Community Awareness on Domestic Waste Disposal Towards Its Impact to the Sustainability of Mangrove Forest in Kuala Selangor

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Abstract. Mangrove forest in Kuala Selangor has seen to be depleting over the years. This study believes that domestic waste disposal is considered as one of the treats to mangrove forest. Local community must play their role in protecting the mangrove forest. This study aims to determine the level of knowledge of the community on the importance of mangrove, level of awareness of the impact of domestic waste disposal to mangroves and their level of practice on proper domestic waste management. Besides, this study aims to identify the correlation between community awareness with knowledge and practice. Structured questionnaire was used to collect data and analyzed using SPSS version 26 software. The finding shows that the level of knowledge of the community on the importance of sustaining mangrove forest is high (n = 256, 85.3%), the level of awareness of community on the impact of domestic waste disposal is also high (Mean = 4.48), while the level of community practice on proper domestic waste management is moderate (Mean = 3.9). The correlation test showed that there was a negligible correlation between knowledge and awareness of community (r = 0.14, <0.05, n = 300) and also weak positive correlation between awareness and practice with (r = 0.33, p < 0.01, n = 300). The finding suggests community with great knowledge does not necessarily have great awareness as well not necessarily with great awareness, community will practice good waste management to secure mangrove forests. Thus, this study recommends strictly enforcing all parties to comply/implementing control at source method, or develop appropriate management plans to reduce domestic waste disposal at mangrove areas.

1. Introduction
Mangrove’s ecosystem is vital to the environment, flora and fauna and also to human life. It performs multifaceted role, including the interactive relationship with the neighboring habitat and sheltering diverse species [1]. It is a treasured storehouse of the nature and particularly production of fish and shellfish. Mangroves also acts as a barrier and first line defend to the coast beyond them as the existing of mangroves in an area can prevent soil erosion to happen. Unfortunate event in 2004 has shown many coastal areas has received huge damage due to tsunami, however in area where mangroves were existing, less damage was recorded [2].
In Peninsular Malaysia, mangroves can be found wild in the sheltered coastlines of Kedah, Perak, Selangor, and Johor; that was bordered by the Straits of Malacca [3]. In Kuala Selangor which located at the northern districts of Selangor has shown the reduction of mangrove area which is from $5.1 \text{ km}^2$ in year 2014 to $4.4 \text{ km}^2$ in 2018 [4]. Despite the advantages of mangroves that can benefit human and other living things, a situation where mangroves forest depleting year by year around the world is still happening.

Mangroves are vulnerable to accumulation and retention of potentially harmful debris, with evidence of a less efficient retention and selective sorting of materials back to the water body closer to their coastal edges [5]. It is an efficient trap for particles and objects which will cause potential smothering pneumatophores and knee-roots [6]. Study in Kendari Bay, Indonesia has showed mangrove roots become traps inorganic trash that is carried or disposed of directly by the surrounding community [7]. Other than that, solid waste that has been thrown to sea by the community near the coast of Metinaro has seen trapped in the roots of $S. \text{ alba}$, $Avicennia$ spp., and $Rhizophora$ spp causing the tree lenticels closed and reducing the uptake of oxygen for active transport in the roots [8].

According to these studies, domestic waste is one of the treats to mangroves. Illegal dumping and poor waste management practice can cause the accumulation of harmful debris at mangrove area. Anthropogenic marine debris (AMD) that are coming from land based can originate from littering or dumping and also poor waste management practice [9]. Unfortunately, the issue of marine debris accumulation in mangroves has been largely neglected [10].

As mentioned above, domestic waste disposal is one of the factors that can contribute to the deterioration of mangrove forest, thus community awareness regarding on this issue is important. Lack of local community awareness is considered as the main problem in weakening the local community participation in mangrove management [3]. Therefore, in this study, the community knowledge, awareness and practice on the impact of domestic waste disposal to the sustainability of mangrove is determined. This study also aims to determine the correlation between community awareness with their knowledge and practice.

