WASTE MANAGEMENT BASED ON PARTICIPATORY AND LOCALITY IN TAMBI VILLAGE, WONOSOBO

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Abstract *- This article aims to explain and detail the problems in waste management in Tambi Village, Wonosobo. Four fundamental issues in waste management are minimal public awareness about waste, lack of support from the village government in dealing with waste, the absence of final disposal sites, and the absence of management of both organic and non-organic waste. The offer of this waste management program is waste management based on active community involvement on a local scale. The purpose of this program is to be able to make a comprehensive study of what has been done in waste management and the obstacles that accompany it. So, this study contains the offer of solutions based on the experience of failure in waste management. The solutions offered include: making a Waste Bank, Making Maggots from organic waste, and making various crafts from non-organic waste. This study is intended to be an amplifier in Musrembang (Development Planning Conference). So that, it becomes one of the village's priority programs. Finally, people can respond to problems in their environment sustainably.*

Keywords*: Waste Management, Community Independence*

1. INTRODUCTION

Garbage is a problem that has become a concern for the community in various areas, especially in Tambi Village. Garbage that accumulates and cannot be adequately managed will harm health and the environment (Sutanto et al., 2021; Yuniarti & Anggraeni, 2018). It needs to be a concern that waste management is considered urgent to be handled in Tambi Village. Moreover, Tambi Village does not have a waste management site, resulting in the polarization of waste in various corners of the village.

The government has an obligation to the waste management program, a macro problem in the community (Fitri et al., 2019; Kalempouw & Kalempouw, 2021). Several mechanisms in the waste management process have received particular attention. However, this often stops in the middle for various reasons. Village government support is considered necessary in waste management. The role of the village government as a policyholder is responsible for existing problems, including waste management. It can be done by making it a village priority program.

In addition, public awareness in managing waste is critical (Armadi, 2021; Oerbawati et al., 2021). Public awareness about waste management needs to be increased, considering that the community is the leading producer of waste. So that people should be able to manage the waste they produce. However, public awareness does not necessarily stand alone. This awareness also needs to be supported by facilities and infrastructure such as socialization, Final Disposal Sites, mechanisms, and systems in Tambi Village. It is vital to provide to increase public awareness of waste management to be more effective.

So that with the various problems above, it is necessary to overcome the waste management crisis in Tambi village. The study from this field analysis aims to offer solutions to waste management problems on a local scale. It is hoped that this study can be a reference in realizing the waste management program in Tambi village.

Several studies on waste management have been carried out quite a lot, considering that the problem of waste is an issue that humans feel quite a lot. Marlena et al. emphasized that facilities and infrastructure are essential in waste management (Marlena et al., 2020). Her article entitled 'Evaluation of the Asset Performance of the Integrated Waste Processing Site (TPST) in Sidoarjo Regency' emphasizes that the performance of the Waste Processing Site does not run well without adequate facilities. It is the same as the reality that happened in Tambi Village. The operation of the final disposal site in Tambi Village has stopped due to the lack of equipment to process it.

Another research entitled 'Optimizing activity by Kanji Bersinar Waste Bank based on community' has an outstanding program in waste management through maximizing Waste Bank programs such as making waste recording applications and providing seeds (Maimunah et al., 2020). However, this program requires significant funds, especially application development. In addition, the provision of seeds for

farming communities has slight effectiveness considering that farmers already have seeds for their economic activities before the waste bank program.

The study entitled 'Increasing Public Awareness to Maintain Environmental Cleanliness by Disposing of Garbage in its Place and Methods of Waste Management' by Puriana et al. This research focuses on increasing public awareness in waste management, starting from actively disposing of waste in its place to utilizing waste (Puriana et al., 2021). This study is one way to address the waste problem. However, this waste study must follow the history of waste management in the local area, the potential and challenges of which are undoubtedly diverse. The study suggests further research to be more detailed in describing traditional and modern waste management on organic and non-organic waste. In addition, socialization in the context of increasing environmental awareness needs to be carried out continuously.

