# BLU-e: over-dimension and over-load for vehicle transport mitigation tool at ferry ports

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**Abstract.** Over-Dimension and Over-Load (ODOL) mitigation in vehicle transportation at ferry ports needs to involve strict inspection and enforcement of regulations at the port, including the use of weighbridge technology and dimensional measurement systems, and training to identify and provide solutions to violations. The study aims to reduce the number of ODOL vehicles and reduce potential losses in both material and immaterial terms by integrating BLU-e and Ferizy. A qualitative approach was applied to detect ODOL vehicles at the port through observation, surveys and interviews in the Land Transportation Management Center (BPTD) VIII Banten area. The results of the study explain the concept of ODOL, dimensional and payload limitations, and the importance of vehicle weighing which plays an important role in reducing the risk of maritime disasters. Tightening ODOL regulations ensures that vehicle loads are in accordance with ship capacity, reducing the risk of maritime accidents that can result in ship sinking and loss of life. Compliance with the rules must be adhered to by all vehicles operating at the ferry port so that the risk of disaster can be significantly reduced, both in terms of transportation safety, infrastructure protection, and emergency response efficiency.

## 1 Introduction

Ports contribute significantly to socio-economic development in the transportation sector, facilitating ferry services for short sea crossings as the main gateway to access various destinations [1]. Trade exchange through economic relations needs to be well developed and can be done using ferry connections [2]. Ferry transportation becomes a sustainable way to transporting passengers across waterways connecting cities or islands [3], transportation facilitates access in supporting activities [4], plays an important role in the development of connectivity, economic prosperity and social cohesion [5], need to develop green transportation to supports sustainable transportation [6]. In urban planning it is necessary to develop policies in ferry operations as a public transportation service for water crossings [7]. Transportation vehicles are an inseparable part of logistics and supply chains in an effort to support increased industrialization and development infrastructure marked by the need for better mobility [8]. All stakeholders who use road transportation are required to understand and implement all regulatory requirements at regional or national level [9]. Island interconnectivity through ferry transportation hubs is important to drive the economic, social and territorial development of the islands and tourism needs [10]. Therefore, there is a need for safety management by conducting dynamic risk assessments of transport vehicles to minimize accidents [11], safety management on ferry crossing services is important to follow up with safe procedures [12].

A port is a land or water location that has certain boundaries that is used as a place for government and business activities, including a place for ships to dock, passengers to board and disembark, and to load and unload goods [13]. The port is equipped with safety, security, service facilities, and supporting activities as center for intermodal transportation transfers [14]. The Motor Vehicle Weighing Implementation Unit (UPPKB) is a work unit under the Ministry of Transportation that carries out the task of supervising the loading of goods using weighing equipment that is permanently installed at certain locations.

ODOL is a condition where the dimensions and weight of a vehicle exceed the factory production standards or the maximum permitted load capacity [15]. ODOL vehicles are certainly detrimental to various parties involved. Losses are not only experienced by road organizers but also the community, vehicle owners, and business actors [16]. ODOL is a serious problem that can cause damage to infrastructure, such as roads, bridges, and even ferries. ODOL can be a risk to the safety of passengers and drivers and based on records from the National Transportation Safety Committee (KNKT), there have been several ship accidents involving ODOL vehicles as one of the factors that played a role in the accident [17]. Some of these accidents include the breaking of the ramp door of the Nusa Putra passenger

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motor ship (KMP), the sinking of KMP Rafelia 2 in the waters of the Bali Strait, and the capsizing of KMP. Satya Kencana III at Kumai Port on October 19, 2022 [18].

In addition, according to the Transportation Policy Agency at the Ministry of Transportation, infrastructure damage caused by ODOL practices has reached IDR 43.45 trillion per year [19]. This has the potential to create a chain incident. The definition of a chain incident in question is when there is a vehicle that exceeds the dimensions and load limits stipulated in concerning traffic and road transportation [20]. Seeing the impact caused by ODOL vehicles, appropriate mitigation is needed to overcome this problem. Integration is a process of unifying or blending different elements so that they become a whole or complete unity. System integration is a concept where systems are interconnected and adjusted to existing needs [21]. Optimization of ferry operations requires information using an integrated data platform which is connected to a mobile application for time efficiency and increased trust for consumers [22].

Electronic proof of passing the test (BLU-e) is a technological innovation that can detect and record the data of the vehicle concerned [23]. Its function is as proof that the vehicle has passed a series of predetermined tests. BLU-e replaces proof of passing the motor vehicle test (KIR) which was previously in the form of a physical book. The BLU-e components consist of two certificates of passing the test, two hologram stickers with QR codes attached to the windshield of the vehicle, and one smart card with NFC technology. NFC encourages the development of business transformation in the transportation sector to be more effective and efficient and creates experiences with better levels of comfort, speed and safety [24]. Meanwhile, Ferizy is part of the digitalization program for River, Lake, and Crossing Transportation (ASDP) in the form of an online-based ticket service that can be accessed by service users via the ferizy.com website or by downloading the application on a cell phone.

The purpose of this study is to reduce the number of ODOL vehicles and reduce potential losses both in terms of material and immaterial by integrating BLU-e and Ferizy. The integration of these two systems is expected to help identify vehicles that violate the permitted dimensions and loads and prevent them from entering ships at the Merak ferry port. This integration is expected to increase the efficiency of handling ODOL problems and avoid losses caused by vehicles exceeding the specified limits.

