



Analysis of Waste Management and Community Participation in the Organization of Residential Area in Supporting Facilities

Suci Istiqah¹, Yuanita FD Sidabutar¹, Selli Dosriani Sitopu²

¹Regional Planning Master's Study Program, Batam University

²Undergraduate Nursing Study Program, Darma Agung University

*Corresponding Author: Suci Istiqah

E-mail: 102622006@univbatam.ac.id



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Abstract

Waste problems often occur, especially in Batam City, because the increase in population has an impact on increasing the amount of waste. Waste processing is a very important service and needs to be provided by the government. A waste processing pattern that involves community participation is the right decision. The implementation of community participation in Belian Village is still not implemented well. Thus, with the current problems it is interesting to carry out a study with the aim of examining waste management factors and community participation in the arrangement of residential areas in Balian Village, Batam City. Data collection techniques include interviews, questionnaires, observation and documentation. Sampling was carried out using the Random sampling method by taking samples at random. Based on the results of the research conducted, it can be concluded that waste processing in Belian Village starting from the stage of containerization, waste collection, waste sorting, waste processing, waste transportation and final waste disposal process is not optimal because waste sorting has not been carried out, while the role and participation of the community in Belian Village which is still lacking because there are still people who throw rubbish on the roadside or sidewalk. Forms of community participation in waste processing in the Belian sub-district are in the form of physical participation and money which are still lacking due to lack of initiative and community awareness in doing small things such as mutual cooperation.

Introduction

Development has a significant impact on various aspects of people's lives, both positively and negatively. One important aspect that needs to be considered is the impact on the environment. Development can improve the quality of human life through providing infrastructure, employment opportunities and economic progress, but it can also cause environmental pollution and damage (Khan et al., 2020). Environmental pollution can come from various sources, including industrial waste and domestic waste. Industrial waste contains dangerous chemicals that can pollute air, water and soil. Meanwhile, domestic waste such as household waste and agricultural waste can also become a source of pollution if not managed properly. To overcome this problem, comprehensive and integrated action is needed. This includes the application of environmentally friendly technology in industrial production processes, effective waste management, strict enforcement of environmental regulations, and public awareness of the importance of protecting the environment (Tian et al., 2020).

Waste is an inseparable part of human daily activities. Hidayat (2020) defines waste as substances or objects that are no longer used, whether in the form of discarded materials originating from households or as waste from industrial processes. Rahmadani (2020) gives

the characteristics of waste as waste material, both materials that are no longer used or materials that have been taken for the main part, from a socio-economic perspective they no longer have a price, from an environmental perspective they are waste materials that are useless and abundant. cause pollution problems and disruption to environmental sustainability.

Waste processing, especially in Batam City, is a very important service requirement and needs to be provided by the government. Because the simultaneous increase in relatively large population with high density will result in large waste generation and must be addressed properly for cleanliness and the environment.

The government's role in waste management can be carried out at the city scale and environmental scale, according to SNI 19-2454-2002 concerning Technical Procedures for Urban Waste Management, government services in waste management are related to the flow of waste handling, namely collection, transfer, management and transportation. At each stage of waste handling, the government is tasked with providing services and facilities until the waste reaches the landfill or is processed as a form of waste reduction and utilization, collecting household waste in each house to be transferred to the TPS (Aulia et al., 2021).

The waste problem is indeed a frightening thing for Batam City, in fact the Batam City Environmental Service often gets questions about the government's performance in managing waste in Batam City. Inadequate and neglected waste handling can be seen from the increasing number of piles of rubbish which cause unpleasant odors and even more piles to the point where they eat up the road (Zubir, 2023).

In the BatamToday.com quote "Batam City Village Head of Belian Invites Residents to implement the waste regulation" the head of Belian Village, Batam City District, invites all levels of society to dispose of waste in its place so that cleanliness and beauty can be achieved as expected so far, because currently there is still a lack of awareness community regarding cleanliness, there are still many people who throw rubbish not in the bin containers that have been prepared by the Batam City DKP.

