Model of logistic transport distribution in the urban area

A A Putra¹, L O M Magribi¹, T Sharly¹, E Ngii¹, A S Sukri¹, A S Sukri¹, R Balaka¹, T Azikin¹, Lawalendo¹, R Srijani¹, M Makmur¹

¹Department of Civil Engineering University of Haluoleo, Kampus Bumi Tridarma Anduonohu, 93232 Kendari, Indonesia

E-mail: putra_adris@yahoo.com

Abstract. Logistics Transportation in supporting Logistics movement in urban areas has very limited space for certain road segments, especially for large trucks and container vehicles. The limited space of movement will determine the effectiveness and efficiency of Logistics transportation itself. Logistics travel from to and from trading locations, finally reaching consumers is not a simple matter, but is influenced by the various chain of movements that affect costs, time, security and safety. The factors that influence the pattern of distribution of freight transport in Kendari City, Types of modes of commercial goods transportation, Road networks and supporting infrastructure, Land use Patterns.

1. Introduction

The logistics system needs an integrated distribution system to be able to guarantee the availability of basic commodities fairly and equitably. The current logistics system can be said to be not optimal as indicated by the state of logistics that has been running so far, where the main driving commodity as a driver of logistics activity has not been effectively coordinated, transportation infrastructure is inadequate in terms of quantity and quality consumers, the difference in these places must be overcome by transportation activities. Along with the increase in population and the advancement of technology, the needs of people are increasing. This results in greater distribution of logistics so that it requires transportation equipment as a means of transportation.

The transportation system continues to be degraded due to the development of various activities in the population of urban areas, changes in the transportation system have had an impact on various aspects of urban life (health, education, trade and industrial). The planning process of the urban transportation system is carried out through policy making which includes the creation of concepts or strategies, to set priorities for the development of the transportation system as an effort of the government to improve the transportation system services. The policy making in transportation system planning was carried out with the aim of: (1) transportation system planning could provide the middle of the paradigm of changing population activities (2) the transportation system had a goal to advance the quality of life of the population; (3) cooperation of government elements in policy making so as to improve the transportation system services [1].

The transportation system faces challenges in policy making based on the potential of the region that is owned by prioritizing economic growth, environmental preservation and welfare for present and future generations [2]. The main priority of revamping the urban transportation system is emphasized on the effectiveness of public transport services, because it will have an impact on the urban environment and the opportunity for the community to improve the quality of life [3]. Transportation system planning requires the integration of the environment, socio-economic population, besides that it needs the right strategy to improve the transportation system, especially the aspects of security,
comfort and structuring of land use systems in urban areas [4]. The demand for transportation systems is based on potential areas using characteristics of urban areas as well as land use systems [5].

Logistics transportation in supporting logistics movements in urban areas has very limited space for certain road segments, especially for large trucks and container vehicles/containers. The limited space of movement will determine the effectiveness and efficiency of Logistics transportation itself. The more efficient and effective logistics transport will be, the more pressing the commodity prices will be. Logistics travel from to and from trading locations, finally reaching consumers is not a simple matter, but is influenced by the various chain of movements that affect costs, time, security and safety, not to mention the movement of Logistics from and outside the city. Logistics Transport Distribution is very closely related to the function of land use, especially in trade locations (marketing locations) and the aspects that influence it, namely the spread of marketing, increased competitiveness, location distribution and expansion of trade, reduction of unnecessary links and location Logistics transport node.

The problem of logistics transportation that often arises is in the distribution of logistics between cities and within cities. Logistics distribution between cities generally uses trucks with large capacity and special facilities for loading and unloading, while to meet the needs of residents in the city in part Production logistics and consumption logistics are sent and imported from outside the city using large trucks. These large trucks will affect the city transportation system, because most logistics shipments are carried out in the morning, afternoon and evening and at that time city traffic is quite dense. Whereas the distribution of Logistics within the city spread throughout the city area and was very difficult to estimate, and by using varied modes of transportation.

Economic aspects of transportation are related to production costs and distribution costs, so production logistics reach consumers. Transportation activity is a derived demand for economic development in the sense that an increase in the economy will be followed by an increase in demand for logistics services. The increasingly severe problem in the field of transportation in general and in particular Logistics transportation, is a phenomenon that is commonly found in various regions in Southeast Sulawesi. This situation is a logical consequence of increased activity and economic growth. The imbalance between demand (demand) and availability (supply), plus the imbalance in the distribution system, causes the issue of logistics transportation to be increasingly complicated.

