

Model of Mass Transportation Integration to Support Green, Growing and Global Vision in Gerbangkertosusila Area

by Dadang S-8

Submission date: 08-Nov-2020 10:11AM (UTC+0700)

Submission ID: 1439276410

File name: 8. Model of Mass Transportation Integration to Support Green_compressed.pdf (102.01K)

Word count: 2295

Character count: 12556

Model of Mass Transportation Integration to Support Green, Growing, and Global Vision in Gerbangkertosusila Area

Dadang Supriyatno

Departement of Civil Engineering, Faculty of Engineering, Universitas Negeri Surabaya

Satriana Fitri Mustika Sari

Departement of Civil Engineering, Faculty of Engineering, Universitas Negeri Surabaya

Abstract

Gresik - Bangkalan - Mojokerto - Surabaya - Sidoarjo – Lamongan Region (Gerbangkertosusila) is one of the national strategic areas (KSN) of Indonesia. The center of the economic activities in the province of East Java is in this region. The high movement of people who still use road-based private vehicles makes traffic congestion on some roads in the region. The condition pushes the government to develop rail-based mass transportation, through the integration of stations with land use, to encourage the use of mass transportation more. This study aims to create a model of the development of mass transportation facilities and infrastructure, which is under the interests of the community-based Transit-Oriented Development program (TOD), to support the economic growth of the region. So, it is necessary to conduct a mass transportation analysis modelling, using a valuation factor analysis, the Hierarchy Process (AHP), then input it into a linear regression equation. The regression equation obtained is $Y = 0.37594X1 + 0.21387X2 + 0.19464X3 + 0.10964X4 + 0.06446X5 + 0.04146X6$.

Keywords— Model of Mass Transportation, Mass Transportation, Kertosusila Gate

1. Introduction

Gresik – Bangkalan – Mojokerto – Surabaya – Sidoarjo – Lamongan is one of the National Strategic Region (KSN) whose spatial planning is prioritized by the government. As the center of the economic activities in East Java, the government creates the master plan for the acceleration and expansion of Indonesia's Economic Development (MP3Ei) in Gerbangkertosusila. One of the main infrastructure development priorities is to assure the availability of adequate transportation means so that economic activities run effectively and efficiently. The phenomenon of urban housing development around Surabaya[1] triggers a high movement effect of the population mobility to suburban areas and vice versa. States that the number of vehicles operating in Surabaya is 60.48% of private cars, 22.35% of motorbikes, and 2.64% of public transportation (MPU). The Population and Civil Registry Service (2008) states that the population of Surabaya City is 2,902,507 people at night and 5 to 6 million during the daytime. The residents of suburban areas do their activities in Surabaya in the afternoon to evening and return to their homes at night.

The fact proves that the high movement of road users causes increased road loads, thus increases congestion. This condition forces the government to develop rail-based mass transportation to reduce road burdens and to improve the mobility of the community.

Some of the advantages of rail transportation compared to road transportation, based on the minister of transportation regulation No. 43/2011 concerning the National Railroad master plan, are bigger capacity, fast, safe, energy-efficient, environmental-friendly, and little use of land. Environmental issues make trains the right choice for the creation of sustainable transportation.

The fact shows that people are not interested in using rail transportation. According to the Head of East Java's Transportation and Transportation Department & LLAJ, the average number of passengers from Surabaya to Sidoarjo is 1605 people/day, and from Sidoarjo to Surabaya are 1776 people/day. It is still below the total capacity of 4200 people with three carriages and 14 trips per day. Likewise, the average number of passengers from Lamongan to Surabaya is 413 people/day that is still below the total capacity of 1200 people, with three cars and four trips per day.

The government's efforts to develop rail-based mass transit infrastructure, in the future, must be accompanied by the big push to encourage the use of public transportation. One way is through the development and implementation of the Transit-Oriented Development (TOD) program. By integrating the train station with the land use around the station, it is expected to encourage transit-based movements in the area around the train station. Also, the plan to develop a monorail network in the north-south corridor, tramways in the west-east corridor of Surabaya, bus networks, public transportation networks, urban rail corridors, and commuters (Surabaya City Planning and Development Agency, 2013) has consequences for the determination of movements directed towards transit. The expected shift of vehicle usage from private to public transportation can occur by paying attention to the characteristics of the area around the transit point (monorail stop point, tram stop, station, bus stop, and city transportation). The successful integration of the network system to the activities at that point can resolve traffic congestion. It is expected that the mass transit integration model can increase the mobility of the community and improve the economic sector of each region in Gerbangkertosusila.

2. Material and Method

2.1. Transportation System

Transportation is an effort to move or divert an object from one place to another, where it is more useful or can be helpful for specific purposes in other places [2]. The transportation process is a movement from the place where the transportation activity begins, to the destination, in which the activity ends. Transportation causes the value of goods to be higher at the destination than at the place of origin, and this value is higher than the costs incurred for transportation. The value given by the transportation is in the form of place value and a time utility. Both of these values are obtained if the goods have been transported to a place where the value is higher and can be utilized on time.

