

AWARENESS ON CONSERVATION OF MANGROVE AMONG THE COMMUNITY OF KUALA SEPETANG TAIPING, PERAK

*¹Nur Idzhainee Hashim, ²Azman A Rahman, ³Nor Hanisah Mohd Hashim

Faculty of Architecture, Planning and Surveying,
Universiti Teknologi MARA Shah Alam,
40450 Shah Alam, Selangor Malaysia

*Corresponding author's email: idzhainee@salam.uitm.edu.my

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Abstract

The State of Perak is fortunate to be endowed with such a unique coastal heritage, “The Matang Mangrove”. The area covers approximately 40,466 hectares of Mangrove Swamp Forest in the Larut, Matang and Kerian District and managed by the Perak Forestry Department since 1904. It has been acclaimed to be one of the best-managed mangrove forests in the world. Mangrove forest is one of the most productive and biodiversity wetlands on earth. These unique coastal tropical forests are among the most threatened habitats in the world and they are naturally grown and have less economic value, therefore, people and the community ignored the crucial role played by the forest. Study on the exploitation of mangrove ecosystem conservation at Kuala Sepetang, Taiping Perak found that few people from the area lack of knowledge and information of the crucial role played by the forest. They are not guilty of disturbing the mangrove forest with so many activities such as exploitation for aquaculture, industrial projects, cultivation, fire wood, charcoal, piling log, and so on without realizing that these activities if continued without efficient management and action, sooner or later will disappearing the mangrove ecosystems. Disappointingly, some respondents disagreed to contribute some amount of money to support the government effort to preserve the mangrove forest thus, the authority and the government need to increase the awareness among the communities and as a whole by doing promotion and educate the people regarding the crucial of the mangrove forest to the nature must be put in syllabus as a national agenda. So that citizens will appreciate of preserving its continual functions for forestry purposes regardless the gender, ethnics, age and level of education. Therefore, the study aims are to evaluate the awareness on conservation of these precious intertidal forests among the community for the benefits of all.

Keywords: Mangrove Forest, Conservation, Environmental Services, Community

1.0 INTRODUCTION

Mangrove forest is one of the most productive and biodiversity wetlands on earth. These unique coastal tropical forests are among the most threatened habitats in the world. It is naturally grown and comparatively less economic value therefore many people ignored the crucial role played by the forest. However, the people cannot totally to be blamed because they lack knowledge on some of the benefits and the importance

of mangrove forest and the understanding of environmental services. Although the awareness of the importance of conservation may have increased, their knowledge on some of the benefits of conserving the natural ecosystem is still not satisfied.

Some people make easy money by cutting the trees to be used as piling poles in the development of houses, and as a fuel source (fire wood) like charcoal industry. Hence, it destroys the mangrove forest rapidly, and the worse cases are the destroyed of the flora's and fauna's habitats. In fact, the mangrove forest disappearing more quickly than inland tropical rainforests due to little public notice and concerns towards the importance of the mangrove resources. Duke *et al.*, (2007), stated that mangrove forests are declining at such an alarming rate, particularly in developing countries, that these ecosystems may completely disappear within the next 100 years.

Nurkin (1994) assured that the destruction of mangrove forest in South Sulawesi had been affected due to the conversion of mangrove forest to fish farms. Approximately, 70 percent of these forests are also contributed to housing and logging activities for charcoal as well as for paper and pulp industries. The South Sulawesi experienced will also occur in Malaysia if these activities were not being monitored and controlled sufficiently. It is essential and convenience to have adequate knowledge on the major issues requiring the site study area to manage towards conservation purposes.

Kathiresan (2003) stated that the primary causes of habitat destruction occur due to the destruction from the human encroachment. In Vietnam, the use of herbicides by the UD Army resulted in the depletion of 104 123 ha of mangroves which are yet to recover (FAO 1982). Therefore, the issues occur in some countries should be a concern on the mangrove forest in Kuala Sepetang by the communities and government to avoid this problem to occur to the nation.

