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Environmentally Friendly Integrated Waste Management Strategy in Rantepao District

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Abstract

This study aims to find out how the solid waste system in Rantepao District is, how much household waste is produced in Rantepao District, and how is an environmentally friendly integrated waste management strategy through waste infrastructure planning in Rantepao District. A sample of 100 respondents' families in each Kelurahan and Lembang in Rantepao District, North Toraja Regency. The data was collected through field research by taking samples and interviews with respondents as well as library research. Data were analyzed using a combination of qualitative and quantitative methods. The results showed that: 1) The solid waste system in Rantepao Subdistrict did not meet the criteria set by government regulations and the National Standardization Body. It is known that this settlement does not have a TPS and must dispose of its waste to Enrekang Regency so that facilities such as garbage carts also need to be added. The condition of the trash containers/bins in the houses of the dominant residents is not in good condition. And the dominant community throws their household waste directly into public places such as rivers and markets. 2) The composition of waste consists of 10% organic waste, while 42% of non-organic waste. It is known that the total average weight of household waste generated for a day in Rantepao District is 11,441.76 Kg/day or 0.48 Kg/person/day and the volume is 125,144.25 Liters/day or 5.25 Liters/person. /day. 3) It takes 98 manual transport carts with a standard length of 160 cm x width 80 cm x height 100 cm or 1,280 liters to support the waste management strategy by collecting waste from the source at least once a day. Procurement of two TPS 3R model 2 in vacant land locations in Rantepao and Lembang Limbong Villages as a planning recommendation as shown in Figures 5.4.1 and 5.4.2. The recommendations from this research are 1) One way that can be done to improve the solid waste system in Rantepao District is the distribution of proper trash cans in each resident's house, by separating organic and non-organic waste from the source. 2) It is necessary to educate the community about 3R waste processing (reduce, reuse, and recycle) and carry out mutual cooperation activities to clean markets and rivers. 3) The provision of facilities and infrastructure as well as the implementation of 3R TPS must be supported by the local government to reduce river pollution by household waste generated by the people of Rantepao District.

Keywords
management strategy; integrated waste; environmentally friendly

I. Introduction

Rantepao District as the capital of North Toraja Regency is also inseparable from the waste problem. The function of the capital that is carried out by the Rantepao District makes this city a city that is quite busy with all its community activities, both as a center of government and a business center for trading goods and services. So that community

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activities in North Toraja Regency are centered in Rantepao District/City. The high level of community activity and the flow of distribution of goods and services in the City of Rantepao of course also has an influence on the production/generation of waste every day. Dense community activities are also directly proportional to the production of waste generated by the community. Data from the Environmental Service of North Toraja Regency, shows that the production of community waste in Rantepao District from year to year has increased significantly. Where in 2017 the amount of waste production in Rantepao District was 65 tons/day, in 2018 it increased to 71 tons/day and in 2021 it was 83 tons/day.

Seeing the large amount of waste generated in Rantepao District, Rantepao District should have a good strategy in managing the lives of its people, especially in waste management. In order to achieve a healthy and prosperous society in the future, it is necessary to have a healthy residential environment. From the aspect of waste, it will be meaningful as a condition that can be achieved if the waste can be managed properly so that it is clean from the residential environment where humans are active in it (Permen PU number: 21/PRT/M/2006).

The current waste management system in Rantepao Sub-district is still limited to Collect - Transport - Dispose of and problem solving is carried out using the sanitary landfill method at the TPA. The advantage of this concept is that the operation time is relatively easy and inexpensive because it only goes through 3 stages in the management process. However, this will then become a problem when the landfill's capacity is full, so local governments need to find new land. The cost of land clearing is getting more and more expensive and the NIMBY (Not in My Backyard) syndrome where local people don't want their environment to be turned into a landfill will make the situation worse.

With the high amount of waste generated in Rantepao District as the center of community activity, Rantepao District should have a good strategy in managing waste, especially Integrated Waste management which is environmentally friendly. However, the current conditions show that the existing waste management system is still carried out manually, namely collecting - transporting - throwing away, without being processed first, so that the current waste disposal system is still considered not optimal, in addition to the limited availability of waste transportation facilities and intensity. transportation of waste to the final disposal site (TPA) so that often the amount of existing waste has not been fully transported to the TPA.

