Linkage Model between Sustainable Consumption and Household Waste Management System

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***Abstract*—**This research focused on the household consumption related with the waste management system. The approach is qualitative and using the quantitative data too. Based on the questionnaires on one hundred households at Kecamatan Duren Sawit we found (Spearman's Rho Correlation) that income has significant correlation with consumption (non-food). People are more likely buying food and non-food products based on their usage value. They have more choices in the market and they try to reduce and recycle their waste.

Based on the observation, the temporary landfills locations are not properly standardized (less than one kilometer), which are close with the housing areas. This caused more diseases and more people to get sick. Even though, we have law UU No. 18/2008 for Waste Management, people do not separate their household waste before it is being carried by the sanitation officer. We must start with the sustainable consumption from the households level to reduce the waste.

***Keywords*—**Household Consumption, Waste Management, Spearman's Rho Correlation

I. Introduction

INDONESIA has more than 250 million of people in 2014. The increase number of population will increase the basic human needs, such as food, clothes, and shelter. On the other hand, the natural resources is limited to support all of the human needs and wants through production process. This phenomena shifts the usage of the natural resources into exploitation stage. It caused environmental degradation (pollution and waste), economic issues (poverty), and social problems (criminality and social conflicts).

Environmental degradation is one of the world major issues. Waste management, especially in developing country like Indonesia, still has big problems based on the infrastructure, institution, financial, law, operational, and community participation. DKI Jakarta Province as the capital city of Indonesia, has the most density area (14,496 people/km^2) compare with other provinces. East Jakarta area has the biggest issue on the unmanaged waste compare with other administrative areas. On Table 1, we can see the data from the Sanitation Department of DKI Jakarta Province.

TABLE I
WASTE VOLUME IN FIVE ADMINISTRATIVE AREAS IN JAKARTA, 2011

No	Sub-District Area	Daily Waste (m^3)	Daily Managed Waste (m^3)	Unmanaged Waste (m^3)
1.	Central Jakarta	5,479	5,479	0
2.	North Jakarta	4,519	4,517	2
3.	West Jakarta	6,490	5,526	964
4.	South Jakarta	5,696	5,642	54
5.	East Jakarta	6,331	3,901	2,430
	Total (Percentage)	28,515	25,065 (87.90%)	3,450 (12.10%)

The main problem on the waste management is the consumer behavior. Today, the emerging society and the development on technology gives us more information and easier for us to get the information. Based on the Engel's Law, the household consumption pattern will shift from food into non-food products as their income increase (with assumption that the consumer preferences do not changed). This happens in Jakarta area, where people spent more on non-food products (63.01%) than on food products (36.99%) in 2012. This phenomena will impact to the waste composition because it based on the packaging materials of the products.

The unmanaged waste caused bad impacts to the environment condition and health issues. So, if people apply the sustainable consumption on daily basis, it is going to reduce the waste generation. Sustainable consumption is consumption where people put environmental value together with the economic behavior thinking before they decide to buy something. I believe that people can act as a homo-economicus and homo-ecologicus. It means that beside people doing consumption activity, they also can preserve the environment condition. To analyze the relationship between the consumption behavior and the waste management, this paper try to analyze deeper on the internal and external value of the consumer behavior and the waste management. The location of the temporary landfills are also affect people how they discard their garbage. All of the temporary landfills in Jakarta are open-dumping sites.

In Indonesia, especially in big cities, there are waste-pickers or scavengers who sort the household waste before it is going to the temporary landfills (tempat penampungan sementara or TPS) or permanent landfills (tempat pengolahan

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sampah akhir or TPA).

II. Methodology

To see the correlation between household consumption and the waste management, this research used the Spearman's Rho Correlation and the formulas are: (a) income and consumption for food and non-food products; (b) consumption and motivation that is based on the need value and usage value; (c) consumption and lifestyle that is based on the other people influence and advertisement media; and (d) household consumption and the 3R principle (Reduce, Reuse, and Recycle) on the waste management. To analyze the temporary landfills, this paper used the spatial analysis.

