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**20 - 21, June 2012**  
**Lampung, Indonesia**



## PREFACE

The activities of the International Conference is in line and very appropriate with the vision and mission of the UBL to promote training and education as well as research in these areas.

On behalf of the First International Conference of Engineering and Technology Development (ICETD 2012) organizing committee; we are very pleased with the very good responses especially from the keynote speakers and from the participants. It is noteworthy to point out that about 45 technical papers were received for this conference

The participants of conference come from many well known universities, among others: Universitas Bandar Lampung, International Islamic University Malaysia, University Malaysia Trengganu, Nanyang Technological University, Curtin University of Technology Australia, University Putra Malaysia, Jamal Mohamed College India, ITB, Mercu Buana University, National University Malaysia, Surya Institute Jakarta, Diponegoro University, Unila, Universitas Malahayati, University Pelita Harapan, STIMIK Kristen Newmann, BPPT Lampung, Nurtanio University Bandung, STIMIK Tarakanita, University Sultan Ageng Tirtayasa, and Pelita Bangsa.

I would like to express my deepest gratitude to the International Advisory Board members, sponsors and also welcome to all keynote speakers and all participants. I am also grateful to all organizing committee and all of the reviewers which contribute to the high standard of the conference. Also I would like to express my deepest gratitude to the Rector which give us endless support to these activities, such that the conference can be administrated on time.

Bandar Lampung, 20 Juni 2012

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# Performance Assessment Tool for Transportation Infrastructure and Urban Development for Tourism

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**Abstract** - Policy development of urban transport system development should be directed to the realization of an integrated national transportation system, orderly, safe and comfortable, and efficient in supporting the mobility of people, goods and services, and supporting regional development, to be laid out and kept adjusted to economic development, the rate of technological progress, spatial policy, environment conservation, and national energy policy that will always be able to meet the needs and demands of community development. For the realization of a sustainable transport system, the following research as a basis for writing the policy in this regard government city bus transport Damri, who has made a regulation will be the availability of means of transport. Due to the limited fleet as well as distance and time long enough to reach into the study area, Damri bus used only for certain people only, so that people are not too dependent on this transport. Other reasons, communities average has had a personal vehicle. While people outside the study area not many people know. They use a private vehicle. The reason, many of them are not aware of the existence Damri bus transportation routes that pass, long wait, as well as other reasons.

*Keyword* : transportation, infrastructure, urban, development, tourism

## I. INTRODUCTION

The rate of progression of a city can be measured by the increasing number of facilities and infrastructure development of the city, (Tamin, 2000). One of the pace of these developments coupled with the fact that the increase in demand for transportation that never can be accommodated by the transportation infrastructure system. This is because efforts to increase the quality and quantity of service of transportation infrastructure system in a particular area will be able to improve the accessibility and mobility in the area who otherwise would be able to re-stimulate the increased demand for transportation.

Free trade is implemented through the World Trade Organization (WTO) and Asean Free Trade Association (AFTA) is a challenge and an opportunity both in national economic development and Lampung Province in particular. Lampung provincial governments need to anticipate its involvement in global trade carefully, because it will get the impact of economic globalization in providing employment opportunities and export and import opportunities. The impact of economic globalization in the tourism sector is no exception.

Tourism can be categorized into the world's largest industrial group. (Final report Tourism Village, Lampung Province Tourism Office, 2007). Approximately 8 percent of exports of goods and services generally comes from tourism. Tourism has also become the biggest contributor in the international trade of the service sector, approximately 37 percent, including 5-top exports 83% of the categories in the WTO, the main source of foreign exchange in 38% of the State. Tourism in Southeast Asia can contribute 10 -12 percent of GDP and 7-8 per cent of the total workforce. Tourism is also supported from one of the various aspects of the infrastructure and means to reach there. Sights can be categorized as a tourist who visited, the main indicator is the infrastructure that supports a good road access and within easy reach. So the role of transport infrastructure is of great significance for systems supporting the continuity of the process.

Indonesia is included in the category of developing countries, are in a high growth stage of urbanization. Due to rapid economic growth so that the needs of the population to perform the movement is increasing. Increasing the number of people living in urban areas are expected to increase from year to year due to the high level of urbanization. In regard to globalization, infrastructure and transport services should be seen as part of a global distribution for passengers and goods. Efficiency of the transportation system as well as the main attraction of investment to be decisive in determining the competitive commodity prices for domestic products, both for domestic consumption and export. Bruton (1993) states that economic growth in the current decade is directly related to the progress and efficiency of transportation systems. Indonesia's trade volume growth in general is quite good is a factor that increasingly aware of the importance of mobility of goods and services in regional and international levels.