## 2 Method

This study uses a qualitative research approach aimed at describing and depicting existing phenomena, both natural and human-engineered, which pay more attention to the characteristics, quality, and interrelationships between activities [25]. Data collection in this study used field surveys, interviews and literature studies where the informants as sources were the head of the Land Transportation Management Center (BPTD) VIII Banten and related experts in it. Field surveys were conducted to detect ODOL vehicles at the port, while the literature study was a series of activities related to the method of collecting library data, reading, recording and managing research materials. Merak and Bakauheni Ferry Ports are the port nodes that connect the islands of Java and Sumatra [26]. The research flow in the study is shown in Fig. 1.

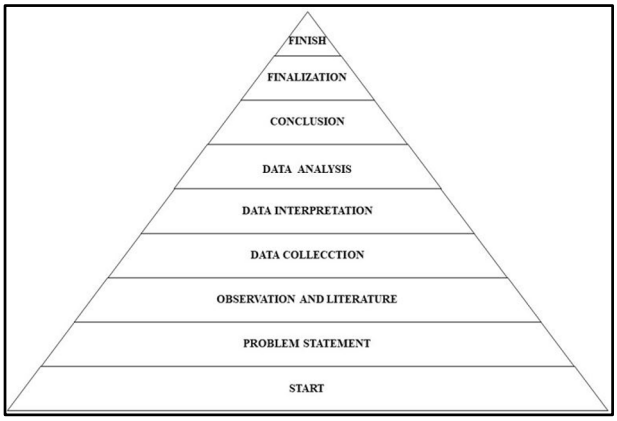



**Fig. 1.** Research flowchart

Data collection is a crucial step related to specific and complex topics such as ODOL vehicle detection at the port. The use of data collection methods such as field surveys, interviews, and literature studies, with sources from related experts can provide various benefits and interests. Field surveys allow researchers to collect empirical data directly at the location at the port, where ODOL vehicles are detected to help obtain accurate information on the number, type, and characteristics of ODOL vehicles, as well as the implementation and effectiveness of existing monitoring systems. Interviews provide in-depth insights into policies, challenges, and strategies used in land transportation management, especially related to ODOL vehicles in understanding the background of policies and operational decisions that may not be revealed through quantitative data alone. Using various data collection methods, such as surveys, interviews, and literature studies, allows data triangulation to strengthen the validity and reliability of research results to provide a more comprehensive picture and reduce bias.

The study that includes field surveys at the port allows researchers to understand the specific conditions and local practices in handling ODOL vehicles which play an important role in identifying unique obstacles and opportunities in that context. Interviews with leaders help in understanding the policies and regulations governing land transportation and ODOL handling and provide insight into the implementation of policies in the field and the challenges faced. With data collected from various sources and methods, more informed and evidence-based recommendations can be formulated to improve the relevance and implemented of recommendations provided to stakeholders. Field data and interviews can reveal areas that require improvement or enhancement, both in terms of technology, policy, and operational practices to help formulate more effective strategies in addressing ODOL vehicle issues. The study based on data collected using various and structured methods can make a significant

contribution to the development of science in the fields of transportation, public policy, and logistics management. Overall, the data collection carried out is an important and integral approach to achieving accurate, comprehensive, and useful study results for various stakeholders. Mitigation to be effective requires proper transportation infrastructure planning [27].

## 3 Results and discussion

The proliferation of ODOL vehicles has created a chain phenomenon that has the potential to endanger oneself and others. Minister of Transportation, Budi Karya Sumadi stated during a webinar related to ODOL that the recorded loss value due to over-dimension and overloaded vehicles is IDR 43,45 trillion per year. According to observation data from Weight in Motion (WIM) at the Motor Vehicle Weighing Implementation Unit (UPPKB), Jasamarga's Automatic Number Plate Recognition (ANPR) and dimension sensors detected overload and over-dimension vehicle data ranging from 9%-42.5% and if concluded, every 1 in 5 vehicles passing through is indicated to be practicing ODOL. Reviewing data on the number of trucks in Indonesia, when viewed on an annual scale, it can be seen that the graph of the number of trucks in Indonesia is always increasing. From the scale obtained, it can be seen that trucks are one of the most popular modes of delivering commodities by the Indonesian people. Therefore, cooperation between truck driver associations and business associations must synergize in supporting government programs to overcome ODOL so that infrastructure and commodity flows can continue to run smoothly. Thus, there are no obstacles to the supply chain and development can continue to increase. Development must be viewed as a multidimensional process that in addition to pursuing economic growth acceleration, addressing income inequality, and poverty alleviation, also requires a series of major changes to the social structure, attitudes of society and national institutions.

According to the Transportation Policy Agency of the Ministry of Transportation, Over-Dimension is a condition in which the dimensions of the vehicle carrier do not comply with applicable production standards and regulations, while Over-Load refers to a situation when a vehicle carries a load that exceeds the specified weight limit. Dimension and load limits can differ for each type of vehicle, be it motorized vehicles such as passenger cars, buses, trucks, or motorcycles or non-motorized vehicles such as bicycles, pedicabs, or strollers, can be determined by different regulations. Regulations regarding ODOL arrangements in Indonesia are not covered in a single regulation, but in various types of regulations. This is due to the relationship between ODOL policies and transportation and roads, which involve not only the national scale, but also the authority of local governments [16]. Trucks as one of the most popular modes of commodity delivery by the Indonesian people, their dimensions are regulated in the Regulation of the Director General of Land Transportation Number KP.4413/AJ.307/DRJD/2020, explaining the dimensions permitted for bulk cargo transportation [28]. The following are the provisions for dimensions, shapes and examples of open cargo bodies for bulk transportation as in Tables 1 and 2. The shape and examples of open cargo bodies for bulk transportation are as shown in Figs. 2 and 3.