The waste problem that often occurs in Batam City, especially in Belian Village, is currently still an obstacle that must be overcome. Vacant land and roads are used by the community as rubbish dumping locations (Wartono et al., 2023).

Table 1. Amount of waste and population data in Belian Village

Year	Number of residents (people)	Waste (m3/day)
2019	68,999	34,488
2020	71,484	35,742
2021	85,714	42,857
2022	81,344	40,672

Source: Batam City Environmental Service, 2023

Based on the table above, as the population increases every year, the volume of waste generation tends to increase. As the population increases, people's consumption patterns and consumer lifestyles change and of course this will have an impact on the volume of waste. This requires public awareness. To solve this waste problem, the alternative can be done with a community participation approach.

Theoretical Review

Garbage is all types of waste in solid form originating from the remains of human and animal activities which are discarded because they are not useful or their presence is undesirable. Garbage is also often called waste as found in Government Regulation Number 85 of 1999 concerning the management of hazardous and toxic waste which is defined as residue from an activity and production process (PP No. 85, 1999).

There is Law Number 18 of 2008 concerning waste management which explains that waste is the remains of daily human activities and natural processes in solid form (Law No. 18, 2008). Government Regulation Number 81 of 2012 explains that there are several types of waste, namely household waste and household-type waste. Household waste is waste that comes from daily activities in the household which does not include feces and specific waste. Household-type waste is household waste originating from commercial areas, industrial areas, special areas, social facilities, public facilities and other facilities (PP No. 81, 2012)

Waste is solid waste and is considered no longer useful and must be managed so as not to endanger the environment and protect development investments (SNI 19-2454-2002), and also if waste is not managed then waste can cause several general problems, namely: (1) It becomes a nesting place for various diseases as a result of the accumulation of rubbish and through flies, cats, rats and dogs, it can spread disease to the community, creating an unsightly aesthetic. (2) Gives off a bad smell due to rotting organic waste and dust which can cause disease. (3) Resulting in groundwater pollution due to seepage of leachate produced and the fermentation process of waste tends to cause blockages and sediment if it enters water bodies, which causes the water to become dirty and can cause flooding in the rainy season.

Operational Techniques for Residential Waste Management

Operational techniques for residential waste management include the basics of planning for activities; (a) Garbage container; (b) Garbage collection; (c) Waste transfer; (d) Garbage transport; (e) Waste management and recycling; (f) Waste water disposal

The following is a waste management operational flow chart below :

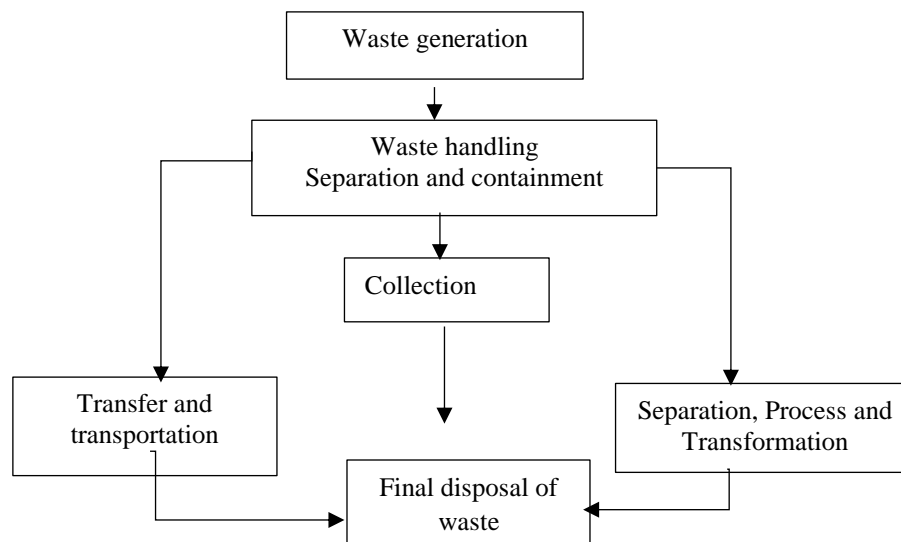


Figure 1. Flow section of waste management operational techniques

Source: (dan Padmi, 2004)

