Evaluation Of Waste Management Policy In Talumelito Landfill, Gorontalo Province, Indonesia

ABSTRACT

Indonesia has been facing problems related to the environment, especially the accumulation of waste. The number of problems in management activities and policy implementation is one of the factors. This study aims to determine and describe the effectiveness, efficiency, adequacy, equity, responsiveness and accuracy of waste management at the Talumelito landfill in Gorontalo Province. This research was conducted in June-September 2024 using a method with triangulation data collection techniques through interviews, documentation and observations. Data analysis was carried out by referring to the opinion of Miles and Huberman, namely data reduction, data display and conclusions. The results showed that waste management is less effective and efficient due to the lack of waste sorters, lack of fuel, not maintained heavy equipment, limited personnel and supervisors causing the desired goals not to be achieved, besides that the lack of budget allocation causes an imbalance between and the increasing amount of community waste and the resulting output. In terms of adequacy and equity, it is considered insufficient, because the availability of an insufficient operational budget requires Talumelito Landfill to reduce the frequency of sanitary landfill waste management which can have a negative impact in the long run, community involvement as partners and efforts to increase employment and improve the economy have not been able to overcome existing problems. In terms of responsiveness, it shows that Talumelito Landfill has been responsive in responding to community complaints by following up on every complaint and facilitating community complaints and suggestions. In terms of accuracy, it shows that the waste management policy at Talumelito Landfill is not optimal because the existing policies have not been able to encourage community participation and the results of waste management at Talumelito Landfill as a whole have not provided significant benefits to the community.

Keywords: [Evaluation, Policy, Waste Management, Talumelito Landfill, Gorontalo Province}

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1. INTRODUCTION

[Waste management plays an important role in creating a safe and healthy environment. Population growth and people's consumptive behaviour, such as the use of disposable goods, cause the volume of waste to increase uncontrollably. This has become one of the main causes of environmental problems in almost all regions [1].

Waste management in Indonesia is becoming an increasingly relevant issue due to the high population growth and the increasing amount of waste produced. Law No. 18/2008 on Waste Management states that waste has become a national problem so that its management needs to be carried out comprehensively from upstream to downstream. This approach aims to provide economic benefits, improve public health, preserve the environment, and change people's behaviour.

Waste management techniques applied today are considered not in accordance with applicable policies, not environmentally sound, and even have a negative impact on environmental and public health. Gorontalo Province also faces similar problems. As a handling step, in 2007, the Gorontalo Provincial Government built the Talumelito Regional

Landfill (TPA) in Talumelito Village, TelagaBiru District, Gorontalo Regency. This landfill started operating in 2010 and uses a sanitary landfill system. Regional policy, Gorontalo Province has regulated waste management through Gorontalo Province Regional Regulation Number 3 of 2013 concerning Waste Management as well as Governor Regulation Number 22 of 2016 concerning the Operational UPT of Talumelito Waste Final Processing Site, including operational costs and environmental impact management.

Table 1. Target and Realisation of the Amount of Waste Processed at Talumelito Landfill from 2019 to 2023

Year	In 2019	In 2020	In 2021	In2022	In 2023
Target Waste processed	22.800 Ton	23.880 Ton	24.880 Ton	25.880 Ton	30.000 Ton
Realisation	33.144 Ton	35.668 Ton	35.198 Ton	37.016 Ton	34.865 Ton

Source: PUPR Agency Work Plan 2023 and PUPR-PKP Agency Work Plan 2024.

The volume of waste entering the Talumelito landfill every year continues to increase significantly and is difficult to control. One of the contributing factors is that the waste entering the landfill is not only residual waste, but also waste that should be recycled. This causes waste management in landfills to potentially fail, especially if the amount of waste managed is too large or if the recycling process is not carried out optimally [2]. In addition, the increase in waste volume has an impact on the amount of budget that must be provided by the government for management. If waste management is not in accordance with the prevailing policy, the government often has to allocate additional budget beyond the previously set target. Therefore, both central and local governments must pay serious attention to this problem by implementing standardised and sustainable waste management [3].

