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To cite this article: Anggrieka Maharani *et al* 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **314** 012017

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# Community-based solid waste management planning in the Administrative Village of Surau Gadang, Padang City

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**Abstract.** The community-based solid waste management system in Administrative Village of Surau Gadang is planned based on SNI-20-3242-2008, with a design period of 8 years (2011-2018). The service level is planned to reach 100%. The total solid waste generation is 64.18 m<sup>3</sup>/d (organic 60.81 m<sup>3</sup>/d, inorganic is 0.75 m<sup>3</sup>/d, while other waste is 2.61 m<sup>3</sup>/d). The sorting process is according to the type of waste. Residential waste collection uses motorized trash tricycles to TPST (integrated waste treatment plant) and non-residential uses pickup cars to TPS (temporary disposal site). Processing carried out at the source is composting the *Takakura* method, while in TPST is composting the *Bokhasi* method, sorting other waste for sale, recycling and making handicrafts. The residue from the remaining processing which was disposed to TPS was 18.43%. The institution formed is a representative of all RW (citizens association). Regulation based on Law No.18 of 2008. The investment in making TPST and its supplementary facilities for eight years is Rp.1,322,000,000, with operational and maintenance costs of Rp.26,678,067/month. The profit obtained is Rp.102,117,284 /month. Community participation can be seen from involvement in technical and non-technical aspects.

## 1. Introduction

Solid waste can cause problems for life and environmental health, especially human life. The habit of throwing trash carelessly, such as throwing solid waste at the roadside can cause uncomfortable feelings because of the aesthetic disturbance and throwing solid waste in the body of water continuously can bring vector disease and even cause flooding. As population increases rapidly, the amount of waste produced also increases. The increasing amount of waste produced will cause complex problems if it is not followed by improvements in waste management facilities and infrastructure. Increasing the amount of waste produced if it is not followed by improvements in waste management facilities and infrastructure will cause problems to be complex. Therefore, to minimize the impacts that occur, proper and comprehensive management is needed.

Household waste production also increases every day due to an increasing number of products and consumption patterns of the people. So, the thing that must be done to overcome the increase in waste volume is by extracting the volume of waste from its source through community empowerment [1]. Community-based solid waste management is a waste handling system that is planned, organized, operated, managed and owned by the community [2]. The principle of community-based solid waste



management technology is fairly simple, easy to operate, inexpensive, accepted by the community and not high technology [3].

Administrative Village of Surau Gadang is one of the potential areas for the implementation of community-based residential waste management systems, because this area is included in the area prioritized in implementing a regional scale waste management system with a new paradigm (community-based solid waste management using the 3R method) in Padang City. This area is also included in the development area I (WP I) according to the regional spatial plan (RTRW) of Padang City in 2008-2028. At this time the solid waste is still collected and stacked at the temporary disposal site (TPS) to be transported to the final disposal site (TPA). Solid waste management in this area is still not fully served by municipal waste institution, namely Dinas Kebersihan dan Pertamanan (DKP) Kota Padang and the local private business entity. Therefore, a community-based solid waste management plan was made in Administrative Village of Surau Gadang, covering a management system that includes operational technical aspects (separation and sorting, storage, collection, processing and transportation of residues) and non-technical aspects (institutional / organizational and management, legal and regulations, benefits, and community participation).

## 2. Literature Review

Regional waste management is a communal waste management activity to serve part or all of the waste resources in the area where management is located [4]. Whereas community-based solid waste management is a waste handling system that is planned, organized, operated, managed and owned by the community. The goal is the independence of the community in maintaining environmental cleanliness through environmentally friendly waste management [2].

Based on SNI 20-3242-2008 waste management is carried out using the 3 R method (reduce, reuse, and recycle). The waste management system is basically various components that are connected to each other. The policy of managing urban waste in Indonesia defines that waste management, outlined in 5 (five) subsystem components, which consists of operational engineering aspects, institutional/management and organizational aspects, regulatory/legal aspects, financing aspects and aspects of community participation [4]. Management operates operational techniques, management and financing can refer to SNI 19-2454-2002, while for review Regulations and Law can refer to Law No.18 of 2008 about Waste Management in Indonesia.