The not yet optimal waste processing is one of the obstacles in waste management in North Toraja Regency, especially in Rantepao District, besides that there is still a lack of awareness from the community to sort waste at their respective homes so that the waste transported to the TPA is still mixed between organic and non-organic waste. This results in the amount of waste generated being transported to the TPA not being reduced from the source of the waste generation, which of course will have an impact on reducing the service life of the TPA.

Waste management will be more optimal if the local government, the private sector and the community are directly involved. The local government provides regulations, the private sector provides facilities/facilities and infrastructure for waste management as well as some funding and the community is involved in the operation process. All these aspects need to work together in order to implement good waste management so as to create good integration between the government, the private sector and the community, especially in waste management.

Optimization of waste management in the residential area of Rantepao District is related to the generation, composition and types of waste in North Toraja Regency. Good

waste management will have a good impact on the environment and will have a positive impact on public health. Seeing these developments, Rantepao District also requires the same priority waste services as other cities, so that it becomes a challenge for local governments in providing maximum waste management services.

II. Review of Literature

2.1 Definition of Planning and Strategy

a. Planning

In the life of every human being must have done planning, whether it is done spontaneously or integrated. Spontaneous planning when someone wants to do something very simple or more to activities that are carried out repeatedly and continuously, for example when we sleep we plan what time to wake up, then what we will do after waking up and so on. Then for integrated planning, for example, when we plan the education of our children, we will start from saving since the children are very early, then send them to schools that are considered good and quality and so on.

According to Taufiqurokhman (2008), planning is a guideline, outline, or instruction that must be followed if you want good results. In drawing up a plan, the first thing to do is to focus on what you want to do, short-term goals and long-term goals for the organization and decide what will be used to achieve these goals. We must predict the extent to which this possibility can be achieved, both in terms of the economic, social and political environment in which the organization is organized and linked with the available resources to realize the plan.

b. Strategy

According to Jauch and Gleuck (Amirullah, 2015: 5), strategy is a unified, comprehensive and integrated plan that links the company's strategic advantages with environmental challenges and which is designed to ensure that the company's main goals can be achieved through proper implementation by the company. not only as a variety of ways to achieve goals but also includes the determination of the various goals themselves.

2.2 Integrated Waste Management Study

Garbage which is residual material after the end of a man-made process that really requires special handling by the government, industry, private sector, and the community as waste producers. Waste management is influenced by the behavior of people who are less concerned about environmental cleanliness so that waste is often disposed of carelessly. Besides that, the lack or even the unavailability of waste disposal facilities also triggers landfills or indiscriminate burning of waste which in turn creates new waste. Even though these activities have a negative impact on the environment and humans such as flooding, air, water and soil pollution, disturbing the aesthetics of the environment and becoming a source of disease spread. On the other hand, if waste is managed properly, the problem of waste is not only resolved, but also can be an alternative to improving the community's economy (Tobing, 2005 in P3M PT. Indocement Tunggal Perkasa, 2014).

2.3 Study of Waste Management Facilities and Infrastructure

Physical facilities and infrastructure or often called infrastructure is a very important part of the community service system. Various physical facilities are vital to support various government, economic, economic, industrial and social activities in the community

and government. In the Big Indonesian Dictionary (KBBI) means are anything that can be used as a tool to achieve a goal or goal. Meanwhile, infrastructure is everything that is the main support for the implementation of a process.

Stone (1974), states that infrastructure is created by public agencies that are held to serve economic, social purposes and fulfill social functions. It is closely related to the fulfillment of public facilities to fulfill socio-economic activities and various government activities.

2.4 Environmental Conservation Study

In Law Number 32 of 2009 concerning Management and Protection of the Environment, the environment is defined as a unitary space with all objects, power, circumstances, and living things including humans and their behavior. Environmental protection and management is a systematic and integrated effort carried out to preserve environmental functions and prevent environmental pollution and/or damage which includes planning, utilization, control, maintenance, supervision, and law enforcement.

