The Spirit of Society Journal
International Journal of Society Development and Engagement
LPPM - Universitas Narotama
ISSN : 2594 - 4777 (Online)
2597 - 4742 (Print)
https://jurnal.narotama.ac.id/index.php/scj/index

Study Of Transport Reform And Development In The Middle Of The Covid-19 Pandemic In Sidoarjo Regency

Dadang Supriyatno[1*], Sri Wiwoho Mudjanarko[2], Satriana Fitri Mustika Sari[3]
[1,3]Department of Civil Engineering Faculty Of Engineering, State University of Surabaya
[2]Department of Civil Engineering Faculty of Engineering, Narotama University Surabaya

dadangsupriyatno@unesa.ac.id

Abstract: Sidoarjo is part of the Gerbangkertosusila which is a Metropolitan area, so facilities and infrastructure are needed that are able to support the needs of the city together with the Covid-19 pandemic, it is necessary to revitalize fundamental public transport. According to a survey conducted using the AHP method, the model Y= 0.158X1 + 0.187X2 + 0.135X3 + 0.156X4 + 0.126X5 + 0.131X6 + 0.066X7 + 0.042X8. The calculation results show that the city of Sidoarjo is ready to be developed. The development carried out is to develop the existing transportation route Purabaya Terminal - Porong Terminal into road-based mass transportation, namely medium buses with a capacity of 30 passengers, which has a circulation time of 1 hour 49.25 minutes/trip, with a load factor of 77%, headway 11.55 minutes , and a fleet that requires 12 units of the fleet, as well as the temporary tariff determined according to the BOK of Rp. 8.334,-. The revitalization of existing transportation is by scraping by rerouting existing transportation to be used as feeders, rejuvenating existing transportation, selling it outside the city, and if it is not roadworthy, old iron scrap is sold using the kiloan method.

Keyword : Development, Revitalization, Public Transportation, Mass Transportation, Pandemic

INTRODUCTION

Sidoarjo Regency is part of the Gerbangkertosusila development area, with its position as part of the Surabaya Metropolitan Area, which has rapidly encouraged this area to grow and develop. The consequence of these developments is the emergence of traffic flows that demand the provision of adequate facilities and infrastructure as well as reliable transportation management, in connection with the transportation function as the main support for community activities.

The success of development is strongly influenced by the role of transportation as the lifeblood of political, economic, socio-cultural, and defense-security life. The development of the transportation sector is directed at the realization of an effective and efficient transportation system in supporting and simultaneously driving the dynamics of development, supporting the mobility of people, goods and services, supporting national distribution patterns and supporting regional development, especially East Java Province. The consequence of these developments is the emergence of traffic flows that demand the provision of adequate facilities and infrastructure as well as reliable transportation management, in connection with the transportation function as the main support for community activities.

In carrying out the journey of people and the movement of goods, the transportation used is according to the perceptions and needs of each service user, including air, sea and land.

Sidoarjo Regency, the main type of transportation infrastructure is road transportation with the main transportation node being the Purabaya type A terminal and 5 supporting C terminals, namely the prohibition terminal, Wadung Asri terminal, Sukodono terminal, Krian terminal and Taman terminal. The function of road transportation is increasingly important with the existence of an air transportation node at Juanda Airport.

During the Covid-19 pandemic there was a decrease in the number of users or users of public transportation which greatly impacted operators, where operational costs increased while the transport load factor never touched 70%, so that reform and development of transportation needs to be carried out in conjunction with the Covid-19 pandemic. Fundamental improvements to public transportation in Sidoarjo and will be completed when the Covid-19 pandemic is over.

The revitalization and development of public transportation as a means of transportation in Sidoarjo Regency is expected to be able to become the backbone of urban and inter-city passenger transportation, so that it can become one of the main drivers of the East Java economy.

LITERATURE REVIEW

Public transport

Public transportation (known as public transportation or mass transportation) is a passenger transportation service by a group travel system available for use by the general public, usually managed according to a schedule, operated on a defined route, and charged for each trip.

Public transportation modes include city buses, trams (light rail), lyn transportation, bison, and trains. Most public transport systems run along fixed routes with stopping points with prearranged schedules. public transport services can be driven by profit by usingratebased on distance or funded by government subsidies where a flat rate fare is charged to each passenger.

According to Ministerial Regulation No. 15 of 2019 Article 1 Paragraph 25 mass transportation is a service for transporting people using public motorized vehicles in urban areas using buses with mass transport capacity and equipped with special lanes.

Public transportation

According to Warpani (1990) public transportation is a paid or rented transportation system. The main purpose of public existence is to provide good and proper transportation services for the community because of its mass nature, it is necessary to have similarities between passengers among passengers with regard to origin and destination.

Public transportation is organized in an effort to meet the needs of safe, safe, comfortable, and affordable transportation. Public transportation of people and/or goods is only carried out by public motorized vehicles. Public transportation is a mode of transportation that is intended for many people, shared interests, receives shared services, has the same direction and point of interest, and is bound by predetermined route regulations and predetermined schedules. This is if they have chosen this public transportation.

Public Transport Service

Optimal service to prospective passengers, the number of available city transportation must meet the needs, but the number of existing city transportation must also be proportional to the number of users of urban transportation services so that the existence of urban transportation becomes efficient. In other words, the quantity supplied must be equal to the demand.

