Waste management model in the residential environment of the Bajo Tribe, Torokeku Village, South Konawe Regency, Southeast Sulawesi Province

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Abstract. Household waste is an environmental problem that has not been resolved properly. The problem of water environmental pollution, the emergence of various diseases, decreased production of fisheries products and a dirty environment can be symbols of poverty and underdevelopment. This study aims to obtain an overview of waste management in the coastal area of the Bajo ethnic settlement of Torokeku Village, to inventory the problems in the waste management system and to provide recommendations for optimizing the waste management system independently and sustainably based on coastal communities. The research was conducted using descriptive qualitative analysis methods in Torokeku Village, Tinanggea District from June to August 2020. Collecting data through structured interview techniques and observations. The results obtained by public awareness are still relatively low, lack of information and knowledge about the impact of environmental problems, there are no real examples that can be used as a reference in managing waste, and the government is less firm in addressing environmental problems. The waste management model formed is Utilizing waste to increase fishery business production by using the 3R principle (Reduce, Reuse, Recycle), optimizing community empowerment activities directly to the target group.

1. Introduction
Garbage is still considered a contributor to problems, especially in the environmental and social fields. This is because waste has a direct and indirect impact on people's lives. The existence of garbage cannot be avoided because garbage exists because there is community life in a place. All community activities always cause waste. The existence of this waste is not only the responsibility of the local government but the whole community to process waste so that it does not have a negative impact on the surrounding environment [1]. Environmental quality improvement consists of various aspects, one of the most influential aspect is the aspect of waste management in residential areas [2]. An increase in the amount of waste that is not balanced with environmentally friendly management will cause environmental destruction and pollution [3]. The main waste is mostly generated from household waste. The production
of household waste in residential areas is increasing day by day. The community in the Bajo ethnic settlement in Torokeku Village has a similar feeling. The bad habits of society's behavior exacerbate this condition. The awareness to keep the environment clean is minimal. The seas and beaches are turned into giant trash bins for disposing of trash.

In fact, the coastal area is a potential productive natural resource, both living and non-living. Various naturally occurring ecosystems consisting of subsystems of land and coastal waters are interrelated [4]. On the coast of Torokeku Village, the lack of awareness of the importance of maintaining a clean environment can be seen from the garbage scattered along the roads, yards of residents' houses or even floating at sea, as in Figure 1 below:

![Figure 1. Environmental conditions around the house yard of the Bajo tribe in Torokeku Village (source: Researcher's documentation, 2020)](image)

Household waste is one of the environmental problems that has not been resolved properly. The problem of water environmental pollution, the emergence of various diseases, decreased production of fishery products and a dirty environment can be symbols of poverty and underdevelopment. This is because in the end it will have an impact on the economy and public health [5]. In line with the research results of [6], it is stated that one of the main priorities that need to be considered in the development of the local economic sector in coastal areas is the provision of trash cans either centrally in a public place or in every household. This study aims to: (1) Obtain an overview of waste management in the coastal area of Torokeku Village, (2) to inventory the problems in the waste management system in the coastal area of Torokeku Village, (3) to provide recommendations for optimizing community-based independent and sustainable waste management systems coastal waste management model through 3R-based waste and waste management. Furthermore, this research is expected to provide an overview of the empowerment of coastal communities in waste management and can be used as an alternative in solving solid waste problems in coastal areas.

2. Research Methods
This research was conducted from July to August 2020 in Torokeku Village, Tinanggea District, Konawe Selatan Regency. The research was conducted using a descriptive qualitative analysis method approach, with the aim of describing or describing a variable, state or certain social phenomenon. This method is used to analyze the condition of coastal communities, awareness of coastal communities in waste management, knowledge and skills of coastal communities in waste management, community empowerment in independent waste management and efforts to increase empowerment of coastal communities in independent waste management.

Data collection was carried out through observation, namely by directly observing and recording and documenting the symptoms found in the field. In addition, data collection was also carried out using
structured interview techniques, namely by asking questions directly to 5 people around Torokeku Village.

