Finding Optimal Location Development UPPKB In South Sumatera Province Using Multi-Criteria Analysis

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Abstrak

Distribusi transportasi komoditas merupakan salah satu faktor penting dari keberlanjutan dan kelangsungan kegiatan ekonomi di wilayah tertentu. Pengiriman berlangsung setiap hari, terutama di jalan utama, dengan mayoritas barang yang diangkut melebihi batas tonase ketika melewati jalan. Jika hal ini terus berlanjut tanpa adanya pengendalian dan pengamanan, maka akan menyebabkan penurunan kualitas fisik jalan, dan dampaknya adalah terganggunya transportasi distribusi barang. Unit Penimbangan Kendaraan Bermotor (UPPKB) merupakan bentuk pengendalian dan pengamanan oleh pemerintah untuk mengendalikan pengangkutan distribusi barang, yaitu di atas tonase. Setiap hari, transportasi distribusi barang di Provinsi Sumatera Selatan begitu tinggi karena provinsi tersebut memiliki banyak pembangkitan dan tempat wisata. Penelitian ini bertujuan untuk mengidentifikasi lokasi pengembangan UPPKB dengan menggunakan metode kuantitatif untuk mendapatkan indikator analisis multi kriteria. Kesimpulannya adalah tanda-tanda yang ditemukan dalam poin-poin potensial menunjukkan hasil yang positif, yaitu memungkinkan untuk melakukan pembangunan UPPKB baru di lokasi tersebut. Lokasi potensial untuk pengembangan UPPKB baru di Sumatera Selatan terletak di Jalan Betung 1 dan Jalan Yusuf Singadekane 1.

Kata Kunci: Identifikasi, Lokasi, Optimal, UPPKB, Sumatera Selatan.

Abstract

Finding the Optimal Location for Developing UPPKB in South Sumatera Province Using Multi-Criteria Analysis: *The distribution of commodity transportation is a crucial factor for the sustainability and continuity of economic activities in specific regions. Shipments occur daily, especially on main roads, with the majority of goods transported exceeding tonnage limits when passing through roads. If this continues without control and security measures, it will lead to a deterioration of the physical quality of the road, disrupting the distribution of goods transportation. The Vehicle Weighing Station (UPPKB) is a form of control and security implemented by the government to regulate the transportation of goods distribution above tonnage limits. Every day, the transportation of goods distribution in South Sumatera Province is significant due to its numerous power plants and tourist destinations. This research aimed to identify the location for the development of UPPKB using a quantitative method to obtain indicators for multi-criteria analysis. The conclusion drawn from the identified potential points indicates positive results, making it feasible to construct a new UPPKB at those locations. The potential locations for the development of a new UPPKB in South Sumatera are Betung 1 Street and Yusuf Singadekane 1 Street*

Keywords**:** *Identification, Location, Optimal, UPPKB, South Sumatera.*

1. Introduction

The movement of goods transport plays an essential role in supporting the economic growth of a region [1]. The condition of the road can affect the economic growth in the area [2]. The reliability of a road is mandatory since damage can impede traffic [3]. The damaged roads inhibited the flow of goods, services, and personal transportation. Additionally, it can also lead to an increase in the operational costs of vehicles due to damage to vehicle parts resulting from burdens, bumpy roads, and perforations [4]. The movement of goods transported on the national road in South Sumatera Province is high because there are a lot of generation and attraction points. The recurring problem is the overweight tonnage issue. According to Government Regulation Number 79, 2013, and 74, 2014 of the Ministry of Transportation [5], the Weighting of Motor Vehicles (UPPKB) is the solution to solve this problem. UPPKB plays a crucial role in controlling goods transport that are over tonnage. To support the operational system of UPPKB, the government issued the latest regulations, i.e., Number 74, 2014. The regulation stipulates that if a vehicle is carrying goods exceeding 5%, its weight must be reduced to meet the tonnage limit. UPPKB aims to provide the best service adhering to specified standards [6]. Some studies in 2018 indicated that the existence of UPPKB is not yet efficient and effective in minimizing road damage. This is attributed to the suboptimal location and quantity of UPPKB for overseeing goods transport exceeding the limiting capacity [6]. In addition, based on the regulation of the Director General of Land Transportation Number 736 of 2017, there are already 9 indicators used to determine the location of UPPKB. However, the document lacks detailed explanations about the analysis procedures that produce