The primary data are (Slovin formula) based on the questionnaires on 100 households or Kepala Keluarga (KK) on the most dense area (Kecamatan Duren Sawit). The respondents are on the seven villages or Kelurahan at Kecamatan Duren Sawit, such as: Pondok Bambu, Duren Sawit, Pondok Kelapa, Pondok Kopi, Malaka Jaya, Malaka Sari, and Klender. Beside this number, I did depth interview with eight KK on the area that are already applied the 3R principle. They are: Kelurahan Pondok Kelapa RW 09, Kelurahan Malaka Jaya RW 06, Kelurahan Malaka Sari RW 03, and Kelurahan Pondok Kopi RW 09. All respondents are being chosen random proportionally.

The secondary data are from the official documentation, academic journal publication, and report/research results. There are twenty eight temporary landfills locations at Kecamatan Duren Sawit but they are not the same number as on the field because there are some other (shadow) TPS. These locations relate with the people behavior on discarding their garbage. I divided the housing area into two categories, such as: the unorganized and organized housing area. Each area describes the waste management system and it will show on the analysis later.

III. Results and Discussions

There are 94,862 KK at Kecamatan Duren Sawit. The respondents filled up the structured questionnaires (contained economic, demographic, social, cultural, and environmental aspects). I used Likert scale (1-5) to gather information about their consumption motivation and their lifestyle. The Spearman's Rho Correlation showed that there is significant correlation (p-value is 0.000 < 0.05) between income and consumption (especially for non-food). On this research, the consumption products are food and non-food. Food products are like rice, yam/cassava/maize, fish, meats, eggs/dairy, vegetables, fruits, sugar/coffee/tea, cooking oil, beverages, tobacco, and food stuffs. For non-food products are like clothes/shoes/hats, purpose party/ceremony, and other goods (not including home facilities, transportation home/telecommunication, tax/insurance, savings, education services, security services/home workers, and health services/physician). The waste from food products assumed comes from the vegetables and/or fruits (kitchen waste) and we know as organic waste. Inorganic waste comes from plastic, paper, glass/metal, and other types.

The waste composition for Jakarta in 2010, we can see on the table below:

TABLE II
Waste composition and Waste Characteristic in Jakarta

No	Waste Characteristics	Percentage (%)
1.	Organic	55.37
2.	Inorganic	44.63
3.	Paper	20.57
4.	Plastic	13.25
5.	Wood	0.07
6.	Linen	0.61
7.	Rubber	0.19
8.	Metal	1.06
9.	Glass	1.91
10.	Buildings Waste	0.81
11.	Hazardous	1.52
10.	Others	4.65
	Total	100

Data are not available on sub-district level, so to see the waste composition at Kecamatan Duren Sawit. So, we can approach it by using the data on Table 2. Based on the one hundred KK, the respondents said that their waste more than 50% are organic waste. Even though, there is shift on the household consumption pattern from food into non-food products but the packaging materials are more likely still on the natural material.

Based on the statistical analysis using Spearman's Rho Correlation, the household consumption (food and non-food products) has significant correlation with the usage value with the p-value is 0.001 < 0.05. The correlation for the need value is insignificant. For the lifestyle, I emphasized on the two sub-variables such as the influence of others and the advertisement media. These sub-variables have significant correlation with household consumption (food products). Based on the observation, on the unorganized housing area, people live in a relatively small size houses; close to their neighbors; and they have more frequent time to communicate to other people. So, they can share information (marketing such as, sachet packaging size or new products). There is significant correlation between household consumption and the advertisement media.

Waste management system from the household level are: (a) collect the waste after cooking time in the morning and evening; (b) put it into a plastic, usually two trash plastic bags per day; (c) people just hang it up in front of their house; (d) the sanitation officer will pick it the trash once every two days by the wheeled bin or motorcycle bin; and (e) the sanitation officer will put the waste into the temporary landfills before it goes to the permanent landfills at Bantar Gebang-Bekasi.