Another problem is the absence of a logistic loading and unloading terminal causing a logistical displacement that is not carried out in the warehouse, tends to carry out loading and unloading logistics on the roadside, even on the road. The presence of Logistics loading and unloading activities, especially on the roadside, results in effective road widths being reduced and disrupting the movement of vehicles going to and through the area which ultimately causes congestion. Limited truck stop facilities (truck bases) are provided, it is not uncommon to find a large truck parked on the side of the road around the location of the truck base. At the base of this truck it is sometimes used also for logistic loading and unloading, but at the boundaries of Logistics that are not easily damaged.

2. Literature review

2.1. Urban Transportation System
Transportation systems have an important role in enhancing the overall economic development of the community towards the development of an area [6]. Transportation system is a system for moving from one place to another, a transportation system is needed a planning technique in carrying out to develop optimal strategies in providing facilities and infrastructure for urban transportation systems [7]. Transportation systems have consequences for social dimensions such as welfare and justice for society [8], [9]. A well-functioning transportation system is a factor that encourages the development of community activities, transportation provides access to movement to the center of trade, education and settlements. Improper transportation system development strategies and programs can damage land use, environment and capacity of public space, besides that service networks that are not effective, will not be able to meet the expectations of transport users

The activities of the city population greatly determine the growth and development of the city, in order to find out the growth and development of the city can be analyzed on two things that need
attention. First, the characteristics of the city are products of various factors, such as topography, history, economic motives and human culture and various opportunities. Next, these characteristics are never static but change following the offer of time and space.

The achievement of a transportation or transportation system that guarantees the safe and fast movement of human and/or logistics is the goal of development in the sector of transportation (transportation). Transportation network systems should be considered for factors that significantly affect the system such as demand characteristics, land use, and existing conditions in an area, besides that the transportation system must be able to be developed to meet the demand for transportation services in the future.

2.2. Level of Logistics Transport Services

Each Logistics transport user for each stage in the distribution channel requires "LOS." According to the difference in LOS requirements describes the behavior of a company or group of Logistics companies, changing the level of service (LOS) is a transportation system attribute that influences users in making decisions. So service attributes have different levels of influence for each user group and transportation system [10].

Total LOS consists of each sub-system, so the performance of the system as a whole is a function of the performance of each element in the system. In general, each sub-system of a transportation system is managed by a variety of different organizations, so there are various operators in a system. Every operator is only concerned with the performance of the sub-system itself. The operator's attention is only in terms of income earned from the sale of services to the user, as well as operating aspects that affect the use of operating costs. This operation method will give a certain LOS.

2.3 Logistic Traffic Management

Traffic management is the management and control of traffic flow by optimizing the use of existing infrastructure through reducing or reducing the level of traffic growth, providing facilities for transportation that is efficient in the use of space, roads and facilitating the movement system [11]. Traffic management is one of the tasks assigned to the Regional Level apparatus for provincial roads and Regional Level officials for the district/municipal roads. Based on Government Regulation Number 22 of 1990 concerning the distribution of government affairs in the field of traffic and road transportation to the level I and level regions II.

Traffic management is carried out aimed at obtaining the efficiency level of overall traffic movement with a high level of accessibility by balancing demand with available supporting facilities, and increasing the level of safety of users that can be accepted by all parties and improving the level of safety as well as possible and improve the state of the environment where the traffic flow is located. Promoting energy use efficiently or other energy-efficient floaters that are smaller than existing energy use.

2.4. Accessibility and Mobility

Accessibility is a concept that connects the system of regulating geographical land use with the transport network system that connects it. Accessibility is a measure of the convenience or ease of the way land use locations interact with each other and whether or not the area is achieved through a transportation network system [12].

Easy or difficult statements are very subjective and qualitative things. Easy for someone is not necessarily easy for others, as well as difficult statements. Therefore we need performance that can be measured, so that it can state the level of accession or convenience.

Otherwise than the mobility is a measure of a person's ability to move which is usually expressed by his ability to pay for transportation costs. Different land uses must have different accessibility because the land use activities are spread unevenly in space (heterogen).

The network system and the movement patterns of both passenger transportation and Logistics Logistics transportation of each city differ depending on the city structure itself, while the structure of a city itself is influenced by patterns of land use and networks. Attraction of travel both people and logistics, while the road network and transportation are means to connect or means of interaction to
serve the movements caused by a city. To set up so that the movement needs can be well served, it is needed where management and management are both in the network system and transportation system.