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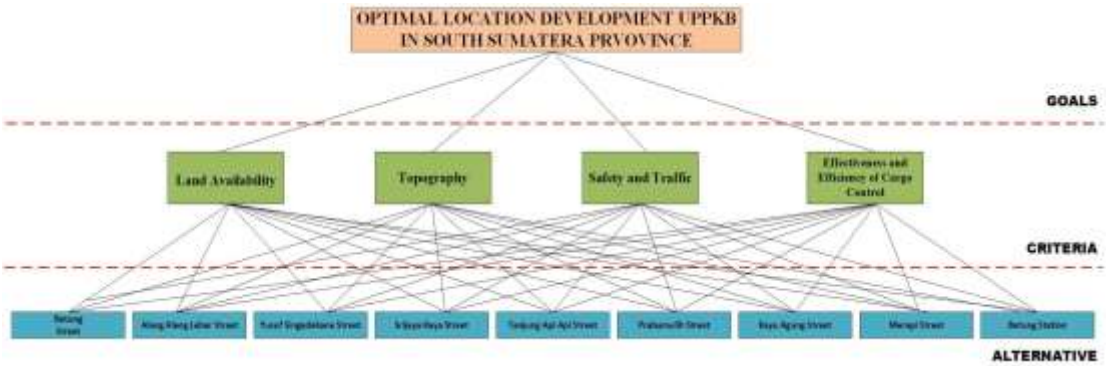
optimal locations for UPPKB. Therefore, the author attempts to use multi-criteria analysis to further operationalize it. The utilization of the Analytic Hierarchy Process (AHP) is justified as it is a straightforward method capable of addressing problems with numerous criteria, which are essential considerations in decision-making [7]. Decision-making, in essence, involves the selection of the most optimal alternative [8]. AHP, introduced by Thomas L. Saaty in the 1970s, stands as one of the decision support methods. This method articulates complex multi-criteria problems into a hierarchical structure.

The hierarchy serves as a representation of a convoluted problem organized into multiple levels. At the highest level are the goals, followed by criteria, sub-criteria, and, finally, the alternative level. Through this hierarchical structure, a complex problem can be systematically organized and described, enhancing its structure and coherence [9]. Based on these problems, this study needs to be conducted to provide more optimal recommendations for the location of UPPKB development. The research output aims to offer recommendations to the Ministry of Transportation for the supervision and security of the national road network in the South Sumatera Province.

2. Methodology

The research method is a systematic approach for acquiring data with a specific purpose, utilizing particular methodologies to address the issues related to the study objects [10][11]. This study employed a quantitative approach that is supported by data in the form of numbers, images from field observations, questionnaires, document reviews, and various literature sources [10][11]. This study consisted of stages, including: (1) content validity study, (2) face validity, (3) test reliability and validity; (4) analysis and conclusions. In the first stage, content validity involves seeking input from experts (academics and local government representatives) to review the suitability and weights of each indicator. The results of this stage include the identification of relevant indicators and their respective weights. The second stage is a validity test in the form of a face validation study, aiming to assess respondents' understanding of the questionnaire. The researcher distributes a questionnaire containing the indicators validated in the content validity stage to a purposive sample of 10 respondents, comprising UPPKB managers, local governments, and UPPKB users. The third stage involves conducting reliability and validity tests using AHP software to assess the validity of the questionnaire completed by the respondents. The fourth stage encompasses analysis and drawing conclusions.

Three types of analyses were performed in this study. The first is descriptive analysis, which serves to describe the obtained data and provide an overview of regional characteristics as an integral part of the research process [10]-[12]. Descriptive analysis is presented and interpreted through tables, diagrams, graphs, or maps. Then, the next analysis is Network Analysis using ArcGIS software. Network Analysis helps in identifying optimum locations for services to be provided [13]. Network analysis aims to determine potential road segments with high daily goods transportation intensity. The required data include national road network data, goods transport routes, trip generation, LHR (volume of goods transport), and the locations of UPPKB. The final analysis is the multi-criteria analysis (MCA), which describes a structured approach used to determine overall preferences among alternative options, where the options fulfill multiple objectives.



Source: Researcher Analysis, 2022
Figure 1. Framework Research

This study adopted the analytic hierarchy process (AHP) to help MCA to make decisions [14]. This indicator is a result of the validity of the content coming from experts. Table 1 shows the indicators and parameters used in the Multi-Criteria Analysis.

Table 1. Indicator of Multi-Criteria Analysis

Indicator	Valuation Technique	Parameter	Weight	Score
Land Availability	Valuation Based on Satellite Imagery Processing	NonBuild Up Area	n/a	3
		Build Up Area		2
		Not Available Land		1
Topography	Valuation Based on Data Spatial Processing	Flat	n/a	3
		Bumpy		2
		Hilly		1
Safety and Traffic	Safety Traffic Valuation Based on Society Interview	High	n/a	3
		Medium		2
		Low		1
	Traffic Valuation Based on VC Ratio	VC Ratio < 0.6	n/a	3
		VC Ratio 0.6-0.7		2
		VC Ratio > 0.7		1
Effectiveness and Efficiency of Cargo Control	Valuation Based on Society Interview	High	n/a	3
		Medium		2
		Low		1

Source: [5]

As shown in Table 2, this analysis is based on the Saaty method [15], which employed a scoring technique with nine levels of assessment. Each level has specific criteria and values. A value of 1 signifies that each criterion holds equal importance, whereas a value of 9 indicates that one criterion is deemed more important than others.

