

Community-based waste management strategy: A Note on Community Empowerment Level in Supporting Waste Bank at Semarang City, Indonesia

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Abstract. Community involvement in waste management becomes one of waste management strategies development from upstream reduce, reuse and recycle. This alternative must be seriously addressed regarding to the increasing municipal waste generation as the population grow. In Semarang City, waste generation has reached 1,207 m³ per day and will gradually increase since the population growth of the city is more than 1.5% per year. When practiced in household level, waste reduction will significantly decrease the municipal waste generation. The emerging trend nowadays is the existence of community-based waste management centres through waste bank, an informal body managed by the community and sometimes by an NGO, such as Srikanthi Waste bank in Tembalang, Semarang City. This waste bank continuously campaigns community empowerment for waste management. Based on this trend, this research aimed to find out the community empowerment level in waste management. This research used descriptive statistic method based on questionnaires distributed to 94 respondents. The empowerment components being researched consist of economic, mobility, socio-culture, and community awareness aspects. The research found out that the community empowerment level was categorized into 2 levels that are viable (31.63%) and independent (31.56%). The factors mostly contributory to the level were communication and satisfaction of benefits obtained from the waste bank. Regardless the percentages, there were more than 46% of the community which did not understand the system of community-based waste management even though they joined the workshop. This research opens a new discussion on the role of community involvement in community-based waste management.

Keywords— CBWM, empowerment, waste bank

1. Introduction

Nowadays, the discussions on waste processing through sorting continue to increase even though this management system has been around since 3000-1000 BC[1]. It is not a new system that every family in the ancient Athenian society had to be responsible for collecting and moving it. The empowerment of the Athenians is believed to be the beginning of the concept of community-based waste management. According to Zurbrügg [2], one of the alternative services of municipal waste is with the existence of community-based organizations. This concept explains that waste management is considered to meet the needs of the community because the community itself is authorized to have transparency in making decisions[3, 4].

Community-based waste management is not just a service, but a cooperative effort that requires coordination of informal actors and conventional management[5]. Through the concept of community-based waste management, people can do some works and have the right to express their opinions and decisions to monitor the waste processing management activities [2]. Recycling turns out as a solution to reduce the need for waste transportation to the final disposal site continuously. Public and private companies working together in waste management can solve the problem of solid waste[6]. Public awareness and waste disposal behavior may affect the willingness of the community to cooperate and participate in adequate waste management practices. Environmental and information awareness on health risks resulting from solid waste management should be communicated to the entire community. Community participation to sort waste can have great benefits. The empowerment theory includes processes and outcomes. Action, activity, or structure is an empowering process, and the outcome of the process generates an empowered level according to Perkins and Zimmerman [7]. The results of community empowerment can improve the quality of life of the community itself and as a value orientation of the empowerment process undertaken[8]. Thus, community's viability is the result of community empowerment and a benchmark of empowerment.

Presently, community-based waste processing tends to develop as an alternative to waste processing when conventional waste processing is considered less environmentally friendly. The difference is that this concept offers a solution handling in the upstream through the sorting which is often called a waste bank[9, 10]. The existence of waste banks provides economic benefits directly obtained by the community as savers which can also reduce the volume of waste, according to Environment Minister Balthasar Kambuaya [11]. Today is the era of modernization where the industry is growing rapidly and the result of all the production process done is in the form of waste [12]. The waste is not only produced from large scale industries but also produced from household scale industries as well. The more and more garbage be produced, effective integrated waste management is needed. Cooperation and involvement of various parties, both the role of formal and informal institutions, and community is needed. The government as

a formal institution now has a big role in waste collection, transportation, and final disposal. While the role of informal institutions is economic aspects such as garbage collectors to seek profit. However, in the process of waste management, the role of the community is not yet fully optimal. According to Chen [12], in some locations there are people who start to process the waste in an integrated manner, but the number is still very small. Whereas if optimized, the contribution of waste utilization can reduce the burden of government in managing waste. This is supported by the statement of Head of BLH (Environmental agency) of Yogyakarta, although there are waste management activities by the community, but the amount of successfully managed waste is still below the national average [13]. Therefore, community participation in waste processing activities is an important thing that needs to be cultivated and must be done starting from the scope of household so that it can optimally overcome the waste problem.

