TRANSPORTATION SYSTEM AND LAND-USE: LEARNING FROM MAKASSAR AND LISBON CONTEXT TOWARDS SUSTAINABLE URBAN DEVELOPMENT

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Abstrak

Transportasi merupakan komponen penting dalam sistem kehidupan, sistem pemerintahan, dan sistem sosial. Transportasi dan pengembangan tata guna lahan sangat penting dalam kebijakan dan program pemerintah. Makalah ini mengidentifikasi kegiatan spasial dan transportasi yang akan dicapai dengan menggunakan metode penelitian kualitatif dan kuantitatif di kota Makassar dan kota Lisbon. Transportasi Makassar berkembang seiring dengan bertambahnya jumlah penduduk, meningkatnya kesempatan kerja, dan meningkatnya tingkat pendapatan masyarakat. Demikian juga, kota Lisbon telah menjadi kota terbesar dan terpadat di Portugal. Wilayah ini adalah rumah bagi pusat teknologi paling menonjol di negara itu dan sebagian besar perusahaan multinasional besar Portugal. Makalah tersebut mengungkapkan bahwa hubungan antara penggunaan lahan dan transportasi merupakan isu yang krusial, berbagai pola pengembangan lahan menghasilkan kebutuhan transportasi yang berbeda. Sebaliknya, struktur sistem transportasi mempengaruhi pola pengembangan lahan, hubungan saling mempengaruhi merupakan dasar untuk meramalkan kebutuhan perjalanan menggunakan 'output' model penggunaan lahan sebagai 'input', dengan asumsi bahwa penggunaan lahan yang berbeda menghasilkan tingkat aktivitas yang berbeda dan perjalanan. Ciri-ciri pergerakan spasial adalah semua karakteristik pergerakan yang berkaitan dengan aspek spasial, seperti penyebab pergerakan, dapat dikelompokkan berdasarkan tujuan perjalanannya. Biasanya tujuan perjalanan dikelompokkan menurut karakteristik dasarnya, yaitu yang berkaitan dengan ekonomi, sosial, budaya, pendidikan, dan agama.

Kata Kunci: Sistem Transportasi, Tata Guna Lahan, Pembangunan Berkelanjutan Perkotaan.

Abstract

Transportation is a significant component in the system of life, government systems, and social systems. Transportation and land use development are essential in government policies and programs. The paper identifies the spatial and transport activities that will be achieved using qualitative and quantitative research methods in Makassar city and Lisbon city. Makassar's transportation develops along with the growing population, increasing employment opportunities, and increasing community income levels. Likewise, Lisbon city has become Portugal's largest and most populous city. The region is home to the country's most prominent tech hub and most of Portugal's major multinational corporations. The paper reveals that the relationship between land use and transportation is a crucial issue, various patterns of land development produce different transportation needs. In contrast, the structure of the transportation system affects land development patterns, the interplay of relationships is the basis for forecasting travel needs using the 'output' of land-use models as 'inputs', assuming that different land uses generate different levels of activity and travel. The characteristics of spatial movement are all characteristics of movement related to spatial aspects, such as the causes of the movement, it can be grouped based on the purpose of the trip. Usually, the purpose of travel is grouped according to its basic characteristics, namely those related to economy, social, culture, education, and religion.

Keywords: Transportation System, Land-use, Urban Sustainable Development.

INTRODUCTION

Urban transportation in many developing countries is a crucial issue, and some of them are already in a critical stage. However, the problems that occur are not only caused by the limited existing transportation infrastructure but have also added to other problems. Low incomes, limited resources, especially funds, the quality and quantity of data related to transportation, the quality of human resources, rapid urbanization, low levels of discipline, and weak planning and control lead to even worse.

One of the functions of roads is to provide facilities for exchanging goods and services from and between locations of popular economic activities, which result in the movement of goods and people. Therefore, the transportation system influences the size, structure shape, and efficiency of the urban area. Transportation is a system consisting of three subsystems, namely the activity system, the movement system, and the network system. The activity system in the city consists of various activities such as industry, housing, trade, services, and others. These activities are located on a plot of land and linked to one another to form land use. This interaction results in human movement between land use.