2.5 Conceptual Framework

The Strategy for Integrated Environmentally Friendly Waste Management in Rantepao District is illustrated in the following framework:

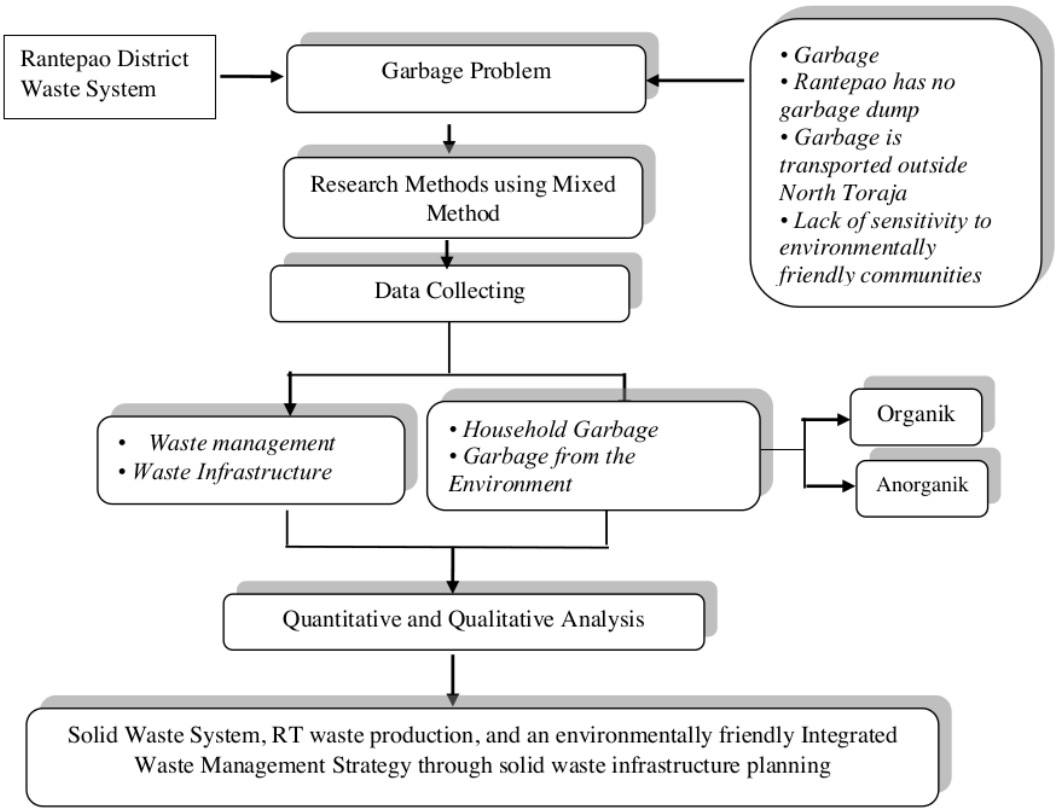

***Figure 1**. Conceptual Framework*

III. Research Method

Based on the goals and objectives to be achieved, the approach used is a descriptive qualitative and quantitative approach. Descriptive research was conducted to determine independent variables, either one or more (independent) variables without making comparisons or connecting with other variables (Sugiyono, 2012:13). Meanwhile quantitative research is research based on positivistic philosophy which is used to examine certain populations or samples, data collection uses research instruments and data analysis is quantitative or statistical. Quantitative research is also called the traditional method, because this method has been used for a long time so that it is easy to become a tradition as an approach to solving research problems. This method is also referred to as the scientific method or scientific research (Creswell, 2010:8). Data collection techniques used in this study are Observation (Observation), Interview, Questionnaire / Scoring, Documentation, Literature Study.

The research location is in one of the sub-districts in North Toraja Regency, namely Rantepao District which is the capital of North Toraja Regency.

With the cluster random sampling technique, the number of samples obtained is evenly distributed for each Kelurahan from a total of 9 Kelurahan and 2 Lembang which have the following population and research samples:

Table 1. Research Sample

No	Village	Population (N)	Sampel Pecahan Cluster Fi = Ni/N	Individu Cluster Ni = fi*n
1	Mentirotiku	5.749	0,20	20
2	Malanggo	4.312	0,15	15
3	Pasele	3.532	0,12	12
4	Singki	1.762	0,06	6
5	Rantepao	2.270	0,08	8
6	Rantepasele	1.937	0,07	7
7	Penanian	1.432	0,05	5
8	Laang Tanduk	2.437	0,09	9
9	Karassik	1.691	0,06	6
10	Saloso	1.677	0,06	6
11	Limbong	1.652	0.06	6
Total Populasi		**28.451**		**100**
Sampel n = N/((1+N)*(,0,1^2))		**99,996**		

Source: Primary Data processed in 2022

There are two types of data used in this study, namely primary data and secondary data. These data were obtained from direct observation to the field and literature study. Observations were made by direct measurement of waste generation.

