

BASELINE SERVICES OF COMMUNITY AND CLEANING AGENCY FOR MUNICIPAL SOLID WASTE MANAGEMENT IN MAKASSAR OF SOUTH SULAWESI

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Abstract: This report established baseline services of the changes that need to occur within the solid waste management in Makassar of south Sulawesi. The analysis covered three parameters consisted of waste production unit, community services and cleaning agency services. The results revealed that waste production unit was about 0.73 kg capita d⁻¹ which was higher than the standard unit of 0.50 kg capita d⁻¹ at the stage of city development, leading towards environmental risks. The potential problem was enhanced by the community attitude to serve only solid waste in their properties, by the solid waste workers to do unofficial waste disposal operation, and by poor quality of vehicles. These suggested that community preparation for participation on solid waste management required special attention in addition to workers and operational facilities within the city cleaning agency.

Keywords: Human resources, operational facilities, waste production unit, waste reduction

INTRODUCTION

Makassar is a provincial city of south Sulawesi. The city (Kota) has an area of 176 km² where the population number was 0.95 million (1990) and 1.13 million (2006). The city has been growing at a rate of 1.7 % yearly, and unofficial forecasts suggest, that by 2015 approximately 1.50 million people will live in the city. Similar to big cities in Java and other provincial cities in Indonesia, Makassar faced pressing problems on high quantity of solid waste. At present, solid waste is generated approximately 0.8 tonne d⁻¹ within the city, and 80 % could be handled by cleaning agency (Dinas Keindahan) [1]. The remaining waste of 0.2 tonne d⁻¹ is unsolved which most common means of coping with this waste is to burn it or dump it on unused land or in rivers and canals. Even the percentage is small, however, this has serious environmental consequences, such as local air pollution and increased incidence of flooding. An effective waste management must become a priority as the population continues to grow and waste production unit increases [2]. Referring to local government regulations [3–6] solid waste management is the responsibility

of local government as well as community in order to prevent severe environmental degradation. The present study was conducted to draw the baseline of management practice and the potential responsibility of each with its constraints.

MATERIALS AND METHODS

Study area was Kota Makassar covering three subregencies (Kecamatan), i.e. Kecamatan Bontoala, Kecamatan Ujung Tanah and Kecamatan Makassar. Villages (Desa) Desa Layang – Kecamatan Bontoala, Desa Tamalabba – Kecamatan Ujung Tanah and Desa Barana – Kecamatan Makassar were populated area within the city.

Respondents were addressed to the local government consisting of cleaning agency (Dinas Keindahan), Kecamatan and Desa managers. A number of 120 respondents were chosen randomly out of 685 officers. Respondents from the local community, consisting of community organizations (RT and RW) and the householders were taken randomly for 150 people that met the required national standard of SK SNI T-13-1990-F [7].

Data collection was established with the help of documents provided by local governments and personal interview to each respondents and field observations. Daily quantity of waste was observed in the solid waste temporary stations (TPS) during the period of first week of a month, covering dry and wet seasons in the year of 2006. Measurement of the waste quantity was carried out in accordance to the national standard of SNI 19-3964-1994 [8]. The primary data on solid waste quantity were measured on volumetric unit due to lack of weight bridges in the existing solid waste facilities.

RESULTS AND DISCUSSION

Waste production unit

The sources of solid waste could be classified into residential: housing settlements, non-residential: all urban facilities such as schools, markets, hospitals, industries, etc, and open spaces: parks and streets. Measurement of collected waste at the TPS(s) revealed the generated waste at the residential, non-residential and open space was 1492, 1383 and 444 m³ d⁻¹ respectively. Thus the total quantity of solid waste at the sources was 3319 m³ d⁻¹. The number of population was 1.13 million (2006) and hence, the volumetric waste production unit was about 2.9 L d⁻¹. Comparison of the waste production unit with other provincial cities in Java [9] and the standard for countries at the stage of development [2] was presented in Table 1. The waste production unit for Kota Makassar was calculated in weight with an assumption for the bulk density of 0.25 tonne m⁻³ [9]. It showed that the waste production unit for Kota Makassar was comparable to other provincial cities in Java, and all were higher than the standard at the stage of development. This confirmed that solid waste was potentially a pressing environmental problem in the cities.

