LOCAL COMMUNITY'S INTENTION TO PARTICIPATE IN SUSTAINABLE MANGROVE FOREST PROGRAM IN MALAYSIA

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By

NURSHAHIRAH BT WAHID MARICAN

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

December 2018

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DEDICATION

For my sunflower

Mama
&
Abah

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

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December 2018

Chairman: Associate Professor Nolila Mohd Nawi, PhD
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Mangrove forest play an important role in balancing the ecosystem since Mangrove trees provides a breeding ground for flora and fauna. In Malaysia, Mangrove forest can be found mainly in Sabah and Sarawak covering about 83% of the total Mangrove forest in Malaysia. Peninsular Malaysia only has 17% of Mangrove forest which are located mainly in the west coast, from Kedah, Perak, and Selangor up to south of Johor. Government bodies and NGO have been working to replant and increase public awareness to protect the Mangrove forest in this past few years. Despite all of this, Malaysia's Mangroves have declined over 45% in the past five decades from an estimated 1.1 million hectares to the current estimate of 564,970 hectares. Past studies have showed that the public participation in mangrove forest programs are still low and stagnant due to lack of awareness. There are also socio-economic factors with several contributing elements such as awareness, perception, attitude, and perceived behavioural control that affects the local community's intention to participate in the Mangrove sustainable programs. Thus, this study would like to understand the local community's intention to participate in the sustainable Mangrove forest programs in Malaysia.

The Theory of Planned Behaviour and Norm Activation Theory are used in this study for the development of the main framework. The study specifically have been conducted in the states that has a higher Mangrove forest percentage; Sabah, Selangor, Perak, Pahang, and Johor. A structure questionnaire were used to collect a total of 871 respondents that has been selected using stratified random sampling. Then, the data were analysed using descriptive analysis, chi-square analysis, factor analysis and multiple regression analysis. Chi-square analysis was applied to determine the relationship between the socio-demographic factors and the intention to participate in the sustainable Mangrove

forest programs. Next, factor analysis was used to explore the determinant factors influencing the local community's intention to participate in the programs. Multiple regression analysis was applied to determine the relationship between socio-demographic factors, extracted factors and local community's intention to participate in sustainable Mangrove forest programs.

This study has discovered that respondents have good awareness towards the importance of Mangrove forest. The findings on chi-square analysis showed that age, education level, income level, household size and lifestyle have significant association with respondent's intention to participate in the sustainable Mangrove forest programs. Factor analysis has identified eight factors namely *environmental benefits, public opinions, ecosystem benefits, public influence, convenient, public encouragement, anti-anthropocentrism*, and *practicality*. The most influencing factors identified using multiple regression are *environmental benefits, public opinions, public influence, convenient,* and *public encouragement* with the addition of perception and socio-demographics characteristic such as age and education level. This study has also discovered a new factor and employed a new framework which is a combination between TPB and NAT. The findings from this study can assist the government and NGO to develop programs based on the local community needs.

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Abstrak tesis yang dikemukan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sains

NIAT PENYERTAAN KOMUNITI TEMPATAN DALAM PROGRAM PAYA BAKAU MAMPAN DI MALAYSIA

Oleh

NURSHAHIRAH BT WAHID MARICAN

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Hutan paya bakau memainkan peranan penting dalam menstabilkan ekosistem. Malah, hutan paya bakau juga menjadi tempat pembiakan utama bagi flora dan fauna. Hutan paya bakau di Sabah dan Sarawak meliputi hampir 83% daripada keseluruhan hutan paya bakau di Malaysia. Di Semenanjung Malaysia, hutan paya bakau tertumpu dikawasan pantai barat iaitu Kedah, Perak, Selangor, dan Johor dengan keluasan hanyalah 17%. Pihak kerajaan dan pertubuhan bukan kerajaan telah melaksanakan pelbagai usaha untuk menanam semula hutan paya bakau. Malah, mereka juga melakukan program yang berterusan untuk meningkatkan tahap kesedaran tentang pentingnya paya bakau untuk kesejahteraan rakyat. Dianggarkan lebih 45% jumlah hutan paya bakau di Malaysia telah dibersihkan dalam tempoh lima dekad yang lalu. Ini menjadikan jumlah hutan paya bakau menurun dari 1.1 juta hektar kepada anggaran terkini iaitu hanya 564,970 hektar sahaja yang tinggal. Kajian lepas menunjukkan tahap kesedaran yang rendah menyebabkan tahap penyertaan tidak memberangsangkan. Kajian turut menemui faktor sosio-ekonomi dengan beberapa faktor penyumbang seperti kesedaran, persepsi, sikap, dan kawalan tingkah laku mendorong kepada niat untuk menyertai program paya bakau mampan di Malaysia. Jadi, objektif utama kajian ini adalah untuk memahami niat penyertaan komuniti tempatan dalam program paya bakau mampan di Malaysia.

Kajian ini menggunakan 'Theory of Planned Behavior' dan 'Norm Activation Theory' sebagai tunjang kajian. Kawasan kajian dipilih berdasarkan negeri dengan jumlah peratusan kawasan hutan paya bakau tertinggi di Malaysia iaitu Sabah, Selangor, Perak, dan Johor. Borang soal selidik digunakan untuk mengumpul sejumlah 871 orang reponden menggunakan teknik persampelan strata secara rawak. Semua data di analisis secara deskriptif, analisis khi kuasa dua, analisis faktor dan analisis regresi berganda. Analisis khi kuasa dua

dijalankan untuk mengetahui hubungan antara faktor sosio demografi dan niat untuk menyertai program paya bakau mampan. Seterusnya, analisis faktor digunakan untuk mengetahui faktor penentu yang mempengaruhi niat masyarakat tempatan untuk menyertai program tersebut. Analisis regresi berganda digunakan untuk menentukan hubungan diantara faktor-faktor seperti sosio demografi, faktor yang diekstrak dengan niat komuniti tempatan untuk menyertai program paya bakau mampan.