Measurement of waste generation using the Load Count Analysis method. This method is a generation measurement method by measuring the amount (weight or volume) of waste that enters the TPS. Data collection was carried out for 2 days in accordance with the sample collection listed in SNI 19-3964-1994 regarding the method of sampling and measuring the generation and composition of urban waste. The equation that can be used to calculate waste generation is as follows:

Waste generation per household (kg/KK.day):
Waste generation per household = amount of waste (kg/KK.day) / number of population sampled (persons).
Total waste generation per RT (kg/day):
Total waste generation per RT = Waste generation per household (kg/KK.day) x total number of households.

IV. Result and Discussion

4.1 Data Processing

a. Weight of household waste generation

a. Average total solid waste generation per household in Mentiroku Village (Kg/KK.day)
= h ($kg/KK.hari$)
h (u)
= 96.4
20
= 4.82 2.41 Kg/KK/day

b. Average total solid waste generation per household in Malanggo Village (Kg/KK.day)
= h ($kg/KK.hari$)
h (u)
= 70.8
15
= 4.72 2.36 Kg/KK/day

c. Average total solid waste generation per household in Pasele Village (Kg/KK.day)
= h ($kg/KK.hari$)
h (u)
= 53.82
12
= 4.44 2.22 Kg/KK/day

d. Average total solid waste generation per household in Singki Village (Kg/KK.day)
= h ($kg/KK.hari$)
h (u)
= 25.68
6
= 4.28 2.14 Kg/KK/day

e. Average total solid waste generation per household in Rantepao Village (Kg/KK.day)
= h ($kg/KK.hari$)
h (u)
= 34.56
8
= 4.32 2.16 Kg/KK/day

f. Average total solid waste generation per household in Rantepasele Village (Kg/KK.day)
= h ($kg/KK.hari$)
h (u)

= 32.62
7
= 4.66 2.33 Kg/KK/day

g. Average total solid waste generation per household in Penanian Village (Kg/KK.day)
= h ($kg/KK.hari$)
h (u)
= 21.8
5
= 4.36 2.18 Kg/KK/day

h. Average total solid waste generation per household in Laang Tanduk Village (Kg/KK.day)
= h ($kg/KK.hari$)
h (u)
= 38.52
9
= 4.28 2.14 Kg/KK/day

i. Average total solid waste generation per household in Karassik Village (Kg/KK.day)
= h ($kg/KK.hari$)
h (u)
= 27.36
6
= 4.56 2.28 Kg/KK/day

j. Average total solid waste generation per household in Lembang Saloso (Kg/KK.day)
= h ($kg/KK.hari$)
h (u)
= 26.04
6
= 4.34 2.17 Kg/KK/day

k. Average total solid waste generation per household in Lembang Limbong (Kg/KK.day)
= h ($kg/KK.hari$)
h (u)
= 25.92
6
= 4.32 2.16 Kg/KK/day

The total average weight of waste generation per household in 11 Kelurahan/Lembang in Rantepao District is:

$$= \frac{\text{K1+BK2}\ldots.+B\text{L1+BL2}}{11}$$

$$= \frac{2.41+2.36+2.22+2.14+2.16+2.33+2.18+2.14+2.28+2.17+2.16}{11}$$

$$= \frac{24.55}{11}$$

= 2.23 Kg/KK/day
= 2.23 5178
= 11,546.94 Kg/day.

b. Volume of Household Waste Generation

a. Average volume of total waste generation per household in Mentiroku Village (Kg/KK.day)

$$= \frac{(L/KK.hari)}{(u)}$$

$$= \frac{966.63}{20}$$

= 48.33 /KK 24.16 L/KK/day.

b. Average volume of total waste generation per KK in Malanggo Village (Kg/KK.day)

$$= \frac{(L/KK.hari)}{(u)}$$

$$= \frac{770.11}{15}$$

= 51.34 /KK 25.67 L/KK/day.

c. Average volume of total waste generation per KK in Pasele Village (Kg/KK.day)

$$= \frac{(L/KK.hari)}{(u)}$$

$$= \frac{631.68}{12}$$

= 52.64 /KK 26.32 L/KK/day.

d. Average volume of total waste generation per household in Singki Village (Kg/KK.day)

$$= \frac{(L/KK.hari)}{(u)}$$

$$= \frac{285.24}{6}$$

= 47.54 /KK 23.77 L/KK/day.

e. Average volume of total waste generation per household in Rantepao Village (Kg/KK.day)

$$= \frac{(L/KK.hari)}{(u)}$$

$$= \frac{397.76}{8}$$

= 49.72 /KK 24.86 L/KK/day.

