

RESEARCH ARTICLE OPEN ACCESS

# TOWARDS WASTE-FREE AREA IN LAKE TOBA INTERNATIONAL TOURISM DESTINATION: THE CASE OF TIGARAS VILLAGE, SIMALUNGUN, NORTH SUMATRA PROVINCE

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## Abstract:

Garbage has become a problem everywhere. Waste production continues to increase both in urban and outside urban areas, due to population growth and various other factors, such as lifestyle, industrial and trade activities. Garbage needs to be managed properly so that it does not become a source of various problems that are very detrimental to society, such as floods, diseases, and air and air pollution. Even though they are not liked, the community is not willing to work together to solve this problem because they run into the free rider problem. The failure of the community to build cooperation in dealing with convenience makes the government have to intervene to overcome it. However, in reality, the government has not succeeded in overcoming it, and even accidentally a new problem has arisen at landfills. Waste management will be effective if it involves the community; because they are the main producers. In order for the community to cooperate in managing waste, waste that is a "public bads" must be turned into various valuable goods (commercial goods) that provide additional income for themselves. For this reason, they must be involved in processing it in a community-based waste management system. This study proves that the people of Tigaras Village are willing to cooperate in managing waste in their community as long as it provides additional income for them. The additional income is obtained from the sale of products they produce from processing waste and subsidies from the government as compensation for the positive externalities enjoyed by the community. It is recommended that the government of Simalungun Regency encourage and facilitate the development of a community-based waste management system along the outskirts of Lake Toba in their area.

**Keywords:** Super priority tourist destination, waste, Lake Toba

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## **I. INTRODUCTION**

Through a Presidential Instruction delivered at a Limited Cabinet Meeting on July 15<sup>th</sup> 2019, Lake Toba and its surroundings were declared a super priority international tourist destination. The government's goal is to make this area a source of foreign exchange income to the state treasury and make it a driving force for the regional economy in order to increase employment opportunities and income for its people.

As a follow-up to the decision, the government is currently working hard to build supporting infrastructure for the Lake Toba tourism area. One of them is the development of transportation infrastructure to make it easier for foreign tourists to visit the Lake Toba area, move around in it and have easy exit access from this very beautiful tourist destination. The government has successfully built and operated Silangit International Airport in Siborong-borong and is currently completing the construction of a toll road from Kuala Namu Airport to Simalungun and Parapat.

The government is also concerned with improving the quality of the environment in this area. But right now the government's main focus is on improving the water quality of Lake Toba which has long been suspected of deteriorating. Even according to the World Bank (2018) the water quality is not suitable for international tourism. The Provincial Government of North Sumatra considers that the existence of the Floating Net Cages industry which has been going on since the early 1990s is the main cause of the deteriorating water. In order to improve the water quality of Lake Toba so that it is suitable for the international tourism industry, the provincial government is trying to eradicate the existence of Floating Net Cages industry by issuing a decree which limits fish production at a very low level so that it will no longer be financially feasible to work on the Floating Net Cages in this lake.

However, this decision was deemed inappropriate. Recent research on the water

quality of Lake Toba has found evidence that pollution of the waters of Lake Toba is not only due to the floating net cage business, and also this business is not even the main pollutant (Hutagaol et al., 2021). This implies that the government's efforts to remove KJA from this lake will not improve the quality of its waters if it is not followed by efforts to control pollutant discharges from other sources, such as hotels and restaurants which are the main polluters in this lake. In addition, various parties have questioned the accuracy of this decision considering the impact on the loss of thousands of job opportunities in a region that is still struggling to overcome unemployment and poverty.

Lake Toba's water pollution is just one of the environmental issues currently plaguing this international tourist destination. Another problem that is no less serious that needs immediate good treatment is waste. In the Joint Agreement of Regents, Governors, Commander of the military Regional, Regional Police Chief, Ministries it is also mentioned to stop logging forests, stop dumping waste into Lake Toba, and handle waste comprehensively (Regional Infrastructure Development Agency Ministry of PUPR, 2020). Environmental cleanliness is part of integral part of the comfort of traveling. Waste is one of the main enemies of the environment. Waste that is scattered and piled up everywhere because it is not managed properly, apart from disturbing the view, will also be a source of various diseases, air and water pollution. Tourist areas like Lake Toba should be clean and free of trash if you want to make it a favorite area to be visited by the tourists.

However, the facts of the field are far from the expectations. Currently, the Lake Toba tourist destination area is far from waste-free. Waste is still scattered and piled up in various tourist sites on the shores of Lake Toba inhabited by residents. Even industrial and residential waste is also found on the shores of the lake. This fact is not a proof that the government ignores waste management because waste management and environmental cleanliness have become one of

the main tasks of local governments throughout Indonesia.