Hasil kajian menunjukkan tahap kesedaran berkenaan hutan paya bakau dikalangan komuniti setempat adalah pada tahap yang memuaskan. Kajian khi kuasa dua mendapati umur, tahap pelajaran, tangga gaji, saiz isi rumah dan gaya hidup mempunyai perkaitan dengan niat mereka untuk menyertai program paya bakau mampan. Analis faktor telah mengenalpasti lapan faktor iaitu faedah alam sekitar, pendapat umum, manfaat ekosistem, pengaruh awam, mudah, dorongan awam, tanggungjawab umum, dan amalan secara praktikal. Faktor yang paling mempengaruhi niat komuniti untuk menyertai berdasarakan análisis regresi berganda adalah faedah alam sekitar, pendapat awam, pengaruh awam, mudah, dorongan awam, persepsi dan ciri sosio-demografi seperti; umur dan tahap pendidikan. Kajian ini telah menemui faktor-faktor baharu dalam menentukan niat yang mempengaruhi komuniti untuk menyertai program paya bakau mampan. Selain itu, kajian ni juga menggunakan gabungan rangka kerja antara 'Theory of Planned Behavior' dan 'Norm Activation Theory' untuk mencapai objektifnya. Hasil daripada kajian ini boleh membantu pihak kerajaan dan pertubuhan bukan kerajaan untuk membuat program yang lebih berjaya dan mempunyai hala tuju yang jelas.

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To my sunflower, thanks for be there with me in this struggling journey

Regards, iera marican.

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

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This is to confirm that:
- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) are adhered to.

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11TH MP	11Th Malaysia Plan
DOSM	Department of Statistical Malaysia
FAO	Food and Agriculture Organization of United Nation
FDPM	Forestry Department of Peninsular Malaysia
KMO	Kaiser-Meyer-Olkin
NAT	Norm Activation Theory
NEP	New Environmental Paradigm
NPP2	National Physical Plan 2
PBC	Perceived Behavioral Control
PCA	Principle Component Analysis
PRF	Permanent Reserve Forest
SPSS	Statistic Package for Social Science
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action

CHAPTER 1

INTRODUCTION

This chapter provides brief explanations about mangrove forest around the world, including the functions of mangrove forest, benefits of mangrove forests to human and also causes of mangroves forest decline. It also provide some information about history of sustainable mangrove forest programs in Malaysia. Furthermore, the problem statement, objectives and significance of the study also being define in this chapter. The chapter will be concluded by an outline of the thesis structure.

1.1   Mangrove Forest Background

Mangrove forests are a unique ecosystem. They provide valuable ecosystem services which dominated by mangrove trees as the primary producer interacting with associated aquatic fauna, social and physical factors of the coastal environment. According to Stanley and Lewis (2009), mangroves can be broadly defined as a woody vegetation types occurring in marine and brackish environments. FAO (2007) reported that, mangrove trees are a common sight on mudflats, tropical and subtropical river banks, and coastlines in many parts of the world. They stand with their roots in salt water and they are regularly subjected to the influence of tides. Mangrove becomes the boundary of two environments (Ewel et al., 1998).

Mangroves have evolved a variety of survival and reproductive strategies to deal with their muddy, shifting, saline environment (Lewis, 1992; Ewel et al., 1998; Dev Roy, 2014). More than 40% of the estimated 18 million hectares of mangrove forest in the world occur in Asia (Ong and Tan, 2008). Mangrove forests or also known as tidal forest, coastal forest, or oceanic rainforest are one of the most productive ecosystems in the world (Kathiresan and Bingham, 2001). According to Qasim (1998), mangrove can be found in the land-sea interface up to the point where water still have the salinity.

Figure 1.1 show that mangrove diversity have been arbitrarily divided into two groups, the Old World and New World groups. The New World mangrove are located in the western hemisphere and have less concentrated type of mangrove species (Feller and Sitnick, 1996). This consists of West Africa, Caribbean, Florida, Atlantic South America, and Pacific North and South America (FOA, 2007; Feller and Sitnick, 1996).

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Whereas, the Old World mangrove group in the eastern hemisphere consists of Australia, Southeast Asia, India, East Africa, and the Western Pacific (FOA, 2007; Feller and Sitnick, 1996). This area by far have the richest diversity of tree species with the mangrove forests in South East Asia (such as in Malaysia) amongst the most floristically developed, in terms of species richness and structure, compared to mangrove forests elsewhere in the world (FAO, 2007; Feller and Sitnick, 1996).
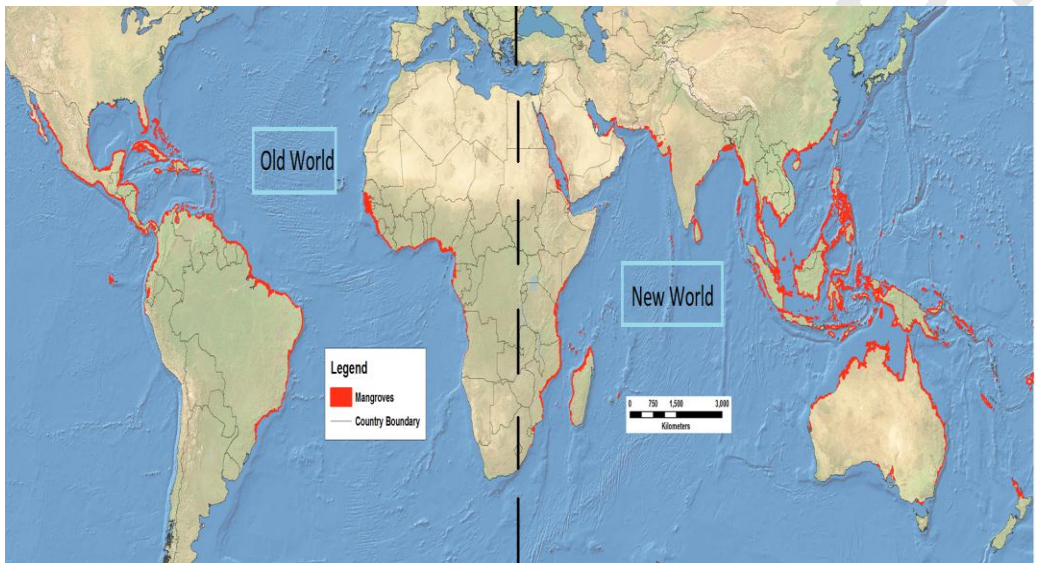
Figure 1.1: Mangrove forest all around the world using earth observation satellite data
Source: Giri et al. (2011)

Mangrove distribution highly affected by the temperature and moisture of an environment (Katherisan and Bingham, 2001). These factor contribute to different type of species between the globes and also affected their size of the plant. In the western hemisphere, there is only eight species of mangrove. The most common species in the new world group are Rhizophora mangal, Avicennia germinaus, Laguncularia racemose, and Rhizophora racemose (Feller and Sitnick, 1996).