2. Materials and Methods

2.1 Research framework.
Firstly, the questionnaire was developed and later checked by expert panels on the relevancy of the questionnaire. Afterwards, a pilot test was carried out to check the reliability of the questionnaire. Then, the questionnaire is distributed on online platform and targeted only to the community in Kuala Selangor. After data was collected, analysis was done by using SPSS version 26 software.

2.2 Study area and target population.
Kuala Selangor is one of the precincts in Kuala Selangor District and is located between $3^\circ \text{ 10'}\text{N to 3}^\circ \text{ 34'}\text{N}$ and between $101^\circ \text{ 6'}\text{E to 101}^\circ \text{ 30'}\text{E}$ and covers an area of $21.6 \text{ km}^2$ [4]. Kuala Selangor district is situated on the west coast of peninsular Malaysia ($3^\circ \text{19'}\text{N, 101}^\circ \text{15'}\text{E}$) in Selangor [11]. The location of Kuala Selangor as shown is figure 1.
Figure 1. Kuala Selangor [12]

Kuala Selangor has population of 10,348 [13]. The sampling size for this survey is 370 households that is required to answer the questionnaire [14]. The respondents were drawn randomly from community in Kuala Selangor [15]. The questionnaire was distributed among Kuala Selangor community in which the target respondents were noticed by the author before they fill up the questionnaire.

2.3 Survey instrument
Quantitative approach was used for this research project. This project focused on descriptive research which is structured questionnaire. The questionnaire was consisted of 4 sections, section A, B, C and D. Section A was focusing on demographic profile of the respondent which include age, gender, education, occupation, income and number of households. Section B was assessing the knowledge of the community on the importance of mangrove forest, while Section C was assessing the awareness of the community on the impact of domestic waste disposal to mangrove and lastly was section D which assessing the practice of community on domestic waste management. The questions were developed and adopted through study conducted [15]. The items in questionnaire were constructed in two different forms which were dichotomous variable (yes or no) and likert scale.

2.4 Validity and Reliability analysis
The questionnaire was sent to expert panels to check on Content Validation Index (CVI). Experts that validated the questionnaire were Associate Professor Dr. Norizah Binti Kamarudin and Associate Professor Dr. Latifah Binti Abd Manaf. Both experts are from University Putra Malaysia. The score given by the experts was (CVI = 0.86) [16]. The value of the CVI showed that the items in the questionnaire are relevant. The acceptable CVI values is at least 0.80 when the number of experts who validate the questionnaire is two [17]. Pilot test was carried out to test the feasibility of the questionnaires. Ten percent of the total sample respondents were used to conduct the pilot test, thus 37 respondents out of 370 respondents were used for the test. The Cronbach's alpha was computed for each of the section by using SPSS version 26. The result of Cronbach’s alpha for each of section in the questionnaire as shown in table 2.

| Table 2. Cronbach’s alpha for each section of questionnaire. |
|----------------------------------------------------------|
| Section | No. of Item | Cronbach’s alpha |
|------------------|-------------|------------------|
| A. Knowledge     | 10          | 0.62             |
| B. Awareness     | 10          | 0.96             |
| C. Practice      | 10          | 0.91             |
A general accepted rule is that $\alpha$ of 0.6-0.7 indicates an acceptable level of reliability, and 0.8 or greater a very good level [19]. The result from the reliability analysis showed that the items in questionnaire can be proceeded.

2.5 Data collection technique
Data from community in Kuala Selangor was obtained through online platform in Google Form. Google Forms is ideal for sending out a short questionnaire, charting the results or exporting them for analysis to a spreadsheet [20]. Target respondents were given a link to access the Google Form and they were required to answer all the questions in the questionnaire. The questionnaire was written in Bahasa Melayu. A short note about the study was stated along with the questionnaire link so that the respondents will understand about the importance of this study and willing to participate. The respondent was told that their answers will not be exposed to other parties. Total respondents that answered the questionnaire was 300 respondents. Then, the collected data were transferred to Microsoft excel and analyzed by using SPSS version 26 software.