## 3. Methods

The research began with a literature study on solid waste management. After that, secondary data collection was carried out regarding the profile of Administrative Village of Surau Gadang, namely population demographics, social, economic, cultural aspects and other supporting facilities and infrastructure. In addition, data is also needed regarding the generation and composition of waste, storage, collection, transportation and final disposal. Primary data collection with a questionnaire aims to determine the existing conditions in managing waste and the willingness of the community to participate in community-based solid waste management. The type of house in the sampling area is classified based on SNI 20-3242-2008. The general design of a community-based solid waste management system contains:

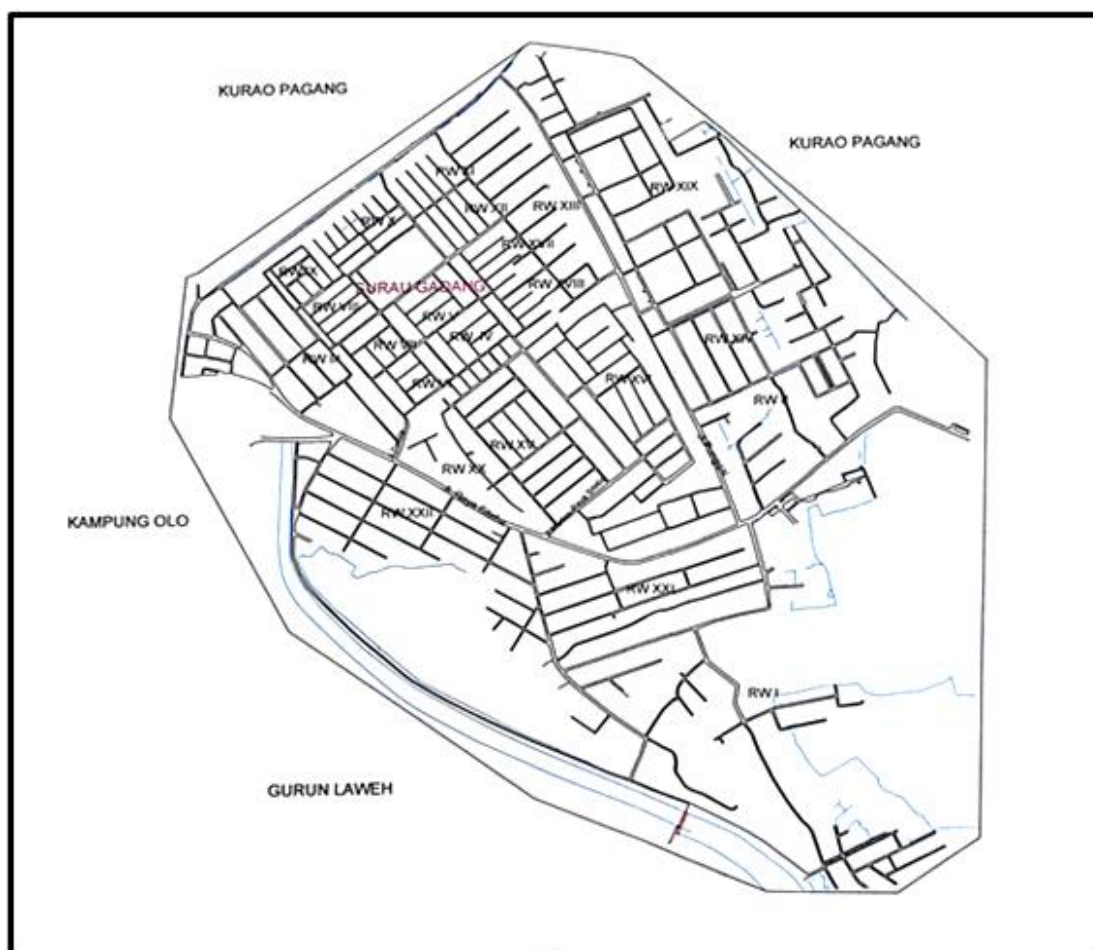
- The design period is in accordance with Padang City Phase I RTRW (2008-2018);
- Population projection;
- Waste generation projection;
- System determination.