Development success is strongly influenced also by the role of transport as the lifeblood of the political, economic, socio-cultural, and defense and security. Development of transport sector in the province of Lampung directed at the realization of the national transportation system is a reliable, highly capable and organized in an effective and efficient in supporting and simultaneously move the dynamics of development, supporting the mobility of people, goods and services, supporting the

distribution pattern of Lampung province and nationally and to support regional development and improvement of international relations that greater consolidation of national and state developments in order embodiment insight archipelago (the mission of transportation system development Lampung 2030, in the Province of Lampung transportation arrangements).

Many varied activities in each sector, is inseparable from the role of government to actively participate in the development of the tourism sector is no exception. In order to realize the situation is very supportive some areas that have the potential to be developed.

So great was the role of means of transport, resulting in the development of the world is multidimensional. For example, one of the basic function of transportation is connecting places - places of employment or residence with the manufacturer's goods to its customers. From a broader perspective, transportation facilities provide a variety of options to go to work, markets, and recreational facilities, as well as providing access to facilities - health, education, and other means, or the movement of people or goods to a destination with a variety of purposes and other conveyances / modes (Khisty, 2005).

Infrastructures such as roads generally are available to serve the majority of the people who use public transportation. Availability of infrastructure cause more developed and advanced regions. Existing infrastructure is not limited to flat roads, but must also cover all areas such as undulating and hilly town of Bandar Lampung conditions.

As with the area of the Gulf District of North Betung most of their range of hills. When viewed from the areas and pathways that must be taken to use local transport has a wide enough area.

Infrastructure of roads and bridges have been there as a supporter of the facility. Similarly, public transport buses that pass through the region Damri. Pathways through which existing and sufficient as opening access to the region.

Potential of natural attractions that the area is very large, number of tourist arrivals, both local and foreign tourists, providing an option for them to visit the region. The involvement of local communities to introduce the region to tourists who come, have a major role for the future existence of this region as a source of natural attractions can be better to have a role to boost tourist arrivals.

As an illustration, the study area has several natural attractions where the potential to be developed. As found in the Stone Putu and surrounding areas. Are among other sights, Forest Park Wan Abdurahman, Butterfly Garden, Garden Fishing, natural bath Garden, Garden Kedaton Earth, Batu Putu Waterfall, as well as the game Combat Simulations Airsoft gun.

Belfast City Government seeks to introduce and facilitate the region with a variety of alternative means of transport, such as public transportation, buses and other public, as well as improvement of infrastructure facilities like roads and bridges. While people around the attractions and the surrounding community, further develop the means of transportation such as

taxis as a means of transport people and goods in limited quantities, in order to support more popular in the community and the region to open wider to the region.

On the other hand, the areas most used by people with the utilization of farm land and fields, partly in the form of rice. And other regional functions as a water catchment areas and conservation functions.

## II. PROBLEM

Provision of infrastructure and transportation system is supported from existing activities and continues over time, thus making this as a requirement that had to be met by all citizens. No exception for people who live far from the center of town or unreachable area with public transportation. As an illustration in the study area, the distance to the sights around the study area when using public transport bus terminal Rajabasa Damri goal - Hanura or vice versa (which is the only transport in the study area) is as follows. From the bus terminal Rajabasa to Butterfly Park is 14 km, 17 km Cibiah Park. Batu Putu Waterfall 18 km, 19 km Bumi Kedaton Garden. In addition to existing attractions in the region of study, in general people have a personal vehicle, such as two-wheeled vehicles, as well as several private cars as well.

Damri bus route through several villages where the people live around before getting to the attractions such as the Urban Village Sumber Rejo, Sumber Agung, Kedaung, Batu Putu, Sumur Puteri, Western District of the Teluk Betung, to Lempasing and ends at the terminal market Hanura. The number of fleets that route study area is limited and numbered 3 units achieved with a travel time intervals once every one hundred minute commute to and from the terminal. Cost or travel rate of four thousand rupiah each way with the distance traveled to reach the next destination terminal is 34.8 km. large distances and lack of transportation fleet of buses through the area causing most people are not too dependent with this fleet. They prefer two-wheeled public transportation such as taxis, although a little expensive but the cost of transportation is always available whenever society needs. As for the people who will enjoy the object - a tourist attraction around the study area, they generally use private vehicles in the form of two-wheelers, four-wheeled private and public transportation on a lease or charter / rental. And the people who live close enough to the sights on foot to reach there.

Public transportation such as buses, most people are used to remotely and bring lots of luggage and one goal or the end purpose only (eg, from terminal Rajabasa - Hanura, and vice versa) and do not stop before reaching the ultimate goal of the terminal.