Transportation services for people using public transportation or public transportation are carried out using buses or passenger cars. Transportation of people by public transportation is served by:

a. Fixed and regular routes are transportation services that are carried out in a fixed and regular route network with a fixed or unscheduled schedule for people transportation services.

b. Not on the route, the transportation of people by public transportation not on the route consists of:
   - Transportation by taxi
   - Rental transportation
   - Transportation for tourism purposes

Public Transport Performance

Public transport performance is assessed based on certain quantitative and qualitative parameters regarding the characteristics of the transportation system being reviewed. These parameters can be used as the basis for calculations used in determining the number of public transportation fleets, one of which is city transportation. The standard values for public transport performance are summarized from:

a. Decree of the Director General No.687/AJ.206/DRJD/2002 concerning Technical Guidelines for the Implementation of Public Transport.

b. Ministry Regulation (PM) No. 98 of 2013 concerning Minimum Service Standards for Transportation of People by Motorized Vehicles.

As in the table below:

Tabel 1 Service Parameters

No	Parameter Value	Sat.	Value Standard		
			Less = 1	Medium = 2	Well = 3
1	Rush hour load factor	%	>100	70-100	<70
2	Load factor not busy hours	%	>100	70-100	<70
3	Travel Speed	km/hour	<5	6-10	>10
4	Headway	Minute	>15	10-15	<10
5	Travel time	Minutes/km	>12	6-12	<6
6	Service Time	O'clock	<13	13-15	15
7	Frequency	Drive/hour	<4	4-6	>6
8	Number of Operating Vehicles	%	<80	80-89	90-100
9	Waiting time	Second	>120	61-199	<60
10	Total passenger	Kend/Day	<180	180-250	>250
11	Circulation Time	Minute	>120	120-60	<60

In table 1, with three weighting criteria, namely the weight of 1 is the service at a poor level. The weight of 2 is in the medium level of service and the weight of 3 is the service with a good level.

The exact number of fleets according to the needs, it is difficult to be certain that what can be done is the number that is close to the magnitude of the need. The basics of calculating the number of fleets according to the technical guidelines of the Ministry of Transportation of the Republic of Indonesia (2002). as follows :

a. Load factor is a comparison between the capacity sold and the available capacity for one trip which is usually expressed in percent (%)

b. Vehicle capacity is the passenger load capacity of each public transport vehicle, which can be seen in the following table.

c. The basis for calculating vehicles on a type of route is determined by vehicle capacity, circulation time, vehicle stopping time at the terminal and intermediate time.

Tabel 2 Vehicle Capacity

Type of Transport	**Vehicle Capacity**			**Passenger Capacity**
	Sit down	**Stand up**	**Total**	
Passenger car	8	-	8	250-300
Small Bus	19	-	19	300-400
Medium Bus	20	10	30	500-600
Single floor Big Bus	49	30	79	1,000-1,200
Double Floor Big Bus	85	35	120	1500-1800

Notes :

- Vehicle capacity figures vary depending on vehicle seating arrangement
- 0.17m/passenger standing space

RESEARCH METHODS

The research uses relevant and valid methods in determining the results of studies related to the development of public transportation in Sidoarjo Regency

AHP method.

Analytic Hierarchy Process is a framework for making effective decisions on problems by simplifying and accelerating the decision-making process by breaking the problem into its parts, arranging variables in a hierarchical order, assigning numerical values to subjective judgments about the importance of each variable and synthesizing various considerations for assigning variables. which one has the highest priority and acts to influence the outcome of the situation. According to Saaty (1993) the hierarchy in question is defined as a representation of a complex problem in a multi-level structure, where the first level is the goal, followed by the level of factors, criteria, sub-criteria and so on down to the last level of alternatives.

Using a hierarchy, a complex problem can be broken down into groups which are then arranged into a hierarchical form so that the problem will appear more structured and systematic.

The stages of decision making with AHP are as follows:

a. Define the problem and determine the desired solution
b. Creating a hierarchical structure starting with the main goal
c. Determine paired comparison research using a hierarchical rating scale.
d. The calculation in the AHP method uses a comparison matrix (reciprocal) if Aij = a then Aji = 1/a.
e. Calculating the eigenvalues and testing for their consistency
f. Repeat steps c, d, and e for all levels of the hierarchy
g. Calculating priority vector
h. Check for hierarchical consistency, the expected consistency is less than or equal to 10%.

State Preference

By definition Stated preference means a preference statement about an alternative compared to other alternatives. Stated preference is different from Revealed Preference whose data is obtained from observations of actual behavior or behavioral reports in the past. Revealed Preference records the actual travel choice decision including indicators of all components on which the decision was made.

This method has been widely used in the field of transportation because this method can measure/estimate how people choose a mode of travel that does not yet exist or see how they react to a new regulation. This technique uses statements of preference from respondents to determine alternative designs.

Stated preference is an approach to respondents to find out their response to different situations. Each individual was asked about their response if they were faced with a given situation in actual circumstances (what was their preference for the choices offered). Most stated preferences use experimental designs to develop alternatives that are presented to respondents

This design is usually made orthogonal, meaning that the combination of attributes presented varies independently of each other. The advantage is that the effects of each response attribute are easier to identify. The main characteristics of stated preference survey techniques are:

a. *Stated preferences*based on the respondent's opinion about how they respond to several alternative hypotheses.
b. Each option is represented as a packet of different attributes such as time, cost, headway, reliability and others.
c. Researchers make alternative hypotheses in such a way that the influence of individuals on each attribute can be estimated, this is obtained by experimental design techniques (experimental design).
d. Questionnaire interview tools must provide alternative hypotheses that can be understood by respondents, neatly arranged and can make sense.
e. Respondents express their opinion on each option choice by ranking, rating and choosing their best opinion from a pair or group of statements.

f. Responses as answers given by individuals are analyzed to get a quantitative measure of the importance (relatively) of each attribute.