Detail designs of operational and non-technical technical aspects include:

- Service area and service level;
- The operational technical aspects include sorting and separation systems, residue collection, processing and transportation;

- Non-technical aspects that include institutional/management organizations, laws and regulations, financing and community participation.

Technical specifications contain the types of materials used in community-based solid waste management systems and work steps in their implementation. These specifications are tailored to the needs and conditions of the field, as well as aspects of costs and operational convenience. While the calculation for the budget plan, covering the investment, operational and maintenance costs of all the facilities and infrastructure needed, as well as the need for implementation in community-based TPST planning is made based on the basic unit price. While the budget plan, covering the investment, operational and maintenance costs of all the facilities and infrastructure needed, as well as the need for implementation in community-based TPST planning. The calculation is made based on the basic unit price. The area to be served and the management system made, is shown in Figure 1 below.



**Figure 1.** Map of Administrative Village of Surau Gadang

#### 4. Results

Based on the results of the study and evaluation, it was found that waste management in Surau Gadang still did not fulfill the concept of waste management with a new paradigm (SNI-20-3242-2008 concerning waste management in settlements using the 3 R concept and involving the community). Where community involvement in managing waste is still minimal, even though Surau Gadang is one of the priority areas for implementing regional scale waste management systems and included in the development area I, according to the regional spatial plan of Padang City in 2008-2028. Temporary waste management is carried out by related institutions namely the Department of Sanitation and Landscaping of Padang City and third parties for transportation services to temporary dumps.

Supporting facilities for managing waste with this new paradigm are not yet available. The community still uses the remaining packaging bags to store mixed garbage, and it is still rare to find people who have the awareness to sort out their own garbage. The garbage container used is also not as it should be. Recapitulation of solid waste management evaluation in this area can be seen in Table 1 below.

**Table 1.** Recapitulation of Solid Waste Management Evaluation in Administrative Village of Surau Gadang

Aspect	Existing	Regulation	Description
Regulation	Not available	SNI 20-3242-2008	Not comply
Institutional/organizational management	Not available	SNI 20-3242-2008	Not comply
Community participation	Not available	SNI 20-3242-2008	Not comply
Operational Technical			
- Area and service level	Available	Permen PU no.21/PRT/M/2006	Not comply
- Storage	Available	SNI 19-2454-2002	Not comply
- Collection	Available	SNI 19-2454-2002	Not comply
- Transportation	Available	SNI 19-2454-2002	Not comply

In order that waste management in the Surau Gadang can be better, then waste management planning is made based on the new paradigm with reference to the applicable regulations in Indonesia. Management that is planned can be seen in the following description.

#### 4.1. General Design

The stages of planning for community-based solid waste management systems in Administrative Village of Surau Gadang are adjusted to the Phase I RTRW of Padang City (2009-2018). Where this aims to improve the quality of facilities and infrastructure services and prepare the development of service centers. Before the planning is carried out, the population projection is calculated first. Projection of population is taken based on the chosen method, namely arithmetic method. The population of Administrative Village of Surau Gadang was obtained at the end of the planning (in 2018), which was 20,704 people. Determination of the amount of waste generation and the composition of the household of Surau Gadang refers to previous studies [5]. More details can be seen in the following Tables 2 and 3.

**Table 2.** Household Waste Generation in Administrative Village of Surau Gadang

Classification	Percentage (%)	Generation Volume (l/o/h)	Generation Weight (kg/o/h)
High Income	20	2.90	0.54
Medium Income	60	2.68	0.44
Low Income	20	2.92	0.57
Average		2.83	0.52

The generation projection at the end of the year (qn) is 3.10 l/p/d. The management system area plan includes all RW in the area. The planned service level is 100% of the total population. In the area of garbage housing is managed by the community. Whereas for non-residential areas spread throughout the Surau Gadang area, management will be carried out by a private entity that already exists in the region, namely the Badan Usaha Ikhlas. The management meant here is management up to polling stations.

