Factors Affecting on Community Participation in Household Solid Waste Management
(A Case Study of Selected Townships in Yangon)

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Abstract

This study aims to analyze the collaboration process among various stakeholders in waste management practices which can support to extend social, economic and environmental benefits, and thus, effect on long term success of waste management practices for the whole community. This study used field research survey with structured questionnaires to identify some of the influential factors on household waste management among various stakeholders. The study found that the level of public awareness and community participation is taking steps to reduce garbage. It also found that the collaboration between local governments, CBOs and community members in waste management practices can improve in local waste management system.

Keywords: solid waste management, household waste, waste recycling, community participation, stakeholder coordination

Introduction

At the beginning of cities, common problem of urbanization is that the discharge of garbage is increasing significantly day by day. In most developing countries, improper waste disposal creates serious environmental problems that affect health of humans and animals and cause serious economic and other welfare losses. In Myanmar, urban population has grown at a rapid rate over the past few years. However, if infrastructure such as housing, access to safe water and sanitary facilities, energy supply, transportation and communication is under supplied or poorly distributed, urbanization can bring about overcrowding, environmental stress and adverse impacts on human health.

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At present, Myanmar has a total population of (51.4) million with the population of Yangon is approximately (7.3) million, and the number of private households were (1.5) million in Yangon (2014 census). Currently, the waste collecting system of Yangon is operated mainly by the Yangon City Development Committee (YCDC). Although they collect all of the garbage from the homes, schools, markets, hospitals, industrial zones and all public places within all of Yangon City area, it has still need to fully participate of various stakeholders and the public, in order to be an efficient solid waste management system.

Moreover, considerable migration has taken place in major cities such as Yangon and Mandalay which is likely to increase in future. Yangon has the largest urban population in Myanmar, and its population density comes to approximately 716.3 persons living per square kilometer in the urban area of Yangon, according to 2014 census. But the process of urbanization contributes an increase in urban population rapidly and waste discharged also increased. Among such waste, the amount of household garbage increased significantly. However, the system for collecting garbage, waste disposal and processing is still not simultaneously developed which negatively impact on urban development of the Yangon.

Therefore, those living in urban area suffers waste-related problems, those may be caused by inadequate attention to environmental consequences, a general lack of knowledge and information concerning these waste related problems.

In turn, this results in garbage-ridden streets, block in the drain and dumping in inappropriate areas. Additionally, YCDC also faces financial conditions and a lack of technical knowledge concerning waste disposal and processing, as is the case in many other developing countries. Therefore, insufficient waste management may create negative impact on the health of residents. Moreover, it also creates negative impact on the urbanization and urban infrastructure of Yangon City. In this context, this study analyzes the importance of community participation in waste management system of Yangon by introducing community-based movements.

Problem Statement and Objective of the Study

Generally, there are four main issues concerning of waste management in developing countries, such as health and sanitation, resources, financial and technological issues. Among them, health and sanitation issue concerns how residents act according to perceived waste management procedures. Due to limitation of awareness, they dispose their garbage illegally or improperly, contributing to improper waste disposal and the limitation of participation in waste management within their community. Financial hardships concern to local government or municipalities, and this issue causes insufficient waste collection and poor waste treatment.

Therefore, the objective of the study is to analyze that which factors are influence on community participation in the city's waste management system. Based on the above discussions, following research questions can be simplified to promote community participation and stakeholders' coordination in waste management system;

(1) Is citizen participation important for waste management? What factors influence on their willingness to participate in waste management practices within their community?

(2) How to motivate community-based organizations (NGOs, NPOs and small/ medium enterprises) to participate in waste management? What factors influence on their interests?

(3) Does stakeholder coordination and public participation correlate to improve waste management systems?

