



INTERNATIONAL CONFERENCE OF  
**TRANSPQRT**  
RESEARCH AND INNOVATION

# PROSIDING

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## INTERNATIONAL CONFERENCE OF TRANSPORTATION RESEARCH AND INNOVATION 2019

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**Toward Integrated, Intelligent And Sustainable  
Transportation**

**13<sup>th</sup> - 14<sup>th</sup> November 2019  
Hotel Ayana Midplaza, Jakarta**



**MINISTRY OF TRANSPORTATION  
AGENCY OF RESEARCH AND DEVELOPMENT  
ON TRANSPORTATION REPUBLIC OF INDONESIA**



**Prosiding International Conference of Transportation Research and Innovation 2019**

**Toward Integrated, Intelligent and Sustainable Transportation**

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## KATA PENGANTAR

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**SUGIHARDJO**

KEPALA BADAN PENELITIAN DAN PENGEMBANGAN PERHUBUNGAN  
KEMENTERIAN PERHUBUNGAN REPUBLIK INDONESIA

Puji dan syukur kehadiran Allah SWT atas segala karunia-Nya, sehingga Prosiding *International Conference of Transportation Research and Innovation (ICTRI) 2019* berhasil diterbitkan. Prosiding ini merupakan kumpulan beberapa paper yang disajikan dalam seminar acara ICTRI 2019 yang telah dilaksanakan pada tanggal 13 – 14 November 2019, di Jakarta. Tema yang diusung pada ICTRI pertama ini adalah "*Towards Integrated, Intelligent, and Sustainable Transportation*".

Tujuan utama dari kegiatan ICTRI adalah pembentukan forum dan agenda riset dan inovasi transportasi nasional. Seminar (*Call for Paper*) sebagai salah satu kegiatan merupakan sarana bagi para peneliti untuk memaparkan hasil penelitiannya. Dalam prosiding ini telah terhimpun sebanyak 12 paper yang telah dipresentasikan.

Terima kasih kami sampaikan kepada semua peserta yang telah berpartisipasi dalam acara ICTRI 2019 khususnya penulis paper dalam prosiding ini. Hasil pelaksanaan ICTRI adalah mapping hasil penelitian di sektor transportasi, dan telah tercetus Deklarasi ICTRI 2019, dengan mempertimbangkan kepentingan semua pihak yang terkait dalam penelitian transportasi baik Pemerintah, Perguruan Tinggi, Industri dan Masyarakat serta memperhatikan pentingnya dukungan terhadap pelaksanaan penelitian di bidang transportasi baik dalam melakukan riset maupun menciptakan inovasi sebagai dasar rekomendasi dalam perumusan regulasi/kebijakan.

Pusat Penelitian dan Pengembangan Transportasi Antarmoda  
Badan Penelitian dan Pengembangan Perhubungan







**REPORT OF HEAD OF RESEARCH AND DEVELOPMENT AGENCY  
MINISTRY OF TRANSPORTATION  
ON  
“INTERNATIONAL CONFERENCE OF TRANSPORTATION RESEARCH AND  
INNOVATION (ICTRI) 2019”  
JAKARTA, NOVEMBER 13, 2019**

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***The Honorable:***

- Directorate General of Research Strengthening and Development, Ministry of Research and Technology;
- Deputy for Development Funding, Nasional Development Plan Agency;
- Prof. Fujiwara Akasima, Editor in chief of Asian Transport Studies, EASTS;
- The Korea Transport Institute;
- Director of PT. LEN Industry;
- Director of PT. Dirgantara Indonesia;
- Head of IPERINDO
- Vice President of ITS Indonesia;
- Head of the Toll Road Regulatory Agency (BPJT);
- Dr. Eng. Muhammad Isran Ramli, S.T., M.T.
- Dr. Elly Adriani Sinaga, M.Sc.;
- Dr. Gede Pasek Suardika, M.Sc.; and

***Distinguished*** All the ICTRI 2019 participants.

**Assalamu’alaikum Warahmatullahi Wabarakatuh,  
Good Morning, Best wishes and peace be upon us.**

Alhamdulillah. Let’s praise and say our gratitude to Allah SWT for giving us blessing so that we can attend the International Conference of Transportation Research and Innovation (ICTRI) 2019 today, involving all the stakeholders in the transportation field.

This conference is held due to the numerous research activities in the transportation sector that have been conducted by the Ministry, governmental institutions, academics and private institutions. Unfortunately, all the research results have not been synergized yet. This condition will bring the possibility of research plagiarism among researchers and the ineffectiveness of the research result for the transportation system development in Indonesia.

This ICTRI is held in order to improve the efficiency and effectiveness of research activities. ICTRI has the important role to establish the National Transportation Research and Innovation Forum and to arrange the transportation research agenda. The National Transportation Research and Innovation Forum will be joined by all the stakeholders related to transportation research. This forum has the function to be the coordination and communication media among the stakeholders, to monitor and evaluate the research agenda that has been determined, to identify and to arrange the map of the condition and position of research activities and transportation innovations in Indonesia.

The conference result is expected to give the policy recommendation and strategic steps for the government related to transportation problem, to give the draft for the research agenda document that consists of Indonesia Transportation Research Map, Indonesia Transportation Vision 2040, Indonesia Transportation Research Roadmap, and Transportation Research and Innovation Agenda.

The Honorable Ministers,

Here we can report that the International Conference of Transportation Research and Innovation (ICTRI) 2019 will be held for 2 (two) days on November 13-14, 2019.

The conference activities consist of:

Plenary session that is held to map and to differentiate the transportation research in Indonesia nowadays, to have benchmarking from research institution in other country and researches by practitioner/industry in the transportation field.

Workshop of the establishment of national transportation research forum and discussion of the future transportation research agenda and the transportation research conducted by each research institution in Indonesia. Exhibition of the transportation innovation, technology and management development.

Poster of ideas and research results for developing the transportation in Indonesia.

Site Visit by visiting the MRT Indonesia.

There is also a seminar conducted with the preliminary activities “call for papers” that collect all the research result in transportation field by individual or team.

Based on the “call for papers” result, we can report that:

There are 146 (one hundred and forty six) participants and papers.

There are 126 (one hundred and twenty-six) qualified papers.

There are 20 (twenty) rejected papers due to incompleteness, plagiarism and publishing.

There are 116 (one hundred sixteen) papers which pass the administration and qualified to the selection.

Based on the jury scoring, there are 40 (forty) papers that pass the qualification. They are 16 (sixteen) finalists in Integration and Transportation Management theme, 9 (nine) finalists in Intelligent and Sustainable Transportation theme, 10

(ten) finalists in Infrastructure and Transportation Technology theme, and 5 (five) finalists in Multimodal Transportation and Logistic theme.

The Papers which passed the selection will be presented on the second day of the seminar. The best paper will be published in Scopus and Sinta 2 indexed journal and will get Rp. 20.000.000,00 (twenty million rupiahs) for the first winner. For the runner up or the second winner will get Rp 15.000.000,00 (fifteen million rupiahs). Rp 10.000.000,00 (ten million rupiahs) for the third winner, and Rp 5.000.000,00 (five million rupiahs) for the fourth winner.

The honorable Ministers,  
The International Conference of Transportation Research and Innovation (IC-TRI) 2019 is attended by 300 (three hundred) participants from:  
Ministries related to the Research and Development;  
Research and Society Devotion Institutions;  
Higher Education/Academy/Polytechnic in Transportation;  
Association related to transportation;  
Institution and Industry related to transportation;  
Transportation experts; and  
Researchers in Research and Development Agency, The Ministry of Transportation

Furthermore, we respectfully invite the Minister of Transportation to be able to give a speech while opening International Conference of Transportation Research and Innovation (IC-TRI) 2019.

It is expected that this International Conference of Transportation Research and Innovation (IC-TRI) is able to be held periodically so that the research agenda can be coordinated and integrated through the directed communication and dissemination in order to be supervised by all stakeholders. Finally, all the research agenda can be arranged more structured and well coordinated so that the implementation can be monitored all the time.

Furthermore, with all respect we would like to invite the Minister of Transportation, Republic of Indonesia, to give the speech and declare the opening of the International Conference of Transportation Research and Innovation (IC-TRI) 2019.

**Wabillahi taufiq walhidayah, Wassalamu'alaikum Warahmatullahi  
Wabarakatuh.**

Head of  
Research and development Agency  
Ministry of Transportation

SUGIHARDJO

## TOPICS SEMINAR







## KEYNOTE SPEAKERS



**welcome  
Remarks**

***Minister of Transportation***

***Topic: "Transportation  
Connectivity for Sustainable  
Development"***



**Opening  
Speech**

***Ministry for Maritime Affairs  
and Investation***

***Topic: "Supporting National  
Transportation Research for  
Acceleration on Transportation  
Infrastructure"***



**Keynote  
Speech**

***Minister of Research, and  
Technology***

***Topic: "Research and  
Innovation to Achieve  
Intelligent, Integrated, and  
Sustainable Transportation"***







**TENTATIVE AGENDA FOR INTERNATIONAL CONFERENCE OF  
TRANSPORTATION RESEARCH AND INNOVATION 2019  
“TOWARDS INTEGRATED, INTELLIGENT, AND SUSTAINABLE TRANSPORTATION”  
Hotel AYANA Midplaza, JAKARTA, 13<sup>th</sup>-14<sup>th</sup> November 2019**

TIME SCHEDULE	ACTIVITY	LOCATION	NOTE
<b>Tuesday, 12<sup>th</sup> November 2019</b>			
15.00 – 21.00 WIB	Registration	Lobby	Committee
<b>Wednesday, 13<sup>th</sup> November 2019</b>			
<b>Dresscode: PSL/Formal Attire</b>			
08.00 – 08.30 WIB	Registration	Grand Ballroom	Committee
08.30 – 08.35 WIB	Indonesian National Anthem and opening praying		Committee
08.35 – 08.40 WIB	Opening Traditional Dance		Committee
08.40 – 08.50 WIB	Speech by Head of Research and Development Agency on Transportation		Head of Research and Development Agency on Transportation
08.50– 08.55 WIB	Signing of Memorandum of Understanding: <ul style="list-style-type: none"> <li>• Research and Development Agency on Transportation and Angkasa Pura I</li> <li>• Research and Development Agency on Transportation, Australia – Indonesia Center and Provincial Government of Jawa Barat</li> <li>• Research and Development Agency on Transportation and UPJ</li> </ul>		Committee
08.55 – 09.10 WIB	Keynote Speech I with topic “Transportation Connectivity for Sustainable Development”		Minister of Transportation
09.10 – 09.25 WIB	Keynote Speech II with topic “Supporting National Transportation Research to Accelerate Transportation Infrastructure Development”		Coordinating Minister for Maritime Affairs and Investation*)
09.25 – 09.40WIB	Keynote Speech III with topic “Research and Innovation to Achieve Intelligent, Integrated, and Sustainable Transportation”		Minister of Research, and Technology/Head of The Agency for National Research and Innovation *)
09.40 – 09.45 WIB	Opening Ceremony		All Ministers
09.45 – 09.50 WIB	Photo Session		Committee
09.50 – 10.00 WIB	Coffee Break + Exhibition Visit Press Conference	Committee	
<b>1<sup>st</sup> Session: Plenary Session</b>		Moderator: Dr. Gede Pasek Suardika, M.Sc.	
10.00 – 10.20 WIB	Transportation Research Positioning in Indonesia nowadays	Grand Ballroom	Head of Research and Development Agency on Transportation
10.20 – 10.40 WIB	Technology Development in Supporting National		Directorate General of

TIME SCHEDULE	ACTIVITY	LOCATION	NOTE
	Transportation Research		Research Strengthening and Development
10.40 – 11.00 WIB	Social Acceptance of Self Driving Technology: A Case of Connected Autonomous Bus and LRT		Prof. Fujiwara Akimasa, Editor in chief of Asian Transport Studies, EASTS
11.00 -11.20 WIB	Perspective on Future Transportation Research in Indonesia		Head of Indonesia Transportation Society (MTI)
11.20 – 12.00 WIB	Dicussion Session		Participant
12.00 – 13.00 WIB	Lunch		Participant
<b>2<sup>nd</sup> Session: Plenary Session</b>		Moderator: Dr. Elly Adriani Sinaga, M.Sc.	
13.00 – 13.30 WIB	Funding Support in Transportation Research and Development	Grand Ballroom	Deputy for Development Funding *)
13.30 – 14.00 WIB	Industry 4.0 for Intelligent and Smart Transportation		The Korea Transport Institute
14.00 – 14.30 WIB	Research Development of Intelligent Transportation		Director of PT. LEN Industry *)
14.30 – 15.00 WIB	Research Development to Enhance Competitiveness of Aviation Industry		Director PT. Dirgantara Indonesia *)
15.00 – 15.30 WIB	Research Development to Enhance International Competitiveness of Shipping Industry		Head of IPERINDO *)
15.30 – 16.00 WIB	Discussion Session		Moderator
16.00 – 19.00 WIB	Break		Participant
<b>Gala Dinner</b>			
<b>Dresscode: Smart Casual</b>			
19.00 – 19.10 WIB	Traditional Dance	Grand Ballroom	Committee
19.10 – 19.15 WIB	Welcome Dinner Speech		Committee
19.15 – 19.20 WIB	Remarks from Speaker Representative		
19.20 – 21.00 WIB	Dinner		Participant
21.00 WIB	Break		Participant
<b>Thursday, 14<sup>th</sup> November 2019</b>			
<b>Seminar (Call for Paper)</b>			
<b>Dresscode: Batik</b>			
08.00 – 08.30 WIB	Registration and Room Section		Committee
08.30 – 11.30 WIB	<b>1<sup>st</sup> Topic:</b> <b>Integration and Transportation Management</b>	Jasmine I	<b>Participant + Jury</b>
	Question & Answer		Participant
	<b>2<sup>nd</sup> Topic:</b> <b>Intelligent and Sustainable Transportation</b>	Jasmine II	<b>Participant + Jury</b>
	Question & Answer		Participant
	<b>3<sup>rd</sup> Topic:</b> <b>Infrastructure and Transportation Technology</b>	Jasmine III	<b>Participant + Jury</b>
	Question & Answer		Participant
	<b>4<sup>th</sup> Topic:</b> <b>Multimodal Transportation and Logistic</b>	Jasmine IV	<b>Participant + Jury</b>

TIME SCHEDULE	ACTIVITY	LOCATION	NOTE
	Question & Answer		Participant
<b>Workshop: Transportation Research and Innovation Forum Discussion</b>			
08.30 – 09.15 WIB	Forming the National Transportation Research and Innovation Forum	Grand Ballroom	<b>Speakers:</b> Dr. Ir. Idwan Santoso, M.Sc., DIC. Hengki Purwoto, S.E., M.A. <b>Moderator:</b> Dr. Eng. Muhammad Isran Ramli, S.T., M.T.
09.30 – 11.30 WIB	Mapping and Setting Roadmap of the National Transportation Research & Research Agenda		
<b>Closing</b>			
11.30 – 11.40 WIB	Declaration of Final Summary	Grand Ballroom	Dr. Eng. Muhammad Isran Ramli, S.T., M.T.
11.40 – 11.50 WIB	Announcement of the best paper		Head of Research and Development Agency on Transportation
11.50 – 12.00 WIB	Closing Statement		Head of Research and Development Agency on Transportation
12.00 – 13.00 WIB	Lunch		Participant
<b>Site Visit</b>			
13.00 – 13.30 WIB	Preparation for site visit		Committee
13.30 – 17.00 WIB	Site visit to MRT Jakarta		Committee
17.00 WIB	Back to Hotel		Committee



<b>KATA PENGANTAR</b> .....	1
<b>REPORT OF HEAD OF RESEARCH AND DEVELOPMENT AGENCY MINISTRY OF TRANSPORTATION</b> .....	3
<b>KEYNOTE SPEAKERS</b> .....	8
<b>DAFTAR ISI</b> .....	13
<b>Optimization of Tank Cleaning to Achieve Good Wall Wash Test on MT. Tirtasari (Khoerul Fata, Vega Fonsula Andromeda, Moh Aziz Rohman)</b> .....	14
<b>Minimizing the Cadets' Anxiety in English Presentation at Maritime Education and Training (Sunarlia Limbong, Novianty Palayukan, Nurul Hatifah)</b> .....	25
<b>SWOT Analysis of The Transportation Management of Toll and Railroad Synergy (Retta Ida Lumongga)</b> .....	36
<b>Selection of Related Crossing Port Site Operation Plan of Ro-Ro Dumai-Malacca Ship (Herma Juniati, Hasriwan Putra, Sukma Rahadian)</b> .....	45
<b>O-BAHN, Intermodal Transportation Solutions in Jakarta (Antonius Dian, Anindira Listy, Dandy Puji)</b> .....	58
<b>PNBP Issuance Analysis of Supervision Card Toward People Transport Licensing in Semarang City (Karmanis, Haryani, Karjono)</b> .....	67
<b>The Evaluation of Parking Facilities for Visitors at The Inland Port of Kalabahi in Alor District, East Nusa Tenggara Province (Yeti Komalasari, Agus Tjahjono, Akbar Maulana)</b> .....	76
<b>Factors Influencing Effective Time: Berth Time (ET:BT) Performance: A Casestudy Of Cirebon Port (Hartati M. Pakpahan, S.T., M.T., Dr. Melia Eka Lestiani, S.T., M.T., Reynaldi Prabowo)</b> .....	88
<b>Troubleshooting Strategy of Urban Transportation in Tegal (Teguh Dwi Mulyanto, Dessy Intan Sari, Budiharso Hidayat)</b> .....	100
<b>Development of Traffic Warning Signs to Boost Safe Driving Behavior (Sodikin)</b> .....	120
<b>Evaluation of Community Response on Improvement in Public Transport Service (Sunie Rahardja, Devina Hamdani, Chrisviandi Wennardy)</b> .....	128
<b>Reviewing the procedure of transporting vehicles on KMP Baronang on Bastiong-Sofifi route in North Maluku Province (Damaida Hatina, Chairu Ilham, Devi Octa Saputri)</b> .....	136

## **Optimization of Tank Cleaning to Achieve Good Wall Wash Test on MT. Tirtasari**

**<sup>1</sup>Khoerul Fata, <sup>2</sup>Vega Fonsula Andromeda, <sup>3</sup>Moh Aziz Rohman**

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Indonesia*

### **Abstract**

Wall wash test is the test of the tank wall on a chemical tanker as a condition that must be made to load methanol. The test will be known as hydrocarbon and chloride levels in the tank wall. Requirements to load methanol is the hydrocarbon content of 0 ppm and 0.5 ppm chloride is minimal. Whether or not the results of this test are determined to wash the wall of the tank cleaning process that has been done. Because of this, the tank cleaning that does should be the maximum.

MT. Tirtasari has made cleaning of the cargo tanks from crude palm oil to methanol and then do a wall wash test. It turned out that the content of hydrocarbons and chlorides are not according to regulations. Man, machine, procedure, and materials into the factors that most affect the implementation of the tank cleaning. Factors man who lack of understanding of the implementation of tank cleaning, factor machine due to lack of care or maintenance has been carried out less than the maximum, the material factors that are limited and supply do not match, the factor procedure that since the implementation of tank cleaning did not correspond to the guidebook.

Keywords: Methanol, Tank cleaning, Wall wash test

### **Introduction**

Chemical tanker is one kind specially designed tanker for transporting dangerous cargo in the tank in the form of chemical products contained in chapter 17 of the IBC code. In operation, a chemical tanker frequently changing load of cargo to load another one. To support the load must be waged one of which is the tank cleaning. Based on a predetermined procedure, tank cleaning is process to remove hydrocarbons and chloride levels of the rest of the previous charge on the wall of the tank. Tank cleaning is done in a chemical tanker depending on the type of cargo to be shipped earlier and type of cargo to be transported further.

MT. Tirtasari is a chemical tanker that often carries crude palm oil and further contains methanol. Methanol is a chemical cargo tanks that require cleaning procedure is quite complicated to hold a wall wash test which is used to check the levels of hydrocarbons and chlorides in the cargo tank wall. If the chloride levels in the tank for more than 0.5 ppm, dry tank should be carried over until the chloride levels of less than 0.5 ppm. Thus, in the process tank inspection (inspection of the

cargo) by cargo surveyor or commonly called wall wash test is then analyzed in the laboratory to determine the levels of chloride and hydrocarbons excellent result.

On January 17, 2018 MT. Tirtasari berthed at the port Loktuan, Bontang, East Kalimantan, to load methanol. After wall wash test on all cargo tank totalling 10 ships cargo tank, there are 2 cargo tanks stated that the hydrocarbon and chloride levels are still high. This means that the tank cleaning that has been done failed. It happened because of negligence committed by the crew at the time of tank cleaning charge to do wall wash test, in addition to the limited time given by the company also led to a reduction of time in carrying out the procedure tank cleaning, so that the time of the wall wash test by cargo surveyor then analyzed in the laboratory, the results are not good or do not qualify loading. Eventually the ship off the dock and asked to do the tank cleaning to produce a good wall wash test. In order surveyor stating the tanks passed inspection, it requires optimal management. Obviously, this is very detrimental to all parties.

**From the above background was found the formulation of the problem raised by the researchers:**

1. Why there is a failure in the implementation of tank cleaning at MT. Tirtasari?
2. How are the efforts undertaken to create a wall wash test is good?

**Base on fifth edition book of tank cleaning, tank cleaning is divided into seven phases:**

1. Precleaning (butterworth with water)
2. Cleaning (butterworth with water or water and detergents)
3. Rinsing (butterworth with water)
4. Flushing (with fresh water)
5. Steaming
6. Draining
7. Drying

**According to Vikas Mahto (2016: 34) "wall wash test" is analytical testing of tank cleanliness. It is a representative sample from the tank surface.**

In the IBC Code chapter 1 states that "A Chemical tanker is cargo ships constructed or adapted and used for the carriage in bulk of any liquid product listed in chapter 17 ". In chapter 17 lists the chemical payload that has been registered and is often loaded along with minimum conditions for handling. The type of chemical tankers according to the IBC Code chapter 2 are:

1. A type 1. Ship is a chemical tanker intended to transport chapter 17 products with very severe environmental and safety hazards which require maximum preventive measures to preclude an escape of such cargo.
2. A type 2 Ship is a chemical tanker intended to transport chapter 17 products

with appreciably severe environmental and safety hazards which require significant preventive measures to preclude an escape of such cargo.

3. A type 3. Ship is a chemical tanker intended to transport chapter 17 products with Sufficiently severe environmental and safety hazards which require a moderate degree of containment to increase of survival capability in a damaged condition.

Chemical tanker cargo changed frequently even contains various types of chemical payloads ranging from possessing a high density to the charge that has a low-density nature even to the charge that require special handling that should be kept from loading to discharging to prevent contamination.

## **Methods**

The method used by the author in presenting the problem is a method of qualitative research with descriptive data presentation. Reason The author uses a qualitative approach as the research approach is because the author sees the nature of the problem in question can develop naturally in accordance with the conditions and the situation on the ground. With this method, the author will describe, explain and relate the details of data based on facts.

The author will explain, describe and explain about an object as it is without engineering or manipulation at any given time where the data may be derived from the text of interviews, photos, video footage, personal documents, notes or memos, and other official documents. The author will try to provide a systematic and thorough analysis includes actual facts, seek detailed factual information which is based on the existing symptoms, identify the actual problems faced to be prepared and pared further.

The research was conducted when The Author did sea project in MT. Tirtasari with crewing company PT. Topaz Maritime addressed at Mega Kuningan Eastern Bloc C 6. 12 A South Jakarta, with ship management of PT. Gemilang Bina Tirta Gemilang and ship owner PT. Diamond Maritime. When the study is held from August 16<sup>th</sup> 2018 until August 25<sup>th</sup> 2019.

The data analysis technique is a method or a way to process a data into information so that the characteristics of the data into an easy to understand and can be found the solution of the problem in writing. outlines a data to be easily understood.

The method used to analyze data in this thesis using qualitative methods, which in this paper there is exposure to all events or events that occur onboard related to the issues discussed in this paper. In writing this essay, the author uses one kind of data analysis method that is fishbone.

## **Result and Discussion**

The process of tank cleaning of crude palm oil cargo to load methanol. Here is the process of tank cleanings after loading the crude palm oil which was dismantled in peacock for subsequent loading methanol in Bontang at 2.18 voyage carried on board MT. Tirtasari:

## 1. Preparation dry tank

Shortly after the boat off the dock and then exit the groove, chief officer instructed the Bosun and Cadets to prepare equipment to be used for the process of tank cleanings. The preparation includes:

- a. Open all the drain valve which used for the purposes of loading and unloading.
- b. Butterworth open a hole
- c. Connecting tank cleaning hose from Butterworth to hydrant in each tank.
- d. Shut manhole cover that exist in each tank.
- e. Shut sounding pipes in each tank.
- f. Set the line-up that will be used to process dry tank. This is done by opening or closing the valve-valve as needed in the tank cleaning so that the water inlet line according their grooves are as follows:

### 1) Inflow

Starting from the sea chest in the pump room absorbing sea water which is connected to a tank cleaning line, then go to the pump further into the strainer and into the heater and out onto the deck through the tank dry line, then through the tank dry hydrant further through tank cleaning hose ago entrance to the butterworth who will squirt into the walls of the tank.

### 2) Outflow

Starting from the water in the tank coming from Butterworth to be pumped out by a submerged cargo pump discharge line and then passed to a manifold. From the manifold then distributed to the pipe that connects to the overboard in the pump room so going out to sea.

## 2. The implementation process of tank cleaning

After ensure the vessel passing more than 25 NM from the coast, the chief officer asked for the engine room to prepare steam into the heater so that the water becomes hot. Then carry out the cleaning process as follows:

- a. Butterworth with hot sea water

At this stage, every tank is sprayed with hot sea water with high pressure. The sea water used is sea water that comes from the cruise navigable by boat. Starting from the flow of water in through the sea chest that is in the pump room is absorbed by the dry tank pump. Then go into the strainer to filter out impurities mixed in the ocean water will go then head to the line on the heater to become hot sea water. The sea water that had been turned into heat and then into the dry line on the tank deck. Then hydrant past the tank which connected by hose tank cleaning. Then go to Butterworth machine. After that the water in the tank will be

pumped out using existing cargo pump in each tank in accordance with the flow out.

b. Butterworth with hot water and detergent

This stage is washing using hot sea water mixed with soap. Hot sea water collected in the tank for about 10 minutes. Then put soap 3 small drums, each measuring approximately 20 liters.

Hot sea water washing was conducted by using cargo pump. Water that has been mixed with soap in the tank will be pumped up through the discharge line then goes into a device mounted between the discharge valve and loading valve shaped like a stretcher. The tool is connected to the tank cleaning hose to Butterworth. Hot water mixed with soap before entering through the stretcher and then passed through tank cleanings entered the Butterworth hose that sprayed onto the walls of the tank vertically and horizontally. The water in the tank will be pumped back and so on for approximately 1 hour each tank. Occasional drain valve, stripping line and drop line is opened so exposed to soap.

c. Rinsing

After the washing process which use hot water mixed with soap, then the next process is flushing. Flushing is done using cold sea water. The flow is the same as inflows but without passing through the heater. For the disposal process is pumped by cargo pump as the flow out to the ship overboard. This process is performed for approximately 30 minutes on each tank until the soap in the tank is missing.

d. Flushing

This stage is carried out by spraying the walls of the tank with fresh water. Sprayed fresh water comes from the fresh water tank. MT. Tirtasari do not have fresh water generator tool which can transform sea water into fresh water, so that the supply of fresh water used for tank cleanings process comes from the ground.

Flushing groove is starting fresh water in the fresh water tank tank cleaning pump absorbed in the pump room through fresh water tank cleaning line. Then go to the dry tank line in the deck and went into the dry tank hydrant and into the Butterworth which will further spraying fresh water to the walls of the tank. For the disposal process is equal to the flow out.

e. Draining

Following flushing with fresh water, the next step is draining the fresh water that is in each tank. This depletion is done by pumping fresh water in the tank using cargo pump out through the discharge line and then through the groove out. At this stage the drain valve is opened in order to rinse well with fresh water, but it also helps to speed up the issuing of the fresh water in the tank.



This is done until the depletion of fresh water in the tank is pumped to the max.

f. Drying and mopping

After draining, the next step is drying tank. Drying was done by means of air into the tanks by means of the so-called free gas fan. This tool is a pump that absorbs the surrounding air then air is pushed in through the fan free gas line into the manifold. From the manifold will be distributed to each cargo line into the cargo tank via the line, then enter the loading line, and into the tank via the pump impeller.

Furthermore, the Chief Officer will check the content of the gas in each tank. Once declared safe, then the process of mopping. Mopping is done by going into the tank and wipe the surface of stagnant water in the tank. Good in the corners of the tank, in which a concave surface, and around the pump.

g. Steaming

After all, declared free tank of gas by the chief officer, and all the tanks had done mopping, the next step is carried out heating the tank by means of evaporation. Chief officer asks the engine room to run steam from the boiler then goes into the steam line is in decks and channelled into the steam line that is in the tank.

After the process tank cleaning, and the tank is completely dry, and the tank is in a state safe for entry or is free of toxic gases, it will be carried out self-wall wash test or testing of the tank wall by the chief officer to know in advance the hydrocarbon content and chloride in each tank will be loaded with methanol. After the chief officer took samples of methanol in the walls of the tank, then will do the testing hydrocarbon content and chloride

After the implementation of the tank cleaning for approximately 3 days later the chief officer of implementing self-wall wash test, it contains hydrocarbons and chlorides still do not meet the requirements. Average hydrocarbon content in each tank exceed 0.5 ppm. While the average chloride content in each tank over 1 ppm. Whereas the requirement to load methanol is a hydrocarbon content of 0 ppm and a maximum chloride content of 0.5 ppm.

Chief officer then ordered the Bosun to carry out the tank cleaning again, but after considering the remaining time for berthing stay 2 days, then the Master advise that does circulation using bright metal for all tanks. Then spraying using the distillate water to the walls of the tank. Once that is done the self-wall wash test again, but two tanks of 12 tanks still not meet the requirements.

The author conducted observations on the implementation of tank cleaning of crude palm oil to methanol, and then examine that occurred some problems that resulted in the failure of tank cleaning has been done and how it should be efforts made during the process of tank cleaning of cargo of crude palm oil to methanol to

produce wall wash a good test. Factors such problems derived from human, machine, material, and procedures.

1) The discussion of the causes of failure in the implementation of the tank cleaning

Tank cleaning often fail because after the wall wah test results are not in accordance with what is required. Dry tank failure due to several factors. These factors and causes are translated into the fishbone diagram below. For simplicity in describing the problems that occur in the factors that lead to the results observed so that the tank cleaning is not good, then it is presented in a table below.

**Table 1. Table Problems That Occur on The Factors Observed During the Implementation of The Tank Cleaning**

No	Factors to be observed	Problems that occur
1.	Man	<ul style="list-style-type: none"> <li>a. Chief officer lack of coordination with Master.</li> <li>b. Chief officer hurry to start the implementation.</li> <li>c. AB do not understand the procedures for implementing the tank cleaning.</li> <li>d. AB does not control around periodically.</li> </ul>
2.	Machine	<ul style="list-style-type: none"> <li>a. Heater takes a long time to reach the required temperature.</li> <li>b. Not meeting the connection between the tank and the tank dry cleaning hose hydrant.</li> <li>c. Tank cleaning hose leaking.</li> <li>d. Lubricants in Butterworth fix mixed with water.</li> <li>e. Gear at the end of the Butterworth portable tucked away by rust.</li> </ul>
3.	Procedure	<ul style="list-style-type: none"> <li>a. Not implemented safety meeting.</li> <li>b. Not implemented precleaning.</li> </ul>
4.	Material	<ul style="list-style-type: none"> <li>a. Limited fresh water.</li> <li>b. Misdirected detergent.</li> </ul>

2) The discussion of the problem and efforts should be made in order to become the optimal dry tank.

a) Chief officer lack of coordination with Master

The Master said that "The chief officer has requested permission from the Master to start tank cleaning. But he did not coordinate with the Master about the process that will be implemented, as well as other constraints. Master thought that there are no obstacles that occur and the tank cleaning has been planned as usual. "

Supposedly when after making a dry tank plan, chief officer to coordinate with the Master about the plan and these constraints. So, if there is less perceived, can be given a feedback and suggestions by the master. So as to take preventive action before something unexpected happens.

b) Chief officer hurry to start implementation

*Chief officer* said that "The chief officer had asked the engine room to immediately raise the temperature of the heater. Chief officer had to wait until about 4 hours in order to reach the required temperature, but the indicator on

the heater cannot reach that temperature. Finally, the chief officer immediately ordered the Bosun to get started with the temperature there".

Chief officer supposed to first make sure that everything was normal and if there are obstacles, then coordination with relevant parties. Just after the start of implementation.

c) AB less understanding the procedure execution dry tank

At the time of butter Worthing with hot sea water, AB B one of the set line-up on the tank number 2 left. So that the water in the tank cannot be pumped out. It is known when in check by a Bosun. Then at 6-12 watchkeeping, the tank cleaning headed by AB A. AB A not prepare detergent and equipment to be used for the next process. As a result, delays for further processing occurs.

For it does not happen it is necessary to the holding of job evaluation and giving understanding to the crew on the implementation in order to achieve optimization of the tank cleaning.

d) AB does not control around regularly

AB C do not know if there Butterworth who did not work. Bosun said that "early starting time, Butterworth works. Then AB C come inside to get rain coat, then standby in poop deck. Then I came out to do a local circulation in the loading line and turns the Butterworth does not work. "This happened several times during the implementation process of tank cleanings and this will greatly affect the outcome of tank cleanings for the Butterworth just hose to two points only.

Then AB B do not know if there is a leaky hose tank cleaning. Bosun said that "when the AB B watch at night. Then near the local standby pump for almost handover. I realized that the pressure on the Butterworth reduced. But the AB B does not do anything. AB B thinks that the pump pressure is reduced because of lowered by me. Then the new AB B know if there is a leak in one of the tank cleaning hose after being told by me.

