

# STUDY ON ENVIRONMENTAL CONSCIOUS AND WASTE AND WASTEWATER MANAGEMENT OF HOUSEHOLD IN RURAL AREA BALIKPAPAN CITY IN INDONESIA

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This study focused on Balikpapan city, Karang Joang Villange. This village is very important for Balikpapan, because it has natural water resources for drinking water. Water pollution of the Manggar Dam is caused by some sources of pollution. In this study, we focused on the household sector, and analyzed lifestyles of people who live around the dam, especially environmental consciousness and waste and wastewater management of household. We distributed the questionnaires and interviewed.

We conducted a workshop for the community. Education for environmentally friendly living is needed to change the people's habits and way of thinking. Results of analysis between environmental consciousness and waste and wastewater management of household are expected to be one of the references in solving the problem of waste and wastewater problems.

**Key Words :** *Solid Waste management, Awareness, Environmental Education*

## 1. INTRODUCTION

Indonesia, as a developing country, has lots of environmental issues to cope with. The increases of population, economy and people activities unquestionably give rise to the volume of waste. If it does not take care properly, the waste problem will never end. As in UU No 18/2008 regarding about managing and arranging the paradigm changes from waste disposal to waste recycling released by State Minister of Environment, Municipal Solid Waste must be managed by reduction and treatment. The reductions comprise of minimalizing the solid waste, recycling and reuse. While the treatments consist of waste separation, waste recollecting or re-transporting and waste processing. Most of people in Indonesia, however, manage the solid waste only by collecting, transporting, and disposing to the landfills without optimizing reduce, reuse, and recycle program. (3R).

There has been emerging bank of waste program currently in Indonesia. This program will potentially reduce the waste disposal and extend the life of landfills. Although people do not yet support the

program fully, at least, there has been a program which encourages people to reduce and also to manage the waste properly.

## 2. PROBLEM

The research is conducted in Karang Joang Village Balikpapan Indonesia. It is located in the northernmost of Balikpapan City and has protected forests with reservoir dam as drinking water supply for people in Balikpapan. Total population of Karang Joang Village is around 1000 people divided into 31 neighborhood associations.

It has the area as the extent of one-third of



Fig.1 Map of Indonesia

Balikpapan consisting of a half of protect forests, dam and village. Most of people in the village are vegetable farmer and merchant. There are two main problems of this research:

**(1) People pattern in treating organic and inorganic waste**

Karang Joang people has been doing an inherited custom which has been passed on for a long time ago, that is throwing the organic and nonorganic waste. The patterns which had been always done are to burn the garbage in the yard or backyard, to throw the garbage away to the river for those whose houses near the river and also for other people living in some other neighborhood associations.

In some Karang Joang neighborhood, the waste which is not transported has become common problem. As a result, it already piles up in the temporary rubbish container. There are some reasons why the waste is not transported even though people have paid retribution for it. As in interview result, the most reason found is the truck to transport the waste rarely comes to the location. Accordingly, most people prefer disposing the waste to their garden or burning it in their backyard. In fact, this results air and soil pollution. This research is intended to give solution what people must do relating to their surrounding waste. If this bad pattern is still going on, the pollution will even get worse.

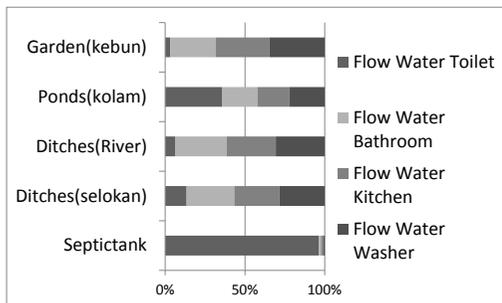


Fig.2 Pattern of domestic waste water disposal

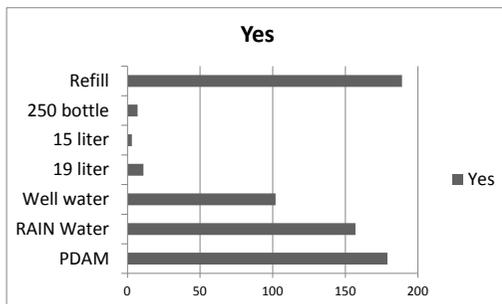


Fig.3 Use of clean water in the village of Karang Joang

**(2) People pattern in disposing liquid waste from toilet, washing clothes, bathroom, and other water needs**

The people habits disposing liquid waste to brooklet is also another problem which leads to dam water pollution. People often throw the garbage near their backyard or garden and it goes into the near river.