The following is an explanation of operational technical aspects:

Waste Container

Waste storage activities are temporary waste storage activities carried out by the community themselves. The initial process in waste collection is directly related to the source of the waste, namely storage. Waste collection is a method of storing waste before it is collected, moved, transported and disposed of at the landfill. The aim is to avoid scattering waste so that it does not disturb the environment (SNI 19-2454-2002). The container materials required according to Indonesian National Standards are not easily damaged, economical, easy to obtain and make by the public and easy to empty.

Meanwhile, according to Syafrudin (2001), the requirements for container materials are durable and waterproof, easy to repair, light and easy to lift, as well as economical, easy to obtain or make by the community.

Garbage Collection

Waste collection is the method or process of collecting waste starting from the shelter/container to the temporary disposal site. Waste collection patterns are basically grouped into 2 (Two), namely: individual patterns and communal patterns (SNI 19-2454-2002) as follows:

Individual Pattern

The waste collection process starts from the waste source and then transported to a temporary disposal site (TPS) before being disposed of at the landfill.

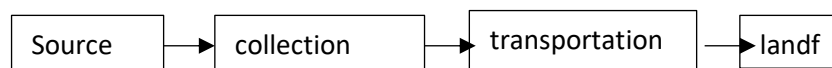


Figure 2. Indirect Individual Waste Collection Pattern

Source: SNI 19-2454-2002

Communal Pattern

Waste collection is carried out by waste producers to the communal waste collection sites that have been provided or to waste trucks that handle the collection points and then transported to the landfill without a transfer process.

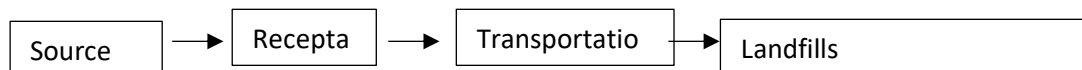


Figure 3. Communal Waste Collection Pattern

Source: SNI 19-2454-2002

Transfer

The process of transferring waste is moving the collected waste into transportation equipment to be taken to the final disposal site. A place used for moving waste equipped with a transport container (SNI 19-2454-2002)

Garbage transport

Waste transportation is the activity of transporting waste that has been collected in temporary storage areas or from waste sources to final disposal sites. The success or failure of waste handling also depends on the transportation system implemented. The ideal waste transportation is with certain container trucks equipped with pressing equipment (SNI 19-2454-2002)

Final Waste Disposal

Final Waste Disposal Site (TPA) is a physical facility for final waste disposal activities. A place to get rid of rubbish so it is safe (SK SNI T-11-1991-03).

Final disposal is a place provided to dispose of waste from all waste transportation for further processing. The principle of final disposal is to destroy domestic waste at a final disposal location. So the final disposal site is a place for processing waste. According to SNI 19-2454-2002 concerning operational techniques for urban waste management, in general waste processing technology is divided into 3 (three) methods, namely: Open Dumping, Sanitary Landfill, Controlled Landfill.

Open Dumping

This dumping method is a waste processing system by simply throwing/piling up waste in one place without any special treatment or correct processing system, so that the open dumping system causes environmental pollution problems.

Sanitary Landfill

The final waste disposal method is carried out by landfilling and compacting the waste, then covering it with soil as a covering layer. Overburden coating work is carried out every day at the end of operating hours.

Controlled Landfill

The controlled landfill method is an improved open dumping system, namely an open dumping and sanitary landfill diversion system, namely by covering the waste with a layer of soil which is carried out after the landfill is full and compacted or after reaching a certain period.