Table 1: Waste production unit for provincial cities

Provincial cities	Population number (million)	Waste production (Tonne d ⁻¹)	Waste production unit (kg capita ⁻¹ d ⁻¹)
Kota Makassar	1.13	830	0.73
Kota Jakarta	10.00	6,000	0.60
Kota Bandung	2.43	2,000	0.82
Kota Surabaya	3.00	2,200	0.73
Development stage [2]			0.50

Community services

Waste generators were responsible for the collection of their own waste by using plastic sacks, buckets or small containers. A typical capacity of bucket or small container was in the range of 100 – 500 L which was sufficient to serve one household of 5 people for 7 days storage. The local community group (RT/RW), covering 200 – 560 households, was responsible for haulage of the collected waste to the nearest TPS.

Based on interviews with respondents from the cleaning agency, it was noted importantly that community supports to solid waste management were insufficient, particularly in social and financial aspects. Therefore, interviews with community were carried out in order to gain a more understanding of the changes that need to occur within these issues. Table 2 presented the willingness of people to do some basic social works. Numbers were a number of respondents who respond the particular answer.

Table 2: Willingness to do social works

Willingness to	Often	Sometimes	Never
Clean the solid waste at any place	14	39	97
Co-operative works for clean environment	29	32	89
Clean the ditch in front of house	27	38	85
Clean the ditch in remote area	15	49	86

In facts, at least 55 % population had no willingness to participate in keeping environment clean outside their properties. In depth interviewed was conducted to the population to gain more understanding on this issue. They agree that local government agency has to take full responsibility on solid waste management because they have paid retribution for solid waste disposal. Additional factors that determined the attitude were beyond the scope of this current study, however, socio-behavioral aspects have to be prioritized in Kota Makassar. This issue was confirmed with and supported to Mangkoedihardjo *et al.* [9] in their work with solid waste management practice in Java.

Cleaning agency services

Solid waste collection at TPS(s) and haulage to the final solid waste disposal site (TPA) were carried out using open trucks and arm roll trucks with container. Transportation from the TPS to the dumpsites was organized and financed by the Dinas Keindahan. Dinas Keindahan provided 101 open trucks and 177 arm roll trucks with container and the capacity of each was 10 m³ on average in addition to 848 truck operators. The disposal amount of waste was measured about 2667 m³ d⁻¹ at the TPA. Therefore, an amount of 652 m³ d⁻¹ was not transferred completely between TPS(s) and TPA, which would be explored as follows.

Observation on the workers on the collection vehicles found that sometimes they even have contracts with junk dealers to earn extra money. They sorted out materials or other items from the waste awaiting collection. Their informal activity was comparable to the workers on the collection vehicles in Java [9] and they contributed the waste reduction at the TPS(s).

In normal conditions, the total capacity of trucks and the supporting operators could balance with the total collected wastes for one trip daily operation. The trucks required regular maintenance, however, no reserve trucks was provided. In case some trucks were not in use, others would operate in two trips daily. However, collection vehicles were very often ancient and in poor repair. Open vehicles lose part of their load during their trips to the disposal site, since trucks were overloaded and waste spills out. Thus, vehicle quality contributed waste reduction between TPS(s) and TPA. Moreover, transportation of waste to the disposal site was time

consuming. A collection vehicle took several hours just to travel from the city to the landfill site because of long distance and the heavy traffic. It was found that some collection vehicles dropped off the waste somewhere such as unused land in order to save operational costs as well as working hours. Therefore, poor quality of vehicles and unofficial disposal operation were accounted for waste reduction that created serious environmental consequences such as increased incidence of flooding which in fact was occurred.

CONCLUSIONS

Makassar faced a potential problem for environmental risks according to three indicators as follows. The waste production unit was higher than the standard at the stage of development and comparable to other cities in Java that experienced in environmental consequences due to solid waste. Community service for solid waste management showed that at least 55 % population had no willingness to participate in keeping environment clean outside their properties. Poor quality of vehicles and unofficial disposal operation were insufficiency services of the cleaning agency. These revealed that human resources attitude of both sides determined the performance of solid waste management in the city.

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