TOURISM INTEGRATED ZONING NEAR SALT LICK AREAS FOR WILDLIFE ECOLOGY MANAGEMENT OF ROYAL BELUM STATE PARK, PERAK

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DEDICATION

I dedicated my appreciation to my beloved family. With their support, I managed to complete my thesis.

Special thanks to:
Mom and Dad.
This is for you.

(**Encik Mansor Osman** and **Puan Che Paridah Wan Sulaiman**)

My siblings, **Shamila Mansor** and **Mohd Shafik Mansor**. There is no words to describe how imaginable love for both of you. Fight each other is the best way!

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Watch me.

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.

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ABSTRACT

Zoning of salt licks area is one of the decision-making issues faced in managing biodiversity conservation that is parallel to ecotourism development. There is uncertainty in general method to distinguish areas with the permitted tourism impacts. Previous studies described several management plans that measured the success rate applicable to national parks but there are still lacking in tropical rainforest. The issue regarding the wildlife and their environment has been largely ignored and there is an underestimation about the true contribution of forest to this ecology. The salt licks areas, however, are opened to the visitors, thus risking the wildlife population in the state park. The aim of this study is to develop a tourism zoning nearby the salt licks area in Royal Belum State Park (RBSP) which could improve the sensitivity of environment and the needs of wildlife. This study used two different methods which were qualitative method and quantitative method. The qualitative method was conducted by distribution of questionnaires to the RBSP and Department of Wildlife and National Park staff. This method provides more explanations and assumptions about the characteristics of the salt licks. The survey could help RBSP staff to develop the tourism zoning area. This study applied the multi-criteria decision making (MCDM) technique to support tourism zoning at RBSP. There are three protection levels of tourism zoning designation, which are high, moderate, and low level. Different level shows different characteristics, where suitability map highlights the effectiveness of zoning in the protected areas is produced. The zoning system can balance between conservation goals and tourism needs. Another method that has been applied was quantitative method which required sample of wildlife photos taken from the camera traps placed at the fieldwork areas in the RBSP. The analyses were carried out from January 2014 to April 2015. The results of correlation between the wildlife distribution which are distracted by human activities are classified into two different zoning areas; the salt licks area nearby the tourism places and the salt licks area which are far from the tourism places. Both zoning areas tend to have moderate negative correlation. Meanwhile, the range value for the salt licks nearby the tourism places and the salt licks area far from tourism places are -0.305 to 0.373 and -0.539 to 0.398 respectively. As conclusion, the increasing number of tourists will cause the number of wildlife decreases. The produced map could contribute to ease the management of wildlife by the RBSP staff and the entry of tourist in the future.