The ability to use stated preference lies in the freedom to make experimental designs in an effort to find wide variations for research purposes. This capability must be balanced by the need to ensure that the response is sufficiently realistic.

Regression Analysis

Regression analysis is a statistical method to study and measure statistical relationships that occur between two or more variables. In simple regression, two variables are studied, while in compound regression, more than two variables are studied. In regression analysis, a regression equation will be determined and used to describe the pattern or form of the relationship function that exists between the dependent variable (dependent variable or response variable) and is usually plotted on the vertical axis (y-axis). While the independent variable (independent variable or explanatory variable) is a variable that is assumed to have an influence on the variation of the dependent variable and is usually plotted on the flat axis (x-axis).

According to Tamin (2008), linear-regression analysis is used to study the relationship between the nature of the problem being investigated. The linear-regression analysis model can model the relationship between two or more variables. The dependent variable (Y) has a functional relationship with one or more independent variables (X1).

Binomial Logit Analysis

Binomial logit analysis is an analysis used to determine the probability of each mode. According to Dhani Yudha (2005), the binomial logit model must meet the axioms of Independent of Irrelevant Alternative (IIA)

The data collection of this research was obtained from certain sources:

a. Secondary data
   1) Population data from BPS Sidoarjo district
   2) Data on land use conditions from BPS Sidoarjo Regency
b. Primary data
   1) AHP interview observation
   2) Observation interview Stated Preference
   3) Number of Passengers Bison and Lyn JSP
   4) Transport Performance
c. Determining Sample
   1) The sample in the AHP Survey uses the Suharsimi Ari Kunto (2010) method by taking 10% of the population.

      409 of the bison passenger population

      Sample = 409 x 10% = 40.9 respondents

      So the respondents who will be surveyed in the AHP interview are 41 respondents.

   2) Determination of the sample in the Stated Preference survey using the Slovin method. (Setiawan, 2007)

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

$$n = \frac{409}{1 + 409\ (0{,}1^2)}$$

= 80.35 respondents

So the respondents who will be surveyed in stated Preference interviews are 80 respondents, which were divided into two locations, namely 40 at Purabaya Terminal and 40 at Porong Terminal.

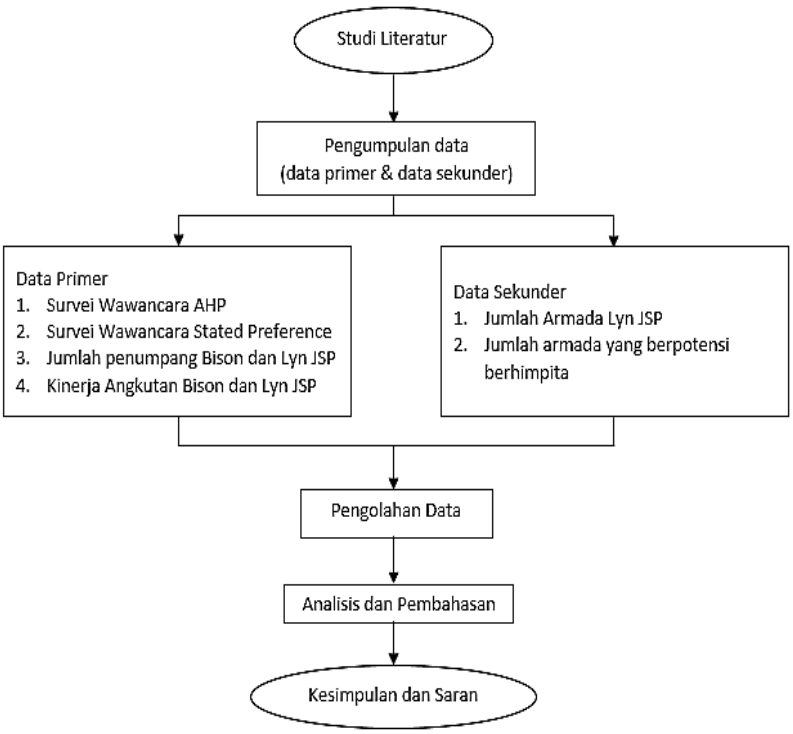

Figure 1. Research Flowchart

DISCUSSION

City Readiness For Development Through The Analytical Hierarchy Process.

Data processing uses the AHP method to speed up the decision-making process by solving the problem into its parts, arranging variables in a hierarchical arrangement. (Saaty, 1997)

*Analytical hierarchy process*used to determine the results of the weighting of each of the influential criteria in the development of public transportation that has been surveyed, interviewed 41 sources who are considered experts, then formed in a readiness model to determine readiness in the development of public transportation.

