainous areas, and even the characteristics and activities of tourism also affect the environmental sustainability of an area. This study aims to identify tourist characteristics, their opinion towards a sustainable environment, their activities conducted at the park and environmental impacts. Overall, 383 respondents agreed to participate, and the response has been analysed using the relative importance's of these activities, and environmental impacts were quantified by the relative importance index method. Most of them visited Mount Kinabalu to experience natural sightseeing and hiking activity. Majority of them know environmental concern but feeling that KNP is rather crowded. Overall, the most popular activities were mount climbing and wildlife sightseeing by domestic and international tourist. The result of the study also has shown that noise and air pollution were ranked as the most important environmental impacts factors. Considering mountain tourism is an attraction and contributor to the economy of Sabah, there must be effective preventive measures. Because of that, planning, implementing and strengthening new policies and rules for tourist activities regarding the conservation and protection will help to minimize the impacts of tourism. Through the results of the study using the Relative Importance Index (RII) analysis, it is hoped that it will be able to help provide suggestions and solutions to balance the impacts of tourism in Mount Kinabalu towards sustainability.

**Keyword:** Tourist activities, environmental impacts, Kinabalu Park, Relative Importance Index Method

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## **INTRODUCTION**

Mountain tourism has been considered as a best program for sustainable development as it can play an important role to both conservation and development of natural resources (Binns & Nel, 2002; Torres-Delgado & Palomeque, 2012). Tourism can substantially support environmental conservation, protection and sustainable use of natural resources and restoration of biological diversity. Because of their elegance, beautiful sites and natural regions are determined as valuable and the necessity to keep the attraction alive can lead to development of wildlife parks and national parks (Gómez & Gómez, 2017; Martínez et al., 2018). Mountain tourism or national park is categorised as part of rural attraction (Ladki, 1993). Strasdas, (2005) identifies mountain tourism as pure, original and natural monuments in a healthy climate. He associates this concept with many forms of tourism such as trekking, expedition, climbing, cultural and rural tourism, health tourism and classical ecotourism (Jaafar et al., 2019). With the existing cultural and natural environmental settings, mountain tourism can provide a marvellous experience for visitors (Nepal, 2002). Malaysia has great potential for nature tourism and ecotourism (Backhaus, 2005). Its tropical rainforests are among the oldest and the most diverse ecosystems in the world (Khalifah & Tahir, 1997). The development of tourism industry has been a major focus in Malaysia since the 1990s. The Seventh Malaysian Plan (1995–2000) is designed to boost the tourism industry by popularizing natural attractions (Sadi & Bartels, 1997) while in the Eighth Malaysia Plan (2001–2005), the government has started to focus on nature-based tourism (Pimid et al., 2020; Latip et al., 2013) or ecotourism (Karim et al., 2020; Latip et al., 2018a). The crucial importance of biodiversity and environmental sensitivity of mountain regions (Lama & Sattar, 2002) calls for a research on the effect of tourism on the ecosystems. Although, tourism provides substantial economic and monetary benefits to a country, but it also generates adverse outcomes for the environment and the host area (Hall, 2016). Due to tremendous increase in the number of tourists, exposed areas are impacted quickly, and many adverse effects can be seen emerging as a result (Butler, 2018). Tourism will affect physical environment such as air, water and soil as well as social and cultural fabrics (Buckley, 2012). [16]. Besides that, according to UNEP (2002), tourism also can cause the same forms of pollution as any other industry such as solid waste and littering, noise, release of sewage, water, air emissions and even visual pollution. Thus Roxas et al., (2018) call for a need to look into issues on environmental conservation and damages.

## **RESEARCH BACKGROUND**

### ***Mountain Biodiversity***

Mountain normally consist of biodiversity attraction which provides a significant and positive correlation with inbound visitor receipts (Freitag & Vietze, 2013).