f. Average volume of total waste generation per household in Rantepasele Village (Kg/KK.day)

$$= \frac{(L/KK.hari)}{(u)}$$

$$= \frac{380.66}{7}$$

= 54.38 /KK 27.19 L/KK/day.

g. Average volume of total waste generation per KK in Penanian Village (Kg/KK.day)
= $(L/KK.hari)$
(u)
= 215.61
5
= 43.12 /KK 21.56 L/KK/day.

h. Average volume of total waste generation per household in Laang Tanduk Village (Kg/KK.day)
= $(L/KK.hari)$
(u)
= 429.66
9
= 47.74 /KK 23.87 L/KK/day.

i. Average volume of total waste generation per household in Karassik Village (Kg/KK.day)
= $(L/KK.hari)$
(u)
= 342.12
6
= 57.02 /KK 28.51 L/KK/day.

j. Average volume of total waste generation per family in Lembang Saloso (Kg/KK.day)
= $(L/KK.hari)$
(u)
= 306.72
6
= 51.12 /KK 25.56 L/KK/day.

k. Average volume of total waste generation per KK Lembang Limbong (Kg/KK.day)
= $(L/KK.hari)$
(u)
= 285.84
6
= 47.64 /KK 23.82 L/KK/day.

The total average volume of waste generation per household in 11 Kelurahan/Lembang in Rantepao District is:
= VK1+VK2….+VL1+VL2
11
= 24.16+25.67+26.32+23.77+24.86+27.19+21.56+23.87+28.51+25.56+23.82
11
= 275.29
11
= 25.02 Kg/KK/day
= 25.02 5178
= 129.553.56 Kg/day.

c. Requirements for the Number of Collectors and TPS 3R

a. Cart Capacity

To calculate the number of carts needed in one settlement, use a manual cart with a standard size of 160 cm long x 80 cm wide x 100 cm high or 1,280 liters with garbage collection from the source at least once a day. So here's the calculation:

$$= \frac{\Sigma volume\ kapasi \text{ enough } gerobak}{1{,}280}$$

$$= \frac{125{,}144.25}{1{,}280}$$

$$= 97.76 \sim 98 \text{ pieces}$$

So it is necessary to have 98 carts for household waste transportation services per day.

b. TPS Capacity

Procurement of 3R TPS is based on technical requirements of TPS and TPS 3R with a minimum capacity of 400 families, with a minimum area of 200 m2. Rantepao sub-district settlements have 5,178 families or 23,837 people. So it should have 13 3R TPS with a minimum area of 200 m2.

Meanwhile, the transfer of waste from TPS is carried out twice a week. Previously, waste reduction was carried out to the transport fleet by reuse, reduce and recycle at this TPS. From the data obtained, 58% or 12,530.76 kg/day of organic waste can be recycled into animal feed and compost. So that 42% of it can be sorted to be reused then the rest is transported to be taken to the nearest Waste Bank/TPA.

d. Waste Infrastructure Planning Strategy

The solid waste infrastructure planning strategy that can be applied in the settlements of Rantepao District based on the data obtained is as follows:

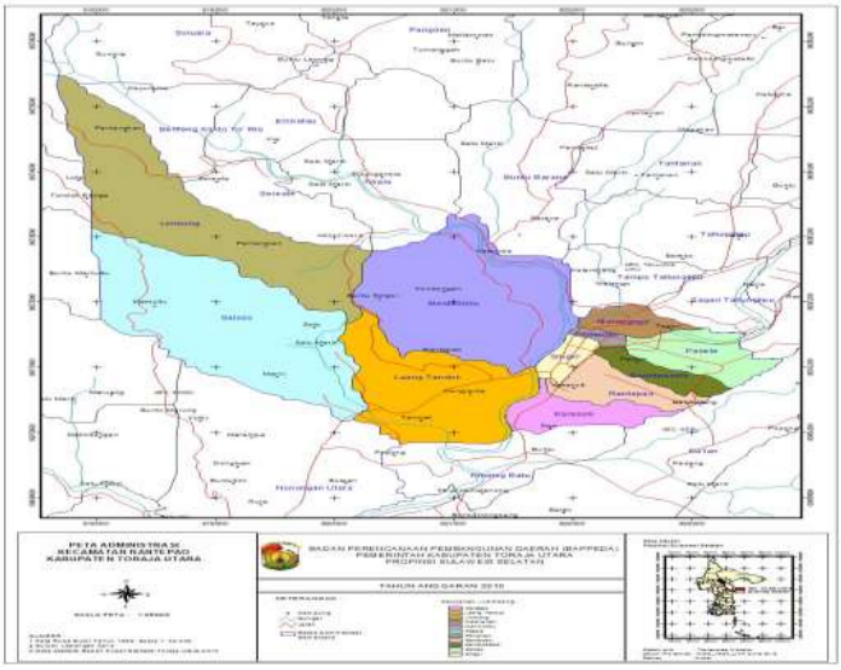

Figure 2. *3R . TPS Location Planning*

Information:

——— : Village/Lembang boundaries
\+ : Church/Places of Worship
• : Residential settlement
——— : River
▭ : TPS 3R
——— : Road

The planning for the location of the 3R TPS was chosen based on the location of vacant land that could be used so that the transportation of waste would be more efficient. It was placed at 2 points, namely the first in Rantepao Village as access for the lower to the TPS, the second in Lembang Limbong. Collector operational planning in accordance with the requirements that can be applied in Rantepao District is the Indirect Communal Pattern for dense settlements. Indirect communal pattern with the following requirements:

1. High community participation;
2. Communal containers are placed in accordance with the needs and locations that are easily accessible to collection tools;
3. Land for the transfer site is available;
4. For relatively flat topography, with an average slope of less than 5%, non-machine collection tools can be used, for example carts or tricycles. Meanwhile, for topographic conditions with a slope greater than 5%, other methods can be used, such as poles, small containers on wheels and sacks;
5. The neck of the road/alley can be passed by the collecting device without disturbing other road users;
6. There must be a waste collection management organization.

The following is an operational plan for a garbage collector that can be applied:

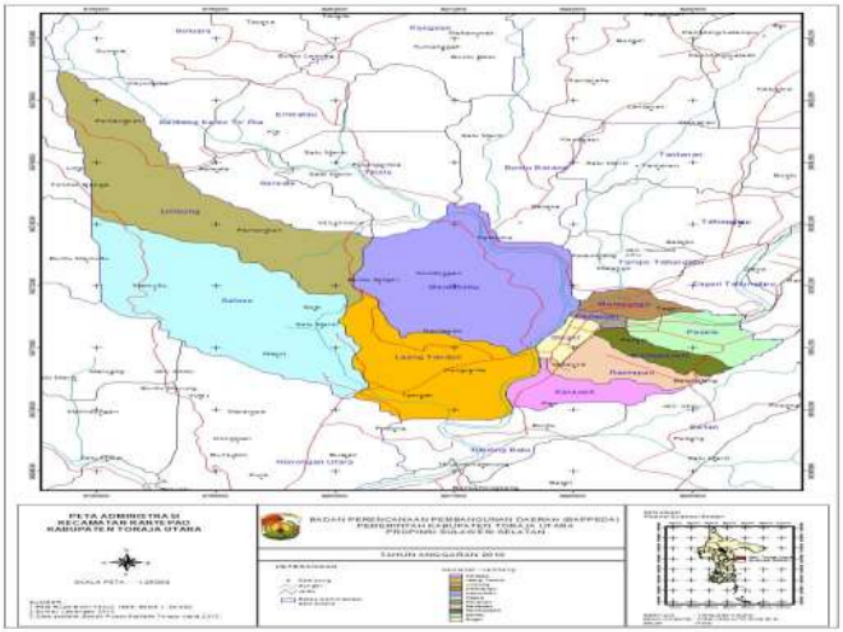

Figure 3. *Planning of Waste Collector Operational Pattern*

Information:

——— : Village/Lembang boundaries
\+ : Church/Places of Worship
• : Residential settlement
——— : River
▭ : TPS 3R
——— : Road
⬬ : Communal Place
⟶ : Movement of Collector to TPS 3R

The Indirect Communal Pattern is more appropriate to use because of the dense settlements of the Rantepao District. Residents bring their waste to communal containers which are placed 2 each per RT with a volume of 1000L based on communal waste containers according to SNI 19-2454-2002 with an average volume of waste per RT is 1,330 L/RT/day. The distribution of labels or signs for the type of waste, then the garbage cart takes the garbage from the communal container to two TPS 3R points, namely TPS 3R I for Karassik Village, Rantepao Village, Malangngo Village, Pasele Village, Rantepasele Village, and Penanian Village. And TPS 3R II for Mentiroku Village, Laang Tanduk Village, Singki Village, Lembang Saloso, and Lembang Limbong, which then in the two 3R TPS waste is sorted and processed, then transported/transported waste to the nearest TPA.