The key issue in Kuala Sepetang, Matang Mangrove is to understand the relationship between the economic generating activities such as fisheries, charcoal and mangrove poles and precious physical resource of the mangrove. A systematic survey needs to be done to analyse the awareness and response of the local community against the mangrove forest. The survey will be a major data base to the Forestry Department to design or to manage the forest accordingly.

2.0 BACKGROUND/LITERATURE REVIEW

2.1 Mangrove Forest

The uniqueness of mangrove ecosystem is widely acknowledged as a valuable resource for the coastal communities. Mangroves are trees and shrubs that grow in saline coastal habitats in nature. It develops along sheltered coastal shores and estuaries with muddy to the sandy substrate that is alternately covered and uncovered by tidal fluxes. Ellison and Stoddart (1991), defines mangroves as a taxonomically diverse group of salt – tolerant, mainly arboreal, flowering plants that grow in tropical and subtropical regions around the world. Today, mangrove forest is one of the Earth's most rapidly disappearing ecosystems.

In Malaysia, mangrove forests from each of the different states are under the jurisdiction of the Forest Department includes Matang mangrove. Over a century, Matang Mangrove Reserve is reckoned to be a model of environmental protection and has been recognised as an outstanding conservation management of

the wealthy and diverse of wildlife and habitats that thrive throughout the mangrove and mudflats area. The mangrove ecosystem has been a valuable resource for the coastal communities.

FAO (1994) stated that mangrove forests are known as providing a wide variety of goods and services to people, including protection from floods, provision of a range of plant and animal products, sediments trapping and nutrient uptake and transformation. These trees adapted to growing in salty soil and water, protect coastlines from erosion and are a natural barrier to strong coastal storms such as hurricanes. At the same time, the mangrove forest has become a major source of income generation and subsistence for the local communities.

Communities across the globe have increasingly confronted environmental and natural resource management decisions that require expenditures to protect and conserve the ecosystems which lately has been at an alarming rate. Mangroves are susceptible to many threats thus the conservation on mangrove forest must be carried out holistically to ensure a balanced ecosystem. Environmental degradation such as soil erosion, air pollution, water pollution and effects on natural fisheries, wildlife and even the mangrove ecosystem itself can occur if the mangrove forests continue to undergo uncontrolled exploitation.

Environmental services act as a tool for environmental protection that could also contribute to poverty alleviation, and it is the benefits that natural resources provide to the community. Four types of categories of environmental services are water services, carbon sequestration, biodiversity conservation and landscape beauty. Hence, efforts especially awareness among the communities shall be intensified to ensure that the sustainability of it will continue and for the sake of the environmental services provided by the mangrove forest. As threats to the world's ecosystems grow and change, increasing attention has been focused on the essential services that ecosystems provide to humans.

2.2 Overview of Mangrove Forest Reserve in Kuala Sepetang

In Peninsular Malaysia, Matang mangroves in Perak is the largest single mangrove forests with a total area of 40, 466 ha and virtually being run by the Larut Matang Forestry Department. It is an example of the sustainably managed mangrove forests, which has been able to sustain the continuing demand for wood and non – timber resources. Matang came under reservation as early as 1902, and it was not until 1906 that the whole of Matang mangroves was finally gazetted as a Permanent Forest Reserve.

Matang mangrove has been acknowledged as the best-managed mangrove plantations in Malaysia, and even both researchers Gong and Ong (1995) proved this. The main objective is to maximise the sustained yield of wood for charcoal production. Historically the Forest Department in Perak, Malaysia, started the management of Matang mangroves (Hassan 1981). The systematic Matang Mangrove Forest management has been acknowledging by the international body as the well-managed system in the world (Okamura, 2010) and the forest is serving as the source for charcoal, firewood and construction materials for example wood pillars.

