Affecting Factors on Local Waste Management in Penyangkringan Village, Weleri: an Identification

Nadia Puspita Adriyanti\textsuperscript{1}, Ova Candra Dewi\textsuperscript{2}, Ahmad Gamal\textsuperscript{3}, Mohammad Joko Romadhon\textsuperscript{4}, and Raditya\textsuperscript{5}

1 Master Degree Student Dept. of architecture, Universitas Indonesia
2 College Lecturer, Universitas Indonesia
3. Assistant Professor, Universitas Indonesia
4. Master Degree Student, Universitas Indonesia
5. Master Degree Student, Universitas Indonesia
E-mail: nadia.puspita61@ui.ac.id

Abstract. Villages in Indonesia usually does not have proper waste management and it is affecting the environmental and social condition in those places. Local governments have been trying to implement many kinds of solid waste management systems and yet many of them does not bear fruit. We argue that the failure of the waste management implementation in Indonesian villages is due to several aspects: the geographic condition of the villages, the social conditions, and the availability of facilities and infrastructures in those villages. Waste management should be modeled in accordance to those three aspects.

1. Introduction
Solid waste is a recurring environmental problems which affects community livelihood. Penyangkringan, which is located in sub-district Weleri, Central Java, is also one of many local communities that have been affected by the absence of suitable solid waste management program for many years. About 39% of drainage networks in Penyangkringan is in bad condition because of the solid wasted was disposed carelessly in to the drainage (RPLP Desa Penyangkringan 2017). Not only it will affect people’s health who live there but it will also affect the environment by indirectly causing flood and it is because the clogged drainage cannot keep the rain water. The local government has been trying to solve the solid waste problems by implementing various solid waste management plan on the Penyangkringan, such as implementing solid waste recycling program and giving free garbage transports. But, the programs cannot be able to solve, even reduce, the solid waste management problem in Penyangkringan.

Penyangkringan is characteristically a typical Indonesian village. First, Penyangkringan covers agricultural area (rice fields), commercial area, and residence area. On the downtown area, Penyangkringan has not only one but two traditional markets that act as the center of economy activities in sub-district Weleri. They sell not only daily necessities but also other things like livestock products and electronics. Second, Penyangkringan has different type of road networks. The road that connects houses and the main road have big difference in size and characteristics. Even the narrower roads that connect houses have different size in each neighborhood. Because of these characteristics, local government is trying to implement different kind of solid waste transportations, in accordance with the type of the road.
We identify factors hampering local waste management in Penyangkringan based on three analytical dimensions: road network, gender roles in local social institution, and the availability of facilities and infrastructures.

2. Literature Review

Waste management in developing countries such as Indonesia has many difficulties compared to more developed countries. Furthermore, the solid waste generation rate in developing countries is higher compared to the developed countries and it is because of the rapid development of urban population and industries (Boadi, 2005). According to Ogawa (2005), there are several constraints that affecting waste management in developing countries: technical constraint which is about the lack of human resources, especially technical expertise, in national and local level and also the lack of research and development activities regarding waste management. Developing countries usually do not have stable economic and industrial development so there is no sufficient fund for development of sustainable solid waste management system. Social aspect also takes part in constraining waste management. Collaborative projects from the government to encourage community to take part in developing waste management often fail because usually there are not enough people to take part in the project and the incentive is too small.

Informal sector in solid waste management prevails because of those constraints. The lack of service provided by the governments is seen by people who have no skill nor proper education as chances to get money for a living. The informal recycling sector can also bring economic benefits to developing countries as they minimize capital expenditures and maximize man power (Haan et al. in Wilson, 2006). However, the informal sector in solid management can affect health of the people working in that sector such as exposed to toxic, infectious components, and gaseous emissions. (Cointreau in Wilson, 2006). To decrease the negative effect, there’s a need to integrate informal sector to formal solid waste management sector by helping organize the informal sector workers and adding value to the recycled materials before selling them (Wilson, 2006).

Aside from integrating informal sector to formal sector, another strategy for successful implementation of solid waste management is to increase degree of youth participation and including their ideas, skill, and experience (Srivastava, 2005). Women participation in solid waste management is also important due to the nature of solid waste management as house chores and it should be taken care of by women (Abadi, 2013). Woman’s activities that related to solid waste management are: managing traditional environment, rehabilitators of the domestic environment, innovators in the use of new more appropriate technology, and protectors and caretakers of domestic environment (Mahapatra in Davies, 2016).

Solid waste management studies need to look at the integration between several aspects. Social structure and behavior can affect the availability of solid waste management infrastructure and how a transportation path for waste transport is determined. It is also can affect the type of waste generated in household or commercial area. Lack of research about solid waste management in Indonesia villages can lead to inappropriate technology and model of solid waste management applied in those area. The technology and models of solid waste management that are taken from developed countries might not work if applied to local areas, that is the reason why local studies is needed to make wise decision making in solid waste management.