In this case, the chief officer must warn the AB with the responsibility firmly on the circumference AB to control both before and when implementing dry tank. Even the Chief Officer should provide penalties for AB were still in violation.

e) Heater takes a long time to reach the required temperature

Chief officer said that "this heater requires a very long time to reach the required temperature. Chief officer has been pressing the engine room to immediately raise the temperature on the heater to 4 hours but the heater still cannot reach it.

Attempts to overcome this is to do with cooperation between the crew deck and engine crew to perform maintenance to the fullest.

f) Not meeting the connection between the tank and the tank dry cleaning hydrant hose

The water pressure is affected by the sequence of pumps and pipes through which the water. During the dry tank implemented, there is a connection between the hydrant and tank cleaning cleaning hose tightly so that no leakage resulting in reduced pressure. Not rapatanya happens because the threaded connection on the dry hydrant tank has been damaged by rust. The drat rusty due to lack of maintenance performed by crew deck during this time.

Efforts should be made to avoid things like that is to perform regular maintenance. Namely by rubbing the surface using a round brush and put their iron grease evenly on the drat.

g) Tank cleaning hose leak

Tank cleaning hose serves as a liaison from the hydrant to the Butterworth dry tank. This object is made of thick rubber. If the tank cleaning hose is leaking it will reduce the pressure that goes into Butterworth. Tank cleaning hose leak because of the main causes is storage that is not stored properly.

Tank cleaning hose stored in the open air. No rooms used for storing dry tank hose. So, exposed to rain and heat. Rubber if exposed to rain and excessive heat for long will broke up could result in leakage when there is pressure in the volume.

Attempts to overcome this is by keeping a dry tank hose in a safe room or enclosed and perform regular maintenance such as washing with fresh water after use.

h) Lubricants in Butterworth fix mixed with water

At the Butterworth fix gear box there is a place to end Butterworth gear rotate in the tank. The gear box is outside the tank or on the deck. It contains the gear box lubrication oil to reduce friction on the existing gear. During the process of tank cleaning, there are some lubricating oil mixed with water. This is because the gear box is not waterproof. Rain water or sea water can enter through the filling hole lubricating oil are not watertight and packing on the lid's gear box which is not impermeable. This resulted in a round at the Butterworth becomes substandard.

i) Lubricants in Butterworth fix mixed with water

At the Butterworth fix gear box there is a place to end Butterworth gear rotate in the tank. The gear box is outside the tank or on the deck. It contains the gear box lubrication oil to reduce friction on the existing gear. During the process of tank cleaning, there are some lubricating oil mixed with water. This is because the gear box is not waterproof. Rain water or sea water can enter through the filling hole lubricating oil are not watertight and packing on the lid's gear box which is not impermeable. This resulted in a round at the Butterworth becomes substandard.

Efforts so that the problem does not occur is to perform regular maintenance. Checking on each section to enter the water. If no packing is damaged then replaced with a new one. If there are parts that must be replaced and not available on the boat then immediately make a requisition to the company.

j) Gear at the end of the Butterworth portable tucked away by rust

When execution of tank cleaning, there are some who do not play Butterworth. After being checked in all parts of the Butterworth, turns gear box inside the tank tucked away by rust flakes. As a result, the process of tank cleanings pending some time to unload gear on the portable Butterworth inside the tank.

Efforts so that it does not happen is to perform maintenance on each gear ends of the Butterworth periodically. And if possible, to give the filter on the pipe flow before entering into gear at the Butterworth so that if there are bits of rust from the pipes can be filtered by the filter.

k) Not implemented safety meeting

Safety meeting very important to do before starting the tank cleaning. It is so that implementation went according to plan.

Before starting the implementation of the tank cleaning, do not do it first safety meeting. Chief Officer said that "before starting the execution was not carried out safety meeting, as chief officer considers that the crew was aware of the work and the salvation of their respective duties. Safety meeting with the non-performance, the directives of superiors to subordinates will be less. So, the actual crew will not understand his job just will not say anything, so at the time of tank cleanings will make mistakes.

Attempts to deal with the problem is to perform scheduling and alerting each other to carry out safety meeting. For the time can be limited to approximately 15 minutes before the activity. This is very useful from the moment there is an error that resulted in implementation of a tank cleaning process is delayed or hampered some time.

l) Not implemented precleaning

In accordance with the manual cleaning your tank, before the implementation of the cleaning process should be carried out precleaning. The purpose of this precleaning is as an initial measure to eliminate the remnants of the charge cannot be issued, subsequent to stripping. Chief Officer said that "before carrying out the cleaning process is not carried out prior precleaning because usually never do besides fresh water is also limited, so for savings fresh water."

Attempts to overcome this is to plan in advance to do precleaning. If you've planned will definitely be taken into account for precleaning time and materials so that fresh water for precleaning available. And precleaning can be carried out in accordance with established procedures.

#### m) Fresh water limited

In the implementation of the tank cleanings, fresh water is recommended to be used for chloride content contained in very minimal fresh water than contained in sea water. Supposedly fresh water is used for precleaning process, as a mixture of washing using detergent, and the process of flushing with fresh water. But because of the limited availability of fresh water, the fresh water is used only at the stage of flushing with fresh water only.

Efforts must be done is to make improvements to the fresh water generator. If required spare part from the ground then immediately make a requisition. And chief officer to be more careful calculating fresh water for tank cleanings. Although in the supply of port, the chief officer must request in supply optimally to the needs of dry tank.

#### n) Misdirected detergent

Previous Chief officer had asked the company to submit the required detergent for tank cleanings. But to reach the ship is bright metal. Chief Officer said that "The chief officer had made a requisition is true, but that is sent wrong. This resulted in a detergent that is used does not comply with the recommended dose. "This lack of detergent to maximize the washing process.

### **Conclusion**

Based on the results of research which the author on the boat as well as the results of the discussion on "Optimizing the cleaning of the cargo tanks of crude palm oil to methanol to produce a wall wash test well in the MT. Tirtasari "then as the final part of this thesis, the author concludes that:

1. The cause of the failure in the implementation of tank cleaning of cargo of crude palm oil to methanol is because of man that because of a lack of understanding of the implementation of tank cleaning, factor machine due to lack of care or treatment has been carried out less than the maximum, the material factors that are limited and supply do not match, factor for the implementation of the procedure with dry tanks are not in accordance with that of the guidebook.
2. Efforts should be made in order to tank cleaning is optimal is the provision of guidance on understanding the crew on the implementation of tan dry, with taking care of the machines and tools of tank cleaning to the maximum, to provide spare for materials tank cleaning ready wear, and to carry out the cleaning of tanks in accordance with the guidelines.

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## **Minimizing the Cadets' Anxiety in English Presentation at Maritime Education and Training**

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### **Abstract**

This research aims to find out the cadets' level of anxiety category in English Presentation, causes of their anxiety and some alternatives ways to overcome that anxiety. The researchers applied a descriptive research design which collected, analyzed, and interpreted a variety of the data. The population was eighth semester cadets of Deck and Engine Department, registered in 2018/2019 academic year. This research applied a random sampling. The researchers applied a purposive technique sampling. The data were collected through questionnaire, observation checklist, and supported by interview. The result of this research based on questionnaire indicated that no cadets had very high anxiety, 16 (31%) cadets had high anxiety, 16 (31%) cadets had moderate anxiety, 19 (36%) cadets had low anxiety, and 1 (2%) cadet had very low anxiety. The obtained data showed the mean score as 49,1 which is classified as moderate anxiety. From the interview, the causes of their anxiety were divided into two, namely linguistics factor relating to the language proficiency comprising (a) low pronunciation and (b) lack of vocabulary, and non-linguistics factor overwhelming (a) lack of rehearsal because of many activities at campus, unsupported friends, and being apathetic towards learning process, (b) afraid of being laughed because of making mistakes, (c) considering the good presentation of friends, and (d) unwonted performing in public.

*Keywords: Anxiety, English Presentation.*

### **Introduction**

As the English teachers and also still English learners, undeniably the researchers had faced some problems in conducting English Presentation, one of them is anxiety. Cambridge Advanced Learner's Dictionary-3<sup>rd</sup> edition defines anxiety is an uncomfortable feeling of nervousness or worry about something that is happening or might happen in the future. Anxiety is the thing that is so difficult to be avoided since it is part of life. Even though with the best preparation, anxiety still becomes the prime problem in facing English Presentation.

Dealing this problem, the researchers believed that anxiety is the prominent feature to be researched since it affects learners' effective verbal and non-verbal communication in English presentation. Therefore, the researchers intended to investigate the level of anxiety category of learners in term of 'Merchant Marine

Polytechnic Makassar (PIP Makassar) and Sekolah Tinggi Ilmu Pelayaran (STIP) Jakarta cadets and the affective factors of their anxious feeling.

#### *The Importance of the Research*

Why this research was important to be conducted, since PIP Makassar and STIP Jakarta are the international school stated IMO (International Maritime Organisation), English is the crucial need for cadet. Undeniable using foreign language rises anxiety for those especially in English presentation. Thus, anxiety in English presentation was important to be researched.

#### *The Urgency of the Research*

This research was urgent to be conducted immediately since one of the requirements of the cadets is passing the academic with good in English. Good English does not only talk about accuracy, comprehension, and fluency of English elements and skill but also non-linguistic factors such as being anxious should be considered as affective factor to build effective communication even though anxiety is a part of human being.

#### *The Feasibility of the Research*

This research was supported by the existence of the cadets and the material presented displayed in Semester Learning Plan based on IMO 3.17.

#### *The Novelty of the Research*

Researching Language combining psychology was rare to research in PIP Makassar and STIP Jakarta especially how to know the barriers to improve cadets' English, in this case anxiety. Therefore, the researchers believed it was a novel idea to conduct this research.

Based on the background above, the research problem was some of the cadets feel anxious when speaking English. Thus, the researchers formulated the research statements, as follows:

1. The cadets' level of anxiety category in English Presentation.
2. The causes of cadets' anxiety.
3. Some alternative efforts to overcome the cadets' anxiety

### **Methods**

This research applied a descriptive research design which collected, analysed, and interpreted a variety of the data to have information the level of anxiety category of cadets and the causes of their anxiety. This research consists of one variable only that is independent variable since this research describes the cadets' anxiety in English Presentation just the way it is.

The population of this research was eighth semester cadets of Deck and Engine Department, Merchant Marine Polytechnic Makassar (PIP Makassar) and Sekolah Tinggi Ilmu Pelayaran (STIP) Jakarta in 2018/2019 academic year. The total population is 20 classes consisting of 480 cadets. This research applied a random

sampling. One class of Deck Department and one class of Engine Department in those both of maritime schools were chosen randomly. To find out the causes of cadets' anxiety, the researchers applied a purposive technique sampling. The researchers purposively chose cadets having high anxiety.

The researchers applied three kinds of instruments to facilitate this research. Those instruments are: Questionnaire, interview and observational checklist. After conducting all procedures of collecting data, the researchers analysed the data. According to Miles and Huberman (1984) in Emzir (2012:129-136), there are some steps in analysing the data. The steps can be seen as follows:

### Data collection

This research covers the cadets' level of anxiety category and the causes of cadets' anxiety as data. Cadets' level of anxiety category was collected through questionnaire which English presentation as the media to find out their level of anxiety. After collecting data, the researchers followed strategies for data analysis based on L.R. Gay's book *"Educational Research, Competencies for Analysis and Application, Eight Edition"*. The researchers used Likert scale to categorize the statement into positive and negative as follow:

**Table 1. Likert's Scoring Table**

No	Scale	Classification of Anxiety
1	73-85	Very High Anxiety
2	59-72	High Anxiety
3	45-58	Moderate Anxiety
4	31-44	Low Anxiety
5	17-30	Very Low Anxiety

*Adapted from Yaikhong & Usaha (2012)*

The data calculated manually start from 17 to 85. Each score of the result of PSCAS was categorized as follows:

**Table 2. PSCAS Score**

	Positive Statement	Negative Statement
1	Strongly Agree	5
2	Agree	4
3	Undecided	3
4	Disagree	2
5	Strongly Disagree	1

*Adapted from Yaikhong & Usaha (2012)*

After that, calculating the mean score and standard deviation of the cadets' answer used the Statistical Product and Service Solution (SPSS 23) Analysis. Meanwhile, the causes of cadets' anxiety data were collected through interview completed by voice recorder and notes.

## Result and Discussion

**Research Statement 1:** The cadets' level of anxiety category in English Presentation.

### Finding 1

The result of the research indicates that no cadets had very high anxiety, 16 (31%) cadets had high anxiety, 16 (31%) cadets had moderate anxiety, 19 (36%) cadets had low anxiety, and 1 (2%) cadet had very low anxiety. It means that the cadets in doing MARPOL English Presentation had range anxiety from very low to high anxiety. It can be seen in the following table.

**Table 3. Frequency and Percentage of the Cadets' Anxiety**

No.	Scale	Clasification Of Anxiety	Frequency	Percentage (%)
1	73-85	Very High	0	0
2	59-72	High	16	31
3	45-58	Moderate	16	31
4	31-44	Low	19	36
5	17-30	Very Low	1	2
Total			52	100

The mean score of the cadet's anxiety is 49,1. It indicates that the cadets were on "moderate anxiety" in MARPOL English Presentation. It almost was on high anxiety.

### Discussion 1

The types of anxiety presented in this research shows range from very low to high anxiety in MARPOL English Presentation. Among 52 cadets, 16 cadets had high anxiety. This data became the researchers' concern to investigate why they had high anxiety in English presentation by analysing their response on questionnaire and the symptoms appeared while they were presenting.

Item number 16 "I have trouble to coordinate my movements while I am presenting my material" showed that most cadets responded 'agree'. It indicated that they were on high anxiety which was strengthened by the symptoms appeared, for instance the cadet DC (anonymous). He was squirming while presenting his material. He admitted that it was his way to minimize his anxiety. It is related to Suleimenova theory in 2013. Furthermore, the other symptom indicating that he had high anxiety was too fast speed of speech. On the contrary, the cadet IM (anonymous) was too slow speed of speech in the presentation, but both of them could be indicated as high anxiety based on Hashemi and Abbasi (2013) theory about the visible symptoms of anxiety. In the presentation, he also tended to display avoidance of speech by remaining silent. Ansari (2015) had stated this phenomenon as symptoms of anxiety.

According to Suleimenova (2013), anxious students show symptoms such as playing with hair or clothing. It was proved by the anxiety symptom showed by some cadets such as playing with their pen or fingers when they were observed. Some of them stated that playing with pen or finger was distraction to minimize their anxiety. It was undeniable since the item number 15 "I dislike using my voice and body

expressively while I am presenting my material” was responded ‘strongly agree’, ‘agree’, and ‘undecided’ by them. It referred that they were lack of capability to use their voice and body expressively in presentation, consequently they chose playing objects as distraction of their anxiety.

The other symptoms showed by the cadets were avoiding eye contact with the teachers who were researchers and rubbing the palms. Ansari (2015) stated that students with debilitating speaking anxiety tend to display avoidance of involvement in task by remaining silent, sitting in back row, avoiding eye contact with the teacher, to name a few. The theory was in line with it. Meanwhile, one of the obvious signs of anxious students was rubbing the palms, it was stated by Hashemi and Abbasi (2013).

The cadets who had high anxiety in English presentation were those who prepared the material well, did not read the script at all, and presented the material in English properly. Meanwhile, the cadets who had low or moderate anxiety were those who prepared the material unwell, tended to read the script while giving presentation, and did not present the material in English properly. Based on the data collection, the three highest mean scores of questionnaire items (attached in appendices) were item number 2 “I start to panic when I have to present because I don’t have good preparation in advance”, number 14 “I feel anxious while I am waiting to present my report”, and number 17 “Even if I am very well prepared, I feel anxious in presenting my report”. These items were negative statements talking about the preparation in doing presentation. The researchers observed that the cadets who had high anxiety responded them with ‘strongly agree’ and ‘agree’ whereas they had good preparation and presented the material well. The researchers concluded that if the cadets prepared the material and presented it in English well, they would feel afraid of making mistake, therefore their confidence was getting low and their anxiety was getting high. Conversely, the cadets who had low or moderate anxiety who had unprepared material, read the script all the time, and showed unsatisfied presentation did not affect their confidence nor anxiety. The researchers assumed that they were indifferent towards the task, less motivation, and they could be careless in answering the questionnaire.

Based on the explanation above referred that the cadets who were on high anxiety were not those who could not present material in English well, they just could not control their anxiety. Likewise, the cadets who were on low or moderate anxiety were not those who could present material in English well, they just had negative attitude towards learning process.

**Research Statement 2:** The causes of cadets’ anxiety.

### **Finding 2**

Based on the finding 1, the cadets who had high anxiety were 16 (31%) cadets. The researchers interviewed them to find why they were anxious in the MARPOL English presentation. After being investigated, the result of interview emerged two causes. They were linguistics factor and non-linguistics factor. These factors can be Figured into the table below.

**Table 4. The Causes of the Cadets' Anxiety**

Linguistics factor	Low pronunciation
	Lack of vocabulary
Non linguistics factor	Lack of Rehearsal, caused by:
	- Many activities at campus impacting on their unconcern in practicing English presentation
	- Unsupported friends
	- Being apathetic towards learning process
	Afraid of being laughed because of making mistake
	Considering the good presentation of friend
	Unwonted performing in public

Based on the table above, it can be seen that the linguistic factor causing the cadets' anxiety was getting high in presentation was low pronunciation and lack of vocabulary (it is related to the questionnaire number seven), meanwhile non-linguistics factor covered lack of rehearsal (it is related to the questionnaire number two), afraid of being laughed because of making mistakes (it is related to the questionnaire number six), considering the good presentation of friends, and unwonted performing in public

### Discussion 2

After analysing the cadets' level of anxiety in the MARPOL English presentation, it was found that 16 cadets were on high anxiety. To find the causes of their anxiety, the researchers conducted interview by using Indonesian with the local accent to get more understandable information on 27 – 29 May, 2019 for cadets in PIP Makassar and 1-3 July, 2019 for cadets in STIP Jakarta. The finding described that the causes of their anxiety were linguistics factor and non-linguistics factor.

1. The linguistics factor relates to the language proficiency comprising low pronunciation and lack of vocabulary.

All interviewees told that low pronunciation became the prime cause of their anxiety, followed by lack of vocabulary. It was in line with Liu (2007) who found that lack of vocabulary, low English proficiency, and memory disassociation were the sources leading to English language speaking anxiety. As a result, the students sometimes decide to avoid interaction or become passive to speak. It is also supported by Tanveer's statement (2007) that language anxiety may be a result as well as a cause of insufficient command of the target language. That is to say, the cadets who experienced it due to linguistics difficulties in learning and using English.

2. The non-linguistics factor overwhelmed lack of rehearsal, afraid of being laughed because of making mistakes, considering the good presentation of friends, and unwonted performing in public.

- a. Lack of Rehearsal

Lack of rehearsal made them did not present the material well. According to their statement, they mastered all contents of MARPOL, unfortunately they did not rehearse before performing. It made the researchers disappointed and



curious to know why they did not practice whereas they had been informed to conduct English presentation a few weeks before the deal schedule. The researchers concluded three reasons of their lack of rehearsal, namely Many activities at campus impacting on their unconcern in practicing English presentation, unsupported friends, and being apathetic towards learning process.

b. Afraid of being laughed because of making mistakes.

It has been explained that the linguistic factor which is low English proficiency covering low pronunciation and lack of vocabulary made the cadets anxious in English presentation. They were reluctant to speak English because of afraid of making mistakes causing them being laughed by their friends, especially the cadets who presented had low English proficiency. It is strengthened by Fiadzawoo (2015) stating that the students were afraid of their friends to laugh at them when making mistakes during speaking.

c. Considering the good presentation of friends

Good presentation delivered by someone should motivate others to do better. Unfortunately, it did not work in the MARPOL English presentation. When the cadet presented the material well, the other cadets felt anxious suddenly even though they had a good preparation. Their anxiety was getting high and their confidence was getting low because they thought their friends' presentation was better than theirs. One of the cadets felt this. He stated that he had prepared anything for the MARPOL English presentation; the slide show, the script, and rehearsal many times. Regrettably, his anxiety could not be controlled well after watching the good presentation delivered by his friend.

d. Unwonted performing in public

To perform interesting English presentation, not only good proficiency is needed in English presentation, but also agility is necessary to overcome unexpected things that might happen in the future. Sometimes, it can be executed for those who are used to doing English presentation. According to the interview, almost all cadets stated that it was their first English presentation. No wonder they were difficult to present material in English. On the other side, it is the important information for the researchers as the teachers to inure them to do English presentation.

**Research Statement 3:** The alternative efforts to Minimize the cadets' anxiety.

### **Finding 3**

#### **The Alternative Solution to Minimize Anxiety by the Experts**

As the following up how important minimizing anxiety in public speaking skill especially in presentation, the researchers also got the chance to interview Dr. Dra. Irwani Pane, S.Psi., M.I.Kom., the owner of public speaking institution in Makassar, and Muhammad Gibran., S.Kom., the news presenter at Kompas TV Jakarta. The alternative solution they offered as follow,

**Dr. Irwani Pane:**

1. Know Your Topic
2. Get and Well Organized
3. Positive Thinking
4. Pep Yourself
5. Engage Your Audience

**Muhammad Gibran:**

1. Know and master what we are going to present deeply.
2. Have confidence enough.
3. Create the interesting materials, such as adding audio visual, picture, diagram and so on.
4. Use English in daily life.
5. Practice all the time.
6. Regard the audience as friends.
7. Practice management and technical vocal in front of the mirror.
8. Do not try to omit anxiety, just minimise it.

**Conclusion**

Based on the findings and discussion in the previous chapter, the researcher concluded that the cadets who were on high anxiety were not those who could not present material in English well, they just could not control their anxiety. Likewise, the cadets who were on low or moderate anxiety were not those who could present material in English well, they just had negative attitude towards learning process. The causes of their anxiety were divided into two, namely linguistics factor relating to the language proficiency comprising (a) low pronunciation and (b) lack of vocabulary, and non-linguistics factor overwhelming (a) lack of rehearsal because of many activities at campus, unsupported friends, and being apathetic towards learning process, (b) afraid of being laughed because of making mistakes, (c) considering the good presentation of friends, and (d) unwonted performing in public.

**Suggestion**

Considering the conclusions above, the researchers gives suggestions as follows:

For the teachers:

1. Considering linguistics factor covering low pronunciation and lack of vocabulary made the cadets anxious in English presentation, the teachers should give more attention in teaching pronunciation and vocabulary all the time.
2. Overcoming high anxiety and enhancing confidence, the teachers should inure the cadets to do English presentation.

For the cadets:

1. The cadets should be aware that English is their basic skill to support their carrier as seafarers, thus they should give more attention and positive response towards English learning.
2. The cadets should improve their English not in the class only, but also in other environments including find English partners to communicate with.

For the institution:

3. The institution should consider the activities of cadets living in dormitory in order that they do not feel fatigue which can impact on the learning process in the class.
4. The institutions should be selective towards the cadets' activities which can support his carrier in the future.

For further researchers:

Further researchers having extensive investigation on anxiety of maritime cadets are required to conduct in different point of view concerning this research only focused on presentation, the researchers expect further researchers to investigate English job interview, on board English communication, and so on.

### **Acknowledgement**

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## **SWOT Analysis of The Transportation Management of Toll and Railroad Synergy**

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### **Abstract**

Along with the needs of the times, transportation management needs to be developed including creating a form of synergy. Integration is a system that experiences mixing to become a unified whole. The purpose is to carry out planning as an effort to anticipate the future by conducting an assessment based on past experience, supported by the resources and capabilities that are currently available to be projected into the future. Study location in the toll road network in the north coast of Java which is adjacent to the railroad network. The principal research methods are quantitative with SWOT analysis. IFAS analysis method for analyzing internal factors, EFAS analysis for external factors, then, entered into a quantitative model that is the SWOT matrix. The result, it was found that based on calculations, coordinates (0.25; -0.05) were included in quadrant II (positive-negative), Strength and Threats. The conclusion is, the strategy must be able to highlight the power to overcome the threats that may arise, by doing diversification. The S-T Strategy is an effort to develop a synergy of various strategies and increase the latest knowledge and abilities of experienced human resources in handling various situations and facility updates by applying the latest technology that is not owned by competitors. The advice given is to immediately multiply the variety of tactical strategies as well as technological updates.

**Keywords:** SWOT Analysis; Transportation; Management; Toll; Railroad; Synergy

### **Introduction**

Based on references from previous studies, the following points are known. In developing a synergy there must be a vision and mission to be achieved through the synergy. (Surilansih,2013) The transportation system is a transportation system that fulfills a sense of justice. (Hairulsyah, 2006; Hairulsyah, 2013). Some cities are facing transportation problems which are already at a critical stage. (Ibrahim,2010). Several problems related to sustainable transportation are described and alternative solutions are presented. Transport demand management policy is recommended as one alternative for solving the problems. (Tamin,2007). The lack of infrastructure support and the absence nationwide of "hub port"; poor management of interconnection or intermodal systems between port infrastructure, transportation and warehousing as well as lower network capability, information technology led to the position of Indonesia is low in terms of competition and

logistics performance index compared with many countries. (Irpan,2016) Hardware provides transportation information in the form of data to be analyzed using transport parameters such as alternative routes, mode choices, price estimates and travel time predictions (Ma'ruf,2018). Importance of supported economic development by defense and security stability. (Syahrin,2018). Implementation of transport the intermodal is to create sustainable passenger services, one stop service, equality in the level of service, and are single seamless services. To support the integration of intermodal transport operations, it is necessary to integrate service networks and transportation infrastructure networks. (Dwitasari,2014) Poor transportation infrastructure as a factor in logistics costs causes an increase in logistics costs. Infrastructure development that supports the implementation of a multimodal transportation system is the Government's goal to reduce logistics costs. (Wirabrata,2012). The level crossing of roads and railways is something that must be considered in transportation because it will affect the performance of roads that intersect with it. (Sitorus, 2013)

Judging from the various things stated above, the novelty in this research is to study the synergy of toll roads and railroads.

The problem is whether the SWOT analysis method can analyze the synergy of toll-railroads in transportation management and what strategies are produced.

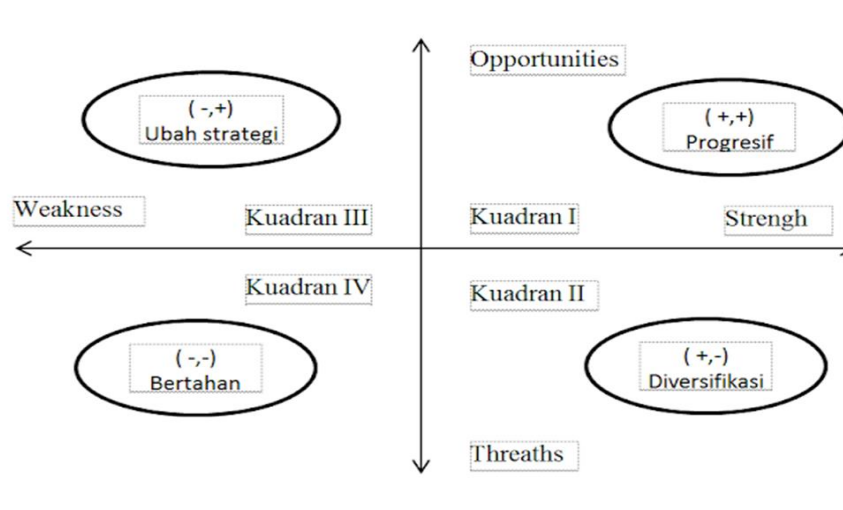
The purpose of research is to carry out planning as an effort to anticipate the future by conducting an assessment based on past experience, supported by the resources and capabilities that are currently available to be projected into the future.

Based on literature studies, analysis by considering Internal strengths and weaknesses are compared to external opportunities and threats, as a basis for generating strategic alternatives to a process, called SWOT analysis. SWOT analysis is the identification of various factors systematically to formulate a company's strategy. This analysis is based on logic that can maximize Strengths and Opportunities, but simultaneously minimize Weaknesses and Threats (Rangkuti, 2016).

Equations:

$$S_n = \frac{S - W}{2}; \frac{O - T}{2}$$

The results obtained determine the position based on the following quadrants (**Figure 1**):



**Figure 1. Determination of Quadrant Using TOWS**

*Source: Based on quadrant distribution in (Rangkutti, 2016: 20)*

Analysis of all existing internal and external factors. From the matrix three can be produced four kinds of organizational strategies with their respective characteristics, namely as follows:

1. SO Strategy is a strategy that must be able to use strength while utilizing existing opportunities.
2. WO Strategy is a strategy that must be demonstrated to reduce the weaknesses faced and at the same time take advantage of existing opportunities.
3. ST Strategy is a strategy that must be able to highlight strength in order to overcome threats that may arise.
4. WT Strategy is a strategy that aims to overcome obstacles and minimize the impact of existing threats.

The concept of thought is as follows (**Figure 2**):



**Figure 2. Concept Thinking TOWS Analysis of Toll-Railway Synergy**

### Methods

The research methods are to use the method of analysis of strengths, weaknesses, opportunities and threats, known as SWOT. Primary and secondary data are used. Quantitative data collection methods are used with a questionnaire for primary data, and literature study for secondary data. IFAS analysis method for analysing internal factors, EFAS analysis for external factors, then, entered into a quantitative model that is the SWOT matrix. Independent variables are existing in internal factors and



external factors. The dependent variable is a competitive strategy. Internal factors are entered into a matrix called the IFAS factor (Internal Strategic Factor Analysis Summary). External factors are entered into a matrix called an external factor matrix or EFAS (External Strategic Factor Analysis Summary). Each component is formulated in the SWOT and then an assessment process will be carried out, with give a score on each sub-component. SWOT interaction is obtained by weighting every aspect studied in determining the synergy of toll roads and railways. From the intersection of the four strengths, weaknesses, opportunities and threats, a certain coordinate will be obtained which will determine the location of the quadrant in determining the synergy strategy of the toll road and railroad. (Rangkuti,2016) The location of this study will be conducted at the location of the toll road network in the north coast of Java which is adjacent to the railroad network.

## Result and Discussions

### Toll road overviews



**Figure 3. Trans Java toll road**

With the toll road development policy, it is realized that there will be greater demand for roads, while the government's ability to meet the availability of roads is very limited. The growth in the number of vehicles with the development of road construction was not balanced. This imbalance then impacts the increasingly congestion on some roads. Based on the picture above, it can be seen that the construction of the Trans Java toll road is running considering that a number of sections have already been operating and investors have not yet been established and a contract has been signed. However, because not all regions in Java are connected to the Trans Java Toll Road, it is necessary to develop railroad. Especially for Java, there are already many rails that have been built and connecting almost most of the area in Java.

## Railroad Overviews



**Figure 4. Cross-Java Railroad**

Schematically, in the following Figure, the direction of the pattern of railway network development in Java according to the draft RTRW of Java and Bali is conveyed. Some of the existing plans are an attempt to reutilize the rail infrastructure network that was built during the Dutch era but is no longer in operation. On the route that will be reutilized at this time the synthetic network is generally out of date (broken) even some of the railroads are gone or have been acquired by residents.

### External Factors and Internal Factors

Considering the various efforts of activities that have been carried out, internal and external factors can be identified as a condition where synergies between the toll road and the railroad are identified as shown in the following tables 1 for internal factors and table 2 for external factors.

**Table 1 IFAS**

<i>No</i>	<i>Uraian</i>	<i>Bobot</i>	<i>Rating</i>	<i>Nilai</i>
<b>STRENGTH</b>				
<i>S1</i>	Representative facilities and infrastructure	0.20	4	<b>0.8</b>
<i>S2</i>	Most of the train operators are quite experienced	0.20	4	<b>0.8</b>
<i>S3</i>	At the location of economic growth occurs quite quickly	0.15	3	<b>0.5</b>
<i>S4</i>	Transportation access can be smoother	0.15	4	<b>0.6</b>
<i>S5</i>	Available human resources for the mastery of technology to control changes in air quality	0.15	3	<b>0.5</b>
<i>S6</i>	Create opportunities for the right mode of transportation	0.15	3	<b>0.5</b>
	<b>Total</b>	<b>1</b>		<b>3.55</b>
<i>W1</i>	Limited funds	0.15	3	<b>0.5</b>
<i>W2</i>	Limited number of managers	0.15	3	<b>0.5</b>
<i>W3</i>	High socio-economic costs	0.25	4	<b>1.0</b>
<i>W4</i>	Lack of synergy policy	0.10	3	<b>0.3</b>
<i>W5</i>	The ego of the manager in uncoordinated planning	0.20	2	<b>0.4</b>
<i>W6</i>	Lack of attention to financing needs for environmental loss control efforts	0.15	3	<b>0.5</b>
	<b>Total</b>	<b>1</b>		<b>3.05</b>

**Table 2. EFAS**

<i>No</i>	<i>Uraian</i>	<i>Bobot</i>	<i>Rating</i>	<i>Nilai</i>
<i>01</i>	The increasing need for safe and ergonomic transportation services <sup>2</sup>	0.25	3	<b>0.8</b>
<i>02</i>	Government support in the construction of the trans Java transportation network	0.20	3	<b>0.6</b>
<i>03</i>	Investment cooperation opportunities	0.15	2	<b>0.3</b>

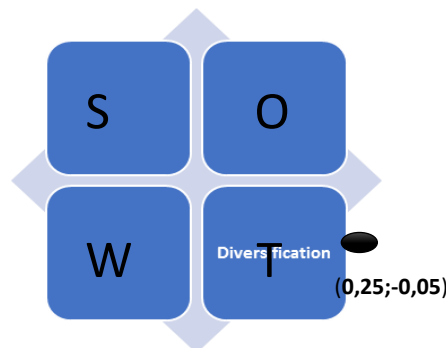
No	Uraian	Bobot	Rating	Nilai
O4	Service opportunities	0.15	3	<b>0.5</b>
O5	Opportunities for the use of new technology	0.10	3	<b>0.3</b>
O6	Increased mobility of goods and passengers	0.15	4	<b>0.6</b>
	<b>Total</b>	<b>1</b>		<b>3.00</b>
T1	The impact of the economy on the movement of unbalanced migration causes imbalances between regions	0.20	4	<b>0.8</b>
T2	Increased competition between transport service operators	0.10	3	<b>0.3</b>
T3	Changes in social order	0.20	2	<b>0.4</b>
T4	The government's ability to conduct supervision in the implementation of limited transportation services raises the problem of controlling environmental pollution	0.10	4	<b>0.4</b>
T5	Community conflict	0.20	3	<b>0.6</b>
T6	Difficult to be agreed upon by all parties	0.20	3	<b>0.6</b>
	<b>Total</b>	<b>1</b>		<b>3.10</b>

Rating: 1 = strongly disagree 2 = disagree 3 = agree 4 = strongly agree

Based on data from internal and external factors obtained weighting scores are as follows: strength factor = 3.55; weakness factor = 3.05; opportunity factor = 3.00; threat factor = 3.10. From the intersection of the four strengths, weaknesses, opportunities and threats, the coordinates are as follows:

$$S_n = \frac{3,55 - 3,05}{2}; \frac{3,00 - 3,10}{2} = 0,25; -0,05$$

From the weighting score above then plotted in the SWOT diagram analysis image consisting of 4 quadrants and the results of the analysis on the SWOT matrix obtained coordinates (0.25; -0.05) which coordinates are included in quadrant II, Diversification.



