

Knowledge and Attitude of Water Villagers' Towards Solid Waste Management

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Abstract

Water village is one of the unique residential areas which can be found along the coastal area in Sabah, Malaysia. However, solid waste is a serious problem in this area due to improper solid waste management system. This paper accesses water villagers' perspective on solid waste management on the aspects of knowledge and attitude. The study was conducted at three selected water village which located in three major towns in Sabah. There are Tanjung Batu Laut water village in Tawau, Tanjung Aru water village in Kota Kinabalu, and Sim-Sim water village in Sandakan. A structured questionnaire survey has been conducted involving 242 respondents. From the results, 48% of the water villagers throw their solid waste directly into the sea. Therefore, water village areas should have a proper solid waste management system due to their location was closed to the main resource of human needs. By throwing their solid waste into the sea, their attitude had cause lot of environmental problem such as water quality problem, disease outbreak and decrease of aesthetic value. It is important to overcome the solid waste management issue in order to provide a better quality of life to the community in water village area and protect the environment as well.

Keyword: water village, solid waste management, knowledge and attitude, Sabah Malaysia

1. Introduction

Water village settlements are common tradition settlements in most of the coast, island, and estuaries in general at the Borneo Island state of Sabah, Malaysia. In particularly, the water village has existed before the 19th century which water village settlements are the former maritime kingdoms (Chua, 2006). It has become the administrative and economic centre of the maritime government. The settlements was later has been destroyed by the western colonial powers and its role as the maritime kingdoms has been marginalized. Typically, the water village settlements close to an area of the township water port and fishing village along the coastal area.

In general, the water village can be considered as a residential area in an urban locality inhabited by the very poor who have no access to tenure land of their own, and hence on vacant land, either private or public (Amaluddin and Mohammad Raduan, 2004). Mostly water village settlements in Sabah located along the coastal area. There were built on the water which use wooden pillar as the construction of the house. During the whole tide, the pole house will be drowned shallow water depths of two to three feet but during the low tide the pillar of the house were stranded with mud as shown in Fig 1. Urban development has forced many people to build a house in the water village settlements. The development has made the water villages into a dense and crowded settlement.



Fig 1: Water Village House

However, currently, in water village, the solid waste problems are quite serious. Solid waste is stranded and floating below their houses. The stranded and floated waste has caused pollution to the water as waste and sewage were directly discharges into the water. It also presents a foul smell and unpleasant view to the village as shown in Fig 2. According to (ICZM, 2010), presence of illegal water villages in the Sabah coastal area has been identified as the main issues that cause solid waste pollution and cleanliness problem in its town and coastal area. Furthermore, the improper solid waste management will lead to environmental impacts to the deterioration of surface water quality as well as air and land pollution (Agamuthu, 2001; Viraraghavan and Pokhrel, 2005).



Fig 2: Solid Waste Situation at Water Village

In Sabah, the solid waste management in the state under the jurisdiction of the respective city/municipal/district councils based on the Local Government Ordinance 1961 which responsible for the collection, treatment and disposal of solid waste. Collection of waste is authorized by each city/municipal/ district council but residents in non-rated areas and informal settlements are not covered by formal waste collection services. However, the local authorities are responsible for removing waste includes “surface water” and “all kind of refuse and effluent” based on Public Health Ordinance 1960 (Kota Kinabalu Municipal Council (Anti-Litter) By-Laws, 1984).

2. Materials and Method

2.1 Study Area

This study was conducted in three selected water villages in Sabah, Malaysia. There are Tanjung Batu Laut water village in Tawau, Tanjung Aru water village in Kota Kinabalu and Sim Sim water village in Sandakan. Tanjung Batu Laut was located about 5 km from Tawau with an area exceeding 300 acres. There are about 6,000 villagers with 800 houses. In Tanjung Aru, there are 3,000 peoples staying in 240 houses where most of them are fishermen. Tanjung Aru is a modern where they have more facilities such as brick bridges and wheel dustbin. Sim-Sim was built on stilts on the coast of Sandakan. With rapid development, the water village has developed into a brick bridge as a connection to the mainland. Currently, there are 480 houses in Sim-Sim with the population around 2,465 peoples.

2.2 Selection of Respondents

A total number of respondents will be selected based on appropriate sample size for the study area at 95% confidence level or $P=0.05$ (Yamane 1967). Based from the sample size equation, total respondents are 242 households involved in this study. Survey was based on purposive sampling where household were chosen based on the purpose of this study which is respondents who live in the water village areas.