**Table 3.** Composition of Waste in Administrative Village of Surau Gadang

Description	Composition (%)	Composition (l/d)
Organic Waste		
Food waste	75.14	43110.7
Garbage	6.37	3657.30
Paper	4.43	2543.90
Plastic	8.41	4824.22
Rubber	0.40	229.63
Amount of Organic Waste	94.76	54365.52
Inorganic Waste		
Metal	0.56	319.48
Glass	0.61	349.44
Others	4.07	2336.23
Amount of Inorganic Waste	5.24	3005.15
Total Generation of waste	100	57370.67

Source: [5]

*4.1.1 Operational Technical Plan.* Operational technical plans can be seen in Table 4 below. The source of garbage served is divided into two parts. This division is based on SNI 20-3242-2008. Can be divided as follows:

- Residential / household areas in the form of kitchen waste, yard waste and another household waste.
- Non-residential area
  - Commercial areas in the form of garbage from restaurants, markets and shops / kiosks;
  - Institutional areas in the form of garbage from offices, health centers / *posyandu*, schools and educational institutions as well as mosques and *musholla* (praying room).

**Table 4.** Recapitulation of Operational Technical Aspects Selected Design

Description	Source	
	Residential	Non-residential
Sorting	- At source: Sorting according to type <ol style="list-style-type: none"> <li>a. Organic waste is easy to rot (green).</li> <li>b. Paper and plastic waste (yellow).</li> <li>c. Inorganic &amp; other waste (red)</li> </ol> - At TPST (area): sorted by type of processing.	Based on the type of waste, the container is adjusted to the type of garbage.
Storage	Individually: 10-60 L sacks / plastic bags and plastic / plastic bin covered in volume from 10 to 60 L.	- Individual: 10-60 L sacks / plastic bag, closed plastic bin volume 10-60 L and plastic bin covered 200-400 L - Communal: For market waste, used insulated containers with a cover measuring 6 m <sup>3</sup> .
Collection	Individually indirect by using a motorized trash tricycles with a capacity of 1.5 m <sup>3</sup> .	Individuals do not go directly to the polling station using the pickup truck (owned by the Badan Usaha Ikhlas)
Treatment	- Household scale: Takakura composting - Regional scale (TPST) <ol style="list-style-type: none"> <li>a. Bokashi Method</li> <li>b. Sales of trash worth selling can be recycled and made into handicrafts.</li> </ol>	
Residue	TPS: container 6 m <sup>3</sup> .	

#### 4.1.2 Non-technical Plan

- Institutional / Organizational and Management Aspects. The development plan in this aspect focuses on management and personnel. All officials and field personnel are expected to be from Surau Gadang residents and have representation from all RW.
- Legal and Regulatory Aspects. Law No. 18 of 2008 concerning waste includes material needed in national waste management.
- Financing Aspect. To manage the system, investment costs from the government are needed, while the operational and maintenance costs are obtained from waste levies and the sale of waste processing results from TPST.
- Aspects of Community Participation. Various forms of community participation in Administrative Village of Surau Gadang in managing the expected management include the following:
  - Community participation in the implementation of the planned system;
  - Community participation in the construction or supervision of the construction of processing facilities;
  - Participating in institutions;
  - Participating in financing (payment of levies);
  - Participate in maintaining and cleaning roads and channels
  - Participating in the separation, provision of garbage containers, collection and processing;
  - Community participation in reducing overall waste generation

#### 4.2. Detail Design

Details of community-based system development in Surau Gadang using the 3R method created using predetermined criteria and criteria in general. Detail design cover technical aspects and non-technical aspects (institutional, management, law and regulation). Management ends at TPS (SNI 20-3242-2008). Table 5 Potential in Surau Gadang area, concrete based on the type of waste.

**Table 5.** Potential of Waste in Administrative Village of Surau Gadang

Composition	Percentage (%)	Waste generation (m <sup>3</sup> /d)
Waste generation projection		64.18
Organic		
Food waste	75.14	48.23
Paper	4.43	2.84
Plastic	8.41	5.40
Rubber	0.40	0.26
Yard junk	6.37	4.09
Total Organic	94.76	60.81
Inorganic		
Glass	0.61	0.39
Metal	0.56	0.36
Total Inorganic	1.17	0.75
Others	4.07	2.61

Regional plans in all RW in Surau Gadang area with a service level of 100% of the total population. For non-residential areas scattered in the Surau Gadang area is managed (done) by the Badan Usaha Ikhlas, which already exists there. The total is 22 RW (RW I to RW XXII). The amount of waste served can be seen in Table 6.