Waste management that is not optimal also triggers public unrest, especially due to environmental pollution that affects soil, water and air. Waste that is not managed properly can cause damage to the ecosystem and threaten the health of the community around the landfill area. Based on these conditions, this study aims to determine and describe the effectiveness, efficiency, adequacy, equity, responsiveness, and accuracy of waste management in Talumelito Landfill, Gorontalo Province.]

2. MATERIAL AND METHODS

[**2.1Time and Place of Research**
This research was conducted in June-August 2024, at the UPTD TPA Talumelito, which is a Technical Implementation Unit at the Public Works, Spatial Planning, Housing and Urban Areas Office of Gorontalo Province.

2.2 Research Approach, Method and Design

Waste management policy evaluation research at the Talumelito landfill in Gorontalo Province will use a qualitative approach because this research requires a deep understanding based on the phenomena that occur [4]. Evaluation activities do not only require data or information about the final results, but also the implementation process and what happens in the process [5]. The results of the approach taken will be presented in a narrative manner to elaborate on a case in a more in-depth/comprehensive manner, and to find trends and directions in the development of a case.

The research will use qualitative methods based on the philosophy of postpositivism or interpretative which is a naturalistic qualitative research method whose process is inductive. Qualitative methodology will produce descriptive data in the form of written or spoken words from people and behaviour that can be observed. The data collected is then connected because it can get conclusions, the research design ensures the integration and direction of the clarity of a study [6]. This research uses formative and summative evaluation models as follows:

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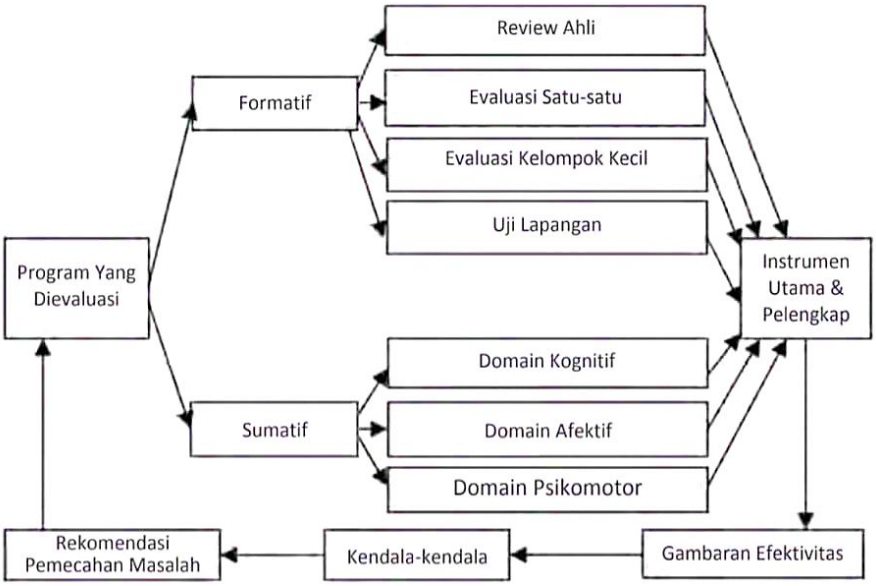

Figure 1. Formative-Summative Model Evaluation Design [5].

2.3 Data Collection Techniques and Procedures

The data used in this study are Primary Data and Secondary Data. Primary data is data obtained by researchers directly from the object under study and secondary data is data obtained from documents, publications that are already in finished form (7). Primary data is obtained through interviews with informants using an instrument in the form of questions related to the concept and focus of the research. Informants in this study were taken from various parties who were considered to have involvement and knowledge related to the research theme including the Head of UPTD TPA Talumelito, Head of Operations and Maintenance Section of Talumelito TPA Installation, Head of Administration of Talumelito TPA, JF. Planning of PUPR-PKP Office, JF. Planning Provincial Bapperda, Talumelito Landfill Staff, Elements of Talumelito Landfill Users, and the community. the total number of informants is 19 people. While secondary data were obtained from planning documents, monthly and annual recap of incoming waste volume, waste retribution, types of incoming waste and other supporting data.