**3. METHOD**

We focused to the people lifestyle living near the dam. We gave questionnaire to the 500 families in 12 living area near the river. We conducted the interview to 5 housewives regarding to what they have bought and how much garbage or waste they produce every day. We also interviewed the owner of a small grocery store who sells his products for people in RT (neighborhood association) 12. From the interview result, it was obtained that one family produced around 5-7 plastics in sachets and 200 to 300 grams of organic waste in a day.

Six months after getting the result of questionnaire and data analysis, we conducted a workshop for Karang Joang people. The topics were government policies about waste disposal management, introduction to Takakura compost production with biopori method, introduction to centralized waste disposal and material about the importance of eco-friendly living near houses and river.

Eco-friendly education is indeed necessary to change how people behave and think, particularly in buying the products so they will not produce much waste.

**4. RESULT AND DISCUSSION**

**(1) Solid waste management pattern**

Management based is one of policy

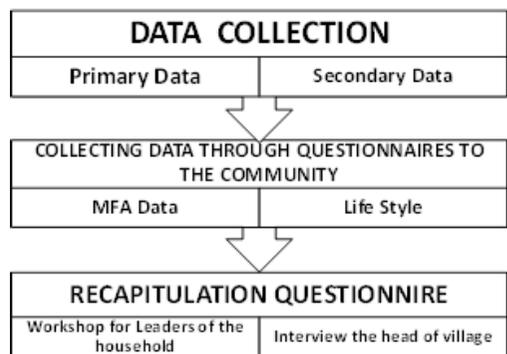
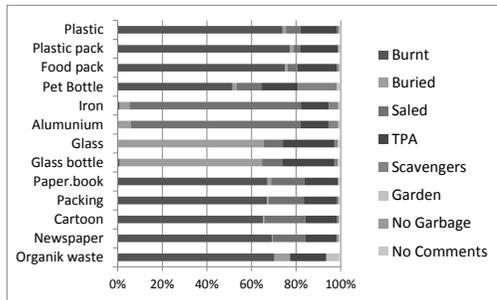
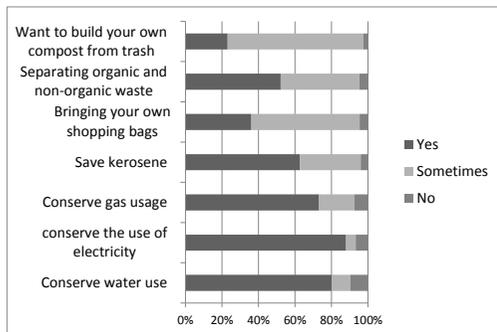


Fig.4 Research flow



**Fig.5** Pattern of dispose of solid waste

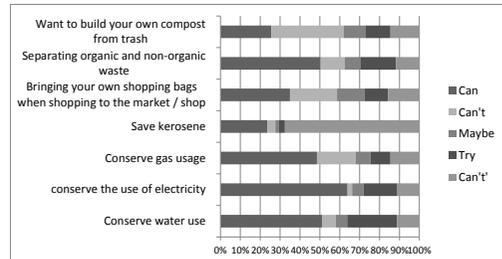


**Fig.6** Eco-friendly lifestyle in current condition

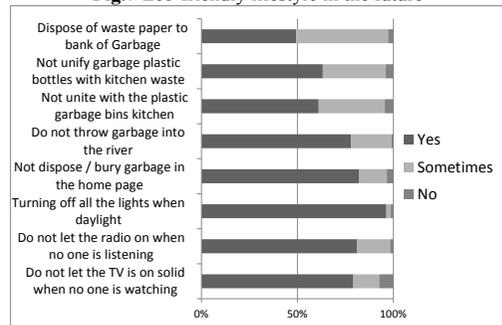
implementation of managing waste enforced by government. Through this management based, it is expected that the waste will finally reduce. The people are expected to participate in managing the compost and to reduce plastic bag use. Based on the questionnaire result, it is discovered that Karang Joang people have this following waste disposal pattern: for more than 50 % respondents answered that they burnt plastic waste, plastic packaging, plastic wrap, paper, carton, newspaper, and organic waste. While for iron and aluminum waste, they prefer selling to junkman in the village, but if there is not much amount of them, they let them in garbage container. Besides, there is unofficial dustman in the village called scavenger. He usually goes around the village to take waste of cardboard, paper, iron and aluminum. Meanwhile, Karang Joang people custom which is inherited hereditarily concerning about waste is to bury garbage glass and glass bottles.