The research studies above show that waste management requires a long process and the support of various parties. Waste management needs to look at aspects of locality and the social conditions of the local community. It may be an excellent thing, but it is not suitable for application in other areas because each location has its problems, obstacles, and challenges. So, the research in this paper wants to look at the waste problem in Tambi Village, Kejajar District, Wonosobo Regency with the accompanying locality issues.

2. METHOD

This study uses an exploratory qualitative method to examine further the management program that has been carried out, then analyzed to produce a new waste management design based on existing locality values. This research begins with making observations in Tambi Village to determine the existing social problems. From the results of observations, it appears that the main problem of the community is regarding the issue of waste. The problem of waste has become a chronic problem faced by the community.

The results of the observations were further developed using an open interview technique to figures, elites, and the general public. The interview results found that waste management has been carried out by the community and the village government but stopped for various reasons. The results of this interview are then reduced to determine points related to waste management, such as the programs that have been carried out, the obstacle factors, and the solutions offered. The observation results were then discussed with several leaders, elites, and community representatives to discuss possible solutions that could be offered. From the meeting, a study on waste management in Tambi village was made with various considerations.

3. RESULTS AND DISCUSSION

A. General Condition

Waste management in Tambi village has been a long process. Several solutions have been implemented. However, this management did not last long. The waste management that has been carried out in Tambi village is as follows:

Table 1. History of Waste Management

No	Mecanims	Location	Obstacle	Information
1.	Waste disposal without management	Tanah Bengkok (village-owned land that was lent to the village administrator to be worked on, and the proceeds were picked as a substitute for salary)	1. No sorting 2. No periodic processing 3. The volume of garbage is too big 4. Too close to settlements 5. Disturbing the mobility of residents 6. Constrained operational costs	It is no longer operating
2.	Waste disposal without processing	Patean (The garbage disposal location in Tambi village, which is now converted into a tourist parking lot)	1. No sorting 2. No periodic maintenance 3. The volume of garbage is too big 4. Close to settlements 5. Annoying residents 6. Constrained operational costs	It is no longer operating
3.	Waste bank of 10th hamlet	Tegalrejo (Name of location)	1. Public awareness is low 2. Some types of waste have not been maximized in processing 3. There is no socialization about the non-organic waste management	Still operating
4.	Socialization of waste sorting, a waste burning initiative by Student Community Service of Gadjah Mada University	Tambi	1. Public awareness 2. Program not continued	It is no longer operating

From the results of the identification of waste management mechanisms in Tambi village, it can be concluded that:

1) There has been a TPA (Final Disposal Site) in Tambi Village, which is located on Patean land and Tanah Bengkok. However, currently, the TPA in Patean has been converted into a Stalang tourist parking lot. Meanwhile, the TPA

located on Tanah Bengkok is no longer functioning due to the absence of regular management so that the waste exceeds capacity. The accumulation of garbage disrupts community mobility, such as odors, public health, and environmental aesthetics. So that the village government took the initiative to relocate the waste and spent approximately 30 million rupiah.

2) There has been waste management in Tambi Village, which was previously managed by Karang Taruna (Village youth group). People are asked to sort and choose between organic and non-organic waste. Then the waste is taken by them and carried to the TPA, located in Tambi Village. It was time to manage non-organic waste into processed products (paving). However, because the volume of waste that is too large is not proportional to the human resources that manage it, the management has finally stopped.
3) After the cessation of waste management, the village community does not have a garbage disposal site. Finally, illegal landfills appear in tea gardens, rivers, forests, and sewers.

From the results of the field study, several things were found that became obstacles to the above management programs, namely:

1) The program is not sustainable
2) The management system that is not yet running
3) Lack of public awareness
4) Lack of support from village government.