The problem is why waste management by the government is not effective in creating a waste-free and clean environment? Waste management must involve the community because they are the main source. Therefore, community-based waste management should be introduced so that the second question that needs to be studied is how the response and support of local communities to community-based Waste Management? This waste management cannot be separated from government support so the question is what assistance does the local government need to provide so that this management model is realized?

This research is a case study conducted in Tigaras Village, Simalungun Regency. This regency is the longest area of its coastline within the Lake Toba tourist area and Tigaras Village is on its shores. Besides being part of the international tourist destination of Lake Toba, here there is a ferry port that connects the outskirts of Sumatra and Samosir Island which is being promoted as an iconic tourist site in the international tourist area of Lake Toba. As one of the entrances and exits of Samosir Island, the cleanliness of Tigaras Village is very important to maintain. The ferry port is one of the tourist storefronts for visitors to the Lake Toba international tourist area.

The main objective of this activity is to gain a good understanding of the causes of ineffective waste management by the government and the willingness of the community to support community-based Waste Management. The activities are also expected to provide input to the government on effective waste control methods in the Lake Toba international tourist area so that an environment that is free of waste and clean is formed. Quality environmental conditions like this are a must if this area wants to be a favorite destination for foreign tourists.

## **II. METHOD**

This study uses the case of waste management in Tigaras Village, Dolok Pardamean District, Simalungun Regency, North Sumatra Province. The research method was carried out using the action research method. Where researchers are directly involved in waste management activities carried out by the community and companies around the study area. The activities were held in July-October 2022.

Data collection activities were carried out in order to provide an overview of the condition of waste management by the community in the study area. There are two types of data used in this study, namely primary and secondary data. Secondary data was obtained from various written sources, including district BPS data. Primary data were obtained from respondents with various professions, such as housewives, local restaurant/eatery and hotel managers. They were randomly selected as many as 20 respondents of the entire (population) in the village. Data obtained through interviews with respondents with questionnaires. Primary data was also obtained from several local figures through in-depth interviews.

Quantitative data processing and analysis was carried out using Excel software. Quantitative data analysis used frequency tabulation, cross tabulation, and descriptive analysis.

## **III. CONCEPTUAL THINKING FRAMEWORK**

### ***A. Trash as "Public Bads" and the Problem of Enjoying Free.***

Human life cannot be separated from the production of waste. Every day people have to consume, both food and other products. Every consumption, people will definitely produce waste. The waste can be in the form of packaging of goods consumed or the rest of the goods. If you take into account the manufacturing process, then the waste will be even more because the process also produces waste.

Globally, waste production is increasing from time to time. This increase has attracted the

attention of various researchers and they have related it to various socioeconomic and demographic factors. One of the factors of positive population growth. For example, currently in Indonesia (2021) population growth is still quite high, 1.22% per year (BPS, 2021). The more the population, the more the need for goods to support their lives. The production and consumption of these goods generates waste.

In the current era of economic and cultural globalization, people's lifestyles are changing rapidly and are increasingly consumptive. In the past, people only bought one or two pairs of clothes a year, now a resident can buy dozens of pairs a year. Likewise the purchase of other necessities, in general it increases per person. Changes in lifestyle have made the growth rate of waste production much faster than the growth rate of the human population itself, especially in communities with relatively high incomes.

Another important factor behind the production of waste which tends to increase from time to time is the increasingly intensive industrial and trading activities. Because these two activities usually take place in urban areas, these are the areas with the greatest waste production.

Humans like goods because they can be used to satisfy their needs. It's different with garbage, humans just don't like it and want to get rid of it immediately away from themselves. Disposal of waste is usually done carelessly, without thinking about the negative impact on the environment in which they live and do their activities.

Waste can have a very bad impact on human life because waste that is scattered and piled up can cause flooding when it rains heavily and produces a very unpleasant odor (air pollution) and is a place for various types of mosquitoes and flies to nest. In addition, the accumulation of garbage in random places will disturb the view. In short, waste that is not managed properly will harm people's lives.

Even so, almost all members of the community do not want to work together to manage it so that they avoid the negative impacts

of this waste. The non-cooperative behavior of the residents mentioned above occurs because a clean and waste-free environment is a public good. A clean and healthy environment benefits all members of society regardless of their contribution to creating it. There is also no point in forbidding a member of the community who does not contribute to making the environment free of waste and clean from enjoying it because their participation will not reduce its usefulness for other residents. After all, it is impossible to prevent him from enjoying it. This means that a clean and waste-free environment has the characteristics of both public goods, namely "non-rivalry and excludable in consumption" (Mangkusubroto, 1999; Stiglitz, 1999; Suparmoko, 2002).