We can see that people are used to burning the organic waste in their backyard or some other people did to their garden without any treatment. But it can potentially be useful if we can change this waste organic into compost that they can use to fertilize their vegetable. Moreover, most of them are vegetable farmer.

The Ministry of Environment regulation is focused on empowering people in managing the



**Fig.7** Eco-friendly lifestyle in the future



**Fig.8** Eco-friendly lifestyle in current condition

waste. According to Aras Mezzo theory (Suharto, 2005:66), this empowerment is conducted by using group as intervening media. Educating, training, and group dynamic are some ways to use in increasing people awareness, knowledge, skill and attitude which can be empowered to possess the ability to solve problems they face.

Some cities in Indonesia have started to implement some managing waste program which is community-based. This program is aimed at reducing the waste in those cities. The problem to deal with is about the low of local government budget to manage the waste. It particularly happens in some areas that are difficult to reach by vehicle. To implement the waste managing program fully, people participation is really required, for example, Surabaya, as the second largest city after Jakarta, possesses waste managing program administered by local government, non-governmental organization, and also cooperating with Kitakyushu city. The first step to take is to make waste management model which is developed by a group of people through producing compost program. After getting some instructions and trainings, people no longer throw the garbage to the street nor the river. As the result, the environment has become not only green but also clean. This method can also be applied in Karang Joang village. Making compost training can be done through PKK (Family Welfare Movement) and religious group in mosque.

Of the 15 questions (in Fig. 7, 8) asked, we can

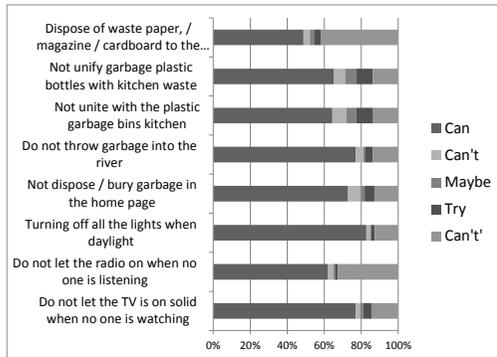


Fig.9 Eco-friendly lifestyle in the future

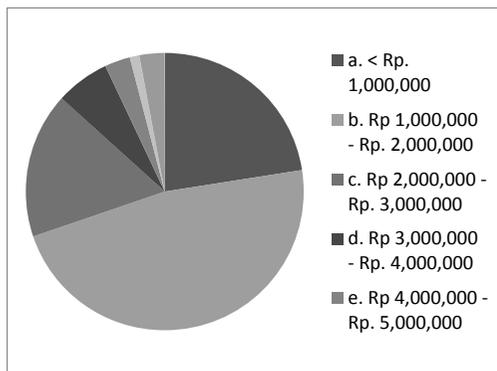


Fig.10 Income Average in Karang Joang

compare as follows: from 7 question now performs live with the pattern of environmentally friendly, in the future they can be in-depth chart. They can maintain the habit. While those who answered No and sometimes, they are answering divided over maybe, and try. It means there is a possibility they attempt to do so. According to the questionnaire result about current people lifestyle and compared to the pattern of life to come, it seems that Karang Joang people has spirit to fix their life pattern to be eco-friendly. Although the use of eco-bag is not the common thing now, they can probably use it for the next time. It is also for producing compost. By looking at the rise of 25 % from the questionnaire answerAccording to the results of the opinion poll, the public is not so much coral Joang energy sources. Average vehicle they own a motorcycle. There is still penduduk who use firewood for cooking.

In the next graph (Fig. 9, 10), the same as in the previous graph, those who answered Yes, the future still be able to live with a friendly environment. On the question of throwing garbage in the river 75% do not throw garbage into the river. The rest sometimes. Tetapiada future, become maybe can

not throw garbage into the river.

