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Feasibility Analysis Of Constructing A Dedicated Terminal (Case Study: Pt Union Perkasa Buana)

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Abstract

Union Perkasa Buana (UPB) is a company engaged in coal mining services, especially in coal transportation and sales. In order to support its smooth operations, PT UPB requires adequate port facilities. This is because the nearest port is unable to support these business activities, so the company plans to build a special terminal. A special terminal is a port facility located outside the work environment and interests of the nearest public port. This study aims to analyze the feasibility of the PT UPB special terminal development plan, with a descriptive qualitative approach and using SWOT analysis to evaluate various factors that influence the planning. The results of the analysis show that the terminal is designed with marginal-type dock facilities, water depths between 3 to 9 M LWS, and will serve barges with a capacity of 3,000 DWT/300 Feet with a maximum load of 7,500 tons. The location of the proposed navigation aids does not interfere with the activities of the surrounding ports, and the one-way shipping route system is considered not to interfere with the main shipping lanes. This special terminal is declared feasible for operation, with recommended strategies in the form of developing dock infrastructure, optimizing navigation facilities, and improving coordination with port authorities to support operational efficiency and safety.

Keywords: Shipping Safety and Security, Special Terminal, Port

1. INTRODUCTION

Sea transportation plays an important and strategic role in supporting loading and unloading activities, passenger mobility, and services [1]. This is in accordance with Indonesia, which is known as a maritime country with thousands of islands, so it has great potential in the field of shipping activities such as passenger mobilization, loading and unloading of goods, services, coast guard and hydrography [2]. Maritime transportation plays a very crucial role in economic, social, governmental, and defense and security life [3]. The port is a facility that has an important role in sea transportation to connect one region to another in an archipelagic region such as Indonesia and support distribution activities so that it can reduce national logistics costs [4]. The port has a strategic role in supporting trade activities to improve the surrounding economy, both nationally and internationally [5]. Based on the main function of the port is as a distribution center for goods and services, which includes export and import activities, as well as a transit and warehousing place [6]. On the other hand, ports are the gateway for goods and people between regions or countries, which supports logistics mobility and economic growth [7]. Referring to the context of national development, ports are also expected to improve Indonesia's maritime connectivity, which is known as the largest archipelagic country in the world [8].

The improvement of the economic sector is related to the existence of ports that have an important and strategic role in supporting business activities so that they can contribute to the growth of the national and international trade industry [9]. However, not every public port in a region has adequate facilities and can serve or support the business activities of all parties. In accordance with existing provisions, to be able to support these activities with adequate facilities, a Special Terminal or Terminal for Self-Interest can be built. A terminal is a port facility consisting of a berthing pool and a place for ships to dock or moor, a stacking area, a place for waiting and getting on and off passengers, and/or a place for loading and unloading goods [10], in addition, the terminal is also part of the port to serve its own interests according to its main business.

These main businesses include activities in the fields of mining, industry, agriculture, fisheries, forestry, tourism, or other activities that in carrying out their main activities require dock facilities.
Special Terminals can be built to support core business activities outside the Work Area and Interest Area, while Terminals for Self-Interest are located within the Work Area and Interest Area [11]. Several other considerations Tersus or TUKS can be built and operated if they can guarantee the safety and security of shipping, and in economic and technical operational calculations are more effective and efficient [12]. Based on the Standards for Business Activities and Products in the Implementation of Risk-Based Business Licensing in the Transportation Sector, the standards that contain related to the Construction of Special Terminals or Terminals for Self-Interest, to support its core business activities such as mining and excavation are the main business activities that can be built Tersus or TUKS [13].
Indonesia is a country with abundant natural resources, and is one of the largest coal producing countries in the world [14]. Kalimantan Island is one of the largest coal producing islands in Indonesia. Based on data from the Central Statistics Agency of Central Kalimantan Province regarding Coal Production in 2016-2018, Kalimantan Province is one of the largest coal producers in Indonesia. The 2016-2018 period, with a total coal mining area in Central Kalimantan of almost 1 (one) million hectares, in 2016 there were around 944,043 hectares. The number of mining business permits (IUP) reached 246-259 IUPs, this figure shows the large scale of the mining industry in the area. There are 3 districts with large areas, namely North Barito, Murung Raya, and Kapuas. Seeing this potential makes Kalimantan the largest coal producer in Indonesia [15]. Based on this, Central Kalimantan Province is one of the largest coal producers in Indonesia.
Limited Liability Company (PT) Union Perkasa Buana is a company that runs a business in the mining services sector, namely coal transportation and sales. Located in Tenggarong, Kutai Kartanegara Regency. In order to support these activities, it will develop a Special Terminal area as one of the main supporting facilities [16]. The existence of the Special Terminal is a very important facility as a means and infrastructure to support activities and delivery of Coal Mining results. Based on this, PT Union Perkasa Buana in supporting its business activities requires a dock for loading and unloading facilities.
The plan to build a special terminal of PT UPB located on the Napo River to support coal transportation and sales business activities requires the existence of a special terminal to support coal mining loading and unloading activities [16]. Regarding the plan to build a special terminal, several considerations must be considered, such as location, economy, and ensuring shipping safety and security [11]. Location is the first aspect that must be considered to map whether there is a public port or a temporary special general terminal around the planned location of the special terminal, and is supported by adequate accessibility, while from an economic perspective, it is predicted to achieve the monthly shipping target with the volume of loading and unloading and the frequency of ships that will dock.
The construction of the pier will have an impact on changes in the marine environment at the activity location [17]. Information on aspects of bathymetry, tides, shipping lanes, and navigation obstacles in a body of water is needed in the planning of this pier. In this regard, it is necessary to know the aspects of bathymetry, tides, shipping lanes, and navigation obstacles as indicators of the feasibility of building a special terminal so that it is safe for ships to sail and anchor, in order to create shipping safety and security. The following is data on the number of shipping accident investigations based on the type of accident in 2018-2022.

Table 1.1 Number of Maritime Accident Investigations by Accident Type 2018 – 2022

No	Description	Year					Total
		2018	2019	2020	2021	2022	
1.	Sinking	10	6	3	5	5	29
2.	Burning/explosion	12	6	2	6	5	31
3.	Collision	3	9	2	4	1	19
4.	Running aground	7	0	4	2	2	15
5.	Other	7	4	1	2	0	14
	Total	39	25	12	19	13	108

Sumber: Source: (National Transportation Safety Committee, 2022) [18]

Based on table 1.1 there were 15 shipping accidents due to grounding, this shows the importance of the hydro-oceanographic aspect in determining the specifications of the dock and the plan for the ship to dock. This also affects the shipping lane and also navigation obstacles during operations. Seeing this, the relevant government agencies need to evaluate the special terminal development plan before granting a permit to build the special terminal. This refers to the Decree of the Port Director in the business licensing evaluation standards. There are (9) nine evaluation standards to ensure that the proposed special terminal development planning permit is feasible.

The evaluation standards that are determined must be able to be met by the company, in this case the company must certainly recognize the strengths that create advantages so that the proposed planning is said to be feasible and guarantees the safety and security of shipping, then the weaknesses that can make the planning of the construction of a special terminal not meet the feasibility aspects. In relation to this, it will be very helpful in knowing the capabilities of a company, taking advantage of every opportunity that comes, and avoiding or minimizing risks.

In relation to this, the researcher determines the appropriate analysis in analyzing the planning of special terminal development, related to the strategy to fulfill the evaluation, the author uses SWOT analysis (strengths, weaknesses, opportunities, threats), because SWOT analysis is able to identify weaknesses and is able to create an opportunity from existing strategy combinations. This is in accordance with SWOT analysis, which is a methodical process for identifying various aspects in order to develop a company strategy.

Based on this, the researcher is interested in knowing how to evaluate the planning of the special terminal of PT Union Perkasa Buana and the aspects contained in the feasibility of the construction of the special terminal of PT Union Perkasa Buana, as well as the fulfillment of the special terminal construction plan, therefore the researcher conducted a study on "Feasibility Analysis of the Construction of a Special Terminal (Case Study: PT Union Perkasa Buana)" in order to analyze the feasibility of the special terminal construction plan of PT Union Perkasa Buana in ensuring the safety and security of shipping.

Some of the problem formulations in this research are:

1. How is the planning for the construction of a special terminal for PT Union Perkasa Buana?
2. How are the aspects of shipping safety and security related to the plan to build a special terminal for PT Union Perkasa Buana?
3. What evaluation fulfillment strategies can be applied to the special terminal development plan of PT Union Perkasa Buana?

Based on the formulation of the problem, this study aims to:

1. Identify the development plan for a special terminal for PT Union Perkasa Buana.
2. Analyze the safety and security aspects of shipping related to the planned construction of a special terminal for PT Union Perkasa Buana.
3. Formulate strategies and recommendations for fulfilling the evaluation of the special terminal development plan for PT Union Perkasa Buana.

This study analyzes the feasibility of developing the PT Union Perkasa Buana Special Terminal as evaluation material for the basis of submitting an operating permit in the future, by analyzing several aspects such as location feasibility, economics such as loading and unloading volume and frequency of ship visits, and aspects of shipping safety and security seen from the specifications of the dock, bathymetry, tides, shipping lanes, and navigation obstacles.

2. LITERATURE REVIEW

2.1. Port

A port is an important facility in sea transportation that functions as a place for ships to anchor, a place for loading and unloading goods, as well as for embarkation and disembarkation of passengers. A port is defined as an area consisting of waters and surrounding land that is used as a place for ships to dock, for passengers to embark and disembark, and for loading and unloading goods, which is equipped with shipping safety and security facilities, as well as supporting facilities for economic activities [19].

Ports have a strategic role in supporting economic and trade activities, both nationally and internationally [5]. The main function of the port is as a distribution center for goods and services, which includes export and import activities, as well as a transit and warehousing place. Not only that, the port also functions as a gateway for goods and people to enter between regions or countries, which supports logistics mobility and economic growth.

Ports also play an important role in connectivity between islands and between countries. This is in accordance with [11] which states that ports have a strategic function in facilitating the distribution of goods, reducing logistics costs, and supporting regional development. Ports can be divided into several types based on their functions, namely Public Ports and Special Ports. Public ports are built and operated by the government or private parties to serve the public interest, while special ports are built and operated by companies to support their main business activities.
Ports are vital infrastructure that supports a country's economic development. With the existence of efficient ports, logistics costs can be reduced, thereby increasing the competitiveness of domestic products in the global market [20]. In addition, the port also contributes to equitable development by opening access to remote areas and supporting the economic development of the region. In the context of national development, the port is also expected to improve Indonesia's maritime connectivity, which is the largest archipelagic country in the world [8]. This is in accordance with the government's vision of making Indonesia the world's maritime axis, where ports are one of the main pillars in realizing this vision.

2.2. Special Terminal

Special Terminal, often abbreviated as Tersus, is a port facility built and operated by certain companies or agencies to support their main business activities, which are generally located outside the Work Area (DLKr) and Interest Area (DLKp) of public ports. Based on [11], a Special Terminal is defined as a port built to support certain activities such as mining, industry, and others that are not served by public ports.
Special Terminals have to support the main business activities of a company. For example: loading and unloading of goods, storage and distribution, supporting operational activities. The role of Special Terminals is very strategic because it allows companies to carry out logistics activities more efficiently and independently, without relying on public ports that may have limited capacity and infrastructure [21]. The construction of a Special Terminal must go through a series of feasibility studies involving various aspects such as: technical aspects, economic aspects, environmental aspects, security and safety aspects.
Special Terminals directly contribute to logistics efficiency and increase the competitiveness of companies in domestic and international markets. With Special Terminals, companies can reduce dependence on public ports [22], speed up distribution times, and reduce operational costs. In addition, Special Terminals also have the potential to provide a positive impact on the regional economy, for example by creating jobs and increasing regional income through taxes and levies.
Special Terminals also support the government's vision in developing the maritime sector as one of the main pillars of national development. Through adequate port infrastructure, including Special Terminals [23], Indonesia can improve connectivity between regions and strengthen its position as a competitive maritime nation in the international world.

2.3. Eligibility

Feasibility is a concept used to assess whether a project or investment can be implemented successfully and generate the expected profits. Feasibility assessment includes various aspects, such as technical, economic, financial, legal, and environmental [24]. The purpose of a feasibility study is to ensure that the project meets all the necessary requirements before implementation.
According to [25], Feasibility is a condition that indicates that an item or project meets the requirements to be operated or developed, both in terms of technical, economic, environmental, and social aspects. Regulations in Indonesia stipulate that before the construction of a special terminal can be carried out, a comprehensive feasibility study must be carried out [11] and [26] requires all special terminal projects to meet strict technical and administrative standards. The feasibility study must cover all relevant aspects and be approved by the authorities before [19] construction begins.
Feasibility studies in the construction of special terminals are not only a reference for evaluating whether the project can be implemented [27], but also serve as a guide for planning and implementing a business activity. Decisions taken based on a good feasibility study will increase the chances of project success and reduce the risk of failure. Thus, a feasibility study is a critical step in the project planning process that should not be ignored.

2.3.1. Safety and Security of Shipping

Shipping safety and security are important aspects in the planning and construction of special terminals. According to the IMO (International Maritime Organization), shipping safety aims to protect ships, passengers, cargo, and the environment from the risk of accidents during the shipping process [28]. In addition, shipping security includes protection against threats such as sabotage or piracy that can disrupt ship and port activities [11]. One of the main parts that is no less important in supporting shipping safety includes shipping navigation aids (SBNP), shipping lanes, docks. Related to SBNP, such as beacons, lighthouses, buoys, play an important role in helping ships navigate routes safely [29]. Shipping lanes must be designed with adequate depth, width, and cleanliness from obstacles to ensure ship safety, as regulated in [30].

Hydro-oceanographic factors, such as bathymetry, tides and others, have an important influence on shipping safety. The depth of the water (bathymetry) must be in accordance with the draft of the ship so that the ship can operate without the risk of running aground [31]. Tides are also important indicators in dock design to avoid submerging the dock structure or mismatching the height of the ship and mooring facilities [32]. Seeing the condition of unmanaged or neglected sedimentation can reduce the depth of the water, thereby increasing the risk of ship accidents, so that dredging steps can be taken [33].