However, to ensure a balance between environment protection or conservation and tourism is a complex issue (Sunlu, 2003). Many mountain areas in the world have claimed ecotourism projects lead to environmental degradation. On the other hand, from mountain ecotourism perspective, researchers do believe that mountains ecotourism promote responsible tourist activities and behaviour (Agyeiwaah et al., 2017; Adenekan., 2017). Some of the important environmental impacts in many mountainous areas contain of noise pollution, overcrowding, garbage pollution, pack stock grazing, extraction of valuable resources, fire hazards, sewage outflow and introduction of non-native species (Nepal, 2002). Therefore, tourism activities should be the main concern to keep the sustainability of mountains. But it is not easy to achieve the certain standard for mountain sustainability (Nepal, 2002). In addition, tourism activities and their impact on environment are an obscure concept (Merwe and Wöcke, 2007). Thus, research on identification on type of tourism activities and its impact is very essential. Ecotourism in a mountain area requires cautious management and control of tourists' activities to avoid negative effects on the natural environment, socio-cultural setting and visitors' pleasure (Tay et al., 2016). In order to achieve sustainable ecotourism destinations, it needs a wide research on criteria, activities and factors to conservation and protection of mountain area (Nepal, 2002). Otherwise, the destination cannot afford to lose number of visitors as the result will greatly impact the socioeconomic of local population.

### ***Study Area***

The World Heritage Site of Kinabalu Park is a centrepiece and oldest site of Malaysia that identified as a biodiversity hotspot with the highest mountain in Southeast Asia (Backhaus, 2005). It is well-known internationally and domestically for its various flora and viability for climbing. Since Kinabalu Park opened to visitors on 1964 till now, the numbers of visitors at Kinabalu Park are increasing year by year because of the tourism activities provided and the attraction of the park itself. In 2010, the number of visitors at Kinabalu Park is 614, 648 increase to 714, 164 or 16.2% in 2014 (The Sabah Parks, 2016). In terms of number of climbers to Mount Kinabalu, there is an increment of 22.7% from 47, 607 in 2010 to 58, 428 in 2014 before declining to 33,414 in 2015. The declining number of climbers is associate to earthquake happened on 5 June 2015 where 137 climbers were stranded on the mountain. However, the number is gradually increase. In future, the Kinabalu Park will be facing issues on the need to sustain the well-being of the environment. As of now, there is no limit in terms of number of visitors visiting the park and they can enter the park and enjoy the activities provided. The management will only limit the number of climbers and requirement for overnight stay in the Kinabalu Park will be determined by number of accommodations available. Based on the given justifications, this paper is conducted to assess the tourism activities and its impact on Kinabalu

Park. The detail research objectives are to identify: 1. Characteristics of visitors and their environment concern level; 2. Activities conducted at Kinabalu park and 3. The environmental impact factors derived from the visitations or activities. The result is hope to provide some information on the tourist characteristics and impact of tourism activities for the future mountain ecosystem

### ***Quality Check***

The aspect of ecotourism impact and preservation are constantly intricate and contested (Nelson, 2010). Tourism plays an important role in conservation by offering financial and political support for public protected area agencies and for protection of mountain. According to (Lama & Sattar, 2002), mountain ecotourism is an essential aspect in sustainable mountain development and protection and controlling and managing tourist's behaviour and activities can support to preserve the mountain region. Several outdoor tourism activities include thousands of participants, but fewer facilities and associated expenditure (Buckley, 2011). There is significant overlap both in personal motivations and in the financial requirement for attending ecotourism programs, which usually contain nature-based, adventurous, and cultural features (Stronza & Durham, 2008). Watching wildlife can be exciting as well as educational and a lot of adventure activities take place in magnificent areas. Many various activities are provided as adventure tourism programs (Buckley, 2010). Non-consumptive nature-based tourism consists of all activities based on watching plants or animals or enjoying landscapes (Newsome et al., 2002). Across the globe, these activities rely on national parks and wilderness areas (Hendee & Dawson, 2005; Cater & Cater, 2007). These are visited by independent travellers, local residents, and commercial tour clients (Buckley, 2011). On the other hand, there are several recorded instances where even powerless or single disruptions have generated major and environmentally essential effects on breeding birds (Buckley, 2010). A similar variety of effects arise for plant species. Trampling is the most seriously examined effect (Liddle, 1997; Cole 1995). However, also for trampling, most evaluations between vegetation types have been made experimentally in a single episode. This contains evaluations between several trampling agents, such as horses, hikers, or mountain bikes (Hill & Pickering, 2009). Besides being repositories of high concentrations of endemic species and essential reservoirs of genetic diversity, mountain areas also purpose as crucial corridors for migrating animals and as sanctuaries for plants and animals whose natural habitat have been compressed or improved by human and natural activities. In overall, the major impacts of tourism activities in mountain areas included:

