

## PUBLIC PERCEPTION TOWARDS SUSTAINABLE MANGROVE FOREST PROGRAMS IN MALAYSIA

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**Abstract:** The mangrove forest has been an important vegetative aspect in maintaining an ecosystem balance. Among its benefits is to cover the source of timber, charcoal, woods, herbs, and fish and shrimp culture where all of this can be valued as economic resources. Even with vast benefits it offers, the number of mangrove forests are constantly declining and if there are no actions being taken, the mangrove forests may face the possibility of extinction. Degradation of mangrove forests in Malaysia is mainly due to development and agriculture. A sustainable mangrove forest is not something that is newly introduced in Malaysia as the Matang forest is known for its sustainable forest management for over 100 years. Sustainable mangrove forest programs do not only involve the necessary authorities but also the public as their participation in replanting and managing the mangrove forest. Thus, this study aims to determine the public perception towards sustainable mangrove forest programs in Malaysia. Data were collected via face-to-face interviews with respondents from the states which have high percentage of mangrove forests such as Perak, Sabah, Selangor, Johor, and Pahang. Prior to actual data collection, a pilot study was conducted in Kuala Selangor with 100 respondents. Respondents were selected by using a simple random sampling technique from mangrove and non-mangrove areas with a total of 871 respondents. Data collected were analyzed using descriptive analysis and chi-square analysis. Descriptive analysis has found that the public perception towards the importance of mangrove forest is high with the overall mean score of 4.09. The chi-square analysis revealed that gender, age, education level, income, marital status, and family members have significant relationships with the public perception towards sustainable mangrove forest programs. The insight of this study can help the government and NGOs to organize campaigns and programs related to sustainable mangroves forest more effectively.

Keywords: Environment, Mangroves, Perception, Sustainable forest

### Introduction

Mangrove forest is a unique ecosystem. It has many functions: providing flora and fauna a breeding site, maintaining a balanced ecosystem as a natural barrier to tsunamis and preventing shoreline erosions. (Barbier *et al.*, 2008; Cochard *et al.*, 2008). According to Stanley and Lewis (2009), mangroves can be broadly defined as a woody type of vegetation occurring in marine and brackish environment. FOA (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. They also become a boundary

of two environments. Mangroves have evolved with a variety of survival and reproductive strategies to deal with the extreme environment which is in muddy and high-saline water (Lewis, 2005; Ewel, Twilley, and Ong 1998; Roy, 2013). 40% of mangroves in the world occur in Asia and 11.7% of Southeast Asia mangroves are found in Malaysia as shown in Figure 1. The distribution of mangrove forests mainly occurs in Sabah and Sarawak. In Peninsular Malaysia mangrove forests are concentrated in Perak, Johor and Selangor (FAO, 2007). There are also other wetland forests such as marshes, estuaries, mudflats, mires, ponds, fens, swamps, deltas, coral reefs, billabongs, lagoons, shallow seas, bogs, lakes, and floodplains as shown in Figure 1 (Spalding, 2010).

