

SOLID WASTE MANAGEMENT IN TRADITIONAL MARKET (CASE STUDY: KEPUTRAN UTARA TRADITIONAL MARKET, SURABAYA)

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ABSTRACT

The traditional market is one of the major solid waste generators. Keputran Utara Traditional Market is one of the huge traditional markets in Surabaya City. Keputran Utara Traditional Market is shaded by PD Pasar Surya. The number of booths operating at the Keputran Utara Traditional Market reached 1.389 booths. This research is carried out to investigate the characteristics of solid waste, the amount of generation market waste, and the management of solid waste. The data research was collected from observations and sampling following SNI 19-3964-1944. The solid waste was produced by Keputran Utara markets, such as vegetable waste (biodegradable), plastic, paper, wood, and bamboo. The results depicted that average waste generation was produced 13,34 tons/day or 43,73 m³ / day. The average percentage of the managed waste is 49,6%, and unmanaged waste is 50,4%. The treated solid waste pass to Wonorejo Compost House in Surabaya by processing waste into compost and food for magot.

KEYWORDS: *solid waste, Keputran Utara, traditional market, waste management*

1 INTRODUCTION

Keputran Utara Traditional Market is one of the huge traditional markets in Surabaya. The Transfer Station (TPS) owned by Keputran Utara Traditional Market, stands on land or land owned by Jasa Tirta with an area of 17,5 meters × 12 meters. According to the latest data from PD Pasar Surya depicts the number of active booths as 1.389 from 1.631 available booths, and the number of traders recorded is 1.220 (Satuan Penelitian dan Pengembangan, 2021). Most of the traders in the Keputran Utara Traditional Market sell vegetables. Activities in the Keputran Utara Traditional Market

include loading dock and unloading of products, transporting merchandise to each booth or pawn, preparation of market, and buying and selling activities.

Traders make preparations by sorting vegetables that are suitable for sale. It is carried out to ensure vegetables of good quality do not become contaminated. During this cleaning process, much waste is generated. Traders usually throw vegetables that are not worth selling next to the booth; over time, they accumulate in the market alley area. Buyers often trample on the vegetables that pile up in this aisle. The traders do not have adequate trash bins (Rachmayanti et al., 2021). The solid waste management is necessary to reduce the generation of solid waste in Benowo Landfill. As we know that in 2011, solid waste generation in Surabaya about 1.075 tons/day, it had increased about 1.400 tons/day 2014 (Pramestyawati & Warmadewanthi, 2020).

According to PD Pasar Surya data, the average waste generated by Pasar Keputran Utara in 2020 is 352,905 tons per month, or 12.099,35 tons per day, with the composition of garbage including vegetable waste (biodegradable), plastic, paper, and wood or bamboo. This garbage accumulates in the Transfer Station of the Keputran Utara Traditional Market, making the market area dirty, damp, and smelly. Regarding the waste problems faced by Keputran Utara Traditional Market and PD Pasar Surya, this study conducted a study on identifying and generating the Keputran Utara Traditional Market. It is expected that this study can determine the amount of generation of each selling booth so that the cleanliness and environmental quality of the Keputran Utara Traditional Market are known.

2 MATERIALS AND METHODS

The primary data collected in this study were market observations, waste collection patterns or routes, and Transfer Station area. For secondary data to be collected, namely PD Pasar Surya data for eight days of waste samples according to Badan Standarisasi Nasional, 1994 waste transportation rites, the amount of managed waste in the composting house, and the amount of unmanaged waste.

3 RESULT AND DISCUSSION

According to SNI 19-2454-2002, the operational technique of municipal solid waste included traditional market consists of the activities of collection to final disposal, which must be integrated by sorting it from the source.