While the two-wheeler or motorcycle 'ojek' known as the first had been there and has become an alternative transportation in most areas of study. Transport is relatively reach all areas of destination, relatively inexpensive and readily available whenever needed. Most people use this transport for a fast and

close. There are also long distance due to the time that must be achieved quickly (suddenly needed) and do not wait long. In some tourist sites, mostly local tourists come with their families to use private vehicles or with friends. And there are also people who use public transportation such as public transportation on a lease. So not many people know that public transport such as buses and Damri has been quite helpful to the community around this area to interact with the outside community, as well as people outside the region.

III. POLICY STRATEGY REVIEW BANDAR LAMPUNG

a. Spatial Plan (Spatial) Bandar Lampung

Belfast city role in the national scale is significant, namely as:

- Center that encourages the surrounding region to develop the plantation sectors, agriculture, tourism and fisheries.
- Gateway to national and international areas.
- National transport node via the Port of Panjang.
- National production base. This makes the city of Bandar Lampung potential as a distribution center for goods and services to the Southern part of Sumatra.

Meanwhile, in Belfast city region scale also has an equally important role, namely as:

- The new growth center (*sub urban*) as District Natar, Tanjung Bintang, Gedong Meneng, Pringsewu, and Padang Cermin.
- Center of trade, transportation center, the center of the development of horticulture, tourism activity center, the center of craft and industrial materials of agricultural, cultural and religious center and central energy supply.
- Terminal services and distribusian collecting goods and services of government, healthcare, telecommunications, and information centers.

Directed the development of Bandar Lampung on a national scale, regional, and local and integral synergistically. Taking into account the physical characteristics, especially the undulating topography, land use, and the dominance of the function, the spatial development of Bandar Lampung based approach to spatial planning (zoning development) is divided into 8 (eight) parts of the city (BWK).

b. Overview of Region

Overview Batu Putu and Surrounding Areas

Based on the Regional Tourism Development Master Plan City of Bandar Lampung, all the attractions in the tourism area and the surrounding Batu Putu in Nature Tourism Development Zone. The zone is also a journey of nature tourism activities in the city of Bandar Lampung.

Identification of Potential Tourism Object

Tourist attraction in this area has considerable potential to develop the tourist market and to attract a more numerous and varied. This is in addition caused diverse objects and attractions

Batu Putu, as well as a very strategic location, which is the southern gateway to the island of Sumatera, which lies close to the capital city of Jakarta, as well as the availability of supporting facilities of tourism that is quite complete. Obviously with this condition, Belfast city started to become an alternative tourist destination for residents of Jakarta and the wider population of the island of Java.

Internal review Batu Putu Zone

Administratively, the Nature Area Batu Putu and surrounding into four districts. Administratively several villages and areas that fall into the tourist areas are:

- Sumber Agung Village, District of Kemiling (458 Ha)
- Kedaung Village, District of Kemiling (577 Ha)
- Sukadanaham Village, District of West Tanjung Karang (416 Ha)
- Sukarame II Village, District of West Teluk Betung (310 Ha)
- Batu Putu Village, District of Teluk Betung Utara (313 Ha)
- Sumur Puteri Village, District of North Teluk Betung (62 Ha)
- Most of the Wan Abdurahman (People Forestry park)

Whole district is geographically located at the western city of Bandar Lampung.

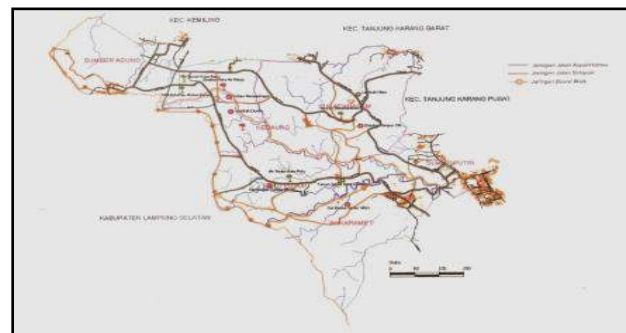
Conditions of Population

Based on population data in 2006, the population in the Region Batu Putu is as follows:

Table 2. 1 Number and Population Density Nature Batu Putu area and Surrounding

No	Village	Wide (Ha)	Population (People)	Density (Life / Ha)
1	Sumber Agung	458	6828	7
2	Kedaung	577	1101	2
3	Sukadana Ham	416	2892	6
4	Sukarame II	310	4630	15
5	Batu Putu	313	4109	13
6	Sumur Puteri	62	4586	50

Sources: Data Monograph District, 2006 in the Development Masterplan Nature Batu Putu and Surrounding Areas, 2007



Sources: *Heritage Tourism Masterplan Final Report Batuputu and Surrounding Areas, 2007*

Fig. 2. 1 Map of Road Network Development Plan Batu Putu and Surrounding Areas

From population data at the source is known that the Great Village is a village with the largest population, however, low population density, while the village is a village that Sumur Puteri has the highest population density. The population that will provide many opportunities for the Region and Surrounding Natural of Batu Putu in the development of tourism.

