OPEN ACCESS
Journal Homepage: http://ejournal2.undip.ac.id/index.php/jwl

JURNAL WILAYAH DAN LINGKUNGAN
P-ISSN: 2338-1604 dan E-ISSN: 2407-8751
Volume X Nomor X, Bulan Tahun, xx-xx
http://dx.doi.org/10.14710/jwl.x.x.xx-xx

Analysis Hierarchy Process and Geospatial in Determination of the Alternative Locations for Temporary Disposal Site in Sumbersari District, Jember, Indonesia

Received :
Accepted :
Available Online :

Abstract: Sumbersari District, one of the urban areas in Jember, meets the problems of a limited number of temporary disposal sites (TDS). The paper aims to determine an alternative location for a new TDS (TDS) in the Sumbersari District by combining the Analysis Hierarchy Process (AHP) and Geographic Information System (GIS) methods. The AHP method is applied to determine the priority land with predetermined variables and the GIS method is applied for weighting physical aspects and spatial to make decisions through buffering and overlay techniques. The results show that AHP weighting obtains priority to land, namely areas that are dominated by land with ownership rights of the State, Property Rights, and Use Rights, land with a distance of more than 1000 m from the existing TDS, and land where the location of excessive existing capacity of TDS more than 100 %. Meanwhile, based on the GIS method through buffering and overlay techniques on physical aspects and priority land aspects, 10 alternative location points were obtained with a value of 26 (Quite feasible and priority). These points were then carried out by field observations resulting in 2 suitable locations, namely A1 in the Antirogo Sub-district and K1 in the Kranjingan Sub-district.

Keywords: AHP, Geospatial, GIS, Jember, Overlay, Temporary disposal site

Introduction

A temporary disposal site (TDS) is a facility that accommodates waste from settlements or agencies to be sorted according to the type and characteristics of waste

*Corresponding Author:

then the residual results are transported by trucks to the final processing site (LANDFILL) as the final stage of waste management (Law of the Republic of Indonesia Number 18 of 2008). However, its function does not become optimal and has a negative impact if it does not get good site planning as in the research of Dhokhikah and Trihadiningrum (2012) inadequate collection places in terms of facilities and size, improper collection methods, scarcity of the number of TDS facilities. Sumbersari District, Jember Regency is one of the urban areas that is allegedly experiencing a threat of decreasing the quality of municipal waste services. The observations illustrate that the current TDSs in Sumbersari District have various physical conditions. The position of some TDSs does not pay attention to the boundaries of surrounding facilities or land uses, such as two TDS in Karimata, and in Mastrip have a road border of 20-100 cm, causing congestion during TDS operating hours. The Sukorejo TDS has a 0 cm border on Sukorejo Market which has the potential to cause unpleasant odors and susceptibility to the spread of disease from the TDS to cooking ingredients or residents who are active in Sukorejo Market.

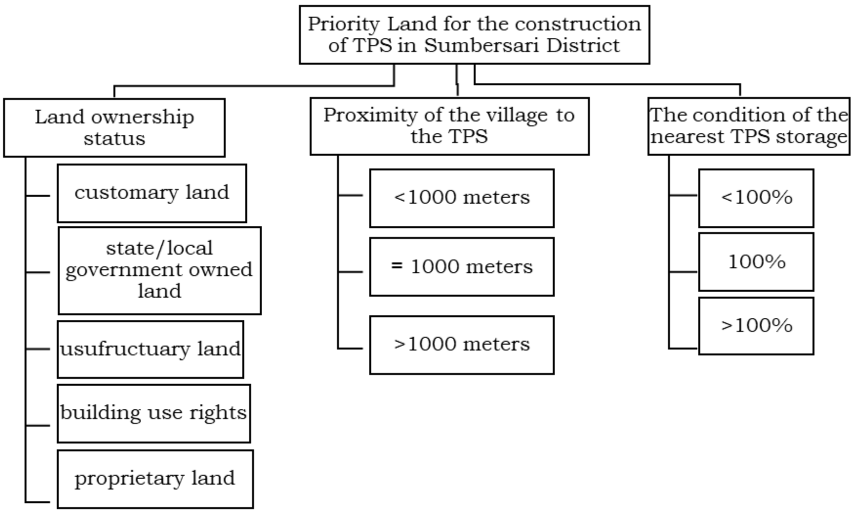
Based on the results of the calculation of waste generation using the SNI 193964-1994 method, it shows that the feasibility conditions of existing TDS capacity in Sumbersari District, Jember Regency on average have a less than 100% capacity, but the Karimata TDS has a more than 100% capacity or has a storage condition that exceeds the capacity of the TDS which causes some waste not to be transported. This condition is influenced by the dimensional capacity of the TDS in accommodating waste generation. Meanwhile, each TDS service coverage cannot serve the waste generation area. In addition, when compared to the Regulation of the Minister of Public Works of the Republic of Indonesia Number 03/PRT/M/2013, each TDS on average exceeds the maximum service range of a radius of 1 km. TDS coverage services are considered not optimal due to the limited number of TDSs in the waste generation source area that exceeds 1 km from the existing TDS. There are three sub-districts that are not optimally served by the existing TDS, which are Kranjingan, Antirogo, and Wirolegi Sub-district. Therefore, it is necessary to plan the construction of TDS in waste source areas that are not served by existing TDS.

This fact is reinforced by the urgency stated in the Strategic Plan of the Department of Environment Jember Regency for 2021-2026, namely the evaluation of the performance achievements of the previous year's targets, more optimal efforts are needed within the next 5 years, one of which is handling waste management through increasing the number of TDS due to the minimal availability of TDS. This indicates that waste services in Jember Regency have not run optimally to manage waste, especially in the provision of TDS infrastructure. The Jember Regency Government has not yet determined the location for the construction of TDS due to limited strategic land.

As an effort to anticipate the declining TDS services, handling efforts are needed in the form of determining the location for additional capacity and adding new TDSs in the Sumbersari District. This study aims to analyze alternative temporary dumping sites (TDS) with the scope of services of Sumbersari District. This research uses spatial analysis and Analytical Hierarchical Processes. Spatial analysis was chosen because of the ease of get decisions through the physical criteria of the TDS construction site so that the necessary information can be captured, modified, and managed quickly and in an appropriate way, and spatially referenced data can be correlated and analyzed with the same platform (Singh, 2019).

Research Method

The study has a location limitation, namely Sumbersari District as an urban district of Jember Regency with an area of 3677.88 ha. This research uses a qualitative approach in the form of AHP and a quantitative approach in the form of spatial analysis through GIS applications. The use of AHP Analysis was used to determine priority land for TDS development through filling out questionnaires by respondents using Purposive sampling techniques with 5 respondents including 2 from the Department of Environment Jember Regency, 2 from Regional Planning And Development Agency Jember, and 1 from Muhammadiyah University. The hierarchy in AHP appears in Figure 1.



Source: Analysis, 2023

Figure 1. Hierarchy of AHP

While the spatial analysis uses buffering and overlay techniques to determine the location from the results of overlapping physical conditions and priority land. The research variables used were adapted from Siregar (2019), Hanafiah (2008), and Anwari, et all (2021) including land use classification, land slope classification, distance to routes, distance to sources of waste generation, distance to water sources, and land ownership data shown in Table 1.