This is difference with the Old World group in the eastern hemisphere that have a vast species of mangrove approximately forty types (Feller and Sitnick, 1996). The most general species in Old World are Nypa and Avicennia marina, Bruguiera, Rhizophora, Sonneratia, Ceriops, and Lumnitzera (FOA, 2007; Alongi, 2002; Feller and Sitnick, 1996). Further inland in the brackish intertidal zone, this is a zone dominated by the Nipah palm (Nypa fruticans). Most coastal species being dominated by red mangroves (Rhizophora mangle). This species has both prop and drop roots that provide structural support and provide air to the submerged underground roots (Tattar et al., 1994; Ewel and Myers 1990).

A few condition need to be achieved in order for mangrove to grow. Climate is one of the most important factor since mangrove are tropical species and cannot tolerate lower temperature (Feller and Sitnick, 1996; Tomlinson, 1986). Most of the mangroves grow in the brackish water habitat (Tomlinson, 1986) this is to reduce competition between freshwater species (Feller and Sitnick, 1996). Other factor that helps lessen competition are tidal wave outflow. The unique characteristics of mangrove roots make it possible to grow and developed under this harsh condition. This tides not only eliminate completion but also bring nutrients for mangrove growth (FOA, 2007; Feller and Sitnick, 1996; Tomlinson 1986).

Mangrove forest is often classified based on the frequency of tidal wave from the sea, which affects the species that grow in these zones. Due to their dispersal mechanism by seawater, many mangrove plants and animals are widely distributed and have broad ranges spanning many countries, and even continents (Kathiresan and Bingham, 2001). This also led to mangrove ecosystem as a main area for all organism to grow, as shown in Figure 1.2 below.
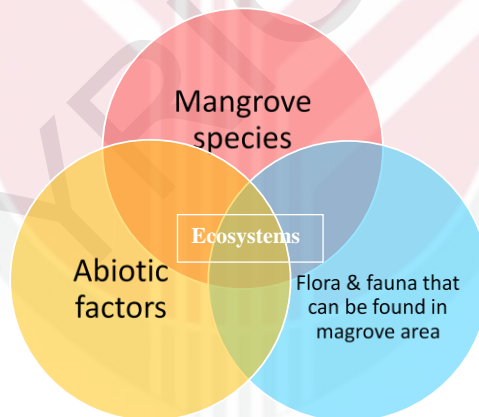
Figure 1.2: Physical and biological ecosystem of mangrove forest
Source: Kathiresan and Bingham (2001)

An ecosystem of the mangrove forest as shown in Figure 1.2 consists of mangrove plants and the associated abiotic factor such as land and sea, climates and latitudes with the flora and fauna including microbes, fungi, and animal in the mangrove forest area (Kathiresan and Bingham, 2001).

Islam and Noor (2008) discover plants include trees, shrubs, ferns and palms are mainly found in the tropics and subtropics river banks and coastline. These

plants usually adapted anaerobic conditions to survive both salt and fresh water environment (Ewel et al., 1998; Walters et al., 2008; Islam and Noor, 2008).

1.1.1 Flora and Fauna Species in Mangrove Forest

Southeast Asia's mangroves are the best developed and probably the most species-diverse in the world (Giesen and Wulffraat, 1998). There are approximately 70 species of plants recognized as mangrove species and the greatest diversity of mangrove species to be found in Southeast Asia (Spalding et al., 1997). This species also being called as 'true mangrove species' included various shrubs and trees. Apparently Southeast Asia, including Malaysia has a very high amount on 'true' mangrove species. This species use a high biodiversity of mangrove forests serve as nursery grounds for lot of animal also varies of plant. Mangrove forest is can be group based on the frequency of tidal inundation from the sea that will affects the species that grow in the specific zones.

The main types of mangroves especially in the Old World usually have the genus Avicennia, Bruguiera, Rhizophora, Sonneratia, Ceriops, and Lumnitzera. Nipah palm dominated in the brackish zone. Mangrove trees have special adaptations to enable them to colonize their environment, such as leaves that can excrete salt, viviparous breeding, stilt and buttress prop roots to support them in the muddy substrate, and pneumatophore roots; roots that can breathe in water.

Wildlife is abundant in the mangrove forest. Long tailed macaques, silvered leaf monkeys, otters, monitor lizards, dugongs, eagles, kingfishers, storks, egrets, herons, mudskippers, mud crabs and lobsters, mangrove snakes, and saltwater crocodiles are just some of the diverse fauna that inhabit mangrove forests. Sabah and Sarawak is also home to the Proboscis monkey, a rather specialized mangrove/coastal forest inhabitant, and endemic to that vast island.

1.1.2 Function of Mangrove Forest

Adeel and Pomeroy (2002) stated that the ecosystems contain protective habitats – such as spawning grounds, a nursery for juveniles, and secure feeding grounds – for a wide number of fish, crab, shrimp, and mollusc species. At the same time, these ecosystems serve as a sanctuary for indigenous and migratory bird species. Mangrove forests also functioning as downstream receiver of water and waste from both natural and human sources (Ahmed, 1995; Annette, 2000).

There are three main ecological services provided by mangrove; shoreline protection, support the food web, and carbon sequestration (FAO, 2007).

Mangroves can buffer the impacts of waves, storm surges, and tsunamis on the coastal area by dissipating incoming wave energy with help from the roots of mangrove that bind and stabilize in the substrate (Walters et al., 2008; Cochard et al., 2008). Mangrove also act as a filter for water runoff, at the same time stabilize the coastline from natural erosion (Massaut, 1999; Boyd, 2002).