ABSTRAK

Pengezonan kawasan jenut garam merupakan salah satu isu dalam membuat keputusan yang dihadapi untuk menguruskan pemuliharaan biodiversiti yang selari dengan pembangunan ekopelancongan. Terdapat ketidakpastian kaedah umum bagi membezakan kawasan dengan impak terhadap pelancongan yang dibenarkan. Kajian yang terdahulu telah menunjukkan beberapa pelan pengurusan yang berjaya digunakan di taman negara tetapi masih terdapat beberapa kekurangan di kawasan hutan hujan tropika. Isu mengenai hidupan liar dan persekitaran mereka telah banyak diabaikan dan ada yang meremehkan sumbangan sebenar hutan kepada ekologi ini. Kawasan jenut garam bagaimanapun telah dibuka untuk dilawati oleh pengunjung sehingga menimbulkan risiko bagi hidupan liar di taman negeri. Tujuan kajian ini adalah untuk membangunkan zon pelancongan berdekatan dengan kawasan jenut garam dalam Taman Negeri Royal Belum Perak (RBSP) untuk meningkatkan kepekaan alam sekitar dan keperluan hidupan liar. Kajian ini telah menggunakan dua kaedah yang berbeza iaitu kaedah kualitatif dan kuantitatif. Kaedah kualitatif dijalankan melalui borang soal selidik yang diedarkan kepada kakitangan RBSP dan Jabatan Perlindungan Hidupan Liar dan Taman Negara. Kaedah ini telah memberi penjelasan dan andaian berkenaan ciri-ciri jenut garam. Soal selidik tersebut telah membantu staf RBSP dalam membangunkan zon pelancongan di RBSP. Kajian ini mengaplikasikan kaedah pembuat keputusan multi- kriteria (MCDM) untuk menyokong zon pelancongan di RBSP. Terdapat tiga tahap perlindungan bagi kawasan pelancongan yang dibenarkan iaitu tahap tinggi, sederhana, dan rendah. Tahap yang berbeza menunjukkan ciri-ciri yang berbeza, di mana peta kesesuaian yang menekankan keberkesanan zon di kawasan terlindung dihasilkan. Sistem kawasan pengezonan ini dapat mengimbangi antara matlamat pemuliharaan dan keperluan pelancongan. Kaedah lain yang digunakan ialah kaedah kuantitatif yang memerlukan sampel gambar hidupan liar yang diambil daripada perangkap kamera yang diletakkan di kawasan kerja lapangan di RBSP. Analisis telah dijalankan dari Januari 2014 sehingga April 2015. Keputusan kolerasi di antara taburan hidupan liar yang terganggu dengan aktiviti manusia telah diklasifikasikan kepada dua kawasan zon yang berbeza; kawasan jenut garam berhampiran kawasan perlancongan dan juga kawasan jenut garam yang terletak jauh daripada kawasan perlancongan. Kedua-dua kawasan pengezonan cenderung mempunyai kolerasi negatif sederhana. Sementara itu, nilai julat bagi kawasan jenut garam berdekatan tempat pelancongan dan kawasan jenut garam yang jauh daripada kawasan pelancongan masing-masing mewakili -0.305 hingga 0.373 dan -0.539 hingga 0.398. Kesimpulannya, peningkatan bilangan pelancong menyebabkan jumlah hidupan liar yang ada di kawasan jenut garam akan menurun. Peta yang dihasilkan boleh menyumbang kepada kemudahan pengurusan hidupan liar oleh kakitangan RBSP dan juga kemasukan pelancong pada masa akan datang.

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LIST OF ABBREVIATIONS

2D	-	2-dimension
3D	-	3-Dimensions
AHP	-	Analytical Hierarchy Process
BNR	-	Barberton Nature Reserve
CDF	-	Conservation Development Framework
CFS	-	Central Forest Spine
CI	-	Consistency Index
CZA	-	Conservation Zoning Area
DBMS	-	Database Management System
DEM	-	Digital Elevation Model
DWNP	-	Department of Wildlife National Park
ERD	-	Entity-relation Design
GCP	-	Ground Control Point
GIS	-	Geographic Information System
GPS	-	Global Positioning Network
HAS	-	Habitat Assessment Suitability
HCVF	-	High Conservation Value Forest
HDF	-	Hill Dipterocarp Forest
IUCN	-	International Union of Conservation of Nature
LCDC	-	Least-cost Distance Calculation

LDF	-	Lowland Dipterocarp Forest
M	-	Motion
MNS	-	Malaysian Nature Society
NRE	-	Natural Resources and Environment
NST	-	New Straits Times
PMP	-	Preliminary Management Plan
PSPC	-	Perak State Park Corporation
RBSP	-	Royal Belum State Park
TIN	-	Triangulated Irregular Network
TRAFFIC	-	Wildlife Trade Monitoring Network
UHDF	-	Upper Hill Dipterocarp Forest
UPM	-	Universiti Putra Malaysia
USM	-	Universiti Sains Malaysia
WPU	-	Wildlife Protection Unit
WWF	-	World Wide Fund for Nature

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Royal Belum State Park (RBSP) was gazetted as a protected area on 3rd of May 2007 under the Perak State Parks Corporation (PSPC) Enactment 2001. The park encompasses a total area of 117,500 ha in the most north region of the State of Perak in northern Peninsular Malaysia (Suksuwan, 2016). RBSP inclines to have the thick forest stretching to Thailand-Malaysia border and the second largest forest reserved and protected area after Taman Negara Pahang (431,435 hectare) in Peninsular Malaysia (Schwabe *et al*., 2014). The establishment of the protected area in Belum-Temenggor was first proposed by W. E. Stevens in 1968 (Suksuwan, 2016). The objective of the establishment is to protect the wildlife habitat from the illegal activities (Schwabe *et al.*, 2014).