**Figure 5. SWOT Matrix Synergy of toll roads and railroads**

Quadrant II's position (positive, negative) signifies an organization that is strong but faces great challenges. Based on the results of the Cartesian quadrant analysis above, the positive synergy form of the development of the toll road and the Trans Java Railway on one hand illustrates the existence of a mutually beneficial relationship between railroad and road transportation modes. Technological improvements in the transportation sector are not limited to the development of environmentally friendly modes of transportation but also to the development of efficient construction projects. Mobility of goods and services will generally move from the hinterland region to growth centers in an effort to create added value in production from businesses and services. In addition, the high pattern of human movement with the current of urbanization also causes the spread of the kinship area of the

community from villages to cities, giving rise to the need for human mobility for social and cultural reasons. The government support which is quite high for the effort to unify the trans Java transportation infrastructure provides an opportunity for investors to invest in the transportation sector through various lines of transportation business. In addition, the opening of new lines in the construction of the Trans java toll road also provides an opportunity for the opening of the accessibility of new areas that can take advantage of this transportation infrastructure for the development of the region. However, there some threats to overcome. The SWOT matrix combination strategy is as follows. (Table 3)

**Table 3. SWOT matrix combination strategy**

<p style="text-align: center;">IFAS</p> <p style="text-align: center;">EFAS</p>	<p style="text-align: center;">Strength:</p> <ol style="list-style-type: none"> <li>1. Representative facilities and infrastructure</li> <li>2. Most of the train operators are quite experienced</li> <li>3. At the location of economic growth occurs quite quickly</li> <li>4. Transportation access can be more smooth</li> <li>5. Available human resources for the mastery of technology to control changes in air quality</li> <li>6. Create opportunities for the right mode of transportation</li> </ol>	<p style="text-align: center;">Weakness:</p> <ol style="list-style-type: none"> <li>1. Limited funds</li> <li>2. Limited number of managers</li> <li>3. High socio-economic costs</li> <li>4. Lack of synergy policy</li> <li>5. The ego of the manager in uncoordinated planning</li> <li>6. Lack of attention to financing needs for environmental loss control efforts</li> </ol>
<p style="text-align: center;">Opportunities:</p> <ol style="list-style-type: none"> <li>1. The increasing need for safe and ergonomic transportation services</li> <li>2. Government support in the construction of the trans Java transportation network</li> <li>3. Investment cooperation opportunities</li> <li>4. Service opportunities</li> <li>5. Opportunities for the use of new technology</li> <li>6. Increased mobility of goods and passengers</li> </ol>	<p style="text-align: center;">SO Strategy:</p> <p>More aggressive with power optimization to increase investment and Optimization of experienced HRD juxtaposed with better new technology</p>	<p style="text-align: center;">WO Strategy:</p> <p>Efforts to solicit investment to overcome funding limitations Efforts to overcome the shortage of labor by optimizing new technologies</p>
<p style="text-align: center;">Threats:</p> <ol style="list-style-type: none"> <li>1. The impact of the economy on the movement of unbalanced migration causes imbalances between regions</li> <li>2. Increased competition between transport service operators</li> <li>3. Changes in social order</li> <li>4. The government's ability to conduct supervision in the implementation of limited transportation services raises the problem of controlling environmental pollution</li> <li>5. Community conflict</li> <li>6. Difficult to be agreed upon by all parties</li> </ol>	<p style="text-align: center;">ST Strategy:</p> <p>Efforts to develop a variety of strategies and increase knowledge and ability of experienced HRD in handling various situations and renewal of facilities to keep up with the latest technology that competitors do not have.</p>	<p style="text-align: center;">WT Strategy:</p> <p>Trying to survive with existing conditions by efforts to improve financial management and HRD management</p>

The explanation of the matrix above is as follows. In a combination of IFAS and EFAS, four strategies can be created. The four strategies are the SO Strategy (Strengths-Opportunities), the SW Strategy (Strengths-Weaknesses), the ST Strategy (Strengths-Threats) and the WT Strategy (Weaknesses - Threats). Each of these strategies can be seen in the box that represents. One appropriate strategy will be chosen, according to the results obtained from the calculations shown in the Cartesian diagram.

### **Conclusion**

It can be concluded that from the analysis of the Cartesian SWOT diagram obtained coordinates (0.25; -0.05) whose coordinates are included in quadrant II, diversification. The situation is stable but faces a number of challenges so it needs to be diversified. Quadrant II is a combination of Strength and Threat, as an S-T Strategy. An S-T strategy is a strategy that must be able to highlight the power to overcome the threats that may arise. A positive synergy strategy can be carried out through an understanding of the strength opportunities that are owned and the problem of threats faced. Human Resources who are considered experienced, so they are considered skilled in doing their work, as well as representative public transportation services and making access easier, are the strengths that need to be highlighted to overcome the possibility of the existence of competitors. So, the S-T Strategy is an effort to develop a synergy of various strategies and increase the knowledge and ability of experienced HR in handling various situations and facility updates by applying the latest technology that is not owned by competitors.

The advice given is to immediately multiply the variety of tactical strategies and make plans that involve the public, as well as technological updates.

### **Acknowledgement**

Thank you to all those who have helped in this research since the study was conducted to be written in scientific writing, as well as to the leadership and all employees, at the R&D center that oversees this research.

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## **Selection of Related Crossing Port Site Operation Plan of Ro-Ro Dumai-Malacca Ship**

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### **Abstract**

This study aims to select the location of the port associated with operation of the Dumai-Malacca ferry ro-ro ship. There are 2 ports that are candidates, namely Pier A of the Dumai Port which is managed by PT. Pelindo I and Bandar Junjungan Port, managed by PT. Pelabuhan Dumai Berseri and UPT Department of Transportation of Riau Province. The analytical tool takes the decision by considering all aspects above, using the Multi Criteria Analysis (AMK) method. Based on the results of an assessment of the potential aspects of the Ro-Ro ferry crossing port, the total value of the Sri Junjungan port is 6.02 while pier A of the Dumai port is 7.85. Even though Pier A of the Dumai Port has a higher value, it still requires several steps to improve the construction of Ro-Ro pier and requires several other facilities.

**Keywords:** Crossing Port, Ro-Ro Ferry, Dumai, Bandar Sri Junjungan, Malacca

### **Background**

Connectivity has been seen as an important issue related to global economic growth. In ASEAN, the passion of the Master Plan Asean Connectivity (MPAC) is to achieve integration in the region for all dimensions through physical, institutional, and personal connectivity. Connectivity will not only reduce transaction costs, time and travel but also connect the core and intra core and peripheral parts of ASEAN to accelerate growth in the region.

One of the planned connectivity programs is the Dumai corridor - Malacca corridor using the RoRo ship. The distance between Malacca and Dumai is around 111 km.

The Dumai-Malacca Corridor is a destination for people crossing with various destinations such as tourist, labor or job seeker, business to Malaysia. In Malacca offers many tour packages targeting the majority of tourists from Sumatra (including other Indonesian regions) to visit Malacca. While Dumai as a developing city, is a special appeal for Malaysian businesses to invest in the oil palm plantation sector. Dumai is a business field for investors engaged in the industrial sector, so that not a few Malaysian business people who come to Dumai. The large number of expatriates who work in Dumai and to provide logistical supplies, has encouraged local governments to support adequate food needs. This is an opportunity for Malaysian business people to fill the needs of the economic chain, by exporting snacks to several supermarkets, including medicines and household appliances.

Business opportunities come alive through the Dumai-Malacca Corridor. Dumai is also open for visits from other parts of Sumatra. Health tourism package or Medical Tourism is also promoted by Malacca.

Now a days, there are 2 ports which have the potential to serve the Dumai-Malacca corridor, which the port managed by Pelindo and the Regional Government. Therefore, it is necessary to conduct a study to determine the most ready and adequate port to serve passenger transportation and / or the Dumai-Malacca corridor goods.

The formulation of the problem of this research is that the location of the Ferry Port in Dumai, Riau Province has not been determined which will serve the transportation of passengers and / or goods in the Dumai-Malacca corridor.

## **Methods**

The location of the research activities and survey locations were carried out in the cities of Dumai and Malacca (Malaysia). The time of the study is three months, from February to April 2019.

This descriptive research aims to make a systematic, factual and accurate description of the facts and the nature of a particular population or area.

The data collection techniques of this study were direct observation in the field, interviews, distribution of questionnaires and focus group discussions.

The research process consists of:

1. Subjects: stakeholders involved in this study consisted of: MOT Malaysia, Directorate General of Sea Transportation, Directorate General of Land Transportation, Riau Provincial Government and Dumai City Government, Operators (PT. Pelindo I (Persero), PT. ASDP Indonesia Ferry (Persero), PT Port of Dumai Berseri (BUMD)) and the community / public.
2. Object: the focus of the object study in this research paper includes: Pier A area of the Dumai Port, the International Passenger Terminal area of the Dumai Port, the Bandar Sri Junjungan Ferry Port area, Ro-Ro Ships, types of vehicle transportation, people and goods.
3. Method: the approach that used in this study is a multi-criteria analysis (AMK) to assess the potential of the Dumai-Malacca Ro-Ro crossing port.

## **Findings and Discussion**

### **Development of Aspects and Indicators of Potential Assessment of Ro-Ro Ports.**

Determination of Aspects, Indicators, Criteria and Methods of Assessment of Potential Ro-Ro Ports

The determination of the potential location of the Dumai-Malacca Ro-Ro crossing port is carried out by considering various aspects comprehensively. There are 7 aspects considered, such as: (1) Compliance with spatial planning and port



documents; (2) Technical operations of the port, especially in the provision of port facilities; (3) Compliance with international shipping regulations, specifically ISPS Code and Marpol certificates at ports; (4) Compliance with the provision of CIQS (Custom, Immigration, Quarantine, and Security) services; (5) Port accessibility and intermodal integration; (6) Port manager readiness and (7) Potential economic, socio-cultural and environmental impacts. Decision-making analysis aids by considering all aspects mentioned above, used the MCA method (Multi Criteria Analysis).

**Table 1. Aspects, Indicators, Criteria and Assessing Methods the Potential of The Ro-Ro Port**

No.	Aspects	Indicators	Criteria	Assessing Method
1	Compatible with Planning Documents	<ul style="list-style-type: none"> <li>• RTRW <u>province</u> Riau</li> <li>• RTRW City of Dumai</li> <li>• <i>Rencana Induk Pelabuhan (RIP) Nasional</i></li> <li>• <i>Rencana Induk Pelabuhan Dumai</i></li> </ul>	<ul style="list-style-type: none"> <li>• Assessment of conformity with Riau Province RTRW</li> <li>• Assessment of conformity with City of Dumai RTRW</li> <li>• Assessment of conformity with <i>Rencana Induk Pelabuhan (RIP) Nasional</i></li> <li>• Assessment of conformity with <i>Rencana Induk Pelabuhan Dumai</i></li> </ul>	<ul style="list-style-type: none"> <li>• Jika sesuai = Nilai 10</li> <li>• Jika tidak sesuai = Nilai 0</li> <li>• Jika tidak disebutkan = Nilai 5</li> </ul>
2	Technical Port	<ul style="list-style-type: none"> <li>• Operational Port</li> <li>• Basic Port Facilities</li> </ul>	<ul style="list-style-type: none"> <li>Assessment of the volume of ro-ro ship transportation &gt; 1000 GT</li> <li>• Assessment of ro-ro ship frequencies &gt; 1000 GT</li> <li>• Evaluation of ro-ro crossing piers &gt; 1000 GT</li> <li>• Assessment of operating time</li> <li>Assessment of landing waters including shipping lanes</li> <li>• Assessment of port ponds</li> <li>• Assessment of ship berth facilities</li> <li>• Assessment of the load weighing facility</li> <li>• Assessment of the passenger terminal</li> <li>• Assessment of passenger and item access to the dock</li> <li>• Assessment of offices for government office activities and services</li> <li>• Assessment of bunker fuel storage facilities</li> <li>• Assessment of water, electricity and communication installations</li> <li>• Assessment of road and railroad access</li> </ul>	<ul style="list-style-type: none"> <li>• Jika memenuhi 4 kriteria = Nilai 10</li> <li>• Jika memenuhi di bawah 4 kriteria = Nilai secara proporsional</li> <li>• Jika memenuhi 12 kriteria = Nilai 10</li> <li>• Jika memenuhi di bawah 12 kriteria = Nilai secara proporsional</li> </ul>

No.	Aspects	Indicators	Criteria	Assessing Method
			<ul style="list-style-type: none"> <li>Assessment of fire fighting facilities</li> <li>An assessment of the waiting area for motorized vehicles before boarding the ship</li> </ul>	
3	Requirement For International Shipping	International shipping requirements: ISPS and maritime environment (Marpol)	Port evaluation with ISPS certificate Assessment of ownership of Marine Pollution (Marpol) certificates	<ul style="list-style-type: none"> <li>Jika memenuhi 2 kriteria = Nilai 10</li> <li>Jika memenuhi di bawah 2 kriteria = Nilai secara proporsional</li> </ul>
4	CIQS Requirements	Immigration, Customs, Quarantine, Security, Health Requirements	An assessment of the availability of immigration requirements Assessment of the availability of Customs requirements Assessment of the availability of quarantine requirements Assessment of the availability of health requirements Assessment of the availability of Police posts	Jika memenuhi 5 kriteria = Nilai 10 Jika memenuhi di bawah 5 kriteria = Nilai secara proporsional
5	Accessibility and Integrity Antarmodes	Integration with road networks (accessible to national roads, highway) Integration with advanced transport networks (urban, inter-city and inter-provincial transportation) Transfer infrastructure (stop, information, connecting road, waiting room, parking, ticket)	Assessment of port integration with national roads Evaluation of harbor integration with highway Assessment of port integration with urban transport Assessment of port integration with inter-city transportation Assessment of port integration with inter-provincial transportation Assessment of facilities for continued transportation stops Assessment of advanced transport information facilities Evaluation of connecting road facilities from the terminal to the next stop Assessment of outsourcing facilities An assessment of the room facilities for the purchase of transport tickets Vehicle parking facility assessment	Jika memenuhi 2 kriteria = Nilai 10 Jika memenuhi di bawah 2 kriteria = Nilai secara proporsional Jika memenuhi 3 kriteria = Nilai 10 Jika memenuhi di bawah 3 kriteria = Nilai secara proporsional Jika memenuhi 6 kriteria = Nilai 10 Jika memenuhi di bawah 6 kriteria = Nilai secara proporsional
6	Port Management	Port business institution	Assessment of the availability of the Port Authority on the	Jika memenuhi 2 kriteria = Nilai 10

No.	Aspects	Indicators	Criteria	Assessing Method
			side of the port Assessment of the availability of seaports by the Port Authority	Jika memenuhi di bawah 2 kriteria = Nilai secara proporsional
		Control of assets	Valuation of port side assets Valuation of port side assets	Jika memenuhi 2 kriteria = Nilai 10 Jika memenuhi di bawah 2 kriteria = Nilai secara proporsional
7	Economic, Social Culture, And Enviroment	Community economic empowerment	An assessment of the existence of shops / kiosks / traders in the port area	Jika memenuhi 1 kriteria = Nilai 10 Jika memenuhi di bawah 1 kriteria = Nilai secara proporsional
		Harmony and balance with other activities	Assessment of the port is not close to residential areas Assessment of the port is not close to the Education area Assessment of the port is not close to the health area	Jika memenuhi 3 kriteria = Nilai 10 Jika memenuhi di bawah 3 kriteria = Nilai secara proporsional
		Environmental preservation	Assessment of the port does not require the development of land that includes conservation/protection areas Assessment of port development plans that do not require reclamation	Jika memenuhi 2 kriteria = Nilai 10 Jika memenuhi di bawah 2 kriteria = Nilai secara proporsional

Source: data analysis, 2019

**Table 2. Evaluation of Indicators on Aspects of Conformity with Planning Documents**

Indicator	Assessment criteria	Existing Condition		Weight	Assessment the port of Pier A	
		The port of sri junjungan city	Pier A of the Dumai Harbor		sri junjungan city	of the Dumai harbor
RTRW of Riau Province	Assessment of conformity with Riau Province RTRW	No specific mention of the location of the port in Dumai which will be used as a ferry port to serve the Dumai-Malacca (Malaysia) cross plan	No specific mention of the location of the port in Dumai which will be used as a ferry port to serve the Dumai-Malacca (Malaysia) cross plan	26,67%	5,00	5,00
City of Dumai RTRW	Assessment of conformity with the City of Dumai RTRW	Development of Wharf and Ferry Port (Ro-Ro) Terminal in Pangkalan Sesai Village (West Dumai District)	There was no mention of the Pelindo 1 port development plan as a crossing port	18,89%	10,00	5,00

Indicator	Assessment criteria	Existing Condition		Weight	Assessment	
		The port of sri junjungan city	Pier A of the Dumai Harbor		the port of sri junjungan city	Pier A of the Dumai harbor
National Port Master Plan (RIP)	Assessment of conformity with the National Port Master Plan (RIP)	There was no specific mention of the location of the port in Dumai which would be used as a ferry port untuk melayani rencana lintas Dumai-Malaka (Malaysia)	It did not specify the location of the port in Dumai which would be used as a ferry port to serve the cross plan Dumai-Malaka (Malaysia)	32,22%	5,00	5,00
Dumai Port Master Plan	Assessment of conformity with the Dumai Port Master Plan	In accordance with Minister of Transportation Decree No. KP 376 of 2006 concerning Determination of the Location of the Dumai Crossing Port in Pangkalan Sesai Village, Dumai Barat District, Dumai City	Regulation of the Minister of Transportation Number KM 39 of 2006 concerning the Dumai Port Master Plan: The Ro-Ro dock development plan is part of a long-term phase II development plan located in the passenger terminal area on the west side of the Dumai port area (next to the Dumai River). The proposed location of pier A which is planned to be the location of the Ro-Ro dock is different from the plan to develop the Ro-Ro dock in the passenger terminal area	22,22%	10,00	0,00
<b>Total Rating Indicator Aspect of Conformity with Planning Documents</b>					<b>7,06</b>	<b>3,89</b>

Source: data analysis, 2019

The calculation results obtained by the sum of all indicators on aspects of conformity with planning documents for the port of Bandar Sri Junjungan obtained a value of 7.06 while the dock A of the Dumai Port of PT. Pelindo 1 (Persero) Dumai Branch obtained a value of 3.89.

**Table 3. Rating Indicators on The Technical Aspects of The Port**

Indicator	Assessment criteria	Existing Condition		B	Assessment	
		Bandar Sri Junjungan	Pier A of the Dumai Harbor		P	D
Port operations	a. Evaluation of roro ship transportation volume > 1000 GT	Serving Dumai-Rupat ro-ro ferry crossings (domestic)	There is no ro-ro ferry service. There are only international ferries of Dumai-Malacca, Dumai-Port Dickson, Dumai-Muar	44,44%	10,00	5,00
	b. Rating of roro ship frequencies > 1000 GT	Frequency of daily ro-ro ferry crossings	There is no ro-ro ferry service. There are only international ferries of Dumai-Malacca, Dumai-Port Dickson, Dumai-Muar			
	c. Rating of roro	The maximum	A dock with 6000 GT			

Indicator	Assessment criteria	Existing Condition		B	Assessment	
		Bandar Sri Junjungan	Pier A of the Dumai Harbor		P	D
	crossing piers > 1000 GT	berth is 1250 GT				
	d. Assessment of operating time	Morning-evening operation hours (7:30 a.m. - 7:00 p.m.)	Morning-time operation hours (9:00 AM - 3:00 PM)			
Fasilitas pokok pelabuhan	a. Assessment of landing waters including shipping lanes	Cruise lines available	Cruise lines available	55,56%	8,33	7,50
	a. Assessment of harbor ponds	The depth of the pool is 5 meters	Depth of -5 MLws			
	c. Assessment of ship berth facilities	<ul style="list-style-type: none"> <li>• Loading and unloading system with movable bridge</li> <li>• The length of the pier is 52 m and the type of pier is dolphin</li> <li>• Number of <i>breasting</i> dolphin 3 pieces and number of mooring dolphins 3 pieces</li> </ul>	Square rubber <i>fenders</i> 20 cm x 20 cm length 3 m Moorings: Steel bolder capacity of 35 tons			
	d. Assessment of load weighing facilities	Weighing facilities are not yet available	Weighing facilities are available			
	e. Assessment of the passenger terminal	There is a passenger terminal	There is an international standard passenger terminal			
	f. Assessment of passenger and cargo access to the dock	Passenger access using trestle to the Ro-Ro boat dock	Passenger access using trestle lines			
	g. Evaluation of offices for government offices and services	There is an office area inside the passenger terminal	Office areas are being built within the port area			
	h. Assessment of bunker fuel storage facilities	There are no bunker fuel storage facilities	There are no bunker fuel storage facilities			
	i. Assessment of water, electricity and communication	Water, electricity and communication installation are available	Water, electricity and communication installations are available			
	j. Assessment of	There is only road	There is only road			

Indicator	Assessment criteria	Existing Condition		B		Assessment	
		Bandar Sri Junjungan	Pier A of the Dumai Harbor	P	D		
	road and or railroad access	access	access				
k.	Assessment of fire fighting facilities	The APAR facility is already available inside the passenger terminal	The APAR facility is already available inside the passenger terminal				
l.	Evaluation of the place to wait for a motorized vehicle before boarding the ship	There is a motorized waiting line before boarding the ship. The motorized waiting lane is not included with the roof cover	There is no waiting room for motorized vehicles before boarding the ship because it does not provide Ro-Ro ferry service				
<b>Total Assessment of Indicators for Technical Aspects of the Port</b>				<b>9,07</b>	<b>6,39</b>		

Source: data analysis, 2019

#### B: Bobot

#### P: Pelabuhan Bandar Srijunjungan

#### D: Dermaga A Pelabuhan Dumai

The calculation results obtained by the sum of all indicators on operational technical aspects for the port of Bandar Sri Junjungan obtained a value of 9.07 while the dock A of the Dumai Port of PT. Pelindo 1 (Persero) Dumai Branch received a value of 6.39. Based on the results of this assessment shows that from the aspect of technical readiness as a class 1 ferry crossing port for Ro-Ro vessels (in accordance with KM 53/2002 on TKN and Port Operational RPM) related to transport volume > 3000 people / day and 500 vehicles / day, frequency > 12 trips / day, jetty > 1000 GT, operating time > 12 hours / day, availability of 12 types of minimum basic facilities (anchored waters, port ponds, berthing facilities, cargo weighing, passenger terminals, passenger/vehicle access to the pier, offices, bunkers, water-electricity-communication installations, road / rail access, fire extinguishers, vehicle waiting areas), the Bandar Sri Junjungan port fulfills the specified criteria more than the Bandar Sri Junjungan Ferry Port. While dock A is the Port of Dumai managed by PT. Pelindo 1 (Persero) Dumai Branch is intended for conventional cargo ship ports and fast ferry docks for international passenger transport ports.

**Table 4. Evaluation of Indicators on Aspects of Compliance with International Shipping Requirements**

Indicator	Assessment criteria	Existing Condition		Weight		Assessment	
		Port of Bandar Sri Junjungan	Port of Bandar Sri Junjungan	Port of Bandar Sri Junjungan	Pier A of the Dumai Harbor		
International shipping requirement: ISPS and	Assessment of ports with ISPS certificates	Not yet carried out the ISPS-code certification process	Already have an ISPS-code certificate	100,00%	0,00		10,00

environment maritime (Marpol)	Assessment of Marine Polution (Marpol) certificate ownership	Not yet doing the Marine Polution (Marpol) certificate	Already have a Marine Polution certificate (Marpol)
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**Total Assessment Indicator Aspects of Compliance with International Shipping Requirements** 0,00 10,00

*Source: data analysis, 2019*

The calculation results obtained by the sum of all indicators on aspects of compliance with international shipping requirements for the port of Bandar Sri Junjungan obtained a value of 00.00 while the pier A Port Dumai PT. Pelindo 1 (Persero) Dumai Branch received a value of 10.00. Based on the results of this assessment shows that from the aspect of compliance with international shipping requirements (IMO-SOLAS), related to ownership of ISPS-code and Marpol certificates, the current position, Dumai Port already has both certificates. The Bandar Sri Junjungan Ferry Port has not yet carried out the certification process.

**Tabel 5. Penilaian Indikator pada Aspek Pemenuhan Terhadap Persyaratan CIQS**

Indicator	Assessment criteria	Existing Condition		Weight	Assessment	
		Port of Bandar Sri Junjungan	Pier A of the Dumai Harbor		Pelabuhan Bandar Sri Junjungan	Dermaga A Pelabuhan Dumai
Immigration, Customs, Quarantine, Security, Health Requirements	a. Assessment of the availability of immigration requirements	Immigration requirements not yet available (there are only immigration rooms not yet operational)	Immigration requirements are available and operational	100,00%	6,00	10,00
	b. Assessment of the availability of customs requirements	Customs requirements are available but only operate on arrival of ships from Batam	Customs and customs requirements are available			
	c. Assessment of the availability of quarantine requirements	The quarantine and fisheries quarantine checkpoint rooms are available	Fisheries and agriculture quarantine requirements are available and are already operating			
	d. Assessment of the availability of health requirements	Health quarantine checkpoint rooms are available	Health quarantine requirements are available and are already operating			
	e. Assessment of the availability of police posts	The are already post and security officers	The are already post and security officers			
<b>Total Assessment Indicator Aspect of Fulfillment of Requirements CIQS</b>					<b>6,00</b>	<b>10,00</b>

*Source: data analysis, 2019*

The calculation results obtained by the sum of all indicators on aspects of compliance with the CIQS requirements for the port of Bandar Sri Junjungan obtained a value of 6.00 while the dock A of the Dumai Port of PT. Pelindo 1 (Persero) Dumai Branch received a value of 10.00. Based on the results of this assessment shows that from the aspect of providing CIQS facilities, dock A at the Dumai Port currently serves fast ferry ships to Malacca, Port Dickson and Muar, so that the provision of CIQS facilities for passengers is complete, but CIQS is not yet available for vehicles / goods. As for the Port of the Bandar Sri Junjungan crossing, there is only a security inspection facility for passenger baggage available and rooms for quarantine, immigration and customs have been prepared.

#### Resume Evaluation of Potential Aspects of Ferry Ports

**Table 6. Total Assessment of Aspects of Potential Ferry Ports**

No.	Aspect	Aspect Weight	Indicator	Indicator Weight	Assessment	
					Port of Bandar Sri Junjungan	Pier a of the Dumai Harbor
1	Compliance with Planning Documents	13,29 %	Riau Province RTRW	26,67%	5,00	5,00
			City of Dumai RTRW	18,89%	10,00	5,00
			National Port Master Plan (RIP)	32,22%	5,00	5,00
			Dumai Port Master Plan	22,22%	10,00	0,00
<b>Total Value Aspects of Conformity with Planning Documents</b>					<b>7,06</b>	<b>3,89</b>
2	<b>Technical Port</b>	12,90 %	Port operations	44,44%	10,00	5,00
			Basic port facilities	55,56%	8,33	7,50
<b>Total Value of Technical Aspects of the Port</b>					<b>9,07</b>	<b>6,39</b>
3	<b>Fulfillment of International Shipping Requirements</b>	17,26 %	Persyaratan pelayaran internasional: ISPS dan lingkungan maritime (Marpol)	100,00 %	0,00	10,00
			<b>Total Value Aspects of Compliance with International Shipping Requirements</b>			
4	<b>Compliance with CIQS Requirements</b>	15,67 %	Immigration, Customs, Quarantine, Security, Health Requirements	100,00 %	6,00	10,00
			<b>Total Value of Aspect of Fulfillment of CIQS Requirements</b>			
5	<b>Intermodal Accessibility and Integration</b>	13,10 %	Integration with road networks (accessible to national roads, toll roads)	37,04%	5,00	5,00
			Integration with advanced transportation networks (urban, inter-city and inter-provincial transportation)	31,48%	10,00	10,00
			Transfer infrastructure (stop, information, connecting road, waiting room, parking, ticket)	31,48%	5,00	1,67
			<b>Total Value of Intermodal Accessibility and Integration Aspects</b>			
6	Port Management	13,10 %	Port business entity institution	44,44%	10	10
			Control of assets	55,56%	10	10



No.	Aspect	Aspect Weight	Indicator	Indicator Weight	Assessment	
					Port of Bandar Sri Junjungan	Pier a of the Dumai Harbor
<b>Total Value of Aspects of Port Management</b>					<b>10,00</b>	<b>10,00</b>
7	Economic, social	14,68 %	Community economic empowerment	44,44%	10,00	10,00
	Culture and the		Harmony and balance with other activities	29,63%	3,33	3,33
	Environment		Environmental Conservation	25,93%	0,00	10,00
<b>Total Value of Economic, Social, Cultural and Environmental Aspects</b>					<b>5,43</b>	<b>8,02</b>
<b>TOTAL PENILAIAN</b>					<b>TOTAL ASSESSMENT</b>	<b>6,02</b>

*Source: data analysis, 2019*

## Conclusion

Based on the calculation results of the assessment of the potential aspects of the Ro-Ro crossing port, the total value of the Bandar Sri Junjungan port is 6.02 while the pier A of the Dumai port is 7.85. It can be seen that pier A of the Dumai port has a higher value than Bandar Sri Junjungan port, in other words pier A of the Dumai port is better equipped to serve the Dumai-Malacca Ro-Ro crossing both technically and institutionally of its operations, including meeting international shipping requirements and CIQS requirements, it is only necessary to construct the Ro-Ro ship dock and add several other facilities that are possible to be carried out in a fast period of time.

However, if focus of the regulatory, planning and historical aspects, the Bandar Sri Junjungan Port is more appropriate to be designated as a port that serves the Dumai-Malaka Ro-Ro crossing, but the Bandar Sri Junjungan port requires preparation, repair and addition of physical infrastructure and technical facilities for the port. considerable capacity (Ro-Ro ship docks, passenger terminals, warehousing and stacking fields), institutional, human resources including the need to prepare international shipping standard IMO-SOLAS (ISPS-code and Marpol) certificates) and CIQS (Custom, requirements) Immigration, Quarantine, and Security) in coordination with relevant agencies such as the Dumai Branch Customs Office, Dumai Branch Immigration Office, Dumai Port Class III Health Office and the Agriculture and Fisheries Quarantine Office. The addition of supporting facilities and compliance with international shipping requirements and CIQS requirements at the Bandar Sri Junjungan port requires time allocation that is not short because it relates to regulations, standard requirements and coordination between agencies.

Moreover, with the considerations above, it can be recommended that the location of the pier A of the Dumai Port can be determined as the crossing port of the Ro-Ro crossing Dumai-Malacca to the port of Bandar Sri Junjungan ready technically port infrastructure and facilities, institutional, human resources including fulfillment of shipping requirements international and CIQS.

Thus, if the Port of Bandar Sri Junjungan has completed and is ready to fulfill all aspects to serve the Dumai-Malacca Ro-Ro crossing, the crossing of the Dumai-Malacca crossing can be moved from dock A of the Dumai Port to the Port of Bandar

Sri Junjungan. Furthermore, along with the needs of the development of potential transportation, other crossing can be developed (not only Dumai-Malacca).

After the crossing of the Dumai-Malacca Ro-Ro crossing is moved to the Port of Bandar Sri Junjungan, the forward development of pier A of the Dumai Port can continue to serve the Ro-Ro ferry crossing only for freight trucks to service the Dumai-Tanjung Bruas Port (Malacca).

