Serunai

Vol. 1, No. 2, December, 2021, pp. 13-27
Rizal Zubad Firdausi; Agus Budianto
Website: https://jurnal.idfos.or.id/index.php/serunai

A Study On Capacity And Physical Supporting Of New Landfill Site In Western Area Of Bojonegoro Regency

Rizal Zubad Firdausi*.[1] ; Agus Budianto[2]
[1]IDFoS Indonesia, Indonesia
[2]Institut Teknologi Adhi Tama Surabaya, Indonesia
*Corresponding autor, email: rizalzubadfirdausi@gmail.com

ARTICLE INFO

Keywords:
Landfill, new landfill site, physical supporting capacity

Available Online:
https://jurnal.idfos.or.id/index.php/serunai

p-ISSN: 2807-6931
e-ISSN: 2807-5870

ABSTRACT

Waste has always been a problem in various regions, starting from the village, sub-district, district/city, even in a country level. The rate of population growth is increasing rapidly which has an impact on increasing the amount of waste. The Landfill for waste in Bojonegoro had been overloaded since 2019, which in 2020 will operate a new Landfill in the western region. Improper planning and inappropriate location of the new Landfill will have a greater negative impact, especially on the surrounding community. The capacity and physical supporting of the landfill are important things that must be considered in planning the development and operation of the landfill, in order to be able to support the activities of using the landfill in a sustainable manner. The purpose of this research was to examine the capacity of the Bojonegoro new Landfill by calculating the capacity of the Bojonegoro New Landfill in serving predictions of waste generation in the future Landfill service area. In addition, this research also analyzed the physical supporting capacity of Bojonegoro new Landfill with a scoring method based on the Landfill feasibility standard. The result of this research was that the Bojonegoro new Landfill was categorized as feasible to operate with the consideration from the results of the analysis that the capacity of the Landfill had a service life of 9 years 7 months which could be categorized as feasible. While the results of the analysis of the physical supporting capacity of the landfill got a total score of 533 with a proper interpretation.

INTRODUCTION

The waste problem is one of the problems faced by a region, starting from a small scale such as at the hamlet, village, sub-district, district/city even in a country level. This will add to the challenges of waste management. (Hoornweg & Bhada-Tata, 2012). The population in Bojonegoro is always growing, there was an increase in

the population from 2010 to 2018 as many as 100,667 people or 8.3%. (BPS Bojonegoro, 2019).

Based on data obtained from the Bojonegoro Regency Environmental Service Department, the waste generated by the Bojonegoro Landfill in 2018 was 263.81 m3/day or 92.34 tons/day. The increasing waste generation will have an impact on the ability to manage waste. The condition of the Bojonegoro Landfill at the end of 2018 was overloaded, with an average waste deposit of 260 cubic meters per day. (Radar Bojonegoro, 2018)

From these problems, the Bojonegoro Government has a plan to create a new waste landfill in the western region of Bojonegoro which will begin to be prepared in 2019 and will operate in 2020. This will certainly have an impact on the surrounding community, both positive and negative impacts. The service life of a landfill that is less than 10 years and an inappropriate location will have a negative impact. Research in Africa showed the importance of planning and predicting the structure of the landfill area and location, especially on the possible strengths, weaknesses, opportunities and threats to the landfill site and should really be considered. (Idowu et al., 2019)

So that every activity that has the potential to change environmental conditions needs to be studied regarding its capacity and supporting, especially in the clearing of new land for the Landfill. The capacity and physical supporting of the Landfill are important things that must be considered in planning the development and operation of the Landfill, in order to be able to support the activities of using the landfill in a sustainable manner. (Maria et al., 2018).

LITERATURE RIVIEW

Amount of Waste

Amount of Waste is the amount that arises from the community in units of volume and weight per capita per day, or expand buildings, or extend roads. (SNI 19-2454, 2002) According to data from the Ministry of the Environment in 2003, the average waste generated was 2.41 liters/person/day. (Hilman, 2005).