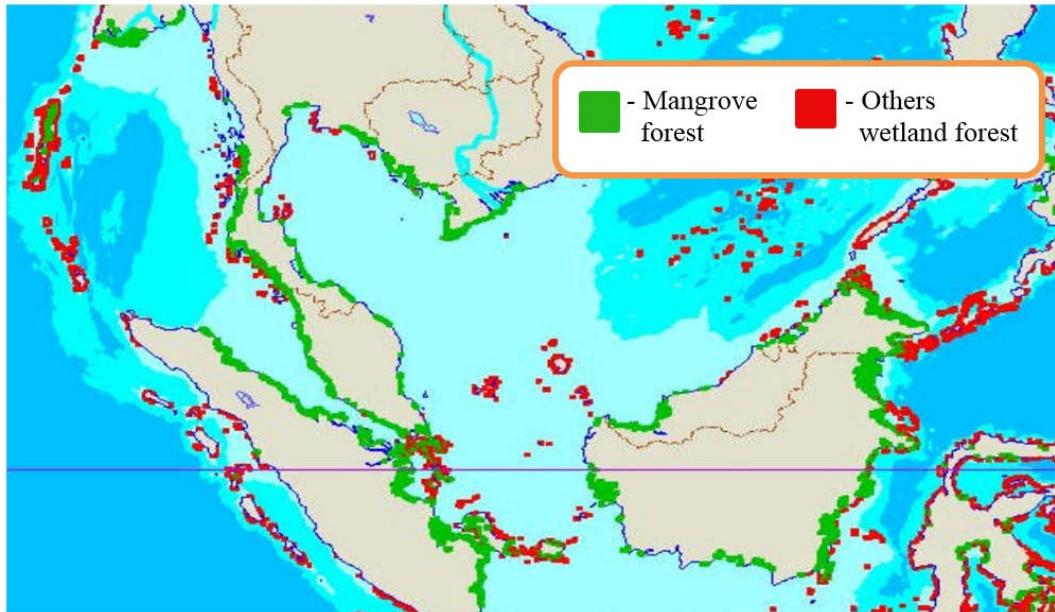


Figure 1: Mangrove forest distribution in Malaysia  
Sources: World Mangrove Atlas (Spalding, 2010)

Mangroves have main functions: shoreline protection, food web support, and carbon sequestration (FAO, 2007). Barbier *et al.* (2008) stated that mangroves can buffer the impact of waves, storm surges, and tsunamis on coastal areas and stabilize the coastline from natural erosion at the same time. Mangroves also provide shelters to many species of fish, shrimp, mollusk, and birds. They also play a role as the breeding area for many species since they are protected from high waves (FAO, 2007; Mastaller 1997). Study also found that Mangroves have doubled the living biomass where they can impound almost 1.24 metric tons of carbon per hectare per year (Hutchison, 2014; Fujimoto, 2004).

Even with vast benefits, Mangroves throughout the world are facing many threats such as pollution, deforestation, aquaculture farming, and rising sea-level (Giri, 2011). In Asia, most of the Mangroves are being converted into large scale of shrimp farming (Abdullah, 2013). In the past decade records have shown that mangrove forests have been decreasing at more than 40% (FAO, 2007). Study by Wells (2006) for UNEP, estimated that mangrove

forest loss might reach up to 60% by the year 2030. Thus, there should be a serious effort to ensure that mangrove losses can be controlled.

Matang mangrove forest has been a popular example of a successful sustainable mangrove forest not only in Malaysia but also in Southeast Asia (Gan, 1993). Over the years, only 250 hectares of Matang mangrove forest have been replaced for necessary development and there have been a net gain of about 1,498 hectares (Abdullah, 2013). The 40,000 hectares of Matang forest reserve is primarily a production forest, but it is also important from its biodiversity point of view. There are many sustainable mangrove forest programs being actively conducted all over Malaysia. As an example, Kuala Selangor Nature Park in Selangor River is home to more than 140 bird species, various wildlife and fireflies. The program has successfully increased the mangrove areas and has become a tourist attraction area (Latif, 2012). RAMSAR Convention, also known as The Convention on Wetlands of International Importance (2003), has classified a few areas such as Pulau Kukup State Park, Sungai Pulai Forest Reserve, and

Tanjung Piai State Park as RAMSAR sites. These areas are not only identified as important for shoreline protection but also act as habitats for many threatened species (Hilton-Taylor, 2000). Sabah and Sarawak have their own programs in order to sustain and conserve mangrove forest including replanting and turning mangrove forest areas as reserve forest (DWNP, 1987). The Sabah Forestry Department (2010) has made restoration programs for mangrove areas around Putatan, Kunak, Lahad Datu, Semporna, and Tawau. Study by Chai (2005) indicated that important mangrove areas in Sarawak are Matu-Daro and Sibul Swamp Forest where both areas have been designated as Forest Reserves and Protected Forest, respectively.

Haron (2005) revealed that public participation level is low in certain sustainable programs. Another study by Omran *et al.* (2009) also found that low participation rate by the household in recycling solid wastes because of lack of initiative by the government to make recycling more approachable. Distance also is a major role for the public on deciding to participate in the sustainable program. Living in the city, far from mangrove forest areas, also gives a negative impact in the public intention to participate in sustainable programs (Bramley, 2009). The public tend to be more involved in sustainable programs if the government or any NGO agency are actively and continuously promoting it (O'Faircheallaigh, 2010). A-Jalil (2014) found that the reason the public does not participate in environmental activities is because they thought their action would change nothing.

