

Participation of Waste Pickers in Waste Management: A Case Study at Randegan Landfill Mojokerto, Indonesia

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Abstract: Waste picker is informal worker who have a role in reducing solid waste in the landfill. This study aimed to investigate the characteristics of waste pickers and their role in the solid waste reduction in the Randegan Landfill, Mojokerto City, Indonesia. The research method was a survey using a questionnaire to obtain information from the respondents and in-depth interviews to a group of 33 waste pickers. The data obtained in this study were analysed descriptively. The results showed that 69.68% waste picker were male aging 46-50 years old. Thirty six percent of the respondents has been working as waste pickers for more than 6 years and 67% of them enjoy their works. All of respondents stated that their work time was irregularly during the morning, afternoon or evening daily with non definite duration work time per day. Their average education was primary school graduates. The majority of respondents' income is less than IDR 1,000,000, -/month. All respondents stated that they can get economic advantage form new waste entering to landfill. The total recoverable waste consist of 369 kg/day plastic; 620 kg/day paper, 209 kg/day bottle/glass waste; 67 kg/day iron waste. From the total of 1265 kg/day recovered waste, they sell to an agent with total income IDR 755,502/day or IDR 22,665,060/month for all 33 pickers. The average income was IDR 686.820,-/month/picker. All pickers have participated for social-, economic- and health training conducted by local government. However, only 21.21% of them used work safety and health equipment's. In conclusion the participation of waste pickers in solid waste management on the landfill play important role in solid waste reduction by 3.3% of the average daily solid waste entering to the landfill and percentage of the considered to be sold able solid waste types compared with similar solid waste that goes to landfill is 12.22%

Key words: Waste picker • Participation • Solid waste management • Solid waste reduction

INTRODUCTION

Randegan Landfill at Mojokerto, Indonesia has 2.5 ha land area and uses open dumping method in its operation. Now, it is improving gradually by using controlled landfill method. Open dumping method used in many developing countries in Africa, Latin America and Asia [1]. Landfill is one of the most commonly methods for disposal of municipal solid waste around the world [2]. The role of waste pickers in some countries was described as an important part in the solid waste management process. There is no specific solid waste management in Randegan Landfill that no waste in particular so that waste picker

activity at the landfill garbage collection has an important role. The presence of 33 waste pickers at the Randegan Landfill became an important part of the operation at Randegan Landfill because waste pickers can take advantage from the waste collected from the landfill. Waste pickers collected various items, such as plastics, glass/bottle, cardboard/box, iron, metal and another items that can be sold. Then the waste pickers will divide and classify the goods to sell them to the collectors either by delivering or being picked up once a week.

Solid waste management in developing countries should not be seen only as a process of garbage collection and disposal, but should be seen as a part of

the arising problems from rapid urbanization due to the natural growth of population and the migration from rural to urban areas [3]. To achieve the success in the waste recycling, solid waste management in developing countries had to involve the approach to integrate waste processing, technology and community involvement so that the approach affects not only in the solid waste reduction but also in creating jobs and thereby increase the income for people who are less fortunate [4]. Solid waste management is a challenge for governments, particularly in developing countries due to the increased production of waste and the burden inflicted on the budget as a result of the high costs associated with solid waste management [5].

Solid waste management is a complex process because it involves many technologies and disciplines [6]. It includes social science disciplines which are related to the role of waste pickers. Several related studies have been mentioned that the economic benefit to the lives of the waste pickers with economic value. The existence and activities of waste pickers at the landfill is also a part of the open dumping landfill that were collected into consideration in reducing waste in the landfill. In a preliminary comparison, landfill disposal resulted more hazardous either for human health, or for ecosystem quality and or for use of resources. The effects of POPs on wildlife are reproductive failure and population declines, abnormally functioning thyroids and other hormone system dysfunctions, feminization of males and masculinization of females, compromised immune systems, behavioural abnormalities, tumors and cancers and gross birth defects [7]. These waste dumps may contain a mixture of general waste and toxic infectious or radioactive wastes and are susceptible to burning and exposure to scavengers [8].