Shoreline protection offer by mangrove are more than dissipate wave. Mangroves have proven to give coastal protection from tidal waves, cyclone and typhoon. As shown in Figure 1.3, mangrove forest naturally act as a barrier from rainfall thus provide protection from several of natural disaster due to fact that the robust root with interlocking system that can withstand strong impact (Sandaliyan and Kathiresan, 2015). In an event of tsunami in 2004, it have been clearly noted that area with mangrove forest were less affected (Jusoff, 2013). Mangrove forest block the storm surges thus, reduce the amplitude and extent of flooding and protecting fresh water in the same times (Zhang et al., 2012). Even different varieties of mangrove give different inundation are, but the protection given by mangrove forests are vital.
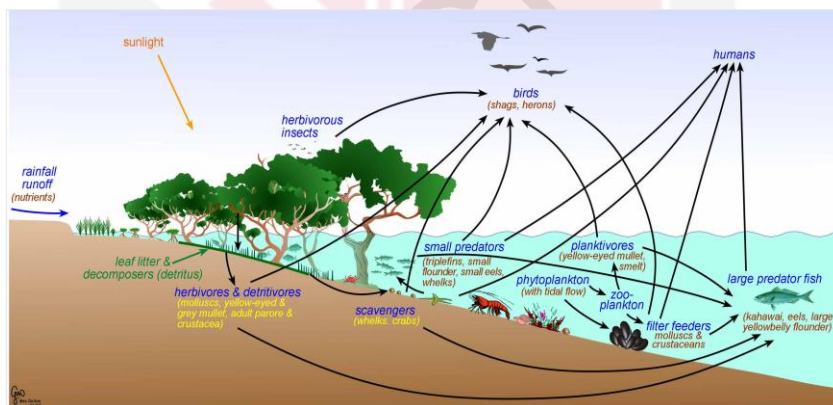
Figure 1.3: The processes involved in the mangrove ecosystem.
Sources: Duke (1992)

In supporting the food web, mangroves play an important role to many fish, shrimps, and mollusks species since the environment provides shelter. It is rich in organic matter, which is a source of food for the fish and other aquatics (Heath, Turner and Davis, 1993; Mastaller and Hodalic, 1997). Mangrove is also home to lots of migratory birds, reptiles, crustacean, and mammals (Ellisons, 2008). Figure 1.3 above shown various type of aquatics life benefitted from mangrove forest area. One of the important mangroves function is to be a breeding site for aquatics animal.

The unique structure of mangrove roots make the environment safer and suitable for the breeding sites and young animal growth (Sasekumar et al.,

1992). Chong (1996) indicated in his study that prawns mainly used mangrove as a breeding area due to tidal current and lateral trapping in mangrove area. The study also mentioned that the mangrove make the area safe and not affected by the current thus make it suitable for breeding prawn larvae (De Freits, 1986; Stoner and Zimmerman, 1988). This explaining the importance of mangrove forest in maintaining and balancing the ecosystem by providing breeding ground for aquatics animal.

Another important role of mangrove forest are carbon cycle (Chumura et al., 2003). Carbon cycle or carbon sequestration are important to manage carbon dioxide (CO_2) level in the atmosphere by removing the CO_2 from the atmosphere. Forests are one of the important component in carbon cycle especially in storing carbon for trees used (Lorenz and Lal, 2010). Mangrove forest can cycle the carbon dioxide at higher rates compare to normal forest are due to tidal transport and increase of sediment deposition mainly because of the mangrove unique roots (Mcleod et al., 2011; Van Lavieren et al., 2012; Fuentes, and Barr, 2015). Mangrove forest has doubled the living biomass of tropical forest by around 152 tons of biomass per hectare (Hutchison et al., 2014). This means, mangrove can help slow down carbon emissions, thus mitigating the vagaries of climate changes.

1.2   Mangrove Forest in Malaysia

FAO 2007 stated that the largest areas of mangrove in Southeast Asia are found in Indonesia, which cover almost 60% of the total mangroves in Southeast Asia. Malaysia is second largest with 11.7%, followed by Myanmar that has 8.8% mangrove areas. Currently, mangrove forest around the world decline from 19.8 million hectares in 1980 to 15.9 million hectares in 1990. These losses represent about 2% per year from 1980 to 1990 and 1% per year from 1990 to 2000 (Wilkie and Fortuna, 2003).

Mangrove forest cover mostly in East Malaysia which in Sabah and Sarawak (Hamdan et al., 2012; Spalding et al., 1997). Perak, Kedah, and Johor cover most of the mangrove forest in Peninsular Malaysia and smaller patches can be found in Pahang, Terengganu and Kelantan. The mangrove forest fond the sheltered coast in west Peninsular Malaysia thus explaining the distribution.

In Malaysia, mangrove forest can be found mainly in Sabah covering about 59% of the total mangrove forest in Malaysia while Sarawak covers about 23% spreading all over the state. Peninsular Malaysia only has 17% of mangrove forest mainly in the west coast area from Kedah, Perak, and Selangor up to the southern area of Johor (Chong, 2006). Table 1.1 show the mangrove forest area extent in Malaysia. It is clear that Sabah have an extensive distribution of

mangrove forest area whereas Kelantan only have 336 hectare of mangrove forest.

Table 1.1: Mangrove distribution in Malaysia

State	Mangrove forest area (ha)
Johor	25,079
Kedah	7,949
Kelantan	336
Melaka	438
Negeri Sembilan	1,267
Pahang	11,473
Pulau Pinang	451
Perak	43,502
Perlis	-
Selangor	15,090
Terengganu	1,265
Sabah	338,000
Sarawak	167,992

Source: Forestry Department Peninsular Malaysia (2011); Sabah Forestry Department (2010); Sarawak Forestry Department (2011)

Mangrove forest in Peninsular Malaysia mostly occur in the west coast area. As shown in Figure 1.4, the Straits of Malacca have a fairly calm seas compared to South China Sea with island of Sumatra sheltering the straits (Hamdan et al., 2012). As a result of this sheltering, the area in west coast have a suitable soil characteristic for mangrove forest growth. In Sabah, mangrove forest mainly of the east coast area facing Sulawesi and Sulu Seas. Rajang and Trusan-Sundar rivers have a large distribution of mangrove forest in Sarawak.