Involvement of local communities is vital to ensure a successful conservation of mangrove forests since they depend on these resources in their daily lives (Eddy, 2017). Thus, this study aims to determine the public perception towards sustainable mangrove forest programs in Malaysia.

## **Methodology**

The sampling areas for this study consist of the public who live near or close to mangrove areas and non-mangrove areas. The sampling area in mangrove areas was selected within 5 km radius from the mangrove forest boundary. The selected areas are determined by the districts that have mangrove forest (Zhang, 2012; Roy, 2013). Out of all states in Malaysia which have mangroves, only a few states with high percentage were selected as sampling areas. From the selected states (Sabah, Johor, Pahang, Perak, and Selangor), only districts with high mangrove forest concentrations were picked as the final sampling areas. Around 53% of mangroves in Malaysia can be found in Sabah and the remaining is in Peninsular Malaysia (Abd. Shukor, 2004). In Peninsular Malaysia, 40.83% of mangroves are concentrated in Perak, which include the Matang Mangrove forest, followed by Johor with 23.54%, and Selangor with 14.16% of mangrove forests. In the East Coast of Malaysia, Kuantan, Pahang was chosen as it has 10.77% of mangrove forest which is concentrated near Sungai Pahang.

Table 2. Result of Most Probable Number and PCR analysis of *Bacillus cereus* in local unhusked rice

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 (2011); Sarawak Forestry Department (2012)

A pilot study with 100 respondents was conducted in Selangor to test and ensure the questionnaire is legit for the research. A detailed questionnaire specifically designed to target public perception towards sustainable mangrove forest programs were distributed by researchers in the target areas. Face-to-face interviews were conducted with the respondents to ensure they did not have any confusion while answering the survey. Respondents were selected randomly in the target areas and most of them are local people. Within the period of eight months, a total of 871 questionnaires were successfully collected from all areas.

The data collected was analyzed using descriptive analysis and chi-square analysis. Descriptive analysis was used to analyze the general information of the respondent's background such as age, gender, income, educational level and more. Mean score was used to study the public perception level towards the importance of mangrove forests in Malaysia.

For mean score analysis, specific questions related to the respondent's perception were chosen from the data collection to understand their perception level. Chi-square analysis was conducted to determine any significant association between socio-demographic profile and the public perception towards sustainable mangrove forest programs in Malaysia.

## Results and Discussion

### *Socio-demographic profile of the respondents*

The results in Table 2 show the summary of respondent's demographic profile in frequency and percentage values in order to make it easier to comprehend. For gender, the male and female respondents can be viewed as equal, where 47.4% (413 respondents) represents male respondents and the female respondents are 52.6% (458 respondents).

Table 2: Socio-demographic profile of the respondents (n=871)

Demographic Characteristic	Frequency	Percentage (%)
<b>Gender</b>		
Male	413	47.4
Female	458	52.6
<b>Age</b>		
Below 19	59	6.8
20 to 29	401	46.0
30 to 39	230	26.4
40 to 49	127	14.6
50 and older	54	6.2
<b>Race</b>		
Malay	446	51.2
Chinese	220	25.3
India	132	15.2
Others	73	8.4
<b>Status</b>		
Single	416	47.8
Married	455	52.2
<b>Living area</b>		
Close to mangrove (Within 5km from mangrove forest boundary)	498	57.2
Close to town	373	42.8
<b>Household size</b>		
1 to 2 person	114	13.1
3 to 4 person	291	33.4
5 to 6 person	306	35.1
7 person and more	160	18.4
<b>Education level</b>		
Primary	5	0.6
Secondary	153	17.6
Diploma	270	31.0
Bachelor	355	40.8
Master and higher	88	10.1
<b>Occupation</b>		
Government	320	36.7
Private sector	238	27.3
Self employed	119	13.7
Looking for job	26	3.0
Students	168	26.5
<b>Income level</b>		
1500 and below	270	31.0
1501 to 2500	166	19.1
2501 to 3500	163	18.7
3501 to 4500	122	14.0
4501 to 5500	90	10.3
5501 and higher	50	6.9