Table 1. Variables and parameters of physical aspects of research

Indicators	Parameters	Expected Value	Value
Distance to Waste Generation Center	• 0-250 meters	• Very Low	1
	• 250-500 meters	• Keep	3
	• 500-750 meters	• Tall	4
	• 750-1000 meters	• Very High	5
	• >1000 meters	• Low	2
The distance of TDS to the Waste Transportation Route	• 0-50 meters	• Very High	5
	• 50-100 meters	• Tall	4
	• 100-150 meters	• Very Low	1
	• 150-200 meters	• Low	2
	• >200 meters	• Keep	3
Land Use for TDS Locations	• Vacant Land	• Very High	5
	• Rice fields, moor, garden	• Keep	3
	• Settlements, Housing	• Tall	4
	• Offices, trade and services	• Very Low	1
	• Forest, thicket	• Low	2
Land slopes	• 0-11%	• Very High	5
	• 12-23%	• Tall	4
	• 24-35%	• Keep	3
	• 36-45%	• Low	2

Indicators	Parameters	Expected Value	Value
Distance to a river or water source	• >45%	• Very Low	1
	• >100 meters	• Very High	5
	• 84-100 meters	• Tall	4
	• 67-83 meters	• Keep	3
	• 51-66 meters	• Low	2
	• <50 meters	• Very Low	1

Source: Analysis, 2023

The flow of this research is shown in Figure 2.

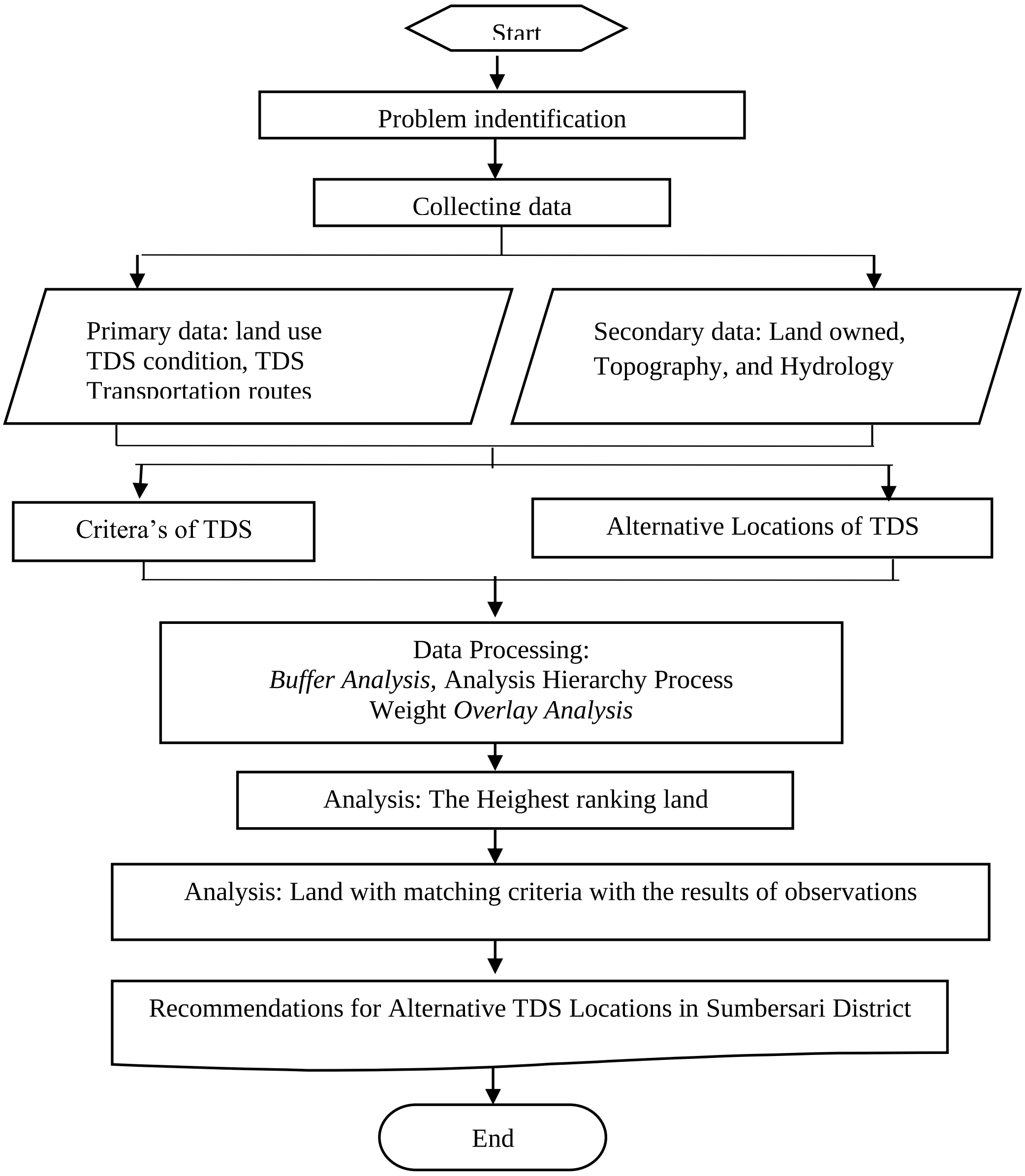
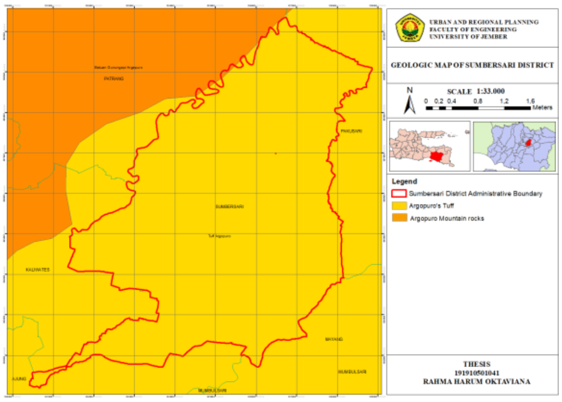


Figure 2. Research Flow

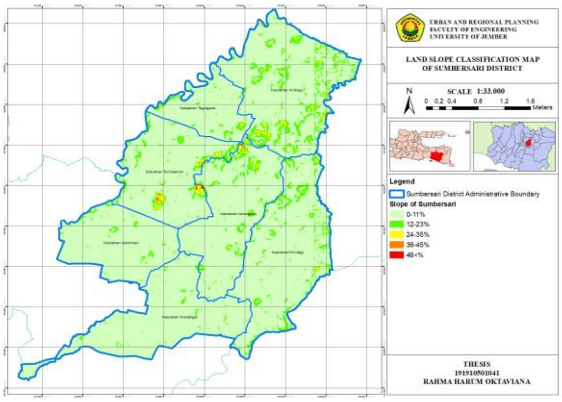
In general, Sumbersari District can be described through physical conditions, population, and land ownership on it, and consists of 7 sub-districts with the largest sub-district area being the Antirogo sub-district and the Sumbersari sub-district is located in the center. Sumbersari District is dominated by geology in the form of Mount Argopuro