Organized waste pickers can significantly reduce the cost of waste management programs in urban areas. Waste pickers helps in reducing the amount of waste that must be collected, transported and disposed of, resulting in budget savings to local governments and extending the lifetime of the landfill [9]. Another important part of the existence of waste pickers is the fact that their activities generate income for the poor in developing countries. Garbage that still have economic value if well organized can generate livelihoods for unskilled workers in developing countries. Although waste pickers has outstanding contribution to solid waste reduction and recycling, but the role of waste pickers in solid waste management is still unrecognized [10]. Many people are not aware of the benefits of social, economic and

environmental impacts of there cycling activities performed by waste pickers. Therefore, the waste pickers are often overlooked in determining the policies and plans of solid waste management systems [11]. It is a contradiction to the policy to increase the public's active role as a partner in solid waste management [12]. The benefits of waste pickers' role in the cities in developing countries are essential for environmental and economic reasons.

By looking at the activities of waste pickers and their potential for the waste management in the landfill, the study was conducted to determine the characteristics of the waste pickers and their participation in supporting solid waste management programs, especially at Randegan Landfill, Mojokerto, Indonesia.

MATERIALS AND METHODS

Research Methods: The research of waste pickers' participation in solid waste management was conducted at Randegan Landfill, Mojokerto, Indonesia during October 2012. The research method used in this study was survey by observing the role of waste pickers in the waste management in the landfill. To collect detail characteristics of waste pickers, questionnaires were addressed to the total of 33 waste pickers and supported by depth interviews.

Primary indicators of the characteristics of the waste pickers were the identity of respondents that includes gender, age levels, employment duration, perception as waste pickers, working time, level of education and income per month. Indicators of the waste pickers participation in the landfill management was the amount of waste obtained, composition of the waste obtained, direct revenue from the sales of waste obtained and the use of the safety and health equipment in solid waste collection as well as its training from local governments.

The indicators of the role of waste pickers in the waste management were the volume of solid waste can be reduced from the total entering waste to the landfill consisting plastic, paper/news paper, cardboard, glass, bottle and iron wastes and revenue of waste pickers from this activities. The data obtained in this study were analyzed with descriptive analysis including percentage, mean and standard deviation.

RESULTS AND DISCUSSION

It was observed that the number of male waste pickers (69.68%) was higher than female waste pickers

(30.32%). They reasoned that the women have more important role in the family and better staying to work at home. Otherwise, the waste picking and collection is the physically hard work and fully in un-comfort condition for dirty and smelly.

The age of respondents ranged from 30 to 60 years old as shown in Table 1. Out of all waste pickers, 12 respondents (36.37%) were 46-50 years old, 7 people (21.21%) were 41-45 years old, while the remains of 6 people (18.18%) were 36-40 years old. The age indicated that the respondents has been working as waste pickers for relatively long time, which most of them stated as more than 6 years.

The experience of respondents as waste picker ranged between 2 - 9 years. From 33 respondents, 12 respondents (36.4%) has been working as waste pickers for 6 years or longer, 10 respondents (30.30%) for 5-6 years, 8 respondents (24.20%) for 5-6 years and 3 respondents (9.1%) for 2-3 years. The experience time of work as waste pickers is shown in Table 2.

The reasons why they got this job were they thought that this is a preference (*halal*) job and can ensure to cover their living cost. Any of them thought that they have no possibility to get other job and there is no specific skill as waste picker required. Most of the waste pickers in Randegan Landfill ranged 46-50 years old, might be that this age range was as non-productive worker for formal job in Indonesia. In addition, to be as waste pickers, the ability to conduct transaction with waste agent in the Landfill area and/or outside one was strictly required due to the strong social life style in uneducated community.

The same study was conducted in Lahore, Pakistan showed that the majority of waste picker was male. Women only involved in scavenging as the collector of household waste in close disposal place from where they live. Family-based activity was a common activity in the landfill which was also the location where the informal sector involved in waste collection activities. The women like to work in a group or accompany their family. Male waste pickers usually work alone or with their families. Some widow usually works alone. They come in person but they have the support of their relatives who already had a job as a waste picker [13].