**Table 1.** Open body car type dump truck

| No | Configuration | Total Allowable Weight | Maximum height of inner tub |
|---|---|---|---|
| 1 | 1.1 | ≤ 5,500 kg | 550 mm |
| 2 | 1.2 | ≤ 8,500 kg | 700 mm |
| 3 | 1.2 | ≤ 16,000 kg | 850 mm |
| 4 | 1.22 | ≤ 24,000 kg | 1,000 mm |
| 5 | 11.22 | ≤ 30,000 kg | 1,100 mm |

**Table 2.** Open body car type non dump truck

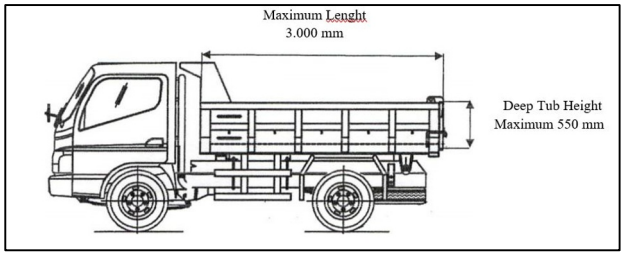
| No | Configuration | Total Allowable Weight | Maximum height of inner tub |
|---|---|---|---|
| 1 | 1.1 | ≤ 5,500 kg | 550 mm |
| 2 | 1.2 | ≤ 8,500 kg | 700 mm |
| 3 | 1.2 | ≤ 16,000 kg | 850 mm |
| 4 | 1.22 | ≤ 24,00 kg | 1,000 mm |
| 5 | 1.1 | ≤ 5,500 kg | 550 mm + 450 mm (trellis) |
| 6 | 1.2 | ≤ 8,500 kg | 700 mm + 500 mm (trellis) |
| 7 | 1.2 | ≤ 16,000 kg | 850 mm + 450 mm (trellis) |
| 8 | 1.22 | ≤ 24,000 kg | 1.000 mm + 400 mm (trellis) |
| 9 | 11.22 | ≤ 30,000 kg | 1.100 mm + 400 mm (trellis) |

One of the steps taken by the government to overcome ODOL is to enforce the law firmly, law enforcement is a method used by parties or government agencies to prevent or handle violations. In the Zero ODOL policy [29] law enforcement is carried out to ensure that the rules and regulations prohibiting ODOL are strictly implemented. One of the initial steps to start the policy in stages is to

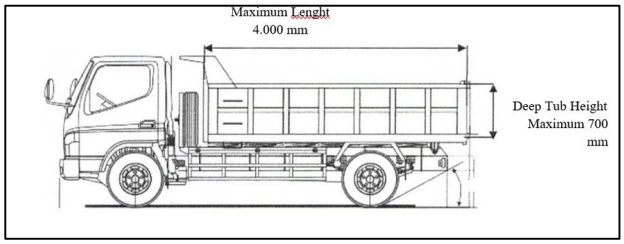
inspect each motorized vehicle to ensure whether they meet the technical requirements or not. This inspection includes checking the arrangement, equipment, size, bodywork, and loading via a weighbridge. Weighbridges have an important role as a means of monitoring and controlling excess loads that violate the limits of goods transportation provisions [30]. Weighbridges have three main functions, namely recording, monitoring, and enforcement functions.

Every goods vehicle carrying a load must be weighed using a weighing device that is permanently installed or can be moved, with the aim of ensuring accurate weight measurements. In addition, another step taken is to test the type of vehicle through physical testing to meet roadworthiness requirements. This test is carried out by the Transportation Agency. In addition, supervision of modification workshops also needs to be carried out to ensure compliance with the rules. If there are motor vehicles that have been modified, the steps taken are to return them to their original form. Providing education to the public about traffic hazards is also an important step in this policy. In addition, ticketing will be carried out for Overload (ODOL) violations. ODOL enforcement can be carried out by reducing excessive load or by reducing the vehicle's road load. For vehicles that are modified with a length or height that exceeds their original size, a mark will be given on the vehicle body by spraying paint, cutting by authorities from the Transportation Service can also be done to adjust the modified vehicle.

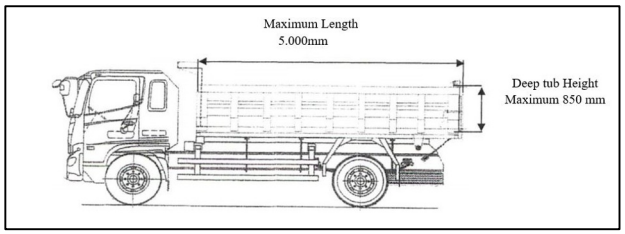
According to the Director General of Land Transportation, the ODOL regulation policy has been implemented since 2023, effectively applicable in all ports, not only for Merak Port, the policy issued by Ministerial Regulation Number 103 of 2017, in Article 2 it is stated that every vehicle to be transported using a ferry must have its dimensions (height) and weight known along with its load. Ferry port operators have the right to reject vehicles that do not comply with this regulation. Vehicles that violate the rules may be directed out of the ticket purchase queue, therefore ferry port operators need to provide special lanes to remove vehicles from the port.