According to [20], synergy between port planning, shipping lane management, and the use of navigation technology greatly determines the level of shipping safety. This is in accordance with [34], which states that good risk management is an important part of ensuring shipping safety. Seeing this, the focus on key indicators such as SBNP, shipping lanes, bathymetry, and shipping lane management systems can greatly improve shipping safety in the construction of special terminals.

The above opinions can be concluded that shipping safety and security is a process that includes the analysis and management of physical and dynamic factors in the waters, such as bathymetry, tides, shipping lanes, and navigation obstacles. Bathymetry ensures that the water depth is sufficient for ships to avoid the risk of running aground, while tides are a reference in designing the height of the pier and determining the safe operational time of the ship. Shipping lanes designed with appropriate width, length, and depth support unhindered ship navigation, and management of navigation obstacles such as sedimentation, vegetation, or artificial obstacles can increase efficiency and reduce the risk of accidents. All of these elements work synergistically to create safe, efficient, and regulatory shipping operations, thus providing long-term benefits for shipping and the sustainability of terminal development.

1 Pier

A pier is an important infrastructure in a port or terminal that is used for ship docking and loading and unloading activities. The pier functions as a place for ships to anchor to connect sea transportation with land activities. According to [35] the pier is designed by considering several main factors, such as the type of pier, the size of the ship to be served, the condition of the waters, and the depth of the pool around the pier. The suitability of the pier design to the operational needs of the ship greatly determines the efficiency and safety of port activities. Commonly used pier types include marginal piers, offshore piers, and floating piers, which are selected based on the characteristics of the location and the type of ship served.

One of the important factors in pier planning is the depth of the water in the ship's berthing area. This also agrees with [36] who explained that the depth around the pier must be adjusted to the draft of the ship in operation, plus a safety margin to anticipate sedimentation or changes in water elevation due to tides. Not only that, the pier structure must be designed to withstand the forces generated by the ship, such as pressure from moorings and ship impacts. Research by [37] emphasizes the importance of selecting appropriate construction materials, such as reinforced concrete or steel, to ensure the strength and durability of the pier in dealing with corrosive marine environmental conditions.

In the context of shipping safety, the dock must also be equipped with supporting facilities, such as bollards, fenders, and other mooring systems, to minimize the risk of damage to ships and dock structures. This is also reinforced by the statement [38] that a good mooring system will increase the stability of the ship during the loading and unloading process, thereby reducing the risk of accidents at the port. Not only that, other facilities such as dock lighting, cranes, and storage areas are also important elements to support operational efficiency.

Research by [39] highlights how important the pier is as the main infrastructure at Tanjung Perak Port in supporting domestic and international goods distribution in East Java. The study stated that the pier has limitations, such as its old physical condition so that it is unable to support the current modern loading and unloading equipment optimally. This results in long ship docking times and reduces port operational efficiency. Seeing this condition in overcoming these obstacles, the construction of the Teluk Lamong Terminal as a modern pier is a strategic solution to increase loading and unloading capacity and efficiency. It is hoped that with this development, the pier can support faster distribution of goods and encourage regional economic growth, while strengthening the national logistics system.

2 Bathymetry

Bathymetry is one of the important indicators in the safety and security aspects of shipping. Bathymetry refers to the measurement of water depth and mapping of the seabed contour to determine the ability of the waters to support ship operations. Sufficient depth is very important so that ships do not run aground while sailing or docking. According to [40], adequate minimum depth must be calculated based on the ship's draft, including additional safety calculations to anticipate water dynamics, such as sedimentation or changes in tidal elevation. Adequate bathymetry allows ships to maneuver safely in shipping lanes and port pools. Seeing this, bathymetry analysis becomes an important part in determining shipping lane routes and port facilities.

Bathymetric conditions also have a direct impact on dredging needs. Waters with high sedimentation tend to experience shallowing, requiring periodic dredging to maintain a safe depth. stated that dredging in the port area must be carried out periodically based on the results of a bathymetric survey to ensure that the mooring area and shipping lane remain in accordance with the draft of the operating ship. In the context of building a special terminal, the results of the bathymetric analysis are used to determine the depth of the turning pool, shipping lane, and optimal mooring location for the ship. This is in accordance with [41], which stipulates that shipping lanes must have sufficient depth to support safe and efficient ship navigation.

Similar studies have shown that bathymetry affects the efficiency and safety of terminal operations. For example, a study by [42] at the Lombok PLTGU Special Terminal shows that the average water depth of 6-8 meters can support ship operations with a maximum draft of 6.5 meters, including a safety margin. Inadequate bathymetry can increase the risk of ships running aground, especially in areas that often experience shallowing due to sedimentation. Bathymetric surveys are a very important initial step in the feasibility study of terminal construction. This survey allows for identification of potential risks and adjustments to dock planning to support shipping safety.

3 Tidal

Tides are one of the hydro-oceanographic aspects that greatly affect the safety and efficiency of shipping operations. Tides occur due to the gravitational forces of the moon and the sun, which cause periodic changes in sea level. In the context of shipping, tides are an important indicator in planning dock height, ship operational time, and port facility design. This is in accordance with [43] that tidal analysis is needed to ensure that the dock can operate properly in maximum and minimum tide conditions, so that the risk of dock submergence or incompatibility between ships and mooring facilities can be avoided. Changes in sea level also affect ship accessibility to shipping lanes and port basins, especially in areas with significant tidal ranges.

Tides are also an important factor in determining the departure and arrival schedules of ships, in extreme low tide conditions ships with large drafts may have difficulty entering or exiting the terminal, requiring waiting time until the water reaches a safe level. Tidal elevation affects the stability of the ship when docked, so it must be considered in the design of mooring structures and bollards. This is supported by [44] that tidal data analysis, including Low Water Spring (LWS) and High Water Spring (HWS), is an important step in port planning to ensure shipping safety.

Empirical research also shows the importance of tidal data in shipping safety. A study by [45] At the Special Terminal of PT Nan Indah Mutiara Shipyard, it was identified that the tidal range of 3.5 meters affected the design of the marginal type pier and the operational schedule of vessels at the terminal. Tidal analysis was used to adjust the height of the pier so that vessels could operate safely

without the risk of inconsistency during changes in sea level. Tides are not only a technical element in port design but also a strategic factor to support shipping safety and efficiency.
The above opinions can be concluded that tides are one of the important elements in shipping safety and security. Tidal analysis is needed to ensure that dock design, ship operational schedules, and port accessibility can adapt quickly to changes in sea level. Considering tidal elevations, such as Low Water Spring (LWS) and High Water Spring (HWS), as well as other water dynamics, shipping operations can run safely and efficiently, especially during maximum tide or extreme ebb conditions.

4 Shipping Lane

A shipping lane is a waterway specifically designed for ships to pass from the open sea to a port or terminal. A good shipping lane must have adequate dimensions, including depth, width, and length sufficient for unimpeded ship navigation. According to [46], a safe shipping lane must consider hydro-oceanographic factors such as water depth, ocean currents, and waves, so that ships can maneuver safely during the process of entering and exiting the port. Regulation of the Minister of Transportation No. 129 of 2016 stipulates technical standards for shipping lanes, including a minimum width of 70 meters and a depth according to the draft of the ship in operation, to ensure shipping safety.
Having shipping lanes that are clear of obstacles is very important to avoid the risk of accidents such as collisions or ships running aground. This is reinforced by the opinion [47] that shipping lanes designed without considering navigational obstacles, such as sedimentation or artificial structures, can increase the risk of accidents, especially in areas with high shipping activity. Management in shipping lanes is needed to ensure that when the ship is sailing there are no obstacles that endanger the safety of the ship. The placement of shipping navigation aids (SBNP) at the initial port entry point, such as beacons or buoys, is also an important part of guiding ships more safely along the channel.
Research by [48] in Biak Port shows that the shipping lane with a depth of 12-16 meters LWS has met the requirements to support ship operations. However, the presence of coral reefs that limit the shipping lane as well as strong winds and sea currents in certain seasons pose challenges to shipping safety, especially in bad weather conditions. In addition, the lack of Navigation Aids (SBNP), such as beacons and buoys, increases the risk of accidents at night or during low visibility. This study recommends improving SBNP facilities and additional safety infrastructure such as tugboats to support safe and efficient navigation in the channel.
The opinions above can be concluded that shipping lanes are an important element in shipping safety and security, which require a design that meets the standards of depth, width, and freedom from obstacles, and is equipped with adequate navigation facilities to ensure safe ship operations in various water conditions.

5 Navigational Obstacles

Navigational obstacles include physical or artificial obstacles that can interfere with the smoothness and safety of ships during navigation, such as sedimentation, aquatic vegetation, artificial structures, or floating objects. These obstacles are one of the important factors in the analysis of shipping safety, especially in shipping lanes and areas around terminals. According to [49] navigational obstacles that are not managed properly can increase the risk of ship accidents, including ship grounding or collisions. Identification and mitigation of obstacles in the waters are important steps to ensure that ships can sail safely and efficiently.
Sedimentation is one of the most common navigational obstacles in waters near terminals. Silting due to sedimentation can reduce the effective depth of the water, endangering ships with large drafts. This proves that periodic dredging is the main solution to overcome sedimentation, especially in shipping channels and port basins [50]. Aquatic vegetation such as water hyacinth or seaweeds can also interfere with ship navigation, especially in calm waters such as rivers or estuaries.
Not only natural obstacles, navigation obstacles can also be artificial structures, such as pilings, bridges, or floating objects that do not have warning signs. In order to reduce the risks posed by these obstacles, [51] requires the installation of navigation aids (SBNP), such as beacons, buoys, or navigation lights, to help navigators identify safe routes.

The above opinions can be concluded that navigation obstacles are an important factor in the safety and security of shipping. Identification and mitigation of obstacles such as sedimentation, aquatic vegetation, and artificial structures are important steps to ensure the smoothness and safety of ships during shipping. Handling navigation obstacles, such as routine dredging and installation of Navigation Aids (SBNP), are needed to guide ships and reduce the risk of accidents, especially in waters prone to obstacles. With good management of navigation obstacles, shipping operations can take place safely and efficiently.

2.4. Analysis

Analysis is a systematic process used to process and compile data obtained from various sources, namely interviews, documentation, and other materials [52]. This process aims to facilitate understanding and delivery of research results to other parties. Analysis is the process of describing, searching for, and compiling data or information systematically [53]. This process involves managing data, selecting the information needed, and drawing conclusions so that the data can be understood. Analysis is a process that is carried out in an orderly manner through the collection of data, information and other things so that they can be processed into information to be used and understood [54], and conclusions are obtained to support decision making.

2.5. SWOT

SWOT analysis is a method used to formulate strategies systematically by examining and identifying various relevant aspects. This method aims to develop strategies that can maximize strengths and opportunities, while minimizing weaknesses and threats. According to [55] SWOT analysis is an approach that enables strategic decision-making through the evaluation of internal and external factors that influence the success of an entity. This process helps organizations determine the best strategy based on the interaction between strengths and opportunities, and weaknesses and threats.

SWOT analysis is often used to improve the strategy formulation process by utilizing methodical principles and frameworks. This method allows for discussion of strategic alternative considerations by identifying key elements that need to be optimized or addressed. This is in accordance with [56] that the results of the SWOT analysis can be used to design combination strategies, such as SO (Strength-Opportunities) strategies that utilize strengths to realize opportunities, or WT (Weaknesses-Threats) strategies that aim to reduce the impact of weaknesses and threats simultaneously.

Empirical research by [57] at Dwikora Port, Pontianak shows that SWOT Analysis can be applied effectively in the context of port development. The SO strategy is recommended to maximize port functions by improving facilities and infrastructure, so that the port can support economic growth, absorb more workers, and increase regional income. This study confirms that SWOT Analysis is not only useful in identifying problems, but also in providing strategic solutions that can be implemented to achieve optimal goals.

2.5.1. Use of SWOT Analysis for Evaluation

SWOT analysis is a systematic and simple method to help businesses develop strategic plans by maximizing opportunities and strengths and minimizing weaknesses and threats. Linking to the evaluation context, SWOT analysis can be used for several purposes [58]. First, to analyze the internal and external conditions of the organization's environment. Analyzing strengths and weaknesses as internal conditions, and opportunities and threats as external conditions, organizations can obtain in-depth analytical conclusions to overcome weaknesses, avoid threats, and maintain strength in facing existing challenges. Second, SWOT analysis can provide a broad picture of the company's position based on the results of evaluations conducted by government agencies. This includes how government agencies assess the company's strengths and weaknesses, as well as the opportunities and threats faced in the context of a special terminal development plan. Through the results of this analysis, companies can understand the extent to which their position is compared to regulatory standards and government requirements. This analysis allows companies to design the right strategy to meet the recommendations of the evaluation, and compliance with policies set by the government, so that it is better when taking care of operating permits in the future.

SWOT analysis is used to assess the company's ability to carry out operational activities and face competitive competition. Assessment of internal strengths and external threats is the basis for developing risk

mitigation strategies that can affect project success. Research conducted by [59] on the development of Brondong Nusantara Fisheries Port uses SWOT analysis to evaluate port development strategies, such as optimizing resource potential, maintaining facilities, and increasing institutional capacity. The results show that the SWOT approach can identify weaknesses such as lack of facilities and high operational costs, while also directing strategic development to support efficiency and regional economic growth.
The above opinions show that SWOT Analysis is a very relevant evaluation tool to analyze the special terminal development plan of PT Union Perkasa Buana. Through this approach, parties can plan strategies in fulfilling evaluations from government agencies regarding development permits based on the potential strengths and opportunities they have, as well as mitigating weaknesses and threats that will occur in the development plan. This makes SWOT a strategic framework that supports data-based decision making to achieve success in the special terminal development plan.

2.5.2. SWOT Analysis Factors

SWOT analysis consists of four factors, where (Harisudin, 2019) explains these factors as follows:

1. **Strengths**
   Strength is a unique advantage or competency possessed by an organization, whether in the form of skills, resources, or operational processes that support its competitiveness. Strength provides added value that allows the organization to better meet the needs and desires of consumers or stakeholders.