Malaysia's mangroves have declined over 45% in past five decades from an estimated 1.1 million hectares to the current estimate of 564,970 hectares. A study by Sabran et al. (2009) showed that around 25 thousand hectares of mangrove is left as at 2009 compared to 446 thousand hectares recorded in 1997. Most of this mangrove is being cleared for developmental activities to occupy the socioeconomic need such as housing and plantation (Sarmin et al., 2016; Chen et al., 2013).

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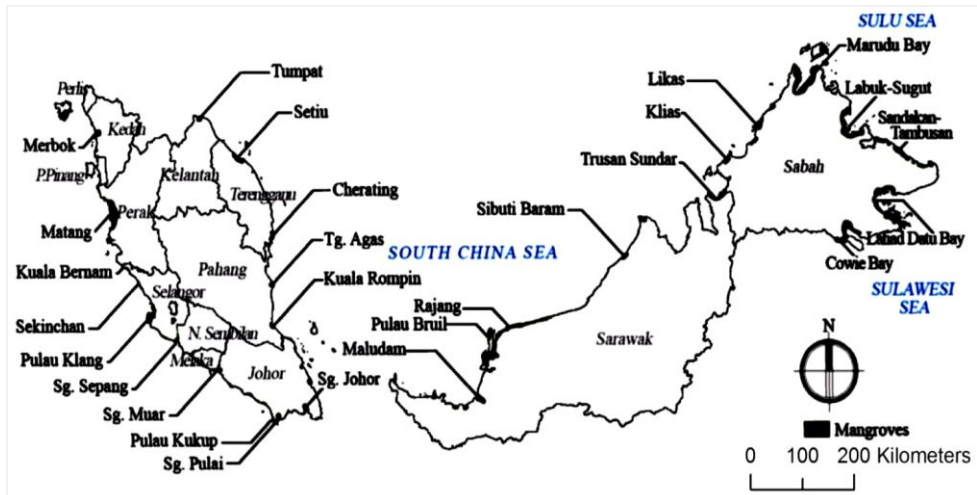
Figure 1.4: Mangrove distribution in Malaysia
(Sources: Hamdan et al., 2012; FRIM, 2012)

In Johor alone approximately 27 km^2 of mangrove forest area has lost within 30 years due to developmental activities (Sarmin et al., 2013). Other than that, aquaculture also one of the main factor that damage mangrove forest (FOA, 2007) however, Sabah already gazetted about 3,600 hectares of mangrove forest for aquaculture development and 5,300 hectares been turn for Aquaculture Industrial zone by the government. Mangrove forest all around the world are on verge of extinction if there is no action taken. There are various of reasoning for mangrove declining, and it is crucial to know the main factor in order to protect the mangrove forest in Malaysia.

1.3   Causes of Mangroves Decline

As said in the previous subtopic, human contravention always been known as a primary cause of mangrove loss. Duke, Negelkerken, Agardy, Wells, and Van Lavieren (2014) discover the mangrove forest around the world already disappear fast enough and global rate of mangrove forest loss now are three to five times greater compare to before. The destruction of mangrove forests are four times faster compare to other land-based forest (Abdullah, Said and Omar, 2014).

It is predicted that by 2050, 35% of mangrove forest in South-East Asia potentially lose because of negative ecological and socio-economic impacts (Duke et al., 2014). Around 1980 till 2005, Asian and Pacific regions lost over 20% of their mangrove forest, whereas only 10% or less mangrove forest lost in East Africa and Australia (Wells and Ravilious, 2006). Another study by Abdullah, Said and Omar (2014) indicated that world's mangroves forest already lose one fifth of it since 1980. The mangroves forest declined are varies for each

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country but mainly for human benefit or profit (FAO, 2007). More than half of mangrove forest area been cleared in a three decades spans (Brown and Fischer, 1918; Oo, 2002; Ardli, 2007; Liu,Yan, and Macnair, 2008).

A study by Duke et al. (2014) and supported by FAO report (2007), main threat to mangrove forest around the world are coastal development including urban and residential area, tourism, industrial, and port. Urban development for housing and tourism especially in an attraction area with large population have recorded a decrease in the mangrove forest areas (Plathong and Plathong, 2004). This happen in all over the world, especially South-East Asia. Developmental activities, increasing of population, and exploitation of mangrove forest resources resulting in mangrove forest declination (Kathiresan and Bingham, 2001; Latiff, 2012). Chaudhuri et al. (2015) reviewed that in Asia such as China, Myanmar, Indonesia, and Philippines, mangrove forest area mainly been transform for agriculture activities and urbanization.

Another threat is overexploitation of mangrove forest products such as timber, fuelwood, and charcoal and also conversion for aquaculture activities. For several decades, lot of mangrove forest areas have been converted for aquaculture culture activities, especially for shrimp farming and oil palm estate (Latiff, 2012). Countries that have fishing as main industry suffer mangrove losses more in this area such as Vietnam, Thailand, and Philippines (FAO, 2007). Plathong and Plathong (2004) discovered that the increased of shrimp ponds in Peninsular Thailand are at alarming rate. Moreover, all of this conversion of mangroves to shrimp farming destroyed mangroves forest and natural breeding area for various marine life. Uncontrolled shrimp farming in Vietnam consequential polluted the farms then destroying mangroves area and also spreading viral diseases (De Graaf and Xuan, 1998). The study by Abino, Castillo and Lee, (2014) also indicated that climate change and human activities around mangrove forest can threaten mangrove forest existence.

Pollution and indirect disturbance including oil spills and pesticides waste are another contributing factors to declining of mangroves. Oil pollution also affected mangroves forest even the degree of deforestation varies for each sites (Duke et al., 1997). Polidoro et al. (2010) and Ellison and Farnsworth (1996) also mentioned petroleum pollution, solid waste and pesticide runoff definitely affected mangroves forest. Industry wastage from factories can reduce water quality around mangrove forest (Choong, 2006). Gan (1995) in his studies revealed that mangroves in Matang forest are polluted with herbicides and pesticides resulting from agriculture activities nearby and mismanage garbage disposal by local.