3. Methodology

3.1. Literature review

Review of relevant literatures related to waste management in developing countries and informal waste management.

3.2. Field survey

Field survey consists of two kind of data collecting:
- Observation
Observation was done to confirm solid waste treatment in Desa Penyangkringan. Observing several locations in Penyangkringan and taking photos of solid waste dumped on the side-road, on the market, and on the drainage. Observation took 2 days.

- **Interview**

To gain information about social conditions in Penyangkringan, there is interview with several important figures in Penyangkringan. Those important figures include KOTAKU facilitators, BKM Barokah’s chief, Penyangkringan’s village-chief, and Weleri sub-district’s head-chief.

3.3. **Data analysis**

Analyzing data from field survey and compare the data with the literature review.

4. **Result and discussion**

4.1. **Geographic conditions**

Penyangkringan has an administrative area of 1.78km². It has a large agricultural land, almost 55.49% of land in Penyangkringan Village is land for rice fields (RPLP Desa Penyangkringan 2017). The soil in the percolation village is partly a sedimentary soil, also called alluvial soil, which is the soil formed from the finer material resulting from the deposition of river flows in the lowlands. Penyangkringan Village is located in the lowlands. The average temperature in the village is 20°C. (Central Bureau of Statistics Kendal 2011). Penyangkringan and other neighbor villages are separated by highways. Penyangkringan also has small river that stretches from South part of Penyangkringan to the East part. On the West side, Penyangkringan adjacents to rice fields.

4.2. **Social conditions**

According to 2017 survey data at Penyangkringan, this area has decent population of people in productive age group (ranging from 15-64 years old, according to Organization for Economic Co-operation and Development). Around 70% population of Penyangkringan is in productive age group (KOTAKU, 2017). The ratio between male and female population in Desa Penyangkringan is almost balance. According to KOTAKU’s data, 29% of the female population in Desa Penyangkringan works as housewife, which means they are the one who usually responsible for taking care of household matter, including solid waste management. Empowering housewives to become part in the decision making in solid waste management can help the system to grow in accordance with the social condition in Desa Penyangkringan.

![Male and Female population in Desa Penyangkringan](image)

Table 1 Male and Female Population Ratio in Desa Penyangkringan
data source: KOTAKU Facilitator (2017)
* KOTAKU is national government program to develop suburban areas

Penyangkringan has self-help community organization called BKM Barokah. BKM is the abbreviation of Badan Keswadayaan Masyarakat. BKM Barokah helps people in Penyangkringan by channeling their aspirations to local government through discussions and proposals. However, BKM Barokah do not gather together very often to have internal discussion and coordination with regard to village planning. Other than BKM Barokah, Penyangkringan people can still gathered together through other social activities like local social gathering (arisaran) and Moslems routine activities in learning Quran together. The community and its social programs can boost people awareness about solid waste management and how to do it.

4.3. Environment conditions
Most of the Penyangkringan neighborhoods have not yet undertaken waste management as environmental threat. Most of the waste is dumped into the rivers and vacant lots, and some of them are partially burned in the backyard of their homes. Penyangkringan Village has an informal temporary garbage dump located in Pasar Kidul area (also called Weleri II Market). This area has been used as a temporary disposal for more than 10 years, but at the same time, it is still used for buying and selling activities on certain Javanese days, such as on Kliwon and Legi days—part of Javanese calender day's name that consists of five days: Kliwon, Legi, Pahing, Pon, and Wage. Penyangkringan has a waste recycling building located in Pasar Kidul area. This building has a waste recycling facility for composting and has been operating for 1.5 years since 2014 and it also has one garbage transport to pick up and deliver garbage from several Penyangkringan neighborhoods. However, the waste recycling facilities was deserted by the employee because the income from selling the fertilizer and the salary were deemed very low and not enough for a living. Pasar Kidul also has temporary waste collection bin which is usually transported to waste landfills located on the other village by local government’s garbage trucks every 2-3 days.

4.4. Road networks
There are different kind of roads in Penyangkringan, some roads can be accessible to trucks and bus, others can only be accessible to motorcycle. Because of that, Penyangkringan needs different kind of garbage transportations to be able to pick up and deliver garbage from houses or from temporary dumpsters from each neighborhood. There are two kind of garbage transportations used to take solid waste from houses, garbage carts and garbage motorcycle. Both has their own advantages and disadvantages.

4.5. Social conditions
Penyangkringan people understood the effect of poor solid waste management to their environment and health but they keep littering the road and river. Sometimes they burn the garbage at their backyard. It happens because for them, it is easier to just throw away the garbage and burn the rest rather than actually managing them. There is also no community garbage cleaning activity that is usually held weekly or monthly by villages. Looking at the total population of productive age group, it is possible to organize weekly community garbage cleaning activity in each neighborhood in Penyangkringan.