2. **Weakness**
   Weaknesses are internal aspects of an organization that can hinder the achievement of business goals or reduce the economic side of the company. This explains that weaknesses can include resource limitations, lack of management skills, weaknesses in marketing strategies, or financial problems. Although weaknesses are natural, organizations need to recognize and address them through performance improvement, policy improvements, or resource development.

3. **Opportunities**
   Opportunities are external conditions that favor an organization and provide the possibility for growth or improved performance. Opportunities often arise from improved relationships with partners or suppliers, technological developments, or positive changes in government regulations.

4. **Threats**
   Threats are external conditions that have the potential to harm an organization or hinder the achievement of its goals. Threats can come from a variety of factors, such as increased competition, changes in government regulations, economic instability, or changes in consumer preferences. These threats can disrupt the stability or performance of an organization if not anticipated properly.

2.6. Related Research

Some previous studies that are relevant to the feasibility analysis of building a special terminal include:

Tabel 2.2 Related Research

No	Researcher	Title	Research Content	Updates
1	[42]	Analysis of Sea Side Facility Needs for Lombok PLTGU Special Terminal Port	This study analyzes the need for seaside facilities for a special terminal for a steam-fueled power plant (PLTGU) in Lombok. The aspects reviewed include: 1. Coal needs for electricity production 2. Types of coal transport vessels 3. Projected loading and unloading volumes 4. Frequency of ship visits 5. Need for water facilities such as shipping lanes, port basins, and berthing areas The results of	This study provides an overview of the need for a special terminal to support PT UPB's business activities by looking at its monthly

			the study indicate that the need for seaside facilities must be adjusted to the characteristics of the transport vessels and the projected loading and unloading volumes. This study provides important insights into the technical aspects that need to be considered in planning a special terminal for a power plant.	shipping targets..
2	[45]	Analysis of Feasibility Study of Construction and Operation of Special Terminals PT. Nan Indah Mutiara Shipyard	This study analyzes the feasibility of building and operating a special terminal for shipyards. The aspects reviewed include: 1. General review of the special terminal, including main and supporting facilities 2. Hydro-oceanographic aspects, including bathymetric measurements, horizontal basic frameworks, detailed situations, tides, and currents 3. Construction engineering aspects, including construction calculation methods for floor slab systems, pile systems, foundation systems, and loading 4. Environmental aspects, including environmental impacts and their handling The results of the study indicate that the construction of a special terminal can increase the capacity of the shipyard industry and requires various facilities and technical considerations based on the results of topo-bathymetric and hydrographic surveys.	This study analyzes aspects of shipping safety and security such as bathymetry, tides, shipping lanes and navigation obstacles.
3	(Nur *et al.*, 2023)	Port Planning Evaluation: Paciran Port Case Study	This study evaluates the planning of Paciran Port to determine the existing conditions and potential development of port facilities. This study uses an evaluation approach based on utility analysis, forecasting, and gap analysis to compare the capacity of existing facilities with future needs. The evaluation results show that the capacity of the dock, stacking yard (LP), and warehouse facilities is still sufficient to serve potential loads until 2042, with the dock utilization rate only reaching 30%, LP at 14%, and warehouse at 10%. However, an evaluation of loading and unloading equipment (B/M) identified that the existing capacity was unable to meet the potential	This study analyzes and provides an overview of the evaluation fulfillment strategy using SWOT analysis.

	load, so additional loading and unloading equipment in the form of excavators or Harbor Mobile Cranes (HMC) was needed. The investment feasibility analysis showed that the addition of two excavator units in 2025 and 2038 was a feasible option, with an NPV value of IDR 1,488,889,800 and an IRR of 14.84%.

Source: Source: (Researcher Processing, 2025) [61]

3. RESEARCH METHODS

3.1. Research Design

This study uses a descriptive qualitative research method to gain an in-depth understanding of the special terminal development plan. The qualitative research method is a method used to study a natural object condition, in this case the researcher as the main instrument [7]. The descriptive method approach, as explained as a process for solving problems through analysis by providing a description of the research object on visible facts or current conditions [62], so that it allows researchers to understand in depth about the feasibility of the special terminal development plan. Qualitative research in the data collection stage used is through interviews, observations, and use of documents [63].

The object of this study is the feasibility of the special terminal development plan of PT Union Perkasa Buana based on several considerations such as the nearest port cannot support PT UPB's business activities, economic aspects and more guaranteeing aspects of shipping safety and security. [64] Qualitative methods explore aspects that influence the feasibility of the special terminal development plan.

3.2. Time and Place of Research

This research was conducted from November to December 2024. The researcher held a meeting with the company, namely PT UPB and the government, namely the Directorate of Ports. This research was conducted in these two places to obtain information regarding the planning of special terminals and evaluation of the permits.

3.3. Case Study Method

When researchers face time constraints to control the events being studied and focus on contemporary phenomena, the case study research method becomes the right approach [65]. This approach allows researchers to track current events and answer research questions that focus on "how" or "why" a phenomenon occurs. It is also equipped with observation or interviews, the case study method has similarities with historical methods. Various forms of evidence used in case studies include documents, interviews, direct observations, and in certain situations, participant observation and informal manipulation, are one of the forms of evidence used in case study methodology.

The purpose of the case study is to answer research questions and investigate issues that are closely related to the phenomenon being studied, including the context in which the phenomenon occurs, because the two are interrelated and inseparable. The phenomenon that is the focus of this study is the feasibility of the development plan for the PT Union Perkasa Buana special terminal. It is hoped that by using a case study approach, researchers can understand the specific facts that are relevant to the case being studied, as well as the use of relevant theories in supporting the analysis and interpretation of research results.

3.4. Data Collection Techniques

Data collection techniques are an important step in conducting research. This is important because if you do not use good data collection techniques, it will be difficult to get good research results. There are several data collection techniques that will be used in this as follows:

1. **Interview**

   Interview is one of the data collection techniques that involves interaction between two or more people which is done verbally either directly or indirectly to obtain primary data from a number of questions asked by researchers to a respondent who is considered to know or be an expert regarding the object that will be targeted by the researcher [66]. The primary data was obtained directly through the results of structured interviews with two sources from PT Union Perkasa Buana and the Port Directorate.

2. **Literature Study**

   The process of obtaining information through searching, collecting, processing, and analyzing references contained in books, journals, articles, and online sources is known as literature study [67]. This literature review aims to provide a theoretical basis that supports efforts to solve the problems that are the focus of this research.

3. **Documentation**

   Documentation is one of the data collection techniques carried out by collecting and studying documents such as images, historical records, monumental works [68]. Documents like this can strengthen the research results from interviews. The documentation is also secondary data, in this case collecting and studying study documents and technical drawings of PT UPB, minutes of field reviews and verifications carried out by government agencies.

3.5. Research Instruments

Research instruments are tools used to collect data in research [69]. This research uses the following instruments:

1. **Main Instruments**

   According to [70] In qualitative research, humans are considered the most appropriate primary instrument for collecting the required data and information. In this study, the author acts as the primary instrument for collecting data. This view is in line with the opinion that in the data collection process, researchers in natural research rely more on themselves as the primary data collection tool.

2. **Supporting Instruments**

   During the in-depth interview process, researchers used various tools to support research and collect information. These tools include mobile phone cameras and notebooks. Researchers used mobile phone cameras to document activities during the study. Notebooks were used to record important things that needed to be considered.

3.6. Data Analysis Techniques

Data analysis techniques aim to understand and process information based on the data that has been collected [71], document analysis is carried out to review documents related to the feasibility of special terminal development plans such as technical studies and plans, minutes of review and evaluation, environmental permits, other documentation and applicable regulations. These documents are analyzed to obtain more complete information about considerations in building a special terminal, aspects of shipping safety and security, and evaluation of the feasibility of a special terminal development plan. Literature study to review previous research and gain a better understanding of the feasibility of a special terminal development plan. Researchers collect, analyze, and present existing data from various literature sources, such as case studies, books, articles, journals, and others. This aims to find appropriate references for the feasibility of the special terminal development plan being studied.

Researchers in identifying the distance considerations of the special terminal plan of PT UPB and analyzing aspects of shipping safety and security use several tools and calculations. Regarding the consideration of distance and shipping lanes using the Google Earth tool by providing a line, the distance can be known with Nautical Mile, while for aspects of shipping safety and security such as bathymetry, tides, docks and shipping lanes using calculations, namely bathymetry using the ArcGis tool and data from the Indonesia Geospatial Portal, and the results of the depth and calculation of the ship to be used are the GT estimation calculations using the GT = k × (L × B × H) approach [72], with the following information:

Description:

L = length (Length Over All, LOA), in meters

B = width (Beam), in meters

H = hull height (Depth), in meters

k = constant factor (usually around 0.2 to 0.25 for barges).

Tidal calculations calculate the position of the water by determining the maximum, minimum and average values. This is done so that the company can determine the operational schedule of ships anchored or moored. The calculation uses the following formula:

Maximum Value (Max) = highest value of all data

Minimum Value (Min) = lowest value of all data

Mean Sea Level :

Formula: MSL = (Σ hi) / n

Where:

hi = water level at observation i

n = total number of observations

The calculation of the dock specifications itself must have a minimum length of 100 meters (±1.1x the length of the ship) so that the ship can dock safely [73]. Regarding the dock specifications, the researcher illustrated it with the AutoCad tool so that it can provide a clear illustration.

The tool used in developing a strategy is SWOT analysis. SWOT analysis is used to determine what strategy is used after looking at the strengths, weaknesses, opportunities and threats of PT Union Perkasa Buana obtained from the interview results. Below is the SWOT analysis matrix. This SWOT analysis can provide results related to what must be done in fulfilling the special terminal plan of PT UPB.

Table 3.3 SWOT Matrix

	Strenght (S) Determine 1-10 Internal strength factors	**Weakness (W)** Determine 1-10 internal weakness factors
Opportunities (O) Menentukan 1-10 faktor-faktor eksternal	**S-O** Creating strategies that use strengths to take advantage of opportunities	**W-O** Creating strategies that minimize weaknesses to take advantage of opportunities
Threats (T) Determine 1-10 External strength factors	**S-T** Creating a strategy that uses strengths to become a threat	**W-T** Creating strategies that minimize weaknesses to take advantage of opportunities

Source: (Prisdina & Fatururrahman, 2023) [74]

The SWOT matrix mentioned above makes it easy to obtain analysis results. This is due to the ability of the SWOT matrix to clearly describe the external opportunities and threats faced in relation to one's strengths and weaknesses. Four potential options can be generated by this matrix: weakness-opportunity strategy, weakness-threat strategy, strength-opportunity strategy, and strength-threat strategy. The steps of the SWOT analysis include identifying and evaluating internal factors with the IFE matrix and external factors with the EFE matrix, generating alternative strategies through the SWOT matrix, and determining the best strategy using the IE matrix and QSPM (Quantitative Strategic Planning Matrix), in QSPM each factor is given an attractiveness score (Attractiveness Score/AS) for each strategy, which is then multiplied by the weight of the factor from IFE and EFE to produce a Total Attractiveness Score (TAS) [75]. This TAS shows the level of effectiveness of each strategy, and the strategy with the highest TAS value becomes the top priority in implementation. The use of TAS in QSPM acts as a primary indicator in a more objective and data-based strategic decision-making process. This process helps companies develop strategic moves that optimize strengths and opportunities while minimizing weaknesses and threats.

The weighting and rating are based on the distribution of research questionnaires conducted on 2 sources. The data were obtained based on the opinions of the government and the company, with the results of weighting and rating on the strength, weakness, opportunities and threats factors. The next step after the data is collected is to create an internal factor evaluation matrix as below.

Table 3.2 IFE Matrix

Internal Evaluation Factors	Weight	Rating	Score
Strength			
1.			
2.			
3.			
4.			
Total			
Weakness			
1.			
2.			
3.			
Total			

Source : (Kusharyanto *et al.*, 2024) [75]

There are five stages in compiling the IFE (Internal Factor Evaluation) matrix:

1. Determine the factors that make strengths and weaknesses in the first column. Strengths and Weaknesses factors are identified from the SWOT analysis.
2. Determine the weight of the factor on a scale of 0.0 - 1.0. The weight indicates how important the factor is in supporting or inhibiting the success of terminal development. The weight is obtained from the average of the assessment results of two sources, then divided by the total so that the number remains 1.0.
3. Calculate the rating (1 - 4) in column three for each factor.
4. Calculate the weight score x rating in column four.
5. Add up all scores to get the company's total score.

The next step is to identify the company's internal factors, enter external factors in the EFE matrix.

Table 3.3 EFE Matrix

External Evaluation Factors	Weight	Rating	Score
Opportunity			
5.			
6.			
7.			
8.			
Total			
Threat			
4.			
5.			
6.			
Total			

Source : (Kusharyanto *et al.*, 2024) [75]

There are five stages in compiling the EFE (External Factor Evaluation) matrix:

1. Determine the factors that create opportunities and threats in the first column. Opportunities and Threats factors are identified from the SWOT analysis
2. Determine the weight of the factor on a scale of 0.0 - 1.0. The weight indicates how important the external factor is in influencing the project. The weight is obtained from the average of the assessment results of two sources, then divided by the total so that the number remains 1.0.

3. Calculate the rating (1 - 4) in column three for each factor.
4. Calculate the weight score x rating in column four.
5. Add up all scores to get the company's total score.
If you get two IFE and EFE matrices, then visualize the IE (Internal-External) matrix. The IE matrix is used to formulate the company's business strategy based on calculations from the IFE matrix and the EFE matrix.