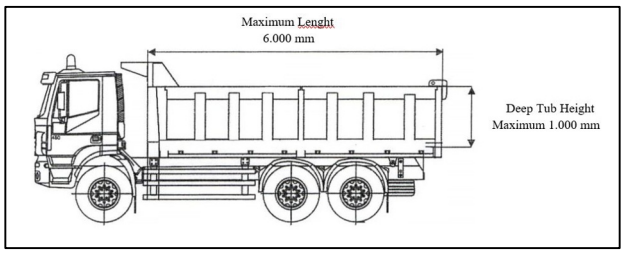

a) axle configuration 1.1 (JBI up to 5,500 kg)



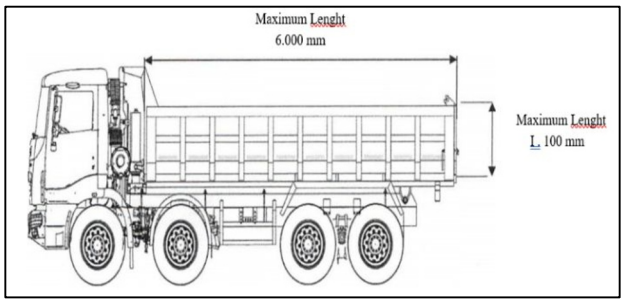

b) axle configuration 1.2 (JBI up to 8,500 kg)



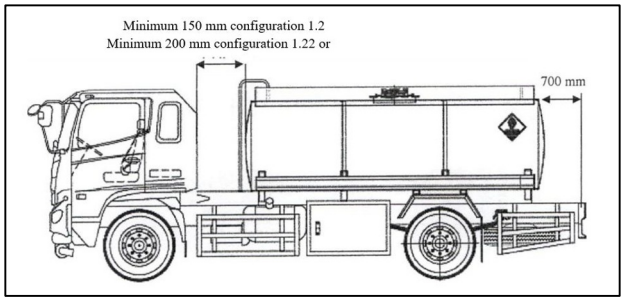

c) axle configuration 1.2 (JBI up to 16,000 kg)




d) axle configuration 1.22 (JBI up to 24,000 kg)




e) axle configuration 1.1 (JBI up to 5,500 kg)



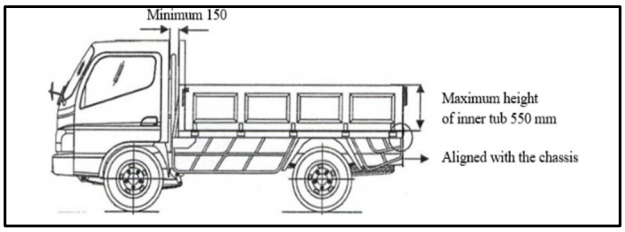

f) tanker

**Fig. 2.** Open loading body type dump truck

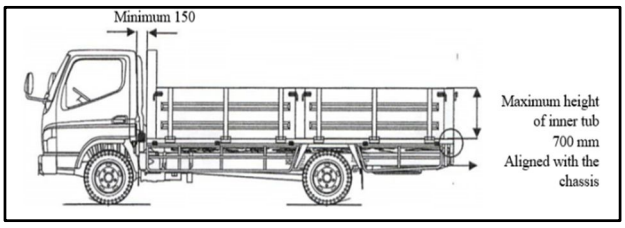
Knowing the dimensions of an open cargo bed, especially for dump trucks, is important for several reasons related to safety, operational efficiency, regulatory compliance, and logistics management. The appropriate dimensions of an open cargo bed can help in even distribution of the load, which is important for maintaining vehicle stability while moving. Dump trucks with unbalanced or oversized loads can be more prone to tipping over, especially when maneuvering or passing through uneven terrain. A load that is well distributed according to the dimensions of the bed can help the driver control the vehicle and ensure that the braking system works effectively. A load that is too high or heavy on one side can reduce braking and control efficiency. Each country or region has regulations that govern the dimensions and weight limits of vehicles, including dump trucks. Knowing the dimensions of an open cargo bed helps operators to ensure that the load being carried is in

accordance with applicable regulations, avoiding fines and legal sanctions. Knowing the dimensions of the bed is also important for the installation of safety devices such as covers or safety nets to prevent spillage of the load during the trip, which is a legal requirement in many areas.

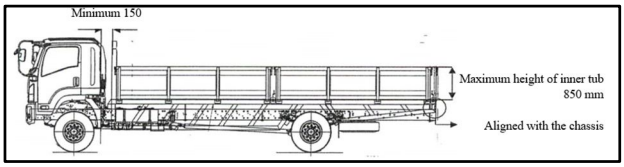
By knowing the capacity and dimensions of the bed, operators can maximize the load carried without exceeding the permitted limits, which aims to help optimize transportation efficiency, reduce the number of trips required, and save operational costs. Clear dimensions of the load body allow for better logistics planning, including more accurate travel routes, vehicle selection, and delivery times. Understanding the dimensions of the open load body helps in proper handling and stowage of the load, reduces the risk of damage to the load and vehicle, and also reduces the risk of spillage or loss of the load during transit. Dump trucks carrying loads exceeding the permitted dimensions can damage infrastructure such as roads, bridges, and tunnels. Knowing the dimensions of the body helps prevent incidents such as collisions with overhead structures or road barriers. Loads that match the capacity and dimensions of the body help in maintaining fuel efficiency because the vehicle is not forced to work beyond its optimal specifications. In addition, it also reduces greenhouse gas emissions, supporting environmental and sustainability goals. Proper loads help prevent excessive wear on vehicle components such as tires, suspension, and braking systems, which can extend the life of the vehicle and reduce maintenance costs. Overall, knowing the dimensions of the open load body on a dump truck is key to safe, efficient and regulatory-compliant operations, which also contribute to environmental and economic sustainability, which can be seen in Fig. 3.