Capacity of Landfill

The capacity of Landfill is the entire volume of waste in the form of waste and amount of landfill that is accommodated in the Landfill, or the efforts that have been made by the Landfill to accommodate the entire volume of incoming waste and landfill.

Waste Amount Prediction

Waste Amount Prediction is a calculation of estimating the amount of waste in the coming year by referring to the data on the amount of waste generated in previous years. For the analysis of the prediction of the rate of waste amount using a geometric equation formula because this method was able to describe a simple realistic population model based on past information. This method tended to give a higher estimate than other methods because it behaved exponentially. It more accurately described the continuous and cumulative nature of population growth. (Gawatre et al., 2016; Pinupolu & Kommineni, 2020).

The geometric equation was the formula used for the projection of the population growth rate. To predict the amount of waste rate can use the geometric equation method because the population affected the amount of waste production.

The formula for the geometric equation was as follows:

$$Px = Pa\ (1 + r)^n$$

with:

Px = Total waste in the projection of year x

Pa = Total waste in the initial year of projection

r = Average increase in waste per year (%)

n = Projection time interval (years)

The resulting projection is used as a multiplier factor for the standard amount of waste generated based on the SNI waste amount table.

Physical Supporting Capacity

Based on the definition of environmental supporting capacity in Law 32 of 2009, environmental supporting capacity is the ability of the environment to support human life, other living things, and the balance between the two.

If it is analogous to the supporting capacity of the Landfill, it will have an understanding of the surrounding environmental conditions in supporting the sustainability of the Landfill. The physical supporting capacity of the Landfill is the ability/limit of the physical environment to accept the load of waste in accordance with the general requirements of the location. As for what is classified in the physical assessment is the physical feasibility of the Landfill location.

In Rezae's research, there were various factors that influenced the selection of Landfills, including the depth of groundwater, around surface water, elevation, land slope, soil permeability, soil stability, flood susceptibility, lithology (soil characteristics) and stratification (soil structure) potential failure, land use type, nearby settlements and urbanization, protected cultural sites protected, wind direction, roads, rail lines, proximity to building materials, pipelines and power lines, and proximity to airports. All of these factors can be categorized into physical and environmental, social, and infrastructure and economic factors. (Rezaeisabzevar et al., 2020). Those factors were the same as the regulations in Indonesia that regulated waste, while the parameters were in accordance with the Minister of Public Works Regulation No. 3 of 2013 concerning the Implementation of Waste Infrastructure and Facilities in Handling Household Waste and Types of Household Waste. In the regulation, it was described about the ways to choose the location of Landfill with the weighting.

Bojonegoro Landfill

The following is a profile of the new Landfill for the western region of Bojonegoro.

Table 1: Profile of Landfill in the western region of Bojonegoro

Description	New Landfill
Name of Landfill	LANDFILL Ngasem
Location	Bandungrejo Village, Ngasem Sub District, Bojonegoro Regency
Width of Landfill	3,9 Ha
Operating Year	2020
Service Area	*Serving 11 Sub Districts in Bojonegoro Regency, including Tambakrejo, Ngraho, Margomulyo, Kedewan,*

	Malo, Padangan, Kasiman, Purwosari, Ngasem, Kalitidu, Ngambon
Type of *Landfill*	*Controled Landfill*
Processing Facility	The plan is to implement 3R Composting Methane capture Incinerator Integrated waste bank Backfill and compaction with heavy equipment
Depth of Excavation	7 meters
Height of Heap	The plan is 7 meters above ground level
Transportation	Closed tub with arm roll

(source: Environmental Service Department of Bojonegoro Regency)

RESEARCH METHODOLOGY

The conceptual framework of this research began with the projection of waste amount in the service area of the New Landfill in the Western Region of Bojonegoro which was used as the basis for analyzing the capacity of Landfill which was then associated with the dimensions of the physical supporting capacity of Landfill.

The types of data used in this research included secondary data obtained through literature studies such as the results of research on urban and rural waste management, and others. The next data was data from the Bojonegoro Regency government such as population, Landfill profile, Bojonegoro waste data, Bojonegoro RTRW and others.