Table 3.4 IE Matrix

IFE ↓ / EFE →	1 (4.0 - 3.0)	2 (2.99 - 2.50)	3 (2.49 - 1.0)
3.0 - 4.0 (Kuat)	I (Grow & Build)	II (Grow & Build)	III (Hold & Maintain)
2.0 - 2.99 (Sedang)	IV (Grow & Build)	V (Hold & Maintain)	VI (Harvest & Divest)
1.0 - 1.99 (Lemah)	VII (Hold & Maintain)	VIII (Harvest & Divest)	IX (Divest)

Source : (Kusharyanto *et al.*, 2024) [75]

There are 3 stages in compiling the IE matrix, namely:
1. Determining the total score of the IFE and EFE Matrices. The results of the IFE Matrix calculation reflect internal strengths and weaknesses, while the EFE Matrix reflects external opportunities and threats. These two total scores are used to determine the position in the IE Matrix.
2. Placing the total IFE and EFE scores into the IE Matrix. The IFE score is used as the vertical axis (internal strength) and the EFE score as the horizontal axis (external strength) in the IE Matrix. The IE Matrix consists of nine strategy cells, which group organizations or projects into major strategy categories: Grow & Build, Hold & Maintain, or Harvest & Divest.
3. Determining strategy based on position in the IE Matrix. Quadrants I, II, IV (Grow & Build) are aggressive strategies such as expansion, investment and innovation, while Quadrants III, V, VII (Hold & Maintain) are survival and stabilization strategies, and Quadrants VI, VIII, IX (Harvest & Divest) are reduction or restructuring strategies.
The QSPM (Quantitative Strategic Planning Matrix) is a tool used to evaluate and select the best strategy based on internal and external factors that have been identified in the SWOT, IFE, and EFE analysis. QSPM helps in determining the most appropriate strategy by assigning an Attractiveness Score (AS) to each factor that influences strategic decisions [76]. This is QSPM, internal and external factors that have been given weight from the results of IFE and EFE combined with available strategic alternatives. Each strategy is then assigned an AS value ranging from 1 (not attractive) to 4 (very attractive), which indicates how effective the strategy is in addressing or utilizing existing factors. Once the AS has been assigned, the next step is to calculate the Total Attractiveness Score (TAS), which is obtained by multiplying the factor weights by the AS values assigned to each strategy. The final result of the QSPM is the total score of each strategy, where the strategy with the highest TAS is the top priority as the most feasible strategy to implement. While the lowest TAS is the supporting priority. Based on this, by using QSPM, the strategy selection process becomes more objective because each factor is given a weight based on its importance, and proposes strategies based on quantitative evaluation, and pays attention to their impact on the success of the company or project being evaluated.

Table 3.5 QSPM Method Strategy

Strategic Factors	Weight	Strategy	TAS Value

Source: (Dahda *et al.*, 2021) [76]

Table 3.6 QSPM Analysis Strategy Priorities

No	Alternative Strategy	TAS Value	Priority

Source: (Dahda *et al.*, 2021) [76]

3.7. Interpretation of Results

Analyze the feasibility aspects of building a special terminal and describe the findings found, supported by a SWOT analysis for company evaluation and can determine strategies or steps in fulfilling what needs to be done.

3.8. Alur Penelitian

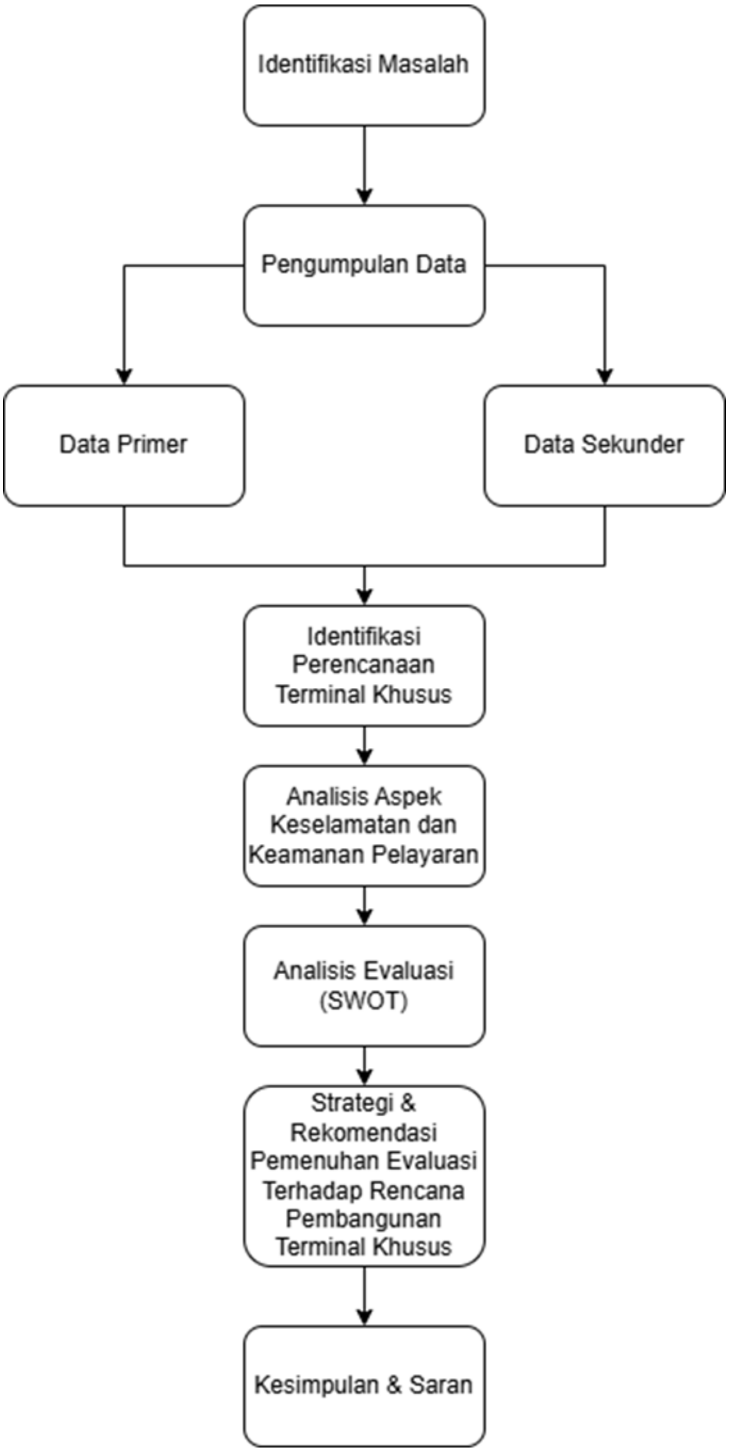

Figure 3.1 Research Flow Chart
Source: (Illustration of Researcher, 2025) [61]

4. RESULTS AND DISCUSSION

4.1. Planning for the Development of Special Terminals

Limited Liability Company (PT) Union Perkasa Buana is a company engaged in coal mining, namely coal transportation and sales located in Telang Baru Village, Paju Epat District, East Barito Regency, Central Kalimantan Province, in supporting its business activities requires a dock, but the nearest public port cannot support this, so PT UPB built a special terminal to support its business activities. Not only location considerations also consider the economic side based on the prediction of loading and unloading per month. The construction of a special terminal must also pay attention to applicable provisions, this aims to create shipping safety and security. The study was conducted to analyze the feasibility of building the special terminal.

4.1.1. Legal Basis for the Construction of Special Terminals

Based on the Regulation of the Minister of Transportation No. PM 52 of 2021 concerning Special Terminals and Terminals for Self-Interest [12], it is stipulated that Special Terminals can only be built with the consideration that the nearest port cannot accommodate its main business activities, and economic and technical operational considerations will be more effective and efficient and better guarantee the safety and security of shipping. Based on these considerations, seeing that the nearest public port cannot support PT UPB's business activities, this is due to accessibility that is not connected to the road network, as well as economic considerations based on the planned loading and unloading volume and frequency of ship visits per year.

4.1.2. Consideration of Distance to Nearby Public Ports

Figure 4.2. Distance Map of PT UPB with BUP PT BNJMP
Source : (Google Earth processed by researchers) [61]

Based on Figure 4.1, the planned location of the special terminal of PT Union Perkasa Buana is outside the Work Environment Area (DLKr) and Interest Environment Area (DLKp) of the nearest public port, while TUKS is inside the Work Environment Area (DLKr) and Interest Environment Area (DLKp) of the public port. Based on Government Regulation No. 61 of 2009 concerning Ports. Special terminals can only be built if the nearest port cannot support its main business activities, and economic and technical operational considerations will be more effective, efficient, and guarantee greater safety and security of shipping [11]. This aims to help create a good and dynamic national distribution pattern, as well as improve international relations [77]. Special terminals also provide economic benefits and advantages, one of which is Non-Tax State Revenue that applies according to the provisions [78].

Based on Figure 4.1, it is known that there is 1 (one) nearest public port that has obtained a Concession permit, namely the Port Business Entity PT Bangun Nusantara Jaya Makmur Perkasa which is located at coordinates 02 ° 14 '4.80" LS / 114 ° 56' 32.24" BT with a distance of approximately 1.78 NM, in addition there is the Rangga Ilung public port which is known only as an administrative office so that it cannot support the business activities of PT UPB. The location around the planned Special Terminal of PT Union Perkasa Buana with Tersus which has obtained temporary use approval to serve the public interest is not in Telang Baru Village. The road construction is in the form of land and some are in the process of opening the road, while access to the BUP BNJMP General Terminal is different and is not connected to the PT Union Perkasa Buana Special Terminal Location, so in this case it requires its own pier for loading coal commodities.

Based on [79] Decree of the Director General of Sea Transportation No. KP-DJPL 762 of 2022 that the construction of a Special Terminal with a distance via land access of less than 30 km from the location of a public port, or a Special Terminal or Special Terminal/Terminal for Self-Interest Temporarily Serving the Public Interest that already has legal permits or determinations, then a special terminal cannot be built. The existing condition shows that the location of the PT UPB tersus is close to the location of the BUP PT BNJMP Public Port, but does not have direct road access to the port, this is a consideration in the construction of the PT UPB tersus. This also does not conflict with the Regulation of the Minister of Transportation No. PM 52 of 2021 concerning Special Terminals and Terminals for Self-Interest.

4.1.3. Planning of Loading and Unloading Volume and Frequency of Ship Visits

Based on Press Release No. 246.Pers/04/SJI/2021 of the Ministry of Energy and Mineral Resources of the Republic of Indonesia, the Directorate General of Minerals and Coal of the Ministry of Energy and Mineral Resources (ESDM) is known that Indonesia has extraordinary natural resource wealth, one of which is coal [80]. Our country's coal reserves currently reach almost 39 billion tons, which shows a very large energy potential. Seeing this potential, the Government continues to encourage utilization efforts to provide welfare to all levels of Indonesian society.

Based on interviews and documentation studies conducted, PT Union Perkasa Buana needs a pier because it receives requests from consumers to go to the transshipment location with a minimum request of 50,000 MT per month. There are several considerations if using a pier owned by a public port around, namely the inflexible shipping time, this is because there are quite a lot of people using the public port, so the company must queue and schedule if they want to make a shipment. Another consideration is being charged a pier usage fee, this certainly adds to the cost of shipping the coal, so if the coal price is down and the shipment is not fully loaded, this can cause quite a large loss, it is different if you have your own pier where you do not pay the pier usage fee, therefore there are not many costs incurred for shipping coal. The coal that will be accommodated at the Special Terminal is planned to come from the mining locations of IUP Multi Perkasa Lestari, PT Anugerah Makmur Serasi, Bahtera Insan Sejahtera, IUP Koperasi Tunas Dayak Gemilang and Koperasi Malintut Jaya Abadi. Coal is transported from the mining location to the crushing plant located in the Special Terminal area using dump trucks with a capacity of 20 tons, with the following loading and unloading predictions:

Table 4.4. Coal Loading and Unloading Prediction at PT Union Perkasa Buana's Tersus

Year	Use	Amount (Ton) / Year/Month
2024	Per Month	50.000
	Per Year	600.000
2025	Per Month	50.000
	Per Year	600.000
2026	Per Month	60.000
	Per Year	720.000
2027	Per Month	60.000
	Per Year	720.000
2028	Per Month	60.000
	Per Year	720.000

Source: (PT Union Perkasa Buana, 2024) [81]

Based on table 4.1 The planned coal production that is processed and shipped or the shipping target through the Special Terminal is 600,000 MT per year or 50,000 MT per month. The plan for barges that will operate at the PT Union Perkasa Buana Special Terminal is 6 (six) units with a capacity of 300 feet or equivalent to 7,000 tons. Seeing the shipping target of 600,000 MT per year or 50,000 MT per month, by using a barge with a capacity of 7,000 MT, the frequency or visit of the barge at each pier is 6 times in 1 (one) month. In relation to this, 6 (six) tugboat units with 1,100 HP engines and assisted by 2 (two) assist units are also planned to help pull empty and loaded barges from the special terminal. Based on the interview conducted, it is known that PT UPB already has an agreement to rent 1 (one) tugboat to support its business activities when the dock can be operated, and in the future it will plan to buy its own tugboat. This has a big impact on the company because it will be easy if it has its own ship, because it will be more efficient and effective in operating.

4.2. Safety and Security Aspects of Shipping

According to the provisions of Government Regulation No. 61 concerning Ports, it is stated in one of the considerations, namely to guarantee the safety and security of shipping in addition to the distance to the nearest port and economically, in realizing the safety and security of shipping, it is necessary to know the conditions of Bathymetry, Ebb and Flow, Shipping Lanes and Navigation Obstacles at the location of the construction of the terminal. This is related to determining the layout of the pier planning at a special terminal by considering the depth, ebb and flow, and economic considerations (Rahmawati, 2015).

4.2.1. Bathymetry

Bathymetry is an important aspect to ensure the safety and security of shipping, this will later be related to the plan of ships that anchor and dock at the pier [82]. This is also related to fluctuating tides, so that the company can take preventive measures so that the ship does not run aground.