BPS (the Central Statistics Agency) of Semarang City (2015) notes that Semarang City produces 1,207 m³ of waste per day. This waste is estimated to increase along with the increase of population. Currently, high garbage volume has made the capacity of TPA (final disposal site) Jatibarang fewer and even can be said as full. As a result, complaints from local communities arose about pollution and local concerns. The latest developing trend is waste processing by the community by way of saving garbage or so-called waste bank [14, 15]. In addition to reducing the volume of waste, waste banks also provide economic benefits to the community [11]. One of the successful waste banks is Srikandhi Waste Bank. Srikandhi Waste Bank is a community in Semarang City with hundreds of people as the members. This waste bank is considered a success because it has a pretty amazing achievement. The achievement is to receive the top 10 best national level Klik Hati MERCK "Social Movements" in CSR program 2010 by PT. Merck Tbk. This Srikandhi Waste Bank won one of two awards contested in the best social action category. In addition, Srikandhi Waste Bank has been a guest star of a national TV station in the event of IMS Talk show in NET in 2014. Currently, it is quite rare for a social environment community that is active and involving the community. The community that cooperates with the waste bank is in Kelurahan (village) Tandang, District of Tembalang, specifically the residents of RW (Rukun Warga/administrative unit at the next-to-lowest level in city) III, IX, XI, and XII. However, according to the results of interviews with residents, it is known that the most active and routine people doing waste processing is the citizens of RW XII.

In line with the sustainable development paradigm, in which one of them is building a healthy environment, according to [16], it needs the openness, equality, community participation, and community empowerment. Community empowerment conducted by Srikandhi Waste Bank is a positive step. In addition to helping the environment, it helps to improve the welfare of the community as well. The level of the result of community empowerment conducted by Srikandhi Waste Bank needs

to be known to be able to achieve better waste processing condition. People as workers have different views, goals, needs, and abilities. Diversity causes different behaviors even in the same environment. Therefore, the level of empowerment of RW XII community that can be achieved can have an influence on their partners, namely Srikandhi Waste Bank. Assessment of the level of community empowerment can be done through the measurement of elements of community empowerment according to Bartle, et al. [17]. Then the level of community empowerment achieved can be known by categorizing it in the level of community empowerment. By knowing the level of empowerment, it can improve the ability of RW XII community of Kelurahan Tandang to improve waste processing activities pioneered by Srikandhi Waste Bank and welfare of the surrounding community. While the improvement of the ability of the community can be realized by knowing the factors of the elements of community empowerment that affect the level of empowerment of RW XII community.

The research on community empowerment is often conducted by other researchers whether in waste processing or other. However, most of the research conducted is qualitative by knowing the description of existing conditions. Other researchers examined the characteristics of the community or how the process was performed. There are still few studies that measure or assess the results of community empowerment itself, especially the level of community empowerment based on theory, and what factors influence from a community that is considered quite successful. Therefore, this research is important as a study to improve existing conditions by knowing the level of the community empowerment and factors that influence it. In addition to bringing benefits to the community, this research will be useful for the government as an input to develop the potential that exists in the community to help improving the condition of waste and environment of Semarang City.

2. Material and Methods

This research uses the core elements of empowerment elements [18] that include economic, sociocultural, mobility, and awareness that is considered the most appropriate to be used as a reference to determine the variables used. The elements of the power of community empowerment according to Bartle, et al. [17] which are used as variables are: altruism, communal values, communal services, communications, self-confidence, context, information, intervention, networking, organization, skills, and wealth.

The research method used is quantitative descriptive with Likert scale analysis technique and confirmatory factor analysis. Likert scale used will be analyzed using scores where many intervals are determined according to the level of community empowerment. The level of community empowerment according to Wrihatnolo and Dwidjowijoto [19] consists of the inviable, viable, independent, and civil society. Sampling technique taken in this research is probability sampling with random sampling in which every member

of population has equal opportunity to be chosen as sample [20]. The number of samples taken will be calculated using Slovin formula [21] with the result of 94 samples. This research describes the characteristics and role of community in waste processing; assess the level of community empowerment; and know the influential factors.