B. Percentage of Waste Samples generated

The data collection was carried out in RW 06, Tambi Village. Data collection was carried out using a random sampling method. The data was taken with an average then multiplied by the existing number category. The method of data collection was done by interview. The data is divided into five categories: house type 36, house type 48, one house with two family cards, public facilities, and houses with food stalls. From the five categories, four samples were taken each as data. The data is used to map waste management in RW 06 and determine the exact location. The following are the results of the percentage of waste data in RW 06:

Table 2. Waste Volume Sample

No	House Category	Number	The volume of Waste Produced Per Day Each House (m3)	Total Waste Volume Per Day (m3)	Total Waste Volume Per 3 days
1	Shophouse	14	0,00825	0,1155	0,3465
2	House Type 48	86	0,00675	0,5805	1,7415
3	House Type 36	24	0,003	0,072	0,216
4	House 2 KK	20	0,006	0,12	0,36
5	Public facilities	2	0,0135	0,27	0,081
	Total	146	0,0375	0,915	2,745

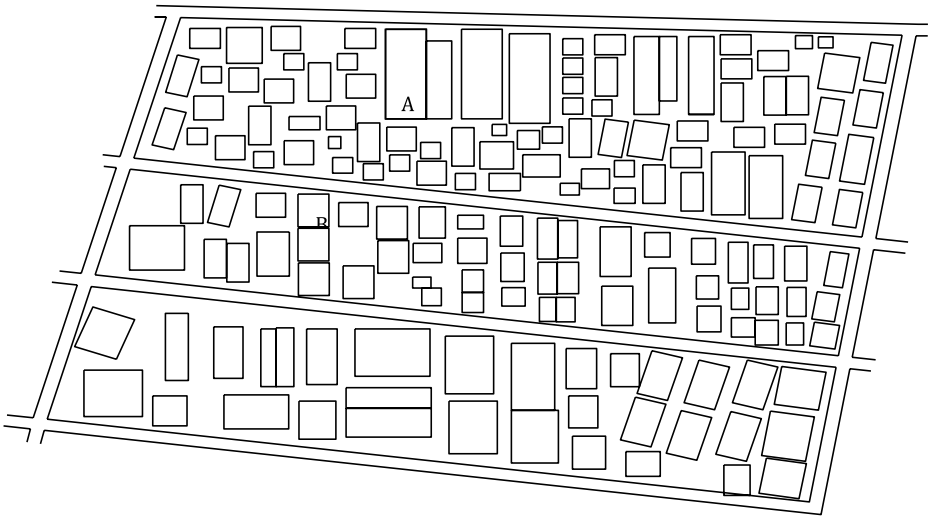

Figure 1. Floor plan of RW 06 Tambi Village

Information
A: SDN 2 TAMBI (Elementary School)
B: MUSHOLAAL-HUDA (Small Mosque)

- Number of houses: 144
- Number of shophouses: 17
- Number of Family Cards: 164
- Number of houses with two Family Cards: 20

C. Formal Legal Waste Management

1) Law No. 32 of 2009 concerning Environmental Protection and Management.
2) RI Law No. 18 of 2008 on waste management.
3) PP RI No. 27 of 2020 on specific waste management – Government Regulation on Specific Waste Management.
4) Governor of Central Java – Central Java Governor Regulation No. 11 of 2019 concerning Prov. Central Java in managing household waste and similar household waste.
5) Wonosobo Regency Regional Regulation Law No. 4 of 2016 concerning Wonosobo Regency Regional Regulation on waste management.
6) Wonosobo Regency Regulation No. 4, LD. 2016/No 4, LL. District Secretariat. Wonosobo
7) Regent of Wonosobo, Prov. Central Java – Wonosobo Regency Regional Regulation No. 4 of 2016 concerning waste management.

D. Tambi Desa Village Waste Management Study

Waste management in Tambi Village has gone through a long process with various approaches. However, due to various obstacles, the waste management process stops. Therefore, the researcher then uses the management data that has been carried out as an evaluation material to create a new waste management concept and learn from previous waste management.

This study is based on community participation with applicable mechanisms. Researchers see that the potential for public awareness can lead to sustainable waste management. Waste management based on community unrest will generate a spark of enthusiasm to deal with the problems themselves. It can be done by inviting the community to participate in waste management programs.

This process of public awareness is fostered by raising awareness about the importance of waste management and its impact if this problem is not handled correctly. This is done by inviting the community to participate in determining the design of people waste management. This program is the result of a waste management socialization program and provides a forum for the community to dialogue to determine solutions to the environmental crisis they are facing.