1. Recapitulation of weight assessment

Tabel 3 Value Weighted Recapitulation

	Economies of Scale and Regional Fiscal Capability	Transport Policy	Land Use	Public Transport Integration	Tickets and Travel Time	Supporting Infrastructure	City Function	City Size
Economies of Scale and Regional Fiscal Capability	1.00	1.00	0.33	1.00	3.00	1.00	2.00	5.00
Transport Policy	1.00	1.00	1.00	3.00	2.00	1.00	2.00	5.00
Land Use	3.00	1.00	1.00	0.40	0.33	1.00	1.00	3.00

	Economies of Scale and Regional Fiscal Capability	Transport Policy	Land Use	Public Transport Integration	Tickets and Travel Time	Supporting Infrastructure	City Function	City Size
Public Transport Integration	1.00	0.33	2.50	1.00	2.00	1.00	3.00	3.00
Tickets and Travel Time	0.33	0.50	3.00	0.50	1.00	1.00	2.00	3.00
Supporting Infrastructure	1.00	1.00	1.00	1.00	1.00	1.00	2.00	3.00
City Function	0.50	0.50	1.00	0.33	0.50	0.50	1.00	1.00
City Size	0.20	0.20	0.33	0.33	0.33	0.33	1.00	1.00
Amount	8.03	5.53	10,17	7.57	10,17	6.83	14.00	24.00

2. Normalize the Reciprocal Matrix to get the priority vector values

Tabel 4 Normalization

	Economies of Scale and Regional Fiscal Capability	Transport Policy	Land Use	Public Transport Integration	Tickets and Travel Time	Supporting Infrastructure	City Function	City Size
Economies of Scale and Regional Fiscal Capability	0.1245	0.1807	0.0328	0.1322	0.2951	0.1463	0.1429	0.2083
Transport Policy	0.1245	0.1807	0.0984	0.3965	0.1677	0.1463	0.1429	0.2083
Land Use	0.3734	0.1807	0.0984	0.0529	0.0328	0.1463	0.0714	0.1250
Public Transport Integration	0.1245	0.0602	0.2459	0.1322	0.1677	0.1463	0.2143	0.1250
Tickets and Travel Time	0.0415	0.0904	0.2951	0.0661	0.0984	0.1463	0.1429	0.1250
Supporting Infrastructure	0.1245	0.1807	0.0984	0.1322	0.0984	0.1463	0.1429	0.1250
City Function	0.0622	0.0904	0.0984	0.0441	0.0492	0.0732	0.0714	0.0417
City Size	0.0249	0.0361	0.0328	0.0441	0.0328	0.0488	0.0714	0.0417
Amount	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

3. Priority vector value

Tabel 5 Priority Vector

Criteria	Priority Vector
Economies of Scale and Regional Fiscal Capability	0.158
Transport Policy	0.187
Land Use	0.135
Public Transport Integration	0.156

Criteria	Priority Vector
Tickets and Travel Time	0.126
Supporting Infrastructure	0.131
City Function	0.066
City Size	0.042

4. Before the priority vector value is used, its consistency must be tested, as follows:
   a. Finding the vector value of K

$$(K) = \begin{bmatrix} 1,00 & 1,00 & 0,33 & 1,00 & 3,0 & 1,00 & 2,00 & 5,00 \\ 1,00 & 1,00 & 1,00 & 3,00 & 2,00 & 1,00 & 2,00 & 5,00 \\ 3,00 & 1,00 & 1,00 & 0,40 & 0,33 & 1,00 & 1,00 & 3,00 \\ 1,00 & 0,33 & 2,50 & 1,00 & 2,00 & 1,00 & 3,00 & 3,00 \\ 0,33 & 0,50 & 3,00 & 0,50 & 1,00 & 1,00 & 2,00 & 3,00 \\ 1,00 & 1,00 & 1,00 & 1,00 & 1,00 & 1,00 & 2,00 & 3,00 \\ 0,50 & 0,50 & 1,00 & 0,33 & 0,50 & 0,50 & 1,00 & 1,00 \\ 0,20 & 0,20 & 0,33 & 0,33 & 0,33 & 0,33 & 1,00 & 1,00 \end{bmatrix} \times \begin{Bmatrix} 0,158 \\ 0,187 \\ 0,135 \\ 0,156 \\ 0,126 \\ 0,131 \\ 0,066 \\ 0,042 \end{Bmatrix} = \begin{Bmatrix} 1,394 \\ 1,670 \\ 1,222 \\ 1,420 \\ 1,143 \\ 1,149 \\ 0,596 \\ 0,359 \end{Bmatrix}$$

   b. Finding the value of the vector Eigen Value (E)

$$(E) = \begin{Bmatrix} 1,394/0,158 \\ 1,670/0,187 \\ 1,222/0,135 \\ 1,420/0,156 \\ 1,143/0,126 \\ 1,149/0,131 \\ 0,596/0,066 \\ 0,359/0,042 \end{Bmatrix} = \begin{Bmatrix} 8,831 \\ 8,938 \\ 9,041 \\ 9,121 \\ 9,095 \\ 8,772 \\ 8,982 \\ 8,644 \end{Bmatrix}$$

   c. Look for $\lambda maks$

$$\lambda maks = \frac{8,831 + 8,938 + 9,041 + 9,121 + 9,095 + 8,772 + 8,982 + 8,644}{8} = 8,928$$

   d. Looking for consistency index

$$CI = \frac{8,928 - 8}{7} = 0,133$$

   e. Testing the consistency of priority vector values

$$CR = \frac{0,133}{1,41} = 0,094$$

0.094≤0.1 (consistent)