The age range of waste pickers in this study was accordance to the waste pickers in landfill of Lahore, Pakistan which mostly of them were old males. Waste pickers need good experience in collecting out the trash, sell, or buy from the owner of the trash. The average age of the respondents is quite old, which is 50 years or

Table 1: Age Range for Waste Pickers in Randegan Landfill, Mojokerto

| No. | Age Range (years) | Percentage (%) |
|-------|-------------------|----------------|
| 1 | 30 - 35 | 3,03 |
| 2 | 36 - 40 | 18,18 |
| 3 | 41 - 45 | 21,21 |
| 4 | 46 - 50 | 36,37 |
| 5 | 51 - 55 | 18,18 |
| 6 | 56 - 60 | 3,03 |
| Total | | 100 |

Table 2: Work Experience Range as Waste Pickers

| No | Work Experience Range (year) | Percentage (%) |
|-------|------------------------------|----------------|
| 1 | 2 - 3 | 9,10 |
| 2 | 4 - 5 | 30,30 |
| 3 | 5 - 6 | 24,20 |
| 4 | > 6 | 36,40 |
| Total | | 100 |

Table 3: Perception and Feel of the Respondents as Waste Pickers

| No | Statement | Percentage (%) |
|-------|----------------------|----------------|
| 1 | Happy | 66,67 |
| 2 | Grateful for the job | 33,33 |
| Total | | 100 |

over with activity as trash buyers as well as sellers to the garbage collectors. The age group 20-30 years doing a lot of work as a pure waste picker, either alone or in part follow their parents until they have had enough experience [13].

Most of the respondents graduated elementary school as their highest education, because to become a waste picker it did not require any special skills, which made the profession was able to absorb the uneducated. The statement was also confirmed by studies conducted in Lahore, where the majority of people involved in the activities of waste pickers was illiterate. They can not get an education because of low economic level or they have illiterate parents. Their social and psychological background makes them have a mindset that "it is better to pick out the trash than go to school." The pickers say that they want their children to go to school but no school accepts them [13].

To the question how the perception and feel to their job, 66.67% (22/33) respondents stated that they are delighted to be a waste picker because they need money to live and they can only be a waste pickers with their present skills. Out of the total, 11 respondents (33.33%) said that they are grateful to get the job, as shown in the Table 3 below.

Furthermore, all 33 respondents (100%) stated that working as waste pickers are a "respectable job". It was stated in the interviews with waste pickers that their job can help the government in creating a clean environment;

help the government in managing and sorting the wet and dry waste; from their works as waste pickers they can support their family and pay for their children's tuition; and because being a waste picker is an honest job.

As viewed from the aspect of the working hours, all 33 respondents (100%) claimed that they do not work every morning but always it always changes, sometimes they work in the morning, sometimes in the afternoon, but sometimes all day if possible. The working hours are also influenced by the day. For the example in Sundays, the volume of waste entering the Randegan Landfill is relatively smaller so that the waste pickers just work for short amount of time. It also depends on the stamina of the waste pickers, the condition of the season and also the temperature. The amount of waste pickers and their working time in every landfill depend on how big the landfill is, the climatic factors as well as the volume of waste that goes to landfill [14].

All the 33 respondents stated that they have a family member with various amount of children. Most respondents have 3 children by 14 people (42.43%), then 4 children by 8 people (24.24%), 2 children by 7 people (21.21%), and last 5 children by 4 people (12.12%). It showed that the waste pickers will need money for their families just like other people in other community. Studies on waste pickers in Lahore, Pakistan also shows that waste pickers need to obtain sufficient income to meet the needs of their families and to support parents and it makes them work hard. Waste pickers consisted of unmarried men or women, either young or old, due to poverty or other reasons [13]. Furthermore, the aspect of income every month of waste pickers can be seen in Table 4.