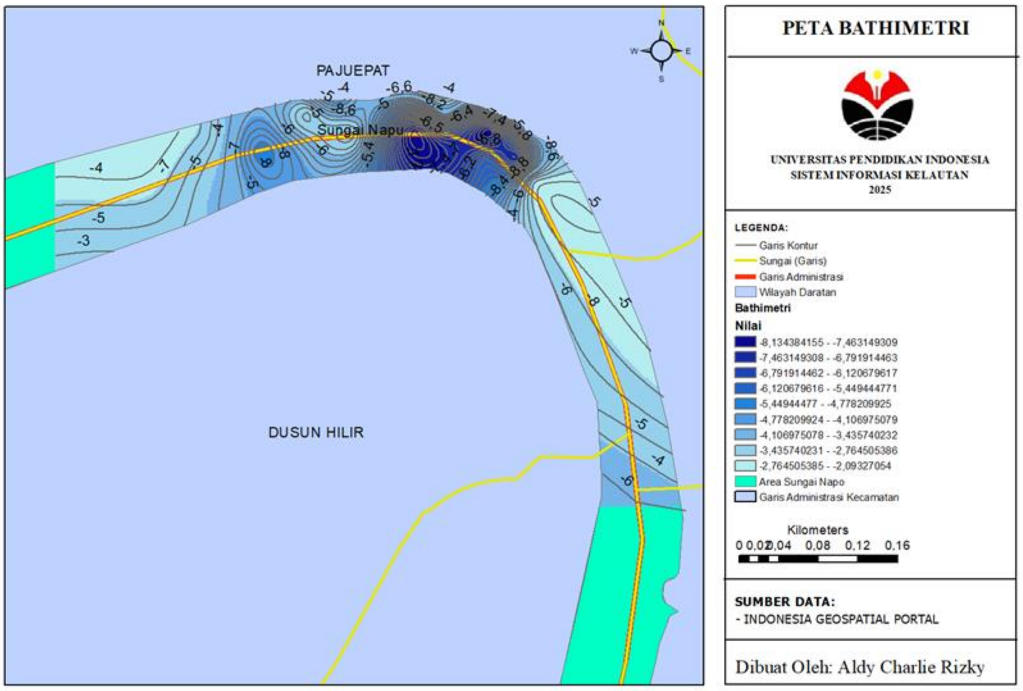

Figure 4.3. Bathymetric Map
Source: (Researcher's Process, 2025) [61]

Based on the interviews conducted and supported by the processing conducted by the researcher, the average depth of the bathymetry measurement results in the PT Union Perkasa Buana Special Terminal area is between 4 and 8 m LWS. The planned ship that will sail is a barge with a maximum size of 3,000 DWT/300 Feet with a load of 7,500 tons. According to the Ministry of Transportation in Government Regulation No. 8 of 2011, at this depth interval, barges with a maximum draft of 6.5 m can anchor or moor [31]. This is also the basis for PT UPB in determining the specifications of the dock, so that the safe depth of the ship can be identified.

Table 4.5 Port Pool Depth Data Range for Each Pier

Harbor Pool	Ship's Load	Bathymetric Data	
		Minimum Depth	Maximum Depth
I	5 – 6,5 m	4 m	8 m
II	5 – 6,5 m	4 m	8 m

Source: (Rinaldy *et al.*, 2014) [83]

Seeing this, it is necessary to estimate the ship that will sail, in this case the researcher provides an estimate of the GT of the barge that is planned to dock. The calculation of the GT estimate uses the GT=k×(L×B×H) approach [72], with the following calculation:

1. Barge 270 feet

L = 270 feet = 82 meters
B = about 24 meters (common for barges of this size).
H = about 5 meters (average).
GT= 0,2×(82×24×5) = 1968 GT.

2. Barge 300 feet

L = 300 feet = 91 meters
B = about 26 meters (general).
H = about 5.5 meters.
GT= 0,2×(91×26×5,5) = 2601 GT.

The results of the estimated GT calculation for a 270 feet barge are 1968 GT, while for a 300 feet barge it is 2601 GT. Based on the GT estimation calculation, it is necessary to pay attention to the draft (water load) for barges operating on rivers. The average draft of the barges to be used is: 270 feet barge around 2.5-3 meters (without cargo), can reach 4-4.5 meters when fully loaded. 300 feet barge around 3 meters (without cargo), up to 5 meters when fully loaded. Looking at the depth data obtained, namely 4 m LWS which is risky especially when fully loaded, because the draft can be almost the same or more than the depth of the river, so that it can cause the potential for running aground, while 8 m LWS is still a safe range because the ship's draft is smaller than the depth of the river. Regarding the suitability of barges for the waters of the Napo River with a depth of 4-8 meters LWS. The main factor that needs to be considered is the draft of the barge, namely the depth of the ship below the water surface. The plan for 270 feet and 300 feet barges, the draft without cargo ranges from 2.5-3 meters, while when fully loaded it can reach 4-5 meters. Based on the river depth of 4 meters (LWS), there is a risk of the ship running aground, especially if the barge is fully loaded, because the ship's draft approaches or exceeds the river depth. However, at a depth of 8 meters (LWS), the ship is safer to operate because there is sufficient distance between the ship's draft and the river bed [84]. The minimum depth needs to be considered at least a minimum of 6 meters to accommodate the ship in various tidal conditions.

The mooring or berthing area of ships with a depth of 4–8 m and an area of approximately 0.41 hectares and a turning pool of 0.48 hectares at the PT Union Perkasa Buana Special Terminal are considered adequate to support barge activities, however the average width of the river is only 80 meters which is a significant challenge, especially when large barges (270–300 feet) maneuver in the turning pool. The Turning Pool has an important role in the safety and security aspects of shipping [34], Therefore, the ideal turning pool should have a minimum diameter of 1.5–2 times the length of the largest ship that will operate in the port, to provide sufficient safe maneuvering space.

Mitigation measures that can be taken include limiting loads to reduce draft, operating when river water is high, and consulting with local water authorities to ensure safety. This is in accordance with river depth conditions if it is often at 4 meters, it can consider using smaller barges, such as 180-240 feet, to reduce risk and realize shipping safety and security.

4.2.2. Tidal

The tidal aspect needs to be considered because it plays an important role in the safety and security aspects of shipping [85], so that it can determine the difference in height between land and water and as a reference in determining the elevation of the pier, so that in determining the specifications of the pier that is built it is not submerged. Not only that, the company can determine the shipping schedule according to the tidal conditions.

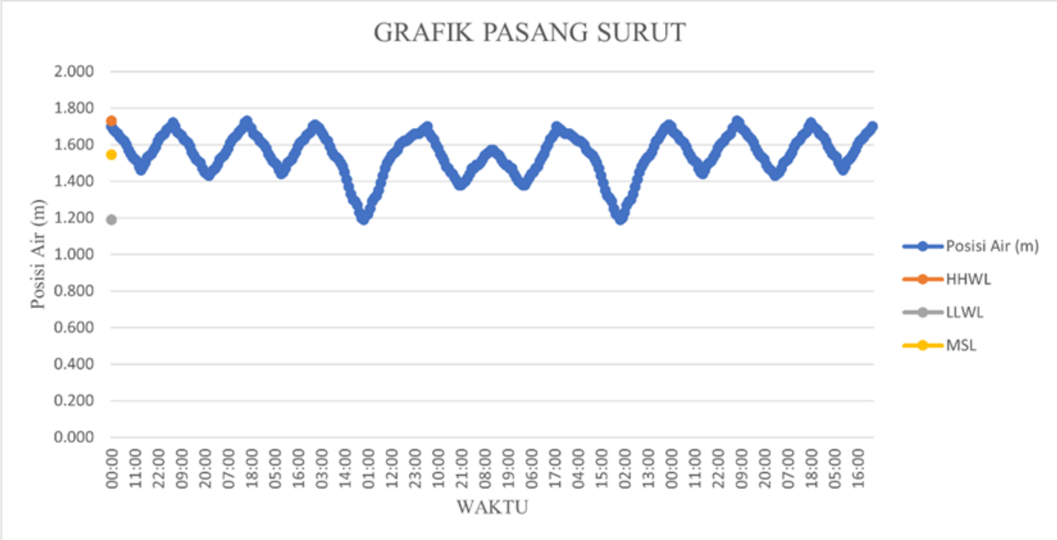

Figure 4.4. Tidal Graph
Source: (PT Union Perkasa Buana processed by researchers, 2025) [61]

The graph shows tidal fluctuations during 15-day observations starting from November 18, 2023 to December 2, 2023. The tidal type is a mixed tidal trending towards diurnal. The maximum value (HHWL) was recorded at 1.73 m at 16:00, while the minimum value (LLWL) was 1.19 m at 23:00, with an average (MSL) of around 1.544 m. Based on this, the following important values were obtained:

- HHWL (Highest High Water Level) : 1,73 m
- LLWL (Lowest Low Water Level) : 1,19 m
- MSL (Mean Sea Level) : 1,544

Based on the tidal chart, the 270 feet barge has a draft of about 2.5 meters without cargo, with a minimum river depth of 4 meters, the minimum safe limit is 1.5 meters, which is safe enough for navigation. While the 300 feet barge has a draft of about 3 meters without cargo, with a minimum depth of 4 meters, the safe limit is only 1 meter which is considered less, but still allows for operation without a full load. When fully loaded, the ship's draft can increase to 4-5 meters, making it risky to sail at a minimum river depth of 4 meters.
Tidal data shows the LLWL value (1.19 m) as the lowest level. This is if the ship is moored during low tide, it can cause the risk of the ship running aground, especially for 300-foot barges. During high tide (HHWL 1.73 m), the water elevation increases by about 0.54 m from MSL, so this condition is quite ideal for anchoring or sailing. Seeing this, the best time for ships to anchor or moor is during high tide, which usually occurs twice a day, while during the lowest ebb it is not recommended for sailing activities, especially ships with cargo.
Based on this, for the safety and security of shipping, a 270-foot barge can be used, but a 300-foot barge is not recommended except during high tide periods. The company arranges the operating schedule by taking into account tidal conditions, so that ships can anchor or moor safely.

4.2.3. Pier

The pier is a port facility so that ships can dock and moor for loading and unloading activities and embarking and disembarking passengers [86]. The pier is an important aspect to support shipping safety and security [87]. The specifications of the PT Union Perkasa Buana pier are planned with the company's needs in achieving shipping targets. PT Union Perkasa Buana plans to build 2 (two) piers in achieving the shipping target. Based on the results of the interviews conducted, there are several considerations by considering accessibility and shipping targets, this shows that PT Union Perkasa Buana needs a pier to dock/moor its ships in supporting its business activities.

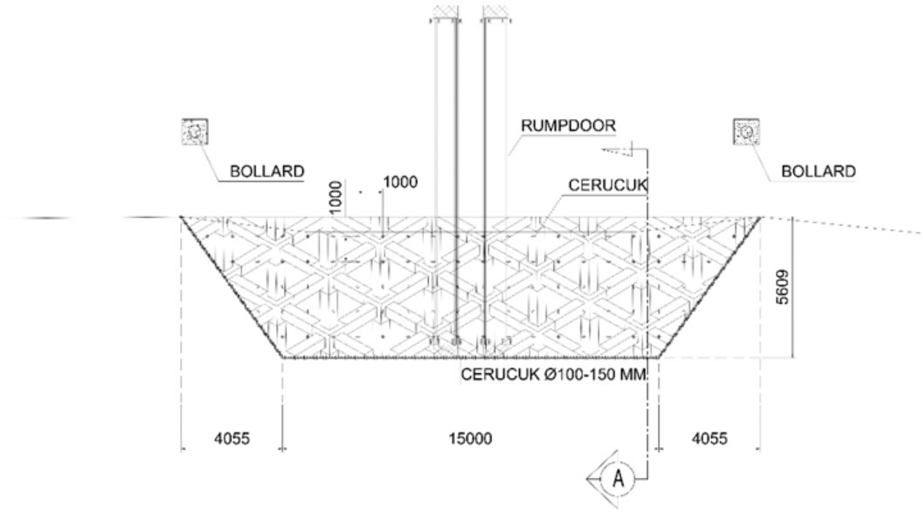

Figure 4.5 PT UPB Tersus Pier Layout Top View
Source: (Illustration of Researcher, 2025)

Based on the interviews conducted, information was obtained regarding the specifications of the 2 (two) docks to be built, namely marginal type with dimensions of 23 m x 5.6 m, and the planned construction is compacted landfill, round wooden gutters/concrete sheet piles. The loading facilities used are Manual Ramdoor. Seeing the depth of the location is 4 to 8 m LWS with a planned barge berthing measuring 3,000 DWT/300 Feet with a load of 7,500 tons.

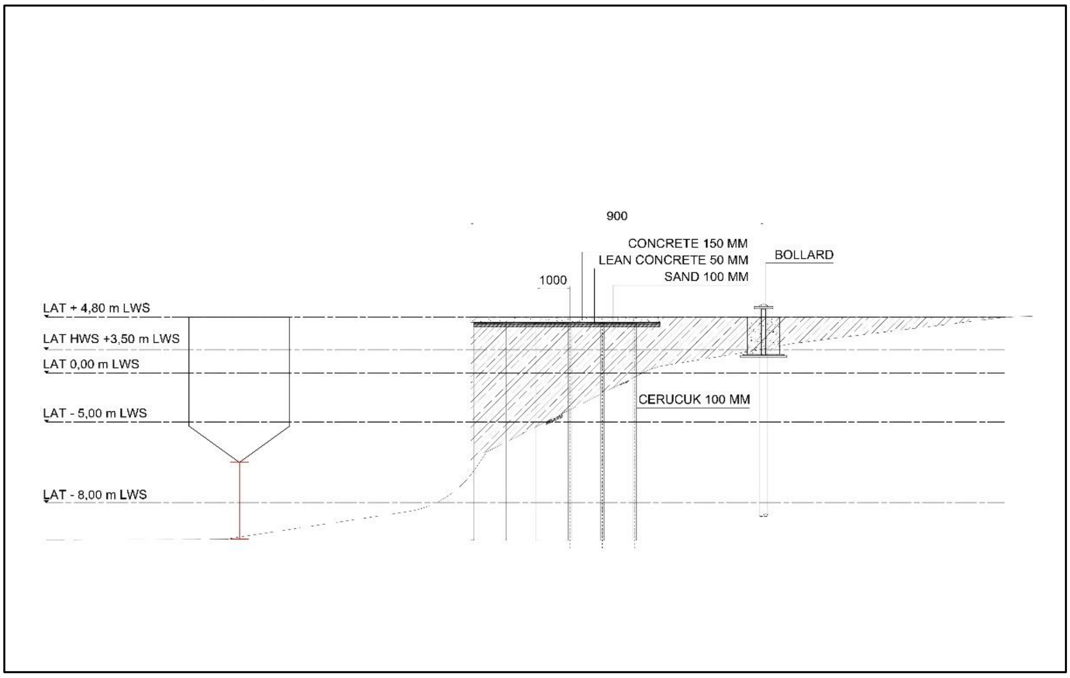

Figure 4.6 PT UPB Tersus Pier Layout Side View
Source: (Illustration of Researcher, 2025)

Based on the condition of the waters which are relatively calm rivers, the pier does not require fenders, breasting & mooring dolphins [88]. This is because the location of the special terminal is on the Napo River which is a tributary of the Barito River, the condition of the waters is calm, and has sufficient depth for ships to sail and dock.