The mangrove ecosystem is mostly occupied by the Malays and the Chinese communities mostly involved in agricultural, forestry and fishing sectors which are expected to be dependent either directly or indirectly on the mangrove forest. However, 74% of the Matang mangrove forest is gazetted as protective forests for logging and regeneration while 24% has been selected as the protective area for ecotourism activities and another 1% is kept as virgin jungle reserve purposes. In consequence, extraction from the natural resources

occurred parallel with the guidelines specified to sustain the protective area which has been gazetted. Among the main vegetation types of Matang are:

- a) “Api api – Perapat” type (*Avicennia – Sonneratia*). This type occurs mainly in the accreting mangrove zone. In some areas, *Avicennia* covers vast areas of the forest.
- b) “Berus type” (*Bruguiera cylindrical*), which occurs close to the coast mostly behind the *Avicennia – Sonneratia* species.
- c) “Lenggadai type” (*B. Parviflora*).
- d) “Tumu type” (*B. Gymnorhiza*) which is the climax mangrove forest type, preceding the inland forest.
- e) “Bakau type” (*Rhizophora spp.*) More than 80% of the mangroves are mainly *R. Apiculata* due to reforestation.



Figure 1: *Rhizophora apiculata*

(Source: Tennysonlee.com)



Figure 2: *Rhizophora mucronata*

(Source: Siput Kunning Journal)

Rahim (2005) stated that two main types of Rhizophoraceae species found in Matang area are *Rhizophora apiculata* (bakau minyak) and *Rhizophora mucronata* (bakau kurap) (Figure 1 and Figure 2). However, Rhizophoraceae represents the major species. These two types of species are mostly preferred especially for the production of better and quality charcoal.

2.3 Loss of Mangrove Forest

Mangrove is one of the most productive ecosystems and a natural renewable resource (Kathiresan, 2003). However, on the global scale, mangrove areas are becoming smaller or fragmented, and their long term survival is at great risk (Duke *et al.* 2007). Table 1 shows mangroves forests are dramatically declining in

most areas worldwide and today, mangroves are being degraded and destroyed globally. Table 2 indicates the list of causes of the degradation of the mangrove forest.

Valiela *et al.*, (2001) stated that 35% of the world's mangrove forest area had been lost in the last past two decades at an annual rate of 2.1%. Somehow, in some Asian countries, the losses are in the range of 50 – 80% are due to mangrove conversion for shrimp farming (Wolanski *et al.*, 2000). Worldwide, loss of mangroves has been significant in recent decades, although in some regions of the world mangroves still occur as very extensive forests (Spalding, 1997; Alongi, 2002).

According to Cohen (1997) in his study, it was found that 44% of the world's population living within 150km of coastline, have spurred the widespread clearing of mangroves which eventually cause extinction to some resources due to over exploitation for fuel wood, habitat loss and so on. Regarding the precious values they contributed, mangroves located along much of the coastline of Southeast Asia are threatened by conversion to agriculture or coastal industrialisation and urbanisation (Ong, 1995). Indeed, this is what has happened in many parts of the tropics, where developing countries that had to develop land for a multitude of purposes resort to clearing the valuable mangroves which are a serious matter and in needs for their concerns.

Table 1 Summary status of mangrove area extent over time

Most reliable, recent mangrove area estimate			Mangrove area estimate 1980	Mangrove area estimate 1990	Mangrove area estimate 2000	Mangrove area estimate 2005
Malaysia	ha	year	Ha	ha	Ha	ha
	564 971	2005	674 000	642 200	589 500	565 000

(Source: Forest Department, August 2005)

Table 2 List of causes of mangrove degradation and loss

List of causes	Description
Over – exploitation by traditional users	As populations grow, the demand for products increase and in the absence of sustainable management practices which can lead to the decline in livelihoods of the mangrove.
Commercial utilization	Mangrove forests vitally important to coral reef and commercial purposes such as collecting medicinal plants from the mangrove leaves.
Conversion for other uses	Conversion of the mangrove forest to various forms of land use such as agriculture, salt ponds, urban and industrial developments and constructions of dikes and roads.
Indirect / Off – site activities	Off - site activities, unrelated to the mangrove ecosystem but detrimental to it, for example
Natural disasters	Storm damage, coastal erosion, naturally shifting hydrology, climate change and sea level rise.
Management failure	Lack of understanding and awareness of the value of mangrove ecosystems among various groups of people including policy makers, officials, developers and local people.

