

## Conference Paper

# Integration of Land Transportation

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## Abstract

Transportation is a field of activity that is very important in people's lives. The importance of transportation for the community is caused by many factors, one of which is the geographical condition of an area which allows transportation to be carried out by land, sea or air to reach all areas. Transportation is the lifeblood of National Development to smoothen the flow of people, goods and information to support the optimal allocation of economic resources. Therefore, transportation services must be sufficiently available and affordable to the public's purchasing power. Transportation that is widely used by people in Indonesia is one of the only land transportation. The increase in population and city area causes the amount of traffic to also increase. While the traffic system is nearing saturation, thus increasing the amount of traffic has a major impact on the environment. This study uses a quantitative approach, explanation, and planning that refers to the results in the field and survey observations of operational conditions in existing conditions and after using the Railbus mode (multimodal). The quantitative method is called a positivistic method because it is based on the philosophy of positivism. And in general, transportation plays an important role in terms of economic development and non-economic development. Integration between modes has many advantages, one of which is service tariffs which can be reduced through the tariff integration mechanism.

**Keywords:** Integration; Transportation; Economy; Prospects.

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## 1. Introduction

Indonesia is an archipelagic country so it is inevitable that there is a need to exchange modes of transportation on a trip, both for passengers and goods from origin to destination. The cost of transportation from the place of origin to the destination is a combination of the cost of transportation for each mode plus the cost of transit from one mode to another. In fact, network integration is the key to the success of a public transportation service system in a region or city. This is because with an integrated public transportation network system, the best network route can be determined which is not only based on the demand for travel needs of the community but also the optimal service coverage mechanism. (<https://putriwindu.wordpress.com/2012/04/29/integrated-nasional/> on accepted October 15, 2020)

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Transportation is a field of activity that is very important in people's lives. The importance of transportation for the community is caused by many factors, one of which is the geographical condition of an area which allows transportation to be carried out by land, sea or air to reach all areas. (Abbas. (2008). *Manajemen Transportasi*. Jakarta: Rajawali Pers. p.2) Transportation is the lifeblood of National Development to smoothen the flow of people, goods and information to support the optimal allocation of economic resources. Therefore, transportation services must be sufficiently available and affordable to the public's purchasing power. Transportation that is widely used by people in Indonesia is one of the only land transportation. The increase in population and city area causes the amount of traffic to also increase. Meanwhile, the traffic system is approaching saturation, so that an increase in the amount of traffic has a major impact on the environment. In general, transportation plays an important role in terms of economic development and non-economic development (Sintabaskoro. *Moda transportasi berkelanjutan yangberwawasan*. Accepted on 11 October, 2020. from Academia: [https://www.academia.edu/4438362/Moda\\_transportasi\\_berkelanjutan\\_yang\\_berwawasan](https://www.academia.edu/4438362/Moda_transportasi_berkelanjutan_yang_berwawasan)) Integration between modes has many advantages, one of which is service tariffs which can be reduced through the tariff integration mechanism.

Currently, Indonesia is facing quite complicated problems related to land transportation. The increasing population, coupled with the increase in people's purchasing power of motor vehicles, has triggered an increase in the number of motorized vehicles. With the construction of transportation facilities, community economic activities, community empowerment, especially in the development of areas with high economic potential, it will be easier to develop. This community economic activity will develop if it has good transportation infrastructure and facilities for accessibility.

The study of transportation and regional development has a wide range and complex dimension of problems. Therefore, the impact of transportation on human life is very positive. To discuss whether transportation is so beneficial for human life, it turns out that there is a negative impact or at least a negative impact on human life if transportation services are not managed properly or are not used for good purposes. (Wibowo, I. (2000). *Negara dan Masyarakat: Berkaca dari Pengalaman Republik Rakyat Cina*. Jakarta: Gramedia. p.26)

Land transportation facilities develop following the phenomena that arise. Choosing the wrong transportation system for urban areas can cause problems for the community and the environment. Technological developments in the transportation sector may require the development of land transportation infrastructure technology in the form of road networks. The land transportation system, which is developing rapidly, demands

changes in the road network arrangement that can accommodate the growing traffic needs. The development of a new road network will require more land availability. The very large land requirements for this land transportation system have a major influence on land use patterns, especially in urban areas. Here environmental issues need to be considered.