4.6. Facilities and infrastructures
There are some problems faced by Penyangkringan associated with waste management, the first is the lack of trash bin in the roadside area. The area along the main road does not have enough trash bins, so it indirectly encourages people to litter. As a result, not only solid waste is accumulating at certain areas, but also clogging the drainage channels. In addition to blockage of drainage channels, the solid waste is also piling up on Pasar Kidul, where the place is not supposed to be used as a waste disposal site while Penyangkringan. The solid waste has piled up high enough that it makes the cost of moving the waste to the landfill area becomes expensive.
Figure 1 Few examples of littering and clogged drainage in Penyangkringan and waste recycling facility in Pasar Kidul
source: KOTAKU RPLP map 2017, with changes

The waste recycling facility provided by the government to reduce solid waste and to empower local community is stopped because the amount of salary and the income from selling the fertilizer were deemed not enough for a living. There were supposed to be five employee working at the waste recycling facility but all of them resigned after working for around 1.5 years, from 2014 to 2015. The salary for the employee was Rp 800,000, which was below the standard salary in Kendal. The standard salary for employee in Kendal in 2015 was Rp 1,383,000. One of the ex-employee is now working as scavenger as he sees it to be more profitable compared to his old job. It is assumed that the waste recycling facility is not supported by other local industries. Producing fertilizer from solid waste will be profitable if the location of the seller or other local industries are near the waste recycling facility so that the transportation cost can be reduced.
Garbage Cart is the cheapest garbage transportation since it only uses man-power. The smallest garbage cart’s capacity is 1m³. However, since it is operated only by man power, it is not time-effective. It is slow and the operator might need to take a break for a few times especially if they have to cover wide area. It is more effective to use garbage cart to serve in smaller neighborhood, taking the trashes and put it in the designated temporary dumpster, from there the trashes can be picked by bigger vehicles such as truck.

Garbage Motorcycle can serve more houses in one day because it uses engine power which is faster than garbage cart. But It should be noted that garbage motorcycle needs gasoline per 100 km, the average use of gasoline for motorcycles is 3L / 100km. The cost will be more expensive because the need to put gasoline price into the budget and the impact on the environment is greater compared garbage cart because the gasoline will emit gas emission out into the air. Also, the garbage motorcycle operator should be someone with skill to operate special type of motorcycle. Local government in Sub-District Weleri has provided one garbage motorcycle to each villages to help them taking trashes from each houses. But since Penyangkringan area is big, it needs more than one garbage motorcycle to take trashes from each house. On the main road, garbage truck is used to take trashes from temporary dumpster and then transport them to the landfill area, which is located on Pagergunung village.

5. Conclusion and suggestion
In conclusion, the connection between road networks, social conditions/gender roles, and facilities and infrastructures affected solid waste management in Penyangkringan. It is important to see solid waste management as a whole system that includes many aspects, starting from the generation, treatment and disposal. To implement solid waste management system to Penyangkringan, it is not only by providing facilities and infrastructures but it is more urgent to manage the local communities in Penyangkringan, encouraging them to understand the importance of managing solid waste in their neighborhood (the capacity building). With the help of self-help community organization, BKM Barokah, the neighborhoods in Penyangkringan can organize weekly community garbage cleaning activity in each neighborhood. Monthly social gatherings such as arisan and pengajian can also be used as media to educate people how to manage their household waste.

6. References
[1] Abadi, Ronny Setiawan. 2013. Biro Penerbit Planologi UNDIP. Keberlanjutan Pengelolaan Sampah Domestik di Kampung Menoreh, Kelurahan, Sampangan, Semarang. Vol 9. Pg 87-96.
[2] Bernache, Gerardo. 2003. Resources, Conservation and Recycling. The Environmental Impact Of Municipal Waste Management: The Case Of Guadalajara Metro Area. Vol 39. Pg 223-237.
[3] Boadi, Owusu Kwadi and Markku Kuitunen. 2005. Journal of Environmental Health. Environmental and Health Impacts of Household Solid Waste Handling and Disposal Practices in Third World Cities: The Case of the Accra Metropolitan Area, Ghana. 68,4, ProQuest. Pg 32.
[4] Davies, Nyatsanza Taurai and Ndebele Sharon Kudzai. 2016. IOSR Journal of Humanities and Social Science. The Usefulness of Including Women in Household Solid Waste Management: A Case Study of Dzivaresekwa High Density Suburb, Harare. Vol. 21. Pg 92-108
[5] Ogawa, Hisashi. 2005. Sustainable Solid Waste Management in Developing Countries. http://www.gdrc.org/uem/waste/swm-fogawa1.htm
[6] Rencana Penataan Lingkungan Permukiman Desa Penyangkringan Kota Tanpa Kumuh (RPLP KOTAKU). 2017.
[7] Srivastava, P.K. et al. 2005. Waste Management. Stakeholder-based SWOT analysis for successful municipal solid waste management in Lucknow, India. Vol. 25. Pg. 531-537

[8] Wilson, David C., Costas Velis, Chris Cheeseman. 2006. Habitat International. Role of Informal Sector Recycling in Waste Management In Developing Countries. Vol 30. Pg 797–808.