The system is a combination of several interrelated components or objects. In every system of the organization, changes in one part can cause changes in other components. A system of transportation is a unit of components that can move goods and people from the place of origin to the destination. If one of the elements does not exist, then the transportation system cannot run properly. The transportation system is explained in the form of a macro transportation system that consists of several micro transportation systems. The overall transportation system (macro) can be broken down into several smaller (micro) systems, each of which is interrelated and influences each other [3].

2.2. Transportation Integration

The national transportation system (sistranas) states that the integration of public transportation is the main target of the development of the national transportation system. It is proposed to guarantee the safety and security, regularity, smoothness, speed, ease of achievement, timeliness, convenience, order, tariff affordability, and low-level of pollution in one transportation network unit, without overloading the community, but still providing maximum and optimal service [4]. Optimal, in this case, implies that the available model of service capacity is balanced with the demand for public

travel needs to provide maximum service during busy periods, but not too many modes are unemployed during quiet times[5].

2.3. Transportation Model

Transportation problems are complex, so the need for transportation modeling to simplify the issues and facilitate a form of simplification of reality or the real world:

- 1) Physical model;
- 2) Maps and graphical diagrams;
- 3) Statistics and mathematical models (equations) that explain some aspects of the physical, socioeconomic, and transportation models, as revealed by Tamin [6] in statistical transportation modeling.

The modeling requires correct data to estimate the parameters of the model as error problems or statistical calculations often arise in the estimation. The analytical approach will facilitate transportation planning. The existence of error makes it difficult to approach reality, but, at least, it approaches the real picture. It is because the data obtained never escape errors at each stage of data collection. However, transportation modeling using a statistical approach has the ultimate characteristic as a forecasting model.

2.4. Data Collection

- a) A survey or an observation method to find out the actual condition of the location and the condition of the surrounding environment:
 1. Integration of public transportation with the train station;
 2. Supporting infrastructure.
- b) Interview method, to obtain data by direct interviews with relevant agencies or resource persons.
- c) Secondary data collection:
 1. Per capita income in each region of gerbangkertosusila.
 2. Transportation policy
 3. City functions and
 4. City size
- d) Determine the sample

2.5. The determination of the sample using the Slovin method.

$$n = \frac{N}{1 + Ne^2}$$

The population taken is passenger data on the Sidoarjo train according to the departure station.

$$n = \frac{2074}{1 + 2074 (0,05^2)}$$

$$n = 335,327 \text{ respondents}$$

The above calculation shows the number of respondents who would be used for interviews that are 335 respondents.

2.6. Data Processing Method

AHP Method

After the interview, the data is processed using the AHP method to speed up the decision making process. It is done by solving the problem in parts and arranging variables in a hierarchical arrangement. The stages of calculating the weight criteria using AHP can be seen in the picture below,

according to Saaty [7]:

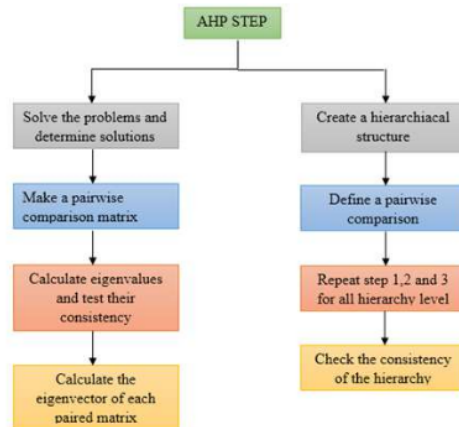


Figure 1. Step AHP

a) Results from AHP processing will then be included in linear regression:

$$Y = aX_1 + bX_2 + cX_3 + dX_4 + eX_5 + fX_6$$

3. Result and Discussion

3.1. Analytical Hierarchy Process

Recapitulation of assessment in reciprocal matrices.

Table 1. Recapitalization of matrix assessments

Matrix	Regional and community capacity	Transportation Policy	Integration	Support Infrastructure	City Function	City Size
Regional and community capacity	1.00	3.00	3.00	3.00	5.00	5.00
Transportation Policy	0.33	1.00	1.00	3.00	3.00	5.00
Integration	0.33	1.00	1.00	3.00	3.00	5.00
Support Infrastructure	0.33	0.33	0.33	1.00	0.33	0.33
City Function	0.20	0.20	0.25	0.33	1.00	3.00
City Size	0.20	0.20	0.20	0.33	0.33	1.00
Total	2.40	5.73	5.78	10.67	17.33	22.00

Test the priority vector value, to find out consistency :

Note that the consistency value is eligible because it is less than 10%, then priority vectors can be used. The next priority vector value is expressed in percentage: regional and community capacity 37.59%, transportation policy 21.39%, integration of public transportation with train station 19.46%, supporting infrastructure 10.96%, city function 6.45%, and the size of the city 4.15%

10

From the results of the processing is known that each factor value for the linear regression model is included in the linear regression equation, as follows:

$$Y = 0.37594X_1 + 0.21387X_2 + 0.19464X_3 + 0.10964X_4 + 0.06446X_5 + 0.04146X_6$$

Transportation modeling with linier regression equations.