3. Results and Discussion

3.1. Waste management in the coastal area of Torokeku Village

Torokeku Village is one of the coastal / seaside villages located in the administrative area of Tinanggea District, Konawe Selatan Regency, Southeast Sulawesi. The majority of the population of Torokeku Village is the Bajo tribe who have a livelihood as fishermen and fish farmers (seaweed cultivators). The total population is recorded at 1,050 people, consisting of 521 men and 529 women, with a total of 212 households [7].

The special characteristic of the settlements in Torokeku Village is that almost 90% of the houses are built with semi-permanent stilt houses that stand above sea level. Problems in the environmental sector are the presence of household domestic waste (detergent, food processing, feces), as well as plastic waste and the like (stereoform), which is directly disposed of into the sea, without any sorting or pre-processing before being discharged into the sea, which causes physical, chemical and microbial pollution, which of course will be able to enter the life chain of fish organisms and will also contaminate humans who consume them. From the observations, most of the local residents still litter. The level of local community awareness of waste management is still very low. This can be seen from not all houses in Torokeku Village to have trash cans, as for those who have trash cans in the yard they are not properly functioning, and when the trash is full, the garbage is immediately thrown into the sea. Sometimes garbage piles up somewhere. So that it causes the gathering of various animals such as mice, flies and other disease-carrying animals. Most residents do not know and do not think about the impact of throwing garbage into the sea. This includes disposing of WC (Water Closed) waste in the form of human waste directly into the sea. The condition of "natural toilets" is still experienced by most residents of Torokeku Village. One of the real impacts that has occurred is the use of polluted sea water which is used to wash fish, seaweed and other marine products. The impact that is felt most over time due to the behavior of throwing garbage and dirt into the sea is the decline in the quality of seaweed cultivated around the waters of Torokeku Village and causing the fishing area to be further away, causing an economic impact on fishermen. Based on the results of direct interviews with village leaders, the waste management activity that some residents who still pay attention to the environment want is waste management activities that can simultaneously generate money or provide direct benefits for them. At the same time, you can fill the spare time while waiting for the seaweed harvest or in the low season for fish catches.

3.2. Problems in the waste management system in the bajo tribe settlement in torokeku village

Based on the identification results in the field, there are three main problems in the waste management system in the coastal areas of Torokeku Village, including: (1) Lack of adequate waste disposal facilities, including disposal of waste from toilets (2) Weak or limited support or participation of local communities, (3) The realization of the environmental management program as a local government program has not been going well.

3.3. Lack of adequate waste disposal facilities, both temporary garbage dumps and garbage transporters and collectors.

The implementation of community-based independent waste management in the coastal area of Torokeku Village is not supported by the existence of supporting facilities and infrastructure. No adequate bins are available. This is further exacerbated by the absence of transportation facilities and infrastructure that can transport community waste. This condition is due to the condition of the roads or the difficult access to and from Torokeku Village because the condition of this village is above the seafront, if the tide is high, this village becomes a floating village. From the research team's monitoring, not a single TPS (Temporary Disposal Site) is available in Torokeku Village. This further strengthens
the community's reason for choosing the sea as a trash can. Another thing that is equally troubling is that most of the Bajo people in Torokeku Village immediately dump their waste or toilet waste into the sea. This is because there is no awareness of the impacts and dangers of sea water pollution for them. So that most residents do not have the initiative to make adequate WC channels. Sewage disposal from toilets is not a priority for them.

3.4. Weak or limited local community support or participation
Like the Bajo tribe in general, the people of Torokeku Village also rely heavily on the sea as a place to find life. Most of the time of the day is spent at sea. This activity is in the form of fishing in the sea which is mostly carried out by men or husbands, and the activity of cultivating seaweed along the coastal waters of Torokeku Village, which is carried out with both men and women (wives). The role of women in seaweed cultivation activities is actually more on land in the form of cleaning the seaweed that has been harvested, installing seaweed seeds on the rope where the seaweed grows, drying and packing the seaweed to be sold to collectors. This activity takes place almost every day, so that most of the community ignores environmental problems. Most of the time is spent on activities that are thought to generate direct money. This is one of the reasons for the lack of support and participation of the local community for waste management and waste that comes from their own daily activities.