Method of Study

This study used descriptive and inferential statistics by using both qualitative and quantitative approach. Primary data is collected from open-ended questionnaires which were distributed to the respondents. Data collection was conducted in January- February 2017 through distribution of structured questionnaire in the five selected townships in Yangon, such as Hlaing, Alone, Thingangyun, Thaketa and Dawpon Townships. The total number of sample household is 96 households which were randomly selected, composing of 21 households from Hlaing, 9 households from Alone, 25 households from Thingangyun, 23 households from Thaketa and 18 households from Dawpon. After data collection, an empirical analysis

tested regression between dependent and independent variables. The analysis has tested by multiple regression analysis by using SPSS. Secondary data was gathered from interviews with city officers, concerned organizations as well as from online sources.

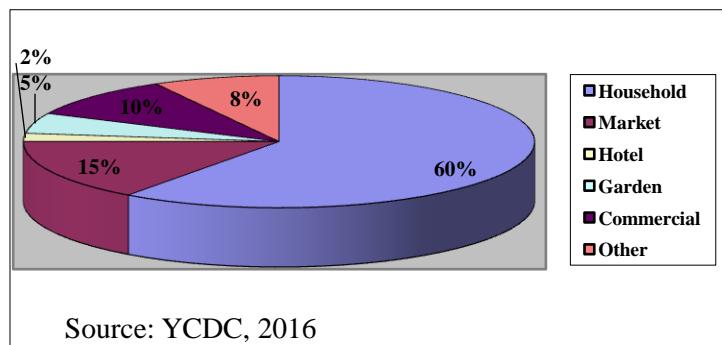## Data Analysis and Findings

Background Information of Survey Area

Yangon is capital city of Myanmar and which composed of 33 townships. For the estimation of demand for solid waste services, a population figure out between 4.6 million to 5.0 million in metropolitan area. In order to keep the city clean and pleasant, YCDC undertook waste collection with a workforce of about 4000 strong utilizing 300 vehicles (YCDC, 2011), including open trucks. Recently, waste management is a major task for Cleansing and Pollution Control Department of YCDC, but the waste management problem still become severe in Yangon City. This is mainly caused by the changing lifestyle of urban people and consumption patterns of urban residents which also contributed to the waste management problem.

Recently, the household sector of Yangon is fast becoming a major generator of waste. YCDC collects about 2000 tons of solid waste per day but this number is rising day by day. (YCDC, 2016)

Moreover, in order to clarify the sources of waste generation, the household sector contributes to 60 percent of solid waste generation, which is the highest rate among all type of waste discharged. According to data from YCDC, the percentage contribution of the waste generated sources is shown in below figure.

Figure 1, Sources of Waste Generation in Yangon

Source: YCDC, 2016

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Regarding to the data in 2016, the percentage and contents of the garbage collected from household sectors within the Yangon City area are shown below:

Table 1, Content of Materials by Kind and Percentage from Household Garbage in Yangon

No	Kind	Components	Total Metric Tons	Percentage (%)
1	Kitchen Waste	Waste from preparation, cooking, and serving of food, peelings of fruits and leftovers	1262	61.0%
2	Plastic	Pieces of plastics and packing plastic for food	238	12.0%
3	Paper	Packing paper, pieces of paper	103	5.0%
4	Glass	Pieces of glasses, broken glasses (not included in glass bottles)	124	6%
5	Metal	Tin, iron	186	9.0%
6	Others	Ashes from fires used for cooking, dirt, catch basin dirt, yard waste, etc.,	145	7.0%
	Total		**2058**	**100%**

Source: YCDC (2016)

From the above table, among the various kinds of solid waste, the kitchen garbage maintains the highest percentage of about 61 percent of the total percentage of municipal solid waste generation. However, gradual increases in population will causes the waste generation rate also increased.

In the case of waste disposal, there were two main final disposal sites, the biggest site is Htainbin, 60 hectares in extent and landfill capacity is over 800 tons per day. The other one is Htwei Chaungn which covers 80 hectares and daily disposal capacity is over 600 tons. Moreover, other dumping sites are located in Kyi Su, Da La, Hlaw Gar and Shwe Pyi Thar.