This research study uses the Triangulation data collection technique. This data collection technique combines various data collection techniques and data sources that already exist, so that more consistent, complete and definite data is obtained. In this study, using two types of data collection techniques through Triangulation, namely Triangulation Techniques and Triangulation Sources.

2.4 Data Analysis Technique

The data that has been obtained from interviews, field notes and documentation, will then be subjected to data analysis, by organising data into categories, translating it into units, synthesising it, synthesising it into patterns, selecting which ones are important and which ones will be studied, and making conclusions so that they are easily understood by oneself and others. Qualitative data analysis techniques are carried out in stages, starting from Data Reduction, Data Display and Conclusion [7].]

3. RESULTS AND DISCUSSION

[**3.1Waste Management**

Waste management is not a new problem and is almost a problem in all regions. Landfill is one of the important facilities that can solve waste problems from many other facilities. The final processing site (TPA) of waste, based on Law Number 18 of 2008 concerning Waste Management, is a place to process and return waste to the environmental media in a safe manner for humans and the environment [8]. Landfill is often considered as the only solution in handling waste. Whereas basically disposing of waste in landfills is not a solution to handling waste if in a waste emergency [9]. If landfill is used as the only solution to waste management, the problem of waste management and handling will gradually become uncontrollable.

3.2 Evaluation of Waste Management Policy

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3.2.1Effectiveness

The Talumelito landfill functions to solve waste problems in 3 regencies/cities, namely Gorontalo City, Gorontalo Regency and Bone Bolango Regency. Talumelito Landfill operations are carried out based on Planning and Operational SOPs prepared based on Law Number 18 of 2018 concerning Waste Management and Gorontalo Governor Regulation Number 22 of 2016 concerning Operations of the Talumelito Waste Final Processing Site Technical Implementation Unit, Charges for Operational Costs and Environmental Impacts. Waste management at the Talumelito landfill faces various operational challenges, despite basically following the applicable Standard Operating Procedures (SOPs).

The first and most frequent problem at Talumelito Landfill is the shortage of fuel oil for the daily operation of heavy equipment such as excavators and dozers for landfilling and compaction of waste. Landfilling and compaction that is not in accordance with the SOP can cause waste to accumulate irregularly, the volume of waste space in the landfill increases faster and has an impact on environmental pollution. Waste is a contributor to GHG emissions after deforestation, transport and energy. Open piles of waste have the potential to increase greenhouse gas emissions and methane gas from organic decomposition [10]. Large piles of waste have the potential to produce gases that are harmful to health and the environment [11].

High rainfall is a major challenge in waste management at Talumelito landfill. Saturated soil causes easy erosion and can result in empty spaces in the waste pile, which risks accelerating leachate production. Leachate coming from the landfill is difficult to control even with strong protection. A poorly managed landfill can have an even worse impact on the surrounding environment, especially due to leachate movement [1].

The Talumelito landfill is supposed to function as a landfill that specifically accepts residual waste. But in reality, there is still a lot of non-residual waste coming in. The incoming non-residual waste can affect environmental performance and health. In addition to external problems, there are internal problems faced by the Talumelito landfill, one of which is the lack of waste sorting personnel.

Based on the problems that the biggest problem currently facing the Talumelito Landfill is that the RPJPN Planning Document for 2025-2045 has confirmed that there are no more plans for the construction of Waste Processing sites such as landfills. This brings a major shift in the paradigm of waste management in Gorontalo Province, from relying on landfilling to a more sustainable and modern approach. An increase in the amount of waste production that is inversely proportional to the availability of waste management facilities will result in disturbances to the existing environment [12].