- Damage to vegetation, flora and plants both on a large scale (i.e., for hotel construction, land clearance, roads, etc.) or small scale (i.e., trampling, collection of plants and damage to sensitive plants by uncontrolled tourists), even by good-humoured "eco-tourists" studying plant-life or watching for wildlife.

- Interference to wildlife and decrease of wildlife habitat region: Mountain tourism and tourism infrastructure are going more into remote and isolated high-altitude region.

- Accretion occurrence of grassland and forest fires from tourist activities: A thrown cigarette butt is all it takes. With raised numbers of tourists, unusual to high forest fires, fire dangers are a serious and real effect of tourism in mountain areas.

- Inadequate and improper human waste management and garbage: Tourism makes an excessive volume level of waste and garbage which mountain communities are unsuspecting to development. High temperatures prevent the natural biodegradable of human wastes at base camps. Wrongly sited toilets pollute mountain areas, channels and influencing water resources downstream. Tourist activities have the potential to produce useful effects on the environment by focusing on environmental conservation and protection (Postma & Schmuecker, 2017; Porto et al., 2018). The harmful impacts of tourism development continuously damage all-natural sources on which it depends (Sunlu, 2003). Unproper management of traditional tourism generates possible risks for the whole ecosystem where it can put enormous danger on an area and cause problems such as water pollution, damage local resources, air and noise pollution, land degradation, solid waste and littering, sewage and aesthetic pollution (Sunlu, 2003).

## **RESEARCH METHODOLOGY**

The study data comprises of a mix of literature review, existing research reports and a questionnaire survey. The literature review and a questionnaire survey were adopted to prioritize the tourist activities and environmental impacts factors in the Kinabalu Park. Fellows & Liu, (1997) stated quantitative methods strive to collect and analyse data. Data collection was executed in quantitative techniques and the questionnaires were well prepared and displayed. The research location for this study is at Kinabalu Park, Sabah. 400 questionnaires were distributed and 383 were returns with 95.8% response rate. The research questionnaire was divided into three sections. Section 1 reviewed the respondents' background, experience and their environment behaviour; section 2 assessed legal and illegal tourist activities; and section 3 assessed environmental impacts criteria. The respondents ranked activities on a scale with the rating of '1' representing very little effect; '2' little effect; '3' medium effect; '4' high effect; and '5' very high effect according to the degree of importance on activities and environmental impact in Kinabalu Park. The questionnaire was reliable and added credibility to the remaining study. The gathered data were examined through descriptive and the relative importance indices (RII) method.

## DATA ANALYSIS

The background of the respondents developed on necessary section for the beginning of the data analysis. There were more male visitors to the park compared to female visitors of 9.0% with majority of them in the range of age of 18-34 years old. Kinabalu Park is attracting to local visitors with 72.8% of them were Malaysian. In terms of level of education, 30.8% having second level of education while 50.9% were still studying in institute of higher education. They were mostly a working adult and students with high visiting intention were to enjoy the sightseeing, trekking and mount climbing. Having a day trip is popular compared to having a night stay in Kinabalu Park.