2.6 Statistical analysis
Data was analyzed by using SPSS version 26 software. Descriptive analysis was used to find the frequency and mean score of items in Section A, B, C and D. Normality test is run to check the distribution of data. Since collected data was not normally distributed, correlation test was used to interpret the relation between awareness and knowledge and also between awareness and practice.

3. Result and Discussion
3.1 Demographic profile
Demographic analysis is conducted to understand the nature of population in Kuala Selangor. There were 300 respondents who had answered the questionnaire.

3.1.1 Gender
Result from demographic analysis showed that majority of the respondents were female ($n=176, 58.7\%$) while the rest of the respondents were male ($n=124, 41.3\%$) as shown in figure 2.

![Gender](image)

Figure 2. Gender background.

3.1.2 Age.
The age group of the respondent mostly were from 20-30 years old ($n=146, 48.7\%$) followed by the age group from 51-60 years old ($n=77, 25.7\%$), 31-40 years old ($n=13.3\%$), 41-50 years old ($n=23, 7.7\%$), 61-70 years old ($n=10, 7.7\%$). Lastly, the smallest age group is 17 years old ($n=1, 0.3\%$) and 72 years old ($n=1, 0.3\%$). Overall the age background provides an insight from every level of age background as shown in figure 3.
3.1.3 Education.
Most of the respondents has higher education background which is \(n=178, 59.3\%\), second higher of education background is diploma \(n=58, 19.3\%\) followed by secondary school \(n=38, 12.7\%\) and with certificate level \(n=26, 8.7\%\). The pie chart in figure 4 shows the percentage of respondent’s education background.

![Figure 4. Education background.](image)

3.1.4 Occupation.
For occupation background, \(n=181, 60.3\%\) of respondents work in private sector. Total number of respondents who works in government sector and self-employed is equal which is \(n=35, 11.7\%\) respectively. Meanwhile, respondents who are unemployed is \(n=36, 12\%\) and respondents who are students has a total number of \(n=13, 4.3\%\). Figure 5 shows the percentage of respondent’s occupation.
3.1.5. Income.

The range of income in the questionnaire survey consisted from less than RM 1000 to more than RM 4000. Respondent with income of more than RM4000 has the highest number of respondents (n=79, 26.3%) followed by income with RM 2001 to RM 3000 which (n=75, 25%), RM 1000- RM 2000 (n=60, 20%), RM 3001- RM 4000 (n=47, 15.7%) and lastly respondent with income less than RM 1000 is (n= 39, 13%)The percentage of respondent’s income is shown in figure 6. The highest group of income can be assumed with the majority of respondent that have age number between (20-30) years old and (51-60) years old as most of them has stable income during the age group.

3.1.6 Number of households.

The respondents also were asked about the number of their household. From the analysis, the number of households with less than 4 has the highest number which is (n=134, 44.7%). Number of households with 4 to 6 people has value of (n=126, 42%). Respondents with household numbers between 7 to 9 people is (n=36, 12%) while respondents with household 10 and more people has the smallest number which is (n=4, 1.3%). Figure 7 shows the percentage of number of households of the respondents.

![Figure 5. Occupation background.]

![Figure 6. Income background.]

![Figure 7. Number of households.](image-url)
3.2 Level of knowledge on the importance of mangrove forest.
The score on the level of respondent’s knowledge on the importance of mangrove forest were set into three categories which are high, moderate and low. Table 2 shows the categories of scoring for the level of knowledge.