Literature studies were carried out, including collecting data from the local government, books, internet and other supporting literature. Primary data were obtained from field observations, interviews, in-depth interviews and questionnaires (questionnaire attached).

Variables and Indicators

This research examined several aspects and variables that would affect the suppoting and capacity of the New Landfill in West Region of Bojonegoro Regency.
The variables and indicators were described in the following table:

Table 2 : Research Variables and Indicators

Aspects	Variables	Indicators
Capacity of Landfill	Ability to receive waste from service area	Capacity of Landfill
		Prediction of Landfill age
Location Eligibility of Landfill	Legality of Landfill	Mentioned in RT RW
		Site Ownership
	Geology Condition	It is not located in *holocene fault zone*
		It is prohibited in dangerous geology zone
		The slope of the zone must be less than

Aspects	Variables	Indicators
		20%.
		It is not allowed in protected areas/nature reserves and flooded areas with a return Period of 25 years.
	Hydrogeological conditions	It is prohibited to have a groundwater level of less than 3 meters
		No soil clearance is more than 10-6 cm/s
		The distance from drinking water sources must be greater than 100 meters
	Climate/Weather	Rain intensity
		Wind condition
	Accessbility	Traffic condition
		Utility condition/road
	Biological environment	Habitat variation
		Ability to support Flora & Fauna
	Site	Site Productivity
	Capacity	Capacity
		Age capacity
	Demography	Surrounding Population Density
		Administration Border
	Safety and comfort	Surrounding buffer zone (Protection Tree) to keep out odors and noise
		aesthetically appropriate

Capacity Analysis of Site Processing Site

To determine the capacity of the Landfill, it was necessary to calculate the population demographic projections for the next few years. In accordance with the technical provisions for the procedures for the survey and demographic assessment (Permen PU RI No 03/PRT/M/2013 Tentang Penyelenggaraan Prasarana Dan Sarana Persampahan Dalam Penanganan Sampah Rumah Tangga Dan Sampah Sejenis Sampah Rumah Tangga, 2013) it was carried out in the following stages:

1. Grouping the survey target areas into regional categories based on population as follows:

Table 3: Regional Categories by Population

No.	Regional Category	Number of Population	Number of Houses
1	City	≥ 1,000,000	≥ 200,000
2	Metropolitan	500,000 – 1,000,000	100,000 – 200,000
3	Big City	100,000 – 500,000	20,000 – 100,000
4	Medium City	10,000 – 100,000	2,000 – 20,000
5	Small City / Village	3,000 – 10,000	600– 2,000

2. Collecting data on the initial population of the planning.
3. Determining the percentage value of population growth per year (r).
4. Calculating the increase in population value until the end of the planning year using the geometric method.
5. Calculating the projected population:

$$Pn = P_0 (1+r)^n$$

where:
Pn = total population in year n;
Po = total population in the base year;
r = population growth rate;
n = number of year intervals.

The capacity of the landfill is the volume of waste and landfill that is accommodated in the landfill or the landfill business to accommodate all incoming waste and the landfill used to cover the landfill in accordance with the volume of landfill land available or planned for landfill. To calculate the capacity of the landfill, use the following formula (Zulfian, 2015):

$$\text{TPA} = L \text{ TPA x } t \text{ rencana}$$

where :
L = Available Area of Landfill
t = planned amount height

Feasibility Analysis of Landfill Locations with Scoring Method

To determine the feasibility of land used several parameters (Khadiyanta, 2005). Furthermore, to test whether the location of the waste landfill has a feasibility value, through the calculation of the interval class to be used, which is as many as 3 classes (appropriate, worthy of consideration and not feasible). Thus the calculation of the width of the interval was as follows:

$$I=R/1 + 3{,}3 \log 3$$

To determine the feasibility of New Landfill Location for the Western Region of Bojonegoro, the analysis carried out was the scoring method. The determination of the score of each variable was based on the weighting of the parameters of each of these variables. The magnitude of the weight of each parameter was determined on the basis of the magnitude of the influence of its importance. The score calculation process was as follows:

1. Each indicator was given a value according to the level of its influence on the feasibility of the Landfill location by adding up the values, determining the value of a factor was determined from the number of indicators assessed in one parameter. The value here meant the ranking of importance of each physical parameter on land use for the Landfill location
2. Furthermore, from the results of the summation, three categories of parameter effectiveness were classified (appropriate, worthy, and not feasible) based on the width of the class interval.
3. The class interval value was calculated using the following formula:

$$I = R/N$$

where:
I = interval width
R = range, i.e. the largest data minus the smallest data
N = number of interval classes, searched by using Sturges rule,

ie: 1 + 3.3 log n

4. The highest score under ideal conditions should be the product of

the multiplication of the weight of the parameter x the highest value of the indicator, while the lowest score was the product of the weight of the parameter x the lowest value of the indicator. After the score limit was generated for each category, then the total level of effectiveness of each parameter was calculated.

5. Furthermore, to test whether the location of the waste landfill has a feasibility value, through the calculation of the class interval to be used, which is 3 classes (feasible, feasible to be considered and not feasible). Thus the calculation of the width of the interval was as follows:

$$1 + 3.3 \log n$$

6. For class intervals were set as follows:
   a. The value of the feasible interval class was 475 – 790
   b. The value of the class interval to be considered was 238 – 475
   c. The value of not feasible class interval was 0 – 238

RESULTS AND DISCUSSION

Waste Amount Projection

To get the results of the projected waste amount, a population projection calculation until 2030 was carried out first. From the projection data, it could be calculated the estimated waste amount that would enter the New Landfill for the West Region of Bojonegoro Regency. Based on the Minister of Public Works Regulation No. 3/PRT/M/2013 the amount of waste generated from the classification of Bojonegoro as a small city was 2.5 liters/person/day. Based on table.4, it was found that the cumulative increase in waste from the population in 2030 was 4,349,968 m3.

Table 4: The results of the calculation of the population projection and the calculation of the projected waste amount until 2030

Year	Number of Population	Number of waste (liter/day)	Number of waste (m^3/day)	Number of waste (m^3/year)
2010	393.383			
2011	394.831			
2012	396.282			
2013	397.745			
2014	399.209			
2015	412.138			
2016	412.613			
2017	425.179			
2018	425.903			
2019	429.149			
2020	432.841	1.082.102,5	1082,1	378.736
2021	436.564	1.091.410,0	1091,4	381.994
2022	440.319	1.100.797,5	1100,8	385.279
2023	444.106	1.110.265,0	1110,3	388.593
2024	447.926	1.119.815,0	1119,8	391.935
2025	451.779	1.129.447,5	1129,4	395.307
2026	455.665	1.139.162,5	1139,2	398.707
2027	459.584	1.148.960,0	1149,0	402.136

Year	Number of Population	Number of waste (liter/day)	Number of waste (m^3/day)	Number of waste (m^3/year)
2028	463.537	1.158.842,5	1158,8	405.595
2029	467.525	1.168.812,5	1168,8	409.084
2030	471.546	1.178.865,0	1178,9	412.603

(Source: processed data)

In Table 4 the analysis of the calculation of the prediction of the amount of waste from 2020 to 2030 using the geometric method could be seen in 2020 the amount of waste was 378,736 m3, in 2018 as much as 409,084 m3, in 2021 as much as 381,994 m3, in 2022 as much as 385,279 m3, in 2023 as much as 388,593 m3 , in 2024 as much as 388,593 m3, in 2025 as much as 391,935 m3, in 2026 as much as 395,307 m3, in 2027 as much as 398,707 m3, in 2028 as much as 402,136 m3 in 2029 as much as 405,595 m3 in 2030 as much as 412,603 m3 with an average increase in the amount of waste per year was 3,357 m3 (0.86%) and the total waste from 2020 to 2030 was 4,349,968 m3. So it could be concluded that the increasing population of waste production also increased.

