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The Business Location Decision for Transport Logistics Service Provider

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ABSTRACT

The aim of this research is to identify industrial, trading and services land use to transport flow. The activities of industrial, trading and services have affected volume traffic. Knowledge about the effect of land use on transportation is needed for LSP in determining its business location. This study used proportional samples size to derive transport flow as result of activities in industrial, trading and services land use. Analysis used in this research was multiple regression analysis to perform transportation flow model. The result show that building area and number of employees significantly influence transportation flow within trading and services land use. For industrial land use, characteristics that more influence transportation flow are building area and number of delivery activities.

Keywords **:** *industrial; land use; trading; service land use; transportation; city logistics; logistics service providers*

A. Introduction

In general, the development of a city influences on the increasing of transportation problem. There are some problems that often occur in a big city, one of them is traffic congestion. Congestion problem occurs due to transportation used greater than available transport infrastructure. Changes in the activity system will affect street network system through changes in level of services for movement system (Petersen, 2002).

The problems of a big city have also occurred in big cities in East Java Province of Indonesia. Increasing economic activities impact on increasing transportation needs. The economic structure in East Java can be seen from the contribution of each economic sector. The main sectors that contribute to Gross Domestic Product (GDP) of East Java are industrial, trading and services sector.

Several cities that provide the large contribution to GDP of East Java is Surabaya and Malang. Surabaya and Malang are cities that have role as the economic area of East Java Province. Population growth in both city around 1,8% every year. As the development of infrastructure in these cities, movement patterns of people and goods increase rapidly toward industrial, trading and services area. This research use part location of the main area in Surabaya and Malang as part of study object.

The development of industrial, trading and services sectors effect on utilizing land and moving people and goods rapidly. This condition emerges transportation problems that must be resolved, such as congestion. This condition also effects on logistics service provider (LSP) as one of the actors in logistical activities (Agustin & Sumantri, 2017a). Knowledge about the effect of land use on transportation is needed for LSP in determining its business location. Based on these issues, this research is conducted to investigate the influence model of industrial, trading and services land use on transport movement attraction. The result of this research can be used as input for logistics service providers to select the business location and solve the congestion.

Increased population and economic growth in urban areas result in growing demand for goods and services (Cherrett et al., 2012). This condition will grow the industrial and business sectors and then the sector requires location to support its operations. Commercial and industrial land use patterns in urban areas will affect the type and quantity of products produced and consumed and subsequently affect the total quantity of transportation of people and goods (Allen, Browne, & Cherrett, 2012). Increased transportation in a city provide both benefits and negative impacts such as pollution, traffic congestion and accident (Kayikci, 2010).

Understanding cities and regions is one of the main scientific challenges of this era. Transportation and land use are elements of this problem. The knowledge about interrelationships between these two key elements is not clear. When the relationship between the transportation and land use is clearly known, it will increase accessibility of a city. Accessibility was influenced also by transportation and activity. Inadequate transportation and high activity at the location result in traffic congestion. Traffic congestion is defined as more than usual travel time (Woudsma, et al., 2008).

City as the main location of business activities play an important role in economic growth. However, many cities have serious traffic problems and environmental impacts, such as noise and air pollution. These negative impacts reduce the economic competitiveness of a city and make quality of life decline (Tseng, Yue, & Taylor, 2005). Urbanization in the world lead to half of the population concentrate in city areas. Several large cities have various problems due to increased population. Rapid population growth and economic growth have caused a significant movement of goods in the transportation networks. This situation impact on traffic congestion and environmental damage, such as traffic congestion, air pollution and large energy consumption (Taniguchi, 2014; Taniguchi, Thompson, & Yamada, 2014)

Increased urbanization has a significant impact also on the socio-economic development of cities. Increased population results in increased new production and trade companies (Sumantri, 2017). As a result, these are increasing the number of movements and longer travel time in the city; deteriorating road quality; decreasing security and decreasing parking area. Consequently, such situation has an impact on reducing the quality of life of the population (J. Witkowski & Kiba-Janiak, 2012). These problems are very complex and need problem solving. The adverse impacts must be addressed by policy holders. Innovative methodologies are needed to overcome them, namely city logistics. City Logistics is a new and innovative concept that aims to solve this complex problem.