Table 2. Score categories of the level of knowledge.

| Score | Categories |
|-------|------------|
| 8-10  | High       |
| 5-7   | Moderate   |
| 0-4   | Low        |

According to the analyzed data, most of the respondent has gained high score on their level of knowledge which is \( n=256, 85.3 \% \), \( n=41, 13.7 \% \) of the respondents has gained moderate score while only \( n=3, 1 \% \) of the respondent has low score. Figure 8 shows the percentage of respondents with the score on their level of knowledge on the importance of sustaining mangrove forest. From the data shown, it can be said that the community of Kuala Selangor has high level of knowledge on the importance of sustaining mangrove forest.

Figure 8. Score of the respondents on the importance of sustaining mangrove forest
3.3 Awareness of the community on the impact of waste disposal on mangrove forest

From data tabulation in Table 3, the descriptive analysis has shown that the mean of score of each item is ranging from 4 to 5 for each of the items. From the descriptive of analysis, the awareness of the community toward the impact of waste disposal is high as the mean score is (Mean=4.48). The lowest mean score is item number 4 (Mean = 4.18). The statement is about the invading of pest to mangrove area due to accumulation of domestic waste. Since the middle ages, we know that they can contribute to human disease as black rats were associated with distribution of plague [21]. Thus, community need to aware on this important aspect. Besides, item number seven also has low score which the mean value is [Mean =4.38]. Greater awareness needs to be emphasized on the impact of plastic materials to mangrove forest as plastic material can cause the mangrove root system to not functioning well and eventually can lead to mortality [7].

| Item                                                                 | N   | Min. | Max. | Sum  | Mean | Std. Deviation |
|----------------------------------------------------------------------|-----|------|------|------|------|----------------|
| C1. Dumping of domestic waste into river body will cause accumulation of waste in mangrove forest | 300 | 1    | 5    | 1374 | 4.58 | 1.000          |
| C2. Accumulation of domestic waste at mangrove forest will cause disruption to organism that lives in that area such as mollusk. | 300 | 1    | 5    | 1365 | 4.55 | 1.005          |
| C3. Dumping of domestic waste at mangrove forest will cause an unaesthetic appearance to its area | 300 | 1    | 5    | 1387 | 4.62 | .937           |
| C4. Accumulation of domestic waste at mangrove forest will invite pests to the area | 300 | 1    | 5    | 1255 | 4.18 | 1.111          |
| C5. Accumulation of domestic waste in mangrove forest will produce bad odor to the area. | 300 | 1    | 5    | 1375 | 4.58 | .941           |
| C6. Mangrove forest will lose its values due to the accumulation of domestic waste in that area | 300 | 1    | 5    | 1357 | 4.52 | .996           |
| C7. Over used plastic material in a household can cause pollution at mangrove forest | 300 | 1    | 5    | 1315 | 4.38 | 1.083          |
| C8. Plastic waste from household will stuck in mangrove root for a long time | 300 | 1    | 5    | 1351 | 4.50 | .987           |
| C9. Accumulation of domestic waste at mangrove forest will cause its root system to not functioning | 300 | 1    | 5    | 1335 | 4.45 | 1.002          |
| C10. Pollution by domestic waste in mangrove forest can cause mangrove mortality | 300 | 1    | 5    | 1336 | 4.45 | 1.025          |

*5 is strongly agree, 4 is agree, 3 is moderately agree, 2 is disagree and 1 is strongly disagree.
3.4 Community practise on domestic waste management

The mean score of respondents on their practise on domestic waste management is tabulated in Table 4. Overall, the total mean score is (Mean=3.9) indicate that there is moderate level of proper practise domestic waste management. The lowest mean score is 3.58 which is statement number 3 which is about practising zero single use plastic. Most of the marine debris is composited from plastic [22] which can harm the mangrove ecosystem. Thus, it is important to ensure that every household in Kuala Selangor to minimise the use of plastic in order to protect mangrove forest in Kuala Selangor.