3.5. The realization of the environmental management program as a government program has not been going well.
Government support in general environmental management in South Konawe Regency already exists. However, the program has not yet fully reached the areas with conditions such as in Torokeku Village. This can be seen through regional regulations Number 19 of 2013 concerning the Regional Spatial Plan of Konawe Selatan Regency for 2013-2033 [8]. There is in paragraph 4 about the environmental management infrastructure system which regulates the solid waste network system. This regulation has not been well implemented for areas directly connected to the sea or areas that are located some distance from the main road. In addition, communication is the key to implementing good governance within the framework of integrated coastal area management, in this case waste management based on coastal communities.

From the results of interviews with several community leaders in Torokeku Village, it is very difficult to change the behavior of residents' lives, especially if the attitude of the government is not active in dealing with this problem. They are even pessimistic about changes in local communities in waste management and toilet waste. This is because there have been government programs related to waste management, but they have not been able to change the behavior of the local community a little in disposing and processing waste.

3.6. Recommendations for an independent waste management system based on the torokeku village community using the 3r principle (reduce, reuse, recycle)
Community-based independent waste management is a strategic approach to the community so that they want to change their behavior in disposing and managing waste. It takes a strategic handling of garbage management [9]. The independent waste management strategy that is introduced must be able to adapt or adapt to the survival of coastal communities [5]. Attitude towards environmental cleanliness is someone's attitude based on their perspective or understanding of environmental cleanliness. People who are positive about the cleanliness of their environment will see cleanliness as something that is useful to strive for and protect. On the other hand, people who have a negative attitude towards these objects will see the object as something useful and not useful and do not need to be held and protected [10]. The implementation of character education caring for the environment in the 3R concept (Reduce, Reuse, Recycle) needs to be done. Reduce can be interpreted as a daily attitude in reducing waste, for example limiting paper use by switching to digital. Furthermore, Reuse (reuse) means reusing used goods without processing them first. Recycle can be interpreted as processing it into other useful
materials, for example recycling waste into crafts or compost [11]. This is in accordance with the opinion [4] that waste has an advantage, namely the efficiency of waste into forms new, more useful.

As has been stated, establishing communication is the main key to be accepted by a community, especially in dealing with the Bajo tribe. When we communicate, we try to share information, ideas or attitudes. Because the communication goals to be achieved are the source, message and purpose [12]. Basically, the culture adopted by a community group is very unique. Language, how to eat, how to dress, how to be polite, the moral standards of one community are different from the moral standards of other communities. The differences are indeed contradictory, but the historical reality shows that there is a sharing of culture that can accept and understand each other's differences [13]. Through the Village Consultative Body (BPD), communication with the Bajo ethnic community in Torokeku Village has been running well. At least outside information can be conveyed. However, there is still need for support from outside parties who are more relevant in delivering programs to protect the environment, the behavior of not throwing garbage into the sea and so on. Apart from the BPD, there are other village officials, namely the hamlet head who are expected to help manage waste independently. Participation in community-based waste management is a high-level participation because it is based on decisions made by the local community (bottom-up), where community involvement in waste management is encouraged by determination and awareness of the implications [14].

In addition, it is also necessary to regulate the waste processing system and the provision of waste management facilities and infrastructure. Therefore, assistance is needed in every empowerment program. Based on the approach made through proper communication, it is known that the people of Torokeku Village are actually interested and willing to process waste, but this activity can also generate money or at least can provide added value. Therefore, the waste and waste management model in Torokeku Village is carried out through mentoring activities in empowerment programs that can be carried out either through the government, universities and non-governmental organizations. The household waste management model, including waste originating from toilets, has been introduced and is currently being implemented by the people of Torokeku Village by continuing to use the 3R principle (Reduse, Reuse, Recycle). The 3R principle is a paradigmatic solution. The application of the waste management model with the 3R principle currently being implemented by the Bajo tribe in Torokeku Village includes:

3.7. Defecation waste management in the waters around the residence of the Bajo tribe in Torokeku Village
There is a resident's house as a pilot in using Tripicon technology. Tripicon is a household sanitation technology for houses with a stilt model, as in other houses in Torokeku Village. Tripicon technology in the form of a septic tank or large waste water collection device (BAB) equipped with a proven and tested sand filter can reduce the number of microorganisms in household wastewater [15]. So that the use of tripicons can reduce waste in the waters. The working principle of the tripicon also contains 3R elements, which can reduce sea water pollution from defecate waste, can be reused and even repeatedly and can recycle defecation into compost. However, the utilization of recycling for now cannot be implemented. An example of the use of a Tripicon on stilt houses of the Bajo tribe in Torokeku Village is shown in Figure 2 below.

3.8. Plastic waste management
Plastic waste is processed into ecobricks. Ecobrick is a solution for utilizing plastic waste. Ecobricks are used plastic bottles containing all kinds of used plastic, clean and dry, and reach a certain density. Plastic waste is collected, then separated according to its type, cleaned and dried. The work of collecting, cleaning and drying plastic waste is mostly done by children, while the work of making ecobricks is done by teenagers, both boys and girls.

Plastic waste is a big concern for environmentalists, especially for the aquatic or marine environment. Plastic waste that is thrown directly into the sea by the people of Torokeku Village has a very bad impact, among others, it can cause the death of marine organisms and the discovery of a lot of microplastics in
the stomach of fish which in turn has an impact on the health of humans who consume it. Through the waste management model with the 3 R principle, the ecobrick making program can reduce plastic waste and can be used for all kinds of purposes such as replacing walls and making parks. In this program, the community, especially children, looks more active in collecting and separating plastic waste. Meanwhile, paint cans, used films, radioactive substances and toxic substances require special handling [15].

![Image](source: Researcher's documentation, 2020)

**Figure 2.** Use of a Tripicon on stilt houses of the Bajo tribe in Torokeku Village (source: Researcher's documentation, 2020)

3.9. Management of household waste (organic waste)
Household waste is trash that comes from kitchen scraps. The waste is in the form of vegetable waste and food scraps. The people of Torokeku Village, in this case housewives, no longer dispose of the rest of their kitchen waste, but rather the household waste is collected and then used as food for maggot caterpillars, which are currently also being cultivated by the people of Torokeku Village. This maggot caterpillar then becomes a highly nutritious natural feed for cultivated fish and can also be used as poultry feed (chickens and ducks). Processing of household waste or organic waste from vegetable scraps is shown in Figure 3 below:

![Image](a) ![Image](b)

**Figure 3.** Household waste processing process; (a) Fermentation process to produce maggot caterpillars, (b) House waste from leftover vegetables used as maggot caterpillar food.

Through a coastal community-based management model using the 3R principle as contained in the waste management application above, it is hoped that it can be the right solution in overcoming the problem of waste or waste for the Bajo tribe community in Torokeku Village, besides that it can provide added value both from an economic perspective, social also in terms of health.
4. Conclusion
The behavior of the people of Torokeku Village, who mostly come from the Bajo tribe, in managing the waste produced has a negative impact on the environment. This is because the sea is still used as trash for them. The awareness to throw garbage in its place is minimal. This is because it is influenced by hereditary habits and the unavailability of facilities to manage the waste. Through a community-based waste and waste management model for coastal areas in Torokeku Village, which is carried out through assistance activities in community empowerment programs. This assistance activity can be carried out either through the government, universities or non-governmental organizations. The household waste management model (organic and inorganic), including waste originating from toilets, was introduced and is currently being implemented by the people of Torokeku Village, namely still using the 3R principle (Reduse, Reuse, Recycle). With this kind of waste management model, it is hoped that it can solve the waste problem in the coastal area of the Bajo tribe settlement in Torokeku Village and provide added value both economically, socially and to overcome health problems.

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