2.3 Questionnaire Survey

Data collection begins with the distribution of questionnaire survey to the household respondents. The survey important to determine the applicable practice of waste was done by the residents. The questionnaire was divided in five sections, Section A, Section B, Section C, Section D and Section E. Section A, focused on the villagers background while section B was about the solid waste issue that occur at the water village. Section C is to identify the solid waste management practices by the villagers at water village while Section D to identify the respondent’s level of knowledge and Section E identify the respondent’s level of attitude regarding solid waste.

2.3 Severity Index

The questionnaire survey were analyzed by using frequency of severity index. The answers to questions were displayed on a 0 to 4 point scale. The severity index (SI) was calculated based on the following equation (1) (Al-Hammad and Assaf, 1996). The rating classification was illustrated in Table 1.

$$SI = \frac{\sum_{i=0}^4 a_i x_i}{4 \sum_{i=0}^4 x_i} (100\%)$$

(Equation 1)

Where:

a_i is the index of a class; constant expressing the weight given to the class

x_i is the frequency of response

$i = 0,1,2,3,4$

x_0, x_1, x_2, x_3, x_4 are the frequencies of response corresponding to

$a_0 = 0, a_1 = 1, a_2 = 2, a_3 = 3, a_4 = 4$

Table 1: Severity Index Rating Classification

Index	Scale	Value of Severity Index
a_0	Strongly disagree	$0.00 < SI < 12.5$
a_1	Disagree	$12.5 < SI < 37.5$
a_2	Not Sure	$37.5 < SI < 62.5$
a_3	Agree	$62.5 < SI < 87.5$
a_4	Strongly Agree	$87.5 < SI < 100$

3. Results and Discussions

3.1 Socio Demographic Respondents

Table 2 shows the socio-demographic characteristics (gender, age, racial background, level of education, length of stay, household size and monthly income). It is also presents the summary about of the respondents' responses regarding their waste management practices, knowledge and attitudes towards solid waste issues.

In Table 2, total respondents were 242 which 92 male and 150 female. Majority of the respondents were aged 36 and above with 33% of them within the age range 36 to 55 years. In other words, the respondents were predominantly mature adults. About 28% of respondents were 55 years old and above followed 19% within age 26 to 35 years and 15% is in range 21 to 25 years. As shown in Table 2, there were majority Bumiputera Sabah with 37% of respondents such as Bajau, Bugis, and others. Meanwhile, there is 26% of respondents were Malay race followed Chinese 19%, non-Bumiputera 15% and 3% of Indian respondents.

Based on questionnaire survey, majority of the respondent's education level is primary school which is 45%. However, there is only 4% of respondents have higher education level till degree. Table 2 shows that about 29% of respondents have no education level followed 14% has secondary school education and 8% have STPM and Diploma. There are 44% of respondents have stay at the study area almost 15 years and above while 28% has stay there about 10 to 14 years. In other words, most of respondents involve in questionnaire survey are

from the origin of the study area. Meanwhile about 28% of respondents were stay about 5 to 9 years and only 9% has stay for 1 to 4 years.

As in illustrated in Table 2, 36 % of respondents had the most number of family members in the ranges of 7 to 9 respectively members in the house. Moreover, 31% of respondents have 4 to 6 family members followed by 23% of respondents have 10 family members and above and only 10% of respondents has 1 to 3 family members in the house. In other words, it shows that there were many big families were stay at the study area. From the aspect of the socio-economic showed that most of the respondents were working in the private sector (35%) followed by self-employment (27%). Housewives and retired respondents constituted 22% and remaining 16% included those working with the Government sector.

Based on the respondent's income level, majority 42% of respondents have income around RM501 to RM1500 per month while 20% of respondents have income around RM301 to RM500 and 18% of respondent have income around RM1501 to RM2000 above. However, only 11% of respondents have income RM2000 and above and 9% of respondents have income below RM300 per month.