Capacity of Landfill

Capacity calculation using the Landfill plan image database, to measure the elevation of the landfill using google earth pro ver.8 software. The results of the calculation of landfill capacity were as follows:

Width of *Landfilling* = 39,035.53 m^2
= 3.90 ha
Height of *Lifting* = 5 m
Width of Lifting = 5 m
Plan of Height = 10 m
Plan of Excavation = 5 m
Elevation basin volume = 132.871,32 m^3
Total Volume of Landfill=718,404.21 m^3

Waste processing at Landfill must be compacted/crushed with heavy equipment, while the compaction factor according to the Minister of Public Works Regulation No. 3 of 2013 was 1.2 or 80% of the volume of solid waste.

Table 5: The calculation results of the volume of waste that is piled up at Landfill

Year	Amount of Waste (m^3/Year)	Landfill-Served WAste (54%)	Reduced Composting (-47%)	Reduced Anorganic (-17%)	After Compacted (80%)	Cmulative (m^3)
2020	378.736	204.517	108.394	89.967,19	71.973,75	71.973,75
2021	381.994	206.276	109.327	90.741,03	72.592,82	144.566,58
2022	385.279	208.051	110.267	91.521,52	73.217,21	217.783,79
2023	388.593	209.840	111.215	92.308,65	73.846,92	291.630,71
2024	391.935	211.645	112.172	93.102,65	74.482,12	366.112,83
2025	395.307	213.466	113.137	93.903,51	75.122,81	441.235,64
2026	398.707	215.302	114.110	94.711,22	75.768,98	517.004,62
2027	402.136	217.153	115.091	95.525,80	76.420,64	593.425,25
2028	405.595	219.021	116.081	96.347,44	77.077,95	670.503,21
There will be an overload in midle of 2029 (718.404,21 m^3)						
2029	409.084	220.906	117.080	97.176,36	77.741,09	748.244,29
2030	412.603	222.805	118.087	98.012,13	78.409,71	826.654,00

(Source: Processed Data 2020)

The calculation of the Landfill volume capacity was based on the use planning from the District Environmental Office of Bojonegoro and the condition of the contour of the land that would be used for landfilling with a capacity of 718,404.21 m3. The calculation results were from the capacity of the New Landfill for the Western Region of Bojonegoro, the New Landfill for the Western Region of Bojonegoro was predicted to be full in mid 2029 or when the Landfill was 9 years 7 months old with waste input from the western Bojonegoro service area.

Based on the instruments in the Minister of Public Works Regulation No. 3 of 2013, age eligibility was assessed by 4 criteria, including:

> 10 years = Very Eligible
5 -10 years = Eligible
3 -5 years = Fairly Eligible
Less than 3 years = Not Eligible

So that with a service life of 9 years 7 months it could be categorized as Eligible.

Landfill Physical Supporting Capacity Analysis

Analysis of the Physical Supporting Capacity of the New Landfill in West Region of Bojonegoro Regency was to test the feasibility of the Landfill location. The assessment parameters use the Selection of Waste Landfill Locations in accordance with the Minister of Public Works Regulation No. 3 of 2013. Collecting data to fill in the scoring in the table using secondary data (administrative maps, UKL UPL New Landfill, Rainfall Data and others), to strengthen and complement the findings from secondary data conducted in-depth interviews with the environmental service.

General Criteria Assessment

In this general criteria analysis, the parameters assessed were administrative boundaries, land rights owners, land capacity, number of owners and community participation getting a value of 144 out of 5 parameters, in detail, it could be seen in table 5.

In terms of administrative boundaries, the location of the New Landfill for the Western Region of Bojonegoro was in the Sawit hamlet, Bandungrejo Village, Ngasem Sub District, Bojonegoro Regency, East Java Province. So that in terms of administrative boundaries, the location of the New Landfill for the Western Region of Bojonegoro is in the administrative area of Bojonegoro.

In terms of land ownership, based on the UKL UPL document for the West Territory of New Landfill, it was land owned by the Bojonegoro Regency Government. The land around the Landfill location was owned by the surrounding community, so land acquisition could still be carried out if it was to be expanded. However, the problem was that the most efficient access to the land was through the Perhutani-owned road, so that potential disputes with other elements of the government could occur.