From the results of determining the scale of values, it is known that the scale values of factors X1, X2, X3, X4, X5, and X6 affect the integration of facilities and infrastructure for each Gerbangkertosusila region.

Table 2. The result of score scale

Variabel/Regional	Regional and community capacity (X1)	Transportasi Policy (X2)	Public Transport and rail station is integrated (X3)	Support Infrastructure (X4)	City Function (X5)
Gresik	0	0	0	0	0.75
Mojokerto	0	0.25	0.75	0.25	0.75
Surabaya	0.25	0.75	1	1	1
Sidoarjo	0	0.50	0.75	0.25	0.75
Lamongan	0	0.25	0.75	0.25	0.75

After the result of score scale in Gerbangkertosusila is known, next step is calculating the score in the formula of a linear regression:

$$Y=0,37594X_1+0,21387X_2+0,19464X_3+0,10964X_4+0,06446X_5+0,04146X_6$$

Table 3. The result of the linear regression

Region	Y (Integration of Mass Transportation)
Gresik	0.07944
Mojokerto	0.30630
Surabaya	0.66587
Sidoarjo	0.46805
Lamongan	0.30630

The above processing shows that:

- a. Gresik, with the result of 0.07944, has mass transportation that is not yet integrated with facilities and infrastructure.
- b. Mojokerto, with the result of 0.30630, has mass transportation that is not yet integrated with facilities and infrastructure.
- c. Surabaya, with the results of 0.66587, has mass transportation that is ready to be integrated with facilities and infrastructure.
- d. Sidoarjo, with the results of 0.46805, has mass transportation that is not yet integrated with facilities and infrastructure.
- e. Lamongan, with the result of 0.30630, has mass transportation that is not yet integrated with facilities and infrastructure.

4. CONCLUSION

The transportation modeling, using linear regression in the Gerbangkertosusila region, shows that only the city of Surabaya has mass transportation that is ready to be integrated with facilities and infrastructure. Gresik, Mojokerto, Sidoarjo, and Lamongan regions each have mass transportation that is not yet integrated with facilities and infrastructure. It is necessary to fix and add facilities to support the integration of mass transportation that could improve the regional economy, minimize road congestion, and also support a green, growing, and global vision.

References

- [1] Lembaga Penelitian dan Pengembangan Masyarakat (LPPM-ITS). 2007. Proposal Penelitian Fenomena Urban Sprawl di Surabaya Metropolitan Area. ITS. Surabaya.
- [2] Miro, F. 2005. Perencanaan Transportasi untuk Mahasiswa, Perencana, dan Praktisi. Erlangga. Jakarta
- [3] Tamin, Ofyaz, Z. 2000. Perencanaan dan Pemodelan Transportasi. Cetakan Kedua. ITB. Bandung
- [4] Transmedia, 2012. Dinas Perhubungan Republik Indonesia
- [5] Warpani, P. Suwardjoko, 2002. Pengelolaan Lalu Lintas dan Angkutan Jalan. ITB. Bandung
- [6] Tamin, O. Z. 1997. Perencanaan dan Pemodelan Transportasi. ITB. Bandung
- [7] Saaty, T.L 1990. Decision Making The Analytical Hierarchy Process. United States of America; McGraw-Hill

Model of Mass Transportation Integration to Support Green, Growing and Global Vision in Gerbangkertosusila Area

ORIGINALITY REPORT

7%

SIMILARITY INDEX

6%

INTERNET SOURCES

3%

PUBLICATIONS

3%

STUDENT PAPERS

PRIMARY SOURCES

1	research-information.bris.ac.uk Internet Source	2%
2	Submitted to Syiah Kuala University Student Paper	1%
3	eprints.ums.ac.id Internet Source	1%
4	news.antara.co.id Internet Source	1%
5	iptek.its.ac.id Internet Source	1%
6	Submitted to Universitas Jenderal Soedirman Student Paper	1%
7	ojs.ummetro.ac.id Internet Source	1%
8	id.123dok.com Internet Source	<1%
9	Submitted to Liverpool John Moores University	

<1%

10

Yuli Sutoto Nugroho, Alexandra K Paleologoudias. "Differences Between Students from Senior High School and Vocational School in the Learning Outcomes of Electrical Engineering Students", 2020 Third International Conference on Vocational Education and Electrical Engineering (ICVEE), 2020

Publication

<1%

11

docsonline.wto.org

Internet Source

<1%

Exclude quotes Off

Exclude matches Off

Exclude bibliography Off