Usually, the tropical rainforest in Peninsular Malaysia contains a very complex ecosystem and consisted of dipterocarp forest with smaller area of freshwater (Suksuwan, 2016). Malaysia Ministry of Natural Resources and Environment (NRE) has estimated 15,000 species of vascular plants, 229 species of mammals, 742 species of birds, 242 species of amphibians, 567 species of reptiles,

over 290 species of freshwater fish, and over 500 species of marine living in Malaysia (Azreen *et al*., 2011). Moreover, almost all Peninsular Malaysian large mammals are found in RBSP which included Malayan tiger (*Pathera tigris jacksoni*), Malayan gaur (*Bos gaurus*), Asian elephant (*Elephas maximus*), and historical records of the critically endangered species of Sumatran rhinoceros.

Studies pertaining to local wildlife often acknowledge salt licks which are the distinct sites with natural concentrations of minerals within or arising from soils or rocks as a key component to support the wildlife health as a supplement for their diets (Molina *et al*., 2014; Blake *et al*., 2011; Edwards *et al*., 2012). Salt licks also defined as a place where animals come to lick the soil, or water to gain the mineral supplementation for their body and dietary toxins as a key component of species distribution and abundance (Azreen *et al.*, 2011). As been stated by Chew *et al.* (2014), the area around Gerik, Perak was known to hold one of the densest elephant populations in Peninsular Malaysia attributed to its large number of salt licks there. Hence this state park was chosen as one of the potential ecotourism sites to be fully developed. Chuan and Weng (2010) stated tourist opinion at Tabing salt licks, where most of tourist were introduced to the salt licks as their first experiences. Some tourist enjoyed the trekking experience before arrived at the salt licks although they rarely view any wildlife. A few tourists preferred to comment on wildlife sightseeing, their expectation and information that describe the nature.

The presence of the humans in and around the salt licks area has often threatened the effectiveness that caused the declination of the wildlife appearance. The area of RBSP has become threatened since the highway of Gerik-Jeli has been developed (Rayan *et al.,* 2015). The author also said that the road construction across the forest area provides an easy entrance for intruders to discover the surrounding areas of RBSP. There are more than 100 entrances points have been discovered. Ahmad Zafir (2009) showed some of the possible entry points to the RBSP in Figure 1.1 below.

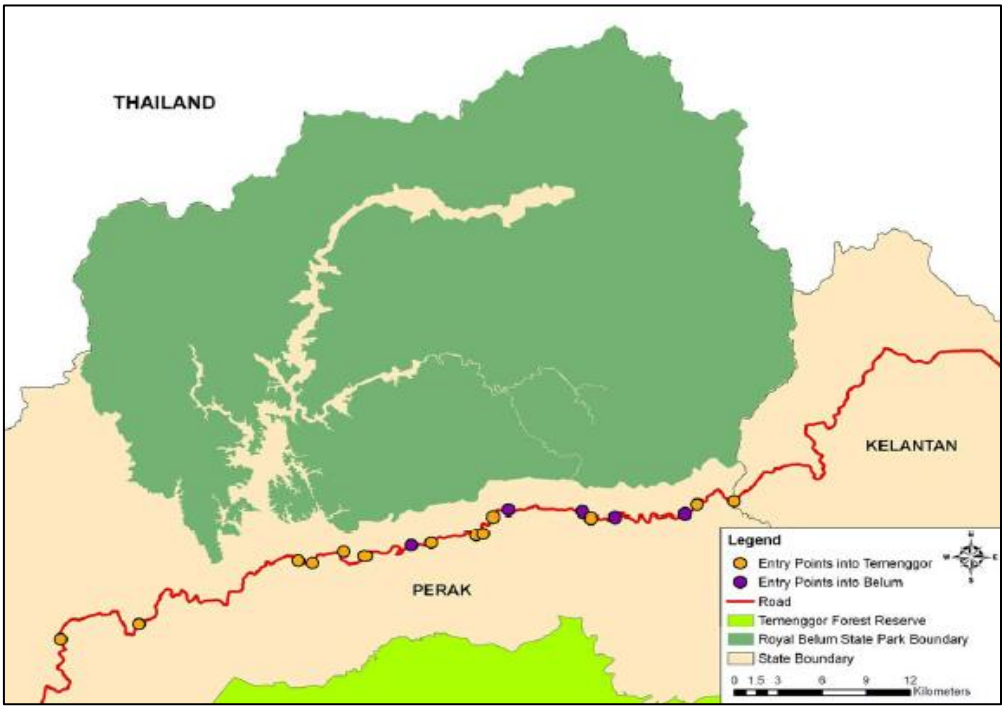

Figure 1.1: The possible poaching entry points to RBSP.