Expected by society no longer dispose of waste both kitchen waste and organic organi into rivers and creeks. Garbage settles on the edge of the river that causes the river becomes unhealthy. Riverbanks filled with rubbish bins plastic sachet of food and beverages. Plastic bags commonly used by people often settles in the river so much garbage piled up. One of the causes of flooding are making large amounts of waste water does not flow. One of the habits of the population Coral Joang is, when taking out the trash glass bottles. They bury it in the backyard. This habit lasted continuously. Surely when glass bottles and other glass brought to the bank of Garbage would be more useful.

Income chart (with the low of family income, the bank waste will at least help the society economy).

Almost 50% people of Karang Joang have income between Rp. 1,000,000 to Rp. 2,000,000. While according to People's Regional Representative Council of Balikpapan in Economy, the minimum wage relative is ranged between Rp. 2,100,000 included incentives.

(<http://kaltim.tribunnews.com/2013/11/15/umk-balikpapan-dinilai-masih-jauh-dari-harapan>)

If we see on the chart, the family income average of Karang Joang people can be categorized middle to lower income. Therefore, if Karang Joang people can join to the Bank Waste Member, they will have additional income for their daily needs. Besides, if we see from the amount of organic waste produced by a household, it can potentially enable to make compost. Based on the questionnaire result, the organic waste produced by a household is about 250 gram. This potential waste is more than enough to produce household compost by using Takakura method. Moreover, in this village, people has a house with large and huge yard in average. This enables for them to start planting flowers to sell.

Nowadays, Karang Joang village has become tourist village for Balikpapan citizens. This is because of the existence of Dam Manggar and the position of village which is located in the hills. The fresh air throughout the year has made this village as a favorite destination to visit. The potential as tourist village can be more improved only if the people willingly preserve and more exploit the village advantages.

If the people on village are given some training to make compost and to plant flower, there will be possibility for the village to have one special product on that village. Becoming tourist village of flowers can truly increase people income.

Therefore, the only solution over the problem is about how the local government can empower

Karang Joang people to be productive in managing and preserving the nature. By giving the training about houseplants or decorated plants, making the compost, and showing how to keep the environment will make people aware of the environment. Besides, most of women in Karang Joang village are housewives. This could be advantageous simply because they can run a business by planting decorated flowers and it will give additional income for the family. This program will work only if the government can help financially by lending the first capital with low interest. Beside money needed to start the business, training to plan and to preserve the flowers is also very important.

Another potential that can be exploited from Karang Joang Village is to make the product which originally comes from the village. It can begin with planting one unique vegetable from the village considering the village has fertile soil and fresh air.

Six months later after the questionnaire was given, we held a workshop divided into two sessions concerning about compost production by using Takakura method and biopori method in the first session. In the second session, we gave material about introduction to the bank of waste. The workshop was started from 8 to 12 AM. It was attended by 38 representatives consisted of wife of head and financial manager of neighborhood association.

After a year and a half of training, we interviewed urban village head of Karang Joang about the people development in environmental program. According to urban village head, there are three banks of garbage in that village, those are on 16 and 17 Besides, the villagers has already started making compost and preserve the environment. The changes of the village are also supported by Water Supply Company of Balikpapan and also Legal Assistance Institution of Balikpapan.

The current waste problem can be handled with managing the waste from the smallest one and producing the compost for organic waste. If these programs can be kept on going, the waste problem in Karang Joang will reduce.

The bank of waste has actually come up in Balikpapan city since 2011. However, its achievement is still relative low. It is different from the composting program. Most of schools have its compost processing for school garden needs. This program is done by the teachers along with the students who are engaged in loving environmental movement. Nevertheless, these two programs are not yet administered in Karang Joang Village. In fact, the programs can be beneficial to change garbage into economic materials if we see from the

total population and the amount of waste that the people produce.

## (2) Wastewater management

The opening of land mines and brick factory is one of the biggest threats for the quality of reservoir water. Its construction near the reservoir can result in silting up the puddle of dam. Most of people who was actually the village newcomer did open the new land for mines or bricks. This problem has attracted attention not only from other people who live near the area but also from the protected forest and Manggar river official authorities.