So based on the results of the analysis above, it is known that the consistency test of the vector value gets consistent results, then the vector value can be used. Furthermore, it is stated in a percentage, namelyEconomic Scale and Regional Fiscal Capability by 15.8%, Transport Policy by 18.7%, Land Use by 13.5%, Integration of Public Transport 15.6%, Tickets and Travel Time by 12.6%, Supporting Infrastructure 13 .1%, City Function 6.6%, and City Size 4.2%. From the results of data processing, it is then entered into the linear regression equation:

Y=0.158X1+0.187X2+0.135X3+0.156X4+0.126X5+0.131X6+0.066X7+0.042X8

Processing Of The Value Scale Of Factors X1, X2, X3, X4, X5, X6, X7, And X8 That Affect The Development Of Public Transportation

This score assessment is based on the existing conditions in the field

Tabel 6 Value Scale

Attribute	Factor	Value Scale
X1	Regional economies of scale and fiscal capacity	0
X2	Transport policy	0.75
X3	Land Use	0.75
X4	Public Transport Integration	0.75
X5	Tickets and Travel Time	0.75

Attribute	Factor	Value Scale
X6	Supporting infrastructure	0.75
X7	City function	0.75
X8	City size	0.75

The value scale in the existing condition is included in multiple linear regression to determine the readiness of public transportation development, the readiness scale is in the table below;

Tabel 7 Readiness Scale

No	Readiness Value (Y)	Information
1	< 0.50	Public transportation has not yet been developed
2	Between 0.51 – 0.61	Public transportation is not yet fully developed
3	Between 0.61 – 0.70	Public transportation is ready to be developed
4	Between 0.71 – 1.00	Public transportation is more ready to be developed
5	>1	Public transportation is very ready to be developed

Source: Ofyzar Z. Tamin

From the results of the observed value scale of existing conditions that have been known to be calculated using a linear regression equation, based on the calculation, the result is 0.632. So from the results of 0.632 Sidoarjo district is ready for the development of public transportation.

Development Of Public Transportation Lyn JSP And Bison Into Mass Transportation Transport

Performance of JSP lyn

Tabel 8 JSP transport performance

No	Parameter	Unit	Results	Weigh t
1	Load factor	%	100%	2
2	Frequency	Kend/Hour	39	3
3	Headway	Minute	1.94	3
4	Speed	Km/Hr	20-33	3

It was concluded that the JSP lyn transportation performance was categorized as good because the average weight was 3.

Bison transport performance

Tabel 9 Bison transport performance

No.	Parameter	Unit	Results	Weight
1	Load factor	%	92.86	2
2	Frequency	Kend/Hour	30	3
3	Headway	Minute	1.91	3
4	Speed	Km/Hr	30-50	3

It is concluded that the performance of Bison transportation is categorized as good because the average weight is 3.

The development of existing transportation to mass transportation must be in accordance with the conditions of the city of Sidoarjo, data on the number of passengers, determination of modes, travel time, road length, headway, circulation time per trip, prediction of vehicle speed is required.

1. Determination of vehicle type

The type of vehicle that will be used for the development of public transportation to mass transportation is a medium bus with a capacity of 30 passengers.

2. Circulation time

Circulation time with an average speed setting of 20 km per hour with a deviation of 5% of the travel time. With the formula:

CTABA = (TAB + TBA) + (σAB +σBA) + (TTA + TTB)

CTABA = (50 + 45) + (2.5 + 2.25) + (5 + 4.5)

= 109.25 minutes or 1 hour 49.25 minutes.

3. Load factor

$$LF = \frac{Number\ of\ Passegers}{Load\ Capacity} \times 100\%$$

$$LF = \frac{23}{30} \times 100\%$$

= 77%

4. Headway

$$H = \frac{60.C.Lf}{P}$$

$$H = \frac{60.30.0.77}{120}$$

= 11.55 minutes

5. fleet needs

$$K = \frac{Number\ of\ pessengers}{Load\ capacity}$$

$$K = \frac{360}{30}$$

= 12 vehicles.

6. Vehicle operating costs

The value of the BOK for medium-sized buses has its own estimated price of Rp. 8.334,-

Stated Preference Survey Results

Response to travel cost difference(∆X1).

Tabel 10 Response to cost difference

Difference in Cost of Bus – LRT (Rp)(∆*X1)*	Number of Respondents Each Rating.					Total
	1	2	3	4	5	
-0	**39**	4	13	3	26	85
-250	**39**	4	12	2	28	85
-500	**39**	4	12	2	28	85
-1,000	**44**	2	12	0	27	85
-1,500	25	2	11	0	**47**	85

Difference in Cost of Bus – LRT (Rp)(*ΔX1)*	Number of Respondents Each Rating.					Total
	1	2	3	4	5	
-2,000	24	2	11	1	**47**	85
-2,500	24	2	11	1	**47**	85
-3,000	24	2	10	1	**48**	85

Response to Travel Time difference

Tabel 11 Response to the difference in travel time

Travel Time Difference (Minutes)*(ΔX2)*	Number of Respondents Each Rating.					Total
	1	2	3	4	5	
-30	21	2	6	2	**54**	85
-27	20	2	6	5	**52**	85
-24	20	3	6	3	**53**	85
-20	22	2	6	3	**52**	85
-16	24	1	7	3	**50**	85
-12	**49**	1	7	3	25	85
-8	**46**	1	9	2	27	85
-4	**45**	1	10	2	27	85