Looking at previous calculations regarding barges, either 270 (82 m) feet or 300 (91) feet with an average width of around 24-26 m. Based on this, the pier length of 23 meters and a width of 5.6 meters is not adequate to accommodate ships of 270 feet or 300 feet. The length of the pier which is only 23 meters is not enough to dock fully, because at least the length of the pier must be able to cover at least 75-100% of the length of the ship, while the width of 5.6 meters is sufficient for pedestrian access and manual ramdoor.

Ideal size of dock for barges 300-foot barge should have a minimum length of 100 meters (±1.1x the length of the ship) so that the ship can dock safely [73]. If it is intended for a 270-foot barge, the length of the pier can be reduced to around 90 meters. The 23-meter pier can currently only be used for small ship operations or partial facilities such as temporary moorings. Not only considering the length of the pier, the pier width of 5.6 meters can be used if only for light activities or manual access. Not for activities involving loaders or cranes, a minimum pier width of 8 meters is recommended. The use of fill soil and wooden/concrete sheet piles is adequate for light pier construction, but if the pier is used intensively by large ships, the construction must be reinforced with reinforced concrete sheet piles or steel structures for resistance to large loads and water abrasion.

Based on this, the planned pier size, which is 23 meters x 5.6 meters, is inadequate for barges measuring 270 feet (82 m) and 300 feet (91 m), so the length of the pier is recommended to be increased to a minimum of 90-100 meters, with a width of 8-10 meters to support operational activities, if in the future using a loader or crane. The water depth ranging from 4-8 meters LWS also needs to be dredged to a minimum of 6 meters, or ideally 7-8 meters, to accommodate a fully loaded ship draft that can reach around 4.5-5 meters and reduce the risk of running aground. Regarding the construction of fill soil and wooden/concrete sheet piles, it should be increased to reinforced concrete or steel structures to be more resistant to heavy loads and abrasion.

4.2.4. Shipping Lane

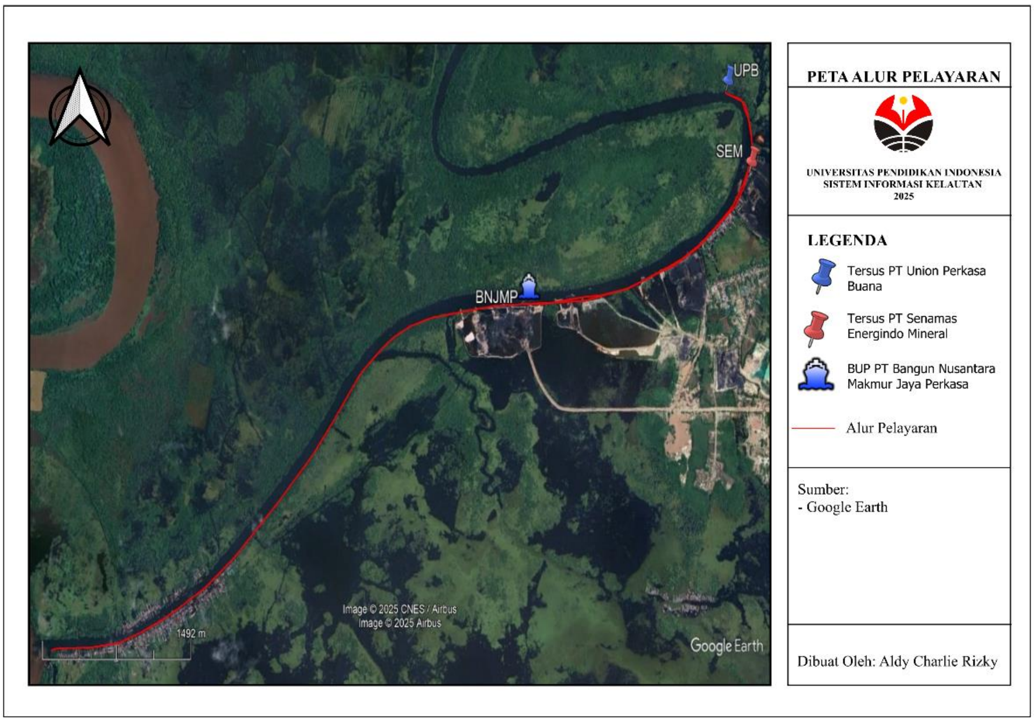

Figure 4.7. Map of Shipping Routes to Barito River
Source: [61]

Based on the Regulation of the Minister of Transportation Number 129 of 2016 concerning Shipping Lanes at Sea and Buildings and/or Installations in Waters, it states that Shipping lanes are waters that in terms of depth, width and freedom from other shipping obstacles are considered safe and secure for sea transport vessels to navigate [30]. The Shipping Lane around the PT Union Perkasa Buana Special Terminal location based on the survey results is with the following channel conditions:

Table 4.6. Special Terminal Shipping Lane Conditions

Flow Conditions		
a	Length (m)	± 9.500 m
b	Width (m)	± 70 – 90 m
c	Depth (m)	Average 4 to 8 m LWS
d	Current (*knot*)	± 1 s/d 3 *knot*
e	Wind (*knot*)	± 0,6 s/d 9 *knot*
f	Tides (m)	1.0 – 1.5 m
g	Channel Challenges	There are 4 (four) jetties on the channel leading to the Barito River

Source: (PT Union Perkasa Buana, 2024) [81]

Table 4.3 data on shipping lane conditions in the Napo River waters as far as about 4.85 NM, the special terminal of PT Union Perkasa Buana has a channel length of about 9,500 meters, a width of 70-90 meters, and a depth of 4-8 meters LWS, with a current speed of about 1-3 knots and winds of 0.6-9 knots. Seeing this, the shipping lane is considered safe enough to be passed by a 270-foot barge [33], especially when considering the existence of tides of 1-1.5 meters which can provide additional depth during the high tide period, however there are several challenges that need to be considered, in the existence of four jetties on the channel to the Barito River and the special terminal of PT Senamas Energindo Mineral (SEM) which is adjacent to the location of the PT Union Perkasa Buana terminal. The width of the river is only 70-90 meters, the potential for obstacles occurs when barges docked at the PT Senamas Energindo Mineral terminal block the maneuvers of ships entering and leaving the PT Union Perkasa Buana Terminal. Not far from the PT SEM tersus is the BUP PT Bangun Nusantara Makmur Jaya Perkasa (BNJMP).
Based on this, shipping management, namely a one-way route system, is very important to avoid potential collisions or congestion in shipping lanes. Ship departure and arrival schedules need to be synchronized and coordinated with the surrounding terminal managers and harbor masters, so that docked barges do not interfere with the movement of other ships [89]. Furthermore, the installation of navigation systems such as channel markings, shipping signs, and beacons, especially at night or in bad weather conditions. Considering that the channel depth is only 4-8 meters LWS, periodic dredging needs to be carried out to maintain the minimum depth, so that fully loaded barges remain safe to pass, especially during the lowest ebb.
Based on this, the ship may have difficulty maneuvering or turning, so it will look for waters with sufficient width and depth for this. PT UPB can widen the port pool such as dredging the dock area [78]. It is hoped that this can guarantee the safety and security of shipping.

4.2.5. Navigation Obstacles

Navigational obstacles play an important role in the safety and security aspects of shipping, in its implementation supported by SBNP facilities as a port entrance that functions to assist navigators in determining the position or course of the ship and notifying of dangers or obstacles to shipping for the sake of sailing safety [90]. Based on the location of the PT Union Perkasa Buana Special Terminal on the banks of the Napo River, there are several factors that need to be analyzed related to navigation, namely bathymetry, tides, and navigational obstacles. Regarding bathymetry, the depth of the river channel varies between 3 to 12 meters LWS, with a channel width of around 70 to 85 meters. These depth conditions indicate the presence of shallow areas that have the potential to be obstacles for ships with large drafts, especially during low tide conditions. The high tidal conditions in this area range from 1 to 1.5 meters, large ships, such as 270-foot barges, must pay attention to when the maximum tide is in order to navigate safely.
Navigational obstacle factors need to be taken into serious consideration. Plants such as jingah trees, blangeran, pandan, and bushes around the channel can be a visual barrier for passing ships, especially at night. The narrow channel width, which is an average of only 70–85 meters, also increases the risk of collision if there is no clear guidance from the Navigation Aids (SBNP) in the form of beacons, buoys, or effective radar reflectors [91]. Not only that, channels that have a clay soil structure also require routine maintenance to ensure that there is no sedimentation that narrows the channel or reduces the depth of the channel.
Seeing this, areas with a depth of less than 5 meters need to be dredged to reach a minimum depth of 7 meters throughout the shipping lane, to support the smooth maneuvering of large ships such as 270-foot and 300-foot barges. Carry out routine pruning and cleaning of plants such as jingah, blangeran, pandan, and bushes around the channel to reduce visual obstacles and prevent navigation hazards. Schedule the departure

or arrival of large ships at maximum tide to take advantage of the increase in depth due to the ebb and flow. Not only that, supervision also needs to be carried out to monitor the condition of the channel regularly, including sedimentation, damage to the SBNP, and other obstacles that may arise.
According to Government Regulation Number 81 of 2000 concerning Navigation [29], the provision of navigation aids is generally carried out by the Government, the provision includes; procurement, operation and maintenance of navigation aids. Navigation Aids are facilities that can be formed naturally or built which are positioned outside the ship with the function of assisting the navigator in determining the position and/or obstacles to navigation to ensure sailing safety [51]. The Navigation District recommends SBNP specifications with the following data:

Table 4.7. Coordinate Recommendations, Types and Specifications of SBNP

a	Position	02° 13' 1.00" LS / 114° 56' 38.00" BT
b	Type	Harbor Beacon
c	Beacon Construction	Single Pipe
d	Beacon Height	10 meters
e	Construction Color	White
f	Light Rhythm	FL W 4 sec (FT 0.5 : Ecl 3.5)
g	Visibility Distance	10 NM
h	Power Source	Solar Power
i	Other Equipment	Radar Reflector

Source: (PT Union Perkasa Buana, 2024) [81]

The location of the Special Terminal of PT Union Perkasa Buana, plans to build a SBNP in the form of a Harbor Beacon with technical specifications that comply with the recommendations of the local Navigation District, such as the use of a Single Pipe type beacon with a height of 10 meters and a solar energy source. Seeing the condition of the existence of the SBNP, it must be considered so that the construction of the SBNP does not interfere with activities at the port, in addition to aspects of navigation obstacles such as channel depth, vegetation that obstructs the view, and channel widths that are not too large, so that planning and maintenance of the SBNP are very important to ensure shipping safety.

4.3. Special Terminal Development Evaluation Strategy

The evaluation analysis of the development of a special terminal of PT Union Perkasa Buana was carried out to identify the feasibility of this planning in various aspects, including location, economics, safety and security of shipping. This evaluation refers to applicable regulations, such as Regulation of the Minister of Transportation Number 52 of 2021 and Regulation of the Minister of Transportation Number 12 of 2021. In this case, researchers used a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis aimed at identifying internal and external factors that influence the feasibility of developing a special terminal, as well as providing recommendations for fulfilling the evaluation. This approach is expected to provide a reference for PT Union Perkasa Buana in fulfilling regulatory requirements for the development of a special terminal.

4.3.1. Government Agency Evaluation of Special Terminals

The evaluation of the agency on the construction of the PT UPB special terminal was carried out by the Office of the Harbormaster and Port Authority Class III Rangga Ilung, the Office of the Class II Type A Navigation District Banjarmasin, and the Directorate of Ports. Based on the minutes of the results of the field review by the Office of the Harbormaster and Port Authority Class III Rangga Ilung dated May 16, 2024 and the Field Verification by the Office of the Class II Type A Navigation District Banjarmasin dated January 19, 2024, it was shown that the plan to build a PT UPB special terminal was operationally feasible to support coal transportation and sales activities. The location of the special terminal with the surrounding public port is not connected by road, this is a consideration for the construction of a terminal. Fully responsible for the impacts caused by operational activities at the Special Terminal Furthermore, in order to fulfill the safety and security aspects of shipping at the Special Terminal, PT Union Perkasa Buana is required to create a 30 m x 300 m Port pool. The company coordinated with the Banjarmasin Class II Type A Navigation District Office, which stated that it was mandatory to install/place Shipping Navigation Aids (SBNP) by adjusting the port construction/installation to help ships/barges enter and exit the port that are not in the Restricted and

Prohibited Area (OTT), as well as provide shipping telecommunications equipment along with the licensing process.

The evaluation process of the Special Terminal is carried out with standards based on [92] Decree of the Director of Port Affairs No. UM.008/1/6/DP-23 concerning the Evaluation Standards for Business Licensing to Support Business Activities (PB-UMKU) of Special Terminals and Terminals for Self-Interest Through the Integrated Hubla Electronic System (SEHATI). There are 9 (nine) requirements in the worksheet for the results of the evaluation of the construction of special terminals in the following table:

Table 4.8 Special Terminal Development Evaluation Results Worksheet

No	Requirements	Available	No	Description
1	Application Letter	√		Application letter addressed to the appropriate licensing authority
2	Business Identification Number	√		Suitability of documents issued
3	Risk-based Commercial License/ NIB	√		Suitability of documents issued
4	Principal Business License	√		Scope of business license is appropriate and valid
5	Proof of Land Rights Ownership Status or Proof of Land Utilization Agreement for Specific Activities	√		Land ownership is in the name of the company
6	Technical Review which at least contains: a. Exit and exit flow plan of the Special Terminal b. Special Terminal pool depth c. The planned loading/unloading volume, and frequency of visits as well as the planned size (tonnage and length) of the largest vessel that will dock/moor d. Navigation-Navigation Obstacles e. Requirement plan for Aids to Navigation-Navigation	√		The technical review contains in accordance with the attached requirements
7	Technical Plan of berthing/mooring facilities which at least contains: a. Drawings of plans, views, sections and sizes (dimensions) and types of construction materials b. Geographical coordinates of at least 4 (four) points, namely 2 (points) on the dock/water side and 2 (two) points on land c. Map of the Working Environment and Area of Interest of a particular Special Terminal d. Situation map of the Special Terminal against other installations/buildings in the vicinity	√		The technical plan contains in accordance with the attached requirements
8	Minutes of review and evaluation of the Tersus development plan by the syahbandar at the nearest port and local navigation district which at least contains: a. Mooring facility data b. Koordinat geografis minimal 4 (empat) titik yaitu 2 (titik) di sisi dermaga/perairan dan 2 (dua) titik di Geographical coordinates of at least 4 (four) points, namely 2 (points) on the dock/water side and 2 (two) points on land c. The plan for the entry and exit of the Special Terminal and the plan for the placement of Navigational Aids	√		The Minutes contain data on berthing/mooring facilities, geographical coordinates, special terminal entry and exit flow plans and SBNP placement plans, field documentation of the construction plan for the facility
9	Environmental approval that contains activities in the port sector in accordance with the provisions of laws and regulations	√		The scope of the document includes port activities (construction of dock facilities)

Source: (KP Ditkepel No UM.008/1/6/DP-23 processed by Researcher, 2025) [61]

The evaluation conducted by the Harbormaster and Port Authority Office Class III Rangga Ilung, and the District Navigation Office Type A Class II Banjarmasin, Directorate of Ports on PT Union Perkasa Buana in the special terminal development plan meets the requirements and can be continued to the next stage and fulfill the necessary requirements as stated in the minutes and field verification. The implementation of these activities is also supervised with applicable provisions.