Figure 4. *Examples of communal containers according to the type of waste*

The second plan is to create a waste bank, where inorganic waste that still has a sale value is collected and separated during the waste sorting process at the two TPS 3R border areas. The inorganic waste is then collected up to a certain amount, then it can be resold to waste collectors. Inorganic waste that still has a selling value includes plastic, styrofoam, glass, iron, paper, cardboard, and others. It is recommended that inorganic waste be sold until it has a value at least equal to the cost of transportation (if the waste must be delivered to collectors).

4.2 Discussion of Research Results and Data Analysis

a. Analysis of the Solid Waste System in Rantepao District

There are three conditions of trash cans/bins found in the homes of residents who were sampled, namely only 35% that had trash cans in good condition, 45% had bad conditions of trash cans and 20% of residents' homes did not have trash cans. Then the unavailability of TPS, waste transportation equipment and no strict prohibition from the

local government not to throw garbage into the river.

The condition of the trash containers/bins in Rantepao District is not in accordance with the Regulation of the Minister of Public Works No. 03/PRT/M/2013 concerning the Implementation of Waste Infrastructure and Facilities in the Handling of Household Waste and Similar Household Waste, where the criteria for waste collection facilities with individual storage patterns are:

a. Water and airtight;
b. Easy to clean;
c. Affordable prices;
d. Light and easy to lift;
e. Aesthetic shapes and colors;
f. Has a lid for hygiene;
g. Easily obtained; and
h. The volume of the container for reusable waste, for recyclable waste, and for other waste is at least 3 days and 1 day for biodegradable waste.

The requirements for the accommodation facilities are as follows:

a. The number of facilities must match the type of waste grouping;
b. Labeled or marked;
c. Distinguished by color, material, and shape (dark container for organic; light color container for inorganic).

Meanwhile, based on SNI 19-2454-2002, the container material requirements are as follows:

a. Not easy to damage and waterproof;
b. Economical, easy to obtain made by the community;
c. Easy to empty.

Requirements for materials with individual and communal patterns based on SNI are as shown in the following table:

Table 1. Trash Container Characteristics

No	Housing Pattern/ Characteristics	Individual	Communal
1	Form	Boxes, cylinders, containers, bins, all lids, and plastic bags	Cylindrical boxes, containers, bins, all with lids
2	Nature	Lightweight, easy to move and easy to empty	Lightweight, easy to move and easy to empty
3	Type	Metal, plastic, fiberglass (GRP), wood, bamboo, rattan.	Metal, plastic, fiberglass (GRP), wood, bamboo, rattan
4	Procurement	Personal, agency, manager	Management Agency

Source: National Standardization Agency 2022

Social activities for reducing waste in this sub-district, such as mutual cooperation in cleaning the market and socialization of waste sorting and processing are rarely carried out. The cleaning of the market is only carried out based on the awareness of residents who own houses around the market

There are 5% of residents who throw their garbage directly into the river, 20% throw their garbage in public places such as markets and in front of people's houses, and 75% of residents who burn their waste and process waste into animal feed. Although 20% of the data from residents who also burn garbage. From the results of the data it was concluded that public awareness in Rantepao District in reducing and processing waste quite often was burned and used as animal feed.

This is due to the absence of waste infrastructure facilities provided and the local government is prohibited from throwing garbage in public places. This condition is not in accordance with the Technical Requirements for TPS and TPS 3R by the Ministry of Public Works and Public Housing (2017) which states that the procurement of TPS such as TPS 3R has a minimum of 400 families, while the settlements in Rantepao District have 5,178 families or 23,837 people. So it should have 13 3R TPS with a minimum area of 200 m2.

So that the conclusion obtained is that the solid waste system in Rantepao District does not meet the criteria set by government regulations and the National Standardization Body.

b. Analysis of household waste production in Rantepao District a

The total average weight of household waste generated for a day in Rantepao District is 11,441.76 Kg/day or 0.48 Kg/person/day and the volume is 125,144.25 Liters/day or 5.25 Liters/person. /day.

The number of carts needed in one settlement uses manual carts with a standard length of 160 cm x width 80 cm x height 100 cm or 1,280 liters with garbage collection from the source at least once a day. From the results of data analysis, it is necessary to have 98 carts for household waste transportation services per day.