Response to changes in departure frequency

Tabel 12 Response to frequency changes

Difference in Departure Frequency (veh/day)*(ΔX3)*	Number of Respondents Each Rating.					Total
	1	2	3	4	5	
-16	54	1	7	2	21	85
-14	54	1	7	2	21	85
-12	54	1	7	2	21	85
-10	49	5	8	2	21	85
-8	47	4	9	2	23	85
-6	44	2	11	4	24	85
-4	30	7	11	4	**33**	85
-2	28	2	10	10	**35**	85

Data Analysis Stated Preference

Data that has been obtained through a survey in the form of a qualitative scale is transformed into a probability scale form and then converted into a symmetric scale form which will later become a utility scale that corresponds to the probability scale.

Tabel 13 Symmetrical Scale

Scale	Response	Probability Scale (P)	Ln utility$\left(\frac{0,9}{1-0,9}\right)$
1	Definitely choose the bus	0.9	2.1972

2	Maybe choose the bus	0.7	0.8473
3	balanced	0.5	0.0000
4	Maybe choose LRT	0.3	-0.8473
5	Definitely choose LRT	0.1	-2.1972

After the symmetric scale is known, the next step is regression analysis to obtain utility where the symmetric scale will be the dependent variable while the independent variable is the difference between each attribute.

By using linear regression it will be obtained constants and efficient for each utility model can be suggested

$$(UB - UTV) = b0 + b1(\Delta X1) + b2(\Delta X2)\ldots\ldots\ldots + bn(\Delta Xn)$$

From the utility model obtained, the probability of mode selection will be obtained using the binomial logit. The responses from the passengers obtained were then analyzed using SPSS so that the constants and regression coefficients of each model were obtained. Then we get the utility forum which is used to find the probability of selecting the mode with the binomial logit model.

Travel Cost Attribute

In selecting the mode of transportation, the ticket price is one of the considerations for service users to determine the choice of mode to be used. Based on the regression analysis, the constant value is 2.558 and the coefficient is -0.001904. So that we get the utility equation

$$(UB - UTV) = b0 + b1(\Delta X1)$$

$$(UB - ULRT) = 2.558 - 0.01904\ X1$$

The equation for calculating the bus and LRT probabilities is as follows:

$$P_B = \frac{e^{U_B}}{e^{U_B} + e^{ULRT}} = \frac{e^{(U_B - U_{LRT})}}{1 + e^{(U_B - U_{LRT})}}$$

$$P_B = 1 - P_{LRT}$$

So that the bus probabilities and LRT probabilities are as follows:

Tabel 14 Travel Expenses Utility

No	□X1	(UB -ULRT)	PB	domestic worker
1	0	2,558	0.928	0.072
2	250	2.082	0.889	0.111
3	500	1,606	0.833	0.167
4	1000	0.654	0.658	0.342
5	1300	0.083	0.521	0.479
6	1500	-0.298	0.426	0.574
7	2000	-1,250	0.223	0.777
8	2500	-2.202	0.100	0.900
9	3000	-3,154	0.041	0.959

The interpretation and conclusion of the above model are as follows;

a. The constant in the model is 2.558, this means that if the two modes have the same ticket price, the difference in utility is 2.558. In this condition the probability of the bus is 0.928 while the probability of LRT is 0.07 so that passengers tend to choose the bus over the LRT when the ticket price is the same.

b. Coefficient□X1is -0.001904 this coefficient can be interpreted that if the bus and LRT ticket prices increase by 1 rupiah, the bus utility will increase by 0.001904, so the coefficient will result in the probability of choosing the LRT

c. The value of the coefficient of determination of 78.5% indicates that the cost of travel contributes 78.5% to the choice of travel mode.

d. When the ticket price difference is Rp. 1.300, - then the probability of choosing the bus is 0.521 while the user chooses LRT is 0.479, from these results the difference in travel costs is Rp. 1.300 the user tends to choose the bus, and vice versa if the difference is more than Rp. 1300 then users tend to choose LRT.

e. So when the maximum price of Rp. 6.300, - then the probability increases, so users tend to choose to use bus transportation to travel from Purabaya Terminal - Porong Terminal.

Travel Time Attribute

In selecting the mode of transportation, travel time is one of the considerations for service users to determine the choice of mode to be used for travel. Based on regression analysis using SPSS software, a constant value of 3.179 was obtained with a coefficient of -0.212. so that the utility equation is obtained

$$(UB - UTV) = b0 + b2(\Delta X2)$$

$$(UB - ULRT) = 3.179\text{-}0.212\ X2$$

The equation for calculating the bus and LRT probabilities is as follows:

$$P_B = \frac{e^{U_B}}{e^{U_B} + e^{ULRT}} = \frac{e^{(U_B - U_{LRT})}}{1 + e^{(U_B - U_{LRT})}}$$

$$P_B = 1 - P_{LRT}$$

So that the probability of bus and LRT is obtained as follows:

Tabel 15 Travel Time Utility

No	□X2	(UB -ULRT)	PB	domestic worker
1	30	-3.181	0.040	0.960
2	27	-2.545	0.073	0.927
3	24	-1.909	0.129	0.871
4	20	-1.061	0.257	0.743
5	16	-0.213	0.447	0.553
6	15	-0.001	0.500	0.500
7	12	0.635	0.654	0.346
8	8	1,483	0.815	0.185
9	4	2,331	0.911	0.089