3.1 Market Waste Generation

The resulting waste generation comes from the goods cleaning process activities carried out by the seller. Part of rotten vegetables are separated from vegetables worth selling, which is carried out to prevent vegetables of good quality from becoming rotten. Furthermore, vegetables that have passed their sale time and are improper are disposed of straight at the Transfer Station. Along with vegetable waste that scattered and trampled on in the market aisles. The garbage cleaners are tasked with cleaning up

[illegible]

The daily waste generation data is obtained from the weighbridge when the waste enters the Benowo Landfill Surabaya. From the waste generation data for 8 days owned by PD Pasar Surya, it was found that generation rate was follows:

Date	Day	Rite	Distance (km)	Ton	m³
1	Friday	2	24,2	15,35	50,33
2	Saturday	2	24,2	16,85	55,25
3	Sunday	2	24,2	14,17	46,46
4	Monday	2	24,2	13,99	45,87
5	Tuesday	2	24,2	14,96	49,05
6	Wednesday	1	24,2	7,53	24,69
7	Thursday	2	24,2	15,61	51,18
8	Friday	1	24,2	8,23	26,98
Total		14		106,69	349,80

The unit change (ton to m³) has been determined by Dinas Kerbersihan dan Ruang Terbuka Hijau (DKRTH) since 2019, settings the density for PD Pasar Surya at 0,305

ton/m³. With this density determination, the units in the PD Pasar Surya data can be converted. The average daily waste produced reaches 13,34 tons or 43,73 m³ from the waste rate in October 2021. This can be used to calculate the need for Transfer Station land and the waste transportation equipment.

3.2 Solid Waste Management

Storage

Storage is carried out at the source of the waste. Individual containers can be trash cans at each booth, while communal containers can be in the form of garbage containers at several locations in the market. The storage at Keputran Utara Traditional Market is barely running, and vegetable waste is allowed to pile up in the market aisles. Only a few booths have a small trash can.



Figure 2: Existing solid waste in the alley of Keputran Utara Traditional Market

Collection

Garbage collection is carried out by cleaning staff. The garbage piled up in the booth was swept by the cleaners using garden forks and wicker baskets. Several market aisles that wheeled containers can pass are cleaned, and waste is put into wheeled containers.

The number of container units at Keputran Market is unknown, so a calculation is carried out to calculate the means for the number of waste collection equipment needed. Here is the formula (1) used to calculate the number of collection tools.

$$\text{The number of collection tools} = \frac{\text{incoming waste number}}{\text{collector volume} \times fp \times rite} \quad (1)$$

The average incoming waste per day is 43,73 m³, the compaction factor in containers with a capacity of 2 m³ is assumed to be 1,2, and the rotation is supposed to be 1. Thus, the results obtained are that the number of collecting equipment that the Keputran Utara Traditional Market must own is 18 containers.

The calculation above shows that at least 18 containers must be owned for one market cleaning cycle. The more rites, the fewer the number of containers. This container is used not only to collect waste but also in the Transfer Station because the large container (10 m³) is complete. If 18 containers do not return to be used as garbage collection tools, then cleaning is incomplete. The availability of container units as collecting waste tools should be added to see the condition of the garbage in this market.



Figure 3: Wheeled container

Temporary Transfer

The collected waste is transferred to the Transfer Station of Keputran Utara Traditional Market opposite the market. The frequency in the implementation of waste collection is once a day. There is a large container of about 10.000 L or 10 m³ in the Transfer Station, which is used to accommodate waste. Garbage that enters the Transfer Station is sorted quickly by DKRTH officers, sometimes assisted by market cleaners. The existing facilities at the Transfer Station are organic waste counting machines. Organic waste that can still be used again is shredded using a shredding machine. The objective of the enumeration is to filter the organic waste so that it can be processed when it gets to the compost house. Sorting and calculation of organic waste are carried out once a day.



Figure 4: Transfer Station of Keputran Utara Traditional Market with container.