City Logistics is a concept integrating existing resources to solve difficulties caused by the impact of increasing population and vehicle ownership in urban areas. The development of a city that is not well managed not only reduces the quality of life in urban areas but also has a negative impact on future city development. City Logistics provides innovative solutions that will be developed to improve the quality of life in urban areas (Taniguchi, Thompson, & Yamada, 2003).

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City logistics play an important role in creating an efficient, environmentally friendly and safe urban goods transportation system. Several policies, including an urban consolidation center, regulations for access the city center, delivery hour, low emission zones have been implemented in urban areas to achieve the goal of city logistics consisting of mobility, sustainability and ability to live. A city logistics model is needed to evaluate the impact of program implementing (Taniguchi, 2014; Taniguchi et al., 2014). City logistics solutions can solve these difficult problems, because city logistics considers the various goals and behaviors of various stakeholders involved in urban logistics activities. City logistics is expected to provide the basis for sustainable and livable city (Taniguchi, 2014; Taniguchi et al., 2014).

In the literature there are many definitions of city logistics. Each definition emphasis on different factors. The concept of city logistics has been proposed by several scientists (Taniguchi, 2014; Taniguchi et al., 2003, 2014; Taniguchi, Thompson, Yamada, & Duin, 2001). The aim is to solve the increasing of urbanization and transportation indexes in the city through integrating existing resources (J. Witkowski & Kiba-Janiak, 2012). There are several areas highlighted related to city logistics, which include goods transportation, passenger transportation, quality of life and sustainable development. The definition of city logistics can be divided into two main groups, which are mainly related to the problem of transportation of goods in city logistics and related to the problem of movement of people in the city (J. Witkowski & Kiba-Janiak, 2014).

City logistics is a process to optimize logistics and transportation activities by considering the traffic environment, traffic congestion, traffic safety and energy savings within the framework of a market economy (Taniguchi et al., 2003). The main objective of city logistics is to improve the living conditions of the population by reducing congestion, CO2 emissions, pollution, noise and increasing mobility (Crainic, Gendreau, & Potvin, 2009). City logistics focuses on the planning, coordination and controlling of processes within certain urban boundaries. City logistics is related to the physical movement of goods, people and information to optimize costs, minimize congestion and improve quality of life (J. Witkowski & Kiba-Janiak, 2012), City logistics is a modern concept that aims to integrate existing resources and to solve problems arising from the increasing city's transportation index (J. Witkowski & Kiba-Janiak, 2014).

Effective and environmentally friendly city logistics require a vision to achieve the setting goals in three areas, namely mobility, sustainability and liveability (Taniguchi et al., 2003; J. Witkowski & Kiba-Janiak, 2012). The main goal of 'mobility' is to get a balance between the adequate traffic capacity and reduced congestion. 'Sustainability' refers to an important issue, namely, environmental protection and energy savings. 'Liveability' refers to quality of life, such as safety, health, and attractiveness of residence(Tseng et al., 2005).

City logistics creates innovative solutions to improve quality of life (Taniguchi et al., 2001). Quality of life is a standard of living measured by indicators related to population income, access to housing, living conditions in the city and ultimately sustainable development (J. Witkowski & Kiba-Janiak, 2014). City logistics has some field focus, involving 1) public and individual transport; 2) transport of material and media; 3) storage of material foods in the areas of commerce; 4) controlling of people and material flows; 5) transport and storage of waste (J. Witkowski & Kiba-Janiak, 2014).

City logistics require commitments from stakeholders, such as firms managing transportation of goods, residents or consumers, manufacturing companies, services and trading companies or shippers, local governments and passenger transport companies. Each stakeholder has different expectations to city logistics (Taniguchi &

Tamagawa, 2005; Tseng et al., 2005; J. Witkowski & Kiba-Janiak, 2014; K. Witkowski & Saniuk, 2010). One of the main objectives of local government is to improve the mobility within a city and the quality of life through satisfying the needs of citizens, including economic and social fields (J. Witkowski & Kiba-Janiak, 2014). Urban policy makers have decided to resolve the urban problems by implementing innovative projects in city logistics.

