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APPLICATION OF CARRYING CAPACITY FOR MANAGEMENT PRACTICE FOR OUTDOOR RECREATIONAL MANAGERS IN MANAGING VISITORS RISK AT COASTAL MANGROVES AREA AT TANJUNG PIAI, JOHOR NATIONAL PARK

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Abstract: *This research presents the necessity for Carrying Capacity Practice to be implemented in the recreational areas in order to ensure that the safety of the users is well provided by the management of the recreational areas. This research also identified the visitor's risks and potential hazard during the course of recreational activities in coastal mangroves national park. This study was conducted at the Johor National Park focusing on the recreational visitor's management at the Tanjung Piai National Park. The data was collected via semi structured interviews with the Tanjung Piai National Park Manager, RAMSAR Manager and the former Tanjung Piai National Park Manager. The data were analyzed using the Nvivo software 11 version. The result indicated that visitors were exposed to the risks due to the uncertain situation of the recreational facilities that were highly exposed to intertidal wave issues and might reduce the reliability of the facilities. Nevertheless, the issue of storm treat could also pose a possible hazard to the visitors and damage to the recreational facilities in the coastal mangroves recreational forest. The limited space during walk on the boardwalk in the coastal mangroves areas also increased the level of difficulty during the emergency situations. Through this observation, this study also proposed the necessity for Carrying Capacity Practice to be implemented in the coastal mangroves national park in order reduce the possibility of hazard to the visitors due to the maximum capacity limit of visitors on the boardwalk facility and to ensure the smoother evacuation process from the national park during the emergency situations.*

Keywords: *Carrying Capacity, Hazard, Recreational Facilities*

Introduction

National parks have been gazetted by the Government as protected areas to be preserved and conserved the natural resources in order to sustain the valuable ecosystem in the nature. At the same time, the national park establishment also aims to contribute to the public utilization as a place to have recreation activities in the protected areas, which is to experience the uniqueness and the wilderness of the nature. The richness of the natural resources becomes an attraction for the public to enjoy the nature by getting involves in outdoors activities in the national parks. The tourists have high level of satisfaction by participating in activities in the nature or in the park environment (Acquah, Dearden, & Rollins, 2016).

The tourist were fascinated with the elements of marine fauna, aesthetics, ecological phenomenon, geographical landscape and perspective moments while participating in nature based tourism (Pearce, Strickland-Munro, & Moore, 2017). This nature attraction was widely recognized as a place for the nature adventure activities and concurrently to promoting the ecotourism industry for the state or country. Therefore, the development in ecotourism sector is also rapidly growing by the involvement of the Federal and Local State Government in promoting their nature attraction to encourage tourist visits. The tropical rainforest, coastal areas, wetland areas and other natural resources are some categories of the valuable natural resources that needs to be recognized and declared as protected areas of national parks. At the same time, the national parks were also a foundation for development in ecotourism sectors. The beauty and uniqueness of the nature encourage the public to visit the national park owing to the nature attraction in the protected nature areas and the idea of having outdoor recreational activities in the wilderness areas. Long term development in ecotourism areas and protected areas of the national park should be continuously conducted in order to ensure the positive impact, the prosperity and the well-being of the communities (Ahmad, 2014).

Coastal mangroves national parks are also getting popular among the public as a place for recreation and leisure activities. The improved recreation facilities and enhanced accessibility in the coastal mangroves national park is gaining interests from the public to visit the national park and to enjoy the nature in this area. The visitors consist of variety of people and communities who spending their recreation and leisure activities in the natural settings. Hence, adequate management strategies are required to improve the tourist facilities and services at the coastal area during peak vacation period (Pessoa, Pereira, Sousa, Magalhães, & da Costa, 2013). Carrying capacity methodological plan is also considered as a good theoretical basis for further studies at tourism destination (Ivanova, 2015).

Study Background

Johor National Park (JNP) of Tanjung Piai is a wetland national park located in the district of Pontian, Johor, Malaysia. This national park consists of the coastal mangrove forests as its main natural resources ecosystem. This national park has been declared as globally important place for wetland conservation under the RAMSAR Convention 1971 on 31st January 2003 due to its value and its scarcity as a wetland in Malaysia. Moreover, this national park is strategically located between the Malaysia, Singapore and Indonesia. The heart of this national park is the southernmost tip of Mainland Asia that located at the heart of this national park. Geographically, this is the important place for geographical value due to it was the location point of The Southern Most Tip of Mainland Asia and it also has a geographically value that attracts both local and foreign visitors to reach the tip.