Table 2: Socio-Demographic Characteristics of Respondents

Variables	Frequency (n=242ed)	Percentage (%)
Gender		
Male	92	38
Female	150	62
Age		
16-20	11	5
21-25	35	15
26-35	48	19
36-54	80	33
55 above	68	28
Racial background		
Malay	62	26
Chinese	47	19
Indian	7	3
Bumiputera Sabah	90	37
Non- Bumiputera	36	15
Educational level		
Primary school	109	45
Secondary school	35	14
STPM/Diploma	20	8
Degree/ Post Graduate	9	4
No education	69	29
Length of stay		
1-4 years	22	9
5-9 years	45	19
10-14 years	68	28
15 years above	107	44
Household size		
1 - 3 persons	25	10
4 - 6 persons	75	31
7 – 9 persons	87	36
10 persons above	55	23
Occupation		
Government	38	16
Private sector	84	35
Self-employment	66	27
Retired/Housewife	54	22

Family income (monthly)		
Below RM 500	22	9
RM 501 – 1000	48	20
RM 1001 – 1500	102	42
RM1501 – 2000	44	18
Above RM 2000	26	11

Regarding to the questionnaire survey, majority 148 of respondents was agreed that the main problem at the study area is solid waste problem followed by 56 respondent's state that water pollution is the main problem. Meanwhile 27 respondents choose noise pollution problem and 11 respondent's state air pollution also become a main problem at the study area. There are a few causes that waste problem might occur at the study area which 36% of respondents, waste problem is because of the low awareness among the villagers regarding waste issues. Meanwhile, 27% of respondents blame the local authority inefficient handling the solid waste in the study area. Besides that, 22% of respondents state waste problem occur because of the reason of dustbin didn't enough for the waste generation by the villagers followed 15% of respondents didn't have choice to dump their waste elsewhere rather than into the water.

Based from the survey as shown in Fig 3, about 48% respondents in the study area state that they were throw directly their waste into the sea. However 36% of the respondents have discharge their waste by throw into the dustbin and 12% of respondents were dispose their waste by burning and composting. Meanwhile others 4% of respondents were stored and collected their recyclables waste materials. Majority of the respondent's discharge their waste directly into the sea because of the location of their house located at the surface of water and only has limited spaces near their house.

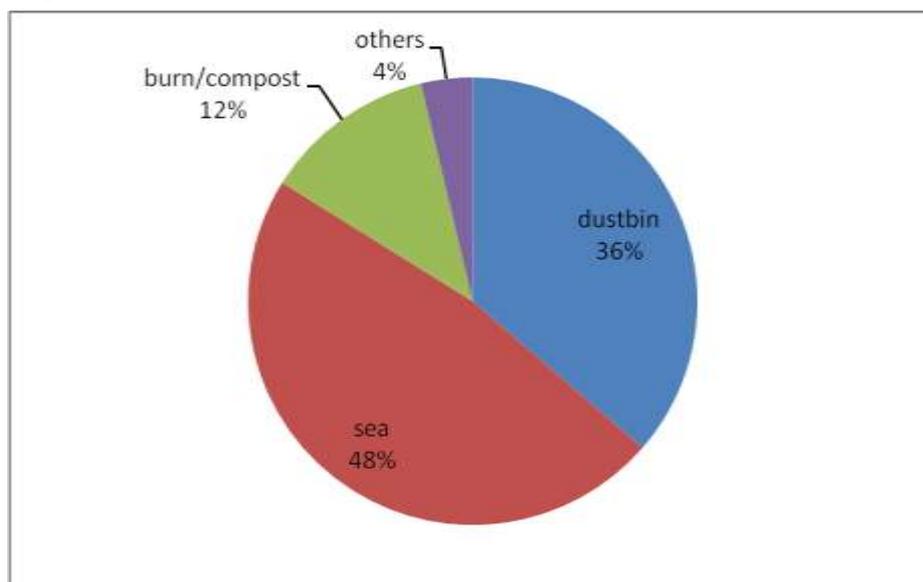


Fig 3: Waste Discharge

About 129 respondent states that they generate waste about 1kg to 3kg in a day while 88 respondents generate waste about less than 1kg per day. There are about 25 respondents that generate waste about 4kg-6kg in a day. The waste generation is based on the total number of household in a house. Based from the survey, majority of the respondents have 7 to 9 family members in the house.

Mostly, the villagers use the traditional method involves dumping all their waste into the surrounding of sea. The absence of collection waste which discharge directly into the water become the major pollutant load on the receiving water and potential health hazard,

human transmission of disease. The solid waste dispose into its waterways has aggravated environmental problem where waste stranded at the coastal zone which create aesthetic and odor problem.