Rock and Argopuro Tuff which causes the soil texture to easily experience water and soil pollution (Febriarta, et al., 2021). The hydrological distribution has a parallel pattern dividing Sumbersari District with the density of tributaries in Kranjingan Sub-district. These geological and hydrological conditions are a consideration for determining the location of TDS, it is better to avoid areas adjacent to water areas so that the remaining pollutants of TDS activities do not pollute the hydrological area. The topography of Sumbersari District is at an altitude ranging from 140-180 meters above sea level and is dominated by slopes of 0-11% with a stable distribution of slopes in Kranjingan Sub-district, Kebonsari Sub-district, and Antirogo Sub-district. Land with such slopes is more recommended in development. The land use conditions of Sumbersari District are dominated by rice fields and residential areas. No land use was found with vacant land types, shrubs, and RTH so the study used the remaining land use types. The condition of the Waste transportation route is on a road with Collector and Local functions which has a road width ranging from 6-8 m and asphalt pavement so as to facilitate the movement of Waste transporters. Sumbersari District is dominated by land status in the form of real estate / customary land in all sub-districts. Meanwhile, land ownership in the form of state/state-controlled land has a limited number of 7 location points and is only spread in three sub-districts, namely Sumbersari, Wirolegi, and Antirogo Sub-district. The physical picture of the condition of the Sumbersari District is presented from Figure 3 to Figure 13.