3. Methodology

3.1. Study Approach
The research approach that is suitable for the purpose is carried out with a survey approach, namely a research approach which is generally used to collect extensive and large amounts of data. The survey approach is part of a descriptive research method that aims to find the position of phenomena (symptoms) and determine the similarity of status by comparing the standards established [13].

3.2. Research methods
In research based on phenomena that exist in the field, and associated with the goals and objectives of the study, the appropriate research method is descriptive. The study of phenomena is more relevant to use descriptive methods, namely fact finding with the right interpretation of things that exist in the community, including relations of activities, attitudes, views, and the influence of a phenomenon [14].

3.3. Data collection technique
This study took respondents in industrial estates (companies of each type of industry), warehousing areas (warehouses of industries, warehouse warehouses, trade warehouses), trade areas that represent types of trade (large trade, and small trade not retailed), actors logistics transport based on the type of transport mode, and key bureaucracy in the research area.
The data collection techniques in the study were carried out by observation and interviews.

3.4. Data collection technique
The analysis technique used in this study is also a combination or a combination of qualitative and quantitative approaches. In addition, this study uses descriptive-phenomenological methods that aim to make a description, description or painting systematically, factually, and accurately of the facts, characteristics and relationships between the phenomena investigated.

Analysis of interaction between regions/regions in terms of patterns of movement of people and logistics. To find out the interaction between regions based on patterns of movement of people and logistics used the origin destination matrix (MAT) and desires. This analysis is used to get how the interaction between regions is based on the number of movements of people and logistics from the place of origin to the destination, which is influenced by the distance between regions.

Analysis of population movements begins by looking at the distribution of movements using the Origin Destination (MAT) method, which is a two-dimensional matrix that contains information about the magnitude of the movement between locations (zones) in a particular area. The shape of the origin matrix can be shown in table 1.

| Zona | 1    | 2    | 3    | ... | N | Oi |
|------|------|------|------|-----|---|----|
| 1    | T11  | T12  | T13  | ... | T1N| O1 |
| 2    |      |      |      | ... | T2N| O2 |
| 3    |      |      |      | ... | T3N| O3 |
|      |      |      |      | ... |    |    |
| N    | TN1  | TN2  | TN3  | ... | TNN| ON |
| Dd   | D1   | D2   | D3   | ... | DN | T  |

Where:

\[ T_{id} = \text{Movement from the zone of origin } i \text{ to destination zone } d \]
Oi = Number of movements originating from the origin zone i
Dd = The number of movements leading to the zone d
\{Tid\} atau T = Total matrix

The results of primary processing data from the destination of the trip obtained based on the results of the questionnaire will be displayed in the form of a matrix table of origin of the trip in each zone in the region. Determination of zones based on the similarity of activities or land use in an area. The origin of the trip destination matrix can be described as follows:

1. Zones that have the potential as travel destinations (towing zones), namely zones that have the largest number of travel destinations;
2. Potential zone as the origin of travel (generating zone);
3. Travel distribution based on destination origin, which is the distribution of the number of trips in either an area (internal zone) or between regions (from each zone to another zone);
4. The pattern of population movements within cities.

To predict the number of trips in the planning year, beforehand the number of Logistics transport must be predicted in advance. With this technique, it is assumed that the development of the number of logistics transport will multiply by itself.

\[ Pt = Po \times (1 + i)^n \]  \hspace{1cm} (1)

Where:

\( Pt \) = Total target logistic transport year
\( Po \) = Number of basic year Logistics transportation
\( i \) = Growth rate
\( N \) = Number of years

4. Results and discussion

4.1. Analysis of the Availability of Logistics Transport Movements

Analysis of the supply (supply) of logistics transport movements in Kendari City, detailed in several analyzes, among others

1. Types of Logistics transportation modes
2. Road network and supporting infrastructure
3. Land Use Pattern

The city of Kendari The highest frequency of logistics transport is by using transportation modes Logistics pick up and for the use of transportation modes Logistics includes the average using medium trucks, small trucks, and large trucks.

| Table 2. Types of logistics transportation in kendari city. |
|----------------------------------------------------------|
| Type of Goods Transport | Private | Public | Government |
|-------------------------|---------|--------|------------|
| Pick Up                 | 591     | 2      | 4          |
| Truck                   | 52      | 32     | 2          |
| Dump Truck              | 35      | 19     | 2          |
| Truck Box               | 11      | 4      | -          |
| Tronton                 | -       | 1      | -          |
| Light Truck             | 6       | 7      | -          |
| Pick Up Truck           | 8       | -      | 1          |
| Total                   | 703     | 654    | 9          |