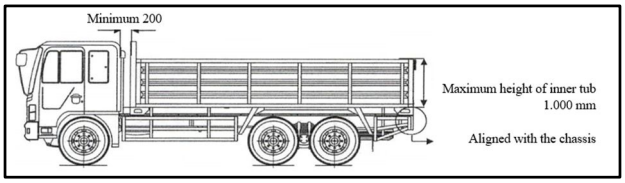

a) axle configuration 1.1 (JBI up to 5,500 kg)



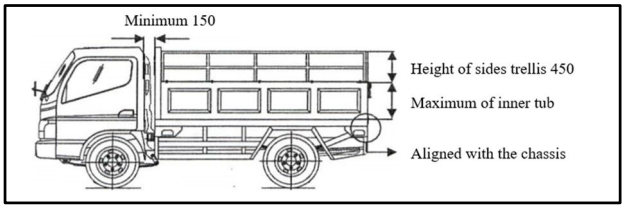

b) axle configuration 1.2 (JBI up to 8,500 kg)



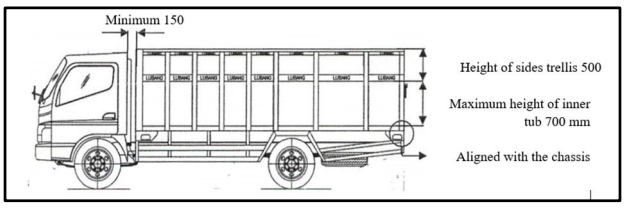

c) axle configuration 1.2 (JBI up to 16,000 kg)



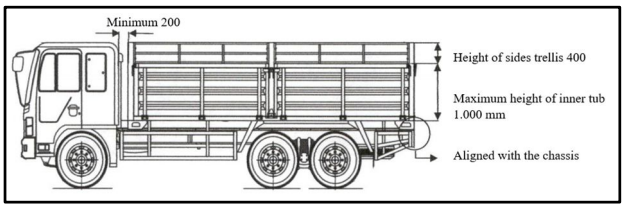

d) axle configuration 1.22 (JBI up to 24,000 kg)



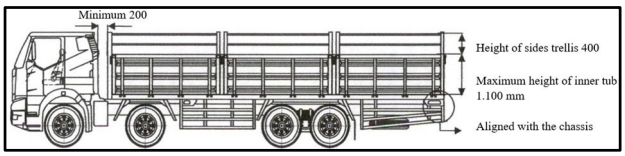

e) axle configuration 1.1 (JBI up to 5,500 kg) equipped with side trellises




f) axle configuration 1.2 (JBI up to 16,000 kg) equipped with side trellises




g) axle configuration 1.22 (JBI up to 24,000 kg) equipped with side trellises




h) axle configuration 11.22 (JBI up to 30,000 kg) equipped with side trellises

**Fig. 3.** Loading body type non dump truck

Choosing a non-dump truck-type open-bed freight vehicle, such as a flatbed truck, pick-up truck, or open cargo truck, has several important reasons related to operational flexibility, load type, logistics efficiency, and operating conditions. Open-bed freight vehicles are suitable for transporting various types of cargo that may be difficult to load in a closed vehicle, such as building materials, large equipment, industrial machinery, or irregularly shaped items. Open-bed vehicles allow for easy loading and unloading of cargo from any side, which is especially useful for large or heavy loads that require the use of auxiliary equipment such as forklifts or cranes. Open-bed trucks are often more economical than closed-bed vehicles or other specialized vehicles that do not require additional features such as cooling systems or climate control, which can reduce purchasing and operating costs. Open-bed trucks allow for more flexible

stacking and arrangement of cargo, maximizing the use of available space to reduce the number of trips required to transport a particular load, saving fuel and time.

Open-bed vehicles are ideal for long or large items, such as pipes, steel beams, and prefabricated structures, that cannot be loaded in a closed vehicle without modification. Open bodies are often used to transport weather-resistant materials, such as construction materials, dirt, rock, or heavy equipment, where protection from the elements is not required. Open bodies can be more accessible to construction or industrial sites that may have limited space or difficult terrain. Open bodies provide additional flexibility in delivery and hauling operations. Open bodies, especially smaller ones such as pick-up trucks, can more easily maneuver in tight spaces or city streets, where larger or enclosed vehicles may be difficult to access. Open bodies allow for quick loading and unloading, which is important in logistics operations that require fast delivery or have tight turnaround times. The ease of access and flexibility in cargo handling helps deliver goods with less rehandling, reducing the risk of damage and increasing shipping efficiency. Open bodies must comply with regulations regarding lashing and securing of loads, as well as dimensional and weight restrictions that require operator knowledge and planning to ensure safety and regulatory compliance. Overall, the selection of a non-dump truck type open body freight vehicle is based on the need for flexibility, efficiency, and the ability to handle a variety of loads. This selection also takes into account aspects of safety, regulatory compliance, and operational optimization.

**Fig. 4.** Vehicle weight measuring tool using weight in motion

Weight in Motion (WIM) is a technology used to measure the weight of moving vehicles, such as trucks or other heavy vehicles, without having to stop the vehicle (Fig. 4). WIM helps detect and control overloaded vehicles. Overloading can cause significant damage to road and bridge infrastructure, increasing maintenance and repair costs. Overloaded vehicles are at higher risk of accidents, especially if the load affects the vehicle's stability and braking. WIM helps prevent these vehicles from entering the roadway without proper control measures.

Data from WIM is used to identify traffic and vehicle load trends that can accelerate road and bridge deterioration and is used to assist authorities in planning and implementing timely maintenance, and extending the life of the infrastructure. By preventing overloaded vehicles, WIM helps reduce costs associated with road deterioration and maintenance, helps logistics and transportation companies optimize loads, which can reduce fuel consumption and improve operational efficiency. WIM provides critical data for transportation planning and policy development. This data is used to understand traffic patterns, infrastructure needs, and to support investment decisions in road and bridge development. WIM systems support law enforcement by providing accurate data on vehicle weights. This makes it easier for authorities to take action against overloading violations and helps in traffic safety efforts. Thus, WIM plays a key role in ensuring that the transportation system operates safely, efficiently and economically.