In the provision of public goods, people tend to choose the strategy of free beneficiaries (Mangkusubroto, 1999; Stiglitz, 1999; Suparmoko, 2002). A clean and free environment from waste is not the dream of all citizens who live in that environment. However, this can be realized only if they work together in unison. According to Olson (1965) the problem of free beneficiaries is a challenge that must be overcome in collective action to achieve the goals that the group has set to achieve. The failure of the group to overcome the problem of free beneficiaries will make the collective action ineffective in achieving its goals.

The question is why does a person adopt a free enjoy strategy when he and other group members are trying to achieve a common goal they have agreed upon? According to Olson (1965) there are two factors that encourage someone to choose this strategy. First, there is an assumption that the effectiveness of the group's struggle to achieve the agreed goals will not be reduced if he himself does not contribute. The reason is because the number of group members is quite large, so in fact their contribution is relatively small to the success of the group's struggle so that it can be ignored.

Second, there is awareness that even if he does not contribute to the group's struggle, he will still

enjoy the results of the group's struggle. There's no point in forbidding him from enjoying it, because that won't diminish the benefits for the other members.

Thus, there is no strong motivation to work together to make dreams come true. It is this absence of motivation that hinders cooperation between members of the community to realize the common desire mentioned above. Communities will suffer because of the continuous production of waste and its haphazard accumulation will become a source of various problems for their lives. To prevent this, the community needs government intervention to overcome the waste problem.

Government involvement and its problems. The provision of public goods is problematic. Even though they need it, none of their consumers are willing to pay for its use. Since no one wants to pay, a profit-oriented company will not want to provide it. While the community itself is difficult to work together to provide it because it collides with the problem of free beneficiaries. If companies and communities are unable to provide the goods that people need to support their lives, the only thing they can rely on is the government. This expectation is in line with Adam Smith's opinion that the provision of public goods is one of the main tasks of the government (Stiglitz, 2000).

Waste management has become one of the main tasks of local governments throughout Indonesia. Because waste has become a problem not only in urban areas but also outside the area. Waste production continues to grow everywhere. However, growth is much faster in urban areas than outside because urban areas not only have high population growth, but also industrial and trade activities are developing rapidly. Now the city government has to spend a very large budget in managing waste. For example, in the city of Jakarta, the DKI government spends a budget of 3.49 trillion (2019) to manage waste alone (Katadata, 2019).

In managing waste both in urban areas and outside, the government relies on the "Collect,

Transport and Dispose" approach. In this approach, officers who are often called "yellow troops" start their work by picking up trash from waste collection points in residential areas, offices, markets and factories, then putting it in a garbage truck for further disposal to a final disposal site (TPA). At the TPA, waste processing activities are almost non-existent. Almost all of this waste is used as landfill material (Winahyu, Hartoyo, and Syaikat, 2013).

Mahyudin (2017) has criticized the application of "Collect, Transport and Dispose" approach and concluded that it failed to solve the waste problem. Besides not being able to solve the problem at the place of origin of the waste, only transporting waste to the final disposal site actually creates new problems at the disposal site, such as environmental pollution (pollution of soil, water and air) and has become a trigger for social conflict. In addition to these problems, it turns out that the transportation of waste from the source to the landfill, which is generally far outside the city, also creates environmental problems for the people living in the vicinity of its journey (Hutagaol, 2009). Waste transportation has resulted in air pollution along the way to the Final Disposal Site. So far, there have been no protests from the affected people. However, there is no guarantee that in the future the community will still be willing to tolerate air pollution caused by the transportation of waste from the source to the Final Disposal Site.

The government's current waste management approach needs improvement because moving waste from urban areas to landfills far outside the city is not a solution but instead a source of new problems. Also, from a financing point of view this approach is no longer viable. In the future, waste production will continue to increase so that its management will be more difficult and more expensive. We need a new approach that is more effective and efficient in overcoming the waste problem.

***B. Transformation of "Public Bads" into "Commercial Private Goods" to Attract Public Interest in Waste Management.***

The main source of waste currently managed by the government is the community, both individually and as households. The waste comes from their consumption activities. Because the community produces it, the control will be more effective if it involves them. The question is how to get the community involved in its management?