(Images from Ahmad Zafir et *al*., 2009)

Human activities have caused losses in biodiversity since the RBSP was covered by the tropical forests with variety of ecology. The example of human illegal activities is poaching and unsustainable harvesting (Hull *et al.*, 2011). Poaching activities are increasing every year due to the demands by the public. They craved for the animal parts or wildlife product. Those parts that was taking from the wildlife including the skin, ivory, and other products which gives benefit to them, thus seen as the potential threats to many wildlife species. Unsustainable harvesting was high among the indigenous community in RBSP itself. Figure 1.2 shows the number of foreign intruders in forest complex Belum-Temengor.

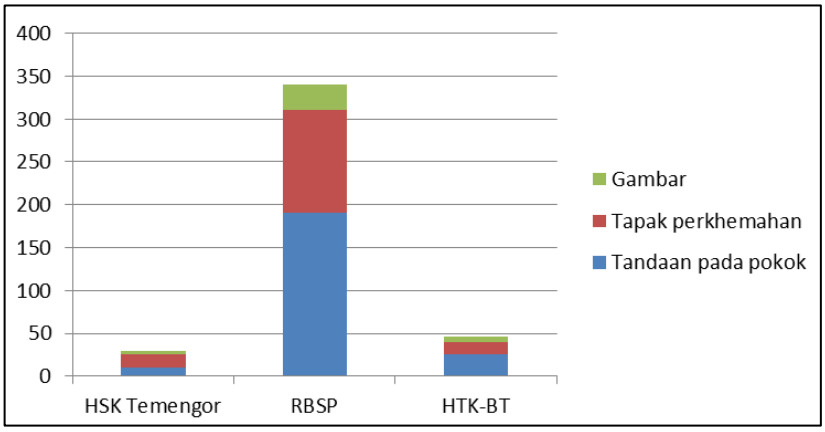

Figure 1.2: The number of signs of foreign intrusions in forest complex Belum-Temengor (Source: PSPC, 2014).

Liu and Li (2008) developed two approaches method for nature reserves functional zoning, using the habitat suitability assessment (HAS)-based and least-cost distance calculation (LCDC)-based on spatial analysis using GIS to extend the controlling and managing. There are also approaches to multi-criteria evaluation of biodiversity in conservation planning that was done by Farashi *et al*. (2016). GIS has the ability to group certain criteria into suitability performances, called multi-criteria decision making (MCDM). MCDM with GIS are widely applied to land management planning (Chang *et al*., 2008) and it was an important improvement to the conventional map overlay (Malczewski, 1999; Eastman, 2001; Hjortsϕ *et al*., 2006; Geneletti and van Duren, 2008; Zhang *et al*., 2013). There are provisions for protection that can be found in Wildlife Conservation Act 2010 (Act 716) for Peninsular Malaysia which provides protection and conservation of wildlife and for matters connected therewith (Law of Malaysia, 2010). The development and implementation of zoning method for protected areas is a critical strategy to enhance the appropriate wildlife conservation system.

Based on the above description, the main aim of this study is to develop a tourism zoning nearby the salt licks area in RBSP, Perak and making the fundamental analysis for the management in the future. This study attempted to come out with the tourism zoning mapping in the area of RBSP. In addition, researchers or managers could use this method to assist the development of conservation strategies

for the wildlife that could expand and modify as necessary. The topics in this chapter look into detail on the wildlife tourism. Furthermore statement of problems, objectives of study, scopes of study, significance of study and the study area background are discussed thoroughly.

1.2 Problem Statement

As the world's population has doubled over the past 40 years, the area of wildlife habitat is given the legal protection nearly 12% of the land surface of our planet (Higginbottom, 2004). The rainforests play an important role in regulated the climate and atmosphere, also in biological diversity (Yuan, 2014). There are many species in RBSP that are being known for its medical and commercial values. The Belum area is more accessible for encroachment after year of 1990, due to the Communist Party Malaysia disarmament (Abdul Kadir, 1998). As the result, the poaching activity were found to be increasing. This activity is a widespread practice among humans for their values (Larson, 2008). Apart from poaching, the activities like conversion of forest into agriculture land has been identified as one of the most significant threats facing the wildlife population there.