Based on how effectiveness is measured, various obstacles in waste management at the Talumelito landfill indicate that waste management has not been effective because overall it does not achieve the success of achieving goals, objectives, programmes [13]. Effectiveness can be interpreted as the level of success that achieves goals or objectives. Target in the sense that it is aimed at the desired condition or state [14].

3.2.2 Efficiency

Production efficiency in waste management at Talumelito landfill is closely related to how optimal the budget is allocated each year. There needs to be a balance between the costs required in achieving certain outputs [15]. The budget allocated to waste management is considered not proportional to the amount of waste that continues to increase every year. As well as the increase and decrease in the budget, the gap between the budget spent and the results of waste management levies has an impact on low production efficiency.

The budget allocation for Talumelito Landfill tends to be unstable, this is known based on the data obtained. It is known that there is a very drastic decrease and increase in the budget from year to year. In the end, it has an impact on the operational implementation of the waste management programme. In an effort to improve the efficiency of waste management production at the Talumelito landfill, there is a need for innovation and the application of renewable technology. Innovation and technology are expected to be able to optimise the waste management process so that it can produce better output than what is currently available. Waste Power Plant (PLTSa), leachate management, waste recycling using more sophisticated technology, waste management reform, RDF technology and landfill mining are innovation models that can be selected.

The limited budget of the Gorontalo Provincial Government is a major obstacle in efforts to improve the efficiency of existing waste management policies. In the future, the Gorontalo Provincial Government needs to review the current waste management problems and include them in regional development planning documents. Development planning is a collection of policies and development programmes to stimulate the public and private sector to use available resources more productively [16].

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Talumelito Landfill is one of the Regional Technical Implementation Units that plays a role in increasing the Regional Original Revenue of Gorontalo Province through waste retribution. Although in fact it is known that the budget required in waste management ranging from employee wages, operation and maintenance of heavy equipment, provision of facilities and infrastructure, exceeds the PAD obtained. The current condition of waste management would be better if the amount of waste entering the Talumelito landfill can be reduced even though it will slightly affect the PAD of Gorontalo Province, rather than continuing to increase the amount of waste.

Table 2 List of Waste Volume in Gorontalo City Region that Goes to Talumelito Landfill from January to September 2024

NO	Moun	VOLUME (TON)	TARIFF (Rp)		Summary (Rp)		TOTAL
			KJP	KDN	KJP	KDN	
1	Januari	2.219,020	47.511	7.127	105.427.859	15.814.956	Rp121.242.814.760
2	Februari	1.927,681	47.511	7.127	91.586.052	13.738.582	Rp105.324.634.480
3	Maret	2.281,808	47.511	7.127	108.410.980	16.262.446	Rp124.673.425.500
4	April	2.094,715	47.511	7.127	99.522.004	14.929.034	Rp114.451.038.170
5	Mei	2.115,535	47.511	7.127	100.511.183	15.077.418	Rp115.588.601.330
6	Juni	2.112,143	47.511	7.127	100.350.026	15.053.243	Rp115.403.269.230
7	Juli	2.698,450	47.511	7.127	128.206.058	19.231.853	Rp147.437.911.100
8	Agustus	2.214,681	47.511	7.127	105.221.709	15.784.031	Rp121.005.740.480
9	September	1.148,079	47.511	7.127	54.546.381	8.182.359	Rp62.728.740.400
TOTAL		**18.812,11**			**893.782.253**	**134.073.922**	**Rp1.027.856.175.460**

Source: Waste Recap UPTD TPA Talumelito, 2024

Table 2. shows that the volume of waste from Gorontalo City every month tends to be stable with an average of 2000 tonnes per month, except in February which has fewer days than other months and September which has not been fully recapitulated. Meanwhile, the highest waste volume was in July, which reached 2,698.450 tonnes with a total retribution of Rp 147,437,911,100. The increase in waste volume and waste retribution in July was the result of floods that hit Gorontalo Province. Suppressing the amount of waste that enters or is delivered to the landfill can be done with waste management innovations, one of which is the waste sorting method. waste sorting can significantly reduce the amount of waste in the city, because the sorted material can be used as recycled material [17].