Table 2. Weightiness Intensity

Value of Intensity of Importance	Definition	Explanation
1	Equal Importance	The two segments contribute equally
2	Slightly Weak	
3	Moderate Importance	Experience and judgment slightly favor one segment over the other
4	Moderate Plus	
5	Strong Importance	Experience and judgment slightly favor one segment over the other
6	Strong plus	
7	Very Strong-Or Demonstrated Importance	A segment is favored very strongly over the other; its dominance demonstrated in practices
8	Very Strong	
9	Extreme Importance	The evidence favoring one segment over the other is of the highest possible order affirmation
2, 4, 6, 8		Intermediate values between the two adjacent judgments

Source: [15]

The process of determining weights and scoring on each indicator is done by interviewing experienced experts and then processed using a hierarchical analytical process. The next process used the mathematical multiplication formula; the value of the weight was multiplied by the score, and then summed to obtain the final value. The output of this analysis is a road with a final value above a certain threshold, which is used as a basis for analyzing potential points.

3. Results and Discussion

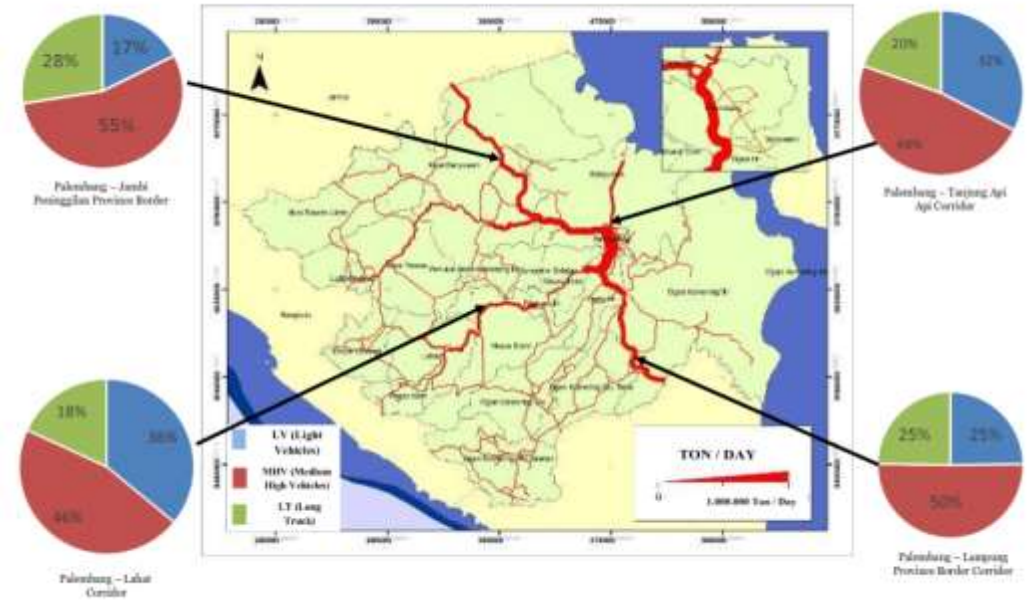
3.1. Analysis of the Potential Generation and Attraction

This analysis used 4-stage transportation planning models, including generating and pulling movements, movement distribution, choice of transportation modes, and load traffic. By utilizing data from the 2016 National Transportation Destination Origin (ATTN) Matrix, the result indicates that the amount of goods transported originating from South Sumatera Province was 443,988,969 tons/month. In

contrast, the quantity of goods transported to South Sumatera Province was 46,233,407 tons/month. The identification results highlight that the potential generation and attraction of goods transportation in the Province of South Sumatera stem from industrial estates, forest products, and port production centers. The majority of goods transportated to the islands of Sumatera and Java are distributed using land transportation modes, while the distribution of goods transported from Sumatera and Java Island predominantly utilizes sea transportation modes. In particular, the distribution of commodity transportation goods using sea transportation modes is dominated by coal transportation. The figure below explains the direction of the generation and attraction of goods transport (tons/day) in South Sumatera Province:

Source: Researcher Analysis, 2022
Figure 2. A) Attraction and Generation Goods Volume (Ton/Day)
(B) Average Traffic Composition of Goods Transport in South Sumatera Province

Figure 2A illustrates trips of goods based on the origin and destination on Sumatera Island. The Indonesian Road Capacity Guide (PKJI) 2014 [5], consists of several categories, including motorbike (MC), Car (Low Vehicle), Medium Truck (Medium-High Vehicle), and Large Truck (Light Vehicle). Figure 2B shows the composition of traffic loading on the National Road of South Sumatera Province, which is dominated by freight transport of 44% in the medium truck category (Medium-High Vehicle). Figure 3 shows the roads in South Sumatera Province, which have a high intensity of movement of goods transportation per day:



Source: Researcher Analysis, 2022
Figure 3. Traffic Load (Ton/Day) and Average Traffic Composition of Goods Transport in South Sumatera Province in 2018

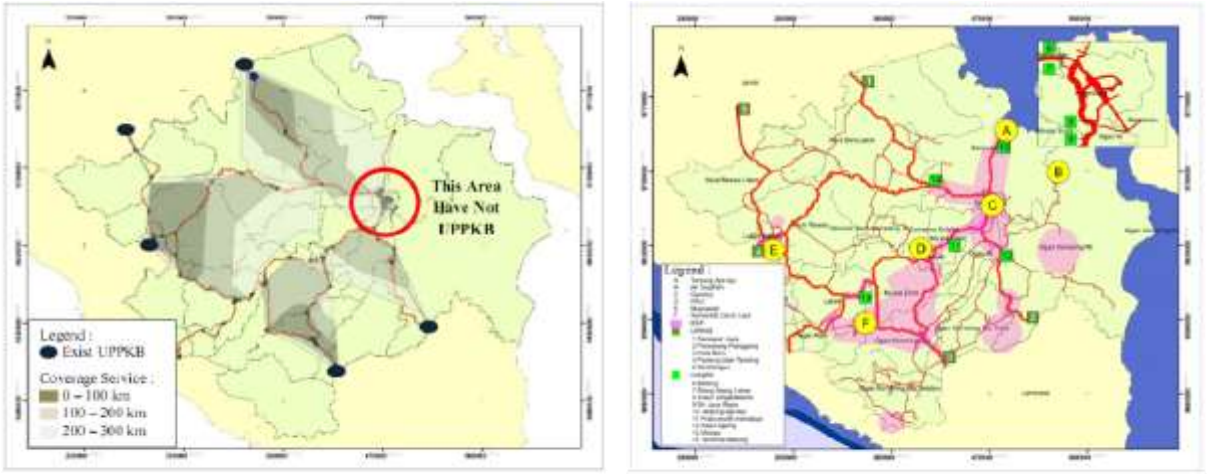
Figure 3 shows that four road segments have a high load of transportation traffic every day, particularly in the movement of coal goods transport. This aligns with the target of South Sumatera Province for the exploration of natural resources, especially coal, reaching 22.7 tons per year [16]. The

highest goods traffic load is observed on the Sumatera East Cross Road to Jambi Province and Lampung Province.

On the east crossing road towards Lampung Province, the goods traffic load exceeds 400,000 tons/day, while on the east crossing road to Jambi Province, it reaches over 300,000 tons/day. Additionally, the road from Palembang City to Lahat Regency bears a significant traffic load, mainly from coal transportation, ranging between 200,000 and 600,000 tons/day. Apart from these three road sections, one road exhibits high intensity in goods transportation, namely the Palembang Corridor to Tanjung Api-Api. The traffic load on this road reaches 180,000 tons/day, with coal goods transport exceeding the prescribed tonnage limit. The anticipation is that the development of a new UPPKB could effectively monitor the movement of coal transportation, ensuring that excess freight loads are monitored and do not cause damage to road structures [17].

3.2. Network Analysis in South Sumatera Province

The data utilized consisted of UPPKB location points overlaid onto a map of goods traffic loading. The output generated a road with a significant load of goods traffic lacking a UPPKB. Figure 4 illustrates the location of the road with a high load of goods traffic without a UPPKB.



Source: Researcher Analysis, 2022
Figure 4. Service Coverage of Existing UPPKB

Figure 4 shows the location of the road (longlist) that serves as the research sample, with the red circle indicating the road section lacking a UPPKB for supervising the transportation of goods with cargo exceeding the tonnage. Previous analyses indicate that this road location bears a very high load of goods traffic, necessitating the establishment of a new UPPKB to minimize road damage. This becomes crucial as the condition of the road can significantly impact the economic growth rate of the area [2][18]. The reliability of a road is imperative, as damage can impede traffic flow [7]. Damaged roads not only hinder the movement of goods, services, and personal transportation but also contribute to increased operational costs for vehicles due to damage resulting from the burden, uneven road surfaces, and perforations [4][19].

3.3. Multi-Criteria Analysis in South Sumatera Province

The multi-criteria analysis aims to streamline the long list of research samples into a shorter list of roads for the construction of the new UPPKB. The indicators for this analysis include the availability of land, traffic safety and smoothness, topography, and the effectiveness and efficiency of cargo control. The initial step involves determining the weight of each indicator to elucidate the level of importance of the assessed object. During the questionnaire completion process, a Comparative Judgment process is employed to evaluate the relative importance of two elements at a certain level in relation to the level above. Ratings are based on the Likert scale [20]. The results are then processed using AHP (Analytic

Hierarchy Process) software. Table 3 explains the results of scoring by ten respondents for each indicator used.