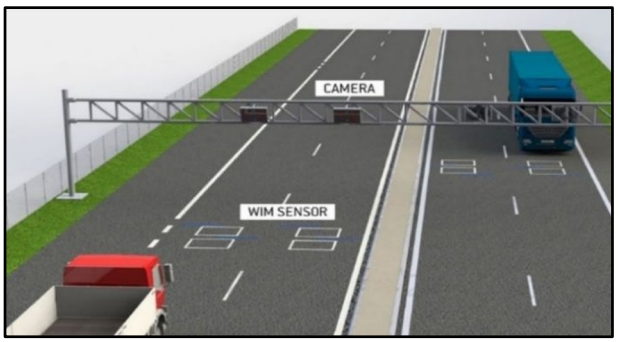



**Fig. 5.** Truck scales using weight in motion

Truck scales using WIM technology are of particular interest in the context of traffic management, safety and infrastructure maintenance (Fig. 5). WIM truck scales enable enforcement of load regulations without the need to stop vehicles, minimizing traffic disruption. WIM truck scales ensure that heavy vehicles on the road adhere to set load limits and help prevent damage to infrastructure. Roads and bridges are designed to handle specific loads. Overloaded vehicles can accelerate deterioration and shorten the life of infrastructure. Using WIM, vehicles exceeding the weight limit can be identified and acted upon to reduce the overload on roads and bridges. Overweight or unbalanced vehicles can pose a serious safety risk to both drivers and other road users. WIM truck scales help detect and prevent vehicles from operating on the road, thereby improving public safety. Compared to conventional weighing methods that require vehicles to be stopped, WIM allows weighing to be carried out dynamically while the vehicle is in motion. The use of WIM can reduce waiting and queuing times, improving transportation and logistics efficiency. WIM provides real-time and accurate data on vehicle weight, load distribution and traffic volume. This data is useful for traffic analysis, infrastructure planning, and transportation policy development. By preventing overloading, WIM truck scales help reduce costs associated with infrastructure repairs and vehicle breakdowns. Additionally, improving vehicle operating efficiency can reduce fuel consumption and other operating costs. Overall, truck scales using WIM technology provide significant benefits in maintaining infrastructure integrity, improving road safety, and supporting more efficient transportation operations.

**Fig. 6.** Truck identified ODOL

Trucks that are indicated as ODOL show certain characteristics that distinguish them from vehicles that comply with the permitted dimensions and weight limits (Fig. 6). ODOL trucks often carry loads that exceed the weight limits permitted by traffic regulations, due to the load being too much or too heavy for the specifications of the truck. The uneven or poorly distributed load can cause certain parts of the truck to carry an excess load, even though the total weight is still within the limits. This can affect the stability and control of the vehicle. ODOL trucks have loads that are too wide or too high compared to the permitted dimensions, which can cause problems when passing through tunnels, bridges or roads with certain dimension restrictions. Trucks or truck and trailer combinations that are too long can be difficult to maneuver, especially in urban areas or on narrow roads. Overloaded trucks often show compressed or sagging suspension, which can be observed from the low distance between the truck body and the wheels. Tires can appear too flat or deflated due to excess pressure, which also increases the risk of tire failure or accidents. ODOL trucks are more difficult to control, especially when cornering, stopping suddenly or maneuvering on narrow roads which can increase the risk of accidents. Overloading tends to increase fuel consumption because the engine has to work harder to move the vehicle. ODOL vehicles often experience faster wear on components such as brakes, tires, and transmission systems, due to the additional load that is not in accordance with the vehicle's design specifications. Overloading can cause decreased brake performance, which is very dangerous, especially on descents or when stopping the vehicle suddenly. ODOL trucks often do not have the appropriate or correct documentation, such as special permits for overloading or dimensions that exceed the limits. Loads that protrude from the truck bed, especially if not properly secured, are another characteristic of ODOLs that can increase the risk of accidents and violations of safety regulations. ODOL trucks require special attention from authorities to prevent negative impacts caused, including damage to infrastructure, increased risk of accidents, and public safety issues.

Detecting ODOL trucks is important for several reasons related to safety, infrastructure maintenance, transport efficiency and law enforcement. Trucks carrying overloaded or oversized loads can increase the risk of accidents, as drivers may have difficulty controlling the vehicle, especially when braking or turning. Early detection allows authorities to prevent these vehicles from causing serious accidents. ODOL vehicles not only endanger their drivers but also other road users, including small vehicle drivers, pedestrians and cyclists. ODOL trucks put excessive stress on roads and bridges, causing accelerated damage such as cracking, deformation and structural collapse. ODOL detection helps prevent or mitigate such damage, extending the life of infrastructure and saving on repair costs. Without effective ODOL detection, the cost of maintaining and repairing infrastructure can increase significantly, burdening government and public budgets. ODOL detection is an important tool in law enforcement, helping authorities to enforce regulations regarding vehicle weight and dimension limits. It is therefore important to ensure that all transport operators comply with regulations and maintain public safety. ODOL detection allows for the imposition of fines or sanctions on violators, which serves as an effective deterrent and enforcement. Vehicles that operate within the dimensions and load limits are typically more fuel efficient and maintenance efficient. ODOL detection helps drive more efficient and sustainable transport practices. By maintaining better infrastructure conditions and reducing accidents, ODOL detection contributes to reduced costs for governments, businesses and society. ODOL trucks tend to be less fuel efficient, which can increase greenhouse gas emissions. By ensuring trucks are operating within legal load limits, emissions can be reduced, contributing to environmental and public health goals. Overall, detecting trucks that are ODOL is critical to maintaining public safety, protecting infrastructure, ensuring regulatory compliance and supporting transportation efficiency and sustainability.