(Source: Review of Mangrove Biodiversity Conservation and Management)

3.0 METHODOLOGY

3.1 Data Collection

In this study, both quantitative and qualitative methods were used and it relied on the random sampling and structured data collection which helped to gain results that are easy to summarise, compare and generalise. Leedy and Ormrod (2001) assumed that quantitative research is specific in its surveying and experimentation, as it builds upon existing theories. Research use survey method as one of the research design to study the communities' awareness of environmental services of mangrove conservation. Apart from that, the communities will also be questioned on the knowledge of the benefits of mangrove forest in Kuala Sepetang. The respondents are chosen based on convenient sampling on a voluntary basis since; it is impossible for a researcher to study on the awareness of the whole communities at Kuala Sepetang, the researcher is relying on the sample to acquire a section of the population.

The total population of the area during the two years (2011 to 2012) was identified to determine the sample size, and the calculation is based on the average population (Table 3). A simplified version of the formula by Yamano (1985) is used to help in determining the needed sample as shown in (Eq. 3.1).

Table 3 Number of residential area for the Year 2011 to the Year 2012

Year	Total of Population
2011	2024
2012	2048

(Source: Head of local Community at Kampung Menteri)

$$\begin{aligned}
 \text{Average population} &= \frac{\text{Total Population}}{\text{Number of Year}} \dots\dots\dots (\text{Eq.3.1}) \\
 &= \frac{2048}{2 \text{ years}} \\
 &= \underline{1024}
 \end{aligned}$$

Yamano (1985) suggested that the sample size, n is at 97% confidence interval and a value of precision, w of 0.05 is obtained by (Eq.3.2):

$$\begin{aligned}
 n &= \frac{N}{1 + N(e)^2} \dots\dots\dots (\text{Eq. 3.2}) \\
 &= \frac{1024}{1 + 1024(0.05)^2} \\
 &= \underline{288}
 \end{aligned}$$

Although the calculated sample size is 288, the actual size obtained is 279. The number of respondents used in the analysis was less than the actual due to some questionnaires found incomplete and less cooperation from the respondents.

4.0 RESULTS AND DISCUSSIONS

The awareness, understanding, and attitude of the communities towards the conservation of mangrove forest for the environmental services among the community at Kuala Sepetang Taiping, Perak were identified by using close – ended questionnaire.

4.1 Views and knowledge of communities on declination of Mangrove Forest in Worldwide

Table 4 Knowledge of respondent regarding the declination of the mangrove forest in the world

Knowledge of Respondent regarding the declination of the mangrove forest in the world	Frequency	Percentage (%)
Yes	250	89.6
No	29	10.4
Total	279	100.0

It shows the majority of the respondents (89.6 %) agreed that the mangrove forest is declining throughout the world. Spalding (1997) estimated that there are 181, 399 sq km of mangrove forests in the world and major historical losses have occurred. WWF Global proved this by revealing that more than 35% of the world's mangroves are already gone. Whereas, 10.4 % disagree with the statement maybe due to the convinced that even activities such as logging, turning mangrove woods to charcoal and so on will not cause degradation on the mangrove forest as replanting methods are still to be done according to the cycle stated. This group might also be the respondent directly involved with activity such as charcoal producer, piling log etc. This argument can be supported by the statement from the charcoal factory owner.

According to Mr Chuan Seng, the owner of the Kuala Sepetang charcoal factory stated that careful attention must always be given to specific forest areas where loggers continue to cut mangrove trees according to the guidelines to produce products parallel with conserving the mangrove ecosystem or for natural regeneration.

4.2 Awareness of environmental services as a tool for environment

Table 5 shows that the respondents are aware of the environmental services provided by the mangrove forest to the living nature and the humans. This is proved by the analysis which 96% agreed that environmental services as a tool for environmental protection. To support this statement, Loosely defined 'environmental services' as the benefits that the natural world provides to people and these benefits are numerous and wide ranging, are often substantial where they are frequently ignored in resource use and management decisions. Hogarth (1999) stated that mangroves are also important to a variety of reasons including aquaculture, agriculture, forestry, protection against shoreline erosion, as a source of fire – wood and building material and other local subsistence use.