Questionnaire Design and Sample Size

A total 110 questionnaires were distributed and 96 papers were collected and thus n= 96 for the citizen group. The sampling method for citizen group is served by simple random sampling and stratified random sampling for community-based organization in terms of rank, which conducted by KII, including 9 officers.

As a first group of respondents, community members are intended to residents from selected townships. For this group, the questionnaire includes topics such as socio-economic condition, the level of knowledge about local waste management system, understanding the benefits from waste separation, resource recycling and clean neighborhood, and their interests on participating in composting project.

The second part concerns with community- based organizations, such as private firms/ NPOs/ NGOs (i.e., JICA and other voluneer groups such as Trash Hero Myanmar). The questionnaire for this group includes topics such as the economic benefits to be gained from composting and recycling and inquiries into what kind of social benefits private entity can provide to local residents.

The last part focuses on government body. In this part, secondary data is collected from YCDC and gathers information concerning the city waste management systems including the total amount of garbage collected from households, the various method of waste disposal, the total amount of recyclables collected and expenditure for city garbage management system.

(I) Analyze the Interests of Citizen Participation for Waste Management

In order to promote waste management systems, local people play as the main actors for waste separation, waste reduction and other roles concerned for waste management. Therefore, factors that can be influenced

on their willingness to participate in waste management practices within their community need to be analyzed.

(a) Socio- Economic Condition of the Respondents

Socio-economic conditions were measured mainly by using certain indicators as age, gender, educational attainment and personal income levels. The sample respondent size was 96 within the Yangon City. Table 2 shows the socio-economic condition of the respondents and their willingness to participate in local waste management systems. From the table, about 56percent of the respondents were willing to participate in composting project while 44percent were not.

Table 2, Socio-economic Condition of the Respondents

Gender	Score	willing to participate	Not willing to participate	Frequency	Percentage
Male	1	23	24	47	48.96
Female	2	31	18	49	51.04
		54	42	96	100
Level of Age	Score	willing to participate	Not willing to participate	Frequency	Percentage
≤ 19 years old	1	0	10	10	10.42
20-29 years old	2	5	8	13	13.54
30-39 years old	3	10	6	16	16.67
40-49 years old	4	16	0	16	16.67
50-59 years old	5	13	10	23	23.96
>= 60 years old	6	10	8	18	18.75
		54	42	96	100.00
Educational Attainment	Score	willing to participate	Not willing to participate	Frequency	Percentage
Primary	1	0	0	0	0
Middle school	2	0	0	0	0
High school	3	24	12	36	37.5
Collage/University	4	30	30	60	62.5
		54	42	96	100
Household Monthly Incom	Score	willing to participate	Not willing to participate	Frequency	Percentage
less than 250,000	1	9	12	21	21.88
250,001-300,000	2	16	30	46	47.92
300,001- 350,000	3	17	0	17	17.71
350,001-400,000	4	12	0	12	12.50
400,001- and above	5	0	0	0	0.00
		54	42	96	100.00

Source: survey data (2017)

In the above table, the range of the score for gender is from 1 to 2, minimum score was 1 and the maximum was 2. The table shows that 47

respondents were male (49percent) and the remaining 49 respondents were female (51percent). Among the males, 23 respondents (49percent) were willing to participate and 24 respondents (51percent) were not. Among female, 31 respondents (63percent) were willing to participate and 18 (37percent) were not. Therefore, it can be concluded that females are more actively willing to participate in household waste management project rather than males.

According to age levels, the range of the score was from 1 to 6, with the minimum score is being 1 and the maximum score is being 6. The table reveals that 16 respondents were 40-49 years old (30 percent) the largest group and were willing to participate in a household waste management project. The age group consisting of 50-59 years old, who contribute to 13 respondents (24percent) of total respondents, also wanted to participate.