As much as 20 respondents (60.61%) have income less than IDR. 1,000,000,-; 10 respondents (30.3%) have income between IDR.1,000,000, to IDR.1,500,000, -; while 3 respondents (9.09%) have income between IDR. 1,500,000 to IDR. 2,000,000, -. The income of the waste pickers economically can be categorized as relatively low to moderate in society. When questioned if there are family members that also worked as waste pickers, from 33 respondents only 3 people (9.09%) stated that their wives also work as waste pickers with income between IDR.1,500,000.- to IDR.2.000.000.

One of the prosperity indicators of the waste pickers beside the income level is the housing condition as well as the land ownership. The social environment and the certainty of having their own home and definite land status is an evidence of the motivation of the waste pickers to continue their work. It can be proved from the waste pickers' statement that they are able to get their

Table 4: Range of Income of Waste Pickers generated from recovered waste

| No | Range of Income Levels (Rupiah) | Percentage (%) |
|----|---------------------------------|----------------|
| 1 | 1,000,000 | 60.61 |
| 2 | 1,000,000 - 1,500,000 | 30.3 |
| 3 | 1,500,000 - 2,000,000 | 9.09 |

Table 5: Land and House building status of Waste Pickers

| No. | Status | Percentage (%) |
|-----|--------------------------------------------|----------------|
| 1 | Housing conditions | |
| | a. Permanent | 100 |
| | b. Semi-permanent | 0 |
| | c. Non-permanent | 0 |
| 2 | Land Ownership Status | 100 |
| | a. 'Petok D' Certificate* | 0 |
| | b. Ownership Certificate c. No Certificate | 0 |

* certificate from local government

land ownership certificate and build their permanent by working as waste pickers. Good social environment is much needed to sustain livelihoods and welfare. The environment that can meet the needs of people in its region is an indicator of the level of welfare of public health [6]. The results of survey research on the social environment on the social condition of the waste pickers can be seen in Table 5.

The result above indicated that although they only working as waste pickers, their income was able to meet their primary needs. In contrast to the conditions of the waste pickers in Lahore, they live as the squatters in makeshift shelters made from materials such as bamboo and cover fabrics/garments that were not used or locally called Jugi (huts) in open places. Dozens of huts can be seen in one place and they were not equipped with decent drainage systems, wastewater, water supply system, bathroom, kitchen, etc. They get their drinking water from the well or nearest river. Other waste pickers live in flats with paying the rent [13].

With the specific characteristics of waste pickers at Randegan Landfill, their motivation and participation can be considered as an important part of the managing waste process of the landfill. Indicators of employment duration in the landfill, satisfaction and motivation become waste pickers are indicators to look up how big a part in reducing waste pickers at the Randegan Landfill that has not done particularly waste. The employment duration in the landfill and the motivation and participation become the indicators of the waste pickers becomes an indicator to look at how much waste pickers reduced the amount of waste at Randegan Landfill that has not carry out specific waste processing method.



Fig. 1: The Participation Mechanism of The Waste Pickers at Randegan Landfill: a. illustrating active zone landfill; b. waste sorting process; c. temporary waste deposit before transporting to and transacting with agent

To increase the role of scavengers in order to reduce waste in the landfill required knowledge and training, as well as educating the public to always improve waste reduction of waste generating sources so that the volume of waste in landfills decreases. According to cultural derivatives, beliefs perception and attitudes are learned response sets. They can therefore be modified or changed through education. These points the facts that people's unconcerned attitudes toward the waste can be changed for better through education. According to formal education for woman is pre-requisite for change in sanitation behaviour [15].

The research on the participation of waste pickers on the landfill of solid waste management in Randegan is seen from the amount of waste collecting, the reduction percentage of the solid waste in the landfill and the economic benefits for the waste picker. The participation mechanism of the waste picker at Randegan Landfill can be seen in Figure 1a;b;1c

The waste pickers did not concern themselves with the using of personal health protective equipment when picking up waste in the landfill. While sorting the waste, only 7 respondents (21.21%) always use them, 5 respondents (15.15%) said that they only occasionally used them and 21 respondents (63.64%) did not use the equipment at all, which is shown in Table 6.