Currently, the level of poverty and unemployment is still very high in Indonesia. The presence of the Covid-19 pandemic which has a negative impact on various economic activities has made the problem worse (Worldbank, 2022). Responding to this situation, the government has distributed social assistance (Bansos) to the poor. However, the purpose of providing social assistance is not to get them out of poverty, but to improve their purchasing power so that they can survive. In fact, the poor need more permanent jobs that will provide income on an ongoing basis than the additional income obtained from social assistance programs whose distribution is irregular and unsustainable.

In various communities and regions, the community has been actively involved in processing waste which produces a variety of recycled products and raw materials that have economic value. According to a researcher more than 60% of waste is organic waste (Waste for Change, 2022). Organic waste can be processed into fertilizer to fertilize plants (Hutagaol, 2009). Meanwhile, plastic waste, which has been increasing rapidly in volume lately can be recycled to produce new plastic products that are salable in the market.

In short, waste processing can be used as a job that generates income for the community, especially the poor. Involving the community in waste control in their community through group processing activities will not only ease the government's budgetary burden, it can also be a solution to the problems of unemployment and poverty at the locality level.

Unemployment and poverty are a social burden for society. The unemployed and their families must receive assistance from the state so that they can maintain their physical quality. Maintaining physical quality is very important for the unemployed because when they enter the world of work their productivity is very much determined by their physical quality. The better the quality, the higher the work productivity. This quality workforce is needed by commercial companies that are pursuing maximum profits.

Unemployed people with poor physical quality will find it difficult to get a job even though the economy is "booming". No company wants to hire people whose productivity is low due to poor physical condition (Ray, 1998). Thus the income that poor families receive from waste processing is not only to fulfill their physical needs, but also to maintain their eligibility to enter the labor market if the economy "booms" in the future.

It is very possible if the processing of waste by the community gets subsidies from the government. The reason is simple. Waste processing will produce a clean and waste-free environment that has the character of public goods that are enjoyed by the wider community without paying the producers. That is, the waste processing produces a positive externality that is enjoyed by the community without paying the producers. According to Stiglitz (2000) so that producers want to increase the production of positive externalities as the public wants, the government needs to provide subsidies to producers. The budget for this subsidy can take the government from saving the cost of processing waste, which has now been taken over by the waste processing community. Giving subsidies to waste processors will not add to the budget burden for the government itself.

***C. Subsidies for Community Based Waste Management Activities.***

If it works effectively, waste management by the community will have a variety of positive impacts on local communities. Floods will not occur again because there will be no more

garbage piled up in the ditches that prevent water from flowing to the disposal site. Also, the environment will be clean and free of garbage. This will make the environment comfortable and free from various diseases that used to come from piles of garbage. All these kinds of positive externalities will make society more prosperous. However, it is impossible to ask them to pay for what they consume. This is because these positive externalities have the character of pure public goods.

In contrast to the negative externalities such as air pollution that cement factories generate, society actually wants producers to generate more positive externalities because their consumption increases their well-being. However, producers will not fulfill this desire because they are not willing to pay for their consumption. Therefore, the government needs to intervene to overcome the gap problem. According to Stiglitz (2000) the government must provide financial incentives for producers to want to produce more as desired by society by providing subsidies to producers. This means that waste processing activities must receive subsidies from the government.

Subsidizing collective waste management by the community will not add to the government's budgetary burden. This is because community involvement in waste management will reduce the workload of government officials who manage waste. This reduction will have an impact on reducing the need for the budget to manage waste from what the government should provide. If the subsidy is given in the form of an income transfer for those involved in waste management, the transfer will make them more enthusiastic about working. Waste will be a good source of income for the poor who are willing to involve themselves in its management. In the future, waste will no longer be a source of problems in tourist areas if the local community responds positively to the income that might be obtained from processing it together. Community-based waste processing will be a mainstay in controlling waste in tourist areas.

## V. RESULTS AND DISCUSSION

### A. Household Waste Production and Management Problems.

The main problem of waste in this village is related to household waste. Households are the main producers of waste. Trash from trade and other economic activities is relatively small. The production of household waste is quite high. The average production is 5.41 kg per household. The production of plastic waste is also quite high. Nearly one-fifth of the waste production is plastic waste (Fig. 1).