### **Acknowledgement**

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## **O-BAHN, Intermodal Transportation Solutions in Jakarta**

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### **Abstract**

*O-Bahn is a bus concept transportation mode that moves with a bio-diesel drive equipped with guidance system on the wheels. O-Bahn can run on regular streets and guideway such as trains that run on rails. The O-Bahn will apply in Jakarta, which has a high population density. This application is carried out using methods that are reviewed in terms of sociology, economics, transportation, and environment. Where Jakarta requires new transportation that is environmentally friendly and also timely in operation. Therefore, the O-Bahn is suitable for safe, time-efficient and high-capacity travel. Based on the survey results 97% of the people agreed to the implementation of new transportation on time and the percentage of 98.5% of the people agreed to the implementation of new environmentally friendly transportation in Jakarta. And the results of air pollution percentage in Jakarta shows that all regions in there have an air pollution standard index (ISPU) above 74 starting from 9 September 2019. This means that air quality in Jakarta is poor. Jakarta has a noise threshold value for working comfortably for 8 hours in one day which is 85 dB, and passenger capacity data is 160 with O-Bahn headway shorter than Transjakarta BRT. So, O-Bahn efforts to be a solution for intermodal transport integration to reduce congestion and various pollution solutions for the creation of a safe and comfortable transportation system.*

**Keyword:** Transportation, O-Bahn, Integration, Intermodal

### **Introduction**

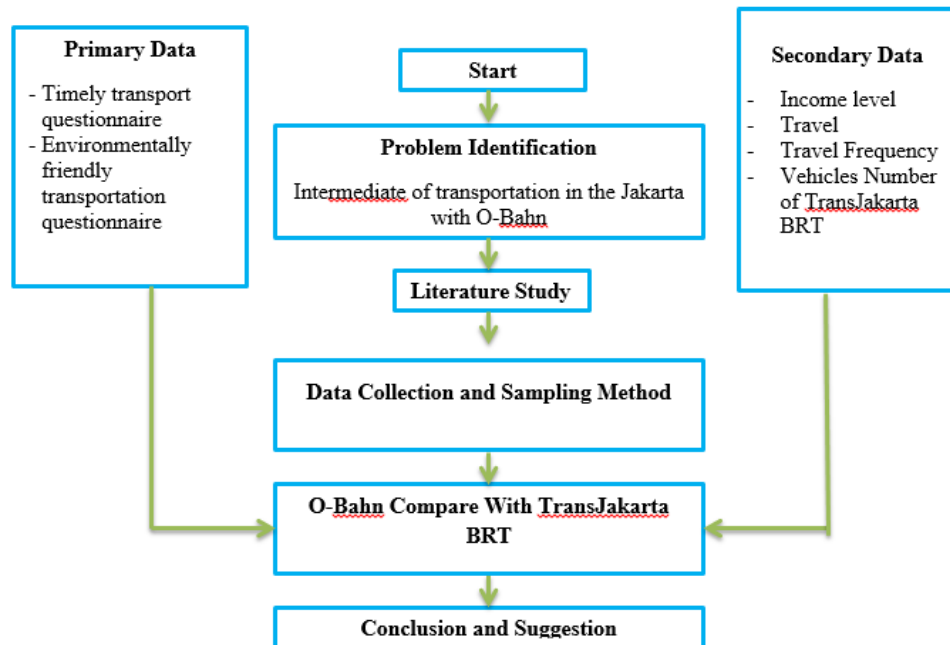
Jakarta with an area of 661.52 km<sup>2</sup> and has a population of 10,374,235 people in 2017 has several internal problems (Wikipedia 2019). Internal problems appear because of an imbalance between the large population living and the extent of the residence. In the end, social and economic inequality also appear. One result is the increased use of personal vehicles causing congestion everywhere. From these problems can trigger other problems. Personal vehicles that mostly use fuel oil will remove carbon gas from the engine. Carbon gas does not have a direct impact on living things in the environment. However, carbon gas contained by the air will cause other impacts on the environment such as global warming and others. Therefore, carbon gas can pollute the air. In addition, the level of use of private vehicles will also have an impact on one's psychic. This can happen because it is seen from the habits of the Jakarta people who tend to be impatient when stuck in traffic. Someone emotional who arises due to the condition of those who are stuck in traffic will cause stress. So, people in Jakarta find it difficult to calculate travel times

and road conditions that will be traversed. From the condition they are stuck in traffic causing the effectiveness of time also decreases.

From the habits of the people of Jakarta, one solution that can be applied is by applying the O-Bahn. O-Bahn is the bus transportation that use special lanes as passenger transfer facility. In developed countries like Australia, the O-Bahn has long been applied. With a special lane, the O-Bahn can go faster than buses and other road vehicles. The number of private vehicles will be easier to reduce, because the psychological condition of the people of Jakarta in general is more concerned with time. O-Bahn can be a solution for those who want to optimize time and money.

The purpose of this study was to determine the effect if the implementation of the O-Bahn as an integrated intermodal mass transportation solution in Jakarta. The simulation of O-Bahn implementation is done by choosing Jakarta as an object because Jakarta is the only city with complex transportation in Indonesia. By still paying attention to general aspects such as the timeliness required by the community, the O-Bahn can compete with other transportation in Jakarta. From the analysis of the impact of O-Bahn in Jakarta, relationships, cost, and timeliness owned O-Bahn can be affected. If that happens, the O-Bahn will develop significantly. In this study will answer the problem formulation as follows: (1). Simulation of O-Bahn implementation in Jakarta transportation? (2). What is the impact of the application of the O-Bahn in Jakarta? (3). What are the environmental, economic and transportation impacts in Jakarta?

## Methods



Source: researcher document

**Figure 1. The Flow Chart of Methods for the Simulation of O-Bahn**

Simulation of the application of O-Bahn is used to integrate intermodal transportation in the city of Jakarta. The O-Bahn influence study uses a sampling

method to collect data. Based on primary data and secondary data obtained, an analysis will be carried out regarding the planning of O-Bahn transport for terminal relations Pulo Gadung - Halim Perdanakusuma Airport. The method used for the effect of O-Bahn implementation in Jakarta by comparing Transjakarta BRT data with BRT O-Bahn

### **1. The Impacts on Sociology**

Sociology is the systematic study of human behavior, the groups to which one belongs, the societies that human beings create, and within which their lives unfold (Hess et al. 1990). Congestion that occurs in Jakarta increases stress and encourages people to take actions such as breaking the path that should not be passed to create time efficiency for the community itself. With the O-Bahn, the community is expected to begin to abandon this behavior. Especially with the O-Bahn, the stress level of the community due to congestion is reduced or even lost.

### **2. The Impact on Economic**

The economy is a method used by a person or group to use resources to obtain various commodities and products so that they can enjoy by the community (Paul Anthony Samuelson 1948). Prosperity can realize where transportation networks connect people and businesses with jobs, markets, and services in a safe, reliable, and timely manner. The implementation of the O-Bahn system aims to continue to create community prosperity and foster an economy increasingly conducive and diverse. The ways that do are:

- a. Speed up the flow of population movements which were previously hampered by the flow of congestion on the highway.
- b. Increase capacity in inner-city ring lines, improve traffic flow on these roads and enable better use and priority of public transport.
- c. Increase intersection performance for vehicles entering from the eastern edge to the City.
- d. Reducing vehicle conflicts by separating bus/traffic lanes, fewer crossing movements, and better crossing operations to minimize user accident risk.

### **3. The Impact of Transportation**

Transport refers to the activity that facilitates the physical movement of goods as well as individuals from one place to another. O-Bahn is a new mode of transportation that combines bus concepts with special lanes such as railroads. The implementation of O-Bahn in Jakarta will have an impact on other transportation. In terms of the development budget, O-Bahn will indeed be higher than the Bus Rapid Transit (BRT) service. Because there will be more infrastructure procurement, an elevated lane is possible. The side of O-Bahn capacity is almost the same as Transjakarta BRT, which is a maximum of 160 people, but the difference is in the frequency of arrivals and headways of both. The O-Bahn line can integrate several other transportation modes, so that the

population transfer service flow can run smoothly, safely, and comfortably.

The following are corridor table data on the Transjakarta BRT

**Table 1.** Transjakarta Corridor Table

Corridor	Route	Number of Shelters	Route Length (km)	Type Route	Description
1	Blok M- Kota	17	12,9	Regular	-
2	Harmoni- Pulogadung	32	24,2	Regular	-
3	Kalideres-Pasar Baru	16	19	Regular	-
4	Pulogadung- Dukuh Atas 2	17	11,85	Regular	-
5	Ancol-Kampung Melayu	18	13,5	Regular	-
6	Ragunan-Dukuh atas 2	20	13,3	Regular	-
7	Kampung Rambutan- Kampung Melayu	14	12,8	Regular	-
8	Lebak Bulus- Harmoni	22	26	Regular	-
9	Pinang Ranti-Pluit	27	29,9	Regular	-
10	Tanjung Priok-PGC 2 (Cililitan)	22	19,4	Regular	-
11	Kampung Melayu- Pulo Gebang	16	15	Regular	-
12	Pluit-Tanjung Priok	25	23,75	Regular	-
13	Ciledug-Kapten Tendean	12	9,3	Elevated (18 s.d 23 m)	Start operating on August 13th, 2017

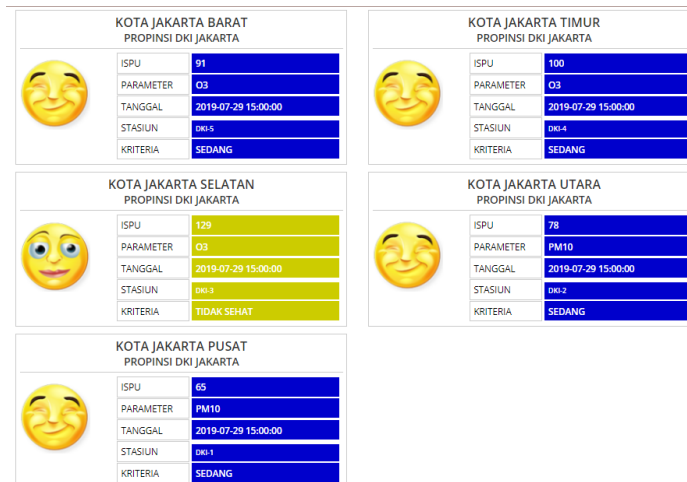
Source: <http://transjakarta.co.id/produk-dan-layanan/infrastruktur/koridor>

Based on the table above, the Jakarta / TransJakarta BRT service has a fleet of 1347 units with a total of 13 corridors. The corridor one-stop reduced to 17 stops due to the MRT project. Pluit stop for corridor 12 closed. So that corridor 12 only serves until Penjaringan stop then directly to the Pluit Landmark Stop.

#### 4. The Impacts on Environmental

In "Economic Sustainability and the Preservation of Environmental Assets," Foy explains that from an economic standpoint, sustainability requires that current economic activity not disproportionately burden future generations (John Morelli 2011). Impacts are a combination of natural resources such as land, water, air, solar energy, minerals, and flora and fauna in a place. All such components have functions that are important and complementary. However, if there is one component whose pollution index exceeds the limit, it will disturb other components. Like in Jakarta. At present, the government is active in overcoming air pollution in Jakarta, which is mostly caused by vehicles. From the data obtained from the ministry of environment and forestry which in this case is handled by the director of air pollution control, all six regions in Jakarta

have an air pollution standard index (ISPU) above 74 as of 9 September 2019, which means that air quality in Jakarta is not good (Kepmen LH No: KEP-45/MENLH/10/1997).



Source: <http://iku.menlhk.go.id/index/>

**Figure 3. Standard Air Pollution Index in Jakarta**

Therefore, with the implementation of O-Bahn, it will not only reduce congestion but also reduce vehicle use, which is considered to be the cause number one air pollution in Jakarta. O-Bahn with more capacity than BRT is also an additional reference in reducing vehicle use and increasing community mobility. Besides air pollution, in Jakarta, it also has noise pollution. Sound pollution can be in the form of noise or unwanted noise, which is an exposure that can pollute the environment. Noise is given a different treatment in handling other pollutants such as chemical pollution and air pollution. Sound can be contaminated when it exceeds the threshold that can be heard normally to cause interference to humans and other living things. The noise threshold value for working comfortably for 8 hours in one day is 85 dB. Sound pollution in Jakarta caused by vehicle sounds such as bajaj and other high-volume vehicles. As a result of noise pollution makes the surrounding area noisy and unpleasant. Direct sound pollution can cause physical deafness and psychological stress.

134 of respondents 76 were male and 58 were female. Most of respondents were between 18 and 24 years old. Therefore, most of them (88 people) were using Commuter Line Train (KRL), more than half of them (61 people) were using Mass Rapid Transit (MRT), and 50 people were using Transjakarta (BRT). About half of respondents (61 people) were high school graduates. Significant number of respondents were university graduates (68 people).



## The Result

Data collecting divided two kinds, namely:

### 1. Primary Data

Primary data is data taken directly. Primary data are data that are collected for the specific research problem at hand, using procedures that fit the research problem best (Hennie et al 2005).

The data we got from the field survey conducted, we got two data, the first data produced a questionnaire with the percentage of the community agreeing that if Jakarta applied new transportation innovations on time as much as 97% and the community disagreed at 3%, and the second data produced a percentage from the questionnaire the community agreed at 98.5% and disagreed at 1.5% that in Jakarta it was suitable to implement new transportation innovations that were environmentally friendly.

### 2. Secondary of Data

Secondary of data is data that already exists and is obtained from the agencies concerned, supporting field observations (includes a map of the route and number of passengers).

**Table 2. Average the Cost for BRT, LRT and LRT in Developed Countries and Developing Countries**

Type	Lower Income Countries (2013 \$/Km)	Higher Income Countries (2013 \$/Km)
BRT Average	\$11,504,575	\$10,054,824
BRT Gold	\$16,312,504	n.a
BRT Silver	\$9,528,467	\$9,729,603
BRT Bronze	\$9,612,943	\$10,380,042
LRT	\$25,373,992	\$37,496,032
HRT	\$87,429,209	\$433,660,969

Source: <https://brtguide.itdp.org/branch/master/guide/why-brt/costs>

From the data obtained, a comparison between BRT (all classes), LRT, and HRT saw from the lowest income, BRT income with LRT has a difference of almost 50%. With a BRT capacity that is less than the O-Bahn, the O-Bahn has the opportunity to be able to reduce the difference. Of course, with a little more expenditure than BRT.

**Table 3. Comparison of Strengths and Weaknesses of BRT and O-Bahn**

Items	BRT	O-Bahn
System and operation		
Capacity	+	0
Right Of way width	0	+
Dynamic Performance	0	0
Permanence way exclusivity	+	++
Tunnel operation ability	0	+
Safety	+	++
Need for new technology	0	-

Items	BRT	O-Bahn
Level of service		
Need to transfer	0	0
Reliability of service	++	+
Comfort (seats, riding)	+	+
Cost		
Investment cost	-	-
Operating cost	+	+
Impacts		
Image, land use impacts	0	+
Noise	0	0

Note: - - = very much inferior, - = inferior, 0 = no difference, += superior, and += = very much superior.

Source: Description and Evaluation of a New Concept The O-Bahn Network

If the frequency of the Trans Jakarta BRT is 1 hour = 10 buses, then the headway reaches 6 minutes. It is obtained from calculations using the formula:

$$H = 1/10 \times 60 \text{ minutes}$$

If the O-Bahn frequency is the same as BRT, but the speed is higher, it can be possible that the O-Bahn headway will be shorter than BRT. It found out the number of passengers per day, and careful calculations are needed. By using the calculation formula:

Number of passengers per day = (density population × 100) ÷ passenger capacity (160)

From the above calculation formula, resulting in the number of passengers per day to Jakarta as follows:

**Table 4. O-Bahn Passenger Assumption Percentage**

City	Percentage of The Population	Population Density Per Km2	Total Passenger Per Day
South Jakarta	0,23	2747	1716
East Jakarta	21,47	15763	9851
Central Jakarta	27,88	15385	9615
West Jakarta	24,37	19516	12197
North Jakarta	17,17	12146	7591

Source:

<https://jakarta.bps.go.id/publication/2018/08/16/67d90391b7996f51d1c625c4/provinsi-dki-jakarta-dalam-angka-2018.html>

## Discussion

O-Bahn and BRT have some similarities. Like convenience, capacity and performance are not much different, can be seen in the comparison table because the facilities used are the same, namely the bus. The O-Bahn dimension is slightly

larger, due to the dimensions of the bus, which requires space for the guidance system. Safety BRT is minimal; as a result of non-sterile lines, the barrier between day-day public is minimal. Guaranteed timeliness is the factor main for passengers preferring O-Bahn. The O-Bahn income aspect has opportunities for better income, such as in the City of Adelaide. Passengers prefer transportation that is more comfortable, safe, and on time. Accumulation of O-Bahn comparison with BRT can conclude that O-Bahn has better characteristics than ordinary busway / BRT systems.

**Number of passengers per day = (population density × 100) passenger capacity (160)**

Guidance system makes passenger service more comfortable and safer. Plans to realize O-Bahn for integration with other modes (for example Aircraft, KRL, and BRT), facilitate the movement of people more smoothly. The private transportation user sector can reduce, which has become the biggest factor in congestion in the city of Jakarta.

### **Advantages and Disadvantages**

#### The Advantages of O-Bahn

1. Ability to use larger vehicles that have a large capacity and more comfortable trips;
2. Ability to operate trains, produce lane capacity much higher and lower unit operating costs (greater driver productivity)
3. Possibility of using electrical traction with many advantages over diesel motors (performance, cleanliness, noise, exhaust, the safety of operations in tunnels, etc.)
4. Narrow road, especially useful in high-density urban areas, in bridge areas, and tunnels
5. Greater security due to positive guidance and the possibility of fail-safe signaling.
6. The capacity of passengers is bigger and safer in transporting

#### The Disadvantages of O-Bahn

1. Requires a higher investment; therefore, the network is unlimited;
2. Not compatible with other traffic in road operations;
3. More difficult route transfers (often not possible) (example: Temporary detours)
4. Vehicles cannot pass each other except existing offline stations
5. Traffic transit units (vehicles or trains) cannot pass

## Conclusion

Every decision regarding the mode that is most appropriate for a particular transportation corridor needs to be made based on functional requirements. O-Bahn is one of the choices of several modes of transportation that is possible. O-Bahn mode is more secure compared to BRT in the field of safety and security. Experience from countries that already operate O-Bahn that is, this model is feasible and can be an effective solution. It combines flexibility and low bus operating costs with a smooth ride and perceived safety features. With the complexity of transportation modes in the city of Jakarta. O-Bahn seeks to be an intermodal integration solution to reduce congestion, and various transit solutions need to be assessed to show the wisdom of investment decisions.

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## **PNBP Issuance Analysis of Supervision Card Toward People Transport Licensing in Semarang City**

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### **Abstract**

The failure of big cities in Indonesia, especially in public transportation was characterized by the deterioration in its services quality, thus impacting on the decline in the number of passengers. Plus, the policy of providing mass transportation tended to override the role of existing transportation (*angkot* and *bus*), so this needed special attention from the government. This research used a qualitative method.

Results of the study: 1) In Semarang City, the use of public transportation such as buses and city / *angkot* transportation continues to decline every year. This happened because of an increasing economy and purchasing power of the people so that private vehicle ownership, which offered greater flexibility of movement was also increasing, and public transportation was increasingly being left out 2). The reach of existing public transport services such as road - based (non-rail) *angkot* was wider and more flexible. 3) The application of public transportation without any support of good existing road - based transport updates, would have little chance of success. 4) A good existing transportation service could be a first last mile trip service, so it was expected to increase the use of public transportation. 5) Reforming existing transportation could be an initial step to encourage people to use public transportation.

Suggestions: Commitment to realize the excellent service, as in the public service law. Permitted for people transportation vehicles in principle was enough for route licenses / operations issued / a five-year validity period and a surveillance card that was extended every year. 2) Commitment to supervise and provide reward and punishment for monitoring results both to the licensing service unit. (3) A cooperation agreement / regulation needed to be made between the regions (*Pemkot*) and the ministry, to synchronize the data periodically, so it could supervise nationally and the use of data was together for evaluation of people transportation policies.

**Keywords:** Licensing, Supervising Cards, and Transportation.

## **Background**

The publish of LAW 9/2015 about the Second amendment of LAW 23/2014 on the Government (regional autonomy), is the regional authority to manage the resources include natural resources, human resources and technology in order to realize a prosperous society.

The area demanded its ability and readiness in both the organizational and the apparatus aspects in responding to the existing resources to give an ideal contribution to the local indigenous revenue (PAD), including one of the efforts to optimize the area's assets such that it is capable of being contributor (PAD / local indigenous revenue), which is potential. Suppose: the management of the parking tax will be managed by the finance and regional assets Office (DPKAD) while the parking levy and surveillance maintenance card of the transportation permission is managed by Provincial Road Transport and Traffic Unit (DISHUB).

The failure of major cities in Indonesia, especially in the city of Semarang to provide good public transportation, is characterized by the condition of public transportation which is getting worse with the decline in service quality and the decrease of the total passengers in public transportation.

Moreover, the policy to offer mass transit that tends to override the role of existing transport (Angkot and bus). It is necessary to get special attention from the government because it is undeniable that public transportation is still needed and still have the potential to be developed. Based on the background of the problem above, it is necessary to conduct a study with the title " An issuance analysis of supervision card towards people transport licensing in Semarang City". In this case, a research problem that formulated in this study: how is the issuance of supervision cards in the transport licensing of people in Semarang?

## **Literature Review**

### **1. Policy Analysis**

According to William N Dunn (2000), policy analysis is an applied scientific discipline that uses various research methods and arguments for generating and moving relevant information to the policy so that it can be used at level in order to solve policy issues.

Policy analysis is taken from a variety of disciplines and professions that are descriptive, evaluative, and prescriptive. As an applied scientific discipline, public policy analysis borrows not only social and behavioral sciences but also public administration, law, ethics and a range of branches of analytic systems and applied mathematics. This policy analysis is expected to be able to generate information and reasonable arguments about: 1) values that constitute a benchmark problem resolved, 2) facts secured as a limiting or enhancing value, 3) actions that its application generates value, to produce these three things an analyst can use one or more of the approaches that exist, among others: empirical, valuative, and normative.

The empirical approach is emphasized mainly on the explanation of the causes and consequences of a particular public policy. This approach results a descriptive information. The evaluative approach itself is emphasized on determining the weight or value of some policies, in this approach the development of these disciplines that often become the result of applied research and not as a cause. The normative approach is committed to action recommendations, resulting in prescriptive information as well as having the results of recommendations on what policies should be adopted for public issues.

## **2. People Transport**

### **a. Route network**

Based on the technical guideline of Directorate General of Transportation Dar, 1996, the route network is a group of routes that become a unitary service in people transportation. Based on the characteristics of its service and the area connected the route is divided into: (a) The main route serves transportation between major regions, between the main areas and supporting areas with the features of a fixed shuttle trip with of mass transportation. (b) The branch route serves transportation between the supporting areas, between the supporting area and the residential area C. The twig route serves transportation in a residential area. (c) The direct route serves the permanent, mass and direct inter-region transportation.

### **b. Type of route network**

Based on Law No. 22 of 2009, article 145-article 157 governing people transportation by vehicle on fixed and regular routes and public transportation of people with motorized vehicles is not on route. The type of transportation Service route network of people with public transportation on fixed and regular route is carried out in route network consisting of: (a) inter-provincial city route, route through more than one region of level I local province. (b) Inter-city routes in the province, which is the route that through the regional level II in one region of the level I local province. (c) The city route, which is a route that is wholly within one region of level II regional municipality or the route in the special capital region of Jakarta. (d) The route crossing the country, which is the route through the state boundary. Inter-State border networks are determined by ministerial decree based on inter - state agreements.

While the Transportation Service route network of people with public motor vehicles not in the route consists of: (a) transportation of people using taxis; (b) The transportation of people with specific goals; (c) Transportation of people for tourism purposes; and (d) Transportation of people in certain regions.

## **Methodology**

This study employed a qualitative descriptive approach. Data Sources: Primary Data sources, (interview results, and observations) and Secondary Data Sources (local legal products and literature books, as well as documents on the issue). Data collection techniques with interviews, and library studies, and discussion (FGD). Data analysis techniques used are interactive model analysis, namely data reduction, data presentation and conclusion withdrawal. Legality of data, using criteria, namely: Credibility, Transferability, Dependability, and Confirmability.

## **Results and Discussion**

The results of the locus study are; in the Provisions for routes and general motor vehicle requirements are determined based on LLAJ RI Law No. 22 of 2009 articles 145 to articles 149 and KM No. 38 of 2007, PP No. 41 of 1993 Article 4 and Article 5. Route networks are established by:

1. Minister of Transportation or appointed official, for cross-border route network in accordance with international agreements;
2. General Director, for route networks that go through more than one provincial region;
3. Governor, for route networks that pass between regencies / cities in one province;
4. The Governor of the Special Capital Region of Jakarta, for the route network that is entirely within the Special Capital Region of Jakarta.
5. Regent, for route networks that are entirely within the district area;
6. Mayor, for all route networks in the City area.

Transportation permits are regulated according to LLAJ RI Law No. 22 of 2009, article 176 and article 179 about permits for organizing people transportation, LLAJ RI No. 14 of 1992, article 41 about Business Transportation Permits and Government Regulation of Republic Indonesia No. 41 of 1993, Article 18 to Article 25. Whereas licensing for route issuance is regulated by PP No. 41 of 1993, Articles 26 to 34, KM No. 35 of 2003 organizing people transportation on the road by public transportation.

Route Typology. From various rules and explanations about the typology of the route, the characteristics of the route (function, service, classification, type) and the type of mode which is used, can be tabulated as follows:



**Tabel 1: Route Typology Table**

No	Route network	Route classification	Types of areas served	Service types	Mode used	Terminal types
1	AKAP	Direct	Serves the permanent, mass and direct inter-region transportation.	Fast, scheduled	Big bus for <i>raya</i> and big city, medium bus for medium and small city.	Availability of A passenger's type at the beginning of departure, stopover, and terminal destination.
2	AKDP	Direct	Serves the permanent, mass and direct inter-region transportation.	Fast, scheduled	Big bus for <i>raya</i> and big city, medium bus for medium and small city.	Availability of at least B passengers' type at the beginning of departure, stopover, and terminal destination.
3	Cities	Main, branch, twigs	Serves transportation between major regions, between the main areas and supporting areas with the features of a fixed shuttle trip with of mass transportation.	Fast, Slow, Scheduled	Big bus until public passengers' cars	Availability of at least B passengers' type at the beginning of departure, stopover, and terminal destination.
4	Countryside	Branch, twigs		Slow, Unscheduled	Medium bus until public passengers' cars	Availability of at least C passengers' type at the beginning of departure and terminal destination.

### **Transport Vehicle Licensing Service Procedure.**

The service system for transporting people in Central Java Province delivers to the Regional Regulations, Governor Regulations and Head of Office. Licensing services are carried out at the Provincial Transportation Agency. Types of licensing services at the Provincial Transportation Agency are:

1. New Route License Approval (SPIT), with conditions:
  - a. Already have administrative requirements, namely: a business permit, an approval letter, owning or driving away a vehicle by attaching the vehicle registration and test book, managing the storage facility/pool of the vehicle,

owning or cooperating with the maintenance facility, a request for a company, a decree from the transportation service/city,

- b. Already have technical requirements that are still higher than the number of vehicles in the route.
- c. Has been considered by the head of district/city transportation agency/office.

If asked for permission from the head of the Central Java Province of the road traffic and transportation service, a license will be issued:

- a. A route permit approval letter;
- b. Letter of Execution of Route Permission
- c. Supervisory Cards; and
- d. Travel Time Cards.

This route permit will be valid for 5 years and can be extended. The supervisory card and travel permit are valid for 1 year and can be extended every year.

2. Operating Permit Approval Letter (SPIO)

- a. Application letter;
- b. Recommendations from district/city transportation offices/offices;
- c. Copy of STNK (vehicle license, Test Book, Business License, Paid Jasa Raharja (government insurance company), Organda Membership (which is still valid);
- d. Original SPIO;
- e. Company Commitment.

If the application is approved by the head of the Central Java Province of the road traffic and transportation service, the government will issue:

- a. a decision on an operating permission;
- b. Letter of operation permit implementation;
- c. Attachment to decision letter of operation permit;
- d. Supervisor Card. This operating license will be valid for 5 years and can be extended.

3. Licensing for route extension/operating permission, with the following conditions: a. Recommendations from district/city transportation offices/offices; b. Application letter; c. Copy of KTP (National Identity Card), STNK (Vehicle license), Test Book, Business Permit, Paid Raharja Services.

4. Exchange Vehicle Composition (in 1 company) with the following conditions: a. Application letter; b. Copy of Vehicle license, Test Book, Business License, paid raharja services; c. Copy of route permit decision.

5. If the application is approved by the head of the Central Java Province of the road traffic and transportation service, a letter will be issued: 1) a route permit decree; 2) Letter of route permit implementation; 3) Attachment of route permit decree; 4) Supervisory Card; 5) Travel Time Cards.
6. Extension of the Supervisor Card and the Travel Hour Card (KJP) with the following conditions: a. Application letter; b. Copy of STNK (Vehicle license), Test Book, Business License, Paid raharja services; c. Copy of decision of route permit/operating permit; d. Copy of Supervisor Card and Travel Time.

The condition of people transportation is getting worse with the decline in the quality of services and a decrease in the number of people transporting passengers, due to the inadequacy of the people transportation industry in following the development of community needs and market conditions.

Transportation of people is still considered ineffective in providing services to the community. Unfair competition that occurs between people transporting people worsens existing services. Meanwhile, the government's efforts in implementing new strategies in improving city mobility have not yet succeeded in bringing meaningful changes.

On one hand, the government's treatment of the public transport industry in each city is different. The lack of interference and investment from the government for the development of public transportation is one reason why the public transport industry in urban areas cannot develop properly.

Public transportation is as the government's obligation facility for citizens to meet their mobility needs. In Semarang City, the use of public transportation such as buses and city / *angkot* transportation continues to decline every year. This is due to an increase in the economy and the purchasing power of the people so that private vehicle ownership, which offers higher flexibility of movement, is also increasing, and public transportation is increasingly being left out.

The issuance of Law 9/2015 is a regional authority to manage its resources, both natural resources, human resources and technology to create a prosperous society. Regions, especially in Semarang City, their ability and readiness both in organizational aspects and their apparatus in responding to available resources in order to be able to make an ideal contribution to Regional Original Revenue (PAD), including one of the efforts to optimize regional assets in such a way that they are able to become contributors (PAD / Regional Original Revenue), which is potential. For example, the Non-Tax State Revenue (PNBP) Issuance of People's Transportation Licensing Control Card for Bus / Passenger Vehicles in 2015-2019, has decreased. You can see the table below.

**Table 2. Non-Tax State Revenue (PNBP) Issuing Card for Supervision of Implementation of People Licensing for Buses/Passenger Vehicles In 2015-2019**

No	source of revenue for buses / passenger vehicles	2015 (Unit)	2016 (Unit)	2017 (Unit)	2018 (Unit)	2019 (Unit)
1	Capacity of 5 people except taxi (Rp.100.000)	9.600.000	10.900.000	5.200.000	7.800.000	
2	Capacity of 10 until 15 people, (Rp.150.000)	26.100.000	31.050.000	15.600.000	13.000.000	13.950.000
3	Capacity of 17 until 24 people (Rp.200.000)	1.800.000	1.200.000	600.000	600.000	-
4	Capacity More than 24 people (Rp.150.000)	500.000	250.000	15.750.000	6.750.000	2.500.000
5	Taxy and the others	-	-	-	-	-
<b>Amount</b>		<b>38.000.000</b>	<b>43.400.000</b>	<b>37.150.000</b>	<b>28.150.000</b>	<b>16.450.000</b>

Source: Semarang City Transportation Agency, 2019

Obstacle factors on public transportation that cause the public transport industry in urban areas (Semarang City) increasingly abandoned by passengers: (a) Individual fleet ownership, (b) Sub-standard fleet quality, (c) Unhealthy competition between operators, (d) Inadequate service performance, (e) Un integrated public transport tariffs, and (f) Inadequate infrastructure conditions.

### Conclusions

First, public transportation is as the government's obligation facility for citizens to meet their mobility needs. In Semarang City, the use of public transportation such as buses and city/*angkot* transportation continues to decline every year. This happens because of an economy increased and people's purchasing power so the personal vehicle ownership which offer higher movement flexibility, is also increasing, and public transport is increasingly being left out. Second, the range of existing public transport services such as road - based (non-rail) *angkot* (public transportation in Indonesia) is wider and more flexible. Third, the application of public transport without any support of good existing road - based transport updates, will have little chance of success. Fourth, a good existing transportation can be "first and last mile trip" service, so it is expected to increase the use of public transportation. Fifth, the reform of existing transportation for people can be the first step to encourage people to switch in using public transportation.

### Suggestions

1. The commitment to realize an excellent service, as it is in the public service law. Permit for transportation vehicles in principle is enough for route licenses/operations issued/a five-year validity period and an extended surveillance card every year.

2. The commitment to supervise and give reward and punishment for the monitoring results both to the licensing service unit.
3. Transportation Licensing for People must be simpler, which should only consist of an operating permit/route and a supervision card attached to the vehicle, not the PO. Route licenses are renewed every five years but must be legalized every year along with an extension of the surveillance card.
4. A rule for vehicles that do not extend or do not work for a certain period must be deactivated for permission to operate the vehicle transportation person.
5. It is necessary to make an agreement / regulation of cooperation between the regions (Pemkot) and the ministry to synchronize data periodically, so that national supervision can be carried out and the use of data together for evaluation of transportation policies on people transportation.

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## **The Evaluation of Parking Facilities for Visitors at The Inland Port of Kalabahi in Alor District, East Nusa Tenggara Province**

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### **Abstract**

The port of Kalabahi is one of the inland ports that is located in Alor District and is managed by the Port Service Unit of The Land Transportation Management Center Region XIII, East Nusa Tenggara. However, in the operation there are some aspects need improvement, especially the parking facility for visitors. During a crowded time, there are many vehicles parked outside the port area. The parking area is disorganized because there is no parking arrangement available. Based on the problem, the authors want to analyze the condition of parking facilities for visitors at the Inland Port of Kalabahi. As the research method, the authors referred to the Decree of the Minister of Transportation Number 52 Year 2004 concerning the Organization of Inland Ports and the Decree of Director General of Land Transportation Number 272/Hk.105/DRJD/96 concerning the Technical Guidelines for Parking Facility Organization. The result of this study found that there is a need to add or to expand the parking area for visitors and to establish parking arrangement to improve the services at the port.

Keywords: evaluation, parking facilities for visitors, vehicles, inland port.

### **Introduction**

Transportation is one of the important aspects of the progress of several fields such as economics, development, and tourism. Due to the role of transportation, everything which is related to the movement of goods and or humans will be very effective and efficient. Transportation also helps in transporting goods and humans which are far away.

Throughout all regions of Indonesia, there is a real need for transportation to create connectivity between regions which aimed to balance development and regional economy. The East Nusa Tenggara Province is one of the regions in Indonesia which consists of islands. According to data from the Central Bureau of Statistics, this province has 1,192 islands (43 inhabited islands and 1,149 uninhabited islands). The total area of this province is 47,931.54 km<sup>2</sup> and it consists of 21 districts and 1 city. Therefore, ferry transportation is very important to connect islands in the province of East Nusa Tenggara. In this province, there are 23 inland ports (21 ports are in operation and 2 ports are under construction). There are 11 ships in which 11 ro-ro vessels owned by

PT. ASDP Indonesia Ferry (Persero) Bolok branch and 3 ro-ro vessels owned by PT. Flobamor.