Residents and the surrounding area Batu Putu four District (Kemiling, Tanjung Karang, West Tanjung Karang, West Teluk Betung and District of Teluk Betung) is very heterogeneous. One measure is the religious diversity that is embraced in the region. The majority religion is Islam. However, the diversity of the population can coexist in harmony and mutual respect.

#### IV. AREA INFRASTRUCTURE CONDITIONS

##### a. Road Network

Classification of existing roads in the area consists of rural road networks and roads between villages / districts. Judging from pavement, roads in the area consists of asphalt and dirt roads. In general, the condition of major roads in the region can be said is good, it is seen from the length of paved roads with a length greater than a dirt road, be it rural roads or roads between villages / districts.

##### b. Bridge

Condition of infrastructure in the region is generally good. This is seen in lane road connecting the bridge that separated by the flow of water from the area that divides the region into several water flow from upstream to downstream. Water flow across the bridge which varies in size based on the contours of each individual - each part of the territory. Where most of the territory consists of hills and valleys.

So the role of a bridge in this region connection so dominant that the existing water flow is not impeded by a network bridge.



Sources: *Heritage Tourism Masterplan Final Report Batuputu and Surrounding Areas, 2007*

Fig. 2.2 Circulation Plan Map and Surrounding Batu Putu Areas.

##### Electrical and Communications Network

In general, all the villages in this area already served by the electricity network. Based on 2005 data, the number of people served by the PLN (electric state company) network is 15.497 KK. But there are still people who use such as oil lamps in the Village Sukadanaham (approximately 300 housing units). Meeting the needs of telecommunications services in the form of telephone facilities in the city of Bandar Lampung has been served by five STO (Automatic Telephone Center). For there are areas such as communications infrastructure, public phones, kiosks, post offices, radio, television and satellite dish.

##### Road Transportation in the city of Bandar Lampung

Transportation system development Lampung Province planned to improve access to urban services and centers of economic growth and equitable hierarki region and improve the quality and range of services that an integrated network of transport infrastructure development across the province of Lampung. Strategies that will be done to improve access to urban services and the center of the region's economic growth, among others, by keeping the linkages between urban and rural areas, development of growth centers, as well as controlling the development of coastal cities and encourage urban areas and growth centers to be more competitive and more effective in the development of the surrounding area. Strategy to improve the quality and range of services that an integrated network of transport infrastructure development across the province of Lampung pursued through efforts to improve the quality of the network infrastructure and realize the integration of transportation by land, sea and air. Transportation system development plan in this regard include the development plan system of transportation by land, sea and air.

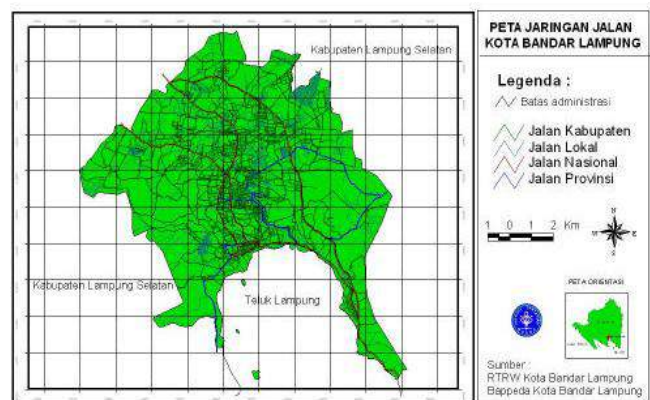


Fig. 2. 3 Road Network Map of Belfast City

As for the length of roads in each district in the city of Bandar Lampung can be viewed at the following table below.