Transportation serves as a bridge that connects producers with consumers. The study of transportation and regional development has a wide range and complex dimensions of problems. Therefore, to be able to understand the work patterns of transportation and accessibility, it is required to have a broad view not only in one field of scientific study. One of the fields of science related to transportation is transportation geography. The issue of affordability due to long distances so as not to be able to carry out economic activities optimally does not apply in developed countries. This is because the development of their transportation is superior so that sometimes transportation is not the main issue for decreased mobility in developed countries. While it is haven't developed like Indonesia. In transportation we can see two categories namely:

1. First: Transfer of materials and products using conveyances.
2. Second: Transport passengers from one place to another.

Transportation is the activity of moving goods (cargo) and passengers from one place to another or transportation is movement from one place to another by means of transportation.

## 2. Research Methods

Methodologically, this research uses a quantitative approach, explanation, and planning that refers to the results in the field as well as an observational survey of operational conditions in existing conditions and after using the Railbus (multimodal) mode. The quantitative method is called a positivistic method because it is based on the philosophy of positivism. This method is a scientific method / scientific because it meets scientific principles, namely concrete / empirical, objective, measurable, rational, and systematic. This method is called quantitative because the research data is in the form of numbers and analysis.

### 3. Results and Discussion

Transportation is the transfer of people or goods from one place to another within a certain time using a vehicle driven by humans, animals or machines. The definition of transportation according to some experts is as follows:

1. According to Morlok (1978), transportation is defined as the activity of moving or transporting something from one place to another.
2. According to Bowersox (1981), transportation is the movement of goods or passengers from one place to another, where the product is moved to the required destination. And in general, transportation is an activity to move something (goods and / or goods) from one place to another, either with or without means.
3. According to Steenbrink (1974), transportation is the movement of people or goods using tools or vehicles from and to geographically separated places.
4. According to Papacostas (1987), transportation is defined as a system consisting of certain facilities along with flow and a control system that allows people or goods to move from one place to another efficiently at any time to support human activities. Transportation of people or goods is usually not the end goal.

The land transportation system which is developing rapidly requires proper management and arrangement. To achieve the ideal transportation system, therefore in its development and development it is necessary to pay attention to its effects on humans and the environment. The effect of the transportation sector on the environment needs to be controlled by looking at all aspects that exist in the transportation system, starting from transportation system planning, including transportation models, facilities, traffic flow patterns, types of vehicle engines, and the fuel used.

The choice of transportation model is determined by considering one of the main requirements, namely that the transfer of goods and people is carried out in the largest number and the smallest distance. Mass transportation is a better option than individual transportation.

Transportation system planning must be accompanied by the provision of appropriate infrastructure that meets transportation requirements and criteria, including storage volume, average speed, peak flow, and road user safety. In addition, it must also meet environmental requirements which include surface types, safety for occupants along the road, noise, air pollution, greening, and lighting.

In achieving an environmentally friendly and energy efficient transportation system, the requirements for the basic specifications of road infrastructure are very decisive. Smooth road surfaces, for example, will reduce dust pollution emissions due to tire friction with the road. Acoustic screens or earthen stumps and green lines along the highway will reduce the noise level of the residential environment around and along the road, and will also reduce air pollutant emissions outside the high speed road boundary.

### 3.1. Congestion Problems

In an effort to solve the congestion problem, there are several ways that can be done to solve the traffic jam problem, including:

1. Upgrade road capacity / infrastructure such as: widening roads, adding traffic lane to the extent that this is possible, constructing toll roads, converting traffic circulation to a one-way street, reducing cross-border conflicts through certain flow restrictions, usually the most dominant ones limiting right-turn flow capacity crossing through traffic lights, crossing not level / flyover, developing intelligent transport system.
2. Restrictions on private vehicles such as: Restrictions on the use of private vehicles to a certain area as planned to be implemented in Jakarta through Electronic Road Pricing (ERP), Restrictions on private vehicle ownership through increased vehicle ownership costs, Restrictions on certain traffic entering certain areas or roads.

### 3.2. Basic Elements of Transportation

(2) There are five main elements of transportation, namely:

1. Humans, who need transportation
2. Goods, which humans need
3. Vehicles, as a means of transportation
4. Road, as transportation infrastructure
5. Organization, as a transportation manager

Basically, the five elements above are interrelated for the implementation of transportation, namely ensuring that the passengers or goods being transported will arrive

at their destination in good condition as when they were originally transported. In this case, it is necessary to know in advance the characteristics of passengers and goods, the condition of facilities and infrastructure construction, and the implementation of transportation.

Land transportation or land transportation is the transfer / transportation of people or goods from one place to another by means of transportation by road, whether driven by human, animal (horse, cow, and buffalo) or machine power.