This community discussion resulted in an objective study submitted at the Musrembangdes (Village Development Plan Meeting). The point is that waste management gets support from village fund allocations. So that this program is a program that is realized, carried out, and implemented by the community. The hope is that they will grow awareness of their responsibility for preserving the environment in which they live.

The study contains the issue of the current environmental crisis, the long history of waste management in Tambi village, what factors stopped the program, and the solutions offered for further waste management. This solution offered is based on the locality of the RW (hamlet), so that waste managers can solve problems in the future comprehensively and based on the values and culture of the local community.

E. Solution Offer

1) Organic trash

Organic waste is often attached to the life of rural communities because most of their essential needs are from plants: vegetables and fruits. Organic waste is produced from wood, tree branches, dry leaves, vegetables, fruits, etc. The activity of recycling organic waste can be done using the bioconversion method. Bioconversion is the transformation of organic waste into a methane energy source through a fermentation process that involves living things. In general, organisms that can play a role in this bioconversion process are bacteria, fungi, and insect larvae.

One of the organic waste management is through the Black Soldier Fly (BSF) process. In Latin, Hermatia illucens, is a type of fly from the Order Diptera species. This native fly from the Americas has also spread throughout the world, including Indonesia. During the growth period, BSF requires an optimum temperature between 30-60 degrees Celsius. Environmental conditions and food intake are highly dependent on the growing phase in the manufacture of BSF. The BSF growth metamorphosis cycle phases are divided into four parts, including; eggs, larvae, pupae, and flies. This process takes place in less than 40 days

a) Egg Phase

At one time laying eggs, female BSF flies can release about 300-500 eggs. Then these BSF female flies lay their eggs in dark and damp places in the form of gaps or holes in easily decomposed material such as animal waste or rotting vegetables. The eggs are 0.04 inches in size and weigh about 1-2 grams, are oval, and slightly yellowish. Maintenance of BSF eggs requires an optimum temperature in the range of 28-35 degrees Celsius. If an optimum temperature does not accompany the process of maintaining BSF eggs, the eggs can hatch longer and even die at specific temperatures.

Then the humidity level also affects the process of maintaining this BSF egg. BSF eggs will fully mature at a humidity level of around 30%-40% and will hatch at a temperature range of 60%-80%. At non-recommended humidity levels, the eggs will dry out, and the embryos in them will die. Such conditions can trigger the growth of Ascomycetes fungi and can accelerate the death of other eggs before they hatch into larvae. The maintenance of BSF eggs cannot be stored in a place that lacks oxygen or in air contaminated with carbon oxide gas which tends to be high.

b) Larvae Phase

After hatching, then the eggs will turn into larvae. The newly hatched larvae from the eggs are almost invisible to the naked eye as they measure about 0.07 inches (1.8 mm). Larval development is swift after hatching. It only takes two days and will undergo some changes from soft to rough skin.

Newly hatched larvae will immediately look for a moist place where they can start feeding on decaying organic material. At this stage, the young larvae will be very susceptible to the influence of external factors, including susceptibility to temperature, low oxygen pressure, moisture content, mold, and toxic materials. The sensitivity of the larvae at this stage does not last long because their resistance to these factors will increase after the larvae are about one week old or more (about 5-10 mg in size).

BSF larvae are photophobic, which is anti or sensitive to sunlight. It can be seen when the larvae are eating, where they are more active and are more often in areas with minimal sunlight. Newly hatched larvae with optimal conditions live at a temperature of 28-35ºC with a humidity of around 60-70%. Unlike when they are newly hatched, the one-week-old larvae will adapt and have a much better tolerance for lower temperatures. When the available food reserves are sufficient, the young larvae can live at temperatures less than 20ºC and higher than 45ºC. That way, BSF larvae grow faster in the temperature range of 30-36ºC.

c) Pupa Phase

After molting until the sixth instar, BSF larvae will have skin that tends to be rougher than before. It is called the puparium, where the pupa begins to enter the prepupa phase. Before pupation, the prepupa will migrate to find a drier and darker place. Pupa size two-thirds of the prepupa is the stage where the BSF is at rest and

has a slightly rough texture with blackish-brown color. During the transition from larva to pupa, Labrukuma (mouth part of the BSF) bends down like an eagle's beak and then functions as a hook when it becomes a cocoon. The metamorphosis into BSF today takes at least ten days to months. Environmental temperature conditions also influence this process.