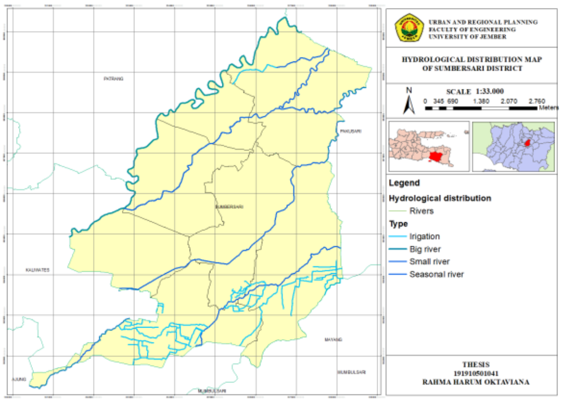
Source:RBI, 2022

Figure 3. Geologic Map Of Sumbersari District



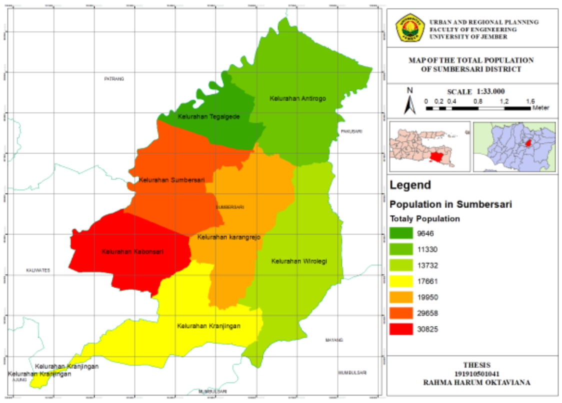
Source: RBI, 2022

Figure 4. Land Slope Classification Map Of Sumbersari District



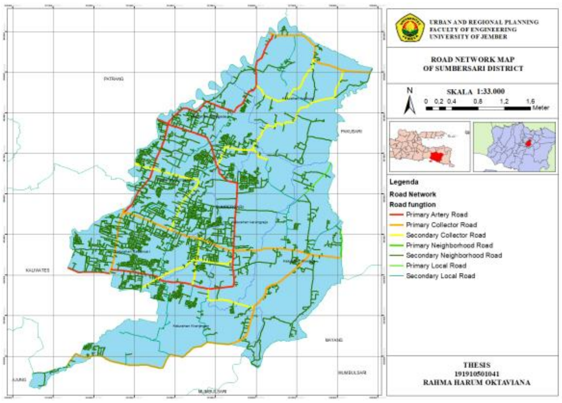
Source: BMSDA Jember Regency

Figure 5. Hydrological Distribution Map Of Sumbersari District



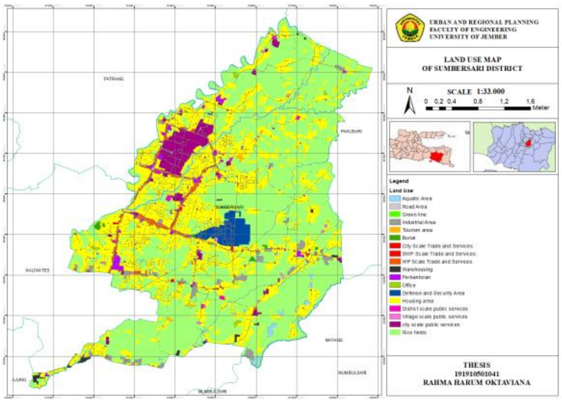
Source:BPS Jember Regency, 2022

Figure 6. Map Of The Total Population Of Sumbersari District



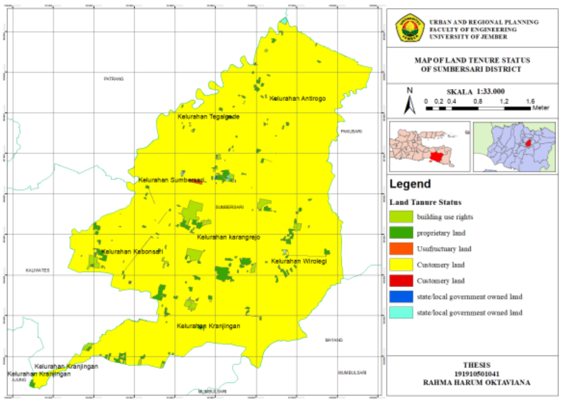
Source: BMSDA Jember Regency

Figure 7. Road Network Map Of Sumbersari District



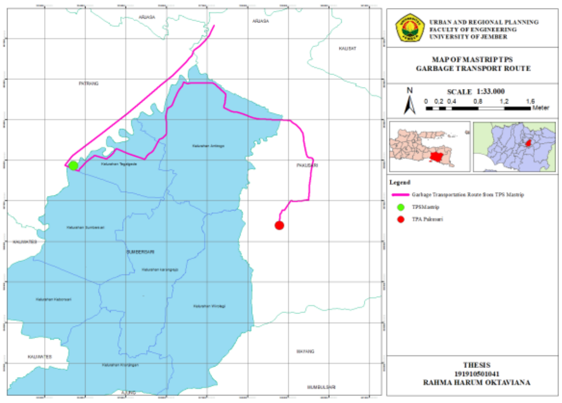
Source:DPUPR Jember Regency, 2022

Figure 8. Land Use Map Of Sumbersari District



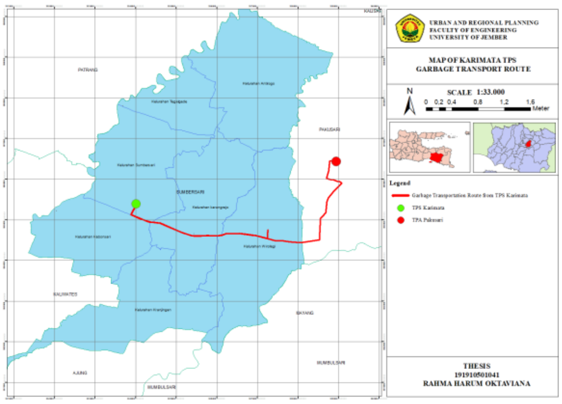
Source: ATR/BPN Jember Regency, 2022

Figure 9. Map Of Land Tenure Status Of Sumbersari District



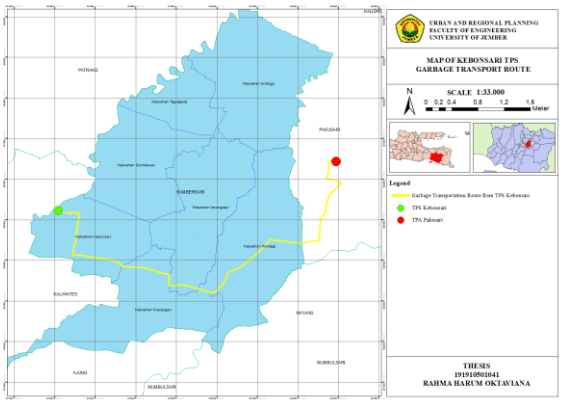
Source: Khomsa, 2022

Figure 10. Map Of Mastrip TDS Waste Transportation Route



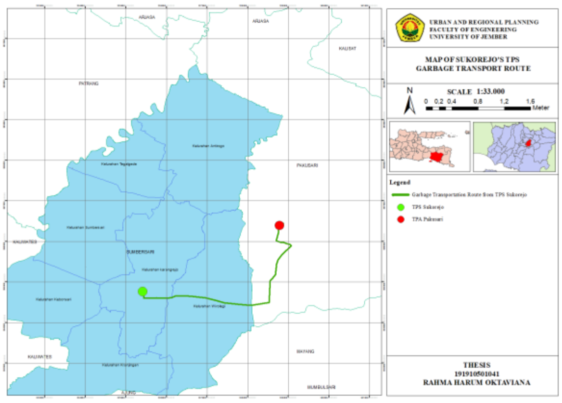
Source: Khomsa, 2022

Figure 11. Map Of Karimata TDS Waste Transportation Route



Source: Khomsa, 2022

Figure 12. Map Of Kebonsari TDS Waste Transportation Route



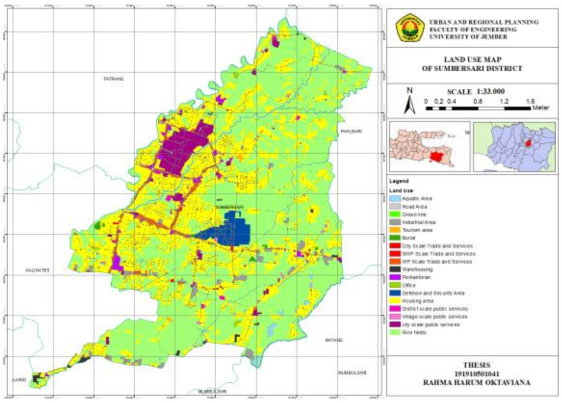
Source:Khomsa, 2022

Figure 13. Map Of Sukorejo TDS Waste Transportation Route

Results and Discussions

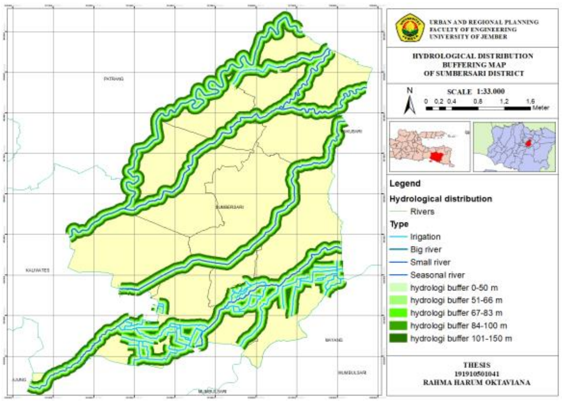
Spatial Analysis of Physical Aspect Variables and Criteria for Determining TDS Zoning in Sumbersari District

The aim of this stage is to find out the zoning map of the feasibility of physical aspects according to their level so that the results of the analysis can be used to determine the zoning of the strategic location of TDS in Sumbersari District. Figure 14 to Figure 18 show the study buffering and classification on physical aspect maps of the Sumbersari District.



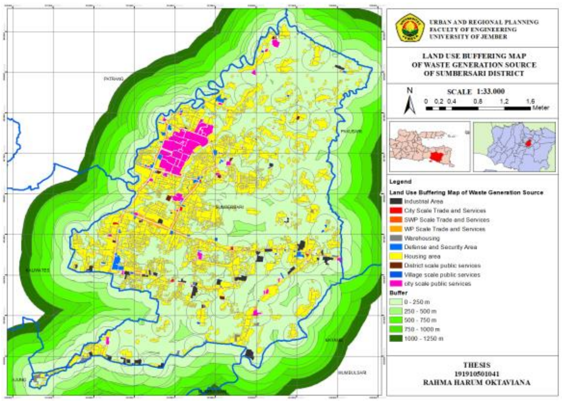
Source:BAPPEDA Jember Regency

Figure 14. Land Use Classification Map of Sumbersari District



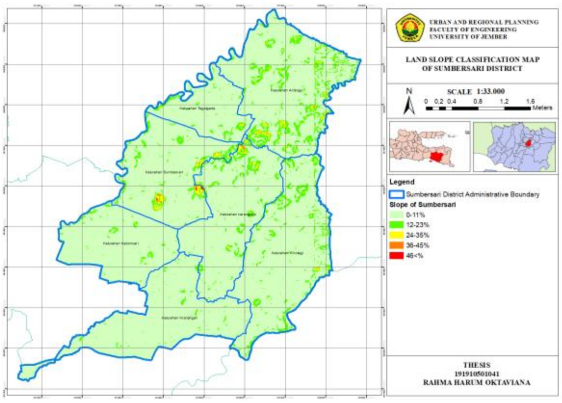
Source: Analysis, 2023

Figure 15. Hydrological Distribution Buffering Map of Sumbersari District



Source:Analysis, 2023

Figure 16. Land Use Buffering Map of Waste Generation Source of Sumbersari District