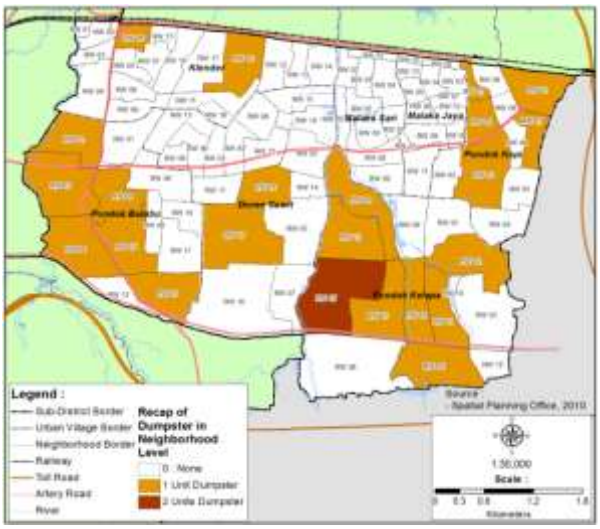

Fig. 1 Temporary landfills at kecamatan duren sawit

Based on the GIS, the temporary landfills locations at Kecamatan Duren Sawit do not spread evenly at the seven villages. The dark brown colored areas on the map above show that there are two units of the TPS and the light brown colored area show one unit of the TPS for each area. There are rivers at Kecamatan Duren Sawit, such as Ciliwung, Kali Sunter, Kali Malang, Cipinang, and Cakung. On the area that do not have temporary landfills ignite people to discard their waste improperly (for example, they use abundant land, beside of the road, in the river, or they burn the waste). Even though, we have Law or Undang-Undang No. 18/2008 for Waste Management but there is no reward and punishment system. So, people just throw their waste to the closet area with their house.

People behavior on their waste management system is low (based on the Environmental Awareness Survey by Statistical Office, 2012). They do not have knowledge about environment and waste management system. Their mind-set put the waste issues on the government responsibility only. There is no law enforcement on the household level, sub/district level, and also the store/market.

The interview that I made with the Sanitation Department of DKI Jakarta Province (East Jakarta), they said that the regulation for the minimum distance between temporary landfills and the housing areas are one kilometer but it does not apply on the field. If we see the temporary landfills with one kilometer radius of service, there are many overlaps area and for some areas there do not have waste management services.

On Figure 2 we can see the red colored area are for small size house; the yellow colored area are for medium size houses; and the green colored area are for big size houses. On the left area of the map, we see that there is no temporary landfills (with one kilometer radius) service, so people on this area can easily throw their waste on the illegal landfills. On this research, I observed the market location. if the housing area is close with any market, it will arise the consumption frequency. I divided market into three categories, such as: (a) traditional market that sells mostly food products; (b) mini-market that sell food and non-food, especially for ready consumed goods, and (c) supermarket that sell more variety of products with modern payment method. Based on the questionnaires, the closest mini-market is less than half kilometer.

I interviewed the seller in the markets, they do not have degradable packaging materials. They receive the products including the packaging material as given goods. there is limited degradable products on the market. For the purpose of this paper, I do not emphasize on the producer side. So, to reduce the waste, the sustainable consumption actions that we can do, such as: separate the organic and inorganic waste before we discard it; reduce the consumption for one time use products, and increase community participation (special case in Indonesia, as we know as Waste Bank).

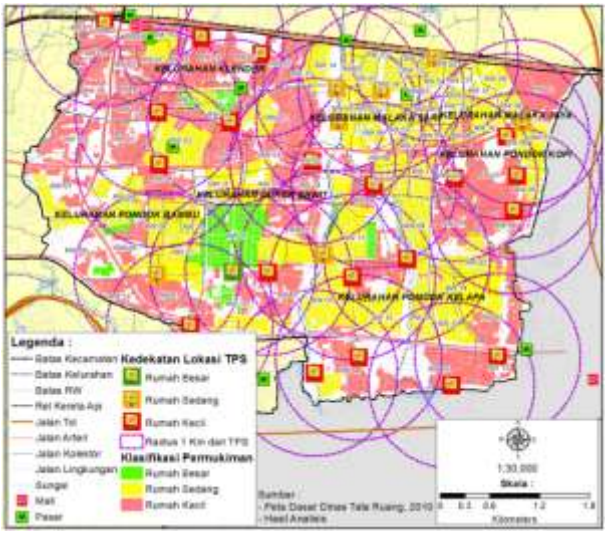

Fig. 2 Temporary landfills at kecamatan duren sawit

IV. Conclusion

Household waste management should be started from the internal side of the consumer to apply sustainable consumption. It will be more sustainable in the future to reduce the unmanaged waste. From the government side, they must do the law enforcement on the household level, sub/district areas, and the closet store/market.

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