**Table 1:** Characteristics of visitors

|                             | Item   | N = 383 | (%)  |
|-----------------------------|--|---------|------|
| <b>Gender</b>               | Male   | 209     | 54.6 |
|                             | Female                                       | 174     | 45.4 |
| <b>Age</b>                  | 18-24  | 140     | 36.6 |
|                             | 25-34  | 130     | 33.9 |
|                             | 35-44  | 71      | 18.5 |
|                             | 45-54  | 31      | 8.1  |
|                             | 55-64  | 11      | 2.9  |
| <b>Origin</b>               | Sabahan                                      | 133     | 34.7 |
|                             | Non Sabahan<br>(Malaysian)                   | 146     | 38.1 |
|                             | International                                | 104     | 27.2 |
| <b>Education</b>            | High school                                  | 57      | 14.9 |
|                             | Vocational school                            | 13      | 3.4  |
|                             | Undergraduate                                | 195     | 50.9 |
|                             | Graduate                                     | 118     | 30.8 |
| <b>Occupation</b>           | Management/adminis-<br>tration               | 131     | 34.2 |
|                             | Students                                     | 107     | 28.0 |
|                             | Self-Employ/business                         | 31      | 8.1  |
|                             | Others such as<br>farmers, educators<br>etc. | 114     | 29.7 |
| <b>Purpose of<br/>visit</b> | Sightseeing                                  | 148     | 38.6 |
|                             | Trekking                                     | 114     | 29.8 |

|                       |                |     |      |
|-----------------------|----------------|-----|------|
|                       | Mount climbing | 86  | 22.5 |
|                       | Others         | 35  | 9.1  |
| <b>Length of stay</b> | Daytrip        | 225 | 58.7 |
|                       | Overnight      | 158 | 41.3 |

The tourist level of concern on environment has been detailed out in table 2. It is interesting to explore on the tourist concern on the environment since their visit was to experience the mountain environment. Out of 383 respondents, 345 of the respondents stated that environmental protection and biodiversity conservation are very important while the remaining (38 respondents) stated it is less important. All the respondents agreed that the establishment of protection for natural areas does help in the environment protection and biodiversity conservation and majority of the respondents that is 343 or 89.6% of them stated that the conservation work done in Kinabalu Park was handled well. In relation to this, 299 or 78.1% of the respondents agreed that Kinabalu Park is environmentally sustainable while 84 or 21.9% of them disagree. Based on the respondent's opinions, 252 or 65.8% perceived that there were too many visitors in Kinabalu Park. Majority of them (275 or 71.8%) pointed that visitors' activities at Kinabalu Park did not cause environmental impacts.

**Table 2:** Tourist level of environmental concern

| Item  | N =383             | Percentage (%) |
|---|--------------------|----------------|
| Environmental value orientation of Kinabalu Park        | Very important     | 345<br>90.1    |
|   | Less important     | 38<br>9.9      |
|   |                    |                |
| Establishment of protection & biodiversity conservation | Helpful            | 199<br>52%     |
|   | Moderately helpful | 184<br>48%     |
| Level of conservation work done                         | Well handed        | 343<br>89.6    |
|   | Not well handed    | 40<br>10.4     |

|  |             |     |      |
|--|-------------|-----|------|
| Is Kinabalu Park is environmentally sustainable? | Yes         | 299 | 78.1 |
|  | No          | 84  | 21.9 |
| Number of visitors                               | Crowded     | 252 | 65.8 |
|  | Not crowded | 131 | 34.2 |
| Visitors activity create impact to environment   | Yes         | 108 | 28.2 |
|  | No          | 275 | 71.8 |

For a long time, researchers have searched for efficient methods to assess the importance of predictors included in a regression analysis. Current methods, such as relative weights and general dominance weights, have demonstrated fantastic promise for leading assessments of predictor importance. However, questions remain on concerning how one should analyze relative importance in the existence of a multidimensional criterion variable. RII or weight is a type of relative importance analyses. RII was applied for the analysis because it ideal fits the goal to prioritize the tourist activities and environmental impacts in the Kinabalu Park. According to J.W. & LeBreton, (2004), RII assists in getting the contribution a specific variable makes to the prediction of a criterion variable both by itself and in combination with other predictor variables. The RII will be computed as final specified outcomes. These variables will be categorized and ranked based on their RII survey where the formula below was used:

$$RII = \frac{\sum W}{A * N}$$

In this, RII = relative importance index; W = weighting given to each factor by respondents; A = highest weight; and N = total number of respondents. The RII value had a span of 0 to 1 (0 not inclusive); the bigger the RII, the more essential was the cause of activities and environmental impacts. The RIIs were rated, and the outcomes are presented in Table 3 and Table 4. Based on the results, the RIIs and the ranking of all activities that provides impact to environment and environmental impact factors are shown in Table 3 and Table 4 respectively. The RII and ranks of the six factors that are classified under the 'Legal activities factors' are shown in Table 2. Legal tourist's activities factors consist of mount climbing (RII = 0.92), followed by activities at the summit (RII = 0.79), bird watching (RII = 0.67) and sightseeing (RII = 0.49). Illegal tourist's activities consist of smoking (RII = 0.92), followed by littering around the park (RII = 0.80), plucking the plants (RII = 0.52) and disturb the animal (RII = 0.33).