From the factor of the number of owners, because the land owner belongs to the local government, the criterion of one ownership was assessed at the New Landfill for the Western Region of Bojonegoro, from interviews with the surrounding community that the land and its surroundings are productive land for rainfed plantations, but the results were less than optimal because they were classified as dry land during the dry season and the distance between the landfill location and the nearest settlement was 500 m and

passes through plantations and trees so that there was no resistance from the surrounding community regarding the operational activities of the landfill or if there was a plan to expand the landfill.

Table 6: The results of the assessment of the feasibility of the Landfill for general criteria

No	Parameter	Quantity	Value	Assessment Result	Total
I.	General Criteria				
1	Administration Limit	5			50
	o Within administrative limits		10	10	
	o Beyond administrative boundaries but within one integrated LANDFILL waste management system		5		
	o Beyond the administrative boundaries and beyond the integrated waste management system		1		
	o Beyond administrative boundaries		1		
2	Owner of land	3			30
	o Regional Government/Central Government		10	10	
	o Individual (one)		7		
	o Private/Company (one)		5		
	o ≥ 1 right owner and or ownership status		3		
	o Social Organization/Religion		1		
3	Site Capacity	5			40
	o ≥ 10 Years		10		
	o 5 -10 Years		8	8	
	o 3 -5 Years		5		
	o Less than 3 years		1		
4	Number of land owners	3			9
	o one (1) kk		10		
	o 2-3 kk		7		
	o 4-5 kk		5		
	o 6-10 kk		3	3	
	o more than 10 kkk		1		
5	Society participation	3			15
	o Spontaneous		10		
	o driven		5	5	
	o Negotiation		1		
Total Value					144

(source: processed data 2020)

Physical Environment Criteria Assessment

Assessment of the physical feasibility of a landfill based on physical environmental criteria was measured by several parameters, including: a) groundwater level; b) groundwater output; c) groundwater flow system; d) utilization of ground water; e) potential flood hazard; f) availability of ground cover; g) rain intensity; h) the road to the location; i) waste transportation time requirement; j) login access; k) traffic; l) land use; m) agricultural impacts; n) protected areas/nature reserves; o) biological habitat conditions; p) noise and odor factors; q) aesthetics.

The assessment of the above parameters was carried out by interview, observation and literature review. From the results of the assessment of the feasibility of the landfill location from the physical environment criteria, a total value of 398 was obtained which is detailed in table 7.

Table 7: The results of the assessment of the feasibility of the Landfill for physical environmental criteria

No	Parameter	Quantity	Value	Assessment Result	Total
II.	PHYSICAL ENVIRONMENT				
1	Land (above ground water level)	5			35
	o Price $\leq 10^{-9}$ cm/det		10		
	o Price 10^{-9} cm/det = 10^{-6} cm/det		7	7	
	o Price $\geq 10^{-6}$ cm.det (unless there is technology input)				
2	Groundwater	5			30
	o $\geq$ 10 m with the break of $\leq 10^{-6}$ cm/det		10		
	o $\leq$10 m with the break of $\leq 10^{-6}$ cm/det		8	6	
	o = 10 m with the break of 10^{-6} cm/det – 10^{-4} cm/det		3		
	o $\leq$ 10 m with the break of 10^{-6} cm/det – 10^{-4} cm/det		1		
3	Groundwater system	3			15
	o *Discharge area*/local		10		
	o *Recharge area dan discharge area local*		5	5	
	o *Recharge* area regional and local		1		
4	Links to groundwater use	3			24
	o Low utilization possibility with hydraulic limit		10	8	
	o Projected to be utilized with hydraulic limits		5		
	o Projected to be utilized indefinitely		1		
	hydraulic				
5	Flood hazard	2			20
	o No flood hazard		10	10	
	o Flood possibility $\geq$ 25 years		5		
	o Flood possibility $\leq$ 25 years Rejected (unless there is technology input)				
6	Cover land	4			20