The interpretation and conclusion of the above model are as follows;

a. The constant in the model is 3.179, this means that if the two modes have the same travel time, the probability of choosing a bus will increase.

b. The coefficient is -0.212, it is interpreted that if the difference between the travel time of the bus and the LRT increases by one minute, the bus utility will increase by -0.212, resulting in an increase in the probability of the bus.

c. The value of the coefficient of determination is 74.1%, indicating that the travel time contributes 74.1% to the choice of travel mode.

d. When the travel time is 15 minutes faster than the LRT, the bus utility will increase so that the probability of the bus increases. So respondents tend to choose the bus over the LRT. On the other

hand, if the travel time is 15 minutes slower than LRT, the probability of LRT increases, so respondents tend to choose LRT.

e. So when the travel time for Purabaya Terminal - Porong Terminal is 40 minutes, the probability of the bus will increase, so users tend to choose the bus for the mode of travel.

Departure Frequency Attribute

Departure frequency is one of the considerations in determining the choice of transportation mode. Based on the regression analysis using SPSS, a constant of -0.1726 and a coefficient of 0.314 were obtained, so that the following utilities were obtained;

$$(UB - UTV) = b0 + b1(\Delta X1)$$

$$(UB - UTV) = -1.726+0.314\ X3$$

The equation for calculating the bus and LRT probabilities is as follows:

$$P_B = \frac{e^{U_B}}{e^{U_B} + e^{ULRT}} = \frac{e^{(U_B - U_{LRT})}}{1 + e^{(U_B - U_{LRT})}}$$

$$P_B = 1 - P_{LRT}$$

So that the bus probabilities and LRT probabilities are as follows:

Tabel 16 Trip Frequency Utility

No	□X3	(UB -ULRT)	PB	domestic worker
1	16	3,298	0.964	0.036
2	14	2,670	0.935	0.065
3	12	2.042	0.885	0.115
4	10	1.414	0.804	0.196
5	8	0.786	0.687	0.313
7	5.5	0.001	0.500	0.500
8	4	-0.470	0.385	0.615
9	2	-1.098	0.250	0.750

The interpretation of the above model is

a. The constant in the model is -1.726, if both modes have the same frequency, then the bus probability is 0.151 while the LRT probability is 0.750. So in this condition users tend to choose LRT

b. The coefficient is 0.314 which can be interpreted if the difference in the frequency of bus and LRT departures increases by one time, the utility increases by 0.314, so that the increase in the coefficient results in an increase in the probability of the bus.

c. The coefficient of determination of 57.1% indicates that the frequency of travel departures contributes 57.1% to the choice of travel mode.

d. If the frequency of departure is 5.5 times more than LRt per day, the utility will increase and the probability of the bus will increase, and respondents tend to choose the bus. And vice versa if the bus departure frequency is less than 5.5 times per day compared to the LRT, the probability of the LRT will increase and the user will choose the LRT

e. On the condition that the frequency of bus departures is 20 times per day, the probability of the bus will rise and users will tend to choose the bus as transportation transportation from Purabaya Terminal - Porong Terminal.

Stages of the Planned Mass Transport Operation Route

According to the calculations that have been made, the fleet needs of 12 units will be procured 3 times with the distribution of routes as follows;

Revitalization of Public Transportation to Mass Transportation

The revitalization of public transportation carried out in this research is the existing public transportation which intersects with the planned mass transportation. The revitalization of this transportation refers to the performance of each transportation as shown in the table:

Tabel 17 Existing Transport Performance

No	Code Route	Route	extend Permission	Rill	Load Factor	Headway (Minute)
1	HB2	Krian – Sidoarjo – Prohibition	89	103	75%	10
2	LTP	Ps. Prohibition – Tanggulangin – Telasih – Jatilang – Pejangkung – Kedungsugo – Kedungwonokerto – Prambon	34	28	52%	8
3	mobile phone	Ps. Prohibition – Prasug – Darmasih - Sedati	-	2	-	9

The form of revitalization/reform of lyn transportation is as follows;

1. Refers to the performance of transportation if the level of service can be improved by correcting the cause of the poor service level, so that the service can be optimized
2. If the load factor is large, the transportation can be increased, but if the load factor is small, then transportation is rerouted to another route.
3. If the load factor is excessive and the headway tends to be small, it is necessary to replace a larger transport capacity.
4. Cut off the route on the main route route passed by mass transportation. So to support the beheading, sub-terminals are needed to make it easier for service users to change modes.
5. The decapitation of the existing transportation will certainly have an impact on the income of the transportation manager, so it can be done by adding routes for zones that have not been reached (blankspot).