**Table 3:** RII and Ranking of Legal and Illegal Activities

| <b>Legal Activities</b>                                     | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> | <b>W</b> | <b>RII</b> | <b>Rank</b> |
|---|----------|----------|----------|----------|----------|----------|------------|-------------|
| Mount climbing  | 1        | 5        | 14       | 94       | 269      | 1774     | 0.92       | 1           |
| Activities at the summit (via ferrata, mountaineering, etc) | 15       | 27       | 23       | 198      | 120      | 1530     | 0.79       | 2           |
| Bird watching   | 24       | 35       | 130      | 158      | 36       | 1296     | 0.67       | 3           |
| Sightseeing   | 48       | 128      | 187      | 14       | 6        | 951      | 0.49       | 4           |
| Nature education  | 237      | 89       | 32       | 22       | 3        | 614      | 0.32       | 5           |
| Photography   | 338      | 8        | 18       | 15       | 4        | 488      | 0.25       | 6           |
| <b>Illegal Activities</b>                                   |          |          |          |          |          |          |            |             |
| Smoking   | 3        | 3        | 12       | 99       | 266      | 1771     | 0.92       | 1           |
| Littering around the park                                   | 8        | 34       | 25       | 191      | 125      | 1540     | 0.80       | 2           |
| Plucking the plants   | 41       | 123      | 179      | 26       | 14       | 998      | 0.52       | 3           |
| Disturb the animal  | 228      | 87       | 43       | 19       | 6        | 637      | 0.33       | 4           |

Scale: 1 = most impact, 2 = impact, 3 = moderate, 4 = not very impact, 5 = less impact, 6 = lesser impact.

The RII of the twelve environmental impact factors are shown in Table 3. Noise pollution (RII = 0.71) ranked the first significantly factor in environmental impact. This was followed by Air pollution (RII = 0.66), tree root is exposed (RII = 0.6) and soil erosion (RII = 0.59).

**Table 4:** RII and Ranking of Environmental Impact Factors

| <b>Environmental Impacts</b>             | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> | <b>W</b> | <b>RII</b> | <b>Rank</b> |
|--|----------|----------|----------|----------|----------|----------|------------|-------------|
| Noise pollution (vehicles, visitors)     | 47       | 44       | 45       | 137      | 110      | 1368     | 0.71       | 1           |
| Air pollution (vehicles, smoke)          | 6        | 143      | 114      | 30       | 78       | 1144     | 0.6        | 2           |
| Tree root are exposed                    | 4        | 167      | 112      | 41       | 59       | 1133     | 0.59       | 3           |
| Soil erosion                             | 11       | 131      | 149      | 28       | 52       | 1092     | 0.57       | 4           |
| Damaged tree or plants                   | 8        | 184      | 85       | 42       | 56       | 1079     | 0.56       | 5           |
| Garbage accumulation                     | 63       | 161      | 109      | 28       | 22       | 934      | 0.48       | 6           |
| Bad smell (garbage, toilet and drainage) | 8        | 176      | 82       | 34       | 78       | 852      | 0.45       | 7           |
| Bare ground                              | 67       | 175      | 90       | 34       | 5        | 848      | 0.44       | 8           |
| Presence of non-native plant             | 102      | 153      | 81       | 27       | 6        | 789      | 0.41       | 9           |
| Waste in the drainage                    | 98       | 165      | 74       | 23       | 8        | 782      | 0.4        | 10          |
| Cleanliness of water                     | 120      | 153      | 56       | 28       | 11       | 761      | 0.39       | 11          |
| Water turbidity                          | 151      | 134      | 62       | 18       | 8        | 717      | 0.37       | 12          |