No	Parameter	Quantity	Value	Assessment Result	Total
	o Enough cover land		10		
	o Enough cover land until ½ service life		5	5	
	o No cover land		1		
7	Rain intensity	3			
	o Under 500 mm per year		10		
	o Between 500 mm until 1000 mm per year		5	5	15
	o Above 1000 mm per year		1		
8	Road to the location/site	5			
	o Flat with good condition		10		
	o Flat with bad condition		5	5	25
	o up/down		1		
9	Waste transport (one way)	5			
	o Less than 15 minutes from waste centroid		10		
	o Between 16 minutes-30 minutes and waste centroid		8		15
	o Between 31 minutes-60 minutes and waste centroid		3	3	
	o More than 60 minutes and waste centroid		1		
10	Entrance	4			
	o Garbage trucks don't go through residential areas		10		
	o Garbage trucks through medium-density residential areas (<300 people/ha)		5	5	20
	o Garbage trucks through medium-density residential areas (>300 people/ha)		1		
11	Traffic	3			
	o Located 500 m from the public road		10	10	
	o Located < 500 m in low traffic		8		30
	o Located > 500 m in moderate traffic		3		
	o Located in high traffic		1		
12	Land use	5			
	o Has little impact on surrounding land use		10		
	o Has a moderate impact on the surrounding land use		5	5	25
	o Has a major impact on the surrounding land use		1		
13	Farm/agriculture	3			
	o Located on unproductive land		10		
	o No impact on surrounding agriculture		5	5	
	o There is a negative effect on surrounding agriculture		1		15
	o Located in productive agricultural land		1		
14	Protected areas/nature reserves	2			20
	o There are no protected areas/nature		10	10	

No	Parameter	Quantity	Value	Assessment Result	Total
	reserves in the vicinity				
	o There are protected areas/nature reserves in the vicinity that are not negatively affected		1		
	o There are protected areas/nature reserves in the vicinity that are negatively affected		1		
15	Biological	3			30
	o Low habitat value		10	10	
	o High habitat value		5		
	o Critical habitatitis		1		
16	Noise, smell	2			20
	o There is a buffer zone		10	10	
	o There is a limited buffer zone		5		
	o There is no buffer		1		
17	Aesthetics	3			30
	o The hoarding operation is invisible from the outside		10	10	
	o The hoarding operation is slightly visible from the outside		5		
	o The hoarding operation is visible from the outside		1		

(source: processed data 2020)

Feasibility Analysis of the New Landfill Location for the Western Region of Bojonegoro

To determine the feasibility of the new landfill location in the western region of Bojonegoro Regency, then the analysis carried out is the scoring method. The process of calculating the feasibility score for the landfill location uses 3 interval classes to be used (Khadiyanta, 2005), and the results were as follows:

Table 8: Landfill feasibility assessment interval class categorization

Interval Class Grade	Category of Landfill
551 - 780	Feasible
276 – 550	Worth Considering
0 – 275	Not Feasible

Source: (Khadiyanta, 2005)

With a score of **542**, based on the interval class above, the feasibility value of the new Landfill location in the western region of Bojonegoro Regency is in the interval class 551 – 780. Thus, the new location for the western region of Bojonegoro Regency can be declared **worthy of consideration**.

POLICY IMPLICATIONS AND RECOMMENDATIONS

In 2029 the government must prepare a new Landfill because in that year the Landfill located in Bandungrejo is projected to be full.

The government needs to innovate waste management that aims to extend the life of the landfill by optimizing waste reduction by reducing it at the source or by creating a Material Recovery Facility (MRF).

CONCLUSION

In terms of the capacity of the New Landfill for the Western Region of Bojonegoro Regency, it was measured from the land capacity of the new Landfill location where from the calculation results the current Landfill land area was 3.9 Ha, and from the results of the calculation of the volume of the Landfill based on contour maps and would be planned high The pile of waste would be 7 m high from the original soil height, so the volume of the New Landfill could accommodate 450,602 m3 of waste with 20 cm of soil piling up for every 1 m of soil height. With a capacity of 450,602 m3, the age of the New Landfill in the western region was 9 years 7 months which was obtained by comparing the capacity of the Landfill with the potential for waste to enter the New Landfill which had been projected with an average of 73,000 m3 per year. Based on the instrument in the Minister of Public Works Regulation No. 3 of 2013, with a service life of 9 years 7 months, it was classified as 5 to 10 years of service life so that it could be categorized as **Feasible**.