Source:RBI 2022

Figure 17. Land Slope Classification Map Of Sumbersari District

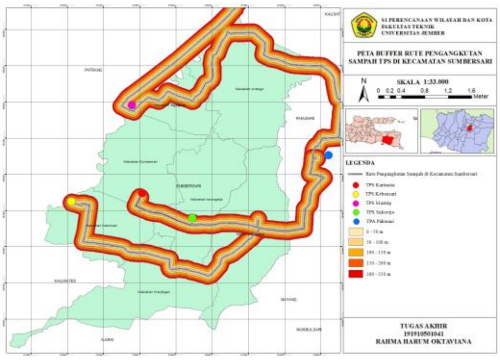
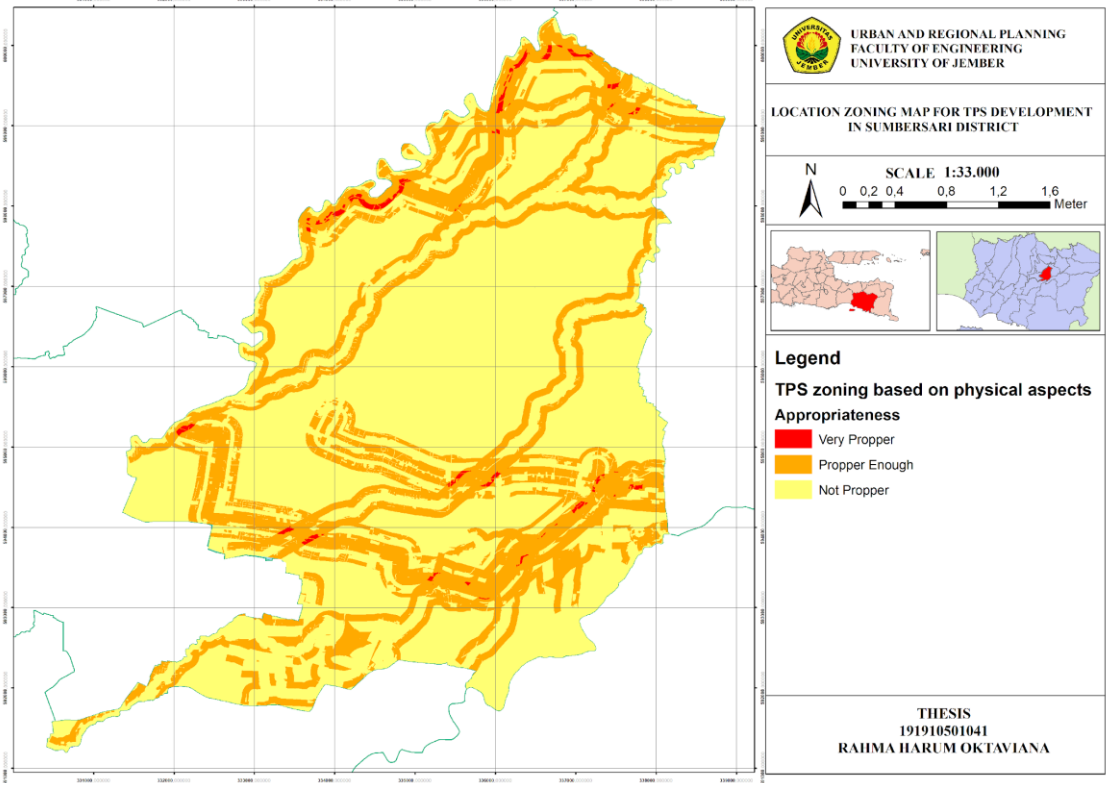


Figure 18. Buffering Map of Waste Transportation Route of Sumbersari District

After buffering and classification functions on physical aspect data, a process was carried out using Weight Overlay on variable zoning maps of physical aspects of determining the location of TDSs in Sumbersari District. The scoring process on the Weight Overlay method produces the highest value of 25 and the lowest of 5. Furthermore, the determination of the number and range of classes resulted in the following classification, which the spatial analysis of physical variables is presented in Figure 19.

1. Values 5 to 11 are zoning that is considered unsuitable for the placement of TDS locations
2. Values 12 to 18 are medium zoning to be used as TDS locations
3. Values 19 to 25 are zoning that is considered suitable for use as a TDS location.



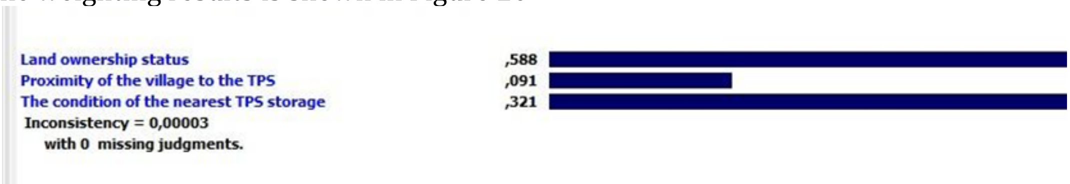
Source: Analysis, 2023

Figure 19. Feasibility Map of Physical Aspects for TDS Construction in Sumbersari District

Seen in Figure 5. areas that have feasibility for the construction of TDS based on physical aspect variables are generally around main roads or waste transportation service routes by truck fleets. This illustrates that accessibility factors are more important than other factors.

Analysis of Priority Land Determination using the AHP method

The stages of AHP analysis are conducted to obtain land that is prioritized in the construction of TDS through the AHP method. The acquisition of scores on each criterion and sub-criteria was carried out using a matrix filled in by 5 selected respondents, namely 2 respondents from the Department of Environment Jember Regency, 2 respondents from the Regional Planning and development agency Jember Regency, and 1 respondent from a lecturer in Environmental Engineering at the University of Muhammadiyah. The result of this stage is 3 priority values through the weighting of the Expert Choice application with an inconsistency value of 0.00003 which states that the weighting results are feasible to use. The weighting results is shown in Figure 20.



Source: Analysis, 2023

Figure 21. AHP Criteria Weighting Chart

Based on the results of the Expert Choice weighting, it can be seen that the first priority is land ownership with a value of 588, the second priority is the condition of the TDS capacity closest to the sub-district with a value of 321, and the third priority is the distance between the sub-district and the existing TDS with a value of 91. The following are the results of calculating indicators on each criterion to determine priority land for TDS development:

1. Land Ownership Variables

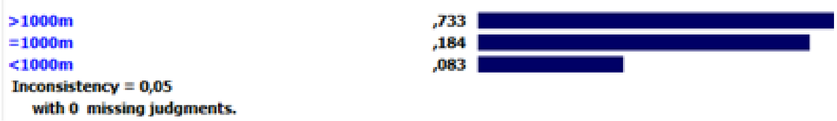
Land tenure variables consist of several types of land ownership status. The results of the Expert Choice weighting show that the first priority is State land with a value of 551, the second priority is freehold land with a value of 273, and the third priority is right-of-use land with a value of 109. The weighting results are presented in Figure 22.

Source: Analysis, 2023

Figure 23. Land Tenure Variable Weighting Chart

2. Variable distance of sub-districts that cause waste to existing TDSs

The variable distance of the sub-district that causes waste to the existing TDS consists of several types. The results of the Expert Choice weighting show the first priority, which is >1000 m with a value of 733. This shows that sub-districts that have a longer distance from the existing TDS are chosen so that the construction of new TDS can reach waste transportation services in sub-districts that have not been served by existing TDS. The weighting results are presented in Figure 24.



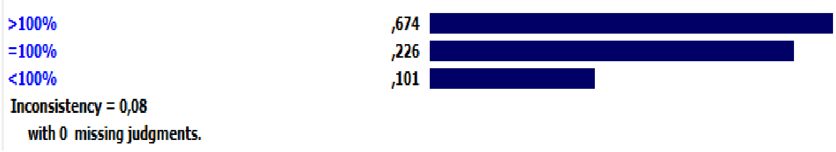
Source: Analysis, 2023

Figure 24. Variable Weighting Diagram of Sub-district Distance Conditions to the Nearest Existing TDS

3. Variable condition of existing TDS capacity

The variable condition of existing TDS capacity around the sub-district consists of several types. The first type is the capacity of more than 100% storage (excessive TDS capacity), the second is equal to 100% storage (sufficient TDS capacity), and the third is less than 100% storage (TDS capacity still available to accommodate waste). Based on the results of the Expert Choice weighting, the first priority is the first type of TDS with a value of 674. It means the existing TDS is over capacity and then the selected location for a new TDS in order to accommodate the existing TDS. The weighting results are presented in Figure 25.