Detecting ODOL trucks in relation to the dimensions of the vehicle cargo deck on a ferry is important for several reasons, primarily related to safety, efficiency, and regulatory compliance. ODOL trucks with loads exceeding the dimensions of the deck can affect the stability of the vessel. Overweight or uneven loads can cause the vessel to become unbalanced, potentially

increasing the risk of capsizing or losing stability, especially in rough weather or high waves. Loads that are too long, wide, or high can pose physical hazards on the ship's deck, including the risk of injury to crew and passengers, as well as the risk of damage to ship infrastructure such as doors, cargo handling systems, and other facilities. Ferries typically have strict weight and dimension restrictions on cargo to ensure safe and efficient operations. Detecting ODOL helps ensure that all vehicles boarding the vessel comply with these restrictions, preventing potential violations that could result in fines or other legal action. Some cargo may require special permits or additional preparation if they exceed standard dimension limits. Detecting ODOL trucks ensures that all vehicles have the necessary documentation and permits to be transported safely.

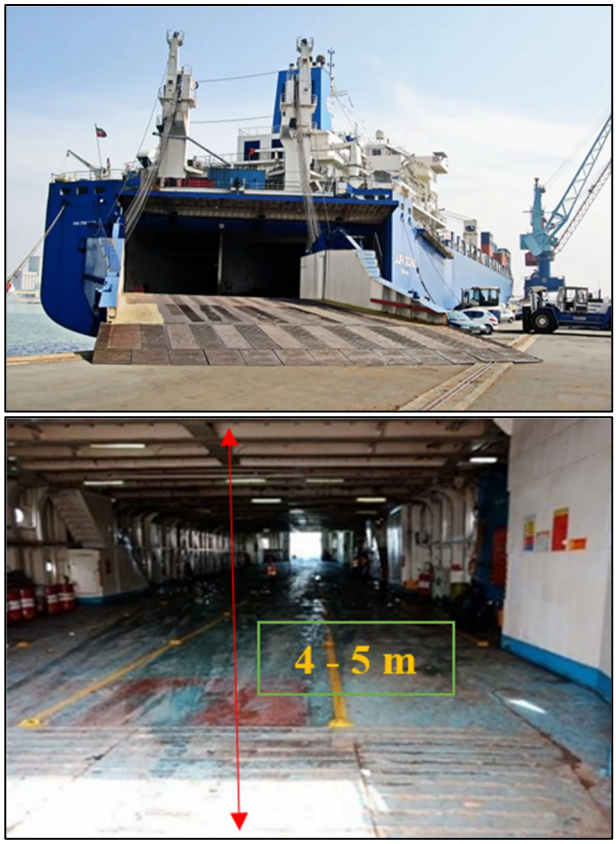



**Fig. 7.** Vehicle loading deck on board ship

Loads that comply with the dimensions of the deck make it easier to arrange and organize vehicles on the ship, maximizing the use of available space and ensuring even load distribution (Fig. 7). Vehicle management on board helps to maintain ship balance and improve operational efficiency. Overloaded or oversized trucks can cause damage to ship facilities, such as deck floors, barriers or cargo handling systems. Early detection of ODOL helps to avoid damage that can be expensive to repair and disrupt ship operations. ODOL trucks detected upon boarding can cause delays in the boarding process, as it may require re-loading or even rejection of vehicles. These delays can disrupt sailing schedules and result in additional costs for ship operators and shippers. Ensuring that all vehicles meet dimensional and weight requirements helps to plan and execute more efficient voyages, reducing waiting times and improving the punctuality of ferry services. Overloaded or oversized ODOL trucks increase the risk of incidents on board, such as fires or hazardous material leaks. ODOL detection helps to reduce this risk by ensuring safe and controlled loading. Carrying excess cargo can increase ship fuel consumption and emissions and have a negative impact on the environment. Ensuring proper loading allows ships to operate more efficiently and environmentally.

Ferizy is an online-based ticket service that can be accessed by service users at 4 ASDP Main Ports. These ports include Merak Port, Bakauheni Port, Ketapang Port and Gilimanuk Port. The presence of the Ferizy application is done so that service users be more comfort and safe when using ferry transportation services. With this ticketing system update, it is hoped that the service system can run optimally and be able to reduce the spike in ticket purchase queues when using the service. The Ministry of Transportation is updating the KIR testing system. This step was taken because of the rampant cases of fraud and illegal levies during the KIR process, such as what happened at the Rembang Regency Transportation Agency, Central Java, which was proven to have carried out illegal levies on vehicle KIR tests. The data listed in BLU-e is the vehicle identity, 4-sided physical photos of the vehicle, and test result data stored in digital format. Therefore, with the development of digitalization from both service providers and regulators, we view this as an opportunity to eradicate ODOL. The BLU-e and Ferizy System Integration Mechanism goes through several stages, including data mapping to identify vehicle dimensions and maximum loads that can be transported by vehicles registered in BLU-e. After that, Ferizy matches the data of prospective port service users to see if they are in accordance with the dimensions and maximum loads recorded in BLU-e.

After the data is mapped, the next stage is data integration [31]. This data integration is carried out to combine the data in both systems into one so that it is more effective in detecting vehicles that violate dimension and load limits. The mapped and integrated data will be tested to ensure that the resulting data evaluates the performance of both systems when they work together, including the extent to which they can detect ODOL vehicles quickly and accurately.

