

# Management of Centralized Waste Systems With Optimization of The use of Existing TPA In The City Of Mojokerto

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**Abstract.** *Waste is basically a material that is wasted or thrown away from a source of the results of human activities and natural processes that have no economic value. Solid waste problems in the City of Mojokerto due to the limited ability of solid waste management in handling solid waste, there are still delays in transporting, inadequate removal capacity and exceeding the capacity of garbage collection and limited processing of waste in landfills (TPA). The formulation of the problem raised in this study is how to optimize the centralized system waste management by optimizing the use of the existing landfill in Mojokerto City? In planning a centralized waste management system by optimizing the use of the existing landfill in Mojokerto, there are several stages, first, the collection system in settlements, markets, protocol roads, schools, shops, hotels / inns and restaurants and hospitals or other health facilities. The second stage is the transportation system consisting of fleet procurement activities, arranging routes to the landfill and monitoring. The third stage is the processing system in the landfill which consists of minimizing the impact of the landfill, monitoring the landfill, making SOP, processing waste technology in the landfill, improving the quality of human resources and increasing / expanding composting.*

**Keywords—**

## I. INTRODUCTION

Waste is basically a material that is wasted or discarded from a source of the results of human activities and natural processes that have no economic value, can even have a negative economic value because in its handling both to dispose of or clean it requires considerable costs [1]. Solid waste management as one of the utilities can affect the development of the city, so that it requires proper handling because the existence of the volume of waste that is increasingly growing with increasing population, while garbage is a pollutant that pollutes the soil, water, air, and aesthetic views of a city and can interfere with health [2]. Therefore, efforts are needed to continuously improve waste management so that it does not interfere with the smooth development of the city [3].

Waste management limitations only pay attention to the stage of removal and use of the disposal system to open land without further processing which can cause soil pollution and water pollution [4]. Groundwater pollution is caused by the entry of foreign objects into the soil, if it exceeds a certain limit it can degrade water quality. Water quality degradation can be caused by color, odor, turbidity, taste, poisoning, and so on. One of them is groundwater pollution caused by the entry of liquid objects and solid objects that cannot be

destroyed in water, which enter through landfills in open land. The waste comes from household waste, trade and so on [5].

Solid waste problems in the City of Mojokerto due to the limited capacity of waste management in handling solid waste, can be seen from the absence of regulations governing waste segregation at the household level, low awareness of the community in sorting waste, there are still delays in transportation, inadequate transfer capacity and exceed garbage storage capacity and limited processing of waste at the Final Disposal Site (TPA). This has resulted in higher intensity of landfill waste, which in turn can cause disruption to the urban physical environment in various areas of the City of Mojokerto, and in particular the problem of lack of handling in the landfill can reduce the quality of life of the people living around it.

Efforts to reduce the problems caused by waste are by planning a waste management system that is efficient and takes into account environmental aspects of sustainable health. Waste management system includes operational technical aspects, institutional aspects, financing aspects, regulatory aspects and social aspects (community participation). This article discusses the technical aspects of waste management in Mojokerto.

To support sustainable development, it is necessary to find a way to manage waste properly and properly through careful and controlled planning in the form of integrated waste management. Therefore, the formulation of the problem raised in this study is how to optimize centralized waste management by optimizing the use of existing landfills in Mojokerto City? The purpose of this study is the compilation of waste management systems in an effort to overcome the problem of waste in the city of Mojokerto. The purpose of this research is to present a solution for achieving better waste management and is expected to be applied in the field.

## II. RESEARCH METHODS

The nature of the study is evaluative. As the aim, the research tries to examine the waste management system that is considered to be able to quickly solve the waste problem in Mojokerto City. The determination of the location of the research for the scope of activities is in the Mojokerto City area.

There are three data collection techniques used [6]. In-depth interview technique as the first technique. This

technique is the first step to obtain complete information from the actors (actors), such as the head of service and staff when implementing solid waste policies. The next technique is observation. This technique is done to see firsthand what is done or what is happening in the waste management system in the field. What happened was the implication of the policy. The final step is structured interviews by giving questionnaires or interview guides to the user community. This step is used to know firsthand what is felt as a result of the implementation of the policy[7].

With these three methods, the researcher uses a data analysis technique used. Namely in-depth interviews and observations will be obtained qualitatively by categorizing and so on following the rules or principles conveyed by Miles and Huberman.

### III. RESULT AND DISCUSSION

The concept is a general description of the direction or plan for managing waste in Mojokerto City. The concept of a waste management plan needs to be made with the aim of developing a modern, reliable and efficient waste management system with environmentally friendly technology. The system must be able to serve the entire population, improve public health standards and provide opportunities for the community and the private sector to participate actively [8]. The approach used in the concept of this waste management plan is "improving the waste management system that can meet the demands in the new paradigm of waste management". For this reason, efforts should be made to change the perspective of "Waste from Disasters to Blessings" [9]. This is important because in essence the rubbish heap sometimes still contains components that are very useful and have high economic value, but because they are randomly mixed, the economic value is lost and even on the contrary it can cause disasters that can endanger the environment.