In this area, one of the institutions that play an important role in water transportation, especially in inland water and ferries transport, is the Land Transportation Management Center (BPTD) Region XIII. It is one of the institutions that directly oversees land transportation in the area of East Nusa Tenggara Province with an office in Kupang City. This is a type C institution which supervises areas of archipelago or areas dominated by ferry transportation for the mobility of human and goods. The Land Transportation Management Center (BPTD) Region XIII has three sections, namely the Road Transport Section, Inland Water, and Ferries Transport (commercial and pioneering) facilities section, Inland Water and Ferries Transport (commercial and pioneering) Traffic Section.

The Land Transportation Management Center (BPTD) Region XIII East Nusa Tenggara Province has 3 inland port service units: service unit of the inland port of Bolok, service unit of the inland port of Labuan Bajo, and service unit of Kalabahi Port which function as supervisor for the operation of ferries transportation.

The authors conducted research at the inland port of Kalabahi which is located in Binongko Village, Kalabahi Subdistrict, Alor District. Alor District is surrounded by islands in Maluku (east side), Lomblen Lembata Strait (west side), Flores Sea (north side) and Umbay Strait and Timor Leste (south side).

The Inland Port of Kalabahi is managed by the Port Service Unit, in which the port operates 4 days a week. There are 5 (five) Ro-ro vessels that serve 5 routes, 1 commercial route namely the Kalabahi-Kupang and 4 pioneering routes namely the Kalabahi-Baranusa, Kalabahi-Lewoleba, Kalabahi-Larantuka, and Kalabahi-Bakalang.

The author conducted observations at the Inland Port of Kalabahi and found inadequate parking facilities for visitors because there were still many vehicles parked outside the port due to inadequate parking capacity. The vehicles of visitors were poorly arranged because there was no proper parking arrangement which made the vehicles were parked irregularly and caused obstruction for vehicles that will enter and leave the port.

## **Methodology**

### **1. Primary Data**

Primary Data is the data obtained based on direct observation by the author. In obtaining primary data, the authors used the following methods:

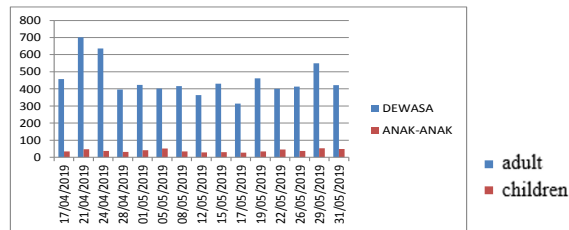
#### **a. Observation**

The authors directly observed the actual conditions of operational activities and existing facilities at the Inland Port of Kalabahi.

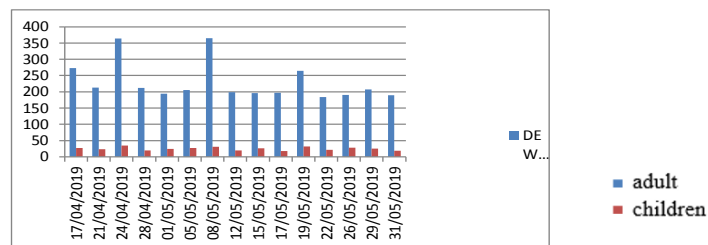
#### **b. Passenger Registration**

In this data collection, a survey of passenger arrivals and departures productivity was carried out for 15 days from 17 April 2019 to 31 May

2019 and a survey of visitors' vehicles at the Inland Port of Kalabahi for 15 days from 17 April 2019 to 31 May 2019 was also conducted.



**Figure 1. Departure Chart of Passengers at the Inland Port of Kalabahi for 15 days**



**Figure 2. Arrival Charts of Passengers at the Inland Port of Kalabahi for 15 Days**

c. Measurement

The measurement of the dimensions of the land facilities at Inland Port of Kalabahi can be seen in the following table:

**Table 1. Characteristics of Infrastructure at the Inland Port of Kalabahi**

No	Name of Facilities	Dimension		Vol	Unit	Condition		Remark
		L	W			Good	Not Good	
		3	4			7	8	
1	Toll Gate/Counters	4	4	16	m2	✓		Outside the port
	a. Terminal Building	30,70	20,94	642,85	m <sup>2</sup>	✓		Not yet operated
	b. Waiting Room	30,70	15,10	463,57	m2	✓		Not yet operated
2.	Operational Office Building	30,70	20,94	642,85	m <sup>2</sup>	✓		Port Service Unit Office



No	Name of Facilities	Dimension		Vol	Unit	Condition		Remark
		L	W			Good	Not Good	
		3	4			7	8	
1	2	3	4	5	6	7	8	9
3.	Parking area for visitors: 4 wheels: 2 wheels:	50 24	30 21	1500 504	m <sup>2</sup>	✓		No arrangement established
4	Parking area for ready-to-load vehicles	50	21	1050	m <sup>2</sup>	✓		Available
5	Lighting in the port area			22	points			
6	Security Post	4	4	16	m <sup>2</sup>			Available
7	Toilets			2	Unit			Available
8	Freshwater Tank			4000	Liter			Available
9	Electricity				KVA/Watt			Available
10	Fire extinguisher			10	Unit			Portable fire extinguisher
11	Supporting facility							
	a. Canteen			7	Unit			Not appropriate
	b. Telephone booth				Unit			Not available
12	Road access							
	a. to the port	200	3,4	680	m			From the main road
	b. in the post area	1801	6	1080	m			Available
13	Official residence			3	Unit			Available

Source: Authors (2019)

#### d. Documentation

In collecting data, the author also took pictures of the operational activities and land facilities at the Inland Port of Kalabahi.

## 2. Secondary Data

These data were obtained based on observations of other parties and from written reports. To obtain secondary data the authors used the following methods:

### a. Literature Research

The authors found information from the literature or books used in the Inland Water and Ferries Transport Polytechnic of Palembang and also from the regulations that are related to this research.

b. Reviewing Internal Documents

Data were collected from various institutions related to research, namely:

- 1) The Land Transportation Management Center (BPTD) Region XIII East Nusa Tenggara Province.
- 2) Transportation Agency in East Nusa Tenggara Province.
- 3) Office of the Kalabahi Port Service Unit.
- 4) The Central Bureau of Statistics in East Nusa Tenggara Province
- 5) PT. ASDP Indonesia Ferry Office Bolok Branch.

**Table 2. Departure Productivity Data at the Inland Port of Kalabahi for the Last 5 Years**

Year	2014	2015	2016	2017	2018	Total number
Trip	159	166	195	219	240	
Passenger	15209	22394	36489	32592	45249	151933
<b>Vehicle (Class)</b>						
I						
II	2529	3072	3275	2933	3848	15657
III	0	0	0	0	0	0
IV	209	205	216	176	251	1057
V	418	449	480	454	567	2368
VI	32	13	8	26	32	111
VII	1	10	10	0	3	24
VIII	11	20	16	0	1	48
IX	0	0	2	0	6	8
Total of vehicles	3200	3769	4007	3589	4708	

Source: The Land Transportation Management Center (BPTD) Region XIII East Nusa Tenggara Province

**Table 3. Arrival Productivity Data at the Inland Port of Kalabahi for the Last 5 Years**

Year	2014	2015	2016	2017	2018	Total number
Trip	155	166	194	217	240	
Passenger	29890	23932	24065	31654	53499	163040
<b>Vehicle (Class)</b>						
I	0	0	0	0	0	0
II	4668	3936	4306	3893	6576	23379
III	0	0	0	0	0	0
IV	314	301	328	305	443	1691
V	492	451	509	486	559	2497
VI	39	5	12	20	55	131
VII	4	10	7	3	1	25
VIII	12	12	6	0	1	31
X	0	0	0	0	4	4
Total vehicles	5529	4715	5168	4707	7639	

Source: The Land Transportation Management Center (BPTD) Region XIII East Nusa Tenggara Province

c. Literature Research

Literature research was done by studying the theories, books, and modules as reference material. In analyzing and discussing the problem, the authors also made a research flowchart in which all data that have been collected can be identified.

### Results and Problem Solving

The problem analysis will be discussed as follows:

1. Analysis of passenger growth
2. Analysis of parking facilities for visitors (drop-off and pick-up vehicles)

#### Analysis of passenger growth

The calculation of passenger growth was predicted based on the realization of transport productivity over the past 5 years. To find out the growth of passengers and vehicles, an exponential method was used. Before analyzing the number of passengers for the next 1 year, the growth rate each year was calculated using the following formula:

$$r = \frac{1}{t} \ln\left(\frac{P_t}{P_0}\right)$$

Information:

$r$  = rate of population growth

$t$  = time period

$P_t$  = Total population in the t-year

$P_0$  = Total population in the current year

To analyze passenger growth for the next 1 year, passenger growth rates each year was calculated. In analyzing passenger growth, the data for the last 5 years were used. Whereas the calculation is as follows:

$$r = \frac{1}{t} \ln\left(\frac{p_t}{P_0}\right)$$

$$\text{Then: } r = \frac{1}{1} \ln\left(\frac{45249}{32592}\right)$$

$$r = 0,328 / 0,33$$

Notes: the value  $r > 0$  indicates a positive population growth or an increase in the number of populations from the previous year. The value of  $r < 0$  indicates that the population growth is negative or there is a reduction in the population from the previous year. The value of  $r = 0$  indicates that there is no change in population from the previous year.

After obtaining the growth rate for each year, prediction can be obtained for the next 1 year using the following formula:

$$P_t = P_0 e^{rxt}$$

Information:

$P_t$  = Total population in the t-year

$P_0$  = Total population in the current year

$e$  = An exponential number of 2,718281828

$r$  = rate of population growth

$t$  = time period

Then:  $p_{2019} = p_{2018} e^{r \cdot x \cdot t}$

$$p_{2019} = 45249 \times 2,718281828^{0,33 \times 1}$$

$$p_{2019} = 45249 \times 1,39$$

$$p_{2019} = 62896,11 / 62897$$

From the calculations above, passenger growth in 2019 was 62897 passengers. With 4 operating days in a week and with 5 trips per week, the number of trips per year can be predicted as much as 5 trips per week x 48 weeks = 240 trips/year. Therefore, to calculate the concentration ratio, the average passenger capacity of ships (246 people) can be used.

$$\begin{aligned} \text{Concentration Ratio} &= \frac{\text{Passenger Prediction in 2019}}{\text{Ship average passenger} \times \text{number of trips/year}} \\ &= \frac{62897}{246 \times 240} \\ &= 1,06 \sim 1,1 \end{aligned}$$

### **Analysis of the visitors' parking area (for drop-off and pick-up of passengers)**

1. Analysis of the appropriateness of the visitors' parking area (for drop-off and pick-up of passengers)
2. The visitors' parking facility (for drop-off and pick-up of passengers) is not appropriate because during the port operation time, there are 2-wheeled vehicles parked outside the port and 4-wheeled vehicles parked irregularly in the parking area provided.
3. Analysis of the factors that affect the parking facilities for visitors (drop-off and pick-up vehicles)

The factor that made the visitors parked their vehicles outside the port was the condition of the parking area which was disorganized because there was no parking arrangement implemented. To calculate the total parking area for visitors (to drop-off and pick-up passengers) which can affect this problem, the Decree of the Minister of Transportation Number KM.52 Year 2004 concerning Management of Inland Port was used as a reference.

The requirement of parking facilities for visitors (to drop-off and pick-up passengers) is known based on calculations in the appendix of the Decree of the Minister of Transportation Number KM.52 Year 2004 concerning Management of Inland Port. The calculations of the parking area requirement for visitors to drop-off and pick-up passengers are described as follow:

1. The visitors' parking area for the 4-wheeled vehicles

$$A' = a \cdot n_1 \cdot N \cdot x \cdot y \cdot z \cdot 1/n_2$$

Information:

A= The total area of the visitors' parking

a= Area required for one vehicle.

(case study: passenger vehicle is 25 m<sup>2</sup>)

n = Number of passengers on one ship

n<sub>2</sub>= Number of passengers in one vehicle

(Average 8 persons/vehicle)

N= Number of ships Arriving/Departing (1 ship)

x= Utilization average (1,0)

y= Concentration ratio, generally taken as (1.1)

z= Utilization ratio, a value of 1.0 is taken

$$\begin{aligned} A_2 &= a \cdot n_1 \cdot N \cdot x \cdot y \cdot z \cdot 1/n_2 \\ &= 25 \text{ m}^2 \times 246 \times 1 \times 1,1 \times 1 \times 1/8 \\ &= 845,62 \text{ m}^2 \end{aligned}$$

Based on the calculation of the visitors' parking area, it is found that the area according to the regulations is 845.62 m<sup>2</sup>.

2. The visitors' parking area for the 2-wheeled vehicles

$$A' = a \cdot n_1 \cdot N \cdot x \cdot y \cdot z \cdot 1/n_2$$

Information:

A= The total area of the visitors' parking

a= Area required for one vehicle.

(case study: 2-wheeled vehicle is 2 m<sup>2</sup>)

n<sub>1</sub>= Number of passengers on one ship

$n_2$ = Number of passengers in one vehicle  
(for class II or motorcycle, the average is 1 person/vehicle)

$N$ = Number of ships Arriving/Departing (1 ship)

$x$ = Utilization average (1,0)

$y$ = Concentration ratio, generally taken as (1.1)

$z$ = Utilization ratio, a value of 1.0 is taken

$$A_2 = a \cdot n_1 \cdot N \cdot x \cdot y \cdot z \cdot 1/n_2$$

$$= 2 \text{ m}^2 \times 246 \times 1 \times 1,1 \times 1 \times 1/1$$

$$= 541 \text{ m}^2$$

Based on the calculation of the visitors' parking area for 2-wheeled vehicles, it is found that the area according to the regulations is 541 m<sup>2</sup>.

**Table 4. Comparison of The Visitors' Parking Area**

No	Parking area	Breadth		Remark
		Current area	Area based on KM.52 Year 2004	
1	4-wheeled vehicles	1500 m <sup>2</sup>	845,62 m <sup>2</sup>	sufficient
2	2-wheeled vehicles	504 m <sup>2</sup>	541 m <sup>2</sup>	not sufficient

Based on the description above, the visitors' parking area, especially for the 2-wheeled vehicles is not appropriate. It needs an additional space of 37 m<sup>2</sup>.

### 3. Analysis of efforts to be made for improving the visitors' parking facilities

The efforts that need to be made for improving the visitors' parking facilities are as follows:

- a. To add more areas for the visitors' parking area, especially for the 2-wheeled vehicles.
- b. To make parking arrangement for the visitors' parking area, especially for the 4-wheeled vehicles

### Problem Solving

The problem solving is proposed as follows:

#### 1. The plan of additional parking area for visitors with the 2-wheeled vehicles

Based on the analysis and calculations, the parking area for visitors with 2-wheeled vehicles based on table IV.1 still needs the addition of 37 m<sup>2</sup>. The plan for the additional parking area is illustrated as follows:



Source: the authors

The plan of additional parking area for the visitors with 2-wheeled vehicles

The picture shows the plan of additional parking area for the 2-wheeled vehicles which take some of the areas of the road shoulder at the port which is  $24 \text{ m} \times 2 \text{ m} = 48 \text{ m}^2$  (more than the needed area of  $37 \text{ m}^2$ ). This is done by observing the condition that there is no permanent barrier between the parking area for the 2-wheeled vehicles with access to the port area. This plan also considers the width of the road shoulder (9 meters), in which the 2 meters of the shoulder will be used for the additional parking area. There will be 7 meters of the road shoulder available and can be passed by vehicles.

Therefore, if the current parking area for the 2-wheeled vehicles ( $504 \text{ m}^2$ ) is added by  $48 \text{ m}^2$ , the total of the area for the 2-wheeled vehicles will be  $552 \text{ m}^2$ .

2. The plan of additional parking area for visitors with the 4-wheeled vehicles

To determine the parking area for the 4-wheeled vehicles, information about the type and the class of the vehicles that dominantly enter the area of the inland port of Kalabahi must be known. Based on table III.5, the vehicles that enter the port area are majority the vehicles class II (motorcycles) and vehicles class IV (minibus).

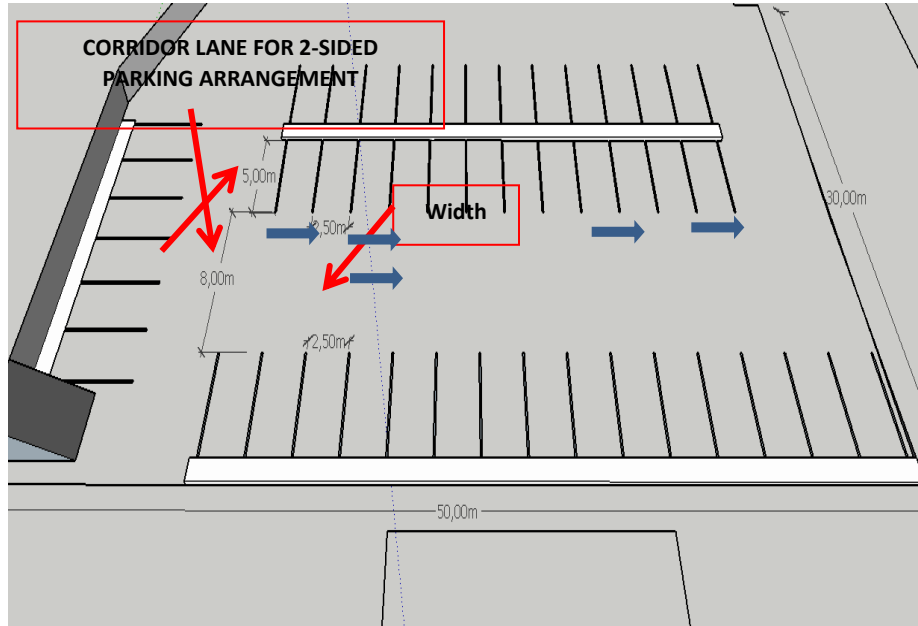
To plan the vehicle parking area which is needed, the parking space unit for each vehicle must be known. The issue concerning the parking space unit for vehicles has been regulated by the Decree of Director General of Land Transportation Number 272/Hk.105/Drjd/96 regarding the Technical Guidelines for Parking Facility Organization. Based on the regulation, the vehicles as listed on table II.1 at the Port of Kalabahi were categorized into Class II vehicles. The parking space unit on table II.2 is for the Class II Vehicles or the passenger vehicles, with a width of 2,5 m and a length of 5 m.

The current total parking areas for the visitors must be known in order to make the adjustment to the current condition. The current total parking areas for the visitors are as follows:

**Table 5. The Current Total Parking Areas for The Visitors**

No	Parking area	Width	Length	Wide (m <sup>2</sup> )
1	4 wheeled vehicles	30	50	1500
2	2 wheeled vehicles	21	24	504

Since the 4-wheeled parking area has been sufficient, it can be proposed to establish a parking arrangement.



Source: the authors

### The Proposal for 4-Wheeled Visitor Parking Arrangement

Based on the above picture, the arrangement for one vehicle is 5 meters long and 2.5 meters wide and the corridor in the 900 opposite parking is 8 meters wide (according to the Regulation of Director General of Land Transportation Number 272/Hk.105/DRJD/96).

PARKING SPACE UNIT	Corridor width (m)							
	<30o		<45o		<60o		<90o	
	1 way	2 way	1 way	2 way	1 way	2 way	1 way	2 way
a. passenger car 2,5 m x 5,0 m	3,0*	6,00*	3,00*	6,00*	5,1*	6,00*	6, *	8,0 *
b. passenger car 2,5 m x 5,0 m	3,50**	6,50**	3,50**	6,50**	5,1**	6,50**	6,5**	8,0 **
c. motorcycle 0,775 m x 30 m	3,0*	6,00*	3,00*	6,00*	4,60*	6,00*	6, *	8,0 *
d. motorcycle 3,4 m x 12,5 m	3,50**	6,50**	3,50**	6,50**	4,60**	6,50**	6,5 **	8,0 **
								1,6 *
								1,6 **
								9,5

*Information:*

\* = parking area without pedestrian facilities

\*\* = parking area with pedestrian facilities

Overall, with the land area of 50 m x 30 m, there are 45 parking slots available for the four-wheeled vehicles.



## Conclusions and Suggestions

Based on the analysis described in the previous chapter, the conclusions are drawn as follows:

1. The condition of the parking area for the visitors at the Inland Port of Kalabahi currently does not meet the standard requirements in the regulations.
2. Factors which influence the parking facilities for the visitors at the Inland Port of Kalabahi are an insufficient parking area for the 2-wheeled vehicles and the absence of parking arrangement in the parking area for the 4-wheeled vehicles.
3. The efforts which can be made are by expanding the parking area for the 2-wheeled vehicles and implementing parking arrangement for the area of 4-wheeled vehicles.

## Suggestions

The suggestions that can be given, especially for the management of the Inland Port of Kalabahi are as follows:

1. The parking area for the visitors should be adjusted to meet the standard requirements as mentioned in the regulation.
2. The parking area for the 2-wheeled vehicles should be adjusted and the parking arrangement for the area of 4-wheeled vehicles should be implemented.
3. The parking area for the visitors, especially for the 2-wheeled vehicles should be added and the parking arrangement for the area of 4-wheeled vehicles should be made as to the plan proposed by the authors.

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## **Factors Influencing Effective Time: Berth Time (ET:BT) Performance: A Casestudy Of Cirebon Port**

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### **Abstract**

Cirebon port is one of the gateways of trade activities for the Province of West Java and parts of Central Java Province. Cirebon port is equipped with dry bulk terminal facilities. In its current operation, the Port of Cirebon is dominated by dry bulk cargo with 90% of coal commodity. Based on data obtained from PT. Pelindo II Cirebon, operational performance in the Port of Cirebon from 2013-2018 for ship services and service of goods on average are below the standards set by PT. Pelindo II Cirebon Branch, particularly the effective time: berth time (ET: BT) ratio which is always below the established standard of 70%. Service performance effective time: berth time ratio (ET: BT) is an important factor in improving the quality of service performance at the Port of Cirebon. Without an increase in service at the port, it will cause the time needed for ships to moor at the port even longer. This will result in the swelling of operating costs when the ship is moored at the port. This study aims to analyze the factors that affect the performance of the effective time: berth time ratio (ET: BT), using the factor analysis method. Based on interviews with employees in the Terminal Business Division of PT. Pelindo II branch of Cirebon, there are four variables that are estimated to affect the performance of the effective time ratio: berth time, namely the number of loading and unloading workers, the number of excavators, the number of dumptrucks, and the number of wheel loaders. Based on the research results, there are two factors formed. In factor 1, the influential variable is the number of wheel loaders, and in factor 2, the influential variable is the number of dumptrucks.

**Keywords:** effective time, berth time, factor analysis, Cirebon Port

### **Introduction**

Ports become one of the important elements in the economy in the Maritime or Archipelagic Countries especially in Indonesia. An efficient and well managed port will encourage the progress of trade, even industries in that regions will advance as well. The port serves as a bridge connecting highways, railroads and distribution warehouses.

Cirebon Port is one of the ports in Indonesia, which is located at Coordinates of 6 ° 42'54 " South Latitude and 108 ° 34'9 " East Longitude. Cirebon port is one of the gateways of trade activities for West Java Province and partly Central Java Province.

Cirebon port is equipped with dry bulk terminal facilities, which 90% of commodity is dominated by coal.

According to data sources from PT. Pelindo II branch of Cirebon, port operational performance from 2013-2018 for ship services and goods services in general are relatively poor, haven't been able to achieve operational performance standards set up by the directorate general of sea transportation. Operational performance data in 2016 was not included in the performance measuring due to loading and unloading activities disturbed by demonstrations from coastal residents living near the Cirebon Port. The demonstration protests the pollution from dry bulk loading and unloading activities for coal commodities. According to the online news source merdeka.com, which was published on Thursday, 01/26/16 at 11:06 West Indonesian Time entitled "Making pollution, the coal loading and unloading port in Cirebon is sealed" has been sealed by the local Ministry of Environment and Forestry. In the contents of the news it was reported, "Cirebon City DPRD Commission A member, Harry Saputra Gani in Cirebon said that sealing the port was one form of the LHK Ministry's seriousness in following up complaints from the people of Cirebon. Rejection of loading and unloading activities in the city of Cirebon has been going on for a long time. The community complained that many residents were suffering from respiratory illnesses from the presence of coal dust. Although it was closed down, the coal loading and unloading activity resumed on the pretext of spending the remaining coal stock on a barge that had already arrived in the Cirebon sea. "Therefore, despite having experienced the sealing of PT. Pelindo II branch of Cirebon still serves loading and unloading for coal, just for a few vessels.

**Table 1. Operational Performance of Cirebon Port, 2013 - 2018**

Variables	Unit	Performance Standard	Operational Performance				
			2013	2014	2015	2017	2018
1. Ship services							
a) <i>waiting time</i>	Hour	1 hour (max)	0,50	0,73	1,23	1,33	1,52
b) <i>approach time</i>	Hour	1 hour (max)	1,0	1,1	1,2	1,0	1,3
<i>effective time</i>			40,38	30,37	30,68	30,09	31,75
<i>berthing time</i>			75,22	70,20	71,05	66,75	72,40
c) ET:BT	%	70% (min)	53,68	43,26	43,18	45,08	43,85
2. Bulk services							
Productivity	t/g/h	238,1 t/g/h (min)	229,7	270,8	267,8	241,4	220,3

Source (PT. Pelindo II branch of Cirebon, Year: 2019).

From **Table 1** it can be seen that the waiting time performance from 2013-2014 is still above the established standard which is one hour. But from 2015 onwards, waiting time performance began to decline. Likewise, the approach time performance is still below the standard set. Similar to the effective time: berthing time (ET: BT) performance, even this performance is always below the established standard of 70%. ET: BT performance standards represent efficiency, because higher value ET: BT means the percentage of time spent on work is also higher. It

also means the total amount of time needed to unload/ load the entire ship's cargo is lower.

Based on the research of Hendra Gunawan, Suhartono, Martinus Edy Sianto (2008), the factors that influence the Container Loading and Unloading Productivity at the Surabaya Diamond Pier (Case Study of PT. Pelayaran Meratus) are the number of port workers or ganks, full empty ratio, container weight, carrier used, and loading and unloading processing time. Meanwhile, according to Iyori Kharisma Muhammad's research (2017), the most dominant factor affecting productivity and ET:BT performance at the Tanjung Perak Port of Surabaya's Jamrud Terminal is a shift of loading and unloading labor that is too long, causing the handling labors to be exhausted, so that work often stops faster than scheduled time.

Cirebon port has a huge potential to be developed in the future, with the increasing volume of coal in Cirebon Port. The performance of operating services at the Cirebon Port has become an important factor in improving the quality of performance services at the Cirebon Port. Effective and efficient services to port users (ships, goods and passengers) are the basic capital for the development of a port (Triatmodjo, 2009). Without an increase in service at the port, it will cause the time needed for ships to berth at the port even longer. This will result in the swelling of operating costs when the ship is berthed at the port.

Therefore, the purposes of this study are:

1. Determining the factors that affect the performance of effective time: berthing time (ET: BT) in dry bulk vessels at Cirebon Port, using factor analysis.
2. Determining model of the factors that affect the performance of effective time: berthing time (ET: BT) at the Cirebon Port, using linear regression analysis method.

Factor analysis is a technique used to investigate factors that can explain the relationship or correlation between various independent indicators that are observed. Factor analysis is an extension of principal component analysis. It is also used to identify a number of relatively small factors that can be used to explain a large number of interrelated variables. So, the variables in one factor have a high correlation, while the correlation with the variables in other factors is relatively low.

Port performance is the high or low level of port services to port users (ships and goods), which depends on the service time of the ship while at the port. High port performance shows that the port can provide good services (Triatmodjo, 2009). Based on the Regulation of the Director General of Sea Transportation Number: HK.103 / 2/18 / DJPL-16 about Port Operational Service Performance Standards at Commercial Ports, nine service performance indicators have been determined related to port services. However, only Percentage of Effective Time: Berthing Time (ET:BT) is investigated in this study.

Percentage of ET:BT is the ratio between effective time and berth time which is an indicator of service related to berthing services. Effective Time (ET) is total hours of vessels spent for loading and unloading while at berth. Berth Time (BT) is total

hours of vessel at berth. Percentage of ET:BT shows how effective the level of port service is for bearing ships.

BT consists of BWT + NOT. Berth Working Time (BWT) is the time for loading and unloading activities while the ship is at the berth, which consists of Effective time (ET) and Idle time (IT). Not operation time (NOT) is a break time, planned stop time during a Ship at the Port (preparation for loading and unloading and work breaks). Idle time (IT) is ineffective or unproductive or wasted time as long as the ship is moored due to the influence of weather and broken loading and unloading equipment.

### **Method**

The study applies a quantitative approach, and the data is collected through primary and secondary sources. The primary data were obtained from in-depth interviews with the employee of PT. Pelindo II branch of Cirebon. The interviews were conducted by non-structured questions. To complement the data, a series of resources from literature reviews, company reports, company website, and existing policy reviews were acquired. Factor analysis is used to investigate the factors influencing the ET:BT performance. The necessary steps to solve problem will be the following:

Data collection techniques used are as follows.

1. Preliminary survey

Preliminary survey was conducted to obtain an overview of the company and to know clearly the issues raised by the researcher.

2. A literature study (library research)

3. Collecting data and information through books, articles, company documentation, other literature, and previous research related to factor analysis, and measurement of performance on the port.

4. Field studies (field research)

Field studies conducted to determine the actual condition of the object of study, ie with direct observation and recording systematically the object under study. A field study conducted by interview and observation. Interviews were conducted with a question and answer to the company related to the research. Researchers conducted interviews to find out any information about the company and the issues raised. In this study, use unstructured interviews. Some interviews were conducted in the absence of the recording, in order to dig more deeply. Field observations carried out to understand the process of ships ranging arrival of the vessel to the ship's departure, especially when the process of loading and unloading of dry bulk cargo ships.

5. Survey of Secondary Data

Secondary data were obtained from the relevant agencies of research, in this case the relevant agencies are PT. Pelindo II branch of Cirebon. Secondary data

is data on the number TKBM (handling labors) 2013-2018, data on the number of excavators 2013-2018, 2013-2018 dumptruck of data, and the data wheel loaders 2013-2018.

### **Processing and Data Analysis**

The main purpose of factor analysis is to describe the structure of relationships among many variables in the form factors or latent variables or variable formations. Factors that formed a random quantity (random quantities) that previously could not be observed or measured or determined directly.

In addition to the main goal, there are other objectives are:

1. To reduce the number of variables origin of a polynomial into a number of new variables a smaller number of variables of origin, and new variables are called factors or latent variables or constructs or variable formations.
2. To identify the relationship between the variables making up factor or dimension by factors formed, by using a correlation coefficient test antarfaktor with its components. Analysis of these factors is called confirmatory factor analysis.
3. To test the reliability of the instrument with valisitas and confirmatory factor analysis.
4. Validation of data to determine whether the results of the factor analysis can be generalized to the population, so that after a form factor, the researchers already have a new hypothesis based on the results of the analysis.

The first stage in the factor analysis is to assess which variables were considered for inclusion in subsequent analyzes. The test is performed by inserting all the variables, and then on the variables subject to a number of tests.

Testing logic is that if a variable does have a tendency to cluster and form factor, the variable will have a fairly high correlation with other variables. In contrast, a variable with a weak correlation with the other variables, would be less likely to cluster in certain factors.

After one or more factors formed, by a factor contains a number of variables, it may be a factor contains a number of variables that split is determined to be entered into which factors, the next process is to perform a rotation that will clarify the position of a variable in a factor.

Factor analysis was used to determine that there is a model of independent variables and the dependent. The process of analysis to determine the factors for the dominant factors in explaining a problem in this study are as follows:

## 1. Correlation & Feasibility Variable

This phase tested the correlation variables that have been defined using the Barlett's Test of Sphericity and Kaiser Meyer Olkin Measure of Sampling Adequacy (MSA). Barlett test and MSA test conducted to assess the feasibility of a variable that will be analyzed using factor analysis can be found in the SPSS output tables KMO and Barlett's Test.

With the following criteria:

### a. Kaiser Meyer Olkin (KMO)

At the Kaiser-Meyer Olkin test if the value of (KMO) equal to 0.5-1.0 indicate that the process of the analysis carried out are appropriate and can continue.

While on the MSA test numbers should be at 0 to 1, with the following criteria:

- 1)  $MSA = 1$ , variable can be predicted without error by the other variables.
- 2)  $MSA > 0.5$ , variables can still be unpredictable and can be analyzed further.
- 3)  $MSA < 0.5$ , variables can not be predicted and could not be analyzed further, or released from other variables.

### b. Barlett's Test of Sphecirity (Barlett)

Barlett test the factor analysis to test the correlation between variables because the desired results in the factor analysis is a high correlation between variables, has a high correlation if the p-value (sig)  $< (0.05)$ , it shows a high correlation value antarvariabel and the process can be resumed. The hypothesis for significance is:

$H_0$  = Not having any correlation

$H_1$  = Having correlation and adequate samples for further analysis.

Criteria to see the significance is:

Value Sig  $> (0.05)$ , then  $H_0$  is accepted, Sig  $< (0.05)$ , then  $H_0$  is rejected.

## 2. Extraction factor

Extraction factor is used to reduce the data of several variables that can explain the correlation between the variables in the study. In this study, the method used for extraction of factors such as Principal Components Analysis method. This method is intended to reduce the number of variables in which each component of the data to the maximum explained variance.

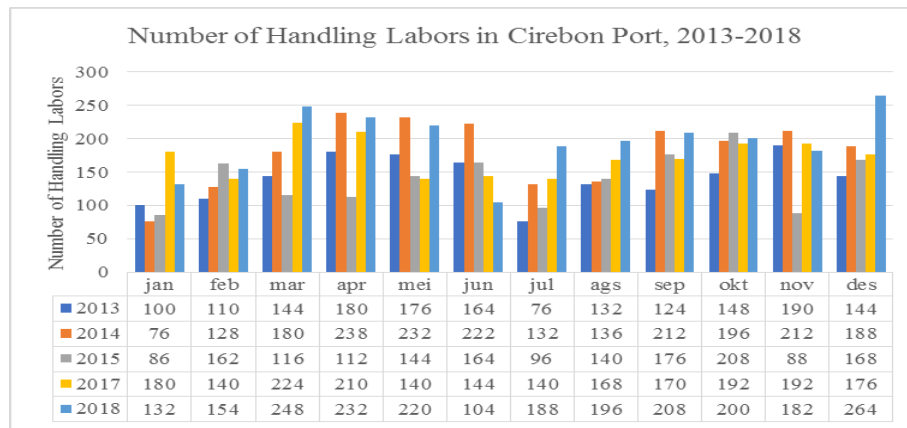
## 3. Rotation factor

The purpose of the rotation factor to clarify the position of a variable of a factor. In this study, using the method of rotation is Varimax Method.