However, overcrowding is a dominant issue in management of this recreational park and the implementation of the carrying capacity practice will help the recreational managers as a management tool for betterment in managing the ecological and social issues (von Ruschkowski, Burns, Arnberger, Smaldone, & Meybin, 2013). The high number of visitors that went into the protected areas has resulted in a crowded situation and at the same time, the boardwalk facilities can only reliably cater for a limited amount of load at a time. Moreover, the outdoor recreational facilities were exposed to the climate change impact and the ecological impact that were reducing the reliability of the facilities. The topological factor is also related to the vulnerability and the connectivity of the bridge network and the traffic carrying capacity of the damaged bridge (Guo, Liu, Li, & Li, 2017).

As for the consequences, many incidents had occurred in this national park in which the visitors fell down into the wetland areas because of the unreliability of the facilities and also the excessive volume of visitors per visitation. The boardwalk facilities are unable to handle the overload of visitors. In addition the recreational facilities in outdoor setting were already receding in strength and condition of the facilities due to environmental weathering. Learning from the devastation that comes about the natural disaster, improvement is needed in minimizing the damage from the natural disaster (Renato et al., 2006). Meanwhile, the physical and health risks that are inherent to adventure tourism might be due to mismanagement, or overlooked entirely by the adventure tourism operators (Mackenzie & Ker, 2012).

The objective of this article is to recommend for the carrying capacity practice to be implemented in the coastal mangroves category of national park. The importance of this practice is in order to prevent the possibility of injury towards the visitors due to the overloading of crowds on the unpleasant condition of the boardwalk facilities that is located in the wetland areas. At the same time, it may facilitate the evacuation process of the visitors in the national park during in case of heavy storm and such unpredictable weathers. Hence, the improvement of the visitors management is crucial in order to ensure the visitors safety are will managed by reducing the potential risks posed towards the visitors in the national park.

Recreational Carrying Capacity

Visitation and visitors management is an important component of the management of park and protected areas (Bushell & Bricker, 2017). Carrying capacity is about the visitors management in the protected areas that takes into account the recreational impact to natural resources in the recreation areas and also to reduce conflicts among the users. It is a regular practice in the management concept for sustainable management of the recreational and protected areas that involves high capacity of users. The concept is about establishing the visitor's limitation of the physical carrying capacity is allowed by that the management to be entering into the protected areas for recreational activities in order to reduce the possibility of the conflict among the visitors and management, and also to the environmental impacts towards the natural resources. The carrying capacity is applicable in managing the overcrowding phenomenon, which lead to discomfort for the users (Silva & Ferreira, 2013).

Carrying capacity in the tourism protected area are separated into four segments; ecological carrying capacity, social carrying capacity, psychological carrying capacity and load carrying capacity (Marcel, 2013). The appropriate and reasonable limitation and the acceptable level of impact should be decided by the administrative management of the national park in order to ensure that the impact or conflict among the visitors, management and the natural resources are within the manageable level. For all parties to be able to accept the limitation imposed by the carrying capacity practice without diminishing the recreational satisfaction of the visitors, the

conflict or impact should be acceptable and manageable by the management of the national park and the impacts are not too damaging to the natural resources, in other words the limit of the impact and conflicts are within the acceptable level. It also depends on the high number of visitors, the availability of the recreation space, the capacity of the facility, the natural constraints, the accessibility to the recreation areas, the risk and safety issues, and any factors that are capable of creating a possibility of conflict or impact among visitors or towards the natural resources.

At the same time, the kinds of outdoor recreational activities to be conducted also should be taken into consideration since the recreational facilities in the recreation areas are limited to cater only a certain number of visitors at one time. For safety aspect, strength and durability of the facilities should also be considered in order to prevent any accident case in the recreational areas due to either technical or natural hazards. The coastal mangrove national park facilities are highly exposed to climate issues and intertidal water levels that may reduce the strength and the durability of the recreational facilities provided in that areas. This in turn may reduce the usability of the boardwalk in the long term that had been placed in the coastal mangrove areas as a main of accessibility medium. Coastal erosion is evidently significant, and there are many factors that may contribute to the coastal erosion (Phong, Parnell, & Cottrell, 2017). The implementation of the carrying capacity concept was not only for balanced use of the resources, but also to be combined in hand with other projects that may emphasize the relevance of carrying capacity application for sustainable use in the protected area (Cupul-Magaña & Rodríguez-Troncoso, 2017).