Most of the respondents were between 20 to 29 years old (46.0%) followed by 30 to 39 years old (26.4%). Thirdly, the respondents between 40 to 49 are shown as 14.6% (127 respondents). The result also shows only 6.8% (59 respondents) from the total respondents are below 19 years old. Lastly, the group that consists of 50 years old and older is only represented by 54 respondents (6.2%). The age range of respondents shows that most of them are in their early adulthood (Erikson, 1994). This is the major age range where they are at their peak of physical and mental health. Also, this is the time where their careers start to stabilize and they possess the ability to think straight and make wise decisions (Erikson, 1994). The majority of the respondents are Malay (51.2%), followed by Chinese (25.3%), Indian (15.2%) and others (8.4%). In terms of marital status, the majority of the respondents are married (52.2%).

Around 57.2% of the respondents have chosen to live in areas close to mangrove forest areas. This captures a more honest perception of the respondents and they have more sense of responsibility to get involved in mangrove forest programs. Furthermore, this ratio of respondents is important to see if there is any relationship between area of living and the intention to participate in the sustainable mangrove forest programs (McDonald, 1998; Shunula, 2002). Educational level is divided into five categories and 40.8% (335 respondents) of the respondents have finished their bachelors, followed by diploma with 31.0% (270 respondents). The highest level in education category is Master or higher, where 10.1% (88 respondents) stated that they have it. The minority of the respondents which were represented by 0.6% (5 respondents) stated that they only finish up until primary school level of education.

Even though the respondents' educational level is quite high, this do not correspond with their income level. Most of the respondents have income level of RM1500 and below as represented by 31.0% of them. This can be a result of most of the respondents of this study is in their young adulthood stage. Most

of them have just finished their studies or have just started their jobs. Middle income level of RM1501 to RM2500 and RM2501 to RM3500 are represented by 19.1% and 18.7% of the respondents, respectively. The number of respondents significantly decreases as their income range increases where; RM3501 to RM4500 shows a representation of only 14.0%, RM4501 to RM5500 shows only 10.3%, and finally 6.9% of respondents have income more than RM5501. The majority of the respondents have a household size of 5 to 6 people which is represented by 35.1% of the respondents (306 respondents), followed by a household size of 3 to 4 people, which consists of 33.4% (291 respondents) of the total respondents. This is followed by 114 respondents who stated that they live alone or with a partner. There are 88 respondents (10.1% of total respondents) who have stated that their household size consists of 7 people and more.

#### ***Public perception towards mangrove forest***

The mean score is used to see the respondents' perception towards the general uses of mangrove forest and the probability of their participation if there is a sustainable mangrove forest program. Table 3 shows the mean score of public perception. The results revealed that public perception towards the importance of mangrove forests are high with the overall mean score of 4.09. The results also revealed that the majority of the respondents knew and believed that mangrove forests are important in protecting a large amount of exotic plants and animals with the mean score of 4.27. They also believed that mangrove forest functions as a natural barrier (mean score of 4.16) and provides timber, fuel, food, and other forest products (mean score of 4.11). Respondents which have the general knowledge about mangrove forest, lack the sense of ownership which will thereby make them to not feel responsible in the care for it (Shunula, 2002).

Table 3: Respondent’s perception towards the importance of mangrove forests (mean score)

Statements	Mean*
I believe mangrove forest will protect a lot of exotic plants and animals.	4.27
I believe mangrove forests can serve as natural barriers to tsunamis and torrential storms.	4.16
In my opinion, mangroves can provide community with timber, fuel, food, medicinal herbs and other forest products.	4.11
To me, participant in these programs can get more positive inputs.	4.10
I believe everyone can participate in sustainable mangrove forest programs	4.05
In my opinion, mangrove forests can provide ecotourism attraction	4.00
In my opinion, it is fun to participate in sustainable mangrove forest programs.	3.93
Overall mean score (n=871)	4.09

\*Notes: 1= Completely disagree, 2= Disagree, 3= Neither agree nor disagree, 4= Agree, 5= Completely agree

The results also show that there is a positive perception towards participation in sustainable mangrove forest programs where the scores are quite high; 4.10 and 4.05, respectively. With a mean score value of 4.00, respondents believed that mangrove forests can be developed as ecotourism spots. Badola (2012) also found that the public agree if mangrove forests have been converted into eco-tourism spots. Respondents believed that the programs can be participated by all age groups and that the participants can get positive input out of these programs.