The factors that influence the urban waste management system are (SNI 19-2454-2002); (1) Population density and distribution; (2) Physical, biological and socio-economic environmental characteristics; (3) Waste generation and characteristics; (4) Cultural attitudes and behavior of society; (5) Distance from the waste source to the final waste disposal site; (6) City spatial and development plans; (7) Waste collection, management and final disposal facilities; (8) Available fees; (9) Local regional regulations

Society participation

Community participation is where the community participates in participating in every activity related to planning, implementation and monitoring carried out by the government which provides policies that will influence daily life. Take part for the welfare of society and for the people at large.

The role of the government or community leaders is related to the socialization and dissemination of information regarding waste processing. This socialization will provide understanding to the public that waste processing should be carried out by each individual so that waste problems can be resolved starting from the roots, namely the source of waste income. Apart from that, the role of the government or community leaders is also related to monitoring waste management actions at the household level. The role of local government has a strong relationship with waste management. Apart from that, community leaders also play a role in providing information and motivation in waste management (Yuliasuti et al., 2013; Hasibuan, 2019).

Community participation in waste management is the community's willingness to help the success of the waste management development program according to each person's abilities without sacrificing their own interests.

Without community participation, all planned waste management programs will be in vain. One of the community's approaches to help government programs succeed is to familiarize the community with behavior that is in accordance with the waste program, namely changing the community's perception of orderly, smooth and even waste management, changing people's habits regarding poor waste management and social factors, local structure and culture (Martinawati et al., 2016).

According to Hadi (1995) in terms of quality, community participation or participation is important as: (1) Input or input in the context of decision/policy making; (2) Strategy to gain support from the community so that credibility in making a decision will be better

Communication that the government has a responsibility to accommodate the opinions, aspirations and concerns of the community.

Methods

Research sites

This research took place in Belian Village, Batam Kota District, Batam City with the consideration that it is one of the Villages with a high population and there are still many waste problems that have not been resolved wisely, such as the lack of public awareness of waste disposal and community participation in waste management. not enough. The following is picture 4. Location of Belian Village.

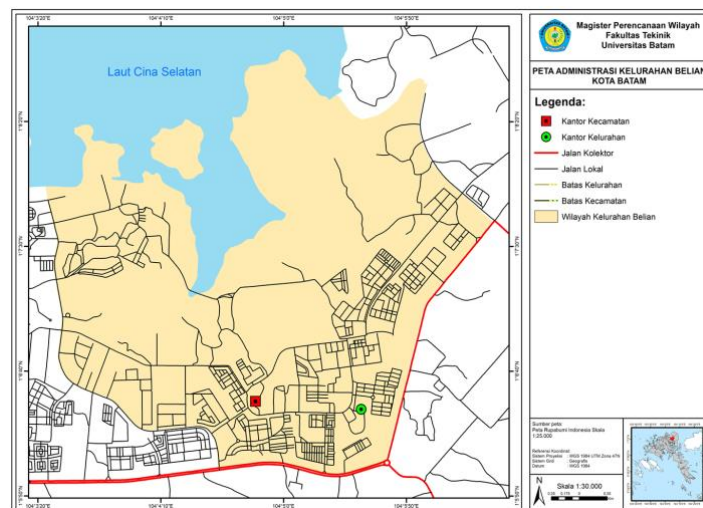


Figure 4. Location of Belian Village, Batam City District

Source: Google earth, 2023

Research Methodology Approach

The approach method used in this research is a descriptive qualitative approach, namely to determine conditions and describe the reality in the field. Data collection techniques to obtain primary data are carried out using activities in the form of questionnaires, field observations and image documentation.

A questionnaire was conducted to obtain data regarding the forms, levels and factors that influence community participation. Field observations to obtain direct information regarding the characteristics of community participation and influencing factors. Image documentation is carried out to describe conditions that occur in the field.