**Table 2.2**  
**Length of Road Town by the Authority in Bandar Lampung**

No	Sub-district	Road length (Km)			Number
		National	Province	City	
1	Western Teluk Betung	-	12.5	74.11	86.61
2	South Teluk Betung	11.89	-	33.02	44.91
3	Panjang	13.27	3.37	50.26	66.90
4	Eastern Tanjung Karang	1.57	10.93	70.10	82.60
5	Northern Teluk Betung	3.23	-	79.38	82.61
6	Center Tanjung Karang	2.77	-	35.51	38.28
7	West Tanjung Karang	1.45	-	82.53	83.98
8	Kemiling	4.24	2.41	75.66	82.31
9	Kedaton	6.25	-	102.39	108.64
10	Rajabasa	6.71	1.6	57.31	65.62
11	Tanjung Senang	-	2.87	61.69	64.56
12	Sukarame	2.09	2.85	90.46	95.40
13	Sukabumi	1.23	2.3	89.30	92.83
	Number	54.7	38.83	901.72	995.25

Source: Ministry of Settlement and Regional Infrastructure Lampung Province

## V. ROAD TRANSPORTATION NETWORK INFRASTRUCTURE

Road transport infrastructure network consists of nodes in the form of terminal passenger traffic and goods terminals and space (Warpani, 2002). Space transport traffic on a road hierarchy of roads defined by function (Roads Act 2004) consists of arterial roads, collector roads, local roads and road environment. Division of every street in the primary road network consists of:

- Primary arterial road, major transportation service connecting the centers of activity;
- Primary collector street, serving the transportation collector / divider are centers of activity.

According to the status (Roads Act of 2004), roads are grouped into:

- National road, arterial road / collector in the primary road network system that connects the provincial capital and the

national strategic roads, and highways, yes ng built it done by the Minister;

- Provincial roads, collector roads within the primary network system, linking the provincial capital with the capital city / town, between the capital of the district / city and national strategic roads, which built it done by the provincial government;
- District roads, local roads in the primary network system, which connects the capital with capital sub-district, between the capital district, the district capital with a local community center, between the center of local activity, and the strategic road district, which built it done by the district.
- Urban roads, public roads in the secondary road network system, linking between the city center and between settlement centers in the city, which built it done by the municipal government.

Network of road transport infrastructure consists of roads and terminals as a node, based on existing data, the road network in Lampung region is composed of sections of national roads, provincial and regency / city. The number of national roads as much as 39 segments, while there are 109 provincial road sections, with a total length of roads in each district.

## Traffic Growth

To make projections / predictions need to be seen a large growth rate of each region in the province of Lampung, in this case is determined at the district level. This growth rate depends on the various aspects, not just depend on population growth and the region's economy. Some of the aspects that determine the increase of traffic growth are:

### a. Regional Development Policy.

Policy development of the region will increase investment to the development of a region. This increase will by itself increase the mobility in the region is characterized by an increased number of vehicle movements into and leave the area. Some of the policy development of Lampung region are:

- Regional Development Program (*Propeda*)
- Provincial Spatial Plan (*RTRWP*)
- District of the Growth Centre
- Provincial Development Agenda
- Development of cities

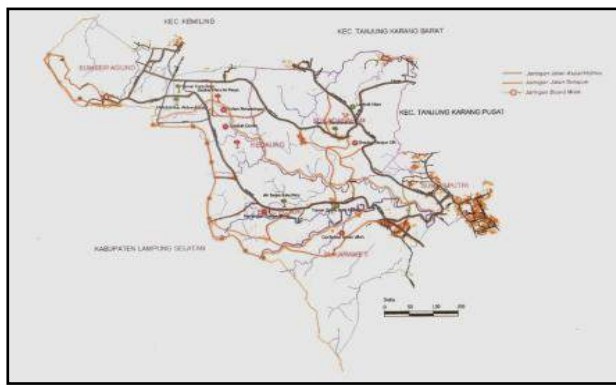
The policy will put some in the category of high-growth areas such as Belfast City, the capital district, some of the hinterland. The rest is in the category of medium and low. Categorization of high-medium-low is done by looking at trends of emphasis on the development of a region.

## b. Tourism

Lampung province known as the province with many attractions scattered throughout the region. As is known, the tourism sector to increase economic growth in an area either through the contribution of the tourism sector itself and from other sectors it generates. This will increase traffic growth in the region. Assuming that the greater development of the tourism sector the greater the value of traffic growth, the southern city of Bandar Lampung, and some spots are areas with high traffic growth.

## c. The production of the Earth

Besides tourism, the production of crops which includes agriculture, plantation, animal husbandry, fisheries, mining and quarrying become a mainstay in some areas and this will increase the mobility of people and goods.



Sources: *Heritage Tourism Masterplan Final Report Batuputu and Surrounding Areas, 2007*

Fig. 2. 4 Map of Area Development Plan Agrowisata

## The elements of the road transport network consists of:

### a. Space-Space Activities

Determination of the activity spaces both in the present and future is needed to see how big the need for transportation support to the existing spaces. By knowing the distribution of activity spaces will be determined based on the priority development areas spaces places activities. Spaces of these activities include:

1. Selected areas of national strategic national interests
2. Strategically key region for the benefit of the province province
3. District is strategically key region for the benefit of the district
4. Key region for the province's strategic national interests
5. District is strategically key region for the national interest

6. District is strategically key region for the benefit of the province

In practice not all of the above categories are owned by the province and only a few are considered appropriate.