## DISCUSSION AND RECOMENDATION

It has been generally accepted that tourism able to provide positive impacts to rural areas includes mountain region development. However, many organizations and scholars also raise their concern on the environment depredation arise from tourism activities. Mountain tourism has been associated with many types of tourism and is a popular tourist destination Worldwide, the increase popularity of Kinabalu Park brought issues related to park sustainability. In ensuring the place attractiveness, research needs to be conducted in measuring the impact of current activities on the park environment. This paper highlights the findings on survey

done on tourist perception on their travel characteristics, environmental concern and impact of activities to environment and environment impact happened at Kinabalu Park. Overall, Kinabalu Park is very attracting destinations to the local people and the number of visitors is increasing significantly. Most of them were in their young or middle age, consist of career people and tertiary level of education students and they involve in activities such as sightseeing and tracking. So, they were educated people and have good concern on environment sustainability. They perceived that Kinabalu Park was under good management however they feel that KP is quite crowded and these activities will bring impact to the environment.

This study has recognized and, based on the quantified RII, identified the influence ranks of tourist activities causing conservation and protection of mountain in Kinabalu Park. In addition, the environmental impacts factors were recognized and based on the RII, identified the most important factors of environmental impacts in Kinabalu Park. The paper quantified the relative importance of tourist activities and environmental impacts and demonstrated the ranking of the activity's environmental impacts according to their importance level for conservation and protection of mountain in Kinabalu Park. The paper revealed the most significant legal and illegal activities causes of conservation and protection. In addition, the research showed the most significant environmental impacts factors in Kinabalu Park.

Based on the result, smoking and littering are the important illegal activities and noise and air pollution, damage planet and trees, soil erosion and garbage accumulation are the most important environmental factors. These results be consistent with those of prior research that they are studied over uncontrolled and illegal tourism activities which could possibly bring a harmful conception on the ecosystems of the park and sustainability (Jaafar et al., 2013).

Andereck t al., (2005), argued the increase of tourism can adversely effect on national park environmentally sustainable development by contributing to the amount of litter and garbage, damage the planet and smoking. Ko & Stewart, (2002) also asserted tourism damaging ecological effects on environment contain ruin the ecosystem and planet, as well as air, noise and water pollution. These findings are additional correspond with Rabbany et al., (2013), who mentioned that uncontrolled tourism activities posture potential dangers to several natural regions throughout the world. It can insert massive pressure on an environment and generated negative effects such as increased air, and noise pollution and soil erosion. Mowforth & Munt, (2015), deduce in his earlier study that transport is constantly raising in reaction to the increasing number of travelers. One effect of the raising of the tourists in air transportation is that tourism reports for above 60% of air travel and is consequently accountable for an essential share of noise and air pollutions. In addition, Rabbany et al., (2013)

noted in mountain regions, trekking tourists produce a huge deal of garbage and waste.

According to the preceding findings, the following recommendations tourism policies can be made as ways to manage and control tourist activities in conservation and protection of mountain in Kinabalu Park.

- Planning and implementing new policies and rules for tourist activities to conservation and protection of mountain in Kinabalu Park. For example, make achievable guidelines for maintainable utilize of all-natural resources. One of the samples of planning of new rules is Fiji's Koroyanitu National Park Development Program. They focused on protect and maintain cultural heritage and soil, water and natural resources as a result of the advancement of ecotourism in landowning villages (Price et al., 2004). In addition, another example for new rules is investment of tourism income (e.g., entry fees, hunting fees, lodge or concessionaire royalties, etc.) in the protection and conservation of biological and cultural variety at mountain tourism areas. A substantial modify in protected region management plan in the 1980s legislated collect an entrance fee of \$13 from tourists, to be transferred in to conservation and local development through the Annapurna Conservation Area Project (Preston, 1997).
- Support policies target to minimize the influences of tourism by means of policy standards along the lines of limiting the number of tourists, timing of visits, group size, setting operational standards.
- Coordination between authorities, including policy makers for tourism planning and associated subject areas such as protected area management and wildlife conservation, trade and industries, transportation, immigration, finance, etc.

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