**Table 6.** Amount of Waste in Administrative Village of surau gadang

Description	Unit	Amount
Total population	people	20704
Solid waste generation unit	l/p/d	3.10
Solid waste generation	m <sup>3</sup> /d	64.18

4.2.1 *Technical Aspects of Operations.* The Party that is categorized based on the source of waste and the source of waste is classified by type of waste. More details can be seen in the following Tables 7 and 8.

**Table 7.** Waste Management

Description	Classification
Residential	Society
Non-residential	Badan Usaha Ikhlas

Separation and Sorting, through the following stages:

- a. Residential area
  - Community / source of waste separates its waste into 3 types of separation, namely organic waste, plastic, paper, and other inorganic waste;
  - Waste is placed in each container;
  - Separate waste is collected individually not directly to TPST.
- b. Non-residential area
  - Provide garbage containers in each source of waste according to its type;
  - Separate waste is collected individually indirectly;
  - Demolition of garbage from pickups owned by the Business Entity at the nearest polling station.

The storage system is planned to provide 3 different types of containers, i.e.:

- Green containers for wet / decaying organic waste.
- Plastic and paper yellow containers
- Metal, glass, textile, rubber and other red containers.

**Table 8.** Source of Waste

Source	Classification	Type
Residential	Kitchen and yard	Food waste, paper, plastic, metal, glass, rubber, textile, wood leaves, and others.
Non-residential Commercial	Restaurant, market dan shop/kiosk	Food waste, fruit and vegetable skins, paper, plastic, metal, glass, rubber, textiles, etc
Institution	Office, school, public health centre mosque & <i>musholla</i> , others	Food waste, paper, plastic, metal, glass, rubber, textiles, leaves, wood, medical, and others.

The planned storage system can be seen in Table 9. Placement of TPST is planned in RW I (based on consideration of accessibility, land availability and collection costs incurred). Land is land owned by the local government.



**Table 9.** Plan for the Storage Systems

Source	Storage pattern	Type of storage	Placement	Containers	Provided by
Residential	Individual	Varied size plastic bags, plastic baskets (10-60 L), closed plastic bins (10-60 L).	On the front yard or kitchen	4141 unit	Community participation
Non-residential Commercial	Individual	Sacks / plastic bags 10-60 L, plastic bin covered 10-60 L, except for market waste used containers 6 m <sup>3</sup> .	In the shop / kiosk yard, kitchen / restaurant yard, in a strategic place at the market location	276 unit	Community participation and government
Institution	Individual	Varied size sacks / plastic bags, 10-60 L closed plastic bin and 200-240 L closed plastic bin.	The main road or other strategic location	201 unit	Community participation and non-governmental
TPST (residue)	Communal	Container 6 m <sup>3</sup> with lid.	Residue area (TPS)	2 unit	Government or administrator

The pattern of collection from waste sources is done individually indirectly, that is:

- Door to door housing waste is scheduled to start at 06.00 in the morning using 9 units of motorized trash tricycles with a capacity of 1.5 m<sup>3</sup>. The collection gathering is 4 rits per day.
- Non-residential waste will be collected using pickup trucks belonging to the Badan Usaha Ikhlas. The collection path will be planned by the business entity itself. Waste collected will be taken to the polling station.

After knowing the amount of solid waste based on the composition, the waste processing potential of Surau Gadang area is obtained as follows.