When salt licks were introduced as one of the tourism sites, the number of tourist was expected to increase tremendously. With advance technology, the media has spread the beautiful of nature in advertisement and exposed people to the world's biodiversity in many ways. Malaysia has welcomed 25.7 million tourists in year 2015 whereas the number of tourist arrivals in year 2016 have risen to 26.8 million respectively (Malaysia Tourism Statistics, 2016). The area of salt licks becomes one of the main attraction for the tourist who came to RBSP. This problem has affected the ecology of wildlife in that area. In order to save the wildlife, PSPC staff faced a big challenge to make sure that the tourist are satisfied with their request. These challenges in wildlife tourism are important due to the half of the world's population now lives in cities, and their relation with the wildlife remains distant. This wildlife tourism provides urban people a chance to get back in nature for experienced.

Wildlife tourism is part of tourism that encounter the relationship between animals and human. Wildlife tourism is specialized as one of the tourism phenomenon. It includes the wildlife safari, bird-watching, spotting animals, visiting a zoo, or wildlife sanctuary. This type of tourism was attracted with the increasing interest from government, the tourism industry, and researchers (Aissa and Abd Khuja, 2014). It explained about the human-wildlife relationship as the opportunity to be closer where tourists were helpful to watch the wildlife in reality. Wildlife tourism activities are seen as the significant part of the experience, thus raise the industry growth and contribute to the economy sector.

In recent years, there are initiatives to focus on viewing wildlife in their habitat. As wildlife tourism is apparently grown, thus the non-government organization were concerns about threats to wildlife populations and their habitat (Higginbottom, 2004). Human presence in the nature-based tourism such as in RBSP have caused conflicts include direct threats to the wildlife population. Nature-based tourism has been defined as the low impact or small-scale alternative to nature areas where it still conserving the environment (Larson, 2008). Several papers have discussed the wildlife tourism but it only focused on single-species such as the functional zoning of nature reserves for giant panda in China (Liu and Li, 2008), the spatial distribution of snares in Ruma National Park, Kenya with implication for management of roan antelope *Hippotragus equinus langheldi* (Kimanzi *et al.,* 2014), and identification of priority areas for grizzly bear conservation and recovery in Alberta, Canada (Nielsen *et al.,* 2009). Hence, wildlife tourism has been successful in helping many species of wildlife in tropical rainforests (Pennisi *et al.,* 2004).

Malaysia also take part in the wildlife tourism since the two thirds of Malaysia territory is covered by tropical rainforests and mangroves (Elagupillay, 1998). Several universities in Malaysia such as Universiti Putra Malaysia (UPM) and Universiti Sains Malaysia (USM) takes part in the wildlife conservation and includes the wildlife tourism in some of their project. DWNP websites has published a lot of journal about the wildlife behavior and the potential threats to wildlife with the cooperation from UPM and USM. Wildlife tourism is essential to encourage the

governments and non-governments especially in taking actions to measure the necessity of conserving the world biodiversity for future.

The focus on wildlife seems to reflect from few factors (Higginbottom, 2004). First, there are increased interest for the wildlife management professional and non-government wildlife organization such as World Wide Fund for Nature (WWF) that provide initiatives in wildlife conserving and tourism involving the wildlife itself. Second, the wild animals are increasingly used in some countries as a flagship for promoting tourism in general such as China that introduced the panda as their trademark. Hence, zoning the protected areas should be designed and implemented to save the wildlife population from the encroachment especially it is deal with the human presence in RBSP.

Alarming trends in ecology system of wildlife in RBSP has inspired to establish the conservation zoning area or set aside the area for conservation of wildlife where human activities are limited or controlled. Zoning is a preventative strategy where it differs from those on a basic level to separate human and wildlife. The theory about zoning is to manage the human presence in the RBSP recreational area, to grow back the wildlife population. The concept and design of zoning were shiftable according to the area itself. One of the successful management of the wildlife tourism is dependent upon a good understanding of the people that take parts in the recreational activities (Liu and Li, 2008). There are areas where no human impacts should be allowed (Hull *et al.*, 2011), thus zoning of protected areas is about to manage the human that are allowed in different areas where it compatible with the wildlife appearances.

In achieving the successfulness in the zoning conservation goals, the MCDM techniques has been chosen to be used with the GIS based. GIS provided the computer-based program that specially designed for store, organize, analyse, integrate, and create the visual interpretation of features information. MCDM is a family of methods where it commonly implemented with decision support system

(Geneletti and Duren, 2008). This author also described that the MCDM systems compare the action based on multiple features to identify the best performing solutions. These methods include techniques to structure the decision problem, perform sensitivity analysis, improve transparency, and enhance result visualization. With these techniques, tourism zoning can be produced with the ability to access and simulate the salt licks area. It is precise to develop the tourism zoning for salt licks in RBSP by using the MCDM techniques in GIS system.