d) Adult Flies

After passing through the puparium phase, BSF transforms into an adult BSF with a body length of approximately 12-20 mm and a wingspan of 8-14mm. The male BSF has a smaller physical size than the female BSF because of the different segments of the stomach they have. The female BSF has a larger abdomen than the male BSF. The lifespan of adult BSF tends to be relatively short, around 4-8 days. After the adult BSF is two days old, the BSF is ready to mate. After mating, adult BSF can lay up to 300-500 eggs in a damp and dark place such as rotten wood. This process requires the optimum temperature in the natural range, which is 27.5-37-5 degrees Celsius. When in captivity, the recommended temperature is around 24.4 degrees Celsius. The optimum humidity in this process ranges up to 30%-90%. It is because BSF is straightforward to dehydrate. A water supply in the captive cage is also needed to anticipate the decrease in humidity levels in the captive cage.

According to the results of research that have been carried out, the benefits of BSF larvae are highly recommended for recycling organic waste. Recycling organic waste using Maggot can break down 250 grams of organic waste into 100 grams. This process takes at least seven days. Wastes such as meat, bones, and eggshells have a higher protein content than vegetable waste in general, although, between these two types of waste, the results are not significantly different.

2) Non-organic waste

There are various ways to manage non-organic waste. Non-organic waste can have a selling value by being sorted and then sold to collectors. The form of management is by collecting, sorting, and selling. In the waste collection, the community can collect waste in plastic, paper, iron and metal, and glass. Sorting is carried out by each community according to the category, then deposited to the Waste Bank. The waste bank management will later be sold to collectors.

One of the other non-organic waste management is making handicrafts. There are various types of handicrafts. Crafts can be in the form of bags, pencil cases, wallets, and others, as for the recommendations for handicrafts that are simple to make but have a selling value, namely making drawstring bags from crackle plastic. Drawstring bags have valuable functions, including being a place to store things, can be used for traveling, and can be used as souvenirs.

Ecobrick is also one of the non-organic waste management that can be the following recommendation. Waste management from eco-bricks usually produces a product from waste into bricks. Ecobricks are called “environmentally friendly bricks” because eco-bricks can be an alternative to brick in constructing buildings.

Plastic waste is a staple in the manufacture of eco-bricks. Plastic waste is packed into plastic bottles tightly, then used to make reusable building blocks. The bricks from eco-bricks are present as a new technological innovation based on collaboration. Besides, the eco-bricks also solve solid waste at no cost for individuals, households, and communities. Making eco-bricks is one way to deal with waste in other forms, besides throwing it to the final disposal. With eco-bricks, we have the opportunity to digest plastic to turn plastic into minimal benefits for the local community and ecosystem. Coupled with the characteristics of the plastic used is very problematic, namely long life and durability, making eco-bricks something sought after.

Risk is inseparable in every starting activity, especially activities related to economic value. As in the manufacture of eco-bricks, of course, some risks will be encountered. Speculative risk has two possibilities, namely profit and loss opportunities. Profit opportunities can occur when the number of sales increases. At the same time, the opportunity to lose can occur when sales decline. Opportunities for loss are also influenced by several factors including, capital, intense competition, unstable market conditions, not solid team, lack of sustainable planning. Pure risk occurs when impacted by loss, and pure risk usually occurs when there is theft, fire, accident, or natural disaster.

Eco-bricks are one of many options in the processing of plastic waste. Making eco-bricks is not too difficult. The tools needed are also easy to obtain. The capital issued is not much, It may even not use capital at all. Besides being friendly to the environment and helping to reduce plastic waste, eco-bricks also have an economical selling value. In making eco-bricks, there are risks when eco brick products are turned into a business. There will be profit and loss opportunities, depending on how the management will be carried out. Nevertheless, at least the manufacture of eco-bricks can help minimize plastic waste to benefit the ecosystem and the local community.