Lastly, climate change (storm intensity and sea level rises) are the least threat to mangrove forest. As mentioned by Polidoro et al., (2010) climate change can be a threat to mangrove forests especially with the changes of the sea temperature. Rising in sea level can disrupt the natural habitat for marine

species and mangroves function naturally (McLeod and Salm, 2006; Gilman et al., 2008; Van Lavieren et al., 2012; Ellison and Zouh, 2012).

Figure 1.5 show the deforestation rate of mangrove forest in Malaysia for past decade. According to FAO (2007), around 20% of Malaysia's mangrove have lost to various development activities. Significantly in Peninsular Malaysia where most of mangrove area being converted into agriculture, housing development, also for roadways. Malaysia Nature Society reported that one-third of Peninsular's mangrove being cleared illegally. Latiff (2012) revealed in his study that mangroves forest in Selangor specifically Kuala Selangor and Port Klang being threaten by development for infrastructure. Same thing happen to Langkawi, where most of mangrove areas has been cleared or polluted by tourism activities and development for economic activities by local.
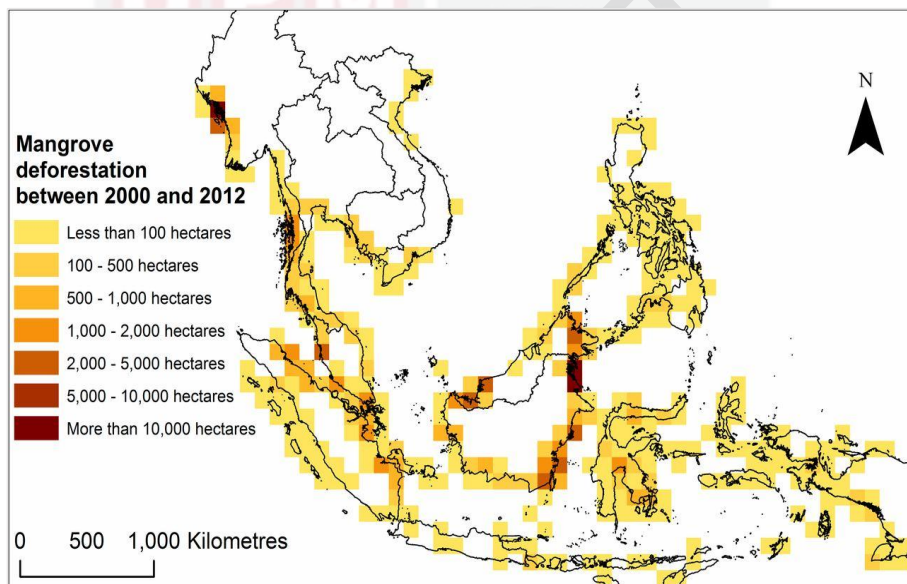
Figure 1.5: Mangrove deforestation rate between 2000 until 2012 in Southeast Asia
(Sources: Richards and Friess, 2016)

Selangor, Kedah and Sarawak mangroves are been converted to palm oil and coconut plantation in early 1960 (Choong, 2006). Surprisingly, only small amount of mangrove has been lost due to aquaculture development. From 1995 to 2002, there are 400 hectares increment of mangrove area been convert for aquaculture programs (FAO, 2007). Study by Abdullah, Ismail, Ng, and Darham (2013) found that, mangrove forest in Malaysia already suffer from shrimp farming but can be control with the right policy. However, study by Vandergeest (2007) reported that a high concentration of shrimp farming in one area will result in high levels of pollution in surrounding area.

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From the discussion, it is clear that declining of mangrove forest in Malaysia are mainly for development and agriculture activities. With lack of programs and efforts to sustain the mangrove forest, the deforestation level keep increasing. Public awareness and perception also play a vital part in maintaining mangrove forest since mangrove in Malaysia mostly in closed proximity with residential area (Rahman and Asmawi, 2016).

All effort for maintaining and sustaining the mangrove forest in Malaysia are due to government and private sector to work together in order to achieve the goal. The government need to make a standardized policy and legislation to ensure there is no competition between forestry, fisheries, and agricultural sector since mangroves forest area tend to be in-between of these environment (Latiff, 2012). However, there is lot of argument that management problem from competing jurisdiction between government sectors with different objective and guidelines (Choong, 2006) and this can disturbed the effort to maintain mangrove forest area.

1.4   Local Community's Participation in Mangrove Forest Programs

Rovaai (2002) states that local community is group of people with similar common values and dependent between each other. The sense of community is found as a main factor for the people to commit to a neighbourhood which also known as social bonding and behavioural rootedness (Riger and Lavrakas 1981; Ahlbrant and Cunningham, 1979). Past studies discover that geographical factor and the size of community play a big part in sense of community. They found a small community in rural area have stronger sense of community and attempt to improve their condition (Bachrach and Zautra; Ahlbrant and Cunningham, 1979). The sense of community is what defines a community. Community also can be defined based on territorial and geographical factors such as town, city, locality, interdependent sources and skills (Agrawal and Gibson, 1999; Coser and Durkheim, 1997; Gusfield, 1975). Local community defines as people living within one particular area with the same sense of community. The same characteristics of a community can be found in different states or location (McMillan and Chavis, 1986).

In order to understand thoroughly on how the local community can affect conservation on natural resources, studies which focusing on people should increase (Sulaiman et al., 2009). The main purpose of the study focusing on people is to clear any misunderstanding related to mangrove forest functions and factors of deforestation (Shuib et al., 2012). In a community and natural resources studied by Agrawal and Gibson (1999), there are several factors; which are multiple interest, local level process, and institutional arrangement that portray the community's relationship with natural resources. Understanding the factor may help a researcher understand why the conservation program success or fail. Their study found that in community-based conservation, it is important for government, NGO, and local work towards the same goals. Government and

NGO need to implement the rules they created in order to gain local trust (Agrawal and Gibson 1999).

Local community often have positive attitude and perception towards conservation program (Shrestha and Alavapati, 2006). It is found that respondents with higher education level and involve in mangrove related work are more aware and have positive attitude towards these conservation programs (Shrestha and Alavapati, 2006). This is consistent with Osman et al. (2014) study where respondents with higher education are more knowledgeable in environment. Thus, this affects their behaviour and intention to participate the programs. On the other hand, poor economic status is more likely to show negative attitude towards environmental conservation (Shuib et al., 2012). Income is found to be one of the determinant factors for respondents to participate in the conservation programs (Diamantopoulos et al., 2003; Gamba, 1994 Zeidner and Shechter, 1988; Jackson, 1983).