The data integration process between the BLUe and Ferizy systems can include users ordering ship tickets in the Ferizy system, ticket ordering data from the Ferizy system is sent to the BLUe system via API, the BLUe system processes ticket ordering data and sends data on dimensions and maximum vehicle load, the Ferizy system receives data from the BLUe system and printed tickets with details of the dimensions and maximum vehicle load. In this process, all vehicles will be identified as to the dimensions and maximum vehicle load so that when entering the port, officers can easily detect ODOL vehicles when checking vehicle documents [32]. When purchasing a ticket, the type of class and group can be directly input into the Ferizy application which is a means for users of the Merak Port crossing service, from the input of data, the class and group of the vehicle will be seen and a cross-check will be carried out between the

BLU-e data and the physical inspection of officers in the field. If the vehicle does not match the data recorded in BLU-e, it can be concluded that the vehicle is an ODOL vehicle and cannot use the crossing service and will receive a warning.

Tightening of ODOL identified vehicles at ferry ports plays an important role in reducing disaster risks, especially in port environments that are prone to accidents and operational disruptions. Tightening of ODOL vehicles contributes to disaster risk reduction at ferry ports to reduce the risk of maritime disasters where ODOL vehicles that are excessive in weight or dimensions can disrupt the stability of ferries that have the potential to cause the ship to capsize or sink, especially in bad weather conditions or rough seas. Tightening of ODOL rules ensures that vehicle loads are in accordance with ship capacity, reducing the risk of maritime accidents that can result in ship sinking and loss of life. Ferries that are overloaded due to ODOL vehicles become more difficult to maneuver, especially in emergency conditions. Tightening of ODOL increases the ability of ships to maneuver better, thereby reducing the risk of accidents at sea. Protection of port infrastructure is urgently needed where ODOL vehicles put greater pressure on port infrastructure such as docks, bridges and loading and unloading facilities. Tightening of ODOL rules will reduce the burden on port infrastructure and prevent damage that can cause disruption to port operations. Well-maintained infrastructure is essential to support emergency response in disaster situations. In addition, ODOL vehicles often take longer to load or unload, which can cause congestion at ferry ports. This congestion can disrupt evacuation or aid delivery processes during disasters. Tightening ODOL regulations can smooth the flow of vehicles and goods to ensure that port operations remain efficient and responsive.

Improved port operational efficiency and resilience can be implemented by reducing the risk of operational failure. Ferries carrying ODOL vehicles are at risk of experiencing faster damage, either to the engine or the ship's structure, which can result in operational failure and impact service delays, especially during disasters where smooth maritime transportation is essential. Tightening ODOL helps ensure that vessels operate according to their capacity and minimizes the risk of operational failure. When disasters occur, ferry ports often serve as vital evacuation and logistics delivery routes. The presence of ODOL vehicles can slow down this process by requiring more time to process. By limiting ODOL vehicles, ports can more efficiently handle the volume of vehicles and goods during disasters, ensuring a quick and smooth response.

Efforts to reduce environmental risks such as damage to marine ecosystems can occur if a ferry carrying ODOL vehicles has an accident where spills of hazardous materials such as oil or toxic goods can pollute the sea and damage the ecosystem. Tightening ODOL helps prevent situations like this by ensuring that ship loads remain within safe limits, reducing the risk of accidents and environmental damage. ODOL vehicles generally use more fuel which can increase air pollution and greenhouse gas emissions. Tightening ODOL rules reduces the number of excess vehicles crossing, thereby reducing emissions that contribute to climate change and potential environmental disasters.

The strategy for tightening ODOL vehicles needs to take several steps that can be taken at ferry ports including tighter inspections, law enforcement, awareness campaigns and cooperation with stakeholders. Strict inspections can be carried out through the implementation of automatic weighbridges and dimension measuring devices at ports to detect ODOL vehicles before boarding the ferry. The application of stricter sanctions and fines for ODOL violators, including a ban on boarding for vehicles that do not comply as one way of law enforcement. While the awareness campaign by conducting socialization to logistics companies and drivers about the risks and consequences of ODOL vehicles, as well as the importance of complying with the rules for mutual safety. For cooperation efforts with stakeholders where it is necessary to involve related parties such as ferry companies, port authorities and local governments to ensure consistent implementation of ODOL regulations. The tightening of ODOL regulations at ferry ports can significantly reduce the risk of disasters, both in terms of transportation safety, infrastructure protection, and emergency response efficiency.

## 4 Conclusion

The integration of the BLU-e (electronic traffic office) and Ferizy (digital ferry service) systems is able to consider disaster risk reduction, especially in ferry ports that play an important role in the sea and land transportation system. Based on the study, the integration of BLU-e and Ferizy is able to create a more structured and efficient mechanism in managing ODOL vehicles. BLU-e allows automatic detection of vehicles that exceed load and dimension limits through digital data, while Ferizy ensures that only vehicles that comply with ODOL rules can access ferry services. This directly reduces the number of ODOL vehicles that can cause accidents and operational disruptions at the port. By reducing ODOL vehicles, the risk of damage to port infrastructure, docks and ferries due to overloading can be minimized in order to reduce maintenance and repair costs, thereby preventing significant material losses. Reducing the number of ODOL vehicles also helps avoid operational delays and congestion at ferry ports, thereby increasing service efficiency. In addition, the risk of accidents that threaten the safety of passengers and port workers can be reduced, reducing immaterial losses related to safety and public trust. ODOL vehicles crossing the port increase the potential for maritime disasters such as ship accidents due to disturbed stability or infrastructure damage during emergency evacuations. The integration of BLU-e and Ferizy reduces disaster risk by ensuring that ferries operate within safe load limits, maintaining vessel stability, and protecting critical infrastructure needed for emergency response. This integrated system creates a safer and more responsive transportation environment to emergency conditions, maintaining stable port operations during critical times such as natural disasters or other

emergency situations. Thus, the integration of BLU-e and Ferizy not only helps in reducing the number of ODOL vehicles but also directly contributes to disaster risk reduction, both in terms of safety, infrastructure protection and operational efficiency at ferry ports. All these efforts have a positive impact on transportation management and risk mitigation in the future.

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