**Table 10.** Potential of Waste Management in Administrative Village of Surau Gadang

Type of waste	Weight (kg/d)	Potency	Processed (kg/d)	Residue (kg/d)
Food (TPST)	6405.75	84.01	5381.37	1024.28
Food (Household)	1601.44	84.01	1345.37	256.07
Yard (TPST)	543.05	94.73	514.43	28.62
Yard (Household)	135.76	94.73	128.61	7.15
Plastic	896.20	92.4	830.24	65.96
Paper	472.08	84.20	397.49	74.59
Metal	59.68	87.80	52.40	7.28
Glass	65.00	64.23	41.75	23.25
Rubber	42.63	0.00	0.00	42.63
Others	433.71	0.00	0.00	433.71
Total	10655.29		8691.75	1963.54

The potential level of reduction in the amount of waste that might be achieved is 81.57% with residues to be disposed to TPS as much as 18.43% (11.83 m<sup>3</sup> / d). The transport of residues from polling stations is adjusted to the garbage transportation schedule by DKP, which is carried out

periodically. The type of TPST used is type III TPST (SNI 20-3242-2008). Plans for facilities and infrastructure at the TPST include collection and transportation facilities; can be seen in Table 11.

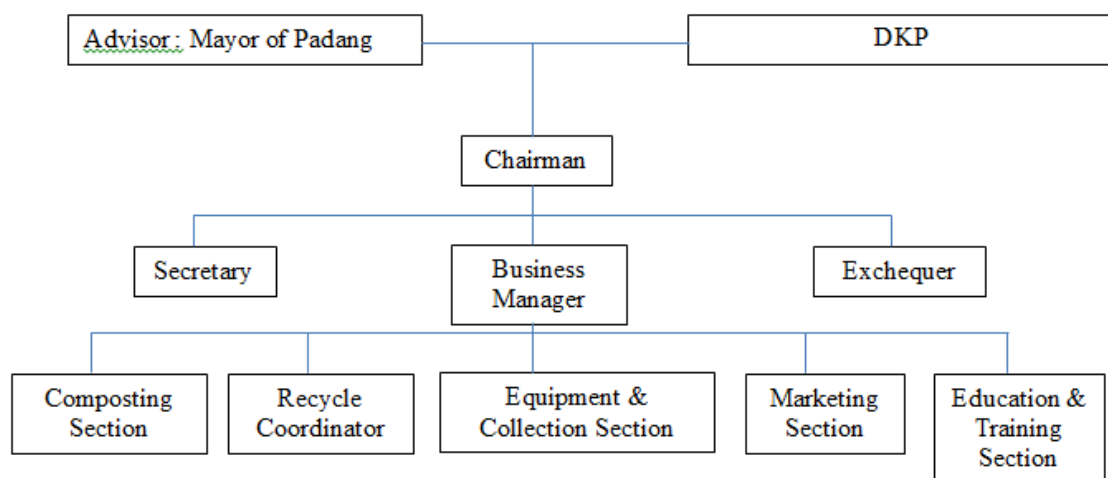
**Table 11.** Plan for Facilities and Infrastructure

Infrastructure	Capacity	Amount
Collector / transporter: motorized insulated trash tricycles	1.5 m <sup>3</sup>	9 unit
a. TPST Land area	480 m <sup>2</sup>	
b. TPST Building area	254.6 m <sup>2</sup>	
c. Organic chopper machine	1500 kg/hour	1 unit
d. Compost sieving machine	2000 kg/hour	1 unit
e. Composter	550 liters	308 unit
f. Residue container/TPS	6 m <sup>3</sup>	2 unit
g. Shovel and hoe		10 /unit
h. Sacks		360 unit
i. Masks and gloves		30/unit
j. Stationery, tables and chairs		1 package

After calculation, the TPST area is 254.6 m<sup>2</sup> which is divided into 9 areas, namely:

- Composting area;
- Compost enumeration and sieving area;
- Sorting area;
- Office and toilet;
- Warehouse equipment and garage motorized trash tricycles;
- Warehouse resulting from compost processing;
- Warehouse as a result of processing inorganic waste;
- Storage area for residue.

4.2.2 *Non-Technical Aspects.* The area's waste management agency is proposed to have a Work Letter (SK) from the Administrative Village of Surau Gadang officials or the regional government to have clearer laws. Plans for increasing community participation are carried out in stages (for 1 year). The form of the managerial organization structure can be seen in Figure 2 below.