Statistical data for 2018 shows that in terms of authority, road guidance is 58.93 km. The length of the road is a national road, 66.22 km in the length of the provincial road, and 423.80 km in the length of the city road. National roads are generally in good condition, while provincial roads and city roads
The results of the research in the field are known that for land use in Kendari City with the most frequency used for trade in the CBD area. Kendari City has one CBD (Central Business District) which is located in the Mandonga area. This area will be used as RDTR (Spatial Detail Plan) in Kendari City. The RDTR is carried out for the realization of the implementation of urban development programs

4.2. Analysis of Logistics Transport Movement Patterns in Kendari City

From the analysis of the calculation of origin and destination of Logistics, transport modes and type of Logistics in each zone/region in this case is the sub-district in Kendari City based on table 3 bellow.

| Origin Destination | Bungkutoko Port | Nusantara Port | Haluoleo airport | O     |
|--------------------|-----------------|----------------|------------------|-------|
| Kendari barat      | 187,706         | 1.088,954      | 472,911          | 1.749,571 |
| Mandonga           | 281,559         | 1.633,431      | 709,367          | 2.624,357 |
| Kadia              | 375,412         | 2.177,908      | 945,822          | 3.499,143 |
| Baruga             | 187,706         | 1.088,954      | 472,911          | 1.749,571 |
| kambu              | 93.853          | 544.477        | 236,456          | 874,786 |
| poasia             | 187.706         | 1.088.954      | 472.911          | 1.749.571 |
| Abeli              | 187.706         | 1.088.954      | 472.911          | 1.749.571 |
| Wua-Wua            | 93.853          | 544.447        | 336.456          | 874.786 |
| puuwatu            | 187.706         | 1.088.954      | 472.911          | 1.749.571 |
| D                  | 1.783.209       | 10.345.062     | 4.492.656        | 16.620.927 |

Based figure 1 shows that for the logistic transport movement pattern outside of Kendari City, for the movement to bring Logistics the most is from the entrance of the Nusantara port to Kadia district, while the movement to bring Logistics is the least movement that comes from the entrance of Bungkutoko Port towards Wua-wua District.

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while the movement to bring Logistics is the least movement that comes from the entrance of Bungkutoko Port towards Wua-wua District.

From the analysis of the calculation of origin and destination of Logistics, transportation modes and type of Logistics in each zone/region in this case is the subdistrict in Kendari City. Table 4. The Number of Logistics Transport Out of Kendari City

| Origin Destination | Kadia | Kendari | Mandonga | Baruga | Kendari Barat | Wua-Wua | Poasia | Kambu | Puuwatu | O      |
|--------------------|-------|---------|----------|--------|---------------|---------|--------|-------|---------|--------|
| Bungkutoko Port    | 301.472 | 60.294  | 150.736  | 120.589 | 241.178       | 30.147  | 60.294 | 30.147 | 1115.446 |
| Nusantara Port     | 160.716 | 32.143  | 80.358   | 64.287  | 128.573       | 16.072  | 32.143 | 16.072 | 578.579  |
| Haluoleo Airport   | 537.495 | 107.499 | 268.747  | 214.998 | 429.996       | 53.749  | 107.499 | 53.749 | 1934.981 |
| D                  | 999.683 | 199.936 | 499.841  | 399.874 | 799.749       | 99.968  | 399.874 | 99.968 | 3698.827 |

Based on table 4 above it can be seen for the number of logistics transport movements out of Kendari City originating from each district through the exit of Haluoleo Airport, Bungkutoko Port, and Nusantara Harbor.

Figure 2. Logistics transport movement pattern out of Kendari City

Based figure 2 shows that for the Logistics transport movement pattern out of Kendari City, the most is from Kadia District Towards Haluoleo Airport and Bungkutoko Harbor, while for the least movement is from Puuwatu and Wua-Wua Districts to Nusantara Harbor.

4.3. Logistics Transport Generating Forecast

Below is a forecasting table for the number of Kendari City Logistics transportation from 2017 to 2037.