## Result and Discussion

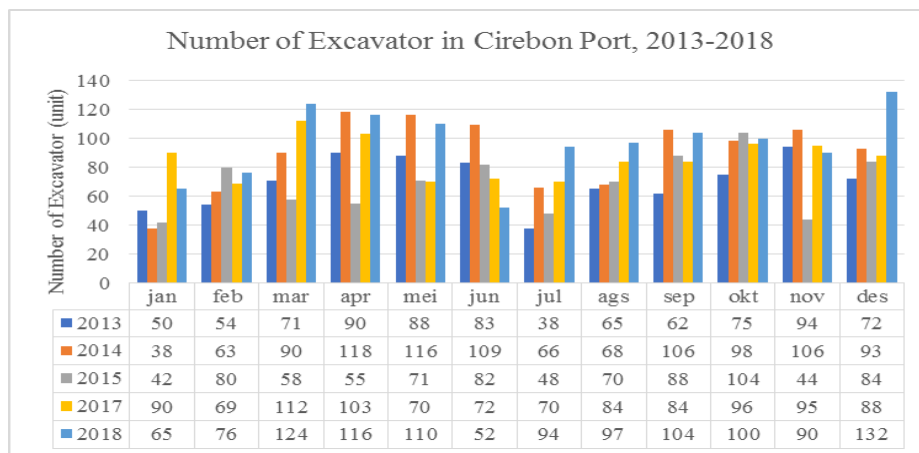
As mentioned before, that the effective time (ET: BT) is the ratio between the effective time and time berth which is an indicator of services related to berthing services. Effective Time (ET) is the number of hours for a boat that is actually used for loading and unloading for berthing in hours. Berth Time (BT) is the amount of time ready to serve ships berthing operation in hours. ET / BT expressed in units of %. Performance effective time (ET: BT) are classified as good if their achievements above standard, good enough if the achievements 90-100%, and less well if the achievement of less than 90%.

Can be seen from the data operational performance of dry bulk in the Port of Cirebon as in **Table 1**, That from the year 2013-2018 none reaching performance standards ET: BT are set at 70%. Based on the results of interviews conducted with employees of PT. Pelindo II branch of Cirebon, found several factors that affect the performance of the effective time: time berth at the Port of Cirebon such as handling labors number, the number of excavators, dump truck number, and the number of wheel loaders.



Source (Business & Terminal Division of PT. Pelindo II Cirebon, Year: 2019)

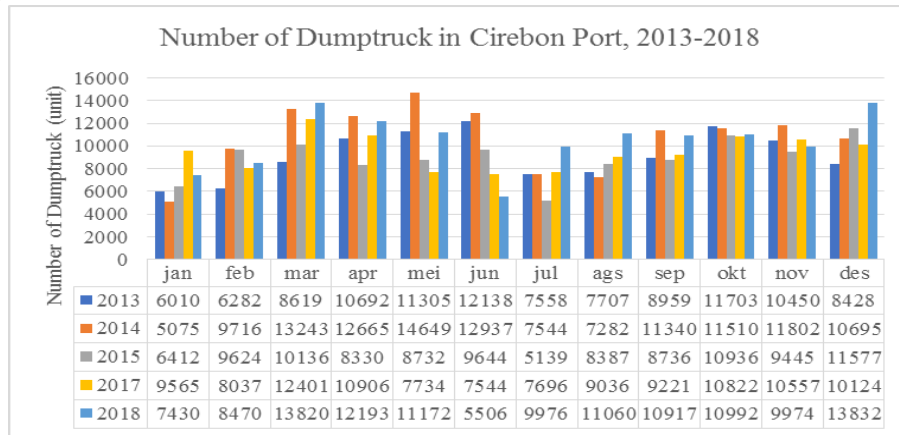
**Figure 1. Number of Handling Labors in Cirebon Port Year 2013-2018 (workers)**



Source (Business & Terminal Division of PT. Pelindo II Cirebon, Year: 2019)

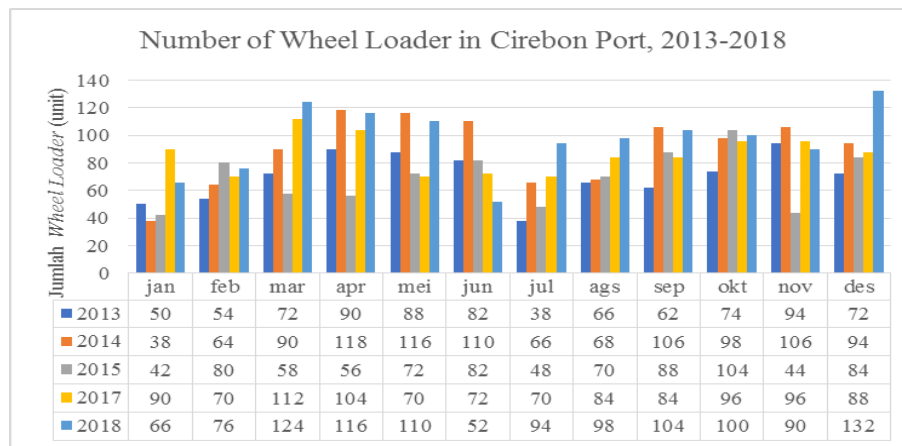
**Figure 2. Number of Excavator in Cirebon Port, 2013-2018 (unit)**





Source (Business & Terminal Division of PT. Pelindo II Cirebon, Year: 2019)

**Figure 3. Number of Dumptruck in Cirebon Port, 2013-2018 (unit)**



Source (Business & Terminal Division of PT. Pelindo II Cirebon, Year: 2019)

**Figure 4. Number of Wheel Loader in Cirebon Port, 2013-2018 (unit)**

Based on the data on **Figure 1 - Figure 4**, there is a trend the use of loading and unloading equipment and handling labors follow a certain pattern. In the mid-term is likely to increase, and at the beginning and end of the semester tends to decrease.

### Factor Analysis

Factors that affect the performance of the effective time: PT. Pelindo II berth time in Cirebon can be determined by using the method of factor analysis. In this study, there are four variables that are considered as factors that affect the effective time: berth time as follows.

**Table 2. Research Variable**

Labels	Variables
X <sub>1</sub>	Tenaga Kerja Bongkar Muat
X <sub>2</sub>	Excavator
X <sub>3</sub>	Dumptruck
X <sub>4</sub>	Wheel loader

**Table 3. KMO Test Value and Bartlett's Test**

	Value	Criteria	Conclusion
<i>Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO MSA)</i>	0.825	> 0,5	Variable is accepted
<i>Bartlett's Test of Sphericity Sig.</i>	0.000	< 0,05	

Based on the output results of KMO and Bartlett's Test over KMO MSA known value of 0.825 > 0.50 and a value Bartlett's Test of Sphericity (Sig) 0.000 < 0.05, factor analysis in this study can be continued because it fulfill the requirements.

**Table 4. Extraction Factor**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.792	94.807	94.807	3.792	94.807	94.807
2	0.207	5.177	99.984	0.207	5.177	99.984
3	0.001	0.014	99.998			
4	9.730	0.002	100.000			
	E-005					

Factor extraction was conducted by Principal Components Analysis. **Table 4** the magnitude of variance can be explained by factors formed. Unknown at this research that there are two factors which are formed:

1. Factor 1 Initial Eigen values are known to have amounted to 3,792 and was able to explain 94 807% variance.
2. While the second factor has Eigan Initial values of 0.207 and 5.177% were able to explain the variance.

The usefulness of the rotation factor to clarify the position of a variable of a factor. In this study, using a method that factors Varimax rotation method. Here are the results of the rotation factor in this study.

**Table 5. Rotated Component Matrix**

Variable	Component (Factor)	
	1	2
X <sub>1</sub>	0,604167	0,342361
X <sub>4</sub>	0,603472	0,343056
X <sub>2</sub>	0,602778	0,34375
X <sub>3</sub>	0,343056	0,603472

*Keterangan:*

*X1 = Labors*

*X2 = Excavator*

*X3 = Dumptruck*

*X4 = Wheel Loader*

Based on the output Rotated Component Matrix above is known:

1. X1 variable correlated with factor 1 sebesar 0.870, while the second factor of 0.493, which means to correlate weakly correlated.
2. X4 variable correlated with the first factor of 0.869 while the second factor correlated only amounted to 0.494 which means the correlation is weak.
3. X2 correlated with the first factor of 0.868, while the second factor of 0,495, which means to correlate weakly correlated.
4. X3 correlated to the second factor of 0.869 while the first factor correlates only amounted to 0.494 which means the correlation is weak.

It can be concluded from the four variables are grouped into two factors as follows:

1. Factor 1 consists of a variable X1 (Labors), X2 (Excavator), and X4 (Wheel Loader).
2. Factor 2 contained only variable X3 (Dumptruck).

### **Linear Regression Analysis**

Based on the results of data processing on one factor affecting the performance of ET: BT is a wheel loader, while the second factor is a dumptruck. Here are the results of stepwise regression analysis:

**Table 6. Statistical Linear Regression Analysis**

Model	R Square	Durbin-Watson	t	Sig.	Tolerance	VIF
1	0,929	2,109	27,237	0	1	1
2	0,778	1,951	14,305	0	1	1

According to the table above is known:

1. In one known to have influence factor of 92.9% to the performance of ET: BT, the Durbin-Watson value (d) of 2,109, where the Durbin-Watson table with a significant level ( $\hat{I} \pm$ ) of 5% is known the value  $dL = 16\ 889$ , and  $dU = 1.4797$ . It can be concluded value (d) is between the  $dU$  and  $4-dU$ , ie  $1.4797 < 2.109 < 2.5203$  so variable X1 (Labors), X2 (Excavators), and X4 (Wheel Loaders), there are symptoms of autocorrelation. While the t test showed a significant value of 0.000, which value is smaller than a predetermined value alpha (0.05) and 9.944 t value greater than t table (2.00324).
2. Factor 2 is known to have the effect of 77.8% to the performance of ET: BT, the Durbin-Watson value (d) of 1.951 where the Durbin-Watson table with a significant level ( $\alpha$ ) of 5% is known the value  $dL = 1.5485$ , and  $dU = 1.6162$ . It can be concluded value (d) is between the value of  $dU$  and  $4-dU$ , ie  $1.6162 < 1.951 < 2.3838$  so on X3 Number of Dumptruck there are no symptoms of autocorrelation. While the t test showed showed a significant value of 0 where the value is smaller than a predetermined value alpha (0.05) and 14.305 t value is smaller than t table (2.00172).

The model equations are obtained as follows:

1. Equation Model Factor 1

$$Y = 22.486 + 69.994 X_4 \dots\dots\dots (1)$$

2. Equation Model Factor 2

$$Y = (-160.845) + 0.326 X_3 \dots\dots\dots (2)$$

Information:

Y = Performance ET: BT

X<sub>4</sub> = Number of Wheel Loader

X<sub>3</sub> = Number of Dumptruck

### Conclusion

Based on the results of the data analysis and processing, it can be concluded as follows:

1. Factors affecting the performance of the Effective Time: Time in Cirebon Harbor Berth factor analysis, ie one with variable factors that affect wheel loaders and two variable factors that affect dumptruck. The increasing number of dumptrucks used for delivery/ receiving during loading and unloading activities can speed up or reduce the performance of berth time. This indicates that the amount of dumptruck in loading and unloading is inadequate and the waiting for dumptruck changes that will make the number of berth time increase or longer.
2. The model equations are derived from the performance factor PT. Pelindo II Berth Time in Cirebon are:
  - a. Equation Model Factor 1
$$Y = 22.486 + 69.994 X_4 \text{ (6.1)}$$
  - b. Equation Model Factor 2
$$Y = (-160.845) + 0.326 X_3$$

### Acknowledgement

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## **Troubleshooting Strategy of Urban Transportation in Tegal**

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### **Abstract**

Urban transportation problems in the form of traffic congestion in Tegal caused by the condition of road network and the condition of facilities and infrastructure of public transportation which is not adequate. A great strategy is needed to solve this urban transportation problems based on the order of priority scale. This research used Analytical Hierachy Process (AHP) method. This research is also equipped with a sensitivity analysis to the priority of alternative policy which is generated by AHP. The result of factor priority assessment is known that land is the most influencing factor of the policy. Based on the priority alternatives policy assessment, the first priority is Construction of the Northern Ring Road. Although the weight factor is changed, but the final result of the sensitivity analysis in the form of factor weight changes resulted that Construction of the Northern Ring Road as the first priority and authority factor is the most sensitive factor that can influence the priority order of policy alternatives.

**Keywords:** Policy, AHP, Sensitivity Analysis

### **Introduction**

The occurrence of urban transportation problems in the city of Tegal in the form of traffic congestion caused by the condition of the road network and the condition of public transport facilities and infrastructure that is not yet adequate. Tegal City Government has various program plans to overcome these problems but experiences various obstacles related to policy implementation. Therefore, the Government needs a policy strategy through alternative solutions to urban transportation problems that are relevant and arranged based on priority scale.

### **The Scope and Limitation of the Study**

The scope and the limitation of the area studied is the area of Tegal City. While the scope of research carried out is as follows:

1. The sampling technique with a purposive sampling technique through certain criteria as requirements in the analysis;
2. The analytical method used in this study uses the Analyticalcal Hierarchy Process method.

## **The Research Questions**

The formulation of the problem in this study is as follows:

1. What factors are constraints and influence Tegal City Government policies related to solving urban transportation problems in Tegal City?
2. What are the relevant alternative solutions to urban transportation problems in Tegal City?
3. What is the alternative priority scale in solving urban transportation problems in Tegal City?
4. What is the feedback from the community regarding alternative priority scale in solving urban transportation problems in Tegal City?
5. What is the strategy that can be carried out in relation to decision making priorities and / or policies in solving urban transportation problems by the Tegal City Government?

## **The Purpose and Objectives of the Study**

The purpose of this study is to determine alternative priorities for solving urban transportation problems in Tegal City. The objectives of this research are as follows:

1. Identifying urban transportation problems in Tegal City based on the opinion of the experts.
2. Determine alternative solutions to the problem of urban transportation in the city of Tegal based on the opinion of the experts.
3. Establish alternative priority scales for solving urban transportation problems in Tegal City.
4. Gathering public opinion on alternative priority scales in solving urban transportation problems in Tegal City.
5. Determine the best alternative that is worth considering as a priority in decision making and / or policy in solving urban transportation problems by the Tegal City Government.

## **Review of Related Literature**

### **Transportation Planning**

Tamin (2000) explains the systems approach to transportation planning is a general approach to a plan or technique by analyzing all factors related to existing problems. For example, local congestion caused by narrowing the width of the road can be solved by making improvements locally. However, this might cause further problems that arise elsewhere.

## **Urban Transportation Policy**

Amrul Alam (2011) explains that urban areas are the areas where the majority of people's daily activities or activities are engaged in the service and trade sectors. Policies are needed in accordance with the character of their community activities. There are a number of aspects that affect urban transportation policies, including:

1. Aspects of road planning and public transport and goods. This aspect includes general spatial and land use planning and transportation management.
2. Aspects of coordination between regulators and operators, including, government management, coordination between institutions or agencies, laws and regulations.
3. Environmental aspects, including the impacts of externalities caused by the three aspects above are general aspects that need special attention from the city government, to create the desired transportation conditions.

## **Analytical Hierarchy Process (AHP)**

Analytical Hierarchy Process (AHP) in the book "Analytic Hierarchy Process in Decision Making in Complex Situations" (Saaty, 1995), is a simple and flexible method that holds creativity in its approach to a problem. This method formulates the problem in the form of a hierarchy of inputs and consideration considerations to produce a relative priority scale. In solving the problem with the AHP method in the book Saaty (1995), also explained some basic principles of the AHP, as follows:

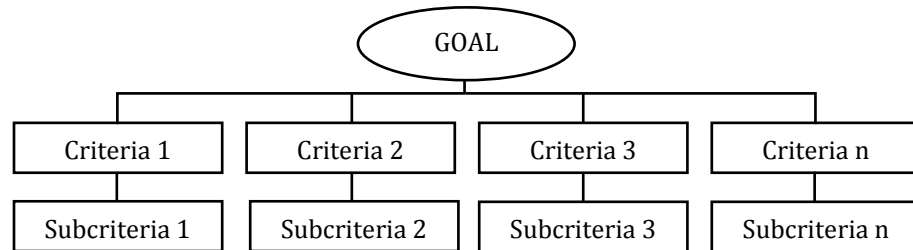
1. Decomposition. After defining the problem, it is necessary to do a decomposition that is to break down the whole problem into its smallest elements.
2. Comparative Judgment. This principle means making judgments about the relative importance of two elements at a given level in relation to the above level. This assessment is the core of AHP, because it will affect the priority of the elements.
3. Synthesis of Priority. From each matrix, the pairwise comparison vector eigen gets local priority, because pairwise comparison exists at each level, so to do global synthesis must be performed between local priorities. The procedure for doing synthesis differs according to the shape of the hierarchy.
4. Logical Consistency. Consistency has the first two meanings that similar objects can be grouped according to their diversity and relevance. The second is the level of relationship between objects based on certain criteria.

Hierarchy is the easiest tool to understand complex problems where the problem is broken down into the elements concerned, arranging the elements in a hierarchy and finally making an assessment of these elements as well as determining which decisions are taken. Hierarchy is also a structural abstraction of a system that studies the function of interactions between components and their impact on the system. This abstraction has interrelated forms arranged in a main goal (ultimate



goal) down to sub-goals, to actors (actors) who give encouragement and down to the goals of actors, then the policies, strategies. The abstraction of the decision hierarchy is as shown in the following **Figure**.

Level 1: Focus/target/goal, Level 2: Factor/criteria, Level 3: Alternative/subcriteria



**Figure 1.** Abstraction of the Decision Hierarchy

For each criterion and alternative we must make pairwise comparisons, ie comparing each other elements at each hierarchy level in pairs so that the value of the element's importance in the form of qualitative opinion. To quantify the qualitative opinion used a rating scale so that the value of opinions will be obtained in the form of numbers. Values and definitions of qualitative opinions on a pairwise comparison scale as shown in the following table.

**Table 1. Matrix Comparison Matrix Scale**

Intensity of Interest	Definition	Explanation
1	Equally important element compared to other elements (Equal importance)	Both elements contribute equally to that trait.
3	One element is slightly more important than the other elements (Moderate more importance)	Experience states slightly side by side with one element
5	One element is clearly more important than other elements (Essential, Strong more importance)	Experience shows strongly in favor of one element
7	One element is clearly more important than the other elements (Demonstrated importance)	Experience shows strongly liked and dominant seen in practice
9	One element is absolutely more important than the other elements (Absolutely more importance)	Experience shows that one element is clearly more important
2,4,6,8	When in doubt between two values of a nearby space (gray area)	This value is provided when a compromise is required

Source: Saaty (1995)

## Research Methodology

### Research Steps

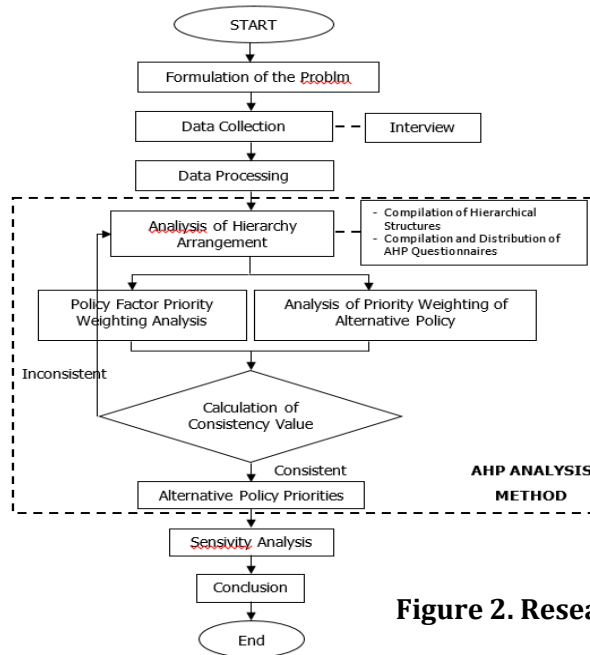


Figure 2. Research Flow Chart

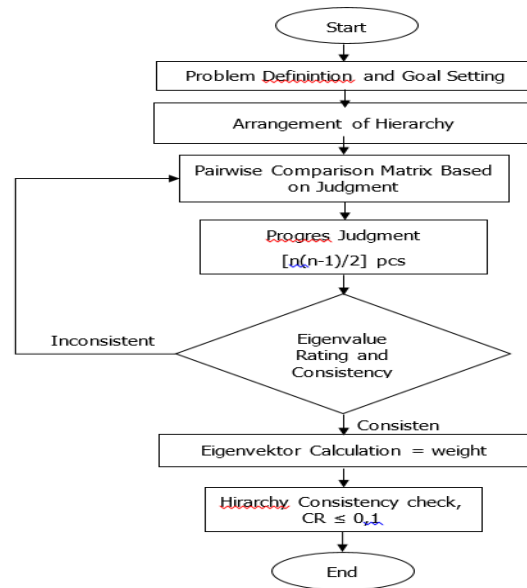


Figure 3. Flow Analysis Method AHP Chart

### Method of collecting data

Data collection techniques used by researchers include 2 (two) ways, namely:

#### 1. Interview

The interview used is an open interview to obtain information about current conditions about transportation in Tegal City, problems, and plans that have

been prepared to address urban transportation problems in Tegal City. This interview technique was chosen to obtain as much information as possible and develop issues or questions according to the conditions at the interview, so that more information is obtained.

## 2. Questionnaire or questionnaire

Questionnaire or questionnaire is arranged based on criteria and solutions chosen based on interviews where the questionnaire format is arranged according to the standard format used in AHP. Through this AHP format the criteria and alternative solutions are compared in importance on an ordinal scale of 0-9.

This questionnaire aims to determine the priority of decision making to overcome the problem of urban transportation in the City of Tegal which is also the final result in this study.

Determination of respondents considers the criteria that support the analysis method that will be used. Required sampling / respondent is included in the expert criteria. Expert criteria were selected through the ability / competence of respondents both in scientific disciplines, as well as their authority to understand urban transportation problems in Tegal City and solutions to overcome these problems. The respondents in this study are as follows:

a. Transportation experts come from academics. Academics are chosen based on the discipline that is mastered namely transportation engineering.

b. Regional Development Planning, Research and Development Agency

The main tasks and functions of the Tegal City Regional Development Planning, Research and Development Agency related to urban transportation planning are in the Infrastructure and Regional Development Sector which consists of 2 (two) Subdivisions. The target respondents to be interviewed are:

- 1) Head of Infrastructure Subdivision;
- 2) Head of Regional Development Head.

c. Service

d. Transportation of Tegal City.

The Tegal City Communication and Information Office as a technical agency related to transportation is available in 2 (two) fields, namely the Traffic and Road Safety Sector and the Transportation and Vehicle Feasibility Sector and 1 (one) Tegal City UPTD Terminal. The target respondents to be interviewed are:

- 1) Head of Management and Engineering Section;
- 2) Head of Road Equipment and Safety Section;
- 3) Head of the Control and Operational Section

- 4) Head of Vehicle Feasibility Section;
  - 5) Head of Road Transportation Section;
  - 6) Head of Tegal City UPTD Terminal.
- e. Tegal City Public Works and Spatial Planning Office.
- The main tasks and functions of the Tegal City Public Works Office related to urban transport infrastructure are in the Highways and Spatial Planning Field. The target respondents to be interviewed are:
- 1) Head of the Road and Bridge Construction Section;
  - 2) Head of Road and Bridge Maintenance Section;
  - 3) Head of Spatial Planning Section;
  - 4) Head of Spatial Control Section;
- f. The Tegal City Police Department in this study was the Kasatlantas of the Tegal City Police Resort.
- g. Tegal City community as feedback.

### **Data Analysis Method**

The data analysis method used in this study is the Analytical Hierarchy Process (AHP) Method. The processes that occur in the AHP method are as follows:

1. Define the problem and determine the desired solution.
2. Create a hierarchical structure that begins with general objectives followed by criteria and possible alternatives at the lowest criteria level.
3. Make a pairwise comparison matrix describing the relative contribution or influence of each element to the criteria above.
4. Do pairwise comparisons so that judgment (decision) of  $n \times ((n-1) / 2)$  is obtained, where  $n$  is the number of elements being compared.
5. Calculate the eigenvalue and test its consistency if it is inconsistent then the data retrieval is repeated again.
6. Repeat steps 3,4 and 5 for each level of the hierarchy.
7. Calculate the eigenvectors of each pairwise comparison matrix.
8. Check the consistency of the hierarchy. If the value is more than 10 percent then the judgment data assessment must be improved.

From the weighting of the criteria of the total respondents above after calculating the average, the priorities are then calculated using a mathematical equation system according to Brodjonegoro (1991):

$$Y = A (a_1 \times \text{weights } a_1 + \dots + a_6 \times \text{weights } a_6) + \dots + D (d_1 \times \text{weights } d_1 + \dots + d_5 \times \text{weights } d_5)$$

Where:

Y = Priority scale

A to D = Weight of Alternative level 2 (based on respondent analysis)

A1, a2, .... d4, d5 = Weight of Alternative level 3 (based on respondents' analysis)

weight a1, weight a2, .... weight d5 = Weight of Alternative level 3 (based on data analysis)

## Findings and Discussion

### Analysis of Hierarchy Arrangement

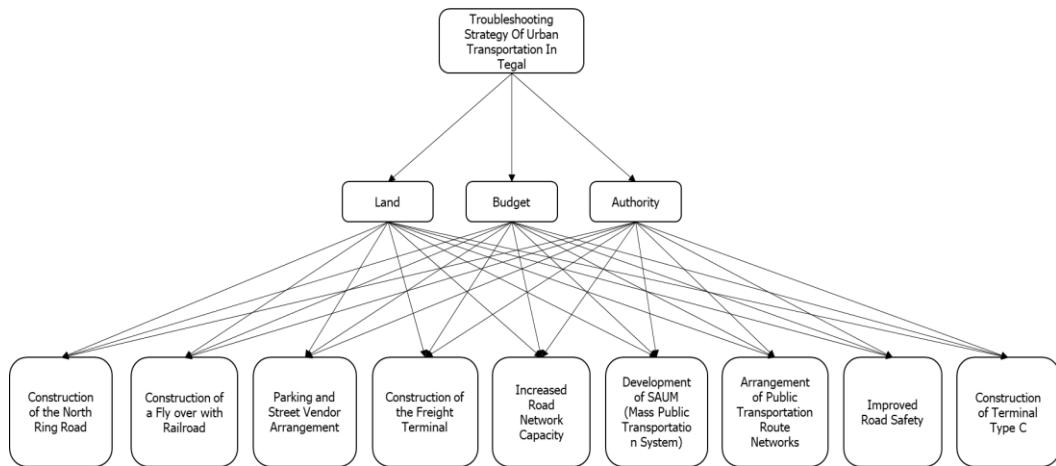


Figure 4. Hierarchy of Urban Transportation Problem Solving in Tegal City

### Priority Weight Analysis

#### 1. Priority Weight Factors

**Table 2. Comparison Matrix Factor**

FACTOR	A	B	C	Information
A	1,00	3,59	6,16	A = Land
B	0,30	1,00	2,71	B = Budget
C	0,18	0,40	1,00	C = Authority

Source: Result Analysis, 2017

**Table 3. Normalization Matrix and Priority Weight Factor**

FACTOR	A	B	C	TOTAL	PRIORITY	%
A	0,68	0,72	0,62	2,02	0,67	67,41%
B	0,20	0,20	0,27	0,68	0,23	22,52%
C	0,12	0,08	0,10	0,30	0,10	10,07%
Jumlah	1,00	1,00	1,00		1,00	100,00%

Source: Result Analysis, 2017

Calculation of consistency test to ensure that the value of the consistency ratio (CR)  $\leq 0.1$ .

$$\lambda_{\max} = 3,10$$

$$CI = (\lambda_{\max} - n) : (n - 1) = (3.10 - 3) : (3 - 1) = 0.10 : 2 = 0.05$$

CR = CI: RI = 0.05: 0.58 = 0.086

CR value = 0.086 ≤ 0.1 indicates that the factor comparison comparison matrix has been consistent.

2. Alternative Policy Priority Weights

Calculation of Alternative Policy Priority Weight Based on Land Factors

**Table 4. Comparative Matrix Comparative Assessment of Land Factors**

ALT	1	2	3	4	5	6	7	8	9
1	1,00	2,53	2,35	7,47	3,00	3,88	5,00	5,00	6,53
2	0,49	1,00	0,58	5,00	2,88	3,00	5,00	5,00	5,00
3	0,58	2,24	1,00	7,47	3,00	3,00	5,00	5,00	5,00
4	0,14	0,20	0,14	1,00	0,20	0,20	0,33	0,33	0,62
5	0,33	0,37	0,33	5,00	1,00	3,00	3,00	3,00	5,00
6	0,27	0,33	0,33	5,00	0,33	1,00	3,00	2,53	2,76
7	0,20	0,20	0,20	3,00	0,33	0,33	1,00	0,55	2,29
8	0,20	0,20	0,20	3,00	0,33	0,49	2,29	1,00	2,94
9	0,16	0,20	0,20	2,12	0,20	0,41	0,57	0,34	1,00
<b>Total</b>	<b>3,37</b>	<b>7,27</b>	<b>5,34</b>	<b>39,06</b>	<b>11,28</b>	<b>15,32</b>	<b>25,20</b>	<b>22,75</b>	<b>31,15</b>

Sumber: Result Analysis, 2017

**Table 5. Matrix and Alternative Priority Weight Based on Land Normalization**

ALT	1	2	3	4	5	6	7	8	9	PRIORITY
1	0,30	0,35	0,44	0,19	0,27	0,25	0,20	0,22	0,21	0,27
2	0,15	0,14	0,11	0,13	0,26	0,20	0,20	0,22	0,16	0,17
3	0,17	0,31	0,19	0,19	0,27	0,20	0,20	0,22	0,16	0,21
4	0,04	0,03	0,03	0,03	0,02	0,01	0,01	0,01	0,02	0,02
5	0,10	0,05	0,06	0,13	0,09	0,20	0,12	0,13	0,16	0,12
6	0,08	0,05	0,06	0,13	0,03	0,07	0,12	0,11	0,09	0,08
7	0,06	0,03	0,04	0,08	0,03	0,02	0,04	0,02	0,07	0,04
8	0,06	0,03	0,04	0,08	0,03	0,03	0,09	0,04	0,09	0,05
9	0,05	0,03	0,04	0,05	0,02	0,03	0,02	0,02	0,03	0,03
<b>Total</b>	<b>1,00</b>	<b>1,00</b>	<b>1,00</b>	<b>1,00</b>	<b>1,00</b>	<b>1,00</b>	<b>1,00</b>	<b>1,00</b>	<b>1,00</b>	<b>1,00</b>

$\lambda_{max} = 9,81$

CI = 0,10

CR = 0,070

Sumber: Result Analysis, 2017

Calculation of Priority Weight of Alternative Policies Based on Budget

**Table 6. Matrix and Alternative Priority Weight Based on Budget Normalization**

ALT	1	2	3	4	5	6	7	8	9	PRIORITY
1	0,24	0,23	0,26	0,22	0,28	0,23	0,20	0,19	0,21	0,23
2	0,19	0,14	0,10	0,16	0,21	0,22	0,22	0,19	0,19	0,18
3	0,26	0,40	0,28	0,17	0,28	0,22	0,19	0,29	0,18	0,25
4	0,03	0,02	0,05	0,03	0,02	0,02	0,02	0,01	0,03	0,03
5	0,08	0,08	0,09	0,12	0,09	0,13	0,11	0,17	0,15	0,11
6	0,05	0,03	0,06	0,08	0,04	0,05	0,08	0,04	0,08	0,06
7	0,05	0,02	0,06	0,06	0,04	0,02	0,04	0,02	0,05	0,04
8	0,08	0,06	0,06	0,12	0,03	0,11	0,10	0,06	0,09	0,08
9	0,04	0,02	0,05	0,05	0,02	0,02	0,03	0,02	0,03	0,03
<b>Total</b>	<b>1,00</b>	<b>1,00</b>	<b>1,00</b>	<b>1,00</b>	<b>1,00</b>	<b>1,00</b>	<b>1,00</b>	<b>1,00</b>	<b>1,00</b>	<b>1,00</b>

$\lambda_{max} = 9,77$

CI = 0,10

CR = 0,066

Sumber: Result Analysis, 2017

Calculation of Alternative Policy Priority Weight Based on Authority Factors

**Table 7. Matrix and Alternative Priority Weight Based on Authority Normalization**

ALT	1	2	3	4	5	6	7	8	9	PRIORITY
1	0,19	0,18	0,25	0,12	0,24	0,28	0,21	0,25	0,17	0,21
2	0,37	0,27	0,35	0,22	0,24	0,31	0,21	0,21	0,18	0,26
3	0,15	0,16	0,16	0,21	0,16	0,19	0,15	0,25	0,17	0,18
4	0,09	0,06	0,03	0,04	0,02	0,02	0,09	0,04	0,08	0,05
5	0,04	0,06	0,05	0,13	0,05	0,03	0,09	0,03	0,08	0,06
6	0,05	0,06	0,05	0,13	0,12	0,06	0,09	0,09	0,13	0,09
7	0,03	0,04	0,03	0,01	0,02	0,02	0,03	0,03	0,04	0,03
8	0,06	0,13	0,05	0,11	0,14	0,08	0,09	0,08	0,13	0,10
9	0,03	0,04	0,02	0,01	0,02	0,01	0,03	0,02	0,03	0,02
<b>Total</b>	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
$\lambda_{max} = 9,94$									CI = 0,12	CR = 0,081

Sumber: Result Analysis, 2017

Recapitalization of Priority Weights for Each Element

**Table 8. Recapitulation of Alternative Policy Priority Matrices Based on All Factors**

ALTERNATIVE	FACTOR		
	LAND	BUDGET	AUTHORITY
	<b>0,67</b>	<b>0,23</b>	<b>0,10</b>
1	0,27	0,23	0,21
2	0,17	0,18	0,26
3	0,21	0,25	0,18
4	0,02	0,03	0,05
5	0,12	0,11	0,06
6	0,08	0,06	0,09
7	0,04	0,04	0,03
8	0,05	0,08	0,10
9	0,03	0,03	0,02

Sumber: Result Analysis, 2017

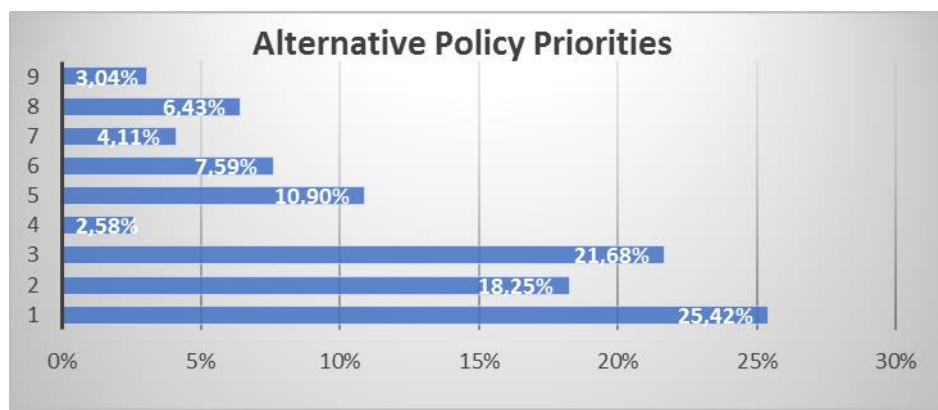
**Table 9. The Weight of Each Factor in Alternative Policies**

ALTERNATIVE	FACTOR			WEIGHT OF PRIORITY	%
	LAND	BUDGET	AUTHORITY		
1	0,18	0,05	0,02	0,25	25,42%
2	0,12	0,04	0,03	0,18	18,25%
3	0,14	0,06	0,02	0,22	21,68%
4	0,01	0,01	0,01	0,03	2,58%
5	0,08	0,03	0,01	0,11	10,90%
6	0,05	0,01	0,01	0,08	7,59%
7	0,03	0,01	0,00	0,04	4,11%
8	0,04	0,02	0,01	0,06	6,43%
9	0,02	0,01	0,00	0,03	3,04%

Sumber: Result Analysis, 2017

**Table 10. Alternative Policy Priority Order**

RANKING	ALTERNATIVE POLICY	WEIGHT OR PRIORITY
1	Construction of the north ring road	25,42%
2	Parking and street arrangement	21,68%
3	Fly over Construction by Railroad	18,25%
4	Capacity building of the road network	10,90%
5	Construction of the SAUM (Mass Public Transportation System)	7,59%
6	Road safety improvement	6,43%
7	Arrangement of the Public Transportation Route Network	4,11%
8	Construction of Terminal Type C	3,04%
9	Construction of Freight Terminal	2,58%



Sumber: Result Analysis, 2017

**Figure 5. Alternative Policy Priorities**

**Sensitivity Analysis**

AHP sensitivity analysis is carried out to determine the tendency of selecting each alternative policy based on changes in each factor.