Results and Discussion

Policies in Waste Processing

To improve public services in waste management, the Batam city government created a policy. In order to further overcome the waste problem in Batam City, refer to Regional Regulation Number 11 of 2013 concerning waste processing. The government plans to process waste by third parties in accordance with what is stated in regional regulation Number 11 of 2013 concerning "waste processing", which explains "the government will reuse, reduce and recycle". This needs to be done because Batam City is an archipelago. The waste problem needs to be addressed directly and quickly by the government, which will have a negative impact on Batam City itself due to the limited land available (Syahputra, 2021).

Batam City Regional Regulation Number 11 of 2013 concerning Waste Processing article 10 paragraph (1) every house must provide waste storage in front of the residential building or place of business which is differentiated based on the type or nature of waste, namely organic waste and non-organic waste.

Batam City Regional Regulation No. 11 of 2013 concerning Waste Processing article 64 prohibits anyone from throwing rubbish carelessly on the streets, parks or public places, into rivers, ponds and drainage. If found violating the provisions, criminal sanctions will be imposed in the form of a fine of Rp. 2,500,000 (Two Million Five Hundred Thousand Rupiah) (Sulistiyorini et al., 2015).

With the Regional Regulations that have been made by the Batam City government, there are still those who do not follow the existing regulations. Based on observations in Belian Village, illegal waste dumping was identified on the road network, road medians and on sidewalks. This of course also reduces the comfort and aesthetic value of the environment.

Source: Observation results in Belian Village, 2023

This illegal dumping of waste by the community is due to the lack of waste storage facilities in the form of rubbish bins or temporary shelters (TPS) and the absence of supervision by the sub-district and waste management UPT in the sub-district. The following is Figure 3. Map of the distribution of illegal waste dumping locations.

The following needs to be implemented: (1) The government carries out implementation outreach to voice the household waste management program, so that household waste management becomes a community activity. In this case the government can work together with stakeholder; (2) Together with stakeholders, form a management organization and work program; (3) The government facilitates implementation outreach activities carried out by managers, in this case managers can collaborate with stakeholders; (4) Together with stakeholders, managers provide direction to the community so that they are able and able to manage waste properly; (5) The community sorts waste at the source level and in accordance with the mechanism determined by the management; (6) Communities need to compost organic waste that comes from households, and sort inorganic waste to make useful items.

Implementing policies is not just about providing information to the public openly, but the government needs to supervise the implementation of policies. The low level of implementation of waste management policies in Belian Subdistrict has resulted in suboptimal results in waste management. The government as a policy implementer needs to provide information that is easily accepted by the public so that the public understands and participates in every policy issued (Sidabutar Yuanita, 2021).

The institutions that play a role in waste management in Batam City are generally the city government, private sector and the people of Batam City itself. These institutions have their respective interests and functions in waste management in Batam City.

Batam City government institutions that play a role in waste management include Bapelitbangda, Environmental Service, BPKAD, SATPOL PP and District. A form of private participation in community participation in waste management is by participating in paying cleaning fees. Apart from that, there are other forms of participation, such as community involvement in integrated waste management or waste banks. This integrated waste management is referred to as a waste bank, namely the activity of saving waste according to the type of waste. This integrated waste management is already running in several areas in Batam City, namely 2 TPS 3R locations, 158 waste bank locations.

Laws and regulations governing the implementation of waste management systems are very necessary for the implementation of supporting aspects, namely operational technical aspects, financing, institutions and the participation of the public and private sector. Existing regulations in Batam City related to waste management currently include: (1) Batam City Regional Regulation Number 3 of 2021 concerning Batam City Regional Spatial Planning for 2021-2041; (2) Batam City Regional Regulation Number 11 of 2013 concerning Waste Management; (3) Batam City Regional Regulation Number 11 of 2011 concerning Retribution for Waste and Cleaning Services; (4) Batam City Mayor Regulation Number 36 of 2012 concerning Guidelines for Implementing Batam City Regional Regulation Number 11 of 2011 concerning Waste/Cleaning Service Levy; (5) Mayor Regulation Number 5 of 2023 concerning Amendments to Batam City Mayor Regulation Number 10 of 2019 concerning Regional Policies and Strategies in the management of household waste and similar household waste; (6) Decree of the Mayor of Batam Number: KPTS 283/HK/XII/2016 concerning the delegation of authority to handle waste/cleaning to the sub-district head in Batam City.