Table 5 The distribution of respondents awareness of environmental services as a tool for environmental

Respondent awareness on environmental services as a tool for environment	Frequency	Percentage (%)
Yes	268	96.1
No	11	3.9
Total	279	100.0

Nevertheless, 3.9% of the total respondents disagree that environmental service as a tool for environmental protection maybe due to lacking knowledge or low education level. Even though the percentage is comparatively small, but this group may lead to the unsustainable of the natural resources and fail to value the precious mangrove ecosystem.

4.3 Types of environmental services provided by the mangrove forest

There are six options for the respondents to answer this question. The first service delivered by the mangrove forest is landscape beauty. The second is disease protection. The third is biodiversity protection. The fourth is watershed protection. The fifth is climate control and lastly is carbon sequestration. The data obtained are shown in Table 6.

From the survey, it shows that all respondents agreed that the environmental services provided by mangrove forest including climate control, watershed protection, biodiversity protection, disease protection, carbon sequestration and landscape beauty serve and improve the livelihood of the communities and the natural livings. The respondents agreed that the provision of environmental services has the character of a public good. Beside that with proper and efficient management by the relevant authority and with the full cooperation of the communities, mangrove forest area has been able to provide commercial returns and to sustain the conservation benefits to the communities.

Table 6 Types of environmental services provided by the mangrove forest

	Landscape beauty	Disease Protection	Biodiversity Protection	Watershed Protection	Climate Control	Carbon Sequestration
Number of respondent	278 (99.6 %)	279 (100 %)	279 (100 %)	279 (100 %)	279 (100%)	279 (100 %)
Total	279	279	279	279	279	279

4.3.1 Awareness of environmental services as landscape beauty

The respondents agreed that mangrove forest contributes to landscape beauty and the natural beauty of it has made it such an amazingly unique place for tourists both local and international to visits the ecosystem. Table 7 shows that only 3.6% of the respondents disagree that mangrove forest supply landscape beauty as

to them mangrove swamps may look like muddy, an unpleasant place filled with mosquitoes, snakes and spiders.

Table 7 Landscape Beauty

Respondent awareness on environmental services as landscape beauty	Frequency	Percentage (%)
Yes	268	96.4
No	10	3.6
Total	278	100.0

4.3.2 Awareness of environmental services as disease protection

As regards to disease protection Table, eight shows that more than 97 % agreed that the extraction from mangrove tree could be used as indigenous medicine and somehow mostly traditional medicines. Kathiresan (2000) stated that extracts from mangroves seem to have a potential for human, animal and plant pathogens and the treatment of incurable viral diseases like AIDS.

Table 8 Disease Protection

Respondent awareness on environmental services as disease protection	Frequency	Percentage (%)
Yes	271	97.1
No	8	2.9
Total	279	100.0

4.3.3 Awareness of environmental services as biodiversity protection

Table 9 shows that less than 2.0 % of the respondent disagree that mangrove forest serve biodiversity protection and a majority agreed on the statement which comprises total percentages with more than 98.0 %. The ecosystem provides a breeding grounds and nurseries for many food fishes and shellfishes, and they do very often encourage and attract other kinds of wildlife which offers protection to both flora and fauna of the ecosystems. Manson *et al.*, (2005) stated that they are productive habitats and may support coastal fisheries for prawns and fishes.

Table 9 Biodiversity Protection

Respondent awareness on environmental services as biodiversity protection	Frequency	Percentage (%)
Yes	274	98.2
No	5	1.8
Total	279	100.0

4.4.4 Awareness of environmental services as watershed protection

As shown in Table 10, more than 96.0 % of the respondent agreed that mangrove forest contributes service for climate control. Majority of the respondent aware that mangroves have a variety of key features that contribute to their resilience to disturbance, such as tsunami and climate changes. In Malaysia and other Asian countries need mangrove forests for beach protection from erosion and the most important is that it can react as a natural barrier to the Tsunami. Stated in Wild Asia on 30 March 2005, The Malaysian Tourist Industry has recovered from the devastating effects of tsunami once occurred in Langkawi, Penang, and Perak.