Table 5. Calculation of forecasting of goods transport in Kendari City in 2037.

| Origin Destination | Bungkutoko Port | Nusantara Port | Haluoleo airport | O      |
|--------------------|-----------------|----------------|-------------------|--------|
| Kendari Barat      | 938.559         | 5.444.932      | 2.364.626         | 8.748.117 |
| Mandonga           | 1.407.838       | 8.167.396      | 3.546.939         | 13.112.175 |
| Kadia              | 1.877.118       | 10.889.863     | 4.729.252         | 17.496.234 |
| Baruga             | 938.559         | 5.444.932      | 2.364.626         | 8.748.117 |
| Kambu              | 469.297         | 2.722.466      | 1.182.312         | 4.374.058 |
| Poasia             | 938.559         | 5.444.932      | 2.364.626         | 8.748.117 |
| Abeli              | 938.559         | 5.444.932      | 2.364.626         | 8.748.117 |
| Wua-Wua            | 469.297         | 2.722.466      | 1.182.312         | 4.374.058 |
Based on figure 3 shows movement to bring Logistics is mostly from the entrance of the archipelago port to Kadia Subdistrict, while for the movement to bring Logistics the least movement is from the entrance of Bungkutoko Harbor towards Wua-Wua District.

**Table 6.** Logistic transport forecast calculation out of Kendari City in 2037.

| Origin Destination | Kadia | Kendari | Mandonga | Baruga | Kendari Barat | Wua-Wua | Poasia | Kambu | Puuwatu | O     |
|--------------------|-------|---------|----------|--------|---------------|---------|--------|-------|---------|-------|
| Bungkutoko Port    | 722.901 | 144.58  | 361.45   | 289.16 | 578.321       | 72.29   | 289.16 | 144.58 | 72.29   | 2674.732 |
| Nusantara Port     | 385.382 | 77.076  | 192.691  | 154.153| 308.306       | 38.538  | 154.153| 77.076 | 38.538  | 1387.370 |
| Haluoleo Airport   | 1288.861| 257.772 | 644.431  | 515.545| 1031.08       | 128.886 | 515.545| 257.772| 128.886 | 4639.892 |
| D                  | 2397.144| 479.428 | 1198.572 | 958.858| 1917.707      | 239.709 | 958.858| 479.428| 239.714 | 8869.418 |

For more clarity the predictions of logistic transport movement patterns from outside the city can be seen in figure 4.

**Figure 4.** Predictions of logistic transport movement patterns out of Kendari.
Based figure 4 shows that for the logistic transport movement pattern out of Kendari City, the most is from Kadia Subdistrict to Haluoleo Airport and Bungkutoko Port, while for the least movement is from Puuwatu and Wua-Wua Districts to Nusantara Harbor.

4.4. Logistics Transport Routes Enter Kendari City

The Logistics transport route into Kendari City was reviewed through the entrance of Haluoleo Airport, Bungkutoko Port and Nusantara Kendari Port and ended at Logistics distribution centers in Kendari City such as supermarkets and markets.

![Map of logistics transport entrance route from haluoleo airport.](image1)

![Map of logistics transportation entrance route from Bungkutoko Harbor.](image2)
4.5. **Logistics Transport Routes Out of Kendari City**

The logistic transport route out of Kendari City was reviewed through expedition centers and logistics shipping companies in Kendari to the entrances to Haluoleo Airport, Bungkutoko Port and Nusantara Kendari Port.

Logistic distribution routes are started from logistics shipping companies in Kendari City, then out through the By Pass Kendari arterial road as the main road to be forwarded to Haluoleo Airport, Bungkutoko Port and Nusantara Kendari Port. For more details, see figure 9, figure 10, figure 11.

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**Figure 7.** Map of logistics transport entrance routes from Nusantara Harbor.

**Figure 8.** Details of the area - a distribution road zone.

**Figure 9.** Details of area distribution area - b zone.
5. Conclusion

Logistics Transport Distribution Patterns in Kendari City started from the entrance of Haluoleo Airport, Bungkutoko Port and Nusantara Kendari Port and ended at the commercial logistics distribution centers in Kendari City such as supermarkets, markets and various logistics trade centers in Kendari.

Logistics Transport Distribution patterns coming out of Kendari City started from expedition centers and logistics shipping companies in Kendari City to the entrance of Haluoleo Airport, Bungkutoko Harbor and Nusantara Port.

The factors that influence the pattern of distribution of Logistics transportation in Kendari City are:

- Type of commercial logistics transportation mode
- Road network and supporting infrastructure
- Land Use Pattern

The amount of commercial logistics transportation in Kendari City experienced an increase of 8.38 percent for logistic transportation in and 4.47 percent for Logistics transportation out of Kendari City.

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