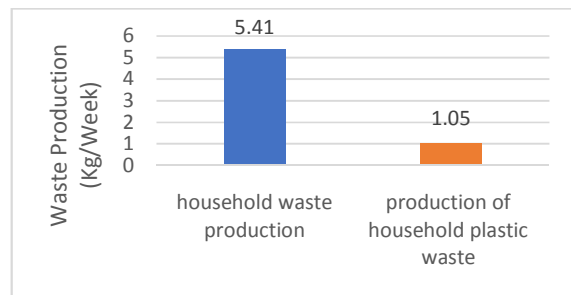


Fig. 1 Waste Production per Household per Week in Tigaras Village

The local community's concern for waste and the quality of its management can be examined from various perspectives such as (a) the availability of temporary waste storage places for waste inside and outside the house and (b) the actions taken for the collected waste. All respondents did not have a waste collection site at home, but almost all of them (97.7%) had a waste collection site in their yard (Fig. 2) and almost all of them were permanent (93.0%) (Fig. 3).

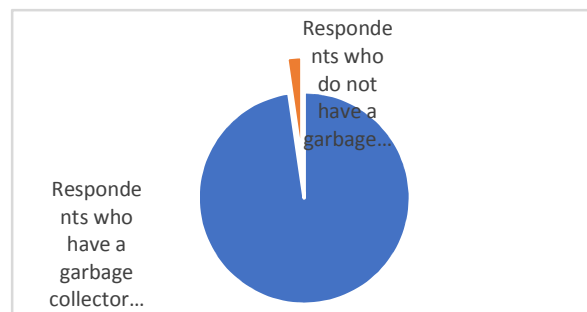


Fig. 2: Percentage of Respondents by ownership of a garbage collection site in their yard

Placement of temporary garbage storage outside the house shows that the household does not like garbage in the house. This is of course because of his awareness of the negative impact on the health of the occupants of the house when kept in the house.

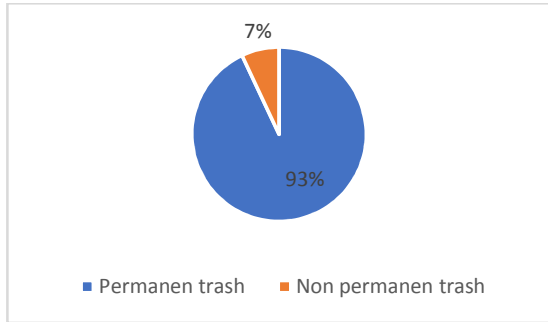


Fig. 3 Percentage of respondents by type of trash can in the yard

The question is what do the people (respondents) do with the garbage that collects in the shelter in their yard? It turned out that the majority (47%) of the respondents burned the garbage, while the others (38%) handed it over to the cleaners and 15% threw garbage into small rivers, ravines and ditches around their housing(Fig. 4& Fig. 5). Burning will produce air pollution that can harm their health and that of the surrounding community, while dumping garbage into rivers, ravines and ditches will block the flow of water so that when it rains heavily it will cause flooding. In addition, the garbage that accumulates in the ditches and ravines will become breeding grounds for various diseases.

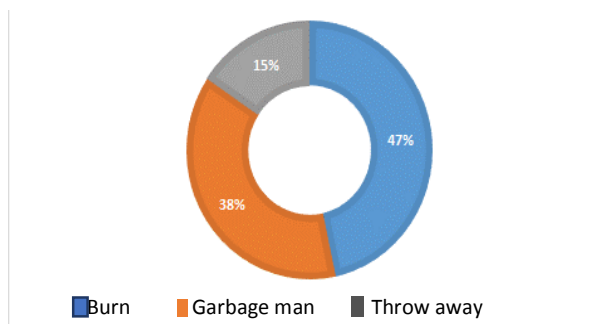


Fig. 4 Percentage of respondents according to their treatment of garbage collected in their yard

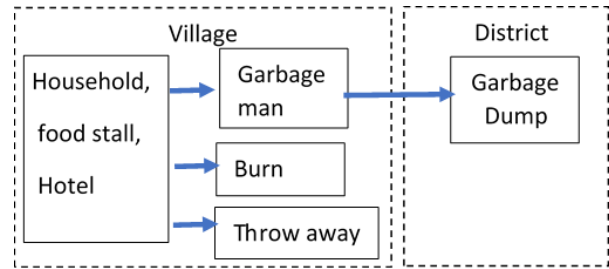


Fig 5. Garbage handling route in Tigaras

Waste management by the respondents as described above is a reflection of the quality of waste management by the village community on the outskirts of Lake Toba. In this village there is a ferry port which is one of the links with the island of Samosir (Simanindo). Also, in this village there are several beach tourism spots. Poor household waste management is a challenge in building and developing international tourism.