Travel occurs because people do activities in a different place from the area where they live. This means that the linkages between spatial areas play a critical role in creating trips.

According to Tamin (2002), those travel patterns are divided into non-spatial and spatial. The concept of non-spatial (spatial) travel characteristics within the city, for example, regarding why people travel, when people travel, and the type of transport they use.

Meanwhile, the concept of the characteristics of spatial travel (with spatial boundaries) within the city is related to the spatial distribution of land uses within an area. In this case, the basic concept is a trip made to carry out a certain activity at a designated location, and the city's land use determines that location.

The increased volume and frequency of existing activities will be followed by demands for the provision of space to accommodate these new activities. As a result, jams and lengthy queues occur, and traffic volume drops dramatically. Based on the classification, the population density level in Makassar is divided into three parts: high, medium, and low. The highest density is in the Makassar District, with a population

density of 33,399 people/km2, while the lowest density is in the Biringkanaya District, with a total of 2,630 people/km2 (BPS Makassar City, 2012).

Likewise, the pattern of population distribution occurs unevenly, as happening in Makassar city accumulates generally in the city center and urban growth centers.

Based on the above situation, one of the components of the transportation system is the planning of the transportation sector nodes, either in the form of terminal facilities, bus stops, or parking, which function as movement nodes. The need for movement nodes as a form of service for public transportation modes, as well as avoiding the accumulation of movements starting from the movement nodes in the future.

Furthermore, reviewing related to the above and then reflecting on it in the context of a city in a developed country is an exciting matter for the development of this study in the future.

Widely, transportation is a significant component in the system of life, government systems, and social systems. Consequently, transportation and land use development play an essential role in government policies and programs.

Makassar, with an area of 199.3 km2 and a population of 1,526,677 people (± 17.3% of the total population of South Sulawesi), with its economic strength, this city has a strategic role and is taken into account in determining the direction of the provincial development policies. Likewise, Lisbon city, with a population of 2,884,297 people and an area of 1,376 km2, has become Portugal's largest and most populous city. Lisbon has the largest GDP (€70 billion) of any region in Portugal and is above the European average. In addition, the region is home to the most prominent tech hub in the country and the majority of Portugal's major multinational corporations.

This paper aims to analyze the characteristics of the transportation mode shift nodes in terms of spatial (land-use) and develop the concept of development of public transport mode shift nodes by reflecting the two cities.

The discussion emphasizes the development of mode transportation shift nodes with transportation systems and spatial variables. Transportation system variable with indicators of a mode of transportation, route, and time.

An indicator of spatial variables is spatial activity.

METHODS

The condition of the city center of Makassar is currently very developed with several spatial plans that have been planned but have not been able to handle in detail the movement of people and irregular public transportation with unclear points (nodes) of changing community transportation modes coupled with chaotic land use. Therefore, developing the concept of a transport mode shift node is necessary. The characteristics of the current node with the variables used by this paper are the transportation variable, including transportation mode selection, route selection, and travel time. In addition, another variable is spatial, including trip generation and road classification. The results of the analysis of both will be made the concept of the development of the transportation modes shift node of Makassar city.

Research specifies the scopes with identifying the spatial and transport activities that will be achieved using qualitative and quantitative research methods. Neuman stated the mixed method as quantitative researchers mainly follow a deductive way and qualitative researchers differently follow an inductive way (2000). So, the research conducted a mixed method to find out detailed information about the transportation system and land use related to each other. As a result, the qualitative data will help to understand the more profound activities of communities, and the quantitative data will help quantify spatial conditions' assumptions.

Data collection and analysis: Interviews be conducted with the different stakeholders and actors to collect the primary data, and observations are conducted to develop the assumed recommendation. The concern of all stakeholders like the representative of the inhabitants, community representatives, local government, and experts were taking part in the interviews. The data collected from secondary sources also support the primary data or vice versa. After the discussions, the data was analyzed quantitatively and qualitatively.