## b. Road Network

The road network is a series of segments and nodes are materialized or manifested to serve the movement of people and goods from origin to destination. The road network can be divided into:

1. Management authority: national, provincial, district / city and country;
2. Function of the road: arterial, collector and local;
3. Hierarchy of services: primary, secondary and tertiary;
4. Transport node.

Node is a point in the road network in which a displacement type of transport such as terminal. Terminal (terminal passengers and goods) are provided for: lower and raise the passenger, or the displacement of intra and inter modes, adjust arrival and departure of public transportation, unpacking and unloading of goods.

Passenger terminal can be classified into three types of terminals, namely:

- a. Type A passenger terminal, which serves public service vehicle for inter-city transportation and inter-provincial or inter-state transport, transportation between cities in the province, city transportation and rural transportation.
- b. Type B passenger terminal, serving the public transport function for transport between cities in the province, or city transportation and rural transportation.
- c. Terminal passengers of type C.

## VI. PUBLIC PASSENGER TRANSPORT.

Warpani (1990) states that public transport passengers are carried by the passenger transport system or pay rent. The definition of public passenger transport is the public transportation (bus, minibus, etc.), rail, water transport and air transport. The main purpose of the existence of public transportation passenger transportation service is of good conduct and proper for the public. The size of good service is the service that is safe, fast, inexpensive and convenient. In addition, the existence of public transit passengers also create jobs.

According to Hinton (1981) adapted by Warpani in the book "Planning for Transport System", the need and role of the Public Passenger Transport facilities will likely continue to play an important role, especially with the threat of declining petroleum reserves. The use of new fuels other than gasoline still takes time trial will be the level of safety, efficiency, and

effectiveness, while the needs of people will be traveling to keep moving up in accordance with the increase of population and activities. The transition from today's technology into future technologies lead to dependence on public transport of passengers getting bigger because the public transport of passengers proved to be more efficient in energy use per unit of transported passengers.

### Performance of Urban Public Transport

Giannopoulos (1989) suggested factors - factors that influences performance of public transport include:

- Bus occupancy value, is the ratio between the number of passengers with a seating capacity of bus, for example, the occupancy of 150% means that passengers do not get a seat or stand 50% of the specified capacity,
- Re abilities, namely transport general reliability is a measure of adherence to the bus at the specified operating rules include compliance with the operating schedule, the feasibility of the physical condition of the bus and the bus crew in the service quality of public transport users,
- Hours of operation are not only affects the operating costs for operators but also mempengaruhi diberik quality service to the community's. It also said that additional hours of operation, especially at night will cause additional relative cost compared to the addition of the day, but it will cause a positive result of increased movement of community activities.

According to A World Bank Policy Study (1986), Urban Transport Standard, a key indicator of performance on bus services, among others, as shown in the following table.

TABLES. 2. 3

PUBLIC SERVICE PERFORMANCE INDICATORS BY WORLD BANK

No	Aspect	Parameter	Standard
1	Number of passengers	Number of persons / bus / day	463-555
2.	Utility vehicles	Average travel distance (km / day)	230-260
3.	Employee productivity	The number of administrative staff, The number of staff workshops / bus Total number of employees	0.3 to 0.4 0.5 to 1.5 3-8
4.	The accident rate	The number of accidents per 100,000 km traveled	1.5 to 3
5.	The extent of damage	% Of damaged bus to the total bus is used	8-10
6.	Avalaibility	The ratio of the number of buses operating with bus	80-90

		number kesluruhan (in%)	
7.	Consumption of materials	Consumption of bakar/bus/100 km journey	15-25
8.	The need for spare parts	% Reserve fee per bus per year towards the cost of Vehicle Operations	7-12
9.	Operating ratio	The ratio of revenues to operating costs	1:05 - 1.08

Sources: A World Bank Policy Study (1986), Urban Transport Standard in Asikin, 1998

While in a book called Bus route and schedule Planning Guidelines issued by the National Cooperative Highway Research (NHCPR) volu-69 had to be said that the performance of transport generally of which include:

### 1. Characteristics of Services

#### a. Regional Services and Range Route

Range and frequency of bus services associated with the density of road and population density. The suggested measures are:

- ✓ On local bus services, outreach services by 0.4 km with a population density greater 1500 people / km<sup>2</sup>, not less 90% of the population can be served,
- ✓ On local bus services, outreach of 0.8 km with a population density of 800-1500 people / km<sup>2</sup>, 50-75% of the population can be served.
- ✓ At the express bus service, outreach of 0.8 km of arterial roads.