The Relationship between Waste Management and Community Participation Waste Management in Belian Village, Batam City

A waste container is a place to temporarily store waste at a waste source. Meanwhile, waste containerization is a method of storing waste temporarily at the source, both individually and communally. The aim of the container itself is to avoid scattering of waste so that it does not have a negative impact on health and the environment and to make the waste collection process easier for officers when collecting waste. Containment is described based on the types of waste bins that are generally used on a domestic scale, such as cement, plastic, rattan and plastic or plastic bags. Good containers have lids and are easy to empty or clean (SNI 19-2454-2002). Based on observations in Belian Village, most people use plastic barrels without lids and are available in every house.

Meanwhile, for storage in shops or stalls, plastic bags or plastic bags are still used, these containers are placed in front of shops or stalls, while for traditional markets they use communal containers made from permanent walls or rattan baskets.

The role and participation of the community in waste containerization in Belian Village still tends to be lacking. Based on observations in the field, this shows that the waste in the waste containers is not sorted first, which waste can be reprocessed and which waste cannot be processed, so that the waste is put it in one container (Yuliana & Haswindy, 2017). The following is Table 2 Types of waste containers in Belian Village.

Table 2. Types of Waste Containers in Belian Village

No	Type of Container
1	Plastic barrel container
2	Plastic Crackle
3	Basket Container
4	Iron Basket
5	Cement Tub Container

Source: Observation results, in Belian Village

Waste Collection and Transport

Waste collection is the process of handling waste by collecting it from each waste source to be transported to a temporary shelter or directly to the Final Processing Site (TPA) without going through a transfer process (SNI 3242-2008). Based on observations in Belian Village, waste collection from households is carried out by officers who visit each house to pick up rubbish that has been placed in plastic or plastic bins. Officers collect rubbish using compactor, armroll, dump trucks and pickup vehicles. Garbage collection is carried out 3x a week. Where community participation in waste collection in Belian Village is still very lacking, because there are still many people collecting waste on the side of the road or on roads that are not used as waste disposal sites. This happens because people do not want to pay the monthly waste fees. Community participation in waste collection requires a monthly payment of around Rp. 10,000 – Rp. 60,000 for this waste transportation is carried out by the Batam City Environmental Service. The following is Figure 7. Garbage collection in Belian Village.

Meanwhile, the waste produced by markets, schools and industry is collected at a temporary disposal site (TPS) and then transported by cleaning staff using dump trucks to the final disposal site (TPA). The following is Figure 8. a map of locations that have Temporary Disposal Sites (TPS) in Belian Village.

Waste Processing

The processing in question is reducing waste that will be thrown into the landfill, the role and participation of the community in Belian Village in processing is still lacking, where the waste processing carried out in Belian Village is in the form of recycling waste that can still be used, this recycled waste is in the form of plastic bottles, plastic - Only some groups of people do this from household plastic. Meanwhile, PKK women and the Environmental Service invited people in Belian Village to plant plants in their respective environments by using used goods using the hydroponic method.

This waste processing cannot be separated from the active role of scavengers in collecting rubbish that can be recycled or reused, this is usually done individually where people look for side jobs such as looking for and collecting plastic bottles and used goods that cannot be used. which is then sold to scrap traders. In the Belian sub-district, waste reduction has been carried out in the form of a waste bank. The number of waste banks in Belian Village is 16 units spread out. The following is table 3. Location of waste reduction facilities in Belian Village.