Stone et al. (2008) discovers that local community wants to participate in the mangrove conservation programs if there are economic benefits to them. Monetary value received from mangrove also be one of the factors. The study also states that local community is only willing to cooperate and participate upon earning their respective personal benefits. Conversely, Roy (2016) found that local community have positive attitude to participate in conservation program but they don't believe in authorities as the program organisers. Success rate of the programs depend on the participation of the local and yet, the local does not trust the authorities and only willing to commit if they are given benefits. Mangrove conservation in Malaysia is divided between different jurisdiction and this makes it hard to handle the conservation properly (Jusoff, 2009). This results in low participation by the public since the programs are inconsistent. Another study discovers low awareness level on the importance of mangrove forest program itself and eventually resulting in low participation (Faridah-Hanum, 2014; Shuib et al., 2012).

1.5 Mangrove Forest Programs Restoration and Conservation in Malaysia

Mangrove forest program can be divided into two types: restoration and conservation. Restoration defines as repairing the damage done by human intervention in the area. Replanting the mangrove forest area are one of the example of restoration programs. Mangrove forest conservation is a practice of maintaining the area for sustainability and keep the natural resources for human and the ecosystem. Matang mangrove forest are one of the successful conservation example in Malaysia (Goessens, 2014). Mangrove forest in Malaysia generally been handle by government however there also several private agencies that involve in restoring and maintaining mangrove forest.

In Malaysia, National Forestry Policy 1978 (NFP) are used to manage all type of forest including mangrove forest. This list mangrove forest as a natural forest

ecosystems that included in conservation management. There also several other policies and act complement and support NFP which is the Land Conservation Act 1960, Protection of Wildlife Act 1972, National Park Act 1980, Environmental Quality Act 1974 and Water Enactment 1935. With difference act and policy, this create an overlaps jurisdiction and misinformation within different agencies thus resulting a hurdle in managing and conserving the mangrove forest (Jusoff, 2009). Furthermore, the information about mangrove forest such as distribution, causes of declining, types of programs being done are hard to obtained (Jusoff, 2009).

As stated before, government sector manage most of the mangrove forest programs in Malaysia. Forestry Department of Peninsular Malaysia (FDPM) cover for Peninsular Malaysia, Sabah and Sarawak. However, but the programs and management of mangrove still depend on each states management agencies. This is because, according to National Forestry Act 1984, all forest that been gazzeted as a Permanent Reserve Forest (PRF) need a working plans for conservation, environmental quality control, and optimum utilization of resources prepared by every State Forestry Department (Hamdan et al., 2012). This explain the difference programs by each states.

Additionally, the National Physical Plan 2 (NPP2) include sustainable development and biodiversity conservation in the plan for 10 years from 2010 till 2020. This plan focusing on emphasise the benefit people get from ecosystem. In NPP2 also serve the guidelines to all agencies and department to plan the programs that can incorporate development and maintain biodiversity and ecological stability (NPP2, 2010). To support the NPP2 objective, the 11[Th] Malaysia Plan (11[Th] MP) also pursue the green growth to protect the natural resources and gains benefits from it in the same time. Among the plan are to ensure sustainability of natural resources, minimise pollution, and conserve the biodiversity (11TH MP, 2015). All of the plan and guidelines focusing on how to use limited resources and fulfil the human social needs yet maintain and sustain the environment in the same time.

In response to the 2004 tsunami, government had develop the "Special National Task Force on Planting of Mangrove and Other Suitable Species in Coastal Areas" (Hamdan et al., 2012) to identify the coastal mangrove area that need restoration and replanting. All task been managed by multidisciplinary approach involving state agencies, universities, and local communities. The result from this effort can be seen through a several study about mangrove forest in Malaysia focusing on distribution of species, local perception, water quality and also remote sensing in related to mangrove forest area.

Sustainable management of mangrove forest being practiced in Perak, Johor, Selangor and Kedah with main objective to get direct benefit from mangrove forest and protect the coastal area in the same time (Hamdan et al., 2012).

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Several level of the plans already been completed. The area involved that have been identified for protection are as shown in Table 1.2 below.

Table 1.2: Mangrove areas that has been identified for protection

Pahang	South East Pahang Peat Swamp Forest; Tasik Chini and its surrounding wetlands
Kedah	Ulu Muda Forest Reserve
Perak	Parts of Matang Mangrove Forest Reserve
Selangor	Kuala Langat Peat Swamp Forest; mangroves in Che Mat Zain and Tengah Islands

Source: FRIM, Status of Mangrove in Peninsular Malaysia (2012).

In Perak, Matang mangrove forest reserved (MMFR) being handled by Perak government for more than 100 years. It's being acknowledge MMFR are one of the best mangrove management system in the world. Yet, there is still a report of a slight loss due to commercial used of mangrove forest in Matang (Goessens, 2014). In Johor, there a long term management plan for mangrove conservation by Forestry Department of Johor and the Danish Cooperation for Environment and Development (Jusoff, 2009).

Mangrove forest in Sabah and Sarawak are manage by state forest department. Around 70% of mangrove forest in Sabah and Sarawak been classified as PRF in order to protect and conserve the area (Choong, 2006). Since the mangrove forest areas in both state are wide and diverse, there are possibility that mangrove forest been used for timber resources when other lowland and peat swamp reduced (Faridah-Hanum, Latiff, Hakeem and Ozturk, 2013).

The Ramsar Convection on Wetlands of International Importance also known as RAMSAR, is an importance international treaty specifically for conservation and sustain the use of wetlands all around the world. As for Johor, RAMSAR acknowledged mangrove forest along Sungai Pulai as an important wetland areas that have national importance (Hasmadi, Pakhriazad, and Norlida, 2011).