RESULTS AND DISCUSSIONS

Analysis of the Shift Nodes Model in terms of Spatial

Movement distribution (origin-destination)

The characteristics of the transport mode shift node with spatial variables can be seen from the travel pattern of the population at the node location by looking at the travel generation and attraction that occurs at the node location; the characteristics of the type of activity at the node location and the road network classification around the node. Distribution of movement occurs when people move from origin to destination using certain modes. The movement pattern in the transportation system is often described as the movement flow that proceeds from the source to the destination zone within a certain area and a certain period.

In identifying the travel pattern of the residents of Makassar city center as a movement from the original location to the destination location at the transportation mode shift node, where the original site in this paper is divided into 2 (two) location points, namely Wajo and Ujung Pandang districts and as the destination for the activity location or land use located outside the Wajo and Ujung Pandang sub-districts with various destinations within the sub-district, based on the site of the transport mode shift node and land use around the

location of the node. The origin of the trip generation comes from settlements in the downtown area, distributed in several villages in the two sub-districts.

Furthermore, from a strictly land use and transportation balance point of view in Lisbon, the node place model adequately identifies and classifies the station areas of Lisbon. It suggests that for the vast majority of station areas, the transportation supply is insufficient to match the potential demand created by the existing land uses around the stations.

Land-use, road classification by node

The movement or travel patterns can be caused by the activity or land use around the node location. Therefore, this analysis is used to determine whether there is a relationship between land use and nodes in population movements in the areas.

Each activity or land use system has certain types of activities that generate and attract movement. The distribution pattern of land use greatly influences the travel patterns of the population. Land use is closely related to the number of trip generation. Therefore, to study trip generation, one should first know the land use of the area to be studied. Land

use shows the urban activities that occupy the respective plot. The use of land in the research area is very diverse, where the research location is the center of the city with various activity functions in it.

Almost all types of land use exist in this area. Starting from trade and services, housing, educational offices, worship, health to culture, and tourism are in the research location.

Several activity centers at the location resulted in the agglomeration of land use in this area. For example, the center of Losari Beach's tourism activity affects the existing land use of the entertainment road to become the dominant trade and service with an average function of services and culinary. The use of trade and service land is the most dominant function in the research location. This function spreads over a land-use area of 70.94 ha, covering 38.50% of the land cover. There are at least three shopping centers, and it is a big attraction in this downtown area, the Makassar Trade Center (MTC), located on Jend. Ahmad Yani, the second is the Butung Wholesale Center located on Sabutung Street, Wajo District. At the same time the third is the Somba Opu

Souvenir Center which is located on Somba Opu Street.

In Lisbon, the analysis results reveal a six-categories typology of station areas based on node index, place index, and ped-shed ratio. The first group comprises 'pedestrian friendliness balanced node-places', in which there is a balance between node and place, and the walking accessibility is high. This group is designated as 'Urban TODs', as they have high multimodal accessibility conditions and present a diverse urban realm where people can walk from/to their destinations within the station area. A second group can be described as "Balanced TADs", corresponding to places revealing node-place balance but poor pedestrian accessibility.

Analysis of the Shift Nodes Model in terms of Transportation System

Selection of mode of transportation

There are various methods used by residents who are active to travel from their place of origin to their destination. Currently, the way to travel using public transportation (*pete-pete*) is mainly done by residents, and almost all residents come to the node to take pete- pete or public transportation. Judging from the percentage of the population of Makassar city who travels in the city center using

public transportation, it is crucial to plan an effective and efficient city public transportation system in order to meet the needs of the population by moving within the city center for daily activities following the development of Makassar city.

Mass transportation is significant with the proportion of 1 bus equal to 5-7 pete-pete, as well as non-motorized feeders, such as pedicabs. The transportation desired by the community is the busway, which is 44% of the population, and buses as much as 35% of the population.