For the physical carrying capacity of the New Landfill for the Western Region of Bojonegoro, assessed from the feasibility of the landfill location based on the location feasibility criteria in the PU Ministerial Decree no. 3 of 2013 a total score of 542 was obtained. Bojonegoro was in the interval class 551 – 780. Thus, the new location for the western region of Bojonegoro Regency could be declared **worthy of consideration**.

ACKNOWLEDGMENT

The acknowledgment was delivered to related parties who have supported the writing of this article, such as who have provided support in the form of data, information and perceptions, especially to the Bojonegoro Regency Environmental Service, Bojonegoro West Region New Final Processing Site Manager, Bandungrejo Village Government and Ngasem Sub District Government.

REFERENCES

BPS Bojonegoro. (2019). Kabupaten Bojonegoro Dalam Angka 2019. In Seksi Integrasi Pengolahan dan Dimensi Statistik (Ed.), *BPS Kabupaten Bojonegoro*. BPS Kabupaten Bojonegoro.

Gawatre, D. W., Kandgule, M. H., & Kharat, S. D. (2016). Comparative Study of Population Forecasting Methods. *IOSR Journal of Mechanical and Civil Engineering*, *13*(04), 16–19. https://doi.org/10.9790/1684-1304051619

Hilman, M. (2005). *Pendidikan Lingkungan Bagi Pendidik Usia Dini*. Kementrian Lingkungan Hidup.

Hoornweg, D., & Bhada-Tata, P. (2012). What a Waste 2012 Final. *Urban Development & Local Government Unit World Bank*, 93. https://doi.org/10.1111/febs.13058

Idowu, I. A., Atherton, W., Hashim, K., Kot, P., Alkhaddar, R., Alo, B. I., & Shaw, A. (2019). An analyses of the status of landfill classification systems in developing countries: Sub Saharan Africa landfill experiences. *Waste Management*. https://doi.org/10.1016/j.wasman.2019.03.011

Khadiyanta, P. (2005). *Tata Ruang Berbasis Pada Kesesuaian Lahan*. Badan Penerbit UNDIP.

Maria, R. P., Sangkertadi, & Supardjo, S. (2018). Analisis Daya Dukung Dan

Daya Tampung Lahan Di Kecamatan Malalayang Kota Manado. *Media Matrasain*, *15*(2), 36–49.

Permen PU RI No 03/PRT/M/2013 tentang Penyelenggaraan Prasarana dan Sarana Persampahan dalam Penanganan Sampah Rumah Tangga dan Sampah Sejenis Sampah Rumah Tangga, 1 (2013).

Pinupolu, P., & Kommineni, H. raja. (2020). Best method of municipal solid waste management through public-private partnership for Vijayawada city. *Materials Today: Proceedings*, *xxxx*. https://doi.org/10.1016/j.matpr.2020.03.816

Radar Bojonegoro, J. P. (2018, April 17). *LANDFILL Banjarsari Overload, Pemkab Bingung. April 2018*.

Rezaeisabzevar, Y., Bazargan, A., & Zohourian, B. (2020). Landfill site selection using multi criteria decision making : Focus on influential factors for comparing locations. *Journal of Environmental Sciences*, *xxxx*. https://doi.org/10.1016/j.jes.2020.02.030

SNI 19-2454. (2002). *Standar Nasional Indonesia 19-2454-2002 Tata Cara Teknik Pengelolaan Sampah Perkotaan. Jakarta: Badan Standarisasi Nasional Indonesia.* Badan Standarisasi Nasional Indonesia.

Zulfian, E. (2015). " *Studi Evaluasi Manajamen Tempat Pemrosesan Akhir (Landfill) Sampah Lempa Di Kabupaten Soppeng*. Universitas Hasanuddin.