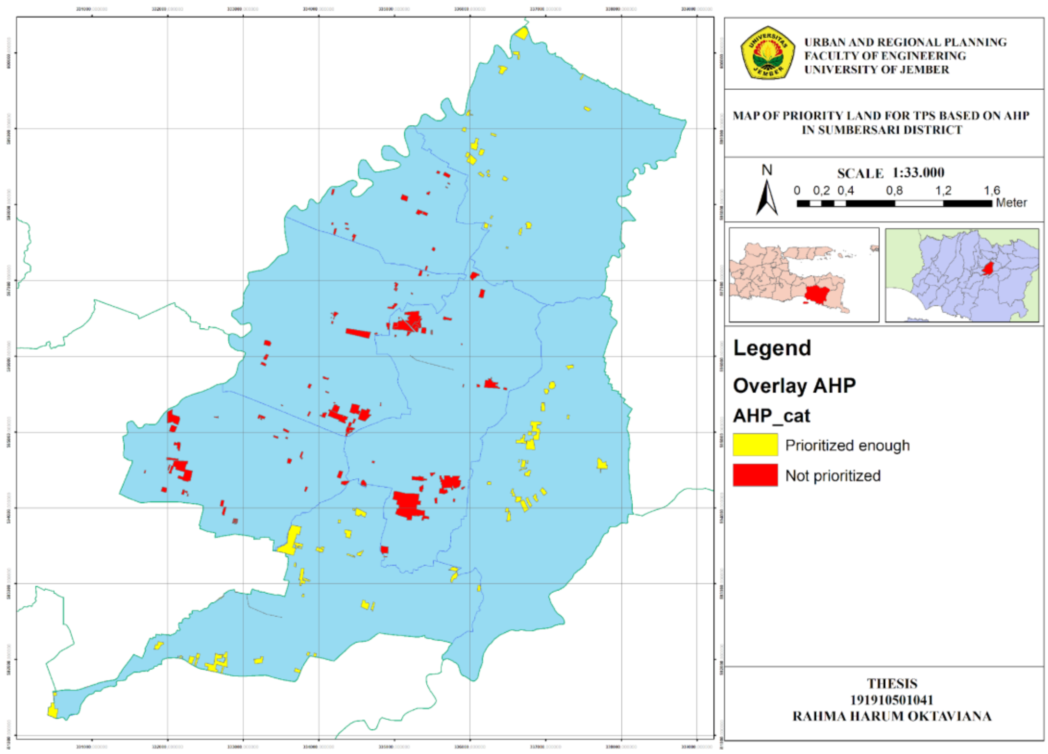
http://dx.doi.org/10.14710/jwl.X.X.XX-XX



Source: Analysis, 2023

Figure 25. Variable Weighting Chart of Nearest Existing TDS Capacity Conditions

The results of the calculation of the three priorities will be converted to spatial using the Weight Overlay method with the results presented in Figure 26. It shows the condition of land with a fairly prioritized category dominating sub-districts that have a considerable distance from existing TDSs, namely Antirogo, Kranjingan, Karangrejo, and Wirolegi Sub-district. Some of them are underserved by existing TDS as the reason to be prioritized for development.



Source: Analysis, 2023

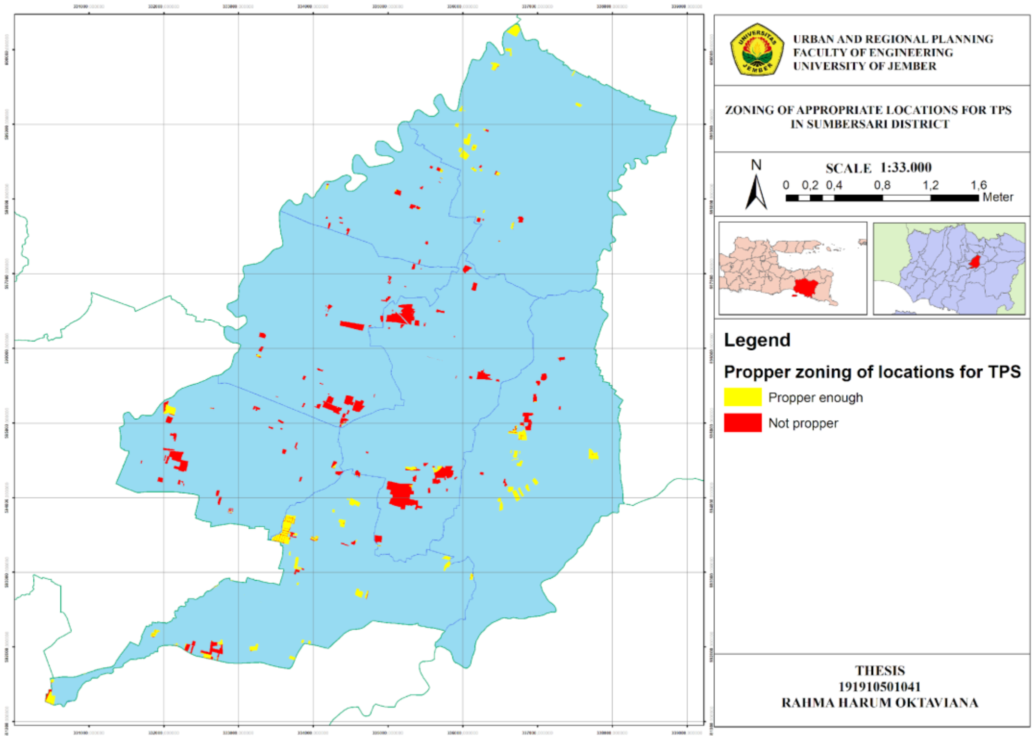
Figure 26. TDS Development Priority Land Map based on AHP Weighting Results

Spatial Analysis of Zoning Feasibility of TDS Location in Sumbersari District

The method is the Weight Overlay function on variable zoning maps for determining the location of TDSs based on physical aspects in Sumbersari District and priority land maps based on AHP results. The results at this stage will be used as a general assessment tool for the current location of TDSs and strategic site plans for the development of TDS facilities in Sumbersari District. The scoring technique is used to obtain the zoning class of the TDS location in Sumbersari District through summation based on the value of the location determination criteria in Table 1. The calculation yields a high value of 40 and a low. Furthermore, the determination of the number and range of classes was carried out to produce the following classification:

1. Values 6 to 17 are zoning that is considered inappropriate for the placement of TDS locations
2. Values 17 to 29 are medium zoning to be used as TDS locations
3. Values 30 to 40 are zoning that is considered suitable for use as a TDS location.

This stage of analysis produced a zoning map of the location of TDSs in Sumbersari District with 28 priority location points and 10 location points with the highest value. The results of the spatial analysis of variables of physical aspects and land priorities according to the AHP method are presented in Figure 27.