1.3 Aim and Objectives of Study

The main aim of this study is to build a tourism zoning development nearby the salt licks area in RBSP by using GIS approach. The most important of zoning development is to improve the amount of the wildlife to advent into this region again. Table 1.1 gives the corresponding research questions and methods used to be performed to solve the research problems. There are three objectives in this study which are:

1. To determine the characteristic that contribute to the impact of tourist concentration in the RBSP.
2. To develop the tourism zoning area at salt licks location in RBSP using GIS Multi-Criteria Decision Making.
3. To analyse the relationship between integrated zoning area with the number of wildlife.

Table 1.1: The objectives of the research, along with research questionnaire and methods.

Objective	Main research questions	Methods
I) To determine the characteristic that contribute to the impact of tourist concentration in the RBSP	a) What are the parameters considered to be built for tourist? b) What are the attraction for tourists to enter the RBSP? c) How to organize the salt licks area that placed in tourism area?	- Literature review - Interviews - Previous studies - Observation - Experts (PSPC and DWNP staffs)
II) To develop the tourism zoning area at salt licks location in RBSP using GIS Multi-Criteria Decision Making	a) What is an appropriate technique to build the tourism zoning? b) How to test the techniques? c) Which best tools used in tropical rainforest?	- GPS - Camera trap - GIS mapping - Questionnaires - Multi-criteria decision making
III) To analyse the relationship between integrated zoning area with the number of wildlife	a) What are the suitable value to be considered for the relationship between the number of tourist and the amount of wildlife? b) How tourist incoming declined the wildlife distribution?	- Tourist data - Wildlife data - Correlation between the number of tourist and the amount of wildlife

1.4 Scopes of Study

There are various issues about the salt licks, particularly on the mineral analysis and habitat use that occurred at different sites with the help of camera traps. Instead of studying about the mineral analysis, the approach of wildlife tourism zoning nearby the salt licks area in RBSP is seen as one of the way to represent the deliverables for better management in the future. Therefore, it focused on enhancement to build the relationship between the wildlife species with the human impact characteristics and came out with some analysis. The scopes of this study are:

i) Firstly, the salt licks location needs to be identified at the area of RBSP. The data collection about the locations of the salt licks area has been collected with the collaboration of the Perak State Park Corporation (PSPC) and the Department of Wildlife National Park (DWNP).

ii) The data analysis was carried out from January 2014 to April 2015. The camera trap was used and installed at certain salt licks to capture the wildlife incoming. Camera trap is an effective way to collect the photos of wildlife incoming to the salt licks area.

iii) In this research, only six salt licks were chosen to be experimented. These salt licks were picked and classified from two different areas with the help of PSPC teams. Three salt licks location were located nearby the tourism places and another three location is located distant from the tourism places. Different area will attract different amount of wildlife to the salt licks. This technique was used to observe the amount and patterns of wildlife incoming to both area of salt licks in RBSP.

iv) GIS system has been used to describe the area of RBSP with the help of terrain data called Digital Elevation Model (DEM). With this map, the salt licks area can be detected at which elevation to be interpreted. MCDM techniques has been applied to map the suitability of which area need to be preserve or should be treated in RBSP.

v) Questionnaires were distributed to the PSPC and DWNP staffs to find out the quality to build the tourism wildlife zoning. These questionnaires were distributed only to the people who know about the salt licks area in RBSP to get the finest data. The assessments involved are: 1) the basic knowledge about the salt licks section, and 2) the database system section.

    a. The first assessment is to know more about the salt licks information such as the frequency of wildlife entered the salt licks, their peak time, the wildlife types, and their patterns of incoming in 24 hours. All of this information is the prior information before developing the tourism wildlife zoning.

b. The second assessment is the database system that has been used in PSPC and DWNP company to save the information about the salt licks itself. It involved the requirement of their system, their information updated frequency, and functionality of their system. These assessments were conducted to support the analysis about the wildlife and to describe the database system which need to be improved.

c. The data about the tourist amount visited the RBSP were also collected at the PSPC office. This data were separated into months to observe which accommodation and activities that attract the tourist to enter the RBSP area. These information is indispensable to differentiate between the amount of tourist with the amount of wildlife appearance at the different salt licks area: 1) nearby the tourism places or, 2) distant from the tourism places. The precision between the human presence and the amount of wildlife entered the salt licks area is determined by assessing the value of correlation coefficient. This analysis is conducted to prove that the amount of wildlife will increase as the number of tourist decrease.