From the questionnaire survey, majority 48% the villagers throw directly their waste into the river. This situation occurs at water village that cannot access by road. This scenario occurs because of no regular solid waste collection service by the municipal district. One of the factors of villagers dumping waste to the sea because of the municipal district didn't include the water village settlements in their collection service due to the unpaid for the taxes for collection service.

While in water village that can be access by road have their regular collection waste service where the local authority provided dustbin and collection service. Almost 36% of the villagers based from the questionnaire survey throw their waste into the dustbin. Although the local authority has provided dustbin and regular collection but some irresponsible villagers throw their waste directly to the sea.

3.2 Respondents Knowledge towards Solid Waste Management

The respondent's knowledge on waste issues was illustrated in Table 3, which resulted in the percentage of severity index in each questions. There are seven statement of knowledge were asked to the respondents. In Table 3 demonstrates the calculations of severity index from the feed-back of respondent's knowledge on waste issues.

Table 3: Respondents Knowledge on Waste Issues

Questions	Frequency Analysis					Severity Index (SI) %
	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree	
1. Waste stranded encourage disease vector to come.	0	0	45	93	104	81.1%
	0%	0%	19%	38%	43%	
2. Improper waste handling cause health problem	0	0	40	113	89	80.1%
	0%	0%	16%	47%	37%	
3. Waste problem can affect environment	27	25	15	98	77	67.9%
	11%	10%	6%	40%	32%	
4. Stranded waste cause bad smell	0	0	28	124	88	62.4%
	0%	0%	12%	51%	37%	
5. Improper waste handling affect villagers social-economic	0	35	22	64	121	77.9%
	0%	15%	9%	26%	50%	
6. Discharge waste to sea cause water pollution	0	0	58	88	96	78.9%
	0%	0%	24%	36%	40%	
7. Waste cause aesthetic problem and make surrounding dirty	0	0	0	84	158	91.3%
	0%	0%	0%	35%	65%	

The results of severity index analyses for knowledge category as shown in Fig 4. Regarding the respondent's knowledge, most of the values of the severity index were within the agree opinion range namely $62.5 \leq SI < 87.5$. The reason being that is this level because majority respondents agree that improper waste management will affect environment and

health as well. The highest severity index obtained in this category is 91.3% which majority respondents agree that waste cause aesthetic problem and make surrounding dirty. Aesthetic problem were the common concern regarding improper waste handling. For example illegal waste dumping can affect the normal collection services as well as the aesthetic of the area.

Besides that, the lowest value of severity index was 62.4%. The values is within in not sure range $37.5 \leq SI < 62.5$. The respondents were not sure that the bed smell is from the stranded waste at the surface of water. This reason is because of the respondents which live far from the land which near to the sea avoid by the bed smell from the stranded waste. However, the problem occurs to the respondents that built house near to the land.

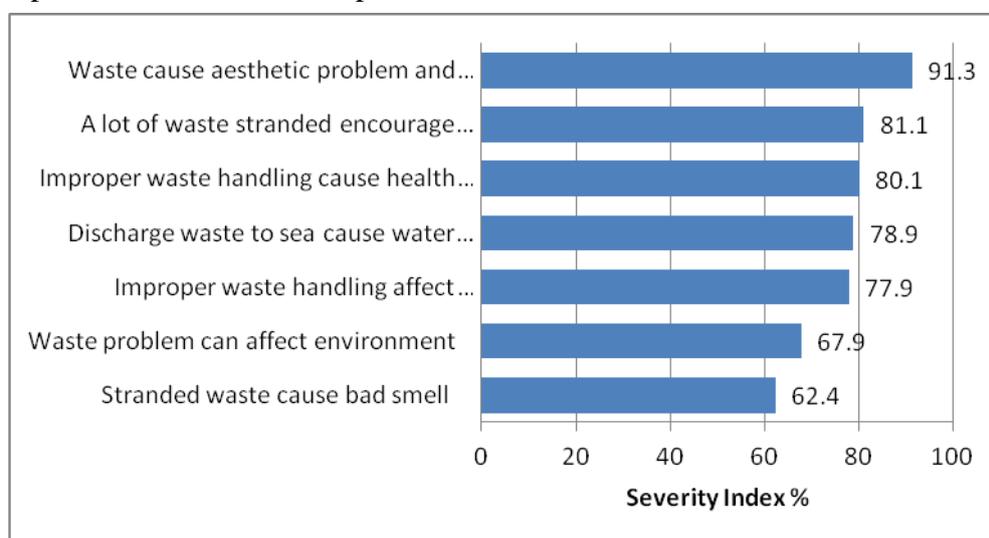


Fig 4: Respondents knowledge on Waste Issues

3.3 Respondents Attitude towards Solid Waste Management

The respondent's attitude regarding waste issues in their village shown in Table 4, which reported the frequency analysis and the value of severity index. There are eight statement about attitude were asked to the respondents.