Below is the sub-terminal layout and the beheading that will be done

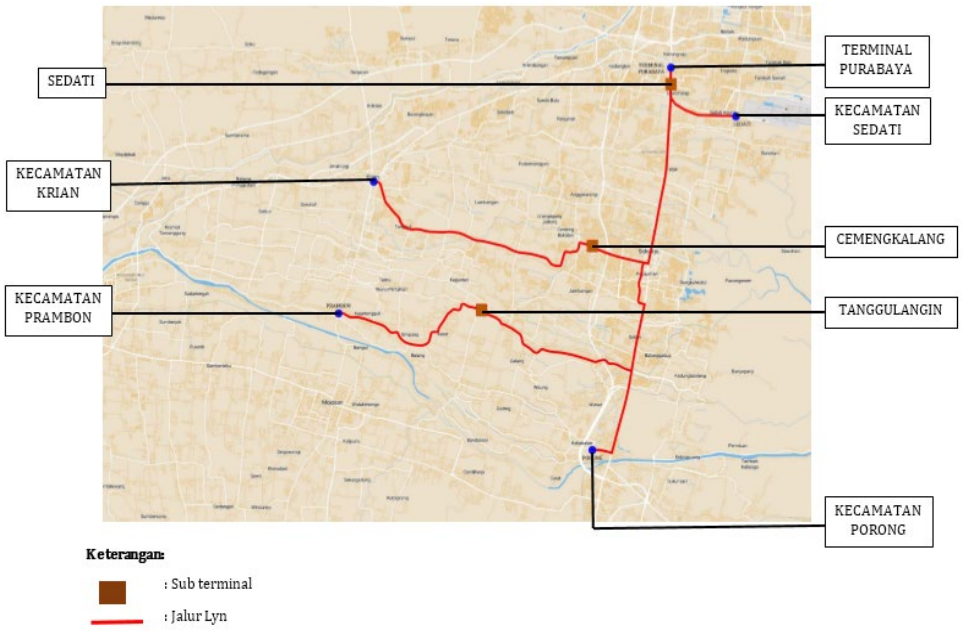

Figure 2. Lay Out Beheading Plans and Sub-Terminals on the Main Line

The lyn transportation that serves the main road as in the layout above is being revitalized;

1. Referring to the load factor and headway on the lyn HB2 route, the revitalization carried out is to replace the transportation capacity to a larger one, namely a mini van with a capacity of 17 passengers, and beheading in Cemengkalang which will then be made a sub-terminal in the beheading area,
2. Referring to the load factor and headway for the Lyn LTP route, the form of revitalization carried out is the beheading of the Tanggulangin area, which coincides with mass transportation on the main road. Then a sub-terminal will be given to the beheading area.
3. Referring to the load factor and headway on the Lyn HP route, the revitalization efforts carried out are by beheading the sedati area, and a sub-terminal will be built.

Transport Development Scenario

The development of existing transportation, namely lyn JSP and Bison, was scraped with the aim of avoiding overlapping transportation with the planned mass transportation and rejuvenating transportation that was not feasible to become mass transportation. The technical implementation of scraping is by selling JSP lyn and bison out of town or diverting to another route (rerouting) by being used as feeders and rejuvenating them, and if they are not, it is not very feasible to sell scrap metal using the kilo method.

Then the next step is to create a consortium or cooperative that aims to manage public transportation. So that transportation entrepreneurs and owners of lyn JSP and bison transportation are not harmed by this mass transportation, it is necessary to conduct socialization for fleet owners with the aim that the transportation offerings they have can be invested in medium bus mass transportation where the comparison made for lyn is 1 medium bus. : 4 vehicles lyn, meaning of perbaThe solution is that for 1 medium bus, the invested lyn is 4 lyn units, and for bison the ratio is 1 medium bus: 3 bison, then 1 medium bus means 3 bison units invested. Another thing that can be an option for transportation entrepreneurs is to be given subsidies from the government but are willing to run or operate in accordance with the terms and standards specified. And there is also another option used in the offer is to use a rental system

CONCLUSION

From the results of the discussion related to the study of transportation reform and development in the midst of the COVID-19 pandemic in Sidoarjo Regency, referring to the results of the analysis of the

performance of the Lyn JSP public transportation and Byson transportation on the route between Porong - Purabaya Surabaya terminal, it is necessary to reform public transportation towards public transportation. mass by referring to Ministerial Regulation No. 15 of 2019 Article 1 Paragraph 25 and Minister of KM 7 of 2010.

The development of public transportation is seen from the current performance of transportation, which is no longer able to serve the movement of passenger transportation in the corridor, so it is necessary to develop efforts to mass transportation.

Based on the results of the AHP analysis, Sidoarjo district is ready to develop public transportation towards mass transportation. The route being developed is the Purabaya Terminal - Porong Terminal route, which is on the main route using Medium Bus mass transportation with a capacity of 30 passengers, load factor 77%, headway 11.55%, circulation time needed 1 hour 49.25 minutes/trip, and needs bus fleet is 12 vehicles. Revitalization is carried out on existing transportation, one of which routes coincides with mass transportation on the main road, namely lyn HB2, LTP, and HP. The form of revitalization carried out is different depending on the performance conditions and the load factor of the transport. The forms of revitalization carried out are:

1. Improve service performance
2. Rerouting to another route
3. Additional transport capacity
4. Decapitation of overlapping routes is added with sub-terminals in each beheading area,
5. Adding routes to zones that have not been reached by transportation (blankspots)

RECOMMENDATION

From the results of the Development and Revitalization of other Public Transport which currently serves the West-East, East-South and North-South corridors, it is necessary to recommend it to the Sidoarjo Regency Government

1. In order to realize the plan to develop mass public transportation based on the Porong-Purabaya Corridor bus, it is necessary to provide bus stop infrastructure facilities at the gathering points for passenger movements.
2. In the medium and long term, in an effort to realize modern mass transportation, the Sidoarjo Regency Government needs to synergize with spatial planning related to modern transportation traces (