Fortunately, the people now has been aware and cared for the continuity of Manggar reservoir by reducing the activity near the Manggar reservoir and by making reforestation program with planting the rubber tree without tilling the soil. "From traditional wastewater treatment to zero-discharge strategy. Traditional end-of-pipe solutions for dealing with effluents coming out of the production plant have being gradually substituted for an increasingly decentralised approach to treat selected wastewater streams in the most effective and economically sound way. Moreover, additional goals like reducing overall effluent emissions by reusing treated wastewater towards zero-discharge strategies or minimising waste generation and disposal costs have been gradually incorporated to a growingly

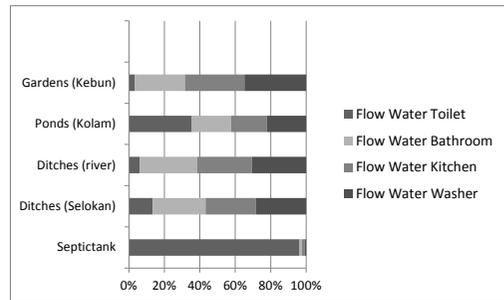


Fig.11 Dispose of waste water

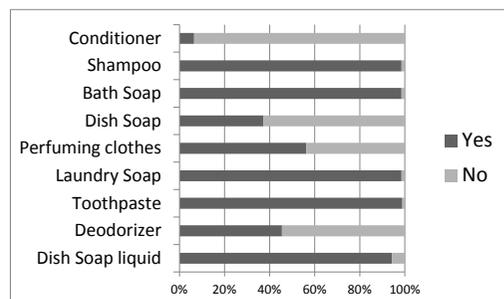


Fig.12 Use of liquid cleaning substance for clean house and toilet

**Table 1** Cross tabulation between degree of education and Wastewater

Education * Flow_water_bathroom Crosstabulation (%)					
Education	Septictank	Pond	Garden	Small Ditches	Big Ditches
Elementary	2	3.3	23.3	6	65.3
Junior School	0	4.1	16.3	10.2	69.4
Senior High	0	4.4	11.8	7.4	76.5
College	0	0.0	16.7	8.3	75.0

Education * Flow_water_kitchen Crosstabulation (%)					
Education	Septictank	Pond	Garden	Small Ditches	Big Ditches
Elementary	0	3.3	27.3	6	63.3
Junior School	2.0	2.0	20.4	6.1	69.4
Senior High	2.9	4.4	13.2	8.8	70.6
College	0	0	25.0	8.3	66.7

Education * Flow_water_washer Crosstabulation (%)					
Education	Septictank	Pond	Garden	Small Ditches	Big Ditches
Elementary	0	3.3	28	6	62.7
Junior School	4.1	4.1	20.4	8.2	63.3
Senior High	0	4.4	14.7	7.4	73.5
College	0	0	25	8.3	66.7

**Tabel 2** Water resources

	Yes(%)	No(%)
PDAM	64.4	35.6
Rain Water	56.5	43.5
Well Water	37.3	62.7
Refill Bottle for Drink	68.2	31.8

holistic water and wastewater management approach (Jose Kanga).

The villagers are used to throwing the wastewater to the brooklet, a big ditch and the garden. In fact, the wastewater streams from the river to Manggar dam. The usage of cleanser as in soap, shampoo, perfume and others can potentially contaminate the dam water.

The money that a family spend for a month in average is +- Rp. 38,000 It is used to buy cleaning needs. It is equal with clothes washing soap as 3-4kg/month.

The table shows the cross tabulation between the degree of education and wastewater disposal pattern from the house.

From the table, it is found that the degree of education does not give much influence of wastewater disposal pattern. Most of people throw the wastewater to the big ditches which directly stream to the tributary and end in Manggar Dam. Meanwhile, the water that a family spend for household needs is around 150-200 litre, it is comparable with 1 drum. The highest amount of water used is from water from Water Supply Company (from Government) as 64.4%, with expenses in average as Rp. 96.045 for each family and from refill drinking water which a family spend Rp. 13.600/ family. It is assumed that the total of a family consist of 5 people. Lots of people also use

rainwater. They often prepare a big drum that can contain 50 liter water and it is stored in front of their houses. They use the rainwater for washing their feet, vehicle, and watering their plants.

## 5. CONCLUSION

Kitakyushu City is a city that has developed a good environment model. Besides that, the city is well known as the eco-friendly city with a sustainable society and economy condition (the office for international environmental cooperation bureau 2007). In 1960, the development of industry in Kitakyushu made the city become a high polluted city. The waste of industry polluted the air, land and water. During 1960 to 1980, the effort conducted among the citizens of Kitakyushu, the company, and the local government resulted in a good improvement of environment quality, it changed Kitakyushu to be an amazing city which succeeds in resolving and regenerating the high polluted environment problem in Japan (the office for international environmental cooperation bureau 2007).