Non-government bodies have done various program to initiate the public participation in mangrove forest conservation. Programs such as Friend of Mangrove and WWF-Malaysia have a stagnant progress and not getting enough attention from public. However, there are some participation from local and volunteer involve in this NGO programs even there is poor documentation to give the exact number (Rahman and Asmawi, 2014). Jusoff (2009) indicated that even with vast benefits and function mangrove forest can provide, public more attracted to making profit with timber, charcoal, and woodchips. With lacking information about mangroves benefits, public easy to forget the important to maintain and sustain the mangrove forest.

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All of the different management plan by each states department and NGO involvement that not following the policies did not contributed the best result for sustaining mangrove forest. This can appear as a challenge to standardize the management plan and to execute it in the whole country. Furthermore, low awareness from public about importance to restore and conserve the mangrove forest area also can be a hurdle to get the participation from public in the programs

1.6   Problem Statement

Ideally, incorporated sustainable maintenance of mangrove forest in ecology and environment may return many benefits to the community in the surrounding area. Past studies have proven that human interference can destroy mangrove natural ecosystem balance and eventually resulting in huge loss in economy, ecology, and social. Thus, Malaysia as a developing country strives to achieve an optimum balance between social development and environmental sustainable development, has created NPP2 and 11th MP to focus on sustainable biodiversity development especially in green growth. Government bodies and NGO have been working to replant, organise awareness programs to protect the mangrove forest area in this past few years. Programs involving the public especially students have been conducted in effort to increase awareness and attitude to sustain and conserve the mangrove forest. Malaysia has successfully managed and sustained one of the oldest mangrove forests in Southeast Asia for almost 100 years. All of these efforts are showing that Malaysia does realise the importance of mangrove forest in environment and biodiversity. However, despite all efforts, the mangrove forest deforestation rate is still at alarming rate.

In span of five decades, mangrove forest in Malaysia have declined over 45% mostly being cleared for housing and plantation (Sarmin et al., 2016; Chen et al., 2013: Sabran et al., 2009). The public and local community's participation is found as important role to ensure the success rate of the program. But, past studies by Jusoff (2009) has found that participation by the public in mangrove forest programs is low. Based on conversation with Senior Assistant Director (Coastal Forest Preservation) of FDPM at 15 September 2016, he said; public participation is low because of the awareness on the programs and importance of mangrove forest is still at low level. Furthermore, he also stated that each area and states is managed by many different agencies, thus making the mangrove forest programs bacome varied and not standardised. The previous programs involving local community all in a consistent state results from lack of awareness. With lack of exposure related to mangrove forest benefits, public awareness is low and this affects their participation in the programs. Given the fact that government has made such tremendous efforts to increase awareness and sustain the mangrove forest area, it is obvious that there is a bright future for a sustainable mangrove forest programs. This study deals with the study related with local community's intention-behaviour towards the sustainable mangrove forest programs. The factors contributing to local community's participation can

be vary from awareness, perception, attitude, and their socio-demographic characteristics.

Based on the study conducted by Faridah-Hanum (2014), low participation in sustainable programs by local community is because of lack of awareness on the importance to maintain the mangrove forest. Some researchers have found that there is a significant relationship between socio-economic factors and participation in sustainable mangrove forest programs. The complications involved in identifying factors of local community's intention to participate in sustainable mangrove forest programs are many. Therefore, the interest in finding the degree of local community's intention to participate in sustainable programs varies with awareness, attitude, practicality, gender, age, income or others has induced the selection of this study.

1.7 Research Question

In this study four specific research questions were addressed. The entire research questions were developed based local community's attitudes, subjective norm and perceived behaviour toward mangrove forest. All of this will lead to intention to participate in sustainable mangrove forest programs in Malaysia.

1. Do local community's aware about sustainable mangrove forest programs in Malaysia?
2. Do local community's socio-demographic profiles effect their intention to participate in sustainable mangrove forest programs in Malaysia?
3. What are the factors that influence local community's intention to participate in sustainable mangrove forest programs in Malaysia?
4. What are the most influential factors that influence the local community's intention to participate in sustainable mangrove forest programs?

1.8 Objectives of Study

The general objectives of this study is to understand the local community's intention to participate in the sustainable mangrove forest programs in Malaysia. The specific objectives are as follows;

1. To describe local community's awareness and perception towards sustainable mangrove programs in Malaysia
2. To determine an association between socio-demographic factors and local community's intention to participate in sustainable mangrove forest programs in Malaysia

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3. To identify factors of local community's intention to participate in sustainable mangrove forest programs in Malaysia
4. To determine the most influential factors that influence local community's intention to participate in sustainable mangrove forest programs in Malaysia

1.9 Significance of the Study

Scope of this study is to understand the main idea of what influence local community's intention to participate in sustainable mangrove forest programs in Malaysia. The study going to be different compare to technical factors research as this more focus on people itself. People are the one who have livelihood around mangrove forest need to be the focus in the study. Since this type of research are uncommon in Malaysia, result from this study offer insight to the sustainable mangrove forest programs in Malaysia that have low successful rate all this time. This study will uncover public perception about mangrove forest and also factor that contribute to participation in sustainable mangrove forest programs and this can help to developed new idea for the programs.

Thus, the result from this study can be used not only for government and NGOs, but also helping policy makers to make a suitable policy that can benefited government, public, local community's and environment. With this information, the government or NGOs can develop a programs that preferable by the public based on the contributing factor of the intention to participate. Besides benefitted the programs developers; government or NGOs, this study also have value for the public. This study will provide knowledge to the public on the importance of managing sustainable mangrove forests and ensuring the continuity of a good environment and lifestyle for the future generations.

1.10 Thesis Outline

This study consists of five chapters covering different areas of the study. Introduction, history, overview of mangrove forest in Malaysia are being discussed in Chapter 1. This chapter also give the problem statement, objective, research questions, and significance of the study. Chapter 2 provide previous literature summary related to the definitions, concepts and theories on critical success factor of the sustainable mangrove forest programs in Malaysia and around the world. Moreover, methodological issues from previous studies also being included. The methodology that discussed in Chapter 2 going to be adopted in Chapter 3. In Chapter 3, the methodology and tools of analysis such as, data sources, conceptual framework, data collection, and definition of analysis data are discussed. Chapter 4 provides the findings of the study that already being analyse and explain. Lastly, Chapter 5 that concludes the study with findings summary, recommendation for future study, and conclusion.

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