The generation of waste generated in the data is due to the absence of sorting and reducing waste from the source and the absence of socialization/education from the government or agencies regarding the reduction and sorting of waste as well as the 3R waste processing, namely Recycle, Reduce and Reuse. This method has also been described in the Law of the Republic of Indonesia No. 18 of 2008 concerning Waste Management Article 20 regarding waste reduction includes activities to limit (reduce), recycle (recycle), and/or reuse (reuse) waste.

The TPS 3R Model 2 design has the following criteria:

a. Have organic waste processing facilities;
b. Has a hangar that is adapted to the wide needs of TPS 3R;
c. Have a storage area for inorganic waste that can still be sold;
d. Have a storage area for inorganic waste that can still be sold;
e. There is a mini landfill

The flow of waste processing at TPS 3R Model 2 is that organic and inorganic waste from residents' homes is transported to TPS 3R by garbage carts/motorcycles, then the waste that arrives at TPS 3R is sorted between organic and inorganic. The organic waste is then chopped and processed to be used as compost. Inorganic waste is re-sorted according to its type (which still has a selling value, such as plastic, glass, paper, etc.), then the residual waste is processed using mini landfills.

The conclusion obtained from the discussion above is that the waste generated in Rantepao District is in a condition that produces a very large amount of waste, so the procurement of 3R TPS is expected to be an effort in reducing waste according to the applicable law.

c. Strategy Analysis of environmentally friendly integrated waste management through waste infrastructure planning in Rantepao District

The planning for the location of the 3R TPS is chosen based on the location of vacant land that can be used for transportation of waste which will be more efficient. For the planning of solid waste infrastructure in Rantepao District, more details can be seen in Figures 5.4.1 and 5.4.2.

Collector operational planning in accordance with the requirements that can be applied in Rantepao District is the Indirect Communal Pattern for dense settlements. The indirect communal pattern is based on SNI 19-2454-2002 regarding Operational Technical Procedures for Urban Waste Management with the following requirements:

a. High community participation;
b. Communal containers are placed according to needs and locations that are easily accessible to collection tools;
c. Land for transfer site is available;
d. For relatively flat topographic conditions, the average slope is less than 5%, non-machine collection tools can be used, for example carts or tricycles. Meanwhile, for topographic conditions with a slope greater than 5%, other methods can be used, such as poles, small containers on wheels and sacks;
e. The neck of the road/alley can be passed by the collection tool without disturbing other road users;
f. There must be a waste collection management organization.

The Indirect Communal Pattern is more appropriate to use because of the dense settlements in Rantepao District.

The second plan is to create a waste bank, where inorganic waste that still has a sale value is collected and separated during the waste sorting process at the 3R TPS. The inorganic waste is then collected up to a certain amount, then it can be resold to garbage collectors

V. Conclusion

Based on the results of observations, interviews, questionnaires and calculations carried out in Rantepao District, it is known that:

1. The solid waste system in Rantepao District has not met the criteria set by government regulations and the National Standardization Body. It is known that this settlement does not have a TPS and must dispose of its waste to Enrekang Regency so that facilities such as garbage carts also need to be added. The condition of the trash containers/bins in the houses of the dominant residents is not in good condition. And the dominant community throws their household waste directly into public places such as rivers and markets.
2. The composition of waste consists of 58% organic waste, while 42% of non-organic waste. It is known that the total average weight of household waste generated for a day in Rantepao District is 11,441.76 Kg/day or 0.48 Kg/person/day and the volume is 125,144.25 Liters/day or 5.25 Liters/person. /day.
3. It takes 98 manual transport carts with a standard length of 160 cm x width 80 cm x height 100 cm or 1,280 liters to support the waste management strategy by collecting waste from the source at least once a day. Procurement of two TPS 3R model 2 in vacant land locations in Rantepao and Lembang Limbong Villages as a planning recommendation as shown in Figures 5.4.1 and 5.4.2. on employee performance mediated by self-efficacy. Employee performance increases, if given motivation to work

harder and self-confidence or self-efficacy in completing the given work so that all work runs smoothly, the stronger the self-efficacy the more active the efforts made by individuals and will increase work productivity. 6) The work environment has a positive and significant effect on employee performance mediated by self-efficacy. Means that an adequate work environment affects employee performance because it is directly related to activities at work, besides self-efficacy or self-confidence is also needed to be able to complete the work given. Because a good work environment is balanced with employee self-efficacy, so that it will have an impact on improving employee performance.

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