4.3.2. Internal Factor Analysis

1. **Strengths**

   The strength factor is an advantage possessed by a company. This factor becomes an added value or comparative advantage that distinguishes the company from others. Based on the results of the analysis that has been carried out, the strengths possessed are as follows:

   a. **Strategic Location**

   Based on considerations of the location of the construction of the special terminal of PT UPB, as well as information obtained from interviews, the location can be said to be strategic because there is access to the waters, namely the Napo River, this can also be seen from the presence of a special terminal and a public port in the waters. The company PT UPB itself also has legality related to the location that is the plan to build a special terminal, and this is also a consideration in building a special terminal for its business activities, where the location of the IUP partner is accessible by the road network.

   b. **Company Resources**

   Based on PT UPB's shipping target of 50,000 MT per month or 600,000 per year. The planned ship to be used is a barge, and supported by a rented tugboat and an assist ship. This is a strength factor that supports PT UPB in the shipping target. This is when compared to surrounding ships that still fully use ship agents in their shipping. The target volume and frequency of ships is one indicator to indicate the smooth supply or demand of goods in a region, this is also supported by regions that have potential [93]. Based on this, the company PT UPB also has competent human resources in the mining and port sectors..

2. **Weaknesses**

   Analysis of internal factors aims to identify weaknesses that the company has in licensing the construction of special terminals. The following are internal factors that affect the feasibility of building special terminals:

   a. **Bathymetry**

   The water depth at the PT Union Perkasa Buana Special Terminal, ranging from 4 to 8 meters LWS, is one of the weaknesses that needs to be considered. A minimum depth of 4 meters can cause the risk of large barges (270–300 feet) with a full draft of up to 5 meters running aground, especially during the lowest ebb. This condition requires restrictions on loads or operational times during high water to reduce the risk of accidents [94]. Not only that, the width of the river, which is only around 80 meters, is a challenge in maneuvering ships in the turning pool, which ideally has a diameter of 1.5 to 2 times the length of the ship. Seeing this, in overcoming risks like this, mitigation that can be done includes the use of smaller barges (180–240 feet), load restrictions, and consultation and coordination with the local harbor master to ensure the safety and security of shipping [95].

   b. **Tidal**

   The difference in elevation due to the ebb and flow is a significant weakness, especially in the operational time scheduling of the PT Union Perkasa Buana Special Terminal. Based on the analysis results, the LLWL value reached 1.19 meters and HHWL 1.73 meters, with

MSL around 1.544 meters. These ebb and flow conditions affect shipping safety, especially for 300-foot barges that have a draft of up to 3 meters without a load and can increase to 5 meters when fully loaded. At minimum ebb conditions, the risk of running aground is high because the safe limit is only 1 meter left. Seeing this, the use of 300-foot barges is recommended only during high tides, while 270-foot barges are more flexible to operate. The company needs to carefully schedule shipping activities based on tidal conditions to ensure the safety and smooth operation of the dock [96].

c. Pier

The planned pier specifications for PT Union Perkasa Buana, namely 23 meters x 5.6 meters, are inadequate for barges measuring 270 feet (82 m) and 300 feet (91 m), which ideally require a pier with a minimum length of 90–100 m in order to be able to dock safely [97]. The current pier length of only 23 meters is only suitable for small boat operations or temporary moorings. The pier width of 5.6 meters is sufficient for manual access but is less than ideal if activities involve loaders or cranes that require a minimum width of 8-10 meters. Construction using fill soil and wooden/concrete sheet piles is sufficient for light piers, but should be upgraded to reinforced concrete or steel structures for resistance to large loads and water abrasion. The water depth of 4-8 meters LWS also requires dredging to a minimum of 6 meters, or ideally 7-8 meters, to accommodate a fully loaded ship draft that can reach 4.5-5 meters to reduce or avoid the risk of grounding [98].

4.3.3. External Factor Analysis

1. Opportunities

Opportunities are external environmental conditions that are beneficial and can be utilized to support the progress of a company or organization. Based on the results of the analysis that has been carried out, the opportunities owned by PT UPB:

a. **Coal Commodity Potential**

Indonesia has coal reserves of nearly 39 billion tons, reflecting the huge energy potential and strategic business opportunities in the mining sector. The government continues to encourage the use of coal to support the welfare of the community, which is in line with the business activities of PT Union Perkasa Buana supported by partners who have IUPs, namely from the Multi Perkasa Lestari IUP mining, PT Anugerah Makmur Serasi, Bahtera Insan Sejahtera, IUP Tunas Dayak Gemilang Cooperative and Malintut Jaya Abadi Cooperative. This partnership allows PT Union Perkasa Buana to meet loading and unloading demands of up to 50,000 MT per month or around 600,000 MT per year, with an estimated 6 ships sailing every month. Fluctuations in coal prices are a challenge that makes the company build its own dock to reduce the cost of using public docks and increase choices that do not only depend on the surrounding public ports, so that the company's operations remain efficient and competitive..

b. **Government Regulation**

Minister of Transportation Regulation No. PM 52 of 2021 provides an opportunity for PT Union Perkasa Buana to build a Special Terminal, on the condition that the nearest public port cannot support the company's main business activities, and is more economically and technically operationally effective and efficient, while ensuring shipping safety. Based on existing conditions, the public port of BUP PT BNJMP is within a radius of less than 30 km, but does not have direct road access to the terminal, so it cannot support PT UPB's business activities. This condition is in accordance with the exceptions stipulated in the Decree of the Director General of Sea Transportation No. KP-DJPL 762 of 2022, which allows the construction of a Special Terminal if the public port does not have adequate accessibility.

Seeing this, the plan to build a Special Terminal for PT UPB does not conflict with applicable regulations and can be continued in the licensing process for the construction of a special terminal, with these considerations it is hoped that it can continue to support PT UPB's business activities..

2. **Threats**

Analysis of internal factors aims to identify threats originating from outside the company. These factors cannot be fully controlled by the company, but have a significant impact on business sustainability. The following are external factors that affect the feasibility of building a special terminal:

a. **Shipping Line**

The shipping lane to the PT Union Perkasa Buana Special Terminal is approximately 9,500 meters long, with a width of 70–90 meters and a depth of 4–8 meters LWS, and a current speed of 1–3 knots. Conditions are considered safe enough for 270-foot barges to pass through, but there are several threats that need to be anticipated. The presence of four jetties on the route to the Barito River and activities at the nearby PT Senamas Energindo Mineral special terminal can hinder ship maneuvers and increase the risk of collision. The limited width of the river increases the potential for route conflicts when barges dock at nearby terminals. Not only that, the limited depth of the channel requires periodic dredging to maintain a safe depth when the ship is fully loaded, especially at the lowest ebb. This requires considering mitigating steps for this threat, the condition of the shipping lane uses a one-way route system that is coordinated with the managers of the surrounding public terminals and ports and the harbor master, installing adequate navigation signs, and considering widening the port basin to ensure safety and smooth shipping.

b. Navigation Obstacles

Navigational obstacles around the PT Union Perkasa Buana Special Terminal are a significant threat that needs to be anticipated to ensure shipping safety. The depth of the channel varies between 3 to 12 meters LWS with several shallow areas increasing the risk of 270-300 feet barges running aground, especially during low tide. Vegetation such as jingah trees, blangeran, and bushes around the channel can also obstruct visibility, especially at night, thus increasing the risk of collision. The width of the channel which is only 70-85 meters is less favorable for this situation, especially if there is no adequate navigation guidance. Seeing this, in order to overcome this threat, dredging of the channel to a depth of at least 7 meters needs to be carried out periodically, accompanied by pruning vegetation that obstructs visibility. The construction of SBNP in the form of a beacon with a Single Pipe specification of 10 meters high using solar power is very important to provide clear navigation guidance. Not only that, routine monitoring of channel conditions, sedimentation, and damage to SBNP must be carried out to maintain the safety and smoothness of shipping.

4.3.4. SWOT Analysis Matrix

Based on the researcher's analysis of the safety and security aspects of shipping to ensure that the special terminal built is operationally feasible. SWOT analysis is used to identify the strengths, weaknesses, opportunities, and threats faced by the company. This approach aims to formulate a more effective and adaptive strategy in dealing with port dynamics. Based on this, the researcher created a SWOT matrix as follows:

Table 4.9 SWOT Analysis Matrix

	Strenght (S)	**Weakness (W)**
	1. Shipping supported by the rental of 1 tugboat to support operations.	1. The minimum river depth of 4 meters risks causing the barge to run aground when fully loaded. 2. Tidal fluctuations between 1 to 1.5 meters require a tight sailing schedule so that large ships can navigate safely. 3. The 23-meter dock length is inadequate for 270–300 feet barges.
Opportunities (O)	**S-O**	**W-O**
1. Demand for Coal Commodities, PT UPB has strategic IUP partners that support shipping activities of up to 600,000 MT per year. This shows the potential of Coal Commodities, so that in increasing operational efficiency it can be supported by the construction of its own dock to reduce the cost of public port usage services. 2. Regulations that allow the construction of special terminals if public ports do not have adequate access.	1. Maximizing IUP partnerships by utilizing coal potential and supported by the construction of special terminals to support business activities, and supported by the rental of tugboats, so that it will facilitate operations.l.	1. Increase the length of the pier to a minimum of 90 meters and dredge to maintain a minimum depth of 7 meters. 2. Arrange a schedule for ships to moor or anchor, this is related to the time of the ebb and flow of the tide, and use safe ship specifications.
Threats (T)	**S-T**	**W-T**

1. The varying channel depths and sedimentation require regular dredging to ensure safe passage of large vessels. 2. Navigational Obstacles, The presence of jetties and other terminal activities and surrounding vegetation that can interfere with vessel maneuvers.	1. Install navigation signs and coordinate shipping schedules with surrounding terminals and harbor masters to avoid potential collisions and other things in shipping lanes.	1. Conduct vegetation pruning and routine maintenance of SBNP to reduce navigation risks and sedimentation in shipping lanes, and schedule large vessel operations during maximum tides.

Source: (Researcher Process, 2025) [61]

Based on the SWOT analysis, the plan to build a Special Terminal of PT Union Perkasa Buana aims to support the business activities of PT Union Perkasa Buana, which has a high demand for coal, in meeting this demand PT UPB has IUP partners and has the potential to load and unload up to 600,000 MT per year. This provides a great opportunity for the company to build its own pier so as not to depend on public ports and reduce operational costs. Not only that, with the existence of a tugboat rental agreement, it can be an added value in supporting operations. Government regulations governing the construction of special terminals provide clear and legitimate legality.

Considerations in building a tersus must also consider other aspects. The challenges faced include weaknesses in bathymetric conditions with a minimum depth of 4 meters which risks causing ships to run aground, tidal variations of 1-1.5 meters which affect operational time, and inadequate dock specifications for large barges. Threats from sedimentation, vegetation that obstructs views, and limited river width also need to be anticipated.

Seeing this in overcoming these challenges, PT UPB is advised to carry out periodic dredging to maintain a minimum depth of 7-8 meters, extend the dock to a minimum of 90 meters, and regulate ship operational schedules based on tidal schedules. Trimming vegetation and installing Navigation Aids (SBNP) need to be done to minimize navigation risks. The widening of the port basin according to the harbor master's recommendation of 30 m x 300 m, can be dredged to meet this.

Coordination with the harbor master and navigation district is very important to ensure that all regulatory requirements are met. It is hoped that with the implementation of these steps, the construction of the special terminal can run efficiently, safely and in accordance with regulations, thus ensuring the safety and security of shipping and supporting PT UPB's business activities.

4.3.5. IFE & EFE Matrix

The IFE Matrix is used to determine the extent of the role of internal factors in the company. The IFE Matrix shows the company's internal conditions in the form of strengths and weaknesses calculated based on ratings and weights. The EFE Matrix is used to determine the influence of external factors on the company. The EFE Matrix describes external conditions consisting of opportunities and threats to the company calculated based on ratings and weights. Based on the calculation results of the Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) Matrices, it can be concluded that internal and external factors have a significant role in determining the feasibility and strategy for developing this special terminal.