3. Result and Discussion

Waste processing activities are carried out by the RW XII community once a week, i.e. on Sundays, located at RT 3 RW XII. This activity is carried out in the morning at around 10:00 am after kerja bakti (community work). The waste processing activities started from individuals and then developed wider by involving the community so that in 2013 the waste processing began in RW XII. Waste processing is not only done by the females only but the males and teenagers also participate so that people who participate in these activities have no age limit. Various age groups are involved in this activity, although toddlers and the elderly are not encountered during the sorting and waste processing activities. Every time this activity is held, the community is free to follow or not. It is only teenagers who have special conditions to supervise the location according to the schedule if there are residents who want to deposit their waste. After the people deposit their waste, it is then being sorted according to type. The types of sorted waste are like food and drink plastics, bottles, paper, and others. Certain types of waste that are difficult to process such as bottles will be immediately resold to the waste collectors.



Figure 1
Community Waste Processing Activities

In the above activities (see Fig. 1), the community gathered to sort the waste according to the type. RW XII community is not only sorting but also processing the waste to become products of economic value. The products include bags, wallets, pencil cases, bins, baskets and others and if there is any type of waste that is difficult to be processed will be resold. Products such as bags and wallets are produced from plastic wraps of food/beverage. While the waste bin is produced from the bottle cap that is

assembled into one. It is different from baskets that can be made with the neck of a plastic of drinking glass or with newspapers and paper waste. In this activity, there are rules that must be obeyed by the community such as the schedule of the teenagers (as previously described), the recording of waste deposit in the waste saving books, especially for the waste processor there is a profit-sharing, and facilities used can be used freely but accordingly. The existing facilities provided by the Srikandhi Waste Bank are in the form of waste sorting tools, such as scales and garbage bins.

Waste processing training has also been gotten by RW XII community precisely in PKK (Family Welfare Movement) event. The training is not only in the event, but also provided through special events within a few days. Training provided by Srikandhi Waste Bank is in the form of waste management. The community is trained how to separate waste properly and process it into a product of economic value. Sometimes, the training provided by Srikandhi Waste Bank is in cooperation with the Sanitation Department of Semarang City. The special event in question is like the training given by inviting the RW XII community of Kelurahan Tandang to Godean, Sleman, Yogyakarta for 3 days to directly see the process of waste processing, starting from sorting the waste to the production of waste-based product. Then the other event is like the training given at Jowondeles Restaurant, Semarang. The event is not only about training but also joint evaluation about waste processing activities in RW XII itself. There are also other events such as training for 2 days in Hotal Grasia, Semarang. It can be said that the training provided by Srikandhi Waste Bank is serious to help improving the community's ability in waste processing activities.

In addition to training, the community also gets information from Srikandhi Waste Bank related to bazaar, expo, exhibition, and others. Information on certain events aims to help people sell their waste processing products. This waste processing activity has the administrator of waste treatment activities of RW XII originating from local community not from Srikandhi Waste Bank. This administrator only consists of 3 people namely the chairman of the RW himself, Mr. Tri, and Mr. Tarno. The administrator is directly related to Srikandhi Waste Bank and has more responsibility. The location of waste processing activities in RT (*Rukun Tetangga*) the lowest administrative unit) 3 previously was at Mr. Tarno's own house. In addition to waste processing activities, the administrators also actively socialize to the residents by inviting to participate in the waste processing activities. This waste processing activity generates money both from the waste deposit provided by the residents and the sale of the product. Every citizen who deposits the waste is then weighed and recorded in the waste bank book. Figure 2 is one example of recording of the results of waste savings made by administrators/teenagers who have a schedule to supervise.