The challenge lies in the decision making in the national park management. This is the crucial part in deciding the target limit of maximum users according to the objectives of the stakeholders. This takes into account both the various aspects of the recreational needs of the visitors and also the safety aspect of the national park visitations. There are a few aspects that should be considered by the national park management in applying this carrying capacity concept such as identifying the conflicts and issues in the protected areas, assessing the level of impacts among the visitors and the level of recreational impact towards the protected resources. By applying this carrying capacity practice, the reasonable maximum number of visitors should be identifiable in order to decide the appropriate headcount limits to be allowed to enter the protected areas. When deciding on the maximum numbers of visitors, many factor involving issues of conflicts were also taken into consideration, such as the recreational experience value, level of conflict, the acceptable limit of the conflicts level, the available spaces, the strength of the facilities and accessibility. For instance, as implemented in Eastern Australia, about only 304 peoples were allowed into the protected area per visitation after consideration of the management (Harriot,Davis, 1997).

Through the implementation of this carrying capacity practice, the number of visitors is limited and regulated according to the condition and situation of the conflicts. Once the maximum number had been achieved, any additional numbers of visitors were not permitted to get into the protected areas in order to reduce the possibility of conflict and damages. The carrying capacity practice also takes into account both the risk elements of the issues with visitors and also the environmental issues. Nevertheless, the value of gaining the recreational experience should also be sustained in order to achieve a good satisfaction level while undergoing recreational experience in the coastal mangroves national park. The carrying capacity indicator is recommended for the visitors management in the protected area (Burns, Arnberger, & von Ruschkowski, 2010).

Methodology

The study was conducted at the JNP of Tanjung Piai, Pontian, Malaysia in October 2017. The preliminary visit to the Head quarter office of Johor National Park Corporation had been done to interview the Head of Marketing and the RAMSAR Manager of JNP to verify the information before getting into the further semi structured interview with the Tanjung Piai National Park Manager directly. The purpose of the preliminary visit was to determine the high capacities of the visitors at Johor National Park. Afterwards, the interview session with the Tanjung Piai National Park Manager (1) , RAMSAR Manager (1) and former Tanjung Piai National Park Manager (1) had been conducted in semi structured interview in separate session. The interviews were conducted in Malay Language, and consequently translated into English. The interview sessions were also recorded for the purpose of re-examination. Then, the outputs from all the conversations in the interviews were transcribed words by words. It was then transferred into the Nvivo Software 11 version for the processing and analysis of the results. However, the limitation of the findings was that it focused and highlighted only on the visitors risk due to the unreliability of the boardwalk facilities at that national park.

Findings & Discussion

The main concern in the interview sessions was to identify the possibility of risks faced by the visitors during their visit at this national park. There are many sources of risk identified, and one of the risks faced by the visitors is the risk on the boardwalk facilities located in the coastal area of mangrove. Hence, the discussions will only be focusing on the risk of facilities located in this area that may possibly pose risks to the visitors during the course of their outdoor recreational activities in this national park. The issue of the facilities unreliability is the main concern in order to prevent any accident or injury in future.

Safety is one of the factors for load-carrying capacity, it is related to the strength of the internal force factor of the beams (Sibgatullin & Sibgatullin, 2017). The beam refers to the ones mounted to hold the boardwalk that were located in the coastal mangroves area. The boardwalk facilities are considered as a walkaway for the visitors and the only accessibility medium that facilitates the visitors to enter this coastal mangrove national park. This is because the location of the coastal mangrove national park is located on the water. The boardwalk is a pedestrian walkway normally constructed to allow people to reach the coastal areas or beaches. Boardwalk had been used by the coastal mangroves national park management team as a connector between the visitors and the coastal mangroves areas. Boardwalk had been used for community exploration either as a path or a walk in the mangroves areas (Johns, 1995). Public accessibility is related to the change in the visitor's interaction with the ecosystem in coastal mangroves (Thiagarajah, Wong, Richards, & Friess, 2015). Nevertheless, facilities erosions are the environmental risk that have an influence on the visitor's recreation experience in the ecotourism sector (Chin, Moore, Wallington, & Dowling, 2000).