Table 4: Respondents Attitude on Waste Issues Table

Questions	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree	Severity Index (SI) %
1. You throw waste into the dustbin	42	100	0	22	78	49.4%
	18%	41%	0%	9%	32%	
2. You throw waste into the sea	77	26	15	86	38	48.1%
	32%	11%	6%	35%	16%	
3. Waste problem affect emotional (pressure, easily anger)	0	55	41	102	44	63.9%
	0%	23%	17%	42%	18%	
You segregate your waste at house	15	126	33	56	12	42.1%
	6%	52%	14%	23%	5%	
You implement 3R (reduce, reuse, recycle) culture at house	60	98	12	48	24	37.4%
	25%	40%	5%	20%	10%	
						64.7%

You always join “gotong-royong” activities at your villages	12	52	8	122	48	
	5%	22%	3%	50%	20%	
You practice environment culture in your daily life	21	116	35	48	22	43.2%
	9%	48%	14%	19%	10%	
You advice neighbour not throw waste into the sea	46	128	12	30	26	35.7%
	19%	53%	5%	12%	11%	

From Fig 5 noted that the respondent’s attitude regarding waste issue, most of the values of the severity index within the disagree range $12.5 < SI < 37.5$ and opinion range $37.5 < SI < 62.5$. Based from the values, it shows that the respondent take initiative in joining cleanup programme with the local authority, however, still the respondents didn’t cooperate with each other in protecting the environment. There still a lack of respondent’s attitude where almost 48.1% of respondents has directly charges their waste into the water. The authorities should need to pay more attention and monitoring especially in the study area. Not only that, based from the results of severity index, there is 63.9% of respondents were pressure and angry regarding the waste problem in the study area. It revealed that waste problem also can affect emotional feeling as well. According Hasnain (2005), public easily become emotional due to the unsystematic waste dumping and related to the aesthetic problem.

Besides that, there is a low severity index which is 35.7% in range disagree range $12.5 < SI < 37.5$. Majority of the respondents were not giving advice to their neighbour regarding discharge waste into the sea. It shows that, the neighbourhoods among the respondents were low and they didn’t care at the surrounding problem.