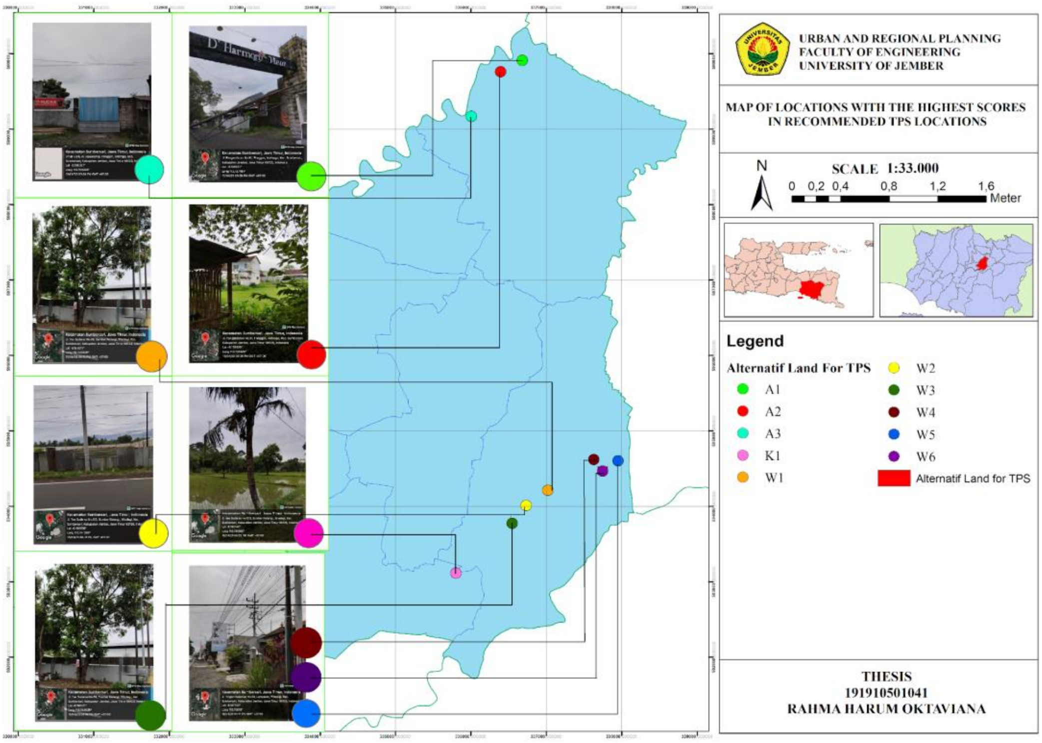


Source: Analysis, 2023

Figure 27. Location Zoning Map for TDS Development in Sumbersari District

Alternative New TDS Locations in Sumbersari District

The results of spatial identification based on the feasibility of physical aspects and AHP analysis, can be found as many as 11 feasible location points with the top ranking to build new TDSs in Sumbersari District, Jember Regency. The distribution of locations is present in Figure 28.



Source: Analysis, 2023

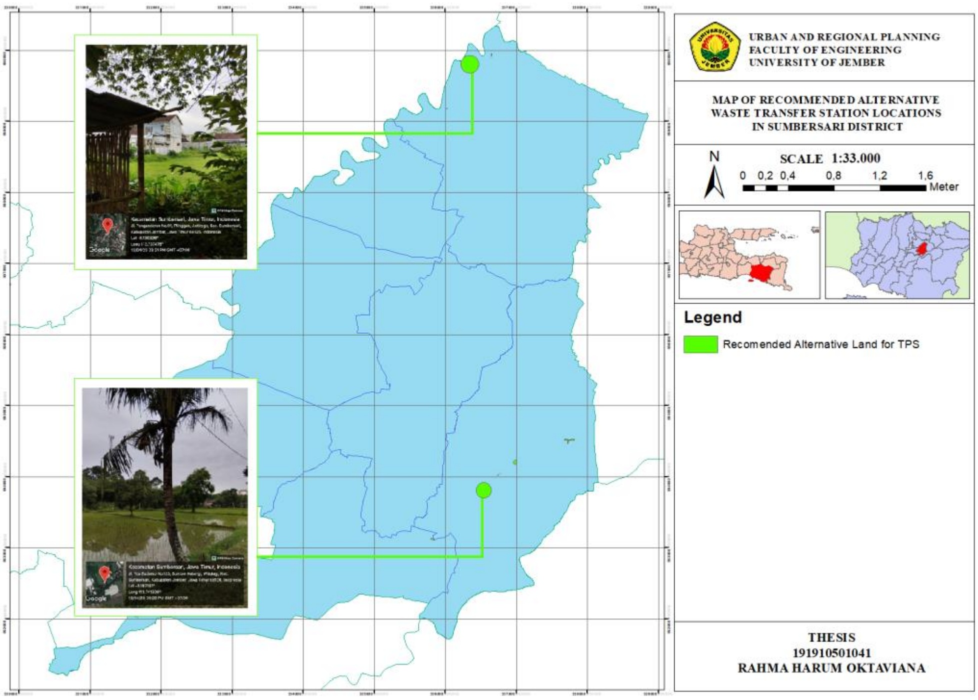
Figure 28. Map of Locations with The Highest Scores in Recommended TDS Locations

The results of these observations illustrate that the zoning of the average TDS location has differences with land use planning by the Regional Planning And Development Agency in the RTRW of Jember Regency in 2015-2035. The condition of each land determines the suitability for the construction of TDS. Land A1 is a densely populated residential land with the availability of vacant land in front of the residential area. This land is considered unsuitable for the developer's residential area because the construction of TDS in the front of the residential area will reduce the aesthetic image. A2 land is a former paddy field that has low productivity. This is evidenced by the absence of irrigation and traces of planting food plants on the land. This land is considered suitable for the construction of TDS because of its location in the source area of waste generation. However, this land needs to be cleared because access from the main route to land A2 is covered by semi-permanent building street vendors. Land A3 is in the boarding house area which makes this land considered unsuitable for the construction of TDS. The construction of TDS in the middle of a built-up area will cause unpleasant odor disturbances for residents of boarding houses around the TDS. K1 land is a paddy field that is still planted with food plants. However, this land is not traversed by technical irrigation infrastructure and this land is planned as residential land based on the 2015-2023 Jember Regency RTRW plan so that the land is considered potentially suitable for TDS development. W1, W2, W3, and W4 land are land with existing conditions as industrial land. The allocation of industrial land is considered unsuitable for the construction of public TDS because the industry has certain types of waste generation so independent and separate waste management is needed by related industries. W5, W6, and W7 land are residential lands that are far from the main access and do not have access to land so the land is considered unsuitable for TDS development. Based on this description, the land recommended for TDS development is K1 and A2. Planning directions are presented in Table 2 and Figure 29.

Table 2. The land recommended for TDS development

Name of Sub-district	Land Code	Referral
Kranjingan	K1	a. Land leveling is required b. It is recommended to increase the landing area at the TDS because the road around the land cannot be used for a U-turn. c. It is recommended for the construction of Type I TDS with the type of depot transfer by considering the amount of waste generation that has not been served.
Antirogo	A2	a. It is necessary to clear land through the eviction of street vendors in front of the land. b. The construction of TDSs must pay attention to the boundaries of surrounding buildings. c. It is recommended for the construction of Type I TDS with the type of depot transfer by considering the amount of waste generation that has not been served.