Table 4. Descriptive statistic for the score item from D1 to D10.

| Item                                                                 | N  | Min | Max | Sum  | Mean | Std. Deviation |
|----------------------------------------------------------------------|----|-----|-----|------|------|---------------|
| D1. I separate my household waste into its category                 | 300| 1   | 5   | 1137 | 3.79 | 1.082         |
| D2. I dispose my household waste at appropriate site               | 300| 1   | 5   | 1324 | 4.41 | .878          |
| D3. I practice Zero Single Use Plastic                              | 300| 1   | 5   | 1073 | 3.58 | 1.059         |
| D4. I use paid collection by local authority/trusted body to dispose my household waste | 300| 1   | 5   | 1136 | 3.79 | 1.309         |
| D5. I practice “reuse/recycle/reduce” of my household waste         | 300| 1   | 5   | 1119 | 3.73 | 1.068         |
| D6. I will involve in waste management activity/campaign in my area | 300| 1   | 5   | 1158 | 3.86 | 1.070         |
| D7. I encourage my family to practice proper waste management       | 300| 1   | 5   | 1264 | 4.21 | .940          |
| D8. I often talk about a proper waste management to my family       | 300| 1   | 5   | 1183 | 3.94 | 1.106         |
| D9. I will report to authority if I see uncollected waste at public dustbin in my housing area. | 300| 1   | 5   | 1135 | 3.78 | 1.135         |
| D10. I will report to the authority if I see illegal dumping at mangrove forest or water body. | 300| 1   | 5   | 1190 | 3.97 | 1.133         |

Valid N (listwise) 300

* 5 is strongly agree, 4 is agree, 3 is moderately agree, 2 is disagree and 1 is strongly disagree.

3.5 Correlation between Knowledge and Awareness

The result from the analysis has shown that there is weak positive relationship between respondent knowledge and awareness (r= 0.14) with (p< 0.05). Following to Guildford’s (1973) Rule of Thumb, when value of (r < 0.2), the correlation is considered negligible positive, thus the relationship is considered insignificant. It can be suggested that the knowledge on understanding on the importance of mangrove forest does not create an awareness on the impact on domestic waste disposal to mangroves among communities. Education is main factor in determine the communities understanding and create positive perception on mangrove forest among local communities [15]. Thus, level of knowledge regarding the problem on domestic waste disposal is suggested to be conducted for future study, so the correlation with community awareness can be determined.
3.6 Correlation between Awareness and Practise

The result through the analysis has shown that there is a positive relationship between awareness of the community and their practice on domestic waste management with \( r = 0.3 \) (with \( p < 0.01 \)). Following Guildford’s (1973) Rule of Thumb when value \( r \) is \( 0.2 - 0.4 \), the relationship is considered low. This finding suggests that community awareness does not correlate with their practice in domestic waste management. The finding is contradicting with previous which stated the level of awareness and extent of practices were positively correlated to a moderate degree [23]. Hence, a different action should be taken in order to create better practice of waste management among the community such as by straightening the enforcement so that community will practice good waste management to secure mangrove forest.

4. Conclusion

As the conclusion, the level of knowledge of the community in Kuala Selangor on the importance of sustaining mangrove forest is high \((n = 256, 85.3\%)\) and their level of awareness of on the impact of domestic waste disposal is also high \((\text{Mean}=4.48)\). Meanwhile the level of practice on proper domestic waste management is moderate \((\text{Mean}= 3.9)\). This study indicates that the correlation between community knowledge on the importance of mangrove forest and their awareness on the impact of domestic waste disposal to mangrove is negligible \((r=0.14, p<0.05)\) while the relationship of community awareness on the impact of domestic waste disposal and their practice on proper domestic waste management is weak positive relationship as \((r=0.33, p<0.01)\). The finding suggests community with great knowledge does not necessarily have great awareness as well not necessarily with great awareness, community will practice good waste management to secure mangrove forests. Thus, this study recommends strictly enforcing all parties to comply /implementing control at source method, or develop appropriate management plans to reduce domestic waste disposal at mangrove areas.

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