Table 4.7 IFE Matrix (Internal Factor Evaluation)

Internal Evaluation Factors	Weight	Rating	Score
Strength			
1. Strategic location for special terminal construction.	0.325	4.0	1.30

2. Shipping supported by the rental of 1 tugboat to support operations, as well as human resources in the mining and port sectors.	0.225	3.5	0.79
Weakness			
1. The minimum river depth of 4 meters poses a risk of causing the barge to run aground when fully loaded..	0.175	2.5	0.44
2. Tidal fluctuations of between 1 and 1.5 meters require strict sailing schedules so that large vessels can navigate safely.	0.125	2.5	0.31
3. The 23 meter long pier is inadequate for 270–300 feet barges.	0.15	2.5	0.38
Total	**1.00**		**3.22**

Source: (Researcher Process, 2025) [61]

IFE Matrix, obtained a total score of 3.22, indicating that internal factors provide more advantages than obstacles. The strategic location of the special terminal is the main strength factor, with the highest score, indicating that the existence of a special terminal in that location greatly supports operational efficiency and accessibility. Other things such as tugboat support and experienced workers in the port and mining sectors are also supporting aspects that strengthen the feasibility of this project. Based on this, there are several weaknesses that need to be considered by the company, such as the depth of the river which only reaches 4 meters, which can increase the risk of running aground for fully loaded barges. The fairly high tidal fluctuations require stricter operational planning, while the length of the pier which is still limited can limit the berthing capacity of large ships. Based on this, although internal factors are quite supportive, efforts to improve infrastructure, such as river dredging and adjusting the design and specifications of the pier, need to be carried out to optimize the construction of the PT UPB special terminal.

Table 4.8 EFE Matrix (External Factor Evaluation)

External Evaluation Factors	Weight	Rating	Score
Opportunity			
1. Demand for Coal Commodities, PT UPB has strategic IUP partners that support shipping activities of up to 600,000 MT per year. This shows the potential of Coal Commodities, so that in increasing operational efficiency it can be supported by the construction of its own dock to reduce the cost of public port usage services.	0.25	4.0	1.50
2. Regulations that allow the construction of special terminals if public ports do not have adequate access.	0.375	3.5	0.88
Threat			
1. The varying depths of the channel and sedimentation require regular dredging to keep large ships safe.	0.20	2.5	0.50
2. Navigational Obstacles, Existence of jetties and other terminal activities as well as surrounding vegetation that may interfere with ship maneuvers.	0.175	2.5	0.44
Total	**1.00**		**3.32**

EFE Matrix, obtained a total score of 3.32, indicating that external factors provide more opportunities than threats. Regulatory support for the construction of special terminals is the strongest external factor, with the highest score, which confirms that government policies have provided good support for the construction of this special terminal to continue. Based on this, the increasing demand for coal exports is also a great opportunity that can be utilized to increase the productivity of special terminals. Other things that also need to be considered are threats that need to be managed properly, such as relatively narrow shipping lanes and high navigation risks, which can have an impact on the operational safety of ships anchored or passing around special terminals. Based on this, mitigation steps such as the installation of shipping navigation aids (SBNP), optimization of ship docking schedules, and increased coordination with port authorities are very important to ensure that terminal operations continue to run safely and efficiently.

4.3.6. IE Matrix

Tabel 4.10 IE Matrix (*Internal-External*)

IFE ↓ / EFE →	1 (4.0 - 3.0)	2 (2.99 - 2.50)	3 (2.49 - 1.0)
3.0 - 4.0 (Strong)	I (Grow & Build)	II (Grow & Build)	III (Hold & Maintain)
2.0 - 2.99 (Currently)	IV (Grow & Build)	V (Hold & Maintain)	VI (Harvest & Divest)
1.0 - 1.99 (Weak)	VII (Hold & Maintain)	VIII (Harvest & Divest)	IX (Divest)

Source: (Researcher Process, 2025) [61]

Based on the calculation results of the Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) Matrices, the total IFE score was 3.22 and the EFE score was 3.32. This value was then mapped into the Internal-External (IE) Matrix, which helps in determining the most appropriate strategy for the conditions of the special terminal being evaluated. The IFE score (3.22) is in the high category and the EFE score (3.32) is also in the high category, the construction of the special terminal is in Quadrant I (Grow & Build) in the IE Matrix. This position indicates that the construction of the special terminal has strong internal factors and is supported by large external opportunities, so the recommended strategy is an aggressive growth and development strategy. The strategy in the Grow & Build category focuses on strengthening infrastructure, expanding operational capacity, and increasing terminal efficiency and competitiveness. In this context, several strategic steps that can be implemented include:

1 Infrastructure Improvement, namely by periodically dredging the river to ensure that the water depth is sufficient for fully loaded barges.

2 Facility Development with a pier extension of 23 meters to accommodate ships measuring 270-300 feet more optimally.

3 Optimization of Navigation and Shipping Safety such as the installation of Shipping Navigation Aids (SBNP) and the preparation of a more structured ship docking schedule to reduce the risk of collisions and ship traffic congestion.

4 Improvement of Coordination with Port Authorities to ensure that all licensing requirements are met quickly and efficiently, so that special terminal operations can run smoothly without administrative constraints.

5 Utilization of Market Demand with the increasing demand for coal exports, special terminals can expand services and cooperation with mining companies to optimize loading and unloading capacity.

4.3.7. QSPM Matrix

The QSPM matrix is used to analyze the real special terminal development strategy based on previously analyzed internal and external factors. The two recommended alternative strategies are as follows:

1 Infrastructure development strategy, which includes periodic river dredging to increase water depth, dock extension to accommodate larger barges, and installation of Shipping Navigation Aids (SBNP) to improve shipping safety and security.

2 Operational optimization strategy, which focuses on preparing shipping schedules, coordinating with port authorities to ensure smooth licensing and operations, and utilizing technology-based navigation systems to overcome the challenges of tidal fluctuations and narrow shipping lanes.

3

Table 4.10 QSPM Method Strategy

Strategic Factors	Weight	Strategy 1 (Development of Special Terminal Infrastructure)	TAS Value 1	Strategy 2 (Operational Optimization)	TAS Value 2
Strength					
Strategic Location of Terminal	0.325	3.5	1.14	3	0.98
Tugboat & HR Support	0.225	2.5	0.56	3.5	0.79
Weakness					
The minimum river depth of 4m risks causing ships to run aground	0.175	3.5	0.61	1.5	0.27
Tidal fluctuations of 1 - 1.5 meters require a strict schedule	0.125	2.5	0.31	2	0.25
The 23m long pier is inadequate for 270-300 feet vessels	0.15	3.5	0.53	2	0.30
Opportunity					
High Coal Demand	0.25	3.5	0.88	2.5	0.63
Regulatory Support	0.375	3.5	1.32	3	1.13
Threat					
Channel Depth and Sedimentation	0.20	3	0.60	2.5	0.50
Navigational Obstacles & Vegetation	0.175	3	0.53	3	0.53
TAS Value	**1.00**		**6.48**		**5.68**

Source: (Researcher Process, 2025) [61]

Table 4.11 QSPM Analysis Strategy Priorities

No	Alternative Strategy	TAS Value	Priority
1	Special Terminal Infrastructure Development	6.48	1 (Top Priority)
2	Terminal Operational Optimization	5.68	2 (Supporters)

Source: (Researcher Process, 2025) [61]

The calculation results on the QSPM Matrix show that the highest TAS attractiveness value of 6.48 is found in alternative strategy 1 terminal infrastructure development. The lowest TAS of 5.68 is found in alternative strategy 2 terminal operational optimization. Based on this, alternative strategy 1 is a priority choice compared to alternative strategy 2, because it is more capable of overcoming the main obstacles in the construction of special terminals, such as limited water depth, tidal fluctuations, and suboptimal dock capacity. Based on this, this strategy also has a greater impact on improving shipping safety and terminal operational efficiency, thus supporting the sustainability and competitiveness of the terminal in the long term.

Operational optimization strategy remains important as a supporting strategy, especially in terms of preparing docking schedules, managing navigation, and strengthening coordination with port authorities. This strategy will support the implementation of the main strategy and ensure that special terminal operations can run smoothly and in accordance with applicable regulations. The strategy for developing special terminal infrastructure is fundamental in improving the feasibility and performance of special terminals as a whole, while the operational optimization strategy supports the sustainability and smooth operation of special terminals in the long term.

4.3.8. Formulating and Matching Business Strategy

a. Business Strategy Based on IE Matrix

The calculation results of the Internal-External (IE) Matrix show that the development plan of PT Union Perkasa Buana's (UPB) Special Terminal is in Quadrant I (Grow & Build). This position indicates that the special terminal has strong internal factors and great external opportunity support, so the most appropriate strategy is an aggressive growth and development strategy. Based on this, the recommended business strategies are:

1) Improving the special terminal infrastructure, namely dredging the river to increase the depth of the waters, extending the pier to accommodate larger barges, and installing Shipping Navigation Aids (SBNP) to improve operational safety.
2) Strengthening operational efficiency by optimizing shipping schedule management, coordinating with port authorities to ensure smooth licensing, and implementing a technology-based navigation system to overcome the challenges of tidal fluctuations and narrow shipping lanes.
3) Expanding cooperation with business partners such as collaborating with mining and logistics companies to increase export volume and create a more competitive business ecosystem.
4) Improving shipping safety and security, namely by adopting the latest security and navigation technology and increasing workforce capacity in the port and mining sectors.

b. Business Strategy Based on SWOT Matrix

The position of PT UPB's Special Terminal in the SWOT Matrix shows that the company has many internal strengths that can be optimally utilized to capture external opportunities. One of the main strengths is the strategic location of the terminal, which allows operational efficiency and better accessibility to the coal export market. With this strength, the company can develop the capacity of the special terminal and increase competitiveness in the coal mining industry. The following are business strategies resulting from the SWOT Matrix:

1) S-O Strategy (Strengths - Opportunities), namely optimizing internal strengths, such as dock facilities and supporting infrastructure, to capture opportunities for increasing coal exports.
2) W-O Strategy (Weaknesses - Opportunities), namely overcoming weaknesses such as limited river depth by conducting periodic dredging, so that ships can operate more efficiently.
3) S-T Strategy (Strengths - Threats), namely using advantages in regulations, namely government support to anticipate risks posed by narrow navigation conditions.
4) W-T (Weaknesses – Threats) strategy, namely developing risk mitigation strategies, such as improving coordination with port authorities and using navigation monitoring technology.

4.3.9. Deciding and Recommending Business Strategies

a. Business Strategy Based on QSPM Matrix

The results of the QSPM Matrix calculation, two alternative strategies are recommended for PT UPB's Special Terminal:

1) Infrastructure development strategy that focuses on improving the physical infrastructure of the special terminal, including river dredging to increase water depth, expanding dock capacity, and improving navigation and shipping safety facilities to support the smooth flow of ships in and out.

2) Operational optimization strategy focuses on more efficient management of ship docking schedules, improving navigation management, and strengthening coordination with port authorities to facilitate the licensing process and ensure smooth operations.

The strategy selection was carried out using the QSPM Matrix, which showed that the special terminal infrastructure development strategy had the highest TAS value of 6.48, while the operational optimization strategy had a TAS value of 5.68. Based on this, the special terminal infrastructure development strategy is the main priority, because it is more capable of overcoming the main challenges in terminal development, such as water depth, limited dock capacity, and increasing shipping safety and security. The operational optimization strategy remains an important supporting strategy to ensure the efficiency of terminal operational management and the smoothness of the licensing process in accordance with applicable regulations.

b. PT UPB Business Strategy Recommendations

Based on the results of the QSPM Matrix calculation, the priority order of strategies for PT UPB's Special Terminal is:

1) Developing and improving terminal infrastructure, including dredging rivers to maintain water depth, extending the pier to increase ship berthing capacity, and installing navigation aids (SBNP) to improve shipping safety and security around the terminal.
2) Optimizing terminal operations, with a focus on increasing shipping schedule efficiency, utilizing navigation technology to support safer ship maneuvers, and ensuring compliance with regulations through intensive coordination with port authorities.

Based on the above, the strategy for developing and improving special terminal infrastructure must be prioritized to improve the feasibility of PT UPB's Special Terminal development and operational performance, especially in facing challenges related to water depth, dock capacity, and shipping safety. Operational optimization strategies are no less important to ensure smooth business processes, shipping efficiency, and compliance with regulations, as well as strengthening relationships and coordination with related parties in supporting the sustainability of terminal operations.

5. CONCLUSION

This study was conducted to analyze the feasibility of building a special terminal, aimed at being an evaluation material for port aspects and aspects of security and safety of shipping. Based on the results of the analysis, the following conclusions were obtained:

1. The plan to build a Special Terminal of PT Union Perkasa Buana was built to support the business activities of coal transportation and sales. The results of the analysis show that the planning of the location of the special terminal is close to one of the surrounding ports, seen from the economic side, the company plans to minimize the cost of dock services at public ports. Not only that, the use of public ports also needs to manage time and wait in line if it is busy, where PT UPB has a shipping target of 50,000 MT per month, this cannot be achieved if using the surrounding public ports. This does not conflict with the applicable regulations. Based on applicable provisions, the company needs to pay attention to technical aspects such as water depth, dock dimensions, and shipping lane management require more attention so that terminal operations are in accordance with standards to ensure shipping safety and security.
2. The safety and security aspects of shipping analyzed include bathymetry, tides, shipping lanes, and the installation of Shipping Navigation Aids (SBNP). The results show that the construction of this special terminal is technically and operationally feasible, but requires fulfillment, such as periodic dredging of sedimentation and pier extension, in order to ensure depth and pay attention to tidal times, this aims to ensure the safety of barge shipping when fully loaded.
3. The evaluation fulfillment strategy for the terminal development plan has been analyzed using the IFE, EFE, IE, and QSPM methods. The results of the IFE (Internal Factor Evaluation) Matrix show that the terminal's internal factors provide more benefits than obstacles, with a score of 3.22, indicating that strengths such as strategic location and infrastructure support have a dominant role in terminal development. The results of the EFE (External Factor Evaluation) Matrix show that external opportunities are greater than threats, with a score of 3.32, where regulatory support and increasing

demand for coal exports are the main factors that strengthen the feasibility of this project. The results of the IE (Internal-External) Matrix show that the terminal is in Quadrant I (Grow & Build), meaning that the most appropriate strategy is aggressive development and growth, such as infrastructure expansion and operational optimization. The results of the QSPM (Total Attractiveness Score - TAS) Matrix show that the infrastructure development strategy has the highest TAS of 6.48, compared to the operational optimization strategy with a TAS of 5.68. This shows that the development of special terminal infrastructure for PT UPB is a major step that needs to be taken to ensure that the terminal can operate properly and optimally, overcome technical constraints such as water depth and dock capacity, and improve shipping safety and security. Operational optimization strategies still need to be implemented to support the effectiveness of terminal management and ensure compliance with applicable regulations.

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