Based on the results obtained, it is known that waste management at Talumelito landfill faces several challenges related to production, allocation, and fiscal efficiency. Although the budget for waste management fluctuates from year to year, the cost required is often not proportional to the amount of waste managed. Innovations such as Waste Power Plant (PLTSa), leachate management technology, recycling technology and waste segregation can support the economy to improve operational efficiency, but until now it is still hampered by budget constraints. Regarding fiscal efficiency, revenue from waste retribution is still low compared to operational costs, and there is a plan to revise the retribution rate to be in accordance with applicable regulations. However, the success of waste management in Talumelito landfill is highly dependent on proper budget allocation and innovative technology utilization.

3.2.3 Sufficiency

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Waste management at Talumelito Landfill faces major challenges, especially when the budget allocation received is insufficient for operational needs. Nevertheless, Talumelito Landfill is committed to providing maximum performance. Budget limitations require UPTD TPA Talumelito to be able to adapt to budget availability. Budget limitations affect various operational aspects, including the implementation of the sanitary landfill SOP. In the last two years the problem of fuel shortages for heavy equipment has been successfully overcome, although the sanitary landfill SOP is not fully implemented. Backfilling and compaction of waste is not done with the frequency it should be to reduce the operational burden of heavy equipment. Although this adjustment did not cause any adverse impacts in the short term, waste management should still be guided by procedures that are carried out regularly and in accordance with the sanitary landfill system in order to avoid negative impacts in the future. Therefore, the budget is one of the supporting factors for the success of activities, without budget support the programme cannot run smoothly [18].

Waste management at the Talumelito landfill continues to provide the best performance with a relatively fixed and even declining budget. The lack of budget greatly affects existing waste management and has a negative impact in the long term if not handled quickly. However, the increase in budget is also not fully able to improve performance if it is not carried out properly in accordance with applicable SOPs.

3.2.4Equalisation

Equity requires consideration of the extent to which a policy can have an impact on the level of social welfare. It aims to create inclusive and sustainable policies that provide more equitable access to the community. One of the impacts of waste management at the Talumelito landfill on community welfare can be seen from the existence of employment opportunities for local residents. Waste can reduce unemployment and poverty alleviation because it can provide economic value without requiring large capital and is easily implemented by the community [19]. Community-based waste management strategies can significantly improve the success of waste management and increase waste recycling activities in developing countries [20].

Talumelito Landfill in this case also seeks to maximise redistributive welfare to increase benefits for certain groups through resource or income redistribution policies. The main focus of this approach is to ensure that groups that are considered disadvantaged, vulnerable, or marginalised receive a greater allocation of available resources. This policy aims to reduce economic and social inequality. In addition to increasing the income of the surrounding community, waste pickers also play a role in waste segregation at the Talumelito landfill although they do not have a major impact. This is supported by the statement that waste management in landfills in developing countries, especially Indonesia, scavengers play a major role in reducing the amount of waste in the landfill and extending the service life of the landfill itself [21]. Local governments must have the ability to commit to waste control in their cities through policies taken by local governments that are oriented towards clean, environmentally friendly, and innovative cities [22].

Waste management at Talumelito landfill uses a sanitary landfill system. The sanitary landfill system is designed to minimise negative impacts on the environment by separating waste types, compacting waste, and daily closure [23]. Although the sanitary landfill system implemented today is better than the previous management system in the form of an open dumping system, it cannot be denied that this system still has the potential to cause environmental pollution through air, soil and water pollution. To minimise the risk of water and soil pollution due to leachate, the UPTD TPA Talumelito routinely tests leachate water at least twice a year. The testing includes the groundwater of residential areas near the leachate reservoirs, so as to provide a clear picture of the potential pollution that may occur.