Since 1960, the Kitakyushu City began to develop the MSW Management (Municipal Solid Waste). Kitakyushu collects 100% of waste issued by the society. The wet waste comes from the household activities is distributed to the incinerator that is available in each working area (for the society in area A, the waste will be distributed to the incinerator that is available in Area A). Meanwhile for the other waste is distributed to the recycling plant that is available in the recycling center in eco town. Kitakyushu City has electricity power plant in 3 solid waste incineration and get the 7 % benefit from the income (Mr. Reiji Hitsumoto, Deputy Director of International environmental cooperation office). However, as a matter of waste management improvement, the city has to make its society involved in the process of waste management so that the collection system becomes more effective. In 1998, the city adopted a program called "waste basket" or "sitei-bukuro" that is a plastic bag bought by the society to put the solid waste. The society must separate and place the plastic bag in a place which government has decided. The citizen can buy that plastic bag at the department store in Kitakyushu City.

The waste will be placed outside the house according to the schedule that the government has decided. For example the blue plastic bag for household waste will be collected every Tuesday and Friday. The orange plastic bag for plastic bottle, the green plastic bag for the common plastic, and

the brown plastic bag for the glass bottle, aluminum and soft drink cans. The wastes will be collected and distributed to the recycling plant based on the schedule arranged by local government. This waste management program is successfully conducted as the result of the high participation of citizens.

The main challenge in MSW Management for the developing country is how to find the best solution in separating and collecting the waste based on the waste category effectively, it is surely aimed to how many wastes can be recycled and how many kinds of waste that can be recycled. If the society can apply the recycling process independently, then the amount of wastes in the waste dump will be reduced and it can make the waste dump age longer.

It is obvious that the citizen participation plays an important role in separating and collecting the waste. Indonesia government assumes that the citizens' awareness is still lack and low about the concept of 3R (Reduce, Reuse, Recycle). The main problem is executing that program publicly. The ministry of environment has created the bank of garbage as a social experiment tool. It is different with other informal sectors such as scavengers and garbage collectors. Bank of garbage is aimed to spread out the concept of 3R and train the citizens until they can apply its concept. The local government must encourage the people to build BGS in order to separate the waste, furthermore it can becomes their habit and becomes the preparation to create the sustainable society. Indeed, the other informal sectors appeared only to get the profit for living. It is actually done by the unemployment people, they are such kind of scavengers in train station or garbage dumps. So basically the bank of garbage and the garbage collectors have a different concept. However, the bank of garbage still needs improving and needs the high collective awareness of society.

According to PermenLH (act of Environment ministry) no 13/2012, there are three main targets of bank of garbage, the first is to apply the concept of 3R among society, and the second is to make a sustainable and comprehensive MSW Management and the last is to increase citizens' awareness regarding the waste management. The bank of garbage is operated by society around their daily life. The central government is responsible to give the technical assistance for bank of garbage, as well as monitoring and evaluating the bank of garbage operation in Indonesia. The local government gives the technical assistance, training, monitoring and evaluating the bank of garbage operation in its area sustainably and comprehensively. The bank of garbage is a place to separate and collect the

recycled waste that has an economical value. The form of bank of garbage institution is cooperation or foundation. The bank of garbage also adopts the banking system. The people can deposit their waste not the money. But still it is the non-profit organization.

In a bank of garbage scenario, the society has to separate the waste into 2 main categories, the organic waste and the inorganic waste. The kinds of waste that can be saved in the bank of garbage are plastic, cardboards, papers, magazines, plastic and glass bottle, iron, and aluminum. The bank of garbage can be functioned to save their valuable waste and build a cooperation with the informal sector such as the waste recycle sellers or recycle industry.

The main challenge in MSW management for the developing countries is to find out the best solution in improving the quality of life, working condition and recycling efficiency in informal sector (Wilson et al., 2006). The most effective way to solve this serious problem is by integrating the waste recycle program to be an MSW Management (Suttibak et al., 2008).

This research results in a conclusion that the level of citizens' awareness is still lack, so that the sustainable and continuous education is still needed, because the role of society highly influences the process recycle effort to be an MSW management that has a great influence towards the waste reduction program.

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