The modeling in this sensitivity analysis is as follows:

1.  $Y_1 = 0.18 \text{ Land} + 0.05 \text{ Budget} + 0.02 \text{ Authority}$
2.  $Y_2 = 0.12 \text{ Land} + 0.04 \text{ Budget} + 0.03 \text{ Authority}$
3.  $Y_3 = 0.14 \text{ Land} + 0.06 \text{ Budget} + 0.02 \text{ Authority}$
4.  $Y_4 = 0.01 \text{ Land} + 0.01 \text{ Budget} + 0.01 \text{ Authority}$
5.  $Y_5 = 0.08 \text{ Land} + 0.03 \text{ Budget} + 0.01 \text{ Authority}$
6.  $Y_6 = 0.05 \text{ Land} + 0.01 \text{ Budget} + 0.01 \text{ Authority}$
7.  $Y_7 = 0.03 \text{ Land} + 0.01 \text{ Budget} + 0.00 \text{ Authority}$
8.  $Y_8 = 0.04 \text{ Land} + 0.02 \text{ Budget} + 0.01 \text{ Authority}$
9.  $Y_9 = 0.01 \text{ Land} + 0.01 \text{ Budget} + 0.00 \text{ Authority}$



Where:

Y1: Construction of the North Ring Road

Y2: Construction of a Fly over with Railroad

Y3: Parking and Street Vendor Arrangement

Y4: Construction of the Freight Terminal

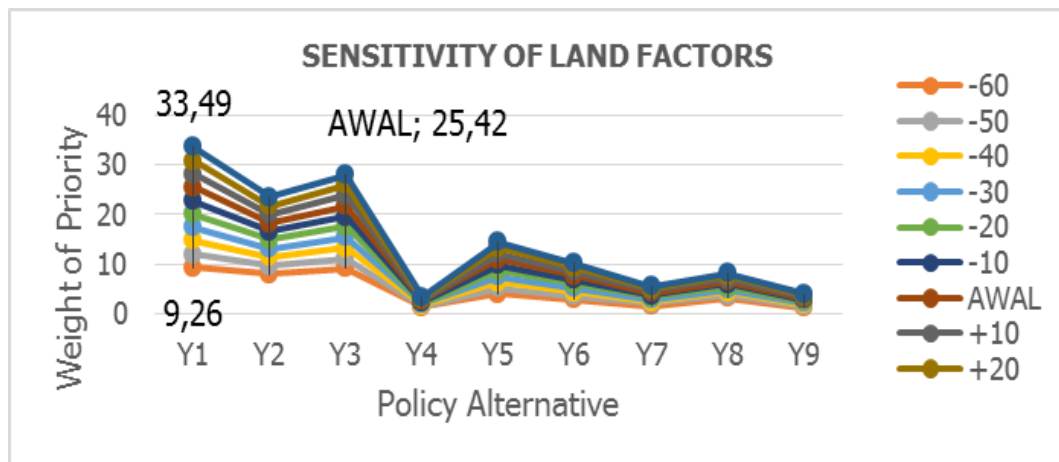
Y5: Increased Road Network Capacity

Y6: Development of SAUM (Mass Public Transportation System)

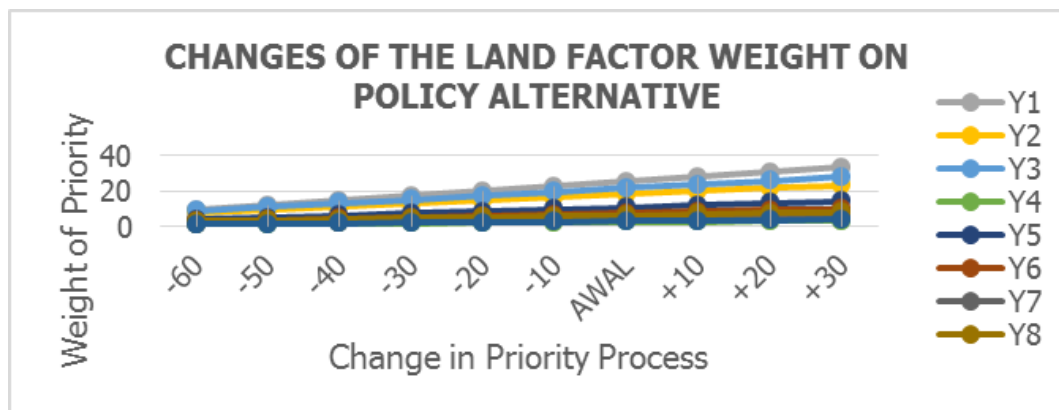
Y7: Arrangement of Public Transportation Route Networks

Y8: Improved Road Safety

Y9: Construction of Terminal Type C

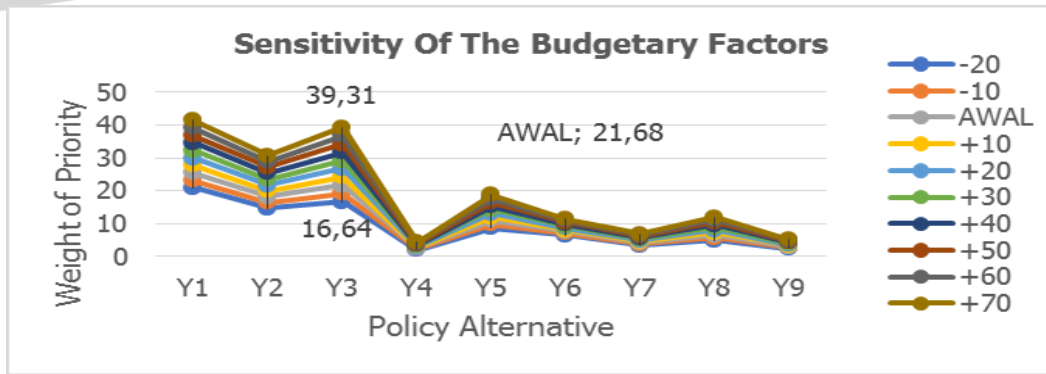


**Figure 6. Sensitivity Graph of Land Factors**



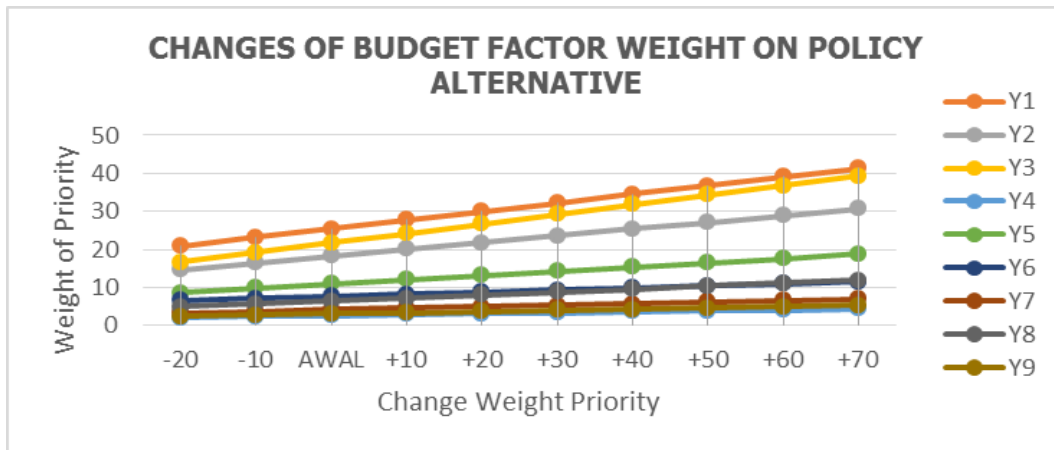
**Figure 7. Graph Changes of Land Factor weight on Alternative Policy**

The **Figure** above shows that changing the priority weights of land factors will not change the priority of alternative policy.

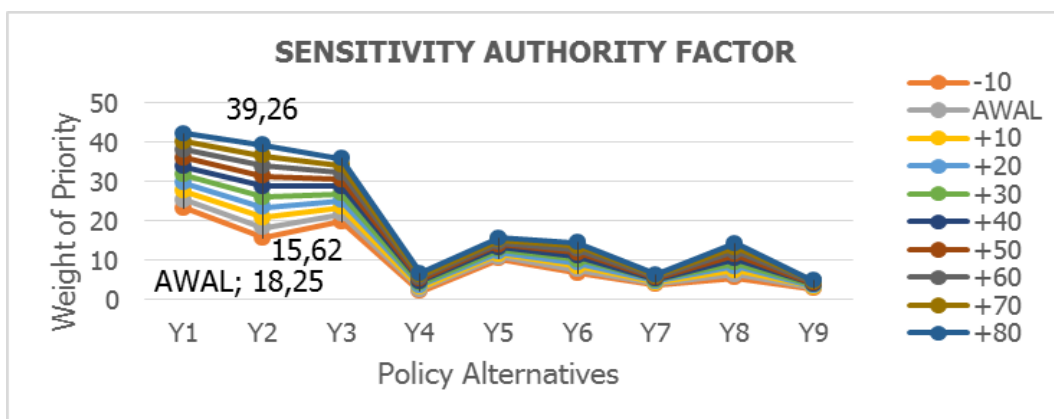


**Figure 8. Graph Sensitivity of The Budgetary Factors**

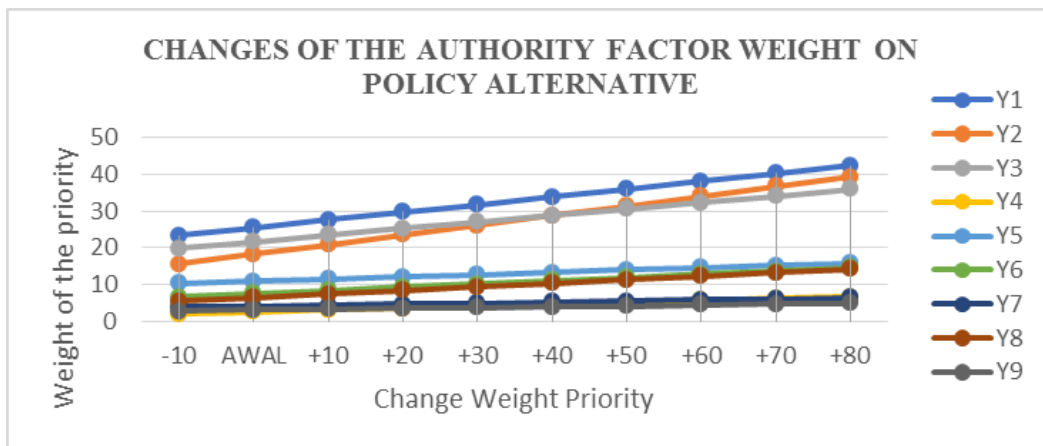
**Figure 8** shows the sensitivity of the budgetary factors in each change condition to policy alternatives. From the sensitivity chart of the budget factor it is known that the alternative policy that is the most sensitive or affected by changes in the budget factor is the alternative Parking Management and PKL (Y3) policy with a change in the priority weight of the alternative policy of 2.52%.



**Figure 9. Graph of Changes Budget Facor weight on Policy Alternative**



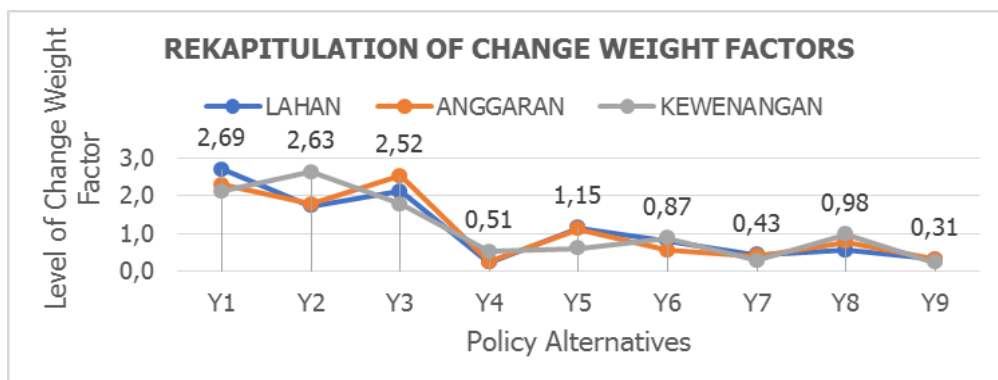
**Figure 10. Graph of Sensivity Authority Factor**



**Figure 11. Graph Changes of The Authority Factor Weight on Alternative Policy**

Figure 11 shows a change in the order of alternative policies caused by an increase in the weight of the authority factor compared to the initial conditions. The first sequence remains in the Construction of the North Ring Road (Y1). The second sequence is the Construction of Fly Over with Railroad (Y3) which in the initial condition is in third place. The third sequence is P Occurrence of 4 (four) changes in the priority order of alternative policies shows that the authority factor is the most sensitive factor or influences the priority order of alternative policies. Therefore, the Tegal City Government needs to determine anticipatory steps in accordance with its authority so that the strategies for solving urban transportation problems that have been determined in order of priority do not change. Steps - steps that can be done include:

1. Making or determining aspects of legality as the legal basis for implementing programs or policies in the field of urban transportation. Parking arrangements and street vendors (Y2) which are in the initial conditions are second.
2. Good coordination between institutions between the Central Government, Central Java Provincial Government, and Tegal City Government to implement strategies for solving urban transportation problems in Tegal City that have been arranged in order of priority.



**Figure 12. Priority Graph Handling Factors in Each Policy Alternative**

Based on **Figure 12** it is known that:

1. Development of the North Ring Road (Y1), the priority order of handling related to the sensitivity of the first factor is land factor with a factor weight change of 2.69%, followed by the budget factor (2.28%) and authority factor (2.12%);
2. The development of Fly over by Railroad (Y2), the priority order of handling related to the sensitivity of the first factor is the authority factor with a change in factor weighting of 2.63%, followed by the budget factor (1.78%) and the land factor (1.72%);
3. Parking Management and Street Vendors (Y3), the priority order of handling related to the sensitivity of the first factor is the budget factor with a change in factor weighting of 2.52% followed by land factor (2.11%) and authority factor (1.77%);

### **Conclusion**

The factors that influence the policies implemented by the Tegal City Government are land, budget, and authority factors.

1. Alternative policies as alternative solutions relevant to urban transportation problems in Tegal City are:
  - a. Construction of the North Ring Road
  - b. Construction of Fly over with Railroad
  - c. Parking Management and Street Vendors
  - d. Construction of the Freight Terminal
  - e. Road Network Capacity Building
  - f. SAUM Development (Mass Public Transportation System)
  - g. Arrangement of Public Transportation Route Networks
  - h. Improved Road Safety
  - i. Construction of Terminal Type C
2. The weighting of priority factors affecting the policy for the first priority is the land factor with a weight of 0.67 or 67% of the total weighting. The second priority is the budget factor with a weight of 0.23 or 23% of the total weighting. And the third priority is the fact of authority with a weight of 0.10 or 10% of the total weighting.
3. Based on the weighting of alternative policy priorities, the order of alternative policy priorities that can be used as a strategy for solving urban transportation problems in Tegal City are:
  - a. North Ring Road Development (weight value / percentage of 0.25 or 25.42%);

- b. Parking Arrangement and Street Vendors (weight value / percentage of 0.22 or 21.68%);
  - c. Construction of Fly over with Railroad (weight value / percentage of 0.18 or 18.25%);
  - d. Increased Road Network Capacity (weight / percentage value of 0.11 or 10.90%);
  - e. Development of SAUM (Mass Public Transportation System) (weight / percentage value of 0.08 or 7.59%);
  - f. Improved Road Safety (weight value / percentage of 0.06 or 6.43%);
  - g. Public Transportation Route Network Arrangement (weight/percentage value of 0.04 or 4.11%);
  - h. Construction of Terminal Type C (weight / percentage value of 0.03 or 3.04%);
  - i. Construction of the Freight Terminal (weight / percentage value of 0.03 or 2.58%).
4. Based on the sensitivity analysis in the form of changes in factor weights and discussion of alternative solutions to urban transportation problems in Tegalt City:
- a. Construction of the North Ring Road remains the first priority even though the weight of priority factors changes;
  - b. Alternative policies for the Development of the North Ring Road (Y1) are the most sensitive or affected by changes in land factors with a change in the priority weight of alternative policies of 2.69%;
  - c. Changing the priority weight of the land factor will not change the order of priority of alternative policies. Changing the priority weight of land factors will only change the priority weight of alternative policies without changing the order;
  - d. Parking Management and Street Vendor (Y3) alternative policies are the most sensitive or affected by alternative budget changes with a change in the priority weight of alternative policies at 2.52%;
  - e. There has been a change in the order of alternative policies caused by an increase in the weight of the budgeting factor compared to the initial conditions. The first to fourth sequences remain the same as the initial conditions in sequence, namely the Construction of the North Ring Road (Y1), Fly Over Construction by Railroad (Y3), Parking and Street Arrangement (Y2), and Capacity Building for Road Networks (Y5). The fifth place is Road Safety Improvement (Y8) which is in the sixth position. The sixth sequence is the Construction of the SAUM (Mass Public Transportation System) (Y6) which in the initial condition was in fifth place. For the seventh to the ninth sequence remains the same as the initial

conditions in sequence is the Arrangement of the Public Transportation Route Network (Y7), Construction of Terminal Type C (Y9), and Construction of Freight Terminal (Y4).

- f. Alternative policies for Fly Over Development with Railroad (Y2) are alternative policies that are the most sensitive or affected by changes in authority factors with a change in the priority weight of alternative policies at 2.63%.
- g. There was a change in the alternative order of policies due to an increase in the weight of the authority factor compared to the initial conditions. The eighth place is the Public Transportation Route Arrangement (Y7), which in the initial condition is seventh. The ninth place is the Construction of Terminal Type C (Y9), which in the initial condition was ranked eighth.
- h. The occurrence of 4 (four) changes in the priority order of alternative policies shows that the authority factor is the most sensitive factor or influences the priority order of alternative policies.

### **Suggestion**

1. Quick and appropriate steps are needed in handling the factors that influence the determination of Tegal City Government policy. The land factor which gets the biggest weight as a factor influencing the determination of urban transportation policy requires the Tegal City Government to utilize land availability as effectively as possible. For example, in alternative parking structuring policies and street vendors to divert parking to the road body, the Tegal City Government can plan a parking building policy.
2. There is a need to do a more in-depth technical study of each of the alternatives to solving urban transportation problems in Tegal City contained in this study.
3. The Tegal City Government can immediately formulate strategic steps in planning and development in the field of urban transportation related to policy priorities that will be carried out in the main programs. These programs can be included in the work plan along with significant budget allocations in supporting sectors in the urban transportation sector such as road safety improvement programs, development of traffic control systems, and others.
4. Related to the authority factor is the most sensitive factor or influences the priority order of alternative policies, Tegal City Government needs to take anticipatory steps according to its authority by:
  - a. Making or determining aspects of legality as a legal basis for implementing programs or policies in the field of urban transportation. The legal basis that can be issued by the Tegal City Government can be in the form of Tegal City Regulations, Mayor Regulations, and others that are in line with Central Java Provincial Government and Central Government regulations;
  - b. Good interagency coordination between the Central Government, Central Java Provincial Government and Tegal City Government implements a

strategy for solving urban transportation problems in Tegal City that has been arranged in order of priority. Coordination is carried out related to the distribution of authority of each level of government towards the implementation of the program or policy. For example, the policy of Fly Over Development with Railroad Tracks that has 2 (two) target development sites, namely Jalan Sudibyo Road with the status of the national road becomes the authority of the Central Government and Abimanyu Road with the status of the City Road becomes the authority of the Tegal City Government so there must be a common perception related to priorities or level of importance in the implementation of the program or policy.

5. The construction of the north ring road as an alternative policy which becomes the first priority shows that the north ring road has a very significant influence on the condition of urban transportation in Tegal City. The government is expected to immediately make efforts to continue work on the construction of the halted north ring road. Good coordination between the Central Government, Central Java Provincial Government and Tegal City Government is needed to continue the work of the northern ring road construction of Tegal. Coordination is carried out related to the handling of factors that influence policies as well as applicable regulations relating to land, budgeting, and governmental authority.

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## Development of Traffic Warning Signs to Boost Safe Driving Behavior

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### Abstract

A significant number of road accidents showed that human error related to unsafe driving behavior shared the largest contribution of traffic accidents. However, the current traffic warning signs are dominated by the warning symbols of potential hazards related to road geometric and road users. There are limited numbers of signs associated with the drivers' behavior, as part of the recommendation not to drive. Therefore, the development of innovative traffic warning signs is demanded to improve safe driving behavior. The development of the traffic warning signs was tested to 140 respondents that consisted of various age groups, gender, education level, professions, driving license type and ownership, daily travel distance, and type of vehicles that they utilized. The survey showed the various level on the 5-Likert scale for drivers' comprehension and conspicuity to six designs, learnability of designs, relevance of designs to drivers' conditions and experience, distinctiveness or uniqueness of signs designs.

**Keywords:** design development, warning sign, symbol, emoticon

### Introduction

The PIARC Road Safety Manual (2003) revealed that human error contributed a 93-percent portion in traffic accidents, in which 57 percent of the accidents were due to drivers' careless behavior, 26 percent related to road factors, 6 percent related to vehicle factors, and 4 percent covered both road and vehicle factors. Meanwhile, the statistical data from *The Blue Book of Road Safety in China* (2007) revealed that drivers' behavior shared the biggest contribution to the occurrence of traffic accidents in several countries. The traffic accidents due to the issue of drivers' behavior reached 41 percent in Italy, 57 percent in the United States of America, 74 percent in Hungary, 75 percent in Brazil and Russia, and 82 percent in Germany. Meanwhile, in 2019, China recorded 94.62 percent of accident cases due to drivers' behavior, followed by Poland that reached 96 percent (Zhang *et al*, 2011).

A lot of researchers reported that the current road sign system was unable to serve functions due to the lack of traffic signs in promoting safe driving behavior. Drivers generally have sufficient perception to detect the traffic signs, however, they perceive less urgency to process the information conveyed through the traffic signs (Al-Madani and Al-Janahi, 2002). Warning signs are intended to communicate the knowledge related to potential hazards and how to avoid them. The signs also

function as a reminder for possible dangers on the road. The effective functions of traffic warning signs will depend on the characteristics of situations, people, and the warning signs themselves (Lesch, 2003).

According to Ng and Chan (2007), the effectiveness of traffic signs is marked by the available function to communicate the messages of the signs to the road users. The signs should offer substantial functions not only based on the characteristics of the road users but also on the influencing features of the signs. An easy-to-observe concept is necessary to consider in designing a road user-friendly traffic warning sign. The traffic warning signs should be able to provide clear messages to the road users about the road conditions at the right time.

Laughery and Wolgater (2014) stated that an effective warning system ought to be attractive, generate knowledge, and lead to behavioral compliance. To achieve the purpose, design and non-design factors are the main matters to consider. The non-design factors include the impacts on the target audience and situation, including context, location, and disturbance. Meanwhile, the design factors include size, color/contrast, words, images, and format. In addition to the criteria regarding the driver's comprehension of the traffic warning signs, Swanson et al (1997) proposed other aspects to consider in producing the effective traffic warning signs, including the ability of the warning signs to attract the drivers' attention (conspicuity), the ease of the signs to remember (learnability), the relevance of the signs to drivers' experiences (relevance), and the uniqueness of the signs which differs from other designs (distinctiveness).

Various pictorial symbols for the official warning signs in Indonesia as stipulated in Regulation of Minister of Transportation No. 13 of 2014 as well as the traffic warning signs in numerous countries as stipulated in the Manual of Uniform Control Devices (MUTCD) 2012 and its revised edition mostly depict the symbols of conditional danger, such as road geometric condition, road surface condition; or other hazards associated with the activities of road users, such as pedestrians, animals, and others. There are limited numbers of traffic warning signs that warn the drivers' careless behavior and physical condition that they should avoid while driving.

As part of development and improvement in the designs of traffic warning symbols in the future, Swanson et al (1997) proposed two processes, including: (i) the modification of the symbols to improve the symbols' readability by maintaining their basic features, as an attempt to generate a good comprehension, and (ii) the redesign of elusive symbols to improve the understanding and optimize the symbols' readability. The optimization of the symbols' readability should refer to the management of the following requirements: (i) changes of the symbols, (ii) size and details, (iii) revision of the shapes,

(iv) relocation of the symbols' elements through large segregation, and (v) deletion or addition of several elements.

## Methods

The development of traffic warning signs to improve safe driving behavior includes a number of efforts, including the designing of traffic warning signs; testing of the traffic warning designs by involving a number of respondents to explore the level of their understanding to the traffic warning designs, level of their attention to the designs, level of ease to remember the symbols of the traffic warning designs, level of relevance of the symbols to their past driving experiences, and level of uniqueness of the traffic warning designs compared to the current models.

This study involved 140 respondents with driving licenses. It featured a *probability sampling* through a *stratified sampling* technique due to the composition of the respondents from various age groups, gender, recent education levels, professions, daily travel distance, type of driving license, the period of driving license ownership, and type of vehicles.

The respondents were requested to evaluate six designs of traffic warning signs through a Likert-scale questionnaire. Every design of the traffic warning signs featured symbols and meanings as shown in **Figure 1**, ranging from Design A to F. Through the 5-scale Likert questionnaire, the respondents were requested to rate every traffic warning design based on a number of criteria, including comprehension, conspicuity, learnability, relevance, and distinctiveness. A 5-point on the Likert-scale questionnaire signifies the highest rate of all aspects of the evaluation.

The results of Likert-scale analysis would be processed to obtain the average point of the respondents' evaluation to the traffic warning designs based on five criteria as cited by Swanson *et al*, 1997, namely:

1. *Comprehension*, the respondents evaluate the traffic warning designs based on their level of understanding of the messages depicted on the designs.
2. *Conspicuity*, the respondents evaluate the traffic warning designs based on the level of attractiveness.
3. *Learnability*, the respondents evaluate the traffic warning designs based on the easy-to-remember feature of the signs.
4. *Relevance*, the respondents evaluate the traffic warning designs based on their relevant driving experiences.
5. *Distinctiveness*, the respondents evaluate the traffic warning designs based on the signature characteristics of the designs that do not resemble other models.

For instance, regarding the aspect of comprehension, a 5-point in Likert-scale questionnaire signifies a response that the traffic warning design is strongly comprehensible, a 4-point signifies a response that the design is comprehensible, a 3-point signifies a response that the design is moderately comprehensible, a 2-point signifies a response that the design is incomprehensible, and a 1-point signifies a response that the design is strongly incomprehensible. A similar evaluation is also applicable for other criteria, including *conspicuity*, *learnability*,

relevance, and distinctiveness.



Design A

Design B

Design C

(Source: Sodikin, 2018a)



Design D

Design E

Design F

(Source: Sodikin, 2018b)

(Source: Sodikin, 2018c)

### Figure 1. Designs of Traffic Warning Signs

The designs of traffic warning signs were developed based on the needs which could be relevant to the current condition. The traffic signs should signify the causing factors of traffic accidents related to human error which reached 93 percent, in which 57 percent were mainly caused by the drivers' ignorance of safety.

The development of traffic warning signs was initiated through a modification of the traffic signs by maintaining their basic features, such as shapes, symbols, color, and background. The symbols of the warning signs referred to the drivers' behavior which were depicted through several expressional pictures. The expressional pictures generally show the expressions that the drivers had been familiar with, such as through emoticon symbols.

The use of modified emoticons in the development of new traffic warning designs was considered based on the function of the emoticon symbols in depicting particular expressions, such as smiling, winking, being furious, and frowning (Rezabek and Cochenour, 1998). Regarding the functions of warning signs as a reminder for the drivers, the use of emoticon symbols for the development of new traffic warning signs was considered relevant.

Emoticons can connect the written messages and face-to-face conversation as well as provide an overview to those whom the messages were addressed through the depiction of facial expressions. Emoticons can also facilitate the international

communication and minimize the gap of communication due to the differences in language (Azuma and Ebner, 2008), thus the warning signs with emoticon symbols are prevalent for all people despite their different regions and languages since the symbols are universally understandable.

Design A is a warning sign that shows drowsy driving behavior. The sign depicts an emoticon head with closed eyes, flat mouth, and upright position as if maintaining the steering wheel to avoid the changes in direction yet exhausted physical condition. This type of driver tends to insist themselves to continue driving despite their inadequate physical conditions, as they are not aware of harming themselves and others.

Design B is a warning sign that shows careless driving behavior by using a mobile phone. The design depicts an emoticon head with a smiling happy face, and upright body position to the steering wheel yet less concentration due to an activity with the mobile phone. This type of driver tends to be unaware of other vehicles and traffic around them.

Design C is a warning sign of an angry driver. It depicts an emoticon head with frowning eyebrows, tightly closed mouth, furious expression, and upright body position to the steering wheel. The picture symbolizes psychological tension of the driver. This type of driver tends to be intolerant and selfish and judge other drivers without reflecting that their reckless action indeed can harm other people.

Design D is a warning sign of reckless driving behavior. It depicts an emoticon head with vertical forehead wrinkle, smirky expression, tilted body, and unstable steering position that indicates an excessive pleasure and carelessness without paying attention to driving safety. This type of driver tends to provoke other drivers, do a zig-zag driving, ignore the safe distance, and tend to violate the traffic rules.

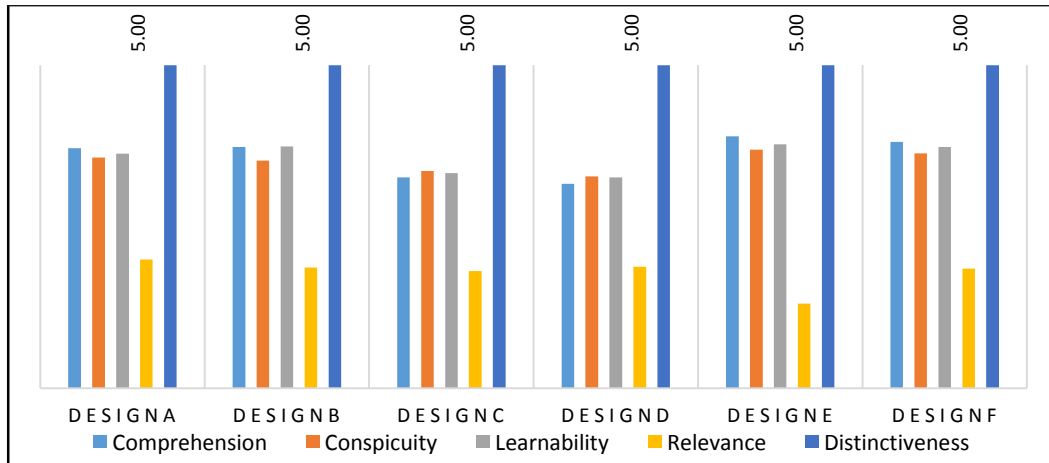
Design E is a warning sign of drunk driving behavior. It depicts an emoticon head with floating eyebrows, one hand that still holds the bottle, a staggering head, and an unstable seat position. This type of driver cannot control their driving and show a slow motoric response that often causes a zig-zag driving without a certain direction.