Likewise, in Lisbon, and especially in the North Bank, the suburban growth was mainly structured by the train, which has led to the creation of urban "areolas" located around the stations. The car-driven suburbanization started only after the beginning of the 1990s, following significant public investments in the road network. However, the node-place model reveals the actual land use and transport conditions favouring car travel once the public transport supply is insufficient and does not take advantage of the urban development concentrated in the sites around the stations.

Selection of route

An excellent public transport route is a route where public transport users can easily use or reach the route of the transport route. To determine the ease with which public transport users can use or reach the public transport route from the place of origin and the ease of reaching their destination after getting off public transportation, an analysis is carried out in terms of the distance travelled to the public transport route.

The use of public transportation (pete-pete) is the main mode used by the majority of the population to move. So that the distribution of the movement of public transportation users is needed to obtain an overview of the demand for the movement of public transport passengers to be considered in determining the trajectory of public transport routes according to existing travel patterns.

From the results of the analysis that has been carried out, all movements that occur are mostly movements of public transport users, as is known about 76% of movements in nine locations/destination zones using public transportation. However, the land use in this zone varies widely, such as trade and service areas, housing, social, education,

and health, so there are various activities in the zone.

Public transportation services within Makassar city, on all public transport routes, make the city center the start and final destination of the trip because the downtown area is the center of activities for both offices and trade and services. The current route pattern connects the downtown zone with the suburban zone. Likewise, the node-place model in Lisbon says nothing regarding the walking accessibility conditions of each station area. However, it reveals distinct situations in terms of walkable access to the train stations. All ferryboat stations and a significant group of train stations (in the Cascais and North lines) reveal small ped-shed ratios due to the station's proximity to the Tagus River. The Sintra line (to the Northwest) has the station areas with the most significant ped-shed ratios, from which AGU-Algueirão is the highest of Lisbon, followed by the Cascais line (to the West).

Travel time

Long travel time is also influenced by the type of mode used. The type of mode most used by the population in carrying out movement is public transportation (pete-pete) and private vehicles. Based on the results of the analysis that has been carried out, it can be seen that the movement of the population in the study location >50% of the population needs a travel time of >30 minutes to move.

From this percentage, it can be concluded that the mode used by the population has not been efficient in supporting the movement of the population in Makassar city. So, it is important to plan a more effective and efficient mode to meet the population's needs by moving within the city center for daily activities following the city's development.

CONCLUSION

This part provides a conclusion and recommendation from the reviews of the relation between the transportation system and land-use. The beginning section contains conclusions and recommendations. The remaining sections recapitulate lessons-learned from the spatial system analysis as well as the ways forward in a structure that connected the flow of the paper.

The study has provided insights into the urban development related to the transportation system and land-use, reflecting Makassar and Lisbon. It has also analyzed a range of spatial conditions and activities as well as the typology.

This typology can be used as a strategic framework for urban and transportation planning of the station areas. In general terms, the typology suggests that 'Urban TODs' are already balanced node-places with good walking accessibility conditions, in which the transportation supply should not decrease. Likewise, a transportation impact assessment is suggested if new major activities or urban facilities are to be located in these places. For this category, the impact of urban and transportation measures on transit patronage and active travel can be significant.

Although this was a relatively uncomprehensive analysis study, confidence in the generalizability of the headline findings is enhanced using multiple methods, literature reviews, and collecting the data. The following conclusions can be drawn:

1. Characteristics of nodes in mode shift in terms of spatial/land-use found 10 nodes with characteristics of nodes based on their general use with mixed functions such as trade and services, settlements, offices, tours, hospitals, education, and green open space. The walking distance for land use to the node is ± 500 meters.

2. The characteristics of the transport mode shift node in terms of the public transport network system found 4 mode characters, namely:

   a) From the house by foot - node - public transportation - location of the activity

   b) From home, take an "ojek" (public motorcycle transportation) - node - public transportation - the location of the activity

   c) From the house, ride "ojek" - node - public transportation - the location of the activity

   d) From the house by foot - node - public transportation - node - public transportation - location of the activity.

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