Table 3. Recapitulation of Questionnaire Results on Interest Level

Aspect A	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	Aspect B	Average
Land Availability	1	1	9	6	8	6	5	7	7	5	Topography	6
Land Availability	1	-2	1	1	-5	-4	-7	-8	-7	-4	Safety Traffic	-3
Land Availability	1	1	1	1	-6	-6	1	-8	-7	-1	Traffic	-2
Land Availability	-9	1	1	-5	-6	-7	1	-9	-8	-5	Effectiveness of Cargo Control	-5
Land Availability	1	1	1	2	-8	-5	1	-7	-8	-1	Efficiency of Cargo Control	-2
Topography	1	1	1	-4	-4	-6	-8	-6	-7	-3	Safety Traffic	-4
Topography	1	1	1	-4	-5	-5	-8	-8	-7	-2	Traffic	-4
Topography	-9	1	1	-4	-6	-7	-8	-7	-7	-4	Effectiveness of Cargo Control	-5
Topography	-9	-2	1	1	-6	-6	-8	-7	-7	-6	Efficiency of Cargo Control	-5
Safety Traffic	9	1	1	1	5	1	8	8	7	4	Traffic	5
Safety Traffic	1	1	-4	1	-6	1	-8	-7	1	1	Effectiveness of Cargo Control	-2
Safety Traffic	1	-3	-4	1	-6	1	-8	-8	1	-3	Efficiency of Cargo Control	-3
Traffic	1	1	1	1	1	-3	-8	-6	1	-2	Effectiveness of Cargo Control	-1
Traffic	1	1	1	1	1	-3	-8	-7	1	-3	Efficiency of Cargo Control	-2
Effectiveness of Cargo Control	1	1	1	7	5	1	7	1	1	3	Efficiency of Cargo Control	3

Source: Researcher Analysis, 2022

The AHP process involves two crucial components: Criteria and Alternatives. AHP is employed to establish the priority of various criteria/alternatives through a pairwise comparison analysis of each criterion/alternative. The questionnaire results are utilized to generate a pairwise comparison matrix, determining priorities/weights for each criterion, sub-criterion, and alternatives [21].

Table 4. Inconsistency Ratio Results

Respondent	Priority Vector						Inconsistency Ratio
	Land Availability	Topography	Safety Traffic	Traffic	Effectiveness of Cargo Control	Efficiency of Cargo Control	
1	0.076	0.240	0.049	0.051	0.062	0.090	0.095
2	0.013	0.040	0.037	0.026	0.062	0.036	0.036
3	0.228	0.160	0.147	0.513	0.155	0..060	0.010
4	0.152	0.160	0.029	0.103	0.309	0.090	0.041
5	0.380	0.200	0.295	0.103	0.309	0.542	0.005
6	0.152	0.200	0.442	0.205	0.103	0.181	0.014
7	0.228	0.160	0.147	0.513	0.155	0.060	0,060
8	0.152	0.160	0.029	0.103	0.309	0.090	0.090
9	0.380	0.200	0.295	0.103	0.309	0.542	0.042
10	0.228	0.160	0.147	0.513	0.155	0.060	0.003

Source: Researcher Analysis, 2022

For this reason, the AHP process also measures and quantifies the degree of inconsistency in the judgment matrix in the form of finding the Consistency Ratio (CR). As per the standard process [15], if the CR < 10%, the assessment matrix is considered for further processing; otherwise, the decision maker will have to reconsider his/her decision [22]. Overall, the consistency value is < 10%, and the research can proceed. Following the acquisition of the comparison matrix (Pairwise Comparison), the subsequent step involves calculating the comparison matrix based on criteria using Expert Choice software [21]. Tables 5 and 6 present the results of transforming the questionnaire responses into weight values for each indicator through a hierarchical analytical process.

Table 5. Calculation of First Step Indicator Weight

	Land Availability	Topography	Safety Traffic	Traffic	Effectiveness of Cargo Control	Efficiency of Cargo Control
Land Availability	1.00	6.00	0.33	0.50	0.20	0.50
Topography	0.17	1.00	0.25	0.25	0.20	0.20
Safety Traffic	3.00	4.00	1.00	5.00	0.50	0.33
Traffic	2.00	4.00	0.20	1.00	1.00	0.50
Effectiveness of Cargo Control	5.00	5.00	2.00	1.00	1.00	3.00
Efficiency of Cargo Control	2.00	5.00	3.00	2.00	0.33	1.00
Total	13.17	25.00	6.78	9.75	3.23	5.53