According to educational background, there were no respondents from primary to middle school level. The largest number of respondents' 63 percent attained a college/ university level and those with only high school level consisted of 37 percent of total respondents. The score for educational background is range from 1 to 4 with the minimum score being 1 and the maximum being 4.

Regarding to analyze the influence of socio-economic conditions on the respondents' willingness to participate in local waste management systems, independent variables consists of socio-economic conditions and dependent variable is the willingness to participate tested by using multi regression analysis. Below Table (3) shows the summary results of the regression analysis.

Table 3, Summary of the Result of Multi regression Analysis

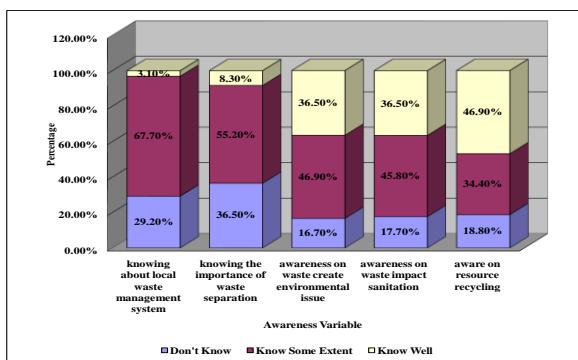| R square	Adjusted R square	F	Sig	Variables	t (sig)
0.394	0.367	14.773	0.00	• Gender • Age • Educational attainment • Income level	3.639 (.000) .171 (.865) -3.476 (.001) 6.567 (.000)

Source: Survey data (2017)

From the summary table, it can be clearly seen that "t= .171" and there is an insignificance p value of "p= .865" (.865>.05) for the age variable. Thus, it should be excluded from analyzing means that age does not influence on a respondents' willingness to participate.

(b) Respondents' Awareness on Local Waste Management System and Waste Related Issues

There are five variables to test the level of awareness on waste related issues in this paper. The number of the respondents who have knowledge of local waste management systems is considerably high for respondents who "know some extent" (67.76 percent) and who "know well" (3.10 percent) Thus, this means that about 71 percent of the respondents know the details of their local waste management system well, such as where the concerned organization brought their household garbage to and how to dispose of it.

Figure 2, Respondents' Awareness on Local Waste Management System and Waste Related Issue

Source: Survey data (2017)

Then, the second variable shows that from the total 96 respondents, about 64percent of the respondents (55.26 percent who "know some extent" and 8.3percent who "know well") have knowledge of the importance of waste separation. Other hand, 36.5percent have limited knowledge of waste separation. It can be concluded that almost 2 out of 3 persons have known about the importance of waste separation for environmental conservation.

The third one concerns the variable of awareness on waste creating environmental issues. For this case, most of the respondents aware for waste can create environmental issue i.e., 83 percent (36.5 percent who "know well" and 46.9 percent who "know some extent"). Additionally, 82 percent

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(36.5 percent who "know well" and 45.8 percent who "know some extent") of the respondents were aware that waste impacts sanitation, while 81 percent (46.9 percent who "know well" and 34.4 percent who "know some extent") of the respondents were aware that waste impacts resource recycling.

In addition, the mean value and the standard deviation of each independent variable and dependent variable are shown in Table 4.

Table 4, Descriptive Statistics for Analysis of Awareness Variable

	Variables	Mean	Standard. Dev	Minimum Score	Maximum Score
Dependent Variable	Willing to participate	0.5625	0.49868	0	1
Independent Variable	Knowing about local waste management system	0.7708	0.60662	0	2
	Knowing the importance of waste separation	0.8021	0.81589	0	2
	Aware on waste create environmental issue	1.5625	1.14994	0	2
	Aware on waste impact sanitation issue	1.5521	1.15958	0	2
	Aware on resource recycling	1.7500	1.23117	0	2

 (Note: score 0= Don't Know, 1= Know some extent and 2= know well)

Source: Survey data (2017)

The above table shows that the mean value for the awareness of resource recycling is the highest one, at 1.75, which close to highest score of 2. This means that the respondents have a high level of awareness concerning resource recycling compared to other variables.