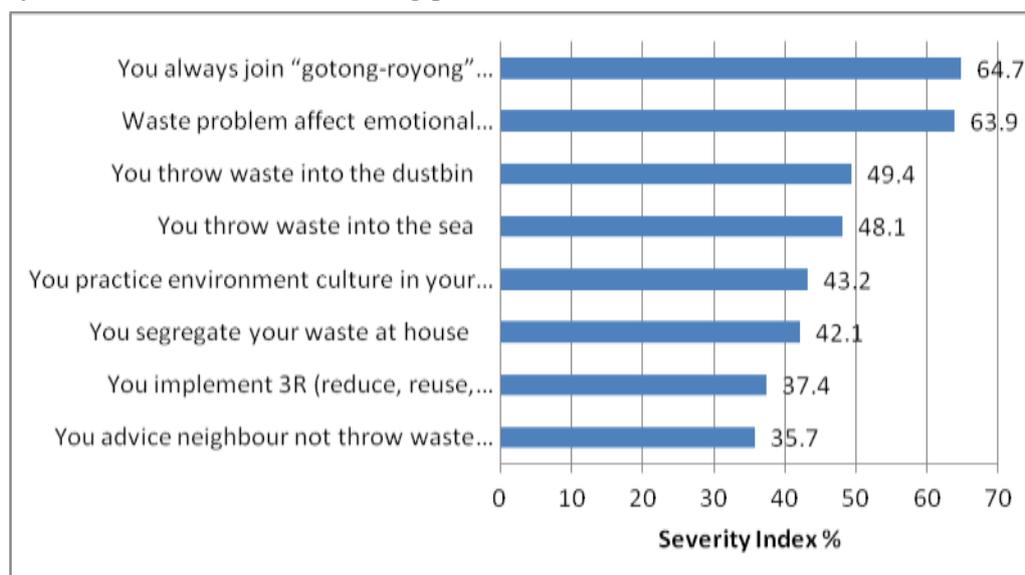


Fig 5: Respondent’s Attitude on Waste Issues

Solid waste management in water village has become seriously matter within the residential. From the questionnaire survey, it also revealed that the awareness level of the villagers was low. This is because about 60% of the villagers didn’t have formal education and works as fishermen. The villagers state that they didn’t have choice to discharge their waste anywhere else than throw to the sea. Recent survey of the villagers in the water village settlements indicated that the residents aware that the waste can pollute the sea however almost of them still throwing their waste to the sea.

At present, local authority also faced problem about immigrants' issues in water village area. The growth and expansion of settlements on water village present was associated with the illegal immigrants from Indonesia and Philippines has resulted the water village settlements with various problems, crime and negative activities (Eric, 2001). However, the immigrants from Indonesia and Philippines have almost conquered the water village settlements especially in the town centre, close to the port have resulted problematic issue with various problems, crime and negative activities. Because of the water village lacking with public facilities, the place has become dirty with stranded and floated waste along the coastal area of Sabah. The migration of this tribe have extended and developed further in the water estuaries.

Furthermore, water village also lacking in terms of public facilities and physical which the surrounding of the water village is dirty and filled with debris. These conditions have results bad impact to the environment and bad image to the state. But there are some water village settlements were "legal" status which the government has built the residential area along the coastal area with services and infrastructure provided. Such services are both network and social infrastructure like water supply, sanitation, electricity, roads and drainage, school, health centers, market places and etc.

Local authorities were also faced problem due to the human resource and financial problem. The municipal council did not have enough human resource in order to support and provide their service to all whole population and places. Financial were also become a burden to them where high cost were need to manage all the waste management in their service area.

4. Impact of Improper Waste Management

Due to the absence of standards and norms for handling MSW will create improper waste management, the water village settlements have cause of water pollution to the river, disease outbreaks and decrease the aesthetic value (Phelps et al 1995).

The uncontrolled waste discharge to the water will deteriorated the quality of surface water by changing the chemical, physical and properties of water (Ramachandra, 2006). Using water polluted by solid waste for drinking water, bathing and food irrigation can cause individuals to disease organisms and other contaminants. Discharging waste to the sea is not a proper way of waste management since water is the main in human needs. It is not only affecting human health but affecting the economy sector for fishing department and tourism (Marc, 2006).

Improper solid waste management also causes the outbreak of disease spread. Waste encourage of the disease outbreaks such as rodents responsible for the spread of disease *leptospirosis*, while mosquito can transmit disease such as malaria and dengue fever (Dolk, 1997). Furthermore, solid waste was the common place for flies which can transmit typhoid, gastro-enteritis disease. Wastes that are not properly managed especially from the households, will brings the serious health hazard and could lead to the spreading of disease.

The aesthetic sensibility is offended by the unsightliness of piles of wastes on the roadside, on the dumping area and at the surface of the water. The situation has made worse by the presence of disease and always become feeding places for dogs and cats. Waste always carelessly and irresponsibly discarded in public, along the roads and highway, and around communal bins. This scenario has become a common things which public should realize that the important to handling the waste in a proper way (Viraraghavan and Pokhrel 2005).

5. Conclusion

As the conclusions, the community of water village was lack of awareness where low of knowledge level and attitude towards solid waste issue. Although they were aware on the effect degrading their waste to the sea, but they still throw their waste to the sea. Proper solid

waste management at the water village is important and the local authorities should take seriously action to overcome the problem. This is due to the location of water village at the coastal area that one of the food source to the community and need to protect the aquatic life and other organisms in the sea. By conducting this research, it can increase the knowledge and awareness of the water village community towards solid waste management in their living area. This study gives awareness and education about proper waste handling and educates the community to be more responsible to the environment as well. Therefore, government, non-government and environment society need launching more campaign to educate the community especially at water village on the importance of protected the environment. The environmental awareness is important in educate the society to become more concern and responsible about the environment for the sustainable of future development.

Acknowledgement

This research is financially supported by a research grant from the University of Putra Malaysia under RUGS 6 (Research University Grant Scheme). The authors would also like to thanks to the reviewers for their time and thoughtful recommendations on the paper.

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