Why is waste management so bad by local people? Kuznet(1955) draws attention to the relationship between people's income levels and their awareness of environmental conservation. In his view, poverty is a threat to environmental sustainability. Because the poor will prioritize meeting their daily needs without taking into account the impact of their actions on environmental sustainability. For them, meeting the needs of today's life is more important than preserving the environment, even though its sustainability is needed to support life in the future. However, according to Kuznets, his awareness of the importance of environmental sustainability will grow on his own in line with an increase in his income.

If we look closely at the income profile of the respondents as presented in Table 1 below, it can be concluded that they are not included in the poor group. The average level of income per capita of respondents is far above the poverty line. The poverty line in North Sumatra Province is IDR 561,004, while the average income per person per month is IDR 1,050,833. This means that Kuznets' opinion cannot be accepted as the reason why the awareness of the people of



Tigaras Village in managing waste properly is very low.

Table 1  
Average Income of Respondents in Tigaras Village

No	Description	Value	Absolute value
01	Average income per person per month	IDR	1.050.833
02	Poverty Line in North Sumatra	IDR	561.004

The question is why the behavior of local people is not in line with Kuznets' opinion, where even though their income is high enough they don't care about environmental conservation? Almost all respondents (93%) thought that the waste problem was not their business, but the government's business (Fig.6). It is the government that should be responsible for waste management in their village.

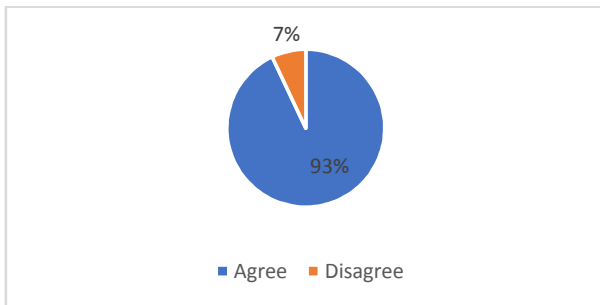


Fig.6 Percentage of respondents who agree or disagree with the opinion that waste management is the responsibility of the government

As explained above, the public's opinion that the government is responsible for waste management cannot be separated from the behavior of the people who choose the "free rider" strategy in dealing with waste. This behavior is rooted in the fact that a clean environment has the character of a public good. As explained above, there is no incentive for the community to cooperate in managing waste in order to create a clean environment. Because once the environment is clean from garbage, everyone can enjoy a clean environment

regardless of whether or not there is contribution in cleaning it from garbage.

**B. Government Involvement in Waste Management.**

As elsewhere in Simalungun Regency, the government through the local Environment and Sanitation Service (DLHK) carries out its responsibilities in local waste management to maintain environmental cleanliness, prevent flooding due to accumulation of waste in ditches/ravines and small rivers and prevent piles of garbage from becoming a breeding ground for infectious diseases. As is generally done in various regions, in Simalungun Regency, waste management is carried out using the PAB approach. This approach relies on government facilities (vehicles) and government-paid cleaning workers. Usually the community contributes in the form of payment for "cleaning money" which is used as an incentive for the cleaning staff involved.

It seems that the government is facing various obstacles in overcoming the waste problem in Tigaras Village. Almost all respondents (95.3%) said that not all of the waste generated in Tigaras Village was transported by cleaning staff (Fig. 7). As explained above, this uncollected waste has to be burned or thrown into ditches/streams. This condition is very concerning considering the fact that Tigaras Village is included in the Lake Toba International Tourism Area and is one of the ferry ports connecting Simanindo (Samosir Island) and Tigaras (Sumatra Island). In order not to damage the image of Lake Toba which is being built as an international tourism area, the government should immediately address this waste problem.

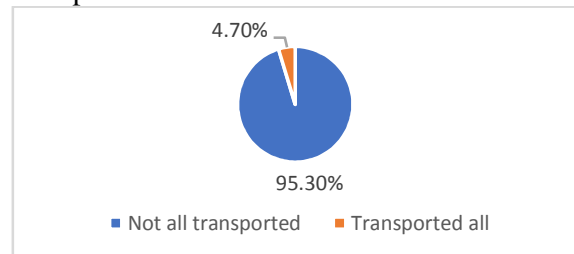


Fig. 7 Percentage of respondents according to the assessment of waste transportation by cleaning staff

The interviews with the respondents revealed various obstacles and problems faced by the government in handling waste in the research villages. One of them is the limited availability of activity support facilities such as transport vehicles and officers.

This has an impact on the frequency of waste transportation and irregular transportation schedules. Only a few respondents (7%) said that the transportation schedule was regular, namely once a week, while others said the transportation schedule was irregular (Fig. 8).