#### b. Route structure and Spacing

Route structure and spacing adjusted to the pattern of roads and population density development. Bus service is provided on the main arterial roads and in its suburbs, as well as the route to the CDB or other activity centers.

#### c. Route Directness and Simplicity

The route should not be longer 20% of the mileage when using personal vehicles.

#### d. The length of the route

Route cultivated as short as possible. Route length does not exceed 40 miles each way or 2-hour travel time.

#### e. Duplication of routes

Route duplication avoided unless the conditions are not possible. Overlapping routes that lead to unnecessary operational costs, irregular headway, though sometimes improve passenger comfort.

### 2. Service level

#### a. Headway and Frequency

The amount depends on the frequency of bus headway and the number of buses



running. Headway greater than 10 to 15 minutes causing quite a long time waiting for passengers. Recommended amount of headway is 2.5; 5; 7.5 and so on so that the passenger is easy to remember.

b. Loading Standard

The amount of loading standards shall be as follows:

TABLE 2.4  
STANDARD MAXIMUM LOADING (% OF SEATS)

Period Time Operation	Type of Service				
	Local			express	
	Headway ≤ 5 minutes	Headway * 6-9 minutes	Headway ≥ 10min	freeway	Arterial
Peak hour 20-30 minutes	160	140	125	100	133
Peak hour 60 minutes	140	120	100	100	120
Transition (SBL / sdh peak)	120	110	100	100	110
Day	100	100	80	100	100
Afternoon	100	100	70	80	80

\* value in this column may be used if headway is not specified

Source: NCHRP 69

c. Load factor (Loading factor)

Load factor (*load factor*) is a very important component in the analysis of the calculation of transport rates because the greater the *load factor* of the rate produced smaller, and vice versa, with the *load factor* is small, the rates will be higher. Based on Government Regulation no. 41 of 1993 article 28 paragraph 2, which regulates the addition of vehicles to routes that are already open, load factor 70% is required except for the pioneering route.

For public transportation, *load factor* (LF) is defined as the ratio between the number of passengers (*demand*) are transported with the available seating capacity (*supply*). *Load factor* of 0.5 means that the vehicle seat yag charged as much as 50% of passenger seats is available. While the load factor of 1 means the same number of passengers transported by the number of seats available. For vehicles with a *load factor* greater than 1 means the number of passengers in a vehicle more than the available seating capacity. To determine the load factor is calculated by the formula:

Where:

LF: *Load factor* or load factor

P: The number of passengers being transported along a path one-way

K: Number of seats

d. Ute opportunity ECE R K

The magnitude of the speed of the route based on the following table:

TABLES. 2.5  
SPEED MANUAL ROUTE

Item	Speed bus route (km / h)	
	Not including the time to stop	Including time stopped
The average system	22.4	28.5
Standard deviation	3.7	6.3
Target	18.7	22.2

Source: NCHRP 69

VII. THE MACROSYSTEM TRANSPORT

Transport system consists of several macro and micro transportation system can be broken down into several smaller more systems (micro), each of which are interrelated and mutually influence as in Fig. 2.5.

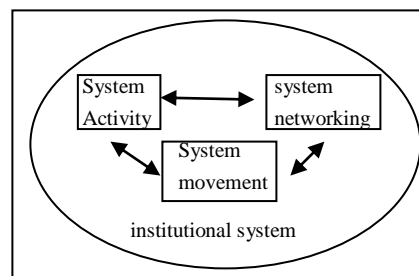


Fig. 2. 5. Transportation system macro

Macro transportation system consists of:

- a. System activity
- b. Transport infrastructure network system
- c. System of traffic movement
- d. Institutional system

Traffic movement arises because of the fulfillment process. We need to move because our needs are not met at where we are. Any land use or activity system (the first micro system) have certain types of activities that will generate the movement and the movement will attract the fulfillment process.

The system is a system of land from the system paused by activity patterns, economy, culture, and another - another. Activities that arise in these systems requires the movement of the tool needs to be done every day that are not met by the land use. The magnitude of the movement are intimately associated with the type and intensity of activities performed.

Movement of the movement of people and / or goods are clearly needed transportation modes (means) and media (infrastructure) mode of transportation where it moves. Necessary transport infrastructure is the stem of the second micro-commonly known as a network system that includes road network system, rail, bi terminals and trains, airports and seaports.