In addition, the training on managing non-organic waste into other valuable items, such as converting plastic waste into pillow crafts from used plastic snacks, coffee wrappers, Instant noodle wrappers, and crackers wraps in various colors to make it look unique, is aimed at increasing public knowledge in managing household waste.

In addition, the benefits of managing plastic waste into a product that can be reused and reduce the amount of waste that goes to the Final Disposal Site (TPA), reduce the environmental impact caused by dumping waste into the environment by utilizing used plastic waste. As for the benefits that can be seen from the economic side, namely being able to increase people's income through the sale of goods that have been recycled, and also the public can finally be sold through e-commerce platforms.

The benefits of managing plastic waste into pillow crafts for the environment are that the waste they produce can be used as a helpful product and reduce the amount of waste to the Final Disposal Site (TPA). Also, it reduces the environmental

impact caused by dumping garbage into the environment, utilizing used waste. Some benefits can be seen from the economic side, namely being able to increase people's income through the sale of goods that have been recycled, and also the public can finally be sold through e-commerce platforms.

In every process of a program's journey, there must be risks from selling pillows made from plastic waste. The possibility of these risks can be classified into 2, namely, internal risks and external risks. Which of these risks can be taken into consideration and evaluated in the future.

Various risks can be found internally in the waste management program. They were starting from the wrong in cutting the shape of the pillow, wrong in shaping the pillow model, to the lack of ideas in making unique and exciting pillows. In addition, the marketing process is also a formidable challenge to do. Meanwhile, external risks such as the lack of buyers visiting and the increasingly fierce local business competition between the community are also risks that are at least considered.

Based on the above explanation, it can be understood that waste is the residue of human activities or natural processes that do not yet have economic value, are not used and reused, are not liked, and must be disposed of in such a way that they do not interfere with human survival. The training on making art from plastic waste such as used plastic snacks, coffee, crackers carried out for residents in Tambi Village is by theoretical and practical methods. The instructor provides material about business opportunities and the use of plastic waste. The plastic is first sorted and then made into handicrafts. This training was attended by the community, especially women in Tambi village.

4. CONCLUSION

Waste management in Tambi Village has experienced a long history with various management models. However, in recent years, waste management has been discontinued due to various accompanying factors. However, the environmental crisis caused by the accumulation of garbage is becoming a public problem that must be resolved.

There are at least four factors that caused this environmental crisis to occur including, the lack of public awareness about waste, the lack of encouragement from the village government to follow up on waste management programs, the absence of a waste disposal site (TPS), and the ineffectiveness of the waste management system.

The management program should be bottom-up, so the community feels they have a responsibility to the program. Program ideas and provisions result from community consultations to determine what kind of program will be carried out. In addition, how to engage the community in discussions related to waste management and a means of socializing environmental awareness.

The form of the program is in making a joint study of the condition of waste management which is the result of conveying aspirations and ideas from the

community. This study contains the history of waste management in Tambi Village, the factors that made the program fail until several proposed solutions were formulated. In essence, one solution that is the focus of this study is local-scale waste management such as the RW (hamlet) and village scope so that the program is focused and the approach is adapted to the environmental conditions of the surrounding community.

This study will be brought by the community to be discussed at the Village Development Plan Deliberation (Musrembangdes) to become one of the priorities in the discussion of the Village Fund. So, this program is a program that was born out of public unrest and resolved as a community. It is hoped that this program can last a long time because its core is public awareness to address problems in the environment in which they live.

After conducting this field study, there are several suggestions to several parties:

1. To the Village Government, the Village Government as a policymaker can pay attention to concrete waste management such as finding land for waste management, conducting various socializations, and collaborating with the community to carry out other environmental crisis management programs.
2. To the community, public awareness is essential in realizing a clean and healthy environment. The responsibility of this awareness should be understood for every society. Some things that can be done are wise in using goods, especially plastic goods, using shopping bags to reduce plastic and sorting organic and non-organic waste to help the waste management process, not throwing garbage in places that are not intended to dispose of garbage.
3. To external parties, waste management is a long-term program. If there is a similar program regarding waste management, it is better to look at the history of waste management that has been carried out to learn from subsequent managements. In addition, community involvement is the key to long-term programs, so attracting the community to become agents of waste management is essential.

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