Source: Researcher Analysis, 2022

Table 6. Calculation of Second Step Indicator Weight

	Land Availability	Topography	Safety Traffic	Traffic	Effectiveness of Cargo Control	Efficiency of Cargo Control	Score	Weight
Land Availability	0.07595	0.24000	0.04914	0.05128	0.06186	0.09036	0.09476	9.48%
Topography	0.01266	0.04000	0.03686	0.02564	0.06186	0.03614	0.03553	3.55%
Safety Traffic	0.22785	0.16000	0.14742	0.51282	0.15464	0.06024	0.21049	21.05%
Traffic	0.15190	0.16000	0.02948	0.10256	0.30928	0.09036	0.14060	14.06%
Effectiveness of Cargo Control	0.37975	0.20000	0.29484	0.10256	0.30928	0.54217	0.30477	30.48%
Efficiency of Cargo Control	0.15190	0.20000	0.44226	0.20513	0.10309	0.18072	0.21385	21.39%

Source: Researcher Analysis, 2022

The Effectiveness and Efficiency Indicator of Cargo Supervision holds the highest weight of 51.87%, followed by Traffic Safety Indicators (21.05%), Traffic Smoothness (14.06%), Land Availability (9.48%), and Topography (3.55%). Subsequently, an assessment of all road segments (longlist) in the research sample is conducted to narrow down the selection. According to Table 2, this analysis employs the Saaty method [15], a scoring technique with nine levels of assessment, where each level has specific criteria and values. A value of 1 indicates that each criterion holds the same importance. Tables 7 and 8 present the results of the assessment of each indicator on all road segments (longlist) that form the study sample:

Table 7. Calculation of Second Step Indicator Weight

Indicator	Weight	Score Long list Alternative Location UPPKB								
		Betung Street	Alang-Alang Lebar Street	Yusuf Singadekane Street	Sri Jaya Raya Street	Tanjung Api-Api	Prabumulih	Kayu Agung	Merapi	Betung Station
Land Availability	9.48%	3	2	2	2	3	3	3	3	2
Topography	3.55%	2	3	2	3	2	2	2	3	3
Safety Traffic	21.05%	3	3	3	2	2	2	2	2	2
Traffic	14.06%	1	2	2	2	2	2	2	3	1
Effectiveness of Cargo Control	30.48%	2	1	2	1	1	1	1	2	2
Efficiency of Cargo Control	21.39%	3	1	3	1	2	1	1	3	1

Source: Researcher Analysis, 2022

For each criterion and alternative, pairwise comparison is necessary. The relative comparative values of all alternative criteria can be adjusted according to predetermined decisions to produce weight and priority. Weights and priorities are calculated by manipulating matrices or solving mathematical equations [23]. Table 8 shows that the road section with the final value is above the highest threshold.

Table 8. Longlist Score X Weight

Indicator	Weight	Score x Weight Long list Alternative Location UPPKB								
		Betung Street	Alang-Alang Lebar Street	Yusuf Singadekane Street	Sri Jaya Raya Street	Tanjung Api-Api	Prabumulih	Kayu Agung	Merapi	Betung Station
Land Availability	9.48%	0.28	0.19	0.19	0.19	0.28	0.28	0.28	0.28	0.19
Topography	3.55%	0.07	0.11	0.07	0.11	0.07	0.07	0.07	0.11	0.11
Safety Traffic	21.05%	0.63	0.63	0.63	0.42	0.42	0.42	0.42	0.42	0.42
Traffic	14.06%	0.14	0.28	0.28	0.28	0.28	0.28	0.28	0.42	0.14
Effectiveness of Cargo Control	30.48%	0.61	0.30	0.61	0.30	0.30	0.30	0.30	0.61	0.61
Efficiency of Cargo Control	21.39%	0.64	0.21	0.64	0.21	0.43	0.21	0.21	0.64	0.21
Total		**2.38**	**1.73**	**2.42**	**1.52**	**1.79**	**1.58**	**1.58**	**2.48**	**1.68**

Source: Researcher Analysis, 2022

Thirdly, the final value is determined using a multiplication formula between the weight and score. The process involves obtaining a shortlist of locations through Comparative Judgment, which entails identifying the largest total number of scores based on the results of the multiplication between scores and weights for each indicator. The roads that occupy the top three positions in the final score (shortlist location) are Merapi Street, Yusuf Singadekane Street, and Betung Street. These three roads serve as the foundation for analyzing potential points to determine optimal new UPPKB construction sites.