Table 3. Waste Reduction Location in Belian Village

Location	Reduction activities	Amount of incoming waste (tons/day)	Amount of waste processed into raw materials/compost (tons/day)
KDA Corporation	Postposting/Recycling	0.5	0.5

Taman Raya Housing Phase II RW 011	Postposting/Recycling	0.5	0.5
Mediterranean Housing	Postposting/Recycling	0.5	0.5
Thp IV Taman Raya Housing Complex	Postposting/Recycling	0.5	0.5
Mas Airport Corporation Blok D	Postposting/Recycling	0.5	0.5
Perum Taman Raya Phase 3	Postposting/Recycling	0.5	0.5
Corporation. KPRI Sekawanda	Postposting/Recycling	0.5	0.5
Corporation. Sandalwood Block F12, No. 1	Postposting/Recycling	0.5	0.5
Corporation. KDA, Jl Gelatik Raya	Postposting/Recycling	0.5	0.5
Corporation. Thp 1 Rw 07 Botanical Park	Postposting/Recycling	0.5	0.5
Corporation. Batara Raya RW 03	Postposting/Recycling	0.5	0.5
Corporation. Raya Hill	Postposting/Recycling	0.5	0.5
Corporation. Buana Vista	Postposting/Recycling	0.5	0.5
Beautiful Pesona Villa RT 03/RW 02	Postposting/Recycling	0.5	0.5
Perum Bida Asri 2 Rt 01/Rw 17 Re Block F	Postage/Cycling	0.5	0.5
Corporation. KDA (Jl. Nuri2)	Postage/Cycling	0.5	0.5

Source: SKK Instruments, 2023

Landfill

The waste disposal process is carried out after the waste has been collected from people's homes and temporary shelters and then the waste is transported to the final disposal site. Where is the final waste disposal location located at Punggur Lake in Kabil Village, Nongsa District. Telaga Punggur TPA is a place for collecting waste throughout Batam City, including household waste, industrial waste and medical waste. The effective landfill area at the Punggur landfill is 48.8 Ha, while the effective landfill area in use is 20 Ha, with the system used being a controlled landfill, namely by covering the waste with a layer of soil which is carried out after the landfill is full and compacted or after reaching a certain period. The total waste stored in the landfill is 853.8 tonnes/day.

The people of Belian Village participate in collecting rubbish, both household rubbish from their own homes and rubbish strewn in front of their yards. Usually the community holds mutual cooperation to clean and collect the strewn rubbish. Some residents of Belian Village have expertise or skills in processing waste that can be recycled. The people of Belian Village routinely pay cleaning fees where each household pays Rp. 20,000- Rp. 60,000, this payment is the obligation of each household, apart from paying cleaning fees, the Belian Village community also contributes money in the context of mutual cooperation activities.

Conclusion

Implementing policies is not just about providing information to the public openly, but the government needs to supervise the implementation of policies. The low level of implementation of waste management policies in Belian Subdistrict has resulted in suboptimal results in waste management: (a) In waste processing, such as waste containers in every house,

waste collection has been carried out by the community and then transported by waste cleaning officers, waste sorting has not been carried out by the community because they still mix all types of waste into waste containers, waste processing is only Most of the people who do this are picked up by scavengers, the final process is that the rubbish that has been collected will be taken to the Telaga Punggur final disposal site (TPA); (b) The form of community participation is based on the results of the analysis in Belian Village, which in the form of energy, expertise and money is still lacking.

Based on the results of this research, the author can provide suggestions to relevant government agencies such as the Batam City Environmental Service, hoping to play a more active role in increasing community participation in the form of programs regarding waste management such as holding outreach to the community, mutual cooperation counseling to the community.

Suggestions for the people of Belian Subdistrict are that they are expected to be more concerned and play an active role in handling waste and knowledge about environmental cleanliness rules by not throwing rubbish carelessly or on the side of the road and being more concerned about the surrounding environment.

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