**Figure 2.** Organizational Structure Planning

Legal aspects and very necessary, with the existence of various regulations will result in the implementation of the system having clear and firm boundaries. Regulations need to be implemented

by all parties so that waste management activities can run as optimally as possible. Law No. 18 of 2018 concerning waste includes material needed in national waste management.

Investment costs are expected to come from financing for the implementation of the 3R waste management program from provincial service. The types of investment costs required are as follows:

- Procurement of land and procurement of buildings intended for TPST and facilities as well as procurement of equipment.
- Procurement of operational facilities which include communal refinement, collection and transportation (motorized trash tricycles) and facilities for processing.
- Operational and maintenance costs are carried out independently. Funds are obtained from sales of processing and withdrawal fees by the city government. This fee is grouped into:
  - Labour costs / employee wages (basic salary, allowances and work clothes);
  - The cost of fuel and oil;
  - Maintenance costs for equipment, such as motorized trash tricycles, chopper machines and so on.

Community participation is very necessary in supporting the waste management system. Type of role has been described previously. The program for raising awareness and education is designed to increase public understanding and awareness of waste management. One method is to conduct education and training. Training is a process of debriefing the choice of technology used, a means of socialization and advocacy of citizens' concerns about the program. Submission of material can work with community organizations such as PKK (organization for family welfare development), Youth Organization, community leaders, universities and the school. Training material is general and technical in nature. Other efforts are also carried out, such as:

- Carry out a campaign to reduce and recycle waste;
- Distribution of media kits (brochures, leaflets, posters, guides / banners);
- The process of socialization can be through social gathering forums, community meetings, holding related competitions, and other activities.

#### *4.3. Technical Specifications*

Provision of needed equipment needs to be planned because it deals with operational and maintenance costs. In the selection and determination of the equipment used it is adjusted to the needs of technical and economic aspects. The types of equipment and supporting facilities proposed include:

- Sacks and plastic bags are used sacks and plastic bags made of 10-60 liters of polystyrene.
- Waste basket is a three-color basket made of plastic, with a size of 10-60 liters. In the use of parts in baskets coated with used plastic.
- Plastic bin used is a bin covered with three colors, made of plastic fiberglass, with a size of 10-60liter and 200-240 liters.
- The container used is made of metal, with an insulation size of 6 m<sup>3</sup>.
- The motorized trash tricycles used are made of iron with a size of 1.5 m<sup>3</sup>, with insulation. Trash tricycles are equipped with mechanical levers.
- Takakura composter with a capacity of 60 liters for household scale needs.
- Composter 550 liters for regional scale in TPST.
- Organic waste counting machine with a capacity of 1500 kg / hour. Fuel needs 1.47 liters / day and operates for 3.93 hours.
- Compost sieving machine with a capacity of 2000 kg / hour, the required fuel is 0.37 liters with usage for 0.98 hours / day.
- TPST has an area of 254.6 m<sup>2</sup> intended for composting areas; enumeration and sieving; sorting area; office and toilet; equipment warehouse and motorized trash tricycles, compost processing warehouse; warehouse for processing inorganic waste; and the area for residue. The building is built using river stone foundation, zinc roof, light steel frame and walls.

#### 4.4. Budget Plan

The budget plan includes the calculation of the cost of implementing a waste management system. Determination of the amount of the budget plan is based on the performance unit. The cost component consists of investment costs, operational and maintenance costs and administrative and operational personnel costs.

- Calculation of investment costs includes the cost of building TPST worth Rp. 744,000,000 and the purchase of machinery and equipment worth Rp. 578,000,000. The machines needed are organic counting machines, compost sieving machines, and motorized trash tricycles. The equipment needed by composter, container, shovel, hoe, mask, and other supporting equipment.
- Operational costs include costs for labor, material and fuel costs. Costs that will be needed are as much as Rp. 311,716,799.
- Maintenance costs consist of maintenance costs for TPST, machinery and collecting equipment, composter, and maintenance of containers. The costs to be incurred are Rp. 8,420,000.
- Total expenditure is the sum of operational costs and maintenance, amounting to Rp. 26,678,066 / month.
- Analysis of unit costs with the amount of processed waste 9.18 tons / day is 95.30 / kg.
- The estimated source of income comes from levies drawn by the government and sales of waste processing results. The income from retribution withdrawal is Rp. 10,352,000 / month and from processing and selling sellable waste for Rp. 118,443,350 / month.
- Then the estimated profit earned per month is Rp. 102,117,284.
- Break-even point is obtained in the second month of operation.