The waste pickers who do not use safety and healthy equipment and tools is thought that the equipment are to heavy and troublesome for them. The amount of waste collected by the waste pickers in Randegan Landfill can be seen in Table 7 below.

The total volume of waste collected by 33 pickers is 1265 kg / day which consists of 369 kg / day plastic, 308 kg / day paper, 312 kg / day cardboard, 209 kg / day bottle / glass and 67 kg / day iron. When compared to the total waste that goes to the landfill, the total volume of waste can be collected by waste pickers was 12.22%, consists of 0.74% plastic waste, 25.47% paper / cardboard, 13.0% bottle / cup and 5.15% iron, as shown in Table 8.

Table 6: Health and Safety Equipment Used by The Waste Pickers at the Randegan Landfill

| No. | Frequent of Use | Percentage (%) |
|-------|----------------------|----------------|
| 1 | Use in all time work | 21.21 |
| 2 | Non use | 63.64 |
| 3 | Anytime use | 15.15 |
| Total | | 100 |

Table 7: Solid Waste Recovered by Waste Pickers based on type of solid waste in Randegan Landfill Mojokerto

| Type of Waste | Recovered waste (kg / day/picker) (x±sd) | Total waste recovered by 33 pickers (kg / day) |
|----------------|------------------------------------------|------------------------------------------------|
| Plastic | 11.18 ± 3.4 | 369 |
| Paper | 9.62 ± 3.3 | 308 |
| Cardboard | 9.45 ± 3.0 | 312 |
| Bottle / Glass | 6.33 ± 2.5 | 209 |
| Iron | 2.03 ± 0.9 | 67 |
| Total | | 1,265 |

Table 8 above shows that percentage of the considered to be sold able solid waste types compared with similar solid waste that goes to landfill is 12.22%. Table 8 also shows that although there are a great mass of plastic waste entering the landfill, but the number that is picked up only a small percentage of 0.74%. This is because the waste pickers' just take the plastic is still in good condition. Plastics that are picked are plastic bags and packaging.

The amount of solid waste entering the Randegan Landfill today is 231.33 m³/day or 38,271 kg / day, while the amount of solid waste collected by the waste pickers are 1265 kg / day. Thus the amount of solid waste reduction in landfill waste by waste pickers based on the entire mass of waste entering the landfill is 3.3%.

All respondents (100%) stated that the sorted waste will be sold directly to the garbage collectors with the purchase price are a deal between the waste picker and the collector. Bargaining will be done until they get a decent price. The respondents stated that they had known the collectors very well and they had been

Table 8: Percentage of Reduced Solid Waste by Waste pickers Based on Similar Waste Type Entering Randegan Landfill

| Type of Solid Waste | Total SolidWaste Recovered by All Waste pickers (kg / day) | Total Solid Waste entering Randegan Landfill (kg / day) | Percentage of Solid Waste reduced by Waste picker |
|-----------------------|---------------------------------------------------------------|------------------------------------------------------------|------------------------------------------------------|
| Plastic | 369 | 5,005.58 | 0.74 |
| Newspaper / Cardboard | 620 | 2,434.03 | 25.47 |
| Bottle / Glass | 209 | 1,607.38 | 13.00 |
| Iron | 67 | 1301.21 | 5.15 |
| Total | 1,265 | 10,348.20 | 12.22 |

Table 9: Price per kg for Each Solid Waste Type

| No | Type of Waste | Price (IDR) |
|----|----------------|-------------|
| 1 | Plastic | 400-500 |
| 2 | Newspaper | 450 |
| 3 | Cardboards | 1500 |
| 4 | Bottle / Glass | 350 |
| 5 | Iron | 2000 |