BUKU TABUNGAN BANK SAMPAH						
HARI/TANGGAL	KODE SLIP	TRANSAKSI			SALDO (Rp)	PARAF
		BERAT (Kg)	SETOR (Rp)	TARIK (Rp)		
Minggu/22-12-13	013	5 kg			1.500	/
Minggu, 11-5-14		6 kg	3.000		4.500	/
Minggu, 7-9-14		4 kg	1650		6100	/
Minggu, 22-2-15		5 kg	3800		9900	/

Figure 2
A Saving Book of Resident of RW XII Kelurahan Tandang

The profit taken is then managed by the administrator of RW XII for the social activities of the waste community deposits that is only 100 rupiah/kg. Social activities carried out include the provision of parcels for the elderly. The given parcels consist of basic foods such as sugar, cooking oil, and rice. Elderly who gets a parcel are the residents of RW XII of Kelurahan Tandang itself. The role and duties of the administrators are directly responsible with the waste processing activities of RW XII such as by participating and overseeing the ongoing activities and conducting the evaluation. RW XII administrators follows the whole series of waste processing activities. The profits obtained from waste deposits are managed directly by the administrator. Srikandhi Waste Bank itself only takes the profit from the sale of waste products in certain events such as the presence of expo, bazaar, and other events. In addition, Srikandhi Waste Bank is also assigned to assist the waste processing through the administrator.

Level of Tandang’s Community Empowerment. The level of community empowerment of RW XII Kelurahan Tandang is obtained from the measurement of 12 variables namely altruism, communal value, communal service, communication, self-confidence, context, information, intervention, networking, organization, skill, and wealth. The variables are then measured according to their own level of empowerment category, i.e. inviable, viable, independent, and civil. From the answers that have been categorized and the number of respondents, the percentage of community empowerment of RW XII Kelurahan Tandang will be known. The majority of RW XII community is at the viable level of 31.63%. The number of people at the level of viable is almost equal to the community who are already at independent level as much as 31.56%. Then followed by the inviable community as much as 21.91% and at least is the people who have been in the civil category as much as 14.89% (see Fig 3).

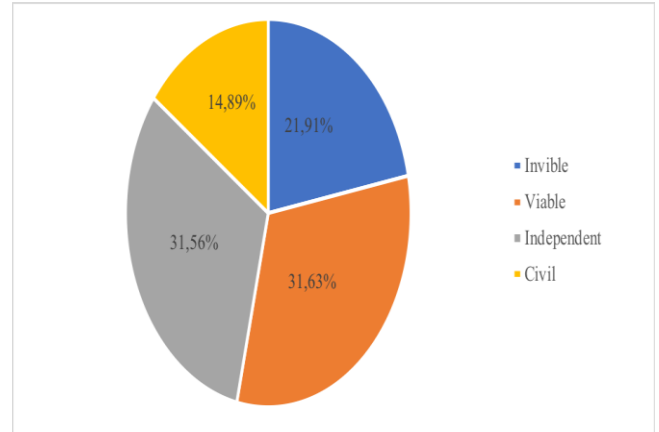
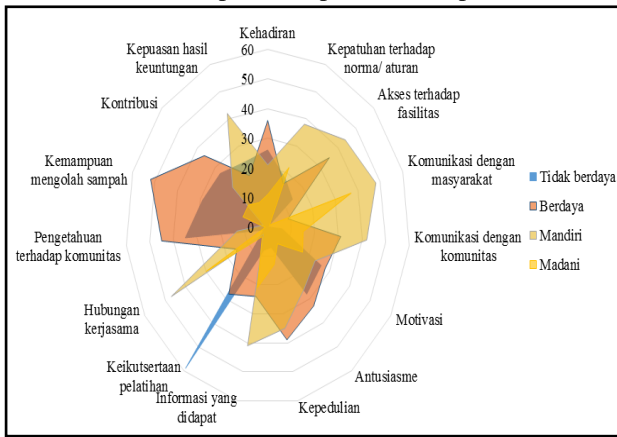


Figure 3
The Percentage of Empowerment Level of RW XII Community Kelurahan Tandang

As explained above, the percentage of community empowerment at the viable level is almost equal to the already independent community. This is due to the viable level indicators achieved, namely attendance, motivation and enthusiasm, community awareness, knowledge of the community, the ability to process waste and the contribution given. The level achieved is balanced with indicators of community compliance on rules, access to facilities, individual communications with society and communities, the adequacy of acquired information, cooperation established, and the satisfaction of profit that are at the independent level. Only the quantity of respondents who answered at the viable level is more than independent. There is one indicator that is at the level of inviable which is the intervention given by Srikandhi Waste Bank to the RW XII community of Kelurahan Tandang where most of the community does not attend the training provided.