Land transportation is chosen based on the following factors:

1. Types and specifications of vehicles
2. Travel distance
3. Purpose of the trip
4. Mode availability
5. City size and settlement density
6. Socio-economic factors

The types of land transportation are:

### 3.3. Road Transportation

Transportation is the transfer of people and / or goods from one place to another by using a vehicle. Based on the Decree of the Minister of Transportation No. 35 of 2003 concerning the Implementation of Road Transport for People, then Road Transportation is classified as follows:

1. Bus

Bus is any motorized vehicle equipped with more than 8 (eight) seats excluding the driver's four seats, either with or without luggage transport equipment.

2. Taxi

Taxi is a public transportation that uses a car to transport passengers. Taxis generally use sedan type cars, but in some countries there are also van type taxis that can carry more passengers or cargo.

3. Microbus

Microbus is a term that refers to public transportation with a predetermined route. Unlike buses that have bus stops as designated stops, Microbuses can stop to pick up or drop off passengers anywhere.

#### 4. *Bemo*

*Bemo* is a three-wheeled motorized vehicle that began to be used in Jakarta in the early 1960s. Initially, *Bemo* was expected to replace the role of the pedicab which was considered inhuman because it used human power as the driving force. Therefore, transportation vehicles that are originally in their home country of Japan are used to transport goods.

#### 5. *Becak*/Rickshaw

*Becak* (from Hokkien: be chia “horse-drawn carriage”) is a three-wheeled mode of transportation commonly found in Indonesia as well as in parts of Asia. *Becak* is an environmentally friendly means of transportation because it does not cause air pollution and does not cause noise. Even so, the presence of pedicabs in urban areas can disrupt traffic due to their slow speed compared to cars or motorbikes.

#### 6. *Delman*

The *Delman* is a traditional two, three or four wheeler transportation vehicle that does not use an engine but uses a horse as a substitute. The name of this vehicle comes from the name of its inventor, namely Charles Theodore Deeleman, a lithographer and engineer during the Dutch East Indies era.

#### 7. Rail Transportation

The type of rail transportation is a train is a wheeled vehicle that is part of a series of trains and is used to transport passengers. Trains are generally equipped with an electric system, an audio-visual entertainment system and toilets. In certain regions or countries trains are equipped with bunk beds for night travel. At first the trains were only given seats and not roofed (for economy class) or roofed (for special classes). Trains are generally closed and are not equipped with separate cabins / rooms like trains that are commonly found today in Indonesia.

Indonesia is a developing country. So that development and development in various aspects are always improved from time to time. No exception in the transportation and transportation sector. The increasing of needs of the community causes access to support the smooth movement from one place to another is getting higher. (Winarno. (2007). *Paradigma Baru Pendidikan Kewarganegaraan Di Perguruan Tinggi*. Jakarta: Bumi aksara. P.10)

Thus, the demand for new transportation will exist if there are driving factors. The demand for transportation services does not stand alone, but is hidden behind other interests. Basically, demand for transportation is caused by the following:

1. Human needs to travel from other locations with the aim of taking part in an activity, for example work, shopping, going to school, and others.
2. The need for goods transportation to be used or consumed in other locations.  
Broadly speaking

Meanwhile, transportation can be divided into 3, namely: land, water and air transportation. The choice of using the transportation mode depends and is determined by several factors, namely:

1. In terms of service
2. Reliability on the move
3. Safety on the way
4. Cost
5. Mileage
6. Movement Speed
7. Reliability
8. Necessity
9. Flexibility
10. Population Level
11. Fuel Use
12. And Others Each mode of transportation according to Djoko Setijowarno and Frazila, has different characteristics, namely in:
  - (a) Speed, shows how long it takes to move between two locations.
  - (b) Availability of service, involves the ability to establish a relationship between two locations.
  - (c) Dependability of operation shows the differences between reality and the specified schedule.



(d) Capability is the ability to be able to handle all forms and needs of transportation.