It's not very clear what causes this problem. However, it should be realized that the provision of facilities and their maintenance are closely related to the availability of the government budget. The possibility of budget constraints is an important factor behind the limitations of this facility.

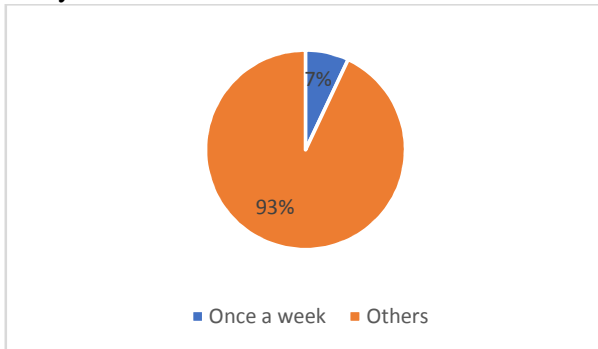


Fig. 8 Percentage of respondents according to an assessment of the garbage transport schedule in Tigaras Village

Giving incentives by the community whose household waste is transported by officers can motivate them to work harder so that the waste management performance is even greater in the village. For that trash money for each garbage collection. However, the community is not very motivated to provide these incentives even though the value is less than IDR 10,000 per transport per household. Most of the respondents (72.1%) of them said that this contribution was too expensive for them (Fig. 9).

It is not surprising that most of the respondents refused to pay, saying it was too expensive for them. The problem is, as explained above, they think that waste management is not their

responsibility, but the government's. This means that they should not pay dues even though they themselves produce the waste. The problem is that those who do not want to pay the dues will not be picked up by the cleaning staff because the fees are "mandatory". If the garbage is picked up by the cleaning staff, the owner has to pay. If many do not want to pay, then a lot of waste will not be collected.

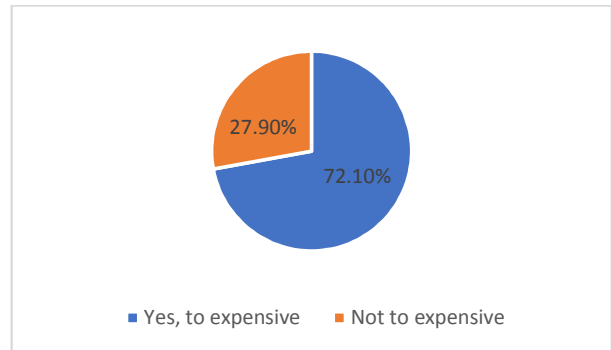


Fig. 9 Percentage of respondents according to their assessment of current waste fees.

Community response and support for community-based waste management. As explained above, waste can be turned into valuable goods through the process of sorting and processing into various valuable products such as organic fertilizers. The proceeds from the sale become income for those involved in sorting and processing it. This processing is carried out by residents who form a waste processing community.

By transforming waste as a product with commercial value through the process of processing and sorting waste, which was previously "public bad" has now turned into commercial goods whose ownership is exclusive to residents who are directly involved in processing it so that it becomes a product that can be traded. The results of the sales become income for the processors. This income becomes an incentive for them to get involved in the processing.

It turns out that the respondents are responsive to the income they might get from the waste processing and segregation mentioned above.

Almost all respondents (97.7%) agree that the community-based waste management method is applied in Tigaras Village (Figure 10). This means that the government no longer needs to be directly involved in waste management in this village. The management is left to a group of people who will process and sort it into products with commercial value. The most potential candidate to carry out the activity is the Tourism Awareness Group (Pokdarwis) which has been formed in this village.

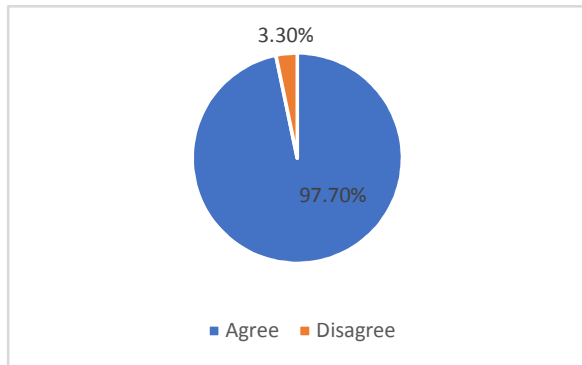


Fig. 10 Percentage of respondents based on the application of community-based waste management

As explained above, community-based waste processing will produce positive externalities in the form of a clean environment, free from the threat of flooding and infectious diseases. The positive externalities generated by this waste processing activity will be enjoyed by the community for free. In order for the producers to be more "enthusiastic" in producing these positive externalities, the government should provide monetary subsidies to the waste processing community as compensation for the benefits enjoyed by the community from the waste-free environment. All respondents (100%) supported the provision of compensation to the processing community for these positive externalities (Fig. 11). According to them, the subsidy will make waste processors more enthusiastic in carrying out waste management so that Tigaras Village is free of waste.