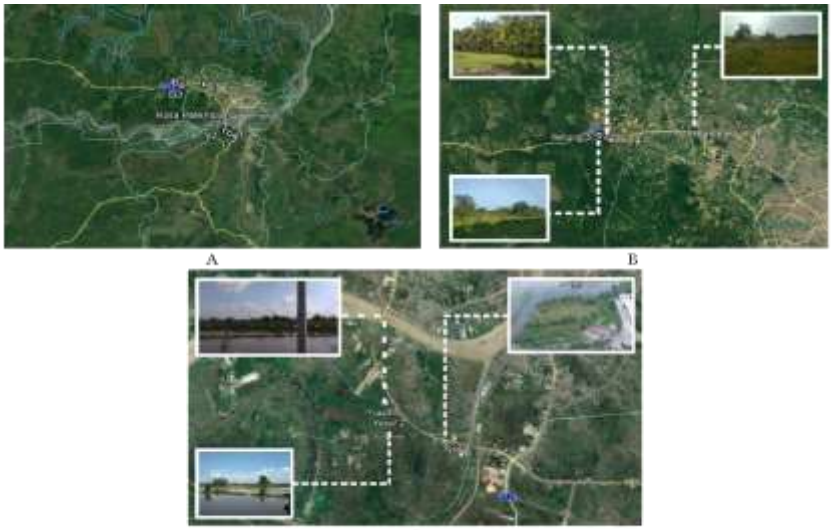
3.4. Potential Location Analysis for UPPKB Development

According to the theory [24], this analysis employed general assessment indicators to identify potential locations for UPPKB development. These indicators include topography, traffic conditions, and socio-economic conditions of the surrounding environment. In this analysis, only the segments of Yusuf Singadekane Road and Betung Road were assessed. This decision was made because Merapi Road already has existing non-active UPPKBs that require reactivation. Table 9 displays the coordinates of several alternative locations for the construction of the new UPPKBs on Yusuf Singadekane Street and Betung Street:

Table 9. Potential Coordinate Points in South Sumatera Province

No	Location	UTM Coordinate	Google Coordinate
Betung Street			
1	Betung 1	464166.00 m E, 9678015.00 m S	-2.913009, 104.677544
2	Betung 2	458288.00 m E, 9677625.00 m S	-2.915854, 104.624270
3	Betung 3	457735.00 m E, 9677790.00 m S	-2.914577, 104.620108
Yusuf Singadekane Street			
1	Yusuf 1	470243.00 m E, 9663497.00 m S	-3.044263, 104.732352
2	Yusuf 2	469123.00 m E, 9664243.00 m S	-3.035184, 104.721932
3	Yusuf 3	469003.00 m E, 9664466.00 m S	-3.035184, 104.721932

Source: Researcher Analysis, 2022



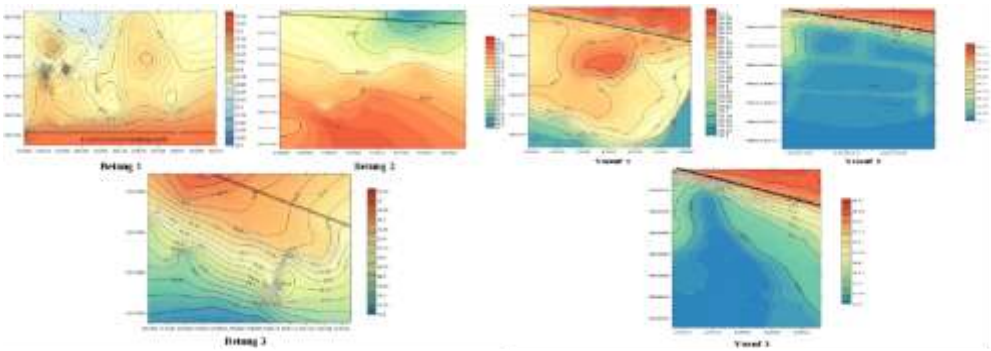
(a) UPPKB Development In Betung And Yusuf Singadekane Street; (b) UPPKB Development In Betung Street; (c) UPPKB Development In Yusuf Singadekane Street.

Source: Researcher Analysis, 2022

Figure 5. Potential Location for UPPKB Development in South Sumatera Province

3.4.1 Topography

The topographic analysis aimed to determine the feasibility of the selected location from the aspect of ease in carrying out the construction of a new UPPKB. Figure 6 shows the results of a topographic analysis for each selected location:



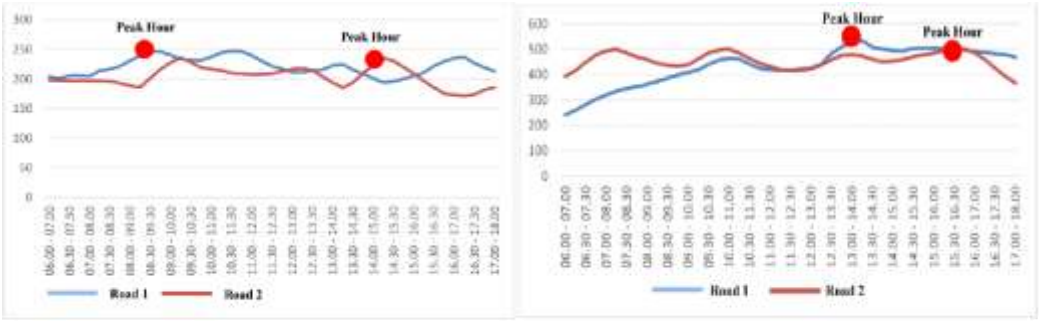
Source: Researcher Analysis, 2022

Figure 6. The Topography of the Potential Locations in Betung and Yusuf 1, 2, 3

The location is feasible, and it is possible to develop a new UPPKB based on the topographic aspects of the Betung 1 and Yusuf Singadekane 1 areas. The topography and location are relatively flat, most of the land use exhibits characteristics suitable for plantations. This aligns with the Guidebook for Technical Criteria for Spatial Planning of Cultivation Areas, which emphasizes important considerations in site selection, including topography, infrastructure, avoidance of flood-prone areas, and exclusion from protected areas [25][26].

3.4.2 Traffic Condition

Traffic condition analysis aims to determine the direction of movement of goods transported during peak hours and as a basis for determining the optimal location points [27]. The causes of congestion and decreased service levels are influenced by traffic volume and side obstacles [28]. High-side obstacles affect the speed value which causes traffic jams [29]. Congestion incurs additional costs borne by the community of IDR638.82 per km trip [30]. Figure 7 shows the amount of movement of goods transported during peak hours on the selected road segment.



(a) Goods Transport Amount In Betung Corridor; (b) Goods Transport Amount In Yusuf Corridor;

Source: Researcher Analysis, 2022
Figure 7. Goods Transport Amount In Palembang-Betung Corridor

The determination of UPPKB construction location points in three locations is based on the results of field surveys and several consideration factors, such as ease of development, VC Ratio value, availability of road infrastructure, road structure, and road characteristics [31]-[36]. The UPPKB location on Betung road is recommended to be built on side 2 (towards the city) because the amount of heavy cargo transportation passing on side 2 is higher than side 1. Similarly, the UPPKB location on Betung Yusuf Singadekane Street is recommended to be built on side 1 (towards the city) as the number of heavy cargo transports passing on side 1 is higher than side 2.

3.4.3 Social Economic Condition

The analysis was conducted by interviewing people who live or work around the neighborhood. Table 10 presents the results of community interviews regarding the new UPPKB development plans in selected locations.

Table 10. Social Economic Condition in Potential Locations in Sumatera Province

Location	Social	Economic
Betung 1	• There are no criminal activities • Land is ready for development • Society's characteristic is heterogen • The society understands the UPPKB function and not contradict with culture	• Land Price IDR2.000.000–4.000.000 / m^2 • Land is owned by society • Half land is rented for stockpile
Betung 2	• There are no criminal activities • Land is ready for development	• Land price is IDR300.000 / m^2 • Land is owned by PTPN 7
Betung 3	• The society is good • The society understands about the UPPKB function and not contradict with culture	• Half land is empty and a half is for plantation
Yusuf 1	• There are no criminal activities, but this location has many residential squatters • Land is ready for development • Society's characteristic is heterogen • The society understands about the UPPKB function and not contradict with culture	• Land price is IDR1.000.000-2.000.000 / m^2 • Land is owned by society • Half land is used for farming and half land is for retail sales of souvenirs
Yusuf 2	• There are no criminal activities • Land is ready for development	• Land price is IDR400.000–500.000 / m^2 • Land is owned by governance province
Yusuf 3	• The society is good • The society understands about the UPPKB function and not contradict with culture	• The land characteristic is a residential area and agriculture

Source: Researcher Analysis, 2022

The community response was positive, and it supported the new UPPKB development plan. The community comprehends the UPPKB's role in overseeing the transportation of goods exceeding specified limits, acknowledging that its construction would not violate local cultural characteristics. They recognize that development will have socio-economic and environmental impacts in the long term. Hence, social activities involving the community are essential for fostering better relations between the community and managers [37].

4. Conclusion

The Motor Vehicle Weighing Unit (UPPKB) operates under the Ministry of Transportation of the Republic of Indonesia, tasked with supervising and enforcing transportation regulations for goods exceeding load limits [38][40]. UPPKB is a government policy aimed at minimizing road damage caused by over-tonnage goods transport [8][41]-[43]. The potential location for a new UPPKB in South Sumatera is on Betung 1 Road and Jalan Yusuf Singadekane 1 Road, chosen due to the presence of a weighbridge, a control tool ensuring the supervision of freight vehicles for traffic and road safety [44]. As a result, business development in Indonesia is increasing, driven by the growth of freight transportation services facilitating the movement of people and goods. The Ministry of Transportation is advised to facilitate the construction of the new UPPKB on Betung and Yusuf Singadekane Streets through a collaboration between the Government and a Business Entity (KPBU-AP). Relying solely on government funding may impede the realization of this recommendation

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