(e) The frequency is the number of moves or relationships scheduled

Integration between modes has many advantages, one of which is service tariffs which can be reduced through the tariff integration mechanism. This has proven to be able to increase the use of public transportation modes by 24% in the City of Vienna (Austria) in 2001 and by 33% in the City of Paris (France) during the period 1975-1993. Other than that,

Supporting Indicators of Transportation Mode Integration 1. Travel Time: According to Tamin (2008) travel time is one of the main factors that must be considered in transportation. Travel time is also the main attraction in choosing the mode used by a trip (human or goods). It is clear that increasing travel time in a mode will reduce the number of uses of that mode and will automatically reduce the level of income or service. 2. Travel costs: According to Tamin (2008) for trips that require several modes of transportation, other factors are more decisive (besides time). Travel is the cost of transit (cost of moving goods or passengers)

For both the movement of passengers and goods in an integrated intermodal transportation system, the thing that needs to be considered is the effort to save transit costs from one mode to another. For this reason, it is necessary to build facilities and infrastructure where goods or passengers are transferred or route one-way route can take place quickly, safely, cheaply, and comfortably so that transit costs can be reduced as little as possible.

Integration is the only way to achieve maximum service and operational standards to have a large and comprehensive impact. Timeliness and ease of movement (mobility) will always be the main reasons for choosing the mode of transportation to support the mobility of city residents. Without integration, don't expect to have a city with a humane and efficient transportation system for its residents.

In achieving an environmentally friendly and energy efficient transportation system, the requirements for the basic specifications of road infrastructure are very decisive. Smooth road surfaces, for example, will reduce dust pollution emissions due to tire friction with the road. Acoustic screens or earthen stumps and green lines along the highway will reduce the noise level of the residential environment around and along the road, and will also reduce air pollutant emissions outside the high speed road boundary.

### 3.4. Traffic engineering

Traffic engineering in particular determines the course of the planned transportation system. Energy savings and pollutant emission reduction can be optimized in an integrated manner in route planning, average speed, mileage per vehicle per destination (vehicle mile trip and passenger mile trip), and so on. Basically, the driving pattern / cycle can be planned through traffic engineering.

Data on the exact driving patterns and cycles in Indonesia are not yet available. In planning, the main consideration applied is that the traffic flow is as smooth as possible, and with the least possible travel time, as can be tested with the origin-destination model. By minimizing the travel time from each point of origin to the respective point of destination, maximum fuel efficiency and reduction of air pollutants can be achieved.

### 3.5. Control at source (vehicle engine)

The type of vehicle used as a means of transportation is part of the transportation system which will have an impact on the physical and biological environment due to air pollution and noise emissions. Both types of pollution are largely determined by the type and performance of the engine used. Pollution control requirements such as those applied by the United States (US) have proven to bring about major changes in the planning of motorized vehicle engines circulating in the world today. Since 1970, along with the energy crisis and the air pollution phenomenon in Los Angeles Smog, the Federal Government issued stringent requirements to control motor vehicle emissions and fuel efficiency.

Changes made in the engine plan, including installation (valve) PCV false carburizing system, ignition system that allows more complete combustion, circulation of fuel oil vapor (BBM) to reduce fuel tank emissions, and after burner to reduce emissions. Meanwhile, retrofit technology is required by installing a Retrofit Catalytic Converter to reduce HC and NOX emissions and dust (TSP). This technology has major implications for the BBM system, because TEL can no longer be added to BBM.

### 3.6. Transport energy

The magnitude of the emission intensity issued by a motorized vehicle is determined not only by the type and characteristics of the engine, but also by the type of fuel used. As well as using LPG, it will allow complete combustion and high energy efficiency. In

addition, in the context of efforts to control exhaust gas emissions, if retrofit equipment is used, fuel requirements, specifically lead free, are required.

By paying attention to these things, it is hoped that the urban transportation system will be as expected, especially in an effort to reduce the level of congestion and prevent the increasing levels of air pollutants by motor vehicle fumes and noise.

Aspects of urban planning and transportation systems will be generic factors of impact that generally arise, especially energy use, air pollution including reducing the level of traffic congestion. As long as the adequate and appropriate aspects of the transportation system are implemented in the context of existing urban planning through transportation management, energy efficiency and prevention of impacts on the environment can be carried out.

In terms of building and developing an ideal land transportation system for life. In fact, the government as the regulator has implemented several regulations in order to overcome or minimize the negative impacts that result from the land transportation system.

## 4. Conclusion

Land transportation facilities develop following the phenomena that arise. The wrong choice of transportation system for urban areas can cause problems for the community and the environment. Technological developments in the transportation sector may require the development of land transportation infrastructure technology in the form of road networks. The land transportation system, which is developing rapidly, demands changes in the road network arrangement to accommodate the growing traffic needs. The development of a new road network will require more land availability. The very large land requirements for this land transportation system have a major influence on land use patterns, especially in urban areas. Here environmental issues need to be considered.

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