The interaction between the system and the activities of this network system generates the movement of people and / or goods in the form of movement of vehicles and / or person (pedestrian). A third micro system or the movement system that is safe, fast, convenient, inexpensive, reliable and in accordance with the environment created by if movement is governed by a system engineering and traffic management is good. Congestion problems that frequently occur in major cities in Indonesia usually arise because of the need for transportation more greater than the available transportation infrastructure, or infrastructure may not work properly.

System activity, network systems, and each system will influence the movement of i as shown in Fig. 6. Changes to the system will clearly affect the activities of the network system through changes in the level of service to the movement system. So is the change in the network system will be able to influence the system through increased mobillitas activity and accessibility of the movement system.

Besides the movement system plays an important role in accommodating the movement to create a smooth movement that eventually return the system will inevitably affect the activities of existing networks and systems in the form of accessibility and mobility. These three systems interact with each other in the micro transportation system macro.

In accordance with the Guidelines of State Policy, 1993, in an effort to ensure the realization of the movement system that is safe, comfortable, smooth, cheap, reliable and in accordance with the environment, then in a systematic macro transport m the stem there are other so-called micro additional institutional systems that include individual, group, institutions, and government agencies and private sector who are involved directly or indirectly in any such micro systems. In Indonesia,

the institutional system related to transportation issues in general are as follows:

- ❖ System institutions; *Bappenas*, the Agency Level 1 and Level II, Regional Development, Local Government
- ❖ The network system; Department of Transportation (Army, Navy, Air) Highways
- ❖ Units; *DLLAJ*, *Organda*, traffic policeman, the public.

*Bappenas*, the Agency, Regional Development and Local Government plays a very important role in determining the system through the activities of both the scale of the policy area, regional, or sector. Network system in general policies determined by either the Department of Transportation, land, sea and air as well as the Department of Public Works through the Directorate General of Highways. Movement system is determined by the *DLLAJ*, *Organda*, traffic cop and the users of the road.

Policy arising out of course can be successfully implemented through regulations that indirectly requires a jug hu law enforcement system is also good. So, in general it can be said that, the government, private, and community play a role in addressing this transportation system, particularly the congestion problem.

## VIII. CONCLUSION

### **Knot**

As is described in Chapter I, the purpose of writing this study is to identify supply and demand for infrastructure and transportation facilities in North Teluk Betung. Results and discussion are described in the previous chapters it can be concluded that:

#### **a. Transport Infrastructure**

##### **1. Roads and Bridges**

- A. The road condition to a tourist attraction in the study area are generally good, except that the entrance to the site of the condition of being a tourist attraction. Average width of roads in the region of 2.5 m - 3, 0 m.
2. Total number of bridges in the study area there are eight. In general the good condition. One in every eight bridges in poor condition Kalidoro the bridge, to be exact direction Tripanca mineral water company.

#### **b. Means of Transportation**

##### **1. 'ojek' motorcycle and private motorcycle**

1. 'ojek' motorcycle as an alternative transportation by most citizens.
2. 'ojek' motorcycle to reach all areas outside the bus Damri lane's.

3. For residents who have two-wheel personal transport as alternative, in addition to supporting the movement, also functioned as a 'ojek' motorcycle.
4. Two-wheeled vehicles that had not been a requirement for residents research, because of economic factors.

### 2. Public Transport Bus Damri

1. It is the only public bus transportation in the study area with the route from Terminal Market purposes Hanura - Rajabasa vice versa.
2. Number passenger bus (load factor) in an average day and peak day showed a reading below 50%.
3. Currently, bus transportation Damri not have a role by the majority of tourist visitors and local residents as a passenger.

### 3. Transport Village (Angdes)

1. village transport features a substantial role for citizens to transport agricultural produce and handicrafts that are temporary.

### 4. Ox carts.

1. Carriage minority cows still needed in the study area as a transport agricultural products a day - the day, from pepper ng to the home and vice versa.

### 5. Private Car

1. Personal car compassion has a greater role for the continuity of the economic activities of citizens.
2. Private car transport crops to the landlord and the residents have been organized.

### 6. Tourism Object

1. In four villages in the study area there are several attractions for immigrants such as Abdurahman Wan Forest Park , Butterfly Garden, Garden Fishing, Batu Putu Waterfall, Bumi Kedaton Garden, Natural Baths and Parks.
2. Visitor attractions have not been to maximize public transport to get to the tourist sites.
3. On private transport generally a major factor in visitors coming to the tourist sites.

### 7. Potential Tourism Object

1. Potential of tourism in the study was the father of potensial nature, artificial tour and agro tourism.
2. The development of tourism in the region of obyek studies require public transport services.

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