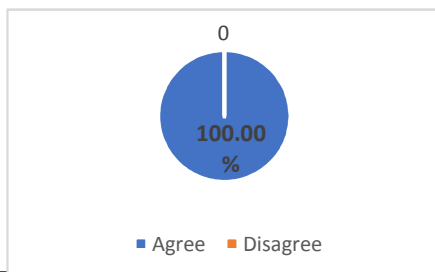


Fig. 11 Percentage of respondents based on their support for providing subsidies to wasteprocessing groups as compensation for the positive externalities enjoyed by the community because the environment is free from waste

Waste segregation is the beginning of the waste processing process and the success of processors in turning waste into commercial products is determined by adherence to the sorting process. Sorting should be done at the household level, which is where the waste will be processed by the waste processing community. Almost all respondents (93%) agree that the government provides monetary incentives to households to encourage them to sort waste at their homes before handing it over to community-based waste processing groups.

Besides being more effective in cleaning the environment from waste and reducing the unemployment rate in the community, there are various other benefits to be gained from the implementation of community-based waste management. The majority of respondents (76.7%) thought that one of the other important benefits was educating the public to be aware of environmental conservation and willing to work with fellow citizens to protect it (Fig. 12).

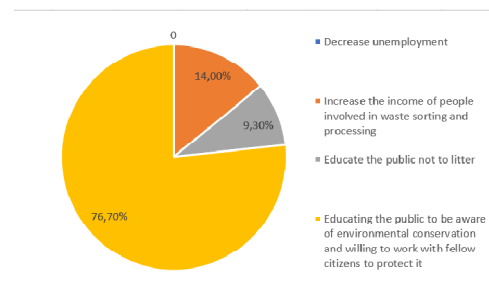


Fig. 12 Percentage of respondents according to other important benefits of implementing community-based waste management

The willingness of the community to support and carry out waste management independently by implementing community-based waste processing and also with the government's

willingness to provide financial support does not mean that community-based waste management will soon be realized so that Tigaras Village will soon be free of waste. Processing waste into commercial products is not an easy job. This activity requires special skills for each commercial product to be produced. To generate money and income, these products must be sold to the people who need them. This requires expertise in marketing.

The two types of skills mentioned above are not necessarily owned by prospective members of the waste processing group. To get the skills need training and coaching for group members. The government's role is a mainstay in the training and coaching of these groups.

One more thing that is needed is equipment and other facilities in the implementation of processing and marketing activities. The government has a strategic role in providing it. As is the case in training and coaching, in providing equipment and supporting facilities for waste processing the government can collaborate with related institutions such as commercial companies in the vicinity of the site and also with universities.

## VI. CONCLUSIONS

Not only is the problem of water pollution in Lake Toba, but also the problem of environmental cleanliness from garbage is an urgent challenge to be overcome to make this area comfortable for visiting tourists. The results of research in Tigaras Village, Simalungun Regency, show that the waste management that has been carried out so far has not been effective in dealing with waste, which is the main source of local households. There are two contributing factors. In addition to the problem of budget constraints, the management of waste that has been carried out by the government in this village has not received support from local households, even though they are actually the main source of waste that is scattered in their village, because they consider waste management to be the responsibility of the government.

The application of community-based waste management that processes and sorts waste into commercial products will be effective in creating a waste-free environment in this village because it directly involves households which are the main source of the waste. The local community supports it because it will provide additional income for residents involved in processing and marketing the products they produce. Apart from selling processed products, they are expected to receive compensation money from the government for positive externalities (mainly environmental conditions that are clean from waste) that are enjoyed by the community.

To realize this community-based waste management, the government needs to provide various material and non-material supports, such as training on waste management and marketing of the results, capital, processing and marketing facilities and institutional development. In this case, the government needs to involve private companies in its administrative area.

## ACKNOWLEDGMENT

This activity is part of the Homecoming Lecturer Program organized by Institute of Research and Community Empowerment Bogor Agricultural University (LPPM IPB) and International Tourism and Fisheries Conflict Resolution Research funded by the LPDP-Ministry of Finance and also Department of Fisheries and Maritime Affairs of North Sumatra Province. Thanks are conveyed to LPPM IPB, the LPDP-Ministry of Finance and the Government of North Sumatera.

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