Then, in order to find the variables that affect the respondents' willingness to participate in local waste management system is tested by using multi-regression analysis. It found that the value of R Square is 0.863 which means that about 86 percent of the variance in the willingness to participate is affected by the knowledge/awareness variable. Then, F value was 112.942 and there is significant p value p= .000 which is less than confident level 0.05. Therefore, it was summarized that there is strong correlation between dependent variable and independent variables.

In addition, in order to examine the correlation of each independent variables and dependent variable, the following model equation could be considered:

$$Y = -0.191 + 0.181X_1 + 0.037X_2 + 0.036X_3 + 0.082X_4 + 0.228X_5$$

t=-5.020   t= 4.256   t= 1.084   t= .669   t=1.577   t= 10.629

p=.000   p= .000   p=.281   p=.505   p=.118   p=.000

(where, Y= willingness to participate, X_1= knowing local waste management system, X_2= knowing the importance of waste separation, X_3= awareness on waste create environmental issue, X_4= awareness on waste impact sanitation issue, X_5= awareness on resource recycling)

The model equation shows that the regression model can be used as a predictor for promoting residents' willingness to participate. Knowledge of local waste management systems, knowledge of the importance of waste separation, awareness on waste creates environmental issue; awareness on waste impact sanitation issues and awareness on resource recycling are positively and significantly correlated with their willingness to participate in local SWM. Among those variables, awareness on resource recycling and knowledge of local waste management systems contribute to high level of influence on their willingness to participate.
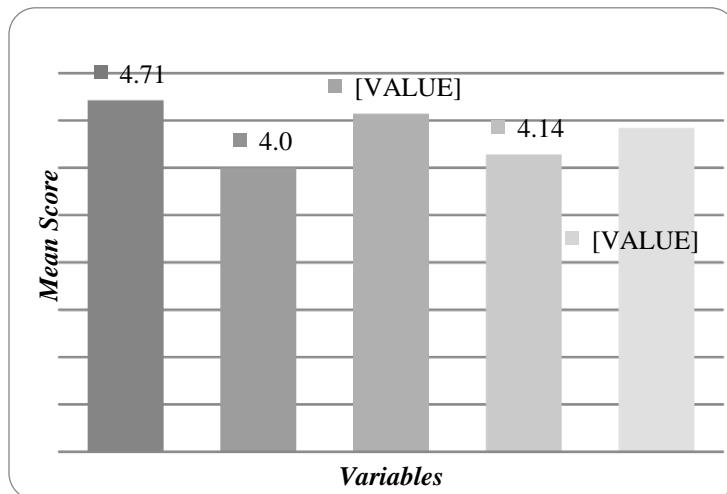
(II) Reasons of CBO's Participation for Solid Waste Management

The participation of community-based organization such as NGOs, NPOs and small and medium private enterprises is essential for the success of waste management systems, also. In this paper, two variables are used to test the interest of CBOs' in this regard.

This case is intended to testing the interest of CBOs' to participate in local waste management systems can be motivated by economic reasons.

The respondents' opinion for economic reasons is shown in figure 3. This figure shows that there are five variables to determine the CBOs' interest of participation is motivated by economic reasons. The mean value for first variable; "community-based composting system can reduce the amount of waste to final disposal" is 4.71 which named as μ_1 (i.e. $\mu_1 = 4.71$). Accordingly, the mean value for second, third, fourth and fifth variables are also named as μ_2, μ_3, μ_4 and $\mu5$, respectively. Then, their values are shown in below figure 3. To analyze this case, the hypothesis should be set as below, as a first step.

Figure 3, Respondents' Opinion for Economic Reasons

Source: survey data (2017)

(µ1= waste separation can reduce the amount of waste disposal to final land
fill site, µ2= can reduce the transportation costs to land fill site, µ3=
can access market opportunity through increased recyclables,
µ4=can create extra earnings from waste separation by means of
getting organic compost and recyclables from HH waste, µ5= can
get formal job opportunity for former informal workers)

Hypothesis testing for economic reasons for participation

H0: if µ1, µ2, µ3, µ4, µ5 ≤ 3, CBOs participation is not influence by
economic reasons.