Transportation

The average waste generated is 43,73 m³ per day, while the capacity of the container in the Transfer Station is 10 m³. The transportation is only performed once a day or one cycle, which results in 33,73 m³ of the waste remaining in the waste transporter, namely the 2 m³ container and wicker baskets at the transfer station. The process of waste transportation from the Transfer Station of Keputran Utara Traditional Market is divided into two schemes:

1) Direct communal waste transportation (Transfer Station to Landfill)

The arm roll truck is the vehicle for transporting waste from Transfer Station of Keputran Utara Traditional Market to the Benowo Landfill. Transport time is usually complete during the day around 11:30 – 12:00 WIB. The waste that enters the Benowo Landfill is not only waste that cannot be processed but also vegetable waste. It is because the amount of waste that enters the compost house is limited.

2) Transportation of sorted waste.

Garbage that is transported to the compost house is waste that has been shredded using a shredder machine. The vehicles for transporting shredded waste are pickup trucks and compactor trucks. The party responsible for transporting this waste is the DKRTH section of the DKP (Cleaning and Landscaping Service). The pickup and delivery time is usually 10:00 a.m to transport waste to the Wonorejo compost house.

Final Process

Keputran Utara Traditional Market waste that is brought to the Wonorejo Compost House will be processed as follows:

Table 2: The final process of solid waste from Keputran Utara Traditional Market

Composting	Solid Waste Treatment using BSF
<p>The chopped garbage is taken to the Wonorejo compost house. Some of this waste will be processed into compost. Garbage carrier vehicles will pass through a weighbridge to determine the weight of the transported waste, after which the market waste is unloaded in front of the cell or room for composting.</p> <p>Officers will pile up organic waste with other waste that will be composted, another mixture of dry leaves. The pile of garbage in this cell is back and forth every 2-3 days to evenly distribute the compost. The waste has been successfully composted and visually shows a blackish color, has decreased in volume, and is dry. The last step is to separate the compost from non-biodegradable waste using a tool</p>	<p>The chopped garbage is taken to the Wonorejo compost house. Some of the waste that is not processed into compost will be processed into maggot feed. Maggot is the larva of the Black Soldier Fly. This chopped waste is put into the box. After that, the maggot larvae are put into the box; the number of maggot larvae is entered according to the calculation of the weight of the food given. This process usually takes 7-8 days before the maggot larvae become adults.</p>

The unmanaged waste will be buried in the Benowo landfill. The location for landfilling the rest of the waste that cannot be processed from the Keputran Utara Traditional Market is the Benowo landfill. The distance between Transfer Pasar Keputran Utara and Benowo Landfill is 24,2 km. The following is a comparison of the amount of processed and untreated waste at the Keputran Utara Traditional Market.

Table 3: The number of solid waste

Month	Waste Generation (Ton)	Waste composting (Ton)	Residue (Ton)
January	592,73	338,46	254,27
February	524,58	311,72	212,86
March	583,79	282,03	301,76
April	562,24	273,04	289,20
May	542,16	291,90	250,26
June	685,59	431,78	253,81
July	443,62	192,99	250,63
Augusts	503,59	199,82	303,77
Monthly Average	584,64	290,22	294,42
Daily Average	18,26	9,55	8,71

Source: Surabaya, 2021 and Satuan Penelitian dan Pengembangan, 2021

4 CONCLUSION

The conclusions from the research at PD Pasar Surya case study of Keputran Utara Traditional Market area:

1. The waste management process at the Keputran Utara Traditional Market includes storage, collection, transportation, and waste processing. However, the storage activities are not optimal because there are no adequate containers (garbage bins) in each booth, and the number of garbage collection devices (wheeled containers) is small, lack of awareness of market traders about the cleanliness of the market.
2. The average amount of waste produced in a day is 13,34 tons or 43,73 m³.
3. The final processing of the waste produced by Keputran Utara Traditional Market, namely composting and waste processing using BSF (processable waste), while the unprocessed waste is transported to Benowo landfill.

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