1.5 Significance of Study

Malaysia is endowed with vast amount of biological diversity, unique cultures, beautiful landscapes, and lush ecosystems. However, ecotourism can contribute the greatest portion of the national income and stimulates the growth of economic sector in Malaysia. Tropical rainforests in RBSP supported with high flora and fauna diversity that have become one of the key attractions for visitors to visit this state parks. Since the RBSP is opened as an ecotourism places, nature-based tourism has been developed in small scale to accommodate the quantity of tourists that visited the RBSP areas. This intensive development may lead to serious damage to the integrity of RBSP, even with the low impact development if it not carefully monitored and regulated.

The increasing demand for wildlife tourism encompassed a good management planning since salt licks have become one of the main attractive places in the RBSP. This results in much innovative research for improving the quality of management for PSPC staffs. The development of visitor use zones has been developed with the highlighted focus conservation zones and the predetermined characteristics. These visitor use zones also provide the management guidelines as the reference for the PSPC staffs in managing the quantity of tourists in time.

The regulation was spread to the local communities that remained in RBSP which is the only human inhabitants living there. The total population of the indigenous community in the RBSP area cannot be confirmed due to the lifestyles of the community that retain the nomad forest lifestyles. However, the existence of the local communities living around the RBSP gives the positive and negative impacts where they participated in appropriate to the tourism activities. For example, the villagers supplied the handicraft made of wood and bamboo for sale to visitors, established the variety of activities for tourists to participate, and help PSPC rangers as guides to waterfall and salt licks area. Otherwise the negative impacts seen through the activities such as hunting for wild animals, the unsustainable collection of forest produce likes rattan, *gaharu* and medical plants (Suksuwan and Kumaran, 2003). The wildlife tourism zoning can help to ensure that the opportunities can be maximized while conflicts and threats hopefully can be reduced.

Understanding what people value about the wildlife viewing is important in developing sustainable tourism practices in protected areas (Reynolds and Braithwaite, 2001; Aihara *et al.*, 2016). Although the protected area can greatly be in wildlife conservation, it rarely covers enough area to maintain the wildlife population. Therefore, this study provides a necessary step to develop the tourism zoning area at salt licks location in RBSP using MCDM techniques. This technique has been used by many countries (Nielsen *et al.*, 2009; Liu and Li, 2008) and it shows a useful and successful decision support for wildlife conservation and nature reserves management at once. Therefore, this research hopefully benefit the economic and recreational activities at the RBSP.

Human activity is one of the threats that disrupted the performance of the wildlife enters the salt licks area. Since RBSP is declared as one of the tourism sites in Perak and due to the numerous attractions available in the RBSP especially salt licks, this place has been developed and commercialized for the benefit of tourists to witness the diversity of varied plant and animal species. More tourist incoming might decrease the advent of the wildlife to the area of salt licks. This study provides a necessary step to analyse the relationship between the number of tourists and wildlife over salt licks location to find the level of correlation on the data quality. This study can be used by other researchers, scientists, or biologist to help in constructing the regional development of RBSP. The regional management development has been made in accordance the age of the technology, thus it is much faster and easier to be operate. Therefore, the management of tourism zoning area can track and trace the number of tourists that visits the salt licks, in the other words, it can be edited by add up or remove the information data that required to be use. The good management of tourism zoning can help to manage the more incoming of wild animals to the salt licks area.

1.6 Study Area Background

Royal Belum State Park, Gerik, Perak is located on the Central Forest Spine (CFS) of Malaysia and be considered as a High Conservation Value Forest (HCVF) due to its high environmental, biodiversity, socio-economic, and landscape value. This HCVF category indicated that this area was classified as the low impact nature-based tourism, educational, and research activity only. This state parks were chosen as the study area for several reasons.

Firstly, this state park is located between the Thailand-Malaysia border and the East-West Highway (Kelantan border) as shown in Figure 1.3. With the togetherness neighboring with Temenggor Forest Reserve (147,741 ha), this forest complex is combined with two adjacent protected areas in Thailand which are Hala-

Bala Wildlife Sanctuary and Bang Lang National Park (Schwabe *et al.*, 2014). The primary goal is to maintain the large well-connected forest landscapes in order to preserve the area of salt licks and the wildlife from being declared extinct.