The condition of the boardwalk at JNP of Tanjung Piai, was indeed unsatisfactory. The concern of the risk and safety aspect was expressed as below:

> *"Sometimes, the boardwalk cracked and collapsed due to the wear-and-tear. In one case that occurred, collapsed because of to the boardwalk at that time was in the unpleasant condition. The boardwalk was constructed on the coastline and was highly exposed to the intertidal sea activity and the possibility of decay is high. It is dangerous*

because the visitors kept on using the boardwalk and that they are installed on the water. It is risky". (Interviewee 3)

Located at outdoor setting, and exposed with the climate change factor also reducing the reliability of the boardwalk facilities located at the coastal mangroves areas. The sea intertidal activities highly influenced the degradation of the material quality of the boardwalk. The erosion process also occurred in this area due to the sea level rise that created a high tide phenomenal that was swamp all the facilities on the coastal areas. As impact, the reliability of the facilities material was reduced, and also encouraged the unpleasant condition of the facilities. This is the risk factor for the visitor's safety because the visitors were fall into the coastal mangroves area and may cause injury to the visitors. Also occurred, intertidal was accelerate the shoreline erosion and damaging the maritime structure (Davidson, 2008).

The location of the boardwalk is located also encouraged the degradation process of the boardwalk's durability with erosion impacted by the sea intertidal process. The risk is expressed as below:

"We are located at the open seas that we are in the first line to be hit by the storm. Because the storm is very powerful here because it is direct to open seas. That is risky due to the big waves and the big waves are able to damaging the boardwalk facilities by encouraging the erosion of the facilities, and also encouraging the decaying process of the facilities. As impact, the quality of the facilities becomes lesser" (Interviewee 2)

Moreover, the boardwalk facility that was constructed on the water is highly exposed to the damage via environmental factors such as the intertidal activities, erosion, termites or the outdoor climate changes. It may reduce the durability of the boardwalk material that had caused a few cases of visitors falling into the water owing to the unpleasant quality of the boardwalks facilities as mentioned by the interviewees. If the boardwalks were damaged, the visitors are in some risk of falling into the coastal mangroves area. If they fall, it become a more problematic situation, especially for the kids and elderly visitors.

In worse scenario, the accident frequently occurred whereby the unpleasant condition of the boardwalk was actually the cause of visitors falling into the water. The issue is highlighted as below:

"Also happened, the boardwalk was dislocated from the original place due to the big waves slamming and damaging it. Facility risk is also one of the issues for the visitors due to the environmental impact. The reliability of the facilities has also reduced and added up to the unpleasant condition of the boardwalk. Also, the visitor had fell down into the water because of this unpleasant facility. It gave a bad impression to our facilities management as the storm, climate change and intertidal activities were damaging our facilities". (Interviewee 1)

The visitors were also exposed to the risk of snakebites because the coastal mangroves is the original habitat for a few species of snakes that can possibly cause injury to the visitors who fell into the coastal mangroves areas. As the national park management team, they should prevent the visitors falling into the water of coastal mangroves because the possibility of snakebites is high. Snake community were found in the mangrove ecological zone (Luiselli & Akani, 2002). The medical risks of snakebites by a harmful species has been recorded, the

mangroves snakes were mostly of unknown biomedical properties that may cause harm to humans (Weinstein, Griffin, & Ismail, 2014).

Load carrying capacity is the fundamental role by the global dynamics as a reliable system in controlling overcrowding (Lenci & Rega, 2011). Limiting of the headcounts that were allowed to enter the national park is important to be enforced in order to reduce the possibility of risk towards visitors who were visiting the coastal mangrove national park. By limiting the visitors number, visitors management issue could be controlled by reducing the overcrowding issue on the limited space of boardwalk facility. The reason to limit the visitors number is to control the high numbers of head-counts using the boardwalk at one time, which is to reduce the possibility of facilities damage due to overloading of the visitors in order to prevent facility breakage and to prevent the visitors from falling into the coastal mangrove areas.

Conclusion

Load carrying capacity approach is highly recommended to be implemented at the coastal mangrove areas either for the national park, state park or any recreation destination that utilizes the coastal mangrove as a main attraction of natural resources for the visitor's recreation. The reliability of the boardwalk facilities located at the coastal mangrove area were damaged due to environmental factors that encouraged the quality degradation of the boardwalk facility. By the implementation of carrying capacity practice, the probability of hazard to the visitors may be reduced through limiting the load carrying capacity of the visitors during peak seasons of visitation and by reducing the maximum load on the boardwalk facilities. Additionally, in case bad weather, carrying capacity application will be helpful to facilitate the visitor evacuation from the coastal mangrove national park.

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