Design F is a warning sign of driving behavior while using mobile phone. It depicts an emoticon head with a smiling happy face, slightly forward-leaning position to the steering wheel, and bowing head yet less concentration on the steering wheel and traffic due to the activity with the mobile phone. This type of driver tends to be unaware of the vehicles and traffic around them, thus they harm themselves and others.

### **Findings and Discussion**

Based on the survey that involved 140 respondents (drivers) regarding a number of criteria, including the drivers' understanding to the designs of traffic warning signs (comprehension), the drivers' attention to the designs (conspicuity), the simplicity of the designs to remember (learnability), the relevance of the design with the

drivers' past experiences (relevance), and the signature features of the designs (distinctiveness) that differ them from other traffic signs as shown in **Figure 2**.



**Figure 2. Respondents' Evaluation to The Development of Traffic Warning Designs**

Each criterion of the new traffic warning signs has a relevant value of the measure on the Likert scale. In terms of comprehension, the lowest point among Design A, B, C, D, E, and F was 3.2, while the highest point was 3.9. In detail, the comprehension aspect resulted in an average point of 3.6, which implied a moderately easy-to-understand feature for the drivers. In terms of conspicuity, those six designs secured the lowest point of 3.3 and the highest point of 3.7. With an average point of 3.5 in terms of conspicuity, those six designs were considered moderately conspicuous to attract the drivers' attention. With regards to the aspect of learnability, those six designs recorded the lowest point of 3.3 and the highest point of 3.8. The average point regarding the learnability aspect was 3.6, implying that those six designs were moderately easy to remember. In terms of relevance, those six designs resulted in the lowest point on the Likert scale of 1.3, while the highest point was 2.0. With an average of 1.5 in terms of relevance, those designs were considered relevant to the respondents' driving experiences. Lastly, those six designs reached the point of 5.0 in terms of distinctiveness, implying the designs' uniqueness that did not resemble any other designs.

Design E, as the traffic sign that warned drunk driving behavior, secured the highest point on the Likert scale in terms of comprehension, conspicuity, learnability. In contrast, Design D that warned reckless driving behavior, recorded the lowest point. In terms of relevance based on the respondents' driving experience, Design A as the traffic sign that warned drowsy driving behavior recorded the highest point. Meanwhile, Design E that warned drunk driving behavior signified the lowest point in terms of relevance. Regarding the distinctiveness, all of the traffic warning designs were considered unique, as they did not resemble other designs of the current traffic signs.

## **Conclusion**

The six designs of traffic warning signs through the modification of emoticon symbols successfully attracted the attention of the respondents that had just seen the new types of warning signs for the first time. They considered that the traffic warning signs were easy to comprehend, moderately conspicuous, moderately easy to remember, and relevant with their driving experiences. The designs of the traffic warning sign did not resemble any current types of traffic signs.

This discovery signifies that the new designs are fairly accepted by the respondents as part of the basic development of relevant traffic warning signs based on the drivers' behaviour when they drive their vehicles. The modification of emoticon symbols in the development of those traffic warning signs can improve driving safety, thus can reduce the risk of traffic accidents due to human error.

## **Acknowledgment**

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## **Evaluation of Community Response on Improvement in Public Transport Services**

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### **Abstract**

**Evaluation of Community Response on Improvement in Public Transport Services.** The traffic jam due to high volume of personal vehicles like cars and motorcycles in DKI Jakarta requires a well planned and sustainable mitigation. One method is to reduce the dependence on private vehicle by providing adequate public transportation facilities such as Airport Train, Automated People Mover (APM), and Mass Rapid Transit (MRT). To quantify the level of utilization of these facilities, this article is to evaluate the perceptions and responses from community and their willingness to shift transportation modes. The primary data for this article is from the distribution of questionnaires related to the operation of the said mass public transportation. Secondary data is from surveys by various agencies and data on said transportation mode. The result is in general the community has positive response about mass public transportation, but its utilization is not optimum. Around 13% of respondents are interested to shift from their current mode to airport trains and 31% to APM. About 36% of respondents have combined transportation modes between private vehicles or paratransit with MRT.

**Keywords:** Airport train, Automated people mover, Modal shift, MRT, Public mass transport

### **Introduction**

According to the 2017 TomTom Traffic Index, Jakarta is ranked as the third most congested city in the world with around 19 million trips per day (Ministry of Transportation of the Republic of Indonesia, 2016). The optimum operating speed is at 26 km / hour and drivers experience travel time of up to 48 minutes longer than the expected travel time in designed speed. The traffic congestion typically occurs on workdays, especially in the morning and evening peak hours.

One of the causes of congestion in Jakarta is the high-volume cars and motorcycles that can only move a small number of people and/or goods in each trip. The motorcycle has an occupancy rate of 1.26 passengers while the car has an occupancy rate of 1.92 - 2.38 passengers (Yudiartono et al., 2018). Congestion due to the volume of low occupancy transportation modes can be mitigated by sustainable mass public transportation. Good planning and implementation of sustainable mass

public transportation will be able to minimize the increase of and reduce the dependency on private and paratransit transportation modes. In the long term, sustainable mass public transportation is expected to drive the users to shift from private and paratransit vehicles to mass public transportation. A system of mass public transportation that can provide adequate mobility for the community will have an impact in reducing congestion, driving the national economy, and reducing air pollution.

The government has initiated the improvements in public transportation services, whether by enhancing the existing services and/or by adding new public transportation infrastructures. Enhancement in existing services includes adding routes, rejuvenating bus stops, and providing Transjakarta feeder buses. The new public transportation modes/infrastructures are the Airport Train, Automatic People Mover, and Mass Rapid Transit. The following is a brief description of each of these new modes:

#### 1. Airport Train

The Airport Train, that begin to operate on January 2, 2018, is an alternative mode of transportation to Soekarno-Hatta Airport. The route consists of stops at five stations, namely Manggarai Station, Sudirman Baru Station (SDB) / BNI City Station, Duri Station, Batu Ceper Station, and Soekarno-Hatta Airport Station (BST). The travel time to ride the airport train from BNI City Station to Soekarno-Hatta Airport Station is about 54 minutes. When it opens, the Airport Train is serving 124 trips per day.



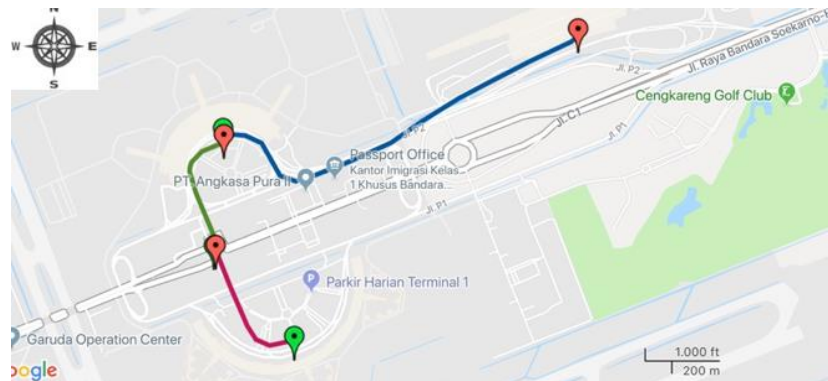
(Hamdani, 2018)

**Figure 1. Airport Train Route BNI City - BST**

To expand the Airport Train services, the Airport Train line has started providing service to Bekasi since June 19, 2019, with approximately 92 minutes of travel time to BST.

## 2. Automatic People Mover

The elevated train or Automatic People Mover (APM) is the first elevated train for airport in Indonesia. The APM functions as connectors from the Airport Train Station and the parking lots to the three terminals at Soekarno-Hatta Airport. The APM is also to facilitate movement of passengers among the terminals and to reduce the circulation of private vehicles within the airport area.

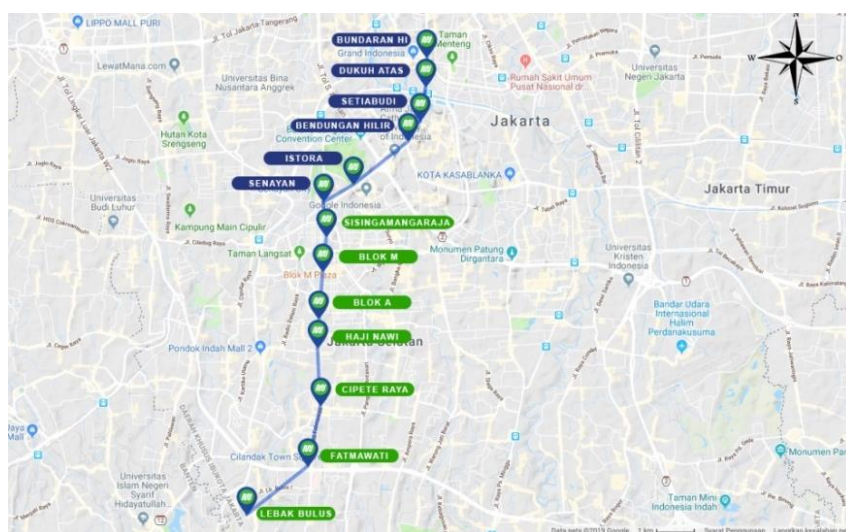


(Hamdani, 2018)

**Figure 2. Automated People Mover Route**

## 3. Mass Rapid Transit

PT. Mass Rapid Transit Jakarta (MRT Jakarta) was established on June 17, 2008 and the Phase 1 construction of the MRT project commenced on October 10, 2013. Jakarta MRT has begun its operations on April 1, 2019. The Jakarta MRT route starts from Lebak Bulus to the Hotel Indonesia Roundabout (HI) with a total route length of 15.7 kilometers. There are 13 stations along the route: seven elevated stations (Lebak Bulus, Fatmawati, Cipete Raya, Haji Nawi, Blok A, Blok M and ASEAN) and six underground stations (Senayan, Istora, Bendungan Hilir, Setiabudi, Dukuh Atas, and HI).



(PT. MRT Jakarta, modified by Wennardy, 2019)

**Figure 3. MRT Jakarta Route**

As reviewed in the *Republika* in August 2018, the MRT has the capacity to mobilize 200,000 passengers per day. Within the first month of its operation, PT. MRT Jakarta states that the number of passengers has reached 82,000 per day (Marison, 2019).

Based on the above explanation, the objectives of this article are as follows:

1. To gather the community responses on mass public transportation services and its role in reducing congestion
2. To quantify the potential amount of transportation modal shift that occurs with the availability of mass public transportation

The results of this evaluation are quantification on the response and on the utilization of mass public transportation which can be used as the basis for evaluating the effectiveness of those modes of transportation. Furthermore, this data can be utilized in planning of other mass public transportation.

### **Methods**

The data for this evaluation consists of primary and secondary data. Primary data are obtained from questionnaires, both online and direct interview. The primary data is conducted when Airport Train, APM and MRT start its operation. The information gathered in the questionnaire are the distribution of age and profession, public interest in using the transportation modes, public opinion about the services, price, potential users, and the aspects that are considered very important in choosing mode of transport as well as various other information. The questionnaire was conducted in two stages as follows:

1. Questionnaire regarding to Airport Train and APM was conducted online by using limesurvey from 6 February 2018 to 6 March 2018. This questionnaire was led by Devina Hamdani, a student in Civil Engineering Department at Pelita Harapan University.
2. Questionnaire regarding to MRT services was conducted online by using Google forms and by interviewing in-person from 27 March 2019 to 7 April 2019. This questionnaire was led by Chriviandi Wennardy, a student in Civil Engineering Department at Pelita Harapan University.

Secondary data are obtained from literature studies, news reviews, and surveys that was conducted by other organization and is used for analysis.

### **Result and Discussion**

#### **Result from Airport Train and APM Questionnaire**

Although more than 60% of repondents know about the Airport Train and APM, the number of users consist of less than 10% of repondents.

1. Respondent

The number of respondents for the Airport Train and APM questionnaire is 91 people with the largest age group (46.2%) between 21-25 years old and most

respondents (40.7%) are employees in private firm. About 23% of the total respondents come to the airport for more than 10 times a year and 92% of the total respondents use private cars to the airport. In addition to private cars, 69.2% of respondents use taxis and online transportation such as Gojek and Grab to the airport. Whereas only a few of the respondents chose to use public mass transportation; 14.3% public shuttle, 1% JAConnexion, and 7.6% Airport Train.

## 2. Service

The questionnaire includes seven service criteria for evaluation. The following table summarizes the importance of those services. It is determined based on percentage of respondents to indicate those services as very important.

**Table 1. Airport Train and APM Service Criteria and Percentage of Response To Indicate It Very Important**

Rank	Service Criteria	Percentage of Respondents
1.	Punctuality	65.9%
2.	Safety	60.4%
3.	Accessibility	58.2%
4.	Frequency of departure	50.6%
5.	Short duration of travel	51.7%
6.	Comfort	48.4%
7.	Travel cost	37.4%

## 3. Modal Shift

As many as 13.2% of respondents are willing to shift their current mode of transportation to the airport train. The top three reasons to shift to airport trains are punctuality, frequency of departure, and short duration of travel. As for the APM, as many as 31.9% of respondents are willing to shift to APM. The top three reasons for using the APM are punctuality, short duration of travel, and comfort.

### Result from MRT Questionnaire

For MRT facility, online questionnaires were distributed using Google forms and in-person interviews were conducted around Jenderal Sudirman Street and the MRT train stations.

#### 1. Respondent

There are 405 respondents for the MRT questionnaire with the largest age group (63%) between 15-25 years old and most respondents (46.7%) are employees in private firm. In the period when questionnaire was distributed, around 33.9% of the total respondents traveling within the South/Central Jakarta area use mass public transportation (public buses, commuter line, airport trains), 38.9% use paratransit (taxis, online cars/motorcycles), and 27.2% use private car/motorcycle.

## 2. Service

The following table ranks the service criteria and the percentage of respondents to indicate the service is very important in selecting transportation mode.

**Tabel 2. MRT Service Criteria and Percentage of Response To Indicate It Very Important**

Rank	Service Criteria	Percentage of Respondents
1.	Safety	68.9%
2.	Accessibility	68.2%
3.	Punctuality	66.2%
4.	Short duration of travel	62.0%
5.	Frequency of departure	59.0%
6.	Comfort	58.5%
7.	Travel Cost	43.2%

## 3. Modal Shift

Of the total respondents, 51.6% indicate that they have used MRT. As for the service criteria that can encourage people to choose MRT, shorter travel duration, punctuality, and safety are the three most selected criteria. The questionnaire also indicates that respondents have used mixed/combined transportation modes (private cars/motorcycle, online cars/motorcycles, taxis) and MRT. From this data, there are 13.8% of private cars/motorcycles, 17.2% of online cars/motorcycles, and 5.3% of taxi users who also use the MRT. Also, there are 20.3% commuter line/TransJakarta/Airport Train user who has combined their trip with MRT. From all the respondents who has not used/combined their trip with MRT, approximately 42.4% are interested to shift and/or combine their transportation mode with MRT.

The questionnaire also inquires the public opinion about the impact that MRT has in reducing congestion on Sudirman road, and 85.6% of respondents agreed that the MRT could have a positive impact on reducing congestion.

## Mode Occupancy Estimation

One of the problems with congestion is inefficient use of road space with private vehicles. The following table compares the occupancy for vehicles in various mode of transportation.

**Tabel 3. Transportation Mode Type, Measurement, and Occupancy**

Transportation Mode	Measurement Length x Width (meter)	Area (meter square)	Occupancy	Occupancy/area (people/meter square)
Car	<sup>2</sup> 2.13 x 5.79	12.33	<sup>1</sup> 1.92 – 2.48	0.155 – 0.20
Motorcycle	2.05 x 0.76	1.56	11.26	0.81
Small Bus	<sup>3</sup> 5.02 x 3.05	15.31	18.00	0.52
Large Bus	<sup>3</sup> 23.11 x 2.46	56.85	<sup>4</sup> 141.34	0.73
MRT Train Cart	<sup>4</sup> 20 x 2.9	58.0	165 (50% of maximum)	2.84

Source: <sup>1</sup>Yudiantono et al., 2018; <sup>2</sup>AASHTO 2011; <sup>3</sup>Busnesia, 2014; <sup>4</sup>MRT Jakarta, 2018

## **Discussion**

The two questionnaires indicate that the community still has a high level of dependency in using both personal and paratransit cars/motorcycle. Cars and motorcycle are the preferred mode of transport because they have high degree of flexibility and mobility. Drivers or passengers can travel according to the desired time without adjusting their time to the departure schedule. Moreover, drivers and passengers in cars/motorcycles have high flexibility in choosing their route for travel. However, cars and motorcycles have a low occupancy rate that are inefficient in utilizing the limited road space.

In general, the community supports government programs in providing mass public transportation. This can be seen from the number of users and interest in mass public transportation. Approximately 7.6% of respondents have used the Airport Train in the one month since the Airport Train began its operation, and 51.6% of respondents have used the MRT within two weeks of the MRT began its operation.

## **Conclusion**

The government has been working on ways to reduce traffic congestion in Jakarta, either through the implementation of traffic policies, enhancing the existing public transportation services, and adding new public transportation infrastructure. In general, people respond positively to government initiative in the provision of public mass transport. Around 86.6% of respondents in the questionnaire agree that the MRT has the potential to reduce congestion. Within the first two weeks of operations, the number of MRT users is quite significant and most likely to increase overtime. The number of Airport Train users is still small when compared to its capacity but has the potential to increase as people become more familiar with the service and with the expansion of the airport rail route network area.

The most important criteria for the community in mass public transportation modes are fairly high level of flexibility with frequent schedules, punctual services, short travel duration, and accessibility of modes. Additional important criteria in mass public transportation are safety and comfort to its users.

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## **Reviewing the procedure of transporting vehicles on KMP Baronang on Bastiong-Sofifi route in North Maluku Province**

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### **Abstract**

The port of Bastiong is one of the inland ports located in the North Maluku Province which is managed by PT. ASDP Indonesia Ferry (Persero) Ternate Branch. It has 9 (nine) routes which are served by 8 (eight) Ro-Ro vessels (Roll on-Roll off). One of the commercial routes served by the port of Bastiong is the Bastiong - Sofifi route with a distance of 14 nautical miles and has a travel time of 2 hours with the average speed of 8 knots. The Bastiong - Sofifi route is the route that has the most trips. There are 7 trips served by the port of Bastiong everyday. This study was aimed to review the procedure of transporting vehicles on KMP. Baronang Bastiong-Sofifi route in North Maluku province. This study used observation to collect the primary data. The authors also used library research and visited several institutions to obtain secondary data to support the findings. To analyze the problem, the authors referred to the Regulation of the Minister of Transportation Number 115 Year 2016 concerning the procedures for transporting vehicles on ships. The findings showed that there were several problems related to the loading and the securing of vehicles on KMP. Baronang. The unavailability of weighbridge made the information about the weight of the vehicles could not be documented. In addition to that, there were other problems such as the inappropriateness of the lashing gear, the space arrangement between vehicles, and the condition of the cargo hold during the voyage. Therefore, it is recommended that the management of the Port of Bastiong improve services on KMP. Baronang, especially related to the procedure of loading vehicles onboard and the procedure of lashing the vehicles carried onboard as regulated by the government regulation.

Keywords: port, ship, lashing, safety, trip

### **Introduction**

#### **1. Background**

Nowadays, the needs of human beings to move from one place to another have been increasing. The transportation sector becomes very important. The condition of Indonesia which consists of many islands and waterways make there are many areas cannot be reached by land transportation only. Therefore, the roles of inland water and ferries transport become highly essentials to connect areas separated by waterways. It is important to support economic activity and other human activities so that all of the activities can run well.

The City of Ternate is located between Latitude of 3° North - 3° South and between Longitude of 124° 7 '32.14 " - 127° 26' 23.12" East. The area of Ternate

city is 5,709.58 Km<sup>2</sup>, consisting of 162.03 Km<sup>2</sup> of land area and 5,547.55 Km<sup>2</sup> of water. To optimize its resources, Ternate City has an inland port named The Port of Bastiong which is managed by PT. ASDP Indonesia Ferry (Persero) Ternate Branch. The port serves nine routes with eight Ro-Ro ships (Roll on Roll off).

One of the routes served by PT. ASDP Indonesia Ferry (Persero) Ternate Branch is Bastiong - Sofifi route with a distance of 14 nautical miles. The Bastiong - Sofifi route is served by KMP. Baronang. This route can be taken in two hours with an average speed of eight knots. Bastiong - Sofifi route is one of the commercial routes served by PT. ASDP Indonesia Ferry (Persero) Ternate Branch.

In the transportation system, safety and security have become the priority to give excellent services for the customers. Safety and security are not only important for the customers but also for the ship operators. One of the aspects that affects the security and safety is the arrangement of vehicles which are carried onboard the KMP. Baronang on the Bastiong-Sofifi route.

During the observation, the authors found that the vehicles carried onboard the KMP. Baronang were not lashed except in bad weather and high wave conditions. The space arrangement for the vehicles was also not appropriate. The vehicles were placed too close to each other.

With the travel time of 2 hours and the wave conditions that can reach up to 2 meters, this condition can be very dangerous for the safety and security of both the customers and the ship's operator onboard.

## 2. Problem Identification

There are several problems found by the authors when conducting observation on KMP. Baronang by referring to the regulation of the Minister of Transportation Number 115 Year 2006. The problems are described as follows:

- a. There is no weighing device (weighbridge) for weighing vehicles before being transported onboard so that the weight of the vehicles was unknown.
- b. The lashing equipment does not meet the standard based on the government regulation.
- c. The spaces between vehicles and between the ship's wall are too close.
- d. The distance between securing points in the longitudinal direction and the athwartships direction are not appropriate: the athwartships was 2.7 meters and the longitudinal was 3.2 meters.
- e. The condition of the cargo hold is not clear from passengers during the voyage.
- f. The lashing procedure was not implemented accordingly so that it could endanger the ship if the high waves hit.

### 3. Objectives

The objective of this research is to find out the implementation of transporting vehicles using ferries based on the Regulation of the Minister of Transportation Number 115 Year 2016 concerning the procedures for transporting vehicles on ships, which includes:

- a. the availability of vehicle weighing equipment.
- b. the type of the lashing equipment provided.
- c. the spaces between vehicles and the spaces to the ship's wall.
- d. the lashing procedure during voyage

### Methods

The study used several methods to obtain data as a reference and comparison. The methods were adjusted to the condition and location of the place where the research object was located. The methods used in this study are:

#### 1. Observation.

The authors directly observed the actual conditions in the field and the process of handling cargo onboard which includes: weighing the vehicle before loading onto the ship, information on the type and weight of the cargo, observing the type and number of lashing devices for securing the vehicles, observing the condition of the hold, observing transverse and longitudinal spaces of the lashing points.

#### 2. Library research

Secondary data were obtained from literature or books in the library of the Inland Water and Ferries Transport Polytechnic of Palembang and other books related to research.

#### 3. Institutional research

Data were collected from various institutions:

- a. PT. ASDP Indonesia Ferry (Persero) Ternate Branch
- b. Indonesian Agency for Meteorological, Climatological and Geophysics.

### Result and Discussion

In analyzing the problems, the authors referred to the Regulation of the Minister of Transportation Number 115 Year 2016 concerning Procedures for Transporting Vehicles on the Ships.

#### 1. The requirement to weigh vehicles before being loaded onto the Ship

Based on the regulation of the Minister of Transportation Number 115 Year 2016 concerning Procedures for transporting vehicles on ships Article 5 clause

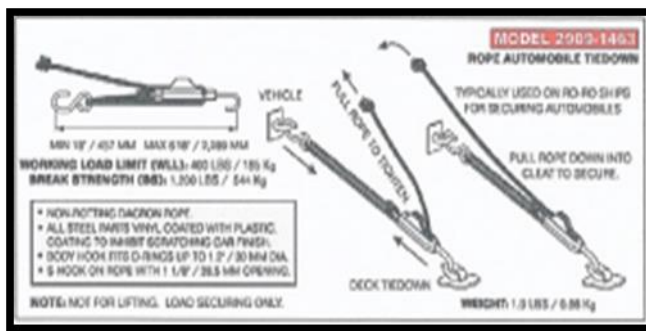
(2), every vehicle that will be carried onboard the ship must be weighed before being loaded to identify the gross weight of the vehicle and its cargo.

From the authors' observation, it is found that the requirement regarding weighing the vehicles has not been implemented accordingly by the lashing personnel at the Port of Bastiong. This is because the port does not provide a weighbridge as a tool to measure the weight of the vehicle and the cargo to be transported. All vehicles that have received tickets based on their class can be directly loaded onto the ship without knowing the weight of the cargo. This condition indicates that the regulation of the Minister of Transportation Number 115 Year 2016 concerning Procedures for transporting vehicles on ships has not been implemented properly yet.

2. The type of lashing equipment used

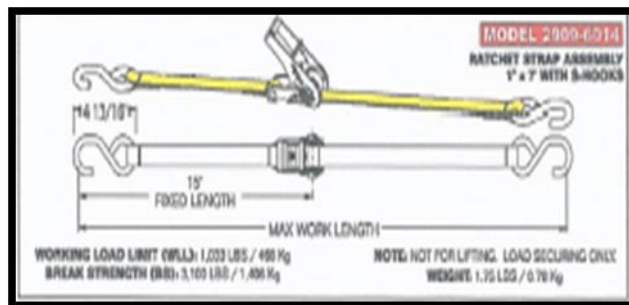
In the regulation of the Minister of Transportation Number 115 Year 2016 concerning Procedures for transporting vehicles on ships article 10 clause (1), there are several types of lashing equipment that can be used:

a. Rope Automobile Tiedown



b. Ratchet Strap Assembly

1) Ratchet Strap Assembly with Hooks

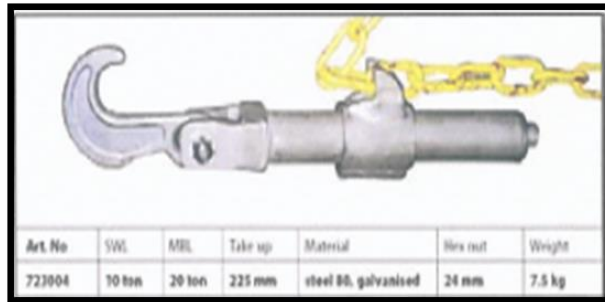


2) Ratchet Strap Assembly with Hooks on One Side



c. Chain with Turnbuckle

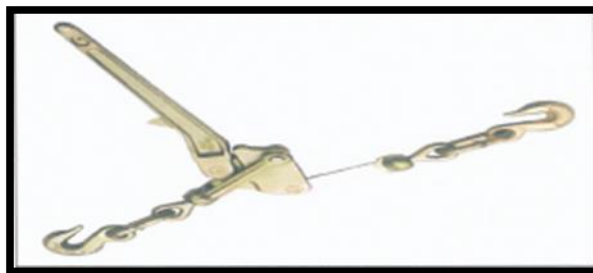
1) Chain with Hooks



2) Turnbuckle and Chain



3) Turnbuckle, Chain, and Hook



Based on the authors' observation, the lashing gears used on KMP. Baronang were the ratchet strap assembly and ordinary ropes.

3. Securing points on ships' decks

Referring to the regulation of the Minister of Transportation Regulation 115 Year 2016 article 11, it is stipulated that every ship carrying vehicles must provide securing points with the following conditions:

- a. The distance between securing points in the longitudinal direction should in general not exceed 2.5 m
- b. The athwartships spacing of securing points should be around 2.8 m - 3 m.

Based on the observation, it was found that the distance between securing points in the longitudinal direction of KMP. Baronang was 3.2 m and the athwartships spacing of securing points of KMP. Baronang was 2.7 m. These conditions were not in accordance with the Regulation of the Minister of

Transportation Number 115 Year 2016 Article 11 clause (1), which states the distance between securing points in the longitudinal direction should in general not exceed 2.5 m and the athwartships spacing of securing points should be around 2.8 m - 3 m.

4. The obligation to secure vehicles during the voyage

According to the regulation of the Minister of Transportation Number 115 Year 2016 article 5 clause (2), vehicles that must be lashed are those which are placed at the bow, at the midships, and at the stern. Based on the observation on KMP. Baronang, it was found that the vehicles transported onboard were not lashed during the voyage.

**Table 1. The Vehicle Lashing**

KMP. Baronang			
Part of ship	The ideal condition based on PM to the regulation of the Minister of Transportation Number 115 Year 2016	The existing condition on KMP. Baronang	Remarks
Fore station (bow)	The vehicles should be lashed		The condition is not appropriate because the vehicles are not lashed.
Middle (midship)	The vehicles should be lashed		The condition is not appropriate because the vehicles are not lashed.
Aft station (stern)	The vehicles should be lashed		The condition is not appropriate because the vehicles are not lashed.

Source: data analysis, 2019

5. The distance or space arrangement between vehicles and the ship's wall.

Based on the regulation of the minister of Transportation Number 115 Year 2016, the distance or space between vehicles should be:

- a. the space between one side of the vehicle is at least 60 cm,
- b. the space between the front and rear of each vehicle is 30 cm.

Based on the results of observation, the arrangements of vehicles on board were not appropriate. The planned system is to set the distance between the vehicles and the distance of the vehicles to the wall of the ship in accordance with the regulations.

There are personnel who should measure the weight and the height of the vehicles, then there are loading personnel who should use stick or ruler with a length of 30 cm and 60 cm to measure the distance between the vehicles in accordance with the regulation of the Minister of Transportation Number 115 Year 2016 concerning the Procedure for Transporting vehicles on Ships article 20. Besides that, the vehicles must be placed athwartships in the direction of the bow or stern of the ship to ease the process of loading and discharging of the vehicles.

6. The condition of the cargo holds

- a. The cleanliness of the cargo holds

Based on the Regulation of the Minister of Transportation Number 115 Year 2016 concerning the Procedures for Transporting vehicles on ships, article 15 clause (1), the cargo holds must be clean from scattered oil and grease to avoid accidents onboard. Based on the authors' observations during the research, it was found that the cargo holds of KMP. Baronang has been clean from scattered oil and grease.

- b. The cargo holds are clear from the passengers

According to the Regulation of the Minister of Transportation Number 115 Year 2016 concerning the procedure for transporting vehicles on ships Article 17 clause (2), the cargo holds must be cleared from the presence of passengers during the voyage.

Based on the results of the observation on KMP. Baronang, it was found that there were passengers who stayed in the cargo hold during the voyage. This is due to the lack of information and there is no strict rule to prohibit passengers to stay in the cargo hold during the voyage. That made the passengers preferred to stay in their vehicles rather than to go to the passenger's waiting room.

To carry out the regulation of the Minister of Transportation Number 115 Year 2016 concerning Procedures for Transporting vehicles on Ships Article 17 clause (2), in relation to the attempt to clear the cargo hold from the passenger during the voyage, the ship personnel must direct all



passengers to wait in the passenger waiting room. If necessary, Captain should post some personnel to watch the cargo hold during the voyage. It is also important to provide sufficient distance between the vehicles and the ship's wall to permit safe access for the crew and the passengers getting into and out of vehicles and proceed to the passenger waiting rooms.

### **Conclusion and Suggestion**

Based on the analysis of the problems, the authors draw conclusions as follows:

The procedure for transporting vehicles onboard KMP. Baronang is not in accordance with the procedure mentioned in the regulation of the Minister of Transportation Number 115 Year 2016. The nonconformities include:

1. The Port of Bastiong does not provide vehicle weighing equipment.
2. The cargo hold is not cleared from passengers during the voyage.
3. There are some lashing gear that do not meet the standard based on the regulation of the Minister of Transportation Number 115 Year 2016.
4. On KMP. Baronang, the spaces or distances between vehicles are not appropriate with the regulation.
5. Vehicles carried by KMP. Baronang are not lashed during the voyage.
6. The space arrangement between the vehicles is too close.

### **Suggestion**

The management of the Port of Bastiong needs to improve services on KMP. Baronang, especially related to the procedure of loading vehicles on board and the procedure of lashing the vehicles carried onboard as regulated by the government regulation. The improvement may include:

1. Providing a weighbridge at the Port of Bastiong to weigh the vehicles before being carried onboard.
2. Prohibiting the passengers from staying in their vehicles during the voyage to ensure passengers' safety.
3. Providing lashing gears which are in accordance with the regulation. It is also important to adjust the spaces between vehicles (the athwartships distance of 2.8 to 3 meters and the longitudinal distance of 2.5 meters)
4. Implementing the regulation concerning the vehicle lashing by forcing the ship's operator to obey the regulation of the Minister of Transportation Number 115 Year 2016 in Article 23 clause (1), (2), (3). Violation towards the regulation will result in administrative sanctions (3 written warnings), license suspension and license revocation.
5. Adjusting the spaces between vehicles according to the regulation: (a) the space between one side of the vehicle is at least 60 cm, (b) the space between the

front and rear of each vehicle is 30 cm, (c) for vehicles which are placed next to the wall of the ship, the space is 60 cm calculated from the inner walls.

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# PROSIDING

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## INTERNATIONAL CONFERENCE OF TRANSPORTATION RESEARCH AND INNOVATION 2019

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**Pusat Penelitian dan Pengembangan Transportasi Antarmoda,  
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**S**eminar (Call for Paper) dalam acara International Conference of Transportation Research and Innovation 2019 merupakan sarana bagi para peneliti, dosen dan mahasiswa/i untuk memaparkan hasil penelitiannya. Dengan tema "Towards Integrated, Intelligent and Sustainable", finalis paper mempresentasikan hasil penelitiannya sesuai dengan empat topik yaitu Integration and Transportation Management, Intelligent and Sustainable Transportation, Infrastructure and Transportation Technology, Multimodal Transportation and Logistic. Hasil penelitian dan inovasi tersebut sangat diperlukan dalam pengembangan transportasi di Indonesia.

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