Socio-demographic relationship with public perception towards sustainable mangrove forest programs

In determining the association between public perception towards sustainable mangrove forest programs and socio-demographic characteristics, Chi-square analysis was employed. In achieving the objective, these hypotheses have been postulated:

H<sub>0</sub> = There is no association between public perception towards sustainable mangrove forest programs and their socio-demographic characteristics

H<sub>a</sub> = There is an association between public perception towards sustainable mangrove forest programs and their socio-demographic characteristics

The results show that there are several socio-demographic characteristics that have an association with public perception towards the mangrove programs, namely: gender, age, education, income, marital status, and family members as shown in Table 4. According to Coulibaly-Lingani (2011), socioeconomic and demographic of respondents and their participation in the sustainable mangrove forest programs are indeed related.

Table 3: Respondent's perception towards the importance of mangrove forests (mean score)

Socio Demographic Characteristics	$\chi^2$	df	Significant	Decision
Gender	8.504	1	0.004*	Reject Ho
Race	0.099	3	0.992	Fail to reject Ho
Age	15.450	4	0.004*	Reject Ho
Area of living	0.223	1	0.637	Fail to reject Ho
Education	33.243	4	0.000*	Reject Ho
Income	20.426	5	0.001*	Reject Ho
Occupation	8.257	5	0.143	Fail to reject Ho
Marital status	5.115	1	0.024**	Reject Ho
Family members	11.383	3	0.010**	Reject Ho

Notes: \*Significant at 1% level, \*\* Significant at 5% level

Area of living does not have an association with public perception towards sustainable mangrove forest programs. This means that for the locals to use and benefit from the forests are far important and it would be difficult for locals to be involved in forest management (Dolisca, 2006). The public will be more aware and willing to make a change if the program is in their favor and benefits them (McDonald, 1998; Agardy 1993). Furthermore, the level of education also plays a vital role in public perception towards participation in the mangrove forest programs. It is proven that the people with higher education are more aware about the importance of balancing the ecosystem and sustaining it (Coulibaly-Lingani, 2014). Zhang (2012) reveals that high education level does have an association with knowledge and awareness of respondents that influence the attitude towards participation in sustainability of mangrove programs.

## Conclusion

This study aims to determine the public perception towards sustainable mangrove forest programs in Malaysia. From this study, it is found that the public perception towards the importance of mangrove forests is high. This can be seen with the overall mean score of 4.09 over the statements focusing on the mangroves' functions and benefits. The public is favorable

towards sustainable mangrove forest programs where they believe their participation can give positive impact to the environment. They also have the mind that mangrove forests are suitable for ecotourism attraction and give them more options for leisure activities. The study also has found that six socio-demographic factors have association with public perception towards sustainable mangrove forest programs. Gender, age, education level, income, marital status, and family members play important roles in public perception towards sustainable mangrove forest programs in Malaysia. Area of living do not indicate an association with public perception towards sustainable mangrove forest program. Thus, not only local communities but every person needs to sustain mangrove forests in the country. Level of education does play a vital role towards public perception and government can carry out more campaigns and promotions to make this program more recognizable by the public. Frequent campaigns or seminars, for instance can help to establish positive perception of the public towards the importance of mangrove forests to the ecosystem.

The government and the private sectors can join hands in managing mangrove forests and develop it as a public attraction as a way to make it more of a family-friendly public attraction spot. Public participation can benefit the government to fill in the gaps of information. This can help

the policy makers to be more aware of all the options that they have in order to remove any potential obstacles in implementing a policy. A detailed policy in maintaining and managing mangrove forests should include; public, developers, investors, and tourists. This can ensure that everyone knows the policy as well as the rules and regulations regarding mangrove forests, thus reducing the risks of damages and losses of areas of the forest. Furthermore, any activities or projects that may cause damage of the forest need to be ruled out. The findings of this study would be able to assist the government and NGOs to organize campaigns and programs related to sustainable mangrove forests more effectively.

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