The conceptual integrated waste management pattern can be described as the scheme in Figure 1 below.

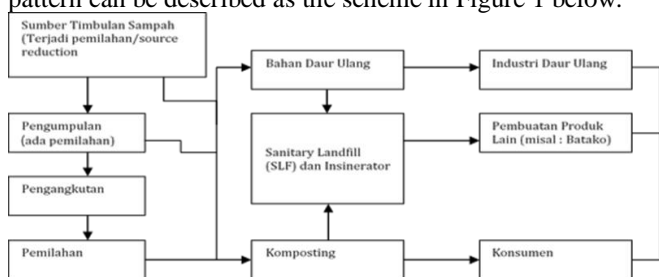


Figure 1 Conceptual Scheme of Integrated Waste Management

Integrated waste management operations as illustrated in the diagram above can be carried out through the following activities:

1. Composting, which can be in the form of:
  - a) Household scale waste composting (1 family and 10 families). The working principle of household scale composting is aerobic kitchen waste composting with the help of bacteria present in garbage and soil.
  - b) Environmental scale composting. The principle works is the processing of household scales of environmental scale ( $\pm$  3500 peoples) or market organic waste with the accumulation of rubbish on the surface of the land with the help of microorganisms that are in the garbage.

2. Recycling waste. Organic waste (paper) and inorganic waste (plastic, glass, metal, etc.) can be recycled by waste collectors or community groups.
3. Incinerator (waste incineration) Incinerator is a waste incineration system sourced from factories, hospitals, offices and residential areas.
4. Reuse of waste. By reusing used cans / bottles into useful new containers and developing refill models such as oils, shampoos, cleaning fluids etc.

### Garbage Handling Planning in Mojokerto City

#### A. Collection System

Management of the collection system at each source is proposed as follows:

1. Settlement
 

Garbage collection in residential areas is regularly carried out using indirect individual patterns, namely by collecting waste from house to house using garbage carts, either drawn by officers, or 3-wheeled motorcycles (motorized carts). The use of motorized carts is used for areas that have narrow road conditions and cannot be traversed by garbage trucks and also road conditions that are not flat which do not allow carts to be pulled by officers. Garbage collection in slums / simple settlements is carried out indirectly in communal ways, namely the collection of rubbish in communal storage areas provided for a group of people in an area to be brought to the nearest polling station which then goes to the landfill. Collector can be a manual wagon. The use of transport trucks to collect waste from the source of waste at the same time transporting waste directly to the landfill (direct communal pattern) can be done for areas that install communal storage in the form of concrete or container TPS.
2. Market
 

Garbage collection in the market location, namely traders in the market can directly put their waste into the market TPS or market containers that are already available in the area around the market. To anticipate rubbish that arises continuously and accumulates rubbish in one place, the collection of rubbish is done at least 2 rites every day and placed containers in the market area.
3. Protocol Road
 

The proposed garbage collection model on the protocol and park road is that the collection of road and park waste must be carried out with sweeping first. Garbage collected is placed at the nearest (direct communal) container, but if there is enough garbage collected and the container is insufficient, the sweeper can use a wheelbarrow or a 3-wheeled motorcycle vehicle for garbage collection and then transport it to a depot or TPS transfer closest (indirect individual).
4. Schools and office buildings
 

The rubbish collection model for school activities is proposed using a direct individual system if the school is located on the side of the road or easily accessible by a garbage transport vehicle to the landfill, and using a wheelbarrow or a 3-wheeled motorcycle vehicle for schools located in the alley near and far from the existence of TPS. For those with no more than 200 meters radius, school waste can be collected in an individual

pattern, not directly with a cart, but if it is far away, a motorized vehicle can be used.

5. Hotels / inns and restaurants

The garbage collection model for hotel and restaurant activities is proposed using a direct individual system if the activity is located on the side of the road or easily accessible by a garbage transport vehicle to the landfill, and using a wheelbarrow or a 3-wheeled motorcycle vehicle for management that is unified with the system or indirect individual collection patterns.

6. Hospitals and Other Health Facilities

Specifically for medical waste, all waste handling requirements must follow the following rules: Temporary collection points before the garbage is transported by officials must meet the requirements of being easily emptied, not made of permanent concrete, located in a location easily accessible by transport trucks and must be emptied at least once every 24 hours. It is highly recommended that have a non-fixed or easily removable model such as a container system.

**B. Transportation System**

Programs that are planned so that the optimal performance of the sub-transport system is as follows:

1. Procurement of the fleet. Transportation fleet procurement is done by calculating the volume of waste to determine fleet requirements and consider operational costs. With the addition of this fleet, it is hoped that containers filled with garbage at the TPS can be immediately transported to the landfill.
2. Set a route to TPA. Arrangement of the route to an efficient landfill taking into account the time and distance of the vehicle from the TPS to the landfill. Efforts are made for the garbage transportation route not to pass through traffic jams.
3. Monitoring transport optimization. The planned system is a fixed container system, the vehicle transports out of the pool directly to the TPS and then carries the container containing the garbage to the landfill. From the TPA, trucks with empty containers go to containers containing garbage at the next TPS until the last visit.