Table 10: Average Revenue of Every Waste Pickers Per Day

| Type of Solid Waste | Average Solid Waste collected by Each Waste Pickers (kg / day) | Average Price Per Kg Solid Waste (IDR) | Total Revenue from Solid Waste/Waste Pickers (IDR / day) |
|---------------------|-------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------|
| Plastic | 11,18 ± 3,4 | 478 ± 41 | 5356 ± 1671,4 |
| Paper / Cardboard | 9,62 ± 3,3 | 9,45±3,0 | 450 ± 0 |
| | 758 ±187 | 4331±1486 | 7162,5 ±3510 |
| Bottle / Glass | 6,33±2,5 | 350 ±0 | 2216 ±886 |
| Iron | 2,03±0,9 | 2000 ±0 | 4060 ±1728,7 |
| Total | | | 22.894 |

cooperating for more than 2 years. The types of solid waste that can be sold and their each pricing can be seen in Table 9 below:

Prices above obtained from the interviews with the waste pickers at Randegan Landfill. The prices were then compared with the waste price in China, with exchange rate the price obtained for the plastic IDR 3,008.55 / kg; paper IDR. 1,552.8 / kg; cardboard IDR. 970.5 / kg; bottle IDR. 97.05/unit; aluminium cans IDR. 970,5/unit [13]. The average revenue of the waste picker at Randegan Landfill are shown in Table 10.

The total income received by each waste picker was IDR. 22.894/day or IDR.686.820, /month. Total revenues of 33 waste pickers are IDR. 755.502/day or IDR. 22.665.060/month resulting from the acquisition of 1265 kg / day of waste. From the received income, 100% of respondents said they were able to set aside income from working as waste pickers to fulfil their primary and secondary needs.

As an illustration to the living of waste pickers that exist in other countries, it can be seen in Lahore, India, where the number of waste pickers in the landfill is 60 people who work for 7 hours/day and collects average 50 kg / day garbage. If the value is multiplied by the days of work, which is 26 days a month, they obtained 1300 kg / month recyclable trash. With revenues of 200Rs/day waste pickers (IDR 36.035.2/day), then the revenue

obtained by waste pickers in Lahore is IDR 936,915.2/month [16].

China has a fixed price of waste (the exchange rate) for each type of waste equivalent to IDR. 97.05/unit for bottles of beer; IDR.194.1/unit for plastic bottles; IDR. 97.05/unit for aluminium cans; IDR.1552, 8/unit for newspaper; IDR.97, 05/kg for cardboards; and IDR 3,008,55 / kg for plastics. The quantity of waste that can be recycled are 2953 pieces bottle of beer/month; 12,822 pieces of plastic bottles month; 9046 pieces aluminium / month; IDR. 11,966 kg newspaper / month; 9682 kg cardboards / month; 1607 kg plastic /month. From the applied waste prices and the waste quantity nowadays, the waste pickers can earn IDR 26,953,114.2 as their income each month [17].

This high generation of waste tells us how source reduction as a waste management method is important that by focusing on the production process itself, examining where waste are generated and exploring how they can be reduced, even simple measures, such as separating waste so that can be re-used more easily, using different raw materials or replacing non-biodegradable products with biodegradable ones, can help achieve large waste reduction results [7].

There are differences in income received by waste pickers at the Randegan Landfill, at Lahore Pakistan and in China, which may be the result from various factors,

such as the volume of solid waste in the landfill, the composition of the waste that goes to landfill, the success of solid waste segregation from the source program, the quality of the waste material, predetermined price and the performance of the waste pickers itself. People should be educated to sort waste into biodegradable, recyclable, inert, composite and hazardous or toxic at source and dispose it as per the direction of the waste management authority, effectively participate in the activities of both local, state and federal government to keep environment clean [18].

CONCLUSION

It was concluded that the waste pickers at the Randegan Landfill showed high motivation to work as waste pickers and still have a sense of high self-esteem or honour. The participation of waste pickers in solid waste volume reduction of Randegan Landfill was 1265 kg / day or 12.22% of the similar solid waste types entering Randegan Landfill. This was equivalent to 3.3% of the total solid waste entering Randegan Landfill per day. The economic revenue was IDR. 22.665.060/day or IDR.686.820, -/month/waste picker. Sustainable development was required in terms of motivation, morale, work methods, job security, marketing and the establishment of the organization / community for the waste pickers by the Government of Mojokerto to increase participation in the solid waste management in Randegan Landfill.

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