Source: Analysis, 2023



Source: Analysis, 2023

Figure 29. Map of Recommended Alternative TDS Locations in Sumbersari District

Conclusion

Determination of alternative locations of TDS in Sumbersari District, Jember Regency is based on spatial analysis of physical aspect variables and analysis of priority land determination using the AHP method. Spatial analysis of physical aspect variables using buffering techniques and Weight Overlay so those areas with good feasibility according to physical aspects are found in the area around the accessibility of waste transportation routes. While the analysis of determining priority land using the AHP method using data processing techniques through the Expert Choice application and weight Overlay techniques in the ArcGIS application, it was found that areas with priority land were areas dominated by land with ownership of State Rights, Property Rights and Use Rights, land that had a distance of >1000 m from the existing TDS, and land that had existing TDS conditions with a capacity of >100%. The land is spread across Antirogo Sub-district, Wirollegi Sub-district, and Kranjingan Sub-district. The land was selected through the highest ranking of 28 points, leaving 10 location points for TDS planning. Furthermore, field observations were carried out to determine the suitability of field conditions with the construction of TDS so as to produce 2 suitable locations, namely A1 in Antirogo Sub-district and K1 in Kranjingan Sub-district.

Acknowledgements

The authors would like to thank those who have helped the research either as data providers, interviews, or research questionnaire fillers. These parties include Regional Planning and Development Agency Jember Regency, Jember Environment Office, Jember Regency Highways and Water Resources Office, ATR/BPN Jember Regency, and Ms. Rusdiana Setyaningtyas, S.T, M.T.

References

Adininggar, & Wulandari. P., (2016). Making A Map Of Land Potential Based on The Physical Condition of The Land Using The Weighted Overlay Method. Journal of Geodesy. Vol 5. Hal 136-146.

Aditama, T., & Hani, B. (2022). Study on Determining the Alternative Location of Landfill (LANDFILL) Waste in Cianjur Regency. Bandung Conference Series: Urban & Regional Planning, 561-576.

Agacsapan, B., & Saye, N. (2019). Determination of Suitable Waste Transfer Staton Areas for Sustainable Territories : Eskisehir Case. Sustainable Cities and Society, 1-38.

Alfidhdha, & Rizky. (2015). Analysis of Waste Management in Tamalanrea District, Makassar City. Sepuluh Nopember Institute of Technology.

Anwari, Holifi, & Iswahyudi, A. (2021). Analysis of TPS Placement in Pamekasan District Based on Geographic Information System. JURTEKSI (Journal of Information Technology and Systems) , 41-48.

Badan standarisasi Nasional (2008). Pengelolaan sampah di permukiman 3242;2008. Badan Standarisasi Nasional. Jakarta

Badan standarisasi Nasional (1994). Metode Pengambilan dan Pengukuran Contoh Timbulan dan Komposisi Sampah Perkotaan19-3964-1994. Badan Standarisasi Nasional. Jakarta.

Badan standarisasi Nasional (2002). Tata Cara Teknik Operasional Pengelolaan Sampah Perkotaan 19-2454-2002. Badan Standarisasi Nasional. Jakarta.

Budiman, R. (2017). Spatial Analysis of Public Health Service Facilities on Settlements in Blitar City. Thesis. Department of Geomatics Engineering, Faculty of Civil Engineering and Planning, Sepuluh Nopember Institute of Technology.

BPS Jember Regency.(2022).Statistik Jember 2021. BPS, Jember.

Damanhuri, F., & Padmi, T. (2010). Diktat Lecture TI-3104 Waste Management. Bandung: Bandung Institute of Technology.

DeMers, & Michael, N. (2009). GIS For Dummies. Wiley Publishing.

Department Of Environment Kabupaten Jember.(2021). Renstra Department Of Environment 2021-2026. Department Of Environment, Jember.

Dhokhikah, Y., & Trihadiningrum, Y. (2012). Solid waste management in Asian developing countries: challenges and opportunities. Journal of Applied Environmental and Biological Sciences , 329-335.

Fatimah, S., Ahmad, & Nugraha, S. (2022). Analysis of the Strategic Location of Temporary Garbage Shelters in Karanganyar District in 2021. Indonesian Journal Of Environment And Disaster (Ijed). Vol 1. Hal 44-54.

Hanafiah, M. (2008). Suitability of TPS Location from Technical Aspects and Community Opinion in Serang City. Thesis. Master Program in Regional and Urban Development Engineering. Diponegoro University.

Herwindah, S., Triyatno, & Suasti, Y. (2020). Spatial Analysis of Temporary Landfills (TPS) in Jambi City. Buana Journal., 4.

Indonesia. Peraturan Menteri Pekerjaan Umum Republik Indonesia Nomor 03/PRT/M/2013 Tentang Penyelenggaraan Prasarana Dan Sarana Persampahan Dalam Penanganan Sampah Rumah Tangga Dan Sampah Sejenis Sampah Rumah Tangga. Sekretariat Negara. Jakarta.

Indonesia (2008). Undang-Undang Republik Indonesia Nomor 18 Tahun 2008 Tentang Pengelolaan Sampah. Jakarta.

Istingadah, J., & Warmadewanthi, IDAA. (2022). Optimization of waste transportation in Kebumen District, Kebumen Regency. ITS Engineering Journal, 11.

Kementerian Pekerjaan Umum. (2013). Materi Bidang Sampah I, Diseminasi dan Sosialisasi Keteknikan Bidang PLP. Ditjen Cipta Karya, Jakarta.

Milasari, L. A. (2021). Analysis of Site Selection of Landfills in Loa Kulu District, Kutai Kartanegara Regency. Kacapuri Journal. 4, 298–305.

Prahasta, & Eddy. (2002). Basic Concepts of Geographic Information Systems. Informatics.

Pratiwi, E. Z., Meidiana, C., & Wijayanti, W. P. (2018). Recommendations for Determining Temporary Garbage Shelter Points in Kedungkandang District, Malang City. Journal of Urban and Regional Planning.,10(1), 25-38.

Rathore, P., & Sarmah, S. (2019). Modeling Transfer Station Location Considering Separation Of Solid Waste In Urban Centers: A Case Study Of Bilaspur City, India. Journal Of Cleaner Production, 44-60.

Rizal, M. (2017). Analysis of Urban Waste Management. Smartek Journal.

Siregar, F., & Rosita. (2019). Analysis of Location Determination of Temporary Shelters (TPS) in Tawangsari District, Sukoharjo Regency. Diponegoro University Vocational.

Suk-ueng, K., & Ruangkitchaya. (2021). Site Suitability Analysis for Electronic Waste Collection: A Case Study in Ban Kok Sub-district, Khueang Nai District, Ubon Ratchani Province. Asian Journal of Scientific and Technological Reports. Vol 24. 18-30.

Supriadi, A. (2018). Analytical Hierarchy Process (AHP) Technique for Determining the Competitiveness Strategy of Embroidery Crafts. Yogyakarta: CV BUDI UTAMA.

Wijayanti, N., Dhokhikah, Y., & Rohman, A. (2023). Analysis of Community Participation in Waste Management in Sumbersari District, Jember Regency, East Java Province. Journal of Sustainable Environmental Management. Vol 7 No. 1: 19-27.