The results of community empowerment conducted by Srikandhi Waste Bank majorly are at **viable** level. The level of community empowerment of RW XII of Kelurahan Tandang is majorly in the viable level of 31.63%. While the community who are at the independent level as much as 31.56%. Then followed by the inviable community as much as 21.91% and the least is the community who have been in the civil category as much as 14.89%. The level of empowerment achieved is due to an infrequent presence. From this infrequent presence, the behaviour of prioritizing the public interest in the community is still low. The community has a weak motivation and less enthusiasm on waste processing activities in RW XII. In addition, the environment awareness owned by the community is also low. Intervention provided by Srikandhi Waste Bank through training is also not followed by the community so that people’s knowledge on the community is still less.

Figure 4
The Construction Spider Graph of the Empowerment



Level of each Indicator

This is supported also by waste processing activities which are entirely managed by the RW. The ability to process waste owned by the community was majorly can only sort out the waste and the contribution given is little. So that it can be said that the skills of RW XII community in this waste processing activities is low. This waste processing activity is still running due to the intervention of Srikandhi Waste Bank which still communicate with the administrator of RW XII. From the level of community empowerment of RW XII, it is known that this condition is in accordance with the literature that is according to Wrihatnolo and Dwidjowijoto [19] which mentions that the inviable to viable community is the community that still make improvements in attitude and point of view and cooperate with among community members by learning the concept of Tridaya (social power, economic power, environmental power)[22]. In addition, the level of empowerment achieved is also in accordance with the opinion of Laverack [23] which mentions that it is in the second level where viable community has the access to resources but does not have the awareness on the existing differences and cannot think critically on the existing obstacles. The RW XII community of Kelurahan Tandang has not been able to direct itself to consistently perform waste processing activities and contribute to the process of discussion/negotiation to achieve mutually beneficial cooperation.

4. Conclusion

The analysis used to determine the factors that influence is by using Confirmatory Factor Analysis (CFA). The indicators measured are in accordance with the variables of the theory used that of 16 elements of community empowerment according to Bartle, et al. [17] only 12 variables used to analyze the results of community empowerment of Srikandhi Waste Bank in the form of community empowerment level of RW XII of Kelurahan Tandang. The variables are altruism, communal value, communal service, communication, self-confidence, context, information, intervention, networking, organization, skill, and wealth. While the indicators used from the overall variables as many as 15 indicators, it is only 14 indicators that affect the level of empowerment of community of RW XII. Indicators that affect the level of empowerment are the compliance of the community on the rules; community access to existing facilities; communication with the community; communication with Srikandhi Waste Bank; motivation owned by the community; community enthusiasm on waste processing activities; community concern on the environment; information obtained by the community; community participation on the training provided by Srikandhi Waste Bank; cooperation established between community and Srikandhi Waste Bank; community knowledge on Srikandhi Waste Bank; the community ability on waste processing; contribution given; and the satisfaction of the profit earned. However, of the overall factors that influence, there are 2 indicators that have the highest level, namely individual communication with the community and wealth. High level of individual communication to the surrounding community shows the inner bond between the members of the community so that it can be concluded that this group of waste processing activities can be categorized into the type of association (*gemeinschaft*) that has not prioritized on the achievement of the purpose of this association. It cannot be said as a social gathering group of (*gesellschaft*), although wealth is one of the factors that has high level because it sees other influential indicator, which is the community does not have the ability to prioritize the public interest to achieve economic orientation and consider the value of use.

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