Figure 2. Leachate Sampling for Quality Standard Testing

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Talumelito Landfill not only plays a role in waste management, but is also active in supporting the improvement of community understanding. Through various education and training programmes. The following is the implementation of waste recycling socialisation and education in Gorontalo Regency.

Figure 3. Waste Recycling Socialisation and Education

Every year, Talumelito Landfill holds 2 to 3 socialisation and education events at village offices. This activity is expected to provide more understanding to the community about the importance of sustainable waste management.

3.2.5 Responsiveness

The presence or absence of complaints from service users is a significant indicator of responsiveness in assessing the quality of service provided by service providers [24]. Complaints from users reflect dissatisfaction with certain aspects of the service, such as timeliness, quality or attitude. The presence of complaints indicates that there is a need for improvement and a thorough evaluation of operational processes and interactions with service users. Conversely, the absence of complaints may indicate that users are satisfied with the service received. This process is important to ensure that the services provided continue to meet the expectations and needs of users, so that customer satisfaction can be well maintained.

To measure the satisfaction of service users and the community, Talumelito Landfill provides correspondence and a Community Satisfaction Survey to assess the satisfaction of waste management services at Talumelito Landfill. In order to make improvements in the public service process, it is necessary to organise a survey of public perceptions of satisfaction with the services provided [25].

Although the service at Talumelito Landfill is generally considered good, there are still some complaints that are often conveyed by the garbage fleet drivers. According to the waste fleet drivers, during the rainy season the access to the *landfill* , which is uphill, becomes muddy and slippery, making it difficult for the waste fleet to operate. This situation results in long queues for the waste fleet to enter the landfill. If not handled properly, it will affect waste collection, especially for Gorontalo Regency which has a limited waste fleet. Service users also submitted suggestions regarding the operating hours of the landfill, specifically a request to extend the service time. The current service time of Talumelito Landfill is considered not optimal because waste transportation in the Regency/City starts earlier and ends later. This is considered to severely limit the transport of waste from the Regency/City to Talumelito Landfill, which is quite far away.

The Talumelito Landfill actively approaches the community through direct interaction in residential areas. This approach aims to understand the real conditions in the community and listen directly to the complaints and needs of the community, so as to obtain more appropriate solutions related to the problems faced and more targeted.

During the COVID-19 pandemic, there have been reports of B3 waste being found by scavengers, allegedly from health facilities such as health centres or hospitals. This situation shows the potential for negligence in medical waste management. Hazardous and toxic waste must not be disposed of carelessly as it can impact environmental components. Hazardous and toxic waste must be separated from general waste because it is very dangerous for the environment [26].

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3.2.6Accuracy

Precision refers to the substance of the goal to be achieved, rather than the methods or tools used to achieve it. Substance emphasises the clarity and relevance of the goal itself, so it is important to ensure that the goals set truly reflect the needs and problems to be addressed. Substance will ensure that the efforts made will have a significant and valuable impact.

The Standard Operating Procedure for waste management at the Talumelito landfill is based on Law Number 18 of 2018 concerning waste management and Governor Regulation Number 22 of 2016 concerning the Operations of the Talumelito Waste Final Processing Site Technical Implementation Unit, Charges for Operational Costs and Environmental Impacts. Although waste management has been carried out based on the applicable SOPs, several problems in the field cause suboptimal implementation and hinder the achievement of goals.

Based on the results of the research, it is known that the waste contribution rates applied based on central and local government policies have differences. It is known that the Governor Regulation that applies in the region sets the retribution rate at only 50% of the rate set in the Minister of Home Affairs Regulation Number 7 of 2021 concerning Procedures for Calculating Retribution Rates. This requires the Gorontalo Provincial Government to review the waste retribution rate, considering that it is an important element in supporting waste management financing and increasing regional fiscal capacity in the future.