#### 5. Discussion

Until now, waste management with the 3 R concept is an alternative effort for waste management in settlements. With the integration among the community, the government and the private sector are expected to manage waste with this paradigm. It can run more effectively and efficiently. Considering that until now there are still limitations on the part of the government (management) in covering all service areas, as well as the increase in waste generation which is increasing, resulting in increasingly limited capacity in the landfill.

With the existence of waste management with a new paradigm, it is hoped that it can provide a win-win solution for all three parties; community, government and private parties in this area. The community can be more independent in managing their waste, and can generate financial benefits from the processing of waste. Public awareness is also expected to increase with the extension and availability of facilities. With the availability of TPST it is also a place for the community to channel creativity, establish ties and enhance the spirit of mutual cooperation. Government burden is also helped, with the smaller service area and the amount of waste that must be transported to the landfill, with other benefits of operational costs and landfill investment can be minimized. The private sector in this area also participated in the transportation of waste to polling stations. Counseling and increasing public awareness must always be improved, so that the waste management using the 3R method becomes a lifestyle and something that cannot be separated in daily life, and does not prioritize mere financial benefits. The government also constantly monitors the sustainability of TPST operations by providing training, allocating funds, and providing needed assistance.

Based on the results of the questionnaire, it was also found that the community wanted to participate and play an active role in waste management with the 3R method, only a small proportion of the people who submitted their objections. This is due to the unavailability of facilities, and a minimal understanding of waste management using the 3R and community-based methods. It is hoped that with the prioritization of the Surau Gadang urban village to become one of the regions that applies the regional scale waste management system, the attention and support from the community and the government can be more significant.

## 6. Conclusions

Based on the planning carried out, the following conclusions are obtained:

- a. The community-based solid waste management system in Surau Gadang is planned to use the 3R method with a design period of 8 years. Where the number of underserved populations at the end of the design period (2018) is 20,704 people.
- b. Management starts from the source. In disaggregated garbage housing areas are collected door to door by using motorized trash tricycles to TPST. The processing carried out at the source is composting with the Takakura method (high income housing), while the processing carried out at TPST is composting with the method of Bokhasi and sorting of other wastes for sale, recycling and making skills. Residue from the remaining processing that will be disposed of to TPST is 18.43%. Management is carried out by the community. Whereas in the non-residential area, disaggregated waste will be collected towards the TPS by Badan Usaha Ikhlas.
- c. Financing consists of investment costs and maintenance operations. Investment comes from the government while financing for operations and maintenance comes from waste retribution from the community and the benefits of processing waste at TPST. The cost of waste management in this area includes an investment fee of Rp. 1,322,000,000 operational and maintenance costs of Rp. 26,678,066 / month and the estimated profit from this waste management is Rp. 102,117,284 / month.
- d. Community participation can be seen from the involvement of citizens, namely participating in the construction or supervision of the construction of the TPST, participating in TPST institutions and personnel, separating and sorting waste at the source and processing, paying waste retribution, engaging in processing at TPST, maintaining cleaning of roads and channels, and participating in socialization and training.

## References

- [1] N. Artiningsih, "Community Participation in Household Waste Management," Semarang, 2008.
- [2] Environmental Service Program, "Community Based Waste Management Training Module. Development Alternatives, Inc. for USAID, "Medan, Bandung, Subang and Surabaya, 2006.
- [3] Department of Public Works, "Procedures for Waste Management in Settlements, SK-SNI-3242-2008," Jakarta, 2006.
- [4] E. Damanhuri, "Final Disposal Technique," Bandung: ITB, 2004
- [5] S. Alhusna, "The Generation Unit, Composition and Potential for Domestic Waste Recycling in Padang City," Padang: Andalas University, 2009.