Table 10 Watershed Protection

Respondent awareness on environmental services as watershed protection	Frequency	Percentage (%)
Yes	268	96.1
No	11	3.9
Total	279	100.0

4.3.5 Awareness of environmental services as climate control

Table 11 shows that majority of the respondents (98.2%) agreed that mangrove forest serves climate control as one of its environmental services whereas only 1.8% does not agree with the statement. This is may be the respondents' not clear or lacking understanding and knowledge on this declaration.

Table 11 Climate Control

Respondent awareness on environmental services as climate control	Frequency	Percentage (%)
Yes	274	98.2
No	5	1.8
Total	279	100.0

4.3.6 Awareness of environmental services as carbon sequestration

Table 12 shows that approximately 68 % of the respondent disagreed that carbon sequestration is one of the environmental services contribute to mangrove ecosystem. Barely, only 31.9% of the respondent agreed with the statement. This indicated that the respondents are lacking knowledge and does not understand on carbon sequestration which is essentially function to capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere or to prevent carbon emissions produced by human activities from reaching the atmosphere.

Table 12 Carbon Sequestration

Respondent awareness on environmental services as carbon sequestration	Frequency	Percentage (%)
Yes	89	31.9
No	190	68.1
Total	279	100.0

4.4 The Willingness to Pay from the Respondents for Conservation of Mangrove Forest

Table 13 Respondent willing to contribute donation to conserve the mangrove forest

Respondent willing to contribute some donation to conserve the mangrove forest	Frequency	Percentage (%)
Yes	123	44.1
No	156	55.9
Total	279	100.0

As shown in Table 13, the respondents are willing to pay or contribute a small amount of money to the conservation and preservation of the mangrove ecosystem from degradation. From the survey, an ecosystem which they would benefit from them regarding the provision of raw materials and its importance are such as soil retention, natural disasters, and climate regulations. Referring to those 156 respondents that are unwilling to contribute to the conservation may be due to the fact that they do not benefit directly from the preservation resource and their perceptions of the conditions of living will just be the same unless contributions done will improve more and benefits them in terms of living style, economics and fair payback will be achieved. Naturally, the work found that if all sides give contributions, benefits should be received equally and justly too. Apart from that, to enhance all party to involve in the contributions for mangrove conservation, awareness alongside with concerns of the potential benefits derived from the forest should be nurtured at an early stage.

There are four options for the respondents to answer this question which is related to question in Part C No. (1) That answered 'Yes'. The first amount of contribution is RM 1- RM5 followed by RM 6 – RM 10, RM 11 – RM 15 and RM16 – RM20. The data obtained were presented in Table 14.

Table 14 The amount of contribution that the respondents willing to contribute to preserved the mangrove forest (per year.

Amount Contribution per year	Frequency	Percentage (%)
RM 1 – RM 5	53	43.8
RM 6 – RM 10	60	49.6
RM 11 – RM 15	5	4.1
RM 16 – RM 20	3	2.5
Total	121	100.0

It can be seen that the amount of the contribution that the respondents willing to pay per year for the mangrove ecosystem conservation. As regards for the 121 respondents that are ready to pay as they realised the significance of the mangrove does affect their livelihood as well as the sacrifice that they are willing to make for the future generations. More than 90% of the respondents agreed or volunteered to contribute RM 10.00 or less to the authority. It is a good indicator that the communities are concern about the needs of mangrove forest to be preserved and control.

5.0 CONCLUSION

Therefore, the study concludes the majority of the respondents agreed that the mangrove forest is declining throughout the world and the benefits from the resources will correspondingly be affected. However, there are still insufficient from the respondents still unaware on this matter due to lacking knowledge or low education level. Even though the percentage is undeniably small, but this group may indicate to the unsustainable of the natural resources and fail to value the precious mangrove ecosystem. It shows that the sustainability of the mangrove forests was influenced by several factors, constraints and obstacles. Occasionally, in many parts of the world, their mangroves are also being threatened and converted for other land uses and activities. Thus, it is clear that there is a need to restore, manage and conserve the mangrove ecosystem sustainability since these mangrove forests are considered to be an outstanding significance or critical importance. Nevertheless, the human activities can cause degradation towards the mangrove forest reserve if the influence of conservation value towards mangrove forests is not present.

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