The policy that regulates the operation of Talumelito*Landfill* only focuses on waste management using the *Sanitarylandfill*system , while in the Gorontalo Province Regional Long-Term Development Plan document for 2025-2045, the target of building Temporary Shelters and Final Processing Sites has been eliminated. This indicates that in the future there will be no new *landfill* construction in Talumelito*landfill*. The development policy that does not go hand in hand between the Talumelito Landfill operational policy and the Gorontalo Province Regional Long-Term Development Plan for 2025-2045 is a challenge in itself. This requires an alternative policy that suits the needs in facing challenges related to waste management, so that it can provide results that have value and benefits. One alternative that can be offered is the use of waqf institutions in sustainable waste management [27].

The context of waste management applied at the Talumelito landfill has never been opposed by the community, even though the location of the landfill is fairly close to community settlements. There are concerns from some people about the potential pollution that can occur in residential areas around the landfill. The location of settlements close to the landfill raises issues regarding water consumption. Rainwater absorbed through landfill sites can be physically, chemically, and biologically polluted which can threaten public health if consumed [28]. Nevertheless, basically the placement of landfill sites has been regulated in the Regional Spatial Plan through various analyses and feasibility studies. Based on the view and implementation of waste management, most people in Gorontalo City, Gorontalo Regency and Bone Bolango Regency do not segregate and reuse waste, presumably due to various factors such as ignorance and indifference.

4. CONCLUSION

Based on the research results, the following conclusions can be drawn:

1. Effectiveness shows that Talumelito Landfill has owned and implemented a waste management policy, but its implementation can be said to be ineffective because there are several obstacles such as not optimizing waste sorting, limited fuel oil (BBM), lack of maintenance and repair of heavy equipment, weather factors, lack of personnel and lack of supervision that hinder the process of achieving programs, goals and objectives of Talumelito Landfill in waste management.
2. Efficiency shows that the UPTD TPA Talumelito is one of the producers of Regional Original Revenue (PAD) for Gorontalo Province through waste retribution. This shows that Talumelito Landfill has fulfilled Fiscal Efficiency in financing government expenditure. However, the limited budget of Talumelito Landfill in managing waste affects the achievement of waste management *outputs*, especially in realizing waste management innovation. In addition, there is a mismatch between waste management expenditure at Talumelito landfill and the tendency of the community to produce waste.
3. Adequacy shows that Talumelito Landfill faces several challenges, mainly related to budget limitations that affect waste management operations. The ever-increasing waste production and a relatively fixed budget, forces Talumelito*Landfill* to adapt in maintaining operational performance even though it requires Talumelito*Landfill* to not implement all *sanitary landfill* procedures. This can certainly have a negative impact in the long run if not addressed with more planned management and sufficient budget allocations.
4. Equity in Waste Management Policy at Talumelito Landfill has been optimal overall because waste management has attempted to maximize community welfare such as providing employment and providing education to the community. However, the value of Talumelito Landfill's equalization efforts for the community does not rule out the

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possibility of community complaints about environmental impacts that cannot be controlled due to budget constraints for processing.

5. In terms of responsiveness, Talumelito Landfill continues to strive to maintain and improve service user satisfaction by providing correspondents, responding to any complaints and facilitating community complaints and suggestions services. In addition, Talumelito Landfill has also provided retribution payment relief to service users who experience an increase in waste volume due to unexpected events such as natural disasters.
6. Accuracy shows that waste management policy implementers have attempted to implement the applicable waste management policy. However, waste management at the Talumelito landfill has not been able to provide significant benefits and results for the community. This is evidenced by segregation from the source of waste that has not been optimal due to the behavior of people who have not acted actively to support waste segregation and there is no solution regarding the Talumelito *landfill* which is almost full in the future. To optimize waste management in Talumelito landfill, alternative policies are needed, such as a policy for determining waste retribution rates, a policy for building sustainable waste management sites.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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