Logistics service provider companies as actors in providing logistics services for certain company have an important role in regional economy. All aspects related to LSP policies affect the cost of logistics which in turn affects the regional economy, one of which is related to determining the location of an LSP company. The location of an LSP has an important role to increase the effectiveness and operational efficiency of an LSP and influences the supply chain of the commodities (Kayikci, 2010). Furthermore, the location of the LSP affects the competitiveness of the industry in the area. If the location of the LSP is not well determined, it will have an economic, environmental and social impact. The economic impact is on congestion, inefficiency, waste management. Environmental impacts are pollutant emissions and the use of non-renewable fossil fuels. Social impact is the difficulty of making journeys and quality of life issues such as loss of greenfield sites (Anderson, Allen, & Browne, 2005). So as the consequence, when determining the location of an LSP, it is necessary to consider all aspects influencing the colocation decision and which are affected by the one.

All influential factors determining location should be considered because it influences on economic, social and environment (Kayikci, 2010). LSP location impact on noise, emissions from goods handling, traffic generated from logistical facilities, traffic from heavy vehicles, heavy vehicles parked. In other words, the development of the LSP area will result in regional traffic growth (Wagner, 2010). The development of logistics companies in suitable and easily accessible areas will reduce regional traffic impacts. Location policies that consider traffic will be a powerful planning tool. The average level of trips generated from transportation and from logistics companies and the type of logistics-related land use are used as input for traffic impact assessment (Wagner, 2010).

The issue of urban freight transportation is important to support better life for the community and the environment (Agustin & Sumantri, 2017b). Urban freight is not only essential for economic growth but also for the environment (Taniguchi, 2014; Taniguchi et al., 2014). Some logistics activities produce traffic congestion, air pollution, noise, crashes. Urban aspects that need to be considered in the level of transport activity are the size and intensity of land use, local facilities, accessibility to local transport infrastructure, availability of parking facilities, and type of road network (Allen et al., 2012). Optimizing the location of logistics facilities is important in big cities, because it greatly affects land use and traffic flow and subsequently affects external diseconomies such as traffic congestion and air pollution (Taniguchi, 2014; Taniguchi et al., 2014).

Integration of land use, transportation and environmental policies is very important for sustainable development. Current policy requires new forms of cooperation among stakeholders and government involvement (Geerlings & Stead, 2002). Integrated assessment can be used to evaluate the impact of urban policies that support sustainable development, involving 1) understanding the policy 2) determining the focus 3) assessing the impacts 4) developing policy recommendations 5) implementing policy recommendations 6) monitoring and evaluating the implementation of the recommendations (Clayton & Spencer, 2012).

Current research on location determination focuses on hierarchical approaches. Location determination based on hierarchical approaches can be grouped

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based on four attributes: flow patterns (i.e., service or goods flow features), service availability, service spatial configuration, and the purpose of finding facilities (Sahin, Sural, & Meral, 2007). This study focuses on the identification of variables affecting flow pattern. The aim of this research is to identify industrial, trading and services land use to transport flow.

B. Method

This study used proportional samples size to derive transport flow as result of activities in industrial, trading and services land use. Analysis used in this research was multiple regression analysis to perform transportation flow model. To calculate the movement attraction of each land use, this study uses multiple liner regression. As input for multiple linear regressions, this study employs survey method and secondary data. Surveys conducted were survey of land use characteristics (building area, parking area, number of visitors, number of employees); road characteristics; industrial, trading and services attraction characteristics (origin of movement objectives, travel times, and modes used); and total traffic volume.

C. Results and Discussion

Calculation of attraction of industrial, trading and services movement use multiple regression analysis. Multiple linier regression analysis is a technique that links one dependent variable with two or more independent variables that are considered affect the change in dependent variable. After finding model, this study uses t and F test and then test significance of model with α 0,05. Independent and dependent variables used in this research are: Number of Movement (Y), Building Area (X_1), Parking Area (X_2), Number of Employees (X_3), Number of Visitors (X_4), and Number of Delivery Activities (X_5)

Attraction of movement is movement that occurs due to activity of land use. This research conducted to find out how big contribution or influence of industrial, trading and services land use to total traffic. Result of multiple linier regression model of movement attraction is useful to find out existing volume generated from all land use. Models were used as inputs to calculate and determine percentage contribution or influence of movement attraction of industrial, trading and services on total traffic.