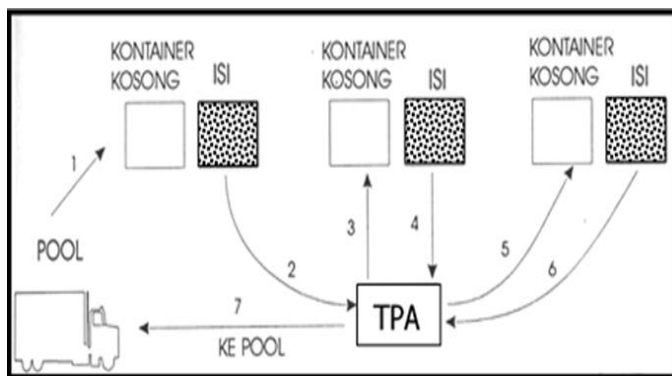


Figure 2 Fixed Container System

In addition to the garbage transport system in the city of Mojokerto can use the system of non-fixed container model arm roll, vehicles out of the pool by bringing empty containers to the TPS to replace or take containers containing garbage to be taken to the landfill, then from the landfill by

carrying empty containers, the transport truck going to the container is filled at the next TPS until the last visit.

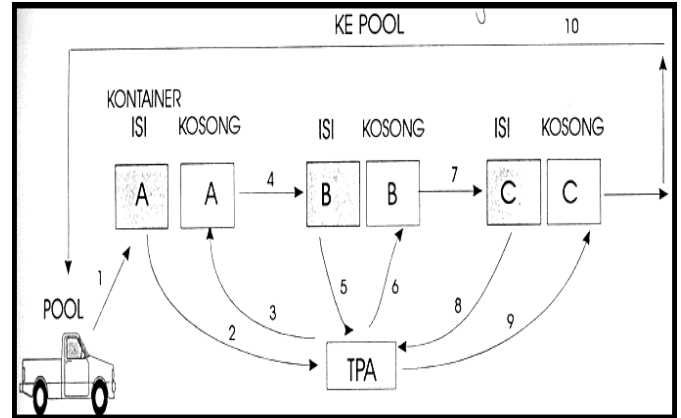


Figure 3 Non-Fixed Container System Model Arm Roll

**C. Final Processing System (TPA)**

Improving the performance of the final processing subsystem programs are planned as follows:

1. Minimizing the impact of landfill, including those caused by:
  - Leachate, to reduce the impact caused by leachate, it is necessary to build a proper WWTP (O&M that is in accordance with the budgetary capacity).
  - Odor, one way to minimize odors due to garbage heaps is by spraying EM4 plus.
  - Fire, taking methane gas is an effort to avoid the danger of fire.
2. TPA supervision. Supervise the waste entering the landfill so as not to bring waste / B3 waste. For B3 waste from hospitals, collaboration between the government and the private sector is needed to establish a B3 waste processor so that B3 waste is not disposed of in the landfill.
3. Making SOP. Making SOP (Standard Operational Procedure) as operational guidelines for waste management in TPA.
4. Technology to process / destroy rubbish in the landfill. Waste that has accumulated in the landfill is immediately reduced by processing / destroying for example organic waste can be used as animal feed or composting and inorganic waste is processed with 3R and incinerator combustion.
5. Improving the quality of human resources. Improving the quality of human resources for waste processing operations in TPA by providing training and socialization to HR.
6. Expand / develop composting and marketing. Composting that can be done by several methods, namely:
  - a. Windrow Composting, garbage is overlaid with a height of 1,7,5 m. In certain periods, garbage is turned over so that it gets enough oxygen. While the composting process is quite long but does not require high operational costs, but requires a fairly large land area.
  - b. Static Pile Composting, like the windrow composting method, but oxygen is provided by channeling pipes to the garbage pile, so the composting process is shorter.

- c. In Vissel Composting, the waste is put into the tank by an aerobic or anaerobic composting process, but this method requires high costs and skilled labor.

#### IV. CONCLUSION

Waste management in Mojokerto City can be considered to implement an integrated solid waste system strengthening system by optimizing the use of the existing landfill. The use of the existing landfill is done because the area of Mojokerto City is relatively narrow so the easiest and fastest way is to do this. In planning a centralized waste management system by optimizing the use of the existing landfill in Mojokerto, there are several stages, first, the collection system in settlements, markets, protocol roads, schools, shops, hotels / inns and restaurants and hospitals or other health facilities. The second stage is the transportation system consisting of fleet procurement activities, arranging routes to the landfill and monitoring. The third stage is the processing system in the landfill which consists of minimizing the impact of the landfill, controlling the landfill, making SOP, processing waste technology in the landfill, improving the quality of human resources and increasing / expanding composting.

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