Secondly, RBSP contains salt licks that attracted the wildlife to come to lick the soil or water surrounding the areas (Scwabe *et al.*, 2014). This area is important to be preserve for maintaining the wildlife ecology itself. The East-West Highway have reduced the ability of the wildlife to roam freely without the risk of fatal encounters with humans and vehicles (MNS, 2005). It also increases the encroachment due to the highway that exposed more entry points for the illegal activities. Minimizing the indirect impacts and threats at RBSP leads to the forest productivity limits concerning the protection of species and salt licks site use. Since the tourism zoning has fixed the suitable factors to conserve the wildlife area in RBSP, the suitable tourism map can determine the high impact areas that need to be monitored.

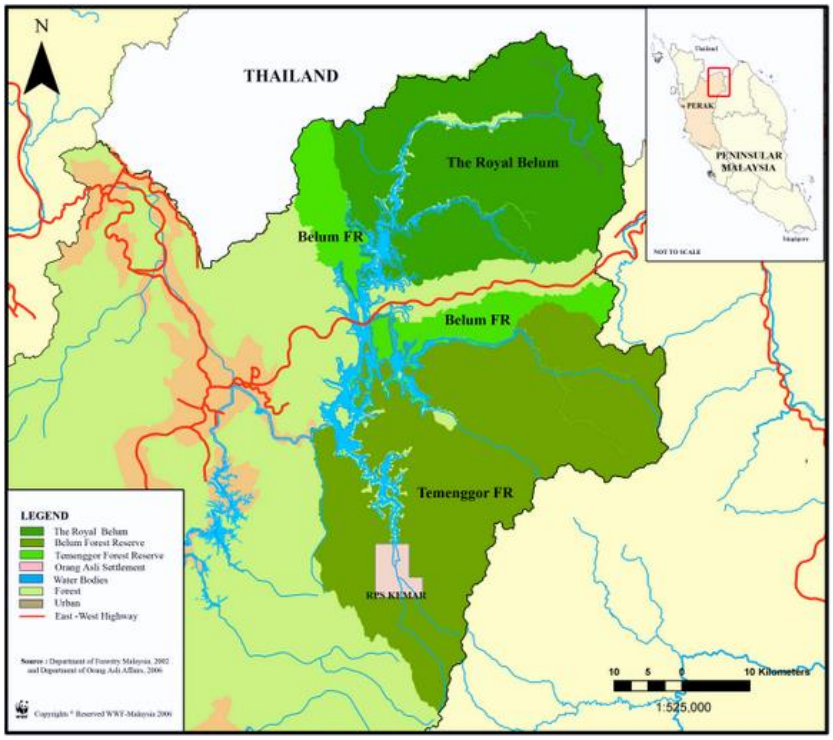

Figure 1.3: The location of the study area at Royal Belum State Park. (Sources: WWF-Malaysia, 2007).

1.7 Thesis Outline

This thesis comprises of five chapters that provide an understanding of the objectives to be achieved. The first chapter gives the basic information about the history of RBSP that explained thoroughly about the types and ecology linkage to the forests itself and the issues about the wildlife tourism protection zoning. This chapter also describe the research problem, aim and objectives of study, scopes of study, and the benefits of the study conducted. Basically, these chapters presented the entire structure of the thesis.

Chapter two consists of the general briefing and exploration about the study through the revision that have the same concern with this study. Overall, this chapter focuses on RBSP, highlights the threats to RBSP in salt licks area, the effects on the wildlife appearance, and the tourists incoming. It is also state the provision for the protection of wildlife and salt licks in wildlife laws of 2010. Furthermore this chapter gives the general understanding on the conservation zoning area and the effects to wildlife and tourists, then proceeded to the framework by using the multi-criteria decision making to achieve the tourism zoning designation suitability nearby the salt licks area.

Next, chapter three presents the methodology that described the process that were taken to achieve the research aim and objectives. It explains the profound process through all phases and covers the previous study, study area selection and the field site survey with the additional of User Need Assessment. Additionally this chapter discusses the processing structure using GIS system including the system design and the system development that come out with the digital mapping which displayed the visual summary of tourism zoning map with the suitable protection levels.

Chapter four consists of data analysis and results of study. It presents the data collection and view the respondent information which explain more about the salt

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