The significant model performed for each land use were below

Table 1. Moving Attraction of Land-Use Classification

Classification	Land use	Surabaya	Malang
Services Area	Health Care Area	$Y = 50,23 + 0,07(X_1) + 1,99(X_4)$	$Y = 12,54 + 0,04(X_1) + 0,28(X_4)$
	Office Area	$Y = 6,53 + 0,02(X_1) + 1,42(X_4)$	$Y = 38,08 + 0,19(X_1) + 0,30(X_4)$
Trading Area	Shopping Area	$Y = 9,89 + 0,01(X_1) + 0,49(X_4)$	$Y = 4,77 + 0,45(X_1) + 0,013(X_4)$
	Workshop & Dealer	$Y = 97,02 + 0,01(X_1) + 2,99(X_2) + 1,290(X_4)$	$Y = 13,19 + 0,23(X_1) + 0,39(X_4)$
	Building Material and Furniture Store	$Y = 0,92 + 0,01(X_1) + 0,67(X_4)$	$Y = 37,96 + 0,46(X_1) + 0,14(X_4)$

	Restaurant & Food Stalls	$Y = 51,82 + 0,07(X_1) + 5,86(X_2) + 0,72(X_4)$	$Y = 1,81 + 0,31(X_1) + 0,44(X_4)$
	Electronic & Computer Store	$Y = 93,57 + 0,06 (X_1) + 2,18(X_4)$	$Y = 4,36 + 0,21(X_1) + 0,46(X_4)$
	Mall	$Y = 4224,40 + 4,32(X_1) + 1,38(X_4)$	n.a.
	Minimarket	$Y = 38,11 + 0,04(X_1) + 4,32(X_2) + 0,62(X_4)$	n.a.
Industry Area	Medium Industry	n.a.	$Y = 5,10 + 0,38 (X_3) + 1,83 (X_5)$

From the model obtained, there are different factors that affect moving attractions, both in terms of the type of land use and the location observed. For service-land-use, the factors influencing moving attraction are the building area and the number of visitors. Both variables affect the moving attraction for the model of Surabaya and the model of Malang. For model of Surabaya, the constants and coefficients variables are greater than model of Malang.

For trading-land-use, there are significant differences between the model of Surabaya and the model of Malang. For models of Surabaya, the variables influencing movement attraction are the building area, the number of visitors, and the parking area. The role of the parking area is quite significant in forming movement attractions of model of Surabaya. For model of Malang, the variables influencing moving attraction are the building area and the number of visitors. When compared between models of Surabaya and models of Malang, in the case of trading-land-use, the model of Surabaya is more dominated by the number of visitors while the model of Malang is more dominated by building areas.

For the Surabaya case study, the more prominent land-use is the existence of a mall or department store. In this case study, there is no industrial model in Surabaya because the area is dominated by the service and trade sectors. For the Malang case study, the most dominant land use is industry (Agustin & Sumantri, 2017b). In industry-land-use, variables influencing the moving attraction of model of Malang are the number of employees and number of delivery activities.

For further research, it is recommended to analyze the contribution of each land use to the overall transportation volume. With the result that the most influent land-use to the volume of vehicles on the road can be identified. Related to location selection, other variables influencing decision making process must be considered, not only transportation factors but also other influential factors, such as customer access; availability of parking space; availability of supporting facilities such as banks, terminals, sea ports, airports; the existence of competitors; and other financial aspects for investment.

D. Conclusion

It can be concluded that characteristics of land use that dominant influence on movement attraction were the number of visitors and the building area for service and trading area and the number of employees and the number of delivery activities for industry area. Model for Surabaya a little bit complex compared to Malang related to parking area. The reason for this fact was the facility and problem of transportation in Surabaya more complex compared to Malang. After knowing volume of vehicle movement caused by attraction of industrial, trading and services land use, for the next study can calculate percentage of contribution of trip of attraction of industrial, trading and services land use with the result logistics service providers can decide the best location based on the impact of land use

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on the traffic condition.

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