H1: if µ1, µ2, µ3, µ4, µ5 > 3, CBOs participation is influence by economic
reasons.

Figure 3 shows clearly that µ1= 4.71, µ2= 4, µ3= 4.57, µ4= 4.14,
µ5= 4.42 > 3. Hence, H0 is rejected and accept H1. Therefore, it can
conclude that CBOs' participation for community-based waste management
can be motivated by economic incentives.

Moreover, one-sample test shows that there is significance p value
(.000<.05) and greater "t" value for each variable for contributing economic
reasons. Therefore, it can be concluded that economic reasons can be used
as a predictor for promotion of CBOs' participation.

In order to summarize the CBOs' interest for participating in local waste management, the descriptive statistics table shows the mean and standard deviation for both variables of economic reasons and social benefits.

Table 5, Descriptive Statistics for CBOs' Interests

Variables	Mean	Standard deviation	Minimum Score	Maximum score
Economic Reasons	4.37	0.65	1	5
Social Benefits	3.94	0.68	1	5

(Note: Score 1= Strongly Disagree, Score2= Disagree, Score 3= Neither agree nor disagree,
 Score 4= Agree, Score 5= Strongly Agree)

In this table, the mean value for motivating by economic reasons is 4.37 and its standard deviation is 0.65. Then, the mean value for providing social benefits is 3.94 with a standard deviation of 0.68. Therefore, the summary finding can conclude that CBOs' participation can be motivated by both factors of economics incentives and social benefits. Among them, economic reasons variable is more strongly influence on participation rather than social benefits.

Findings and Conclusion

In case the of local residents' participation, the summary findings reveal that members of the community will be interested in taking part in local waste management systems if they can see or be aware that the waste related issue can affect them. This means that the awareness factor can strongly influence on their participation. Therefore, it is necessary to distribute information on the present situation of local waste management systems in order to improve personal knowledge. According to analysis, information requirements can broadly be classified into two categories for acquiring knowledge: (1) waste separation can strongly impact on waste reduction and resource recycling and (2) waste treatment and disposal options and their potential impacts on environment and public health risks.

Moreover, participation by the third sector (i.e., NGOs, NPOs and CBOs) has played an important role for comprehensive and sustainable

solid waste management. The results summarized that the interests of CBOs in participating is not only influenced by economic reasons but also by the expected social benefits. Among those benefits, economic benefits that can be derived from recycled goods and compost directly influences the willingness to participate. Therefore, these entities need to create and/or extend markets for recycled goods and organic compost, and then, they also have to upgrade the required standard of those goods and compost over time as a key to enhance recycling.

Finally, local authorities (YCDC) can promote community participation and stakeholder coordination by introducing community-based solid waste management. This will intend to develop the sense of responsibility of individuals and social groups for environmental protection. Moreover, local authorities can reduce the burdens of waste management through community-based movement and thus they can concentrate more on other local development options. Therefore, this will also contribute to sustainable regional development, in the long term.

In order to conclude that, as a first step for Myanmar would be to promote community-based movement. The rational for this is because the concept of community and CBOs' participation in solid waste management and community-based solid waste management are increasingly being advocated as a means of responding to inadequate response from local governments. Hence, Myanmar should set up community-based waste management system or community-based kitchen waste separation and reduction project. This system should be initially introduced to urban residents in Yangon. In addition, creating and extending the markets for recyclables and organic compost should be also implemented. Moreover, it needs to provides subsidies for waste recycling and tax systems imposed on waste generators can support to reduce polluting or resource intensive activities however author cannot study that the polluters pay principle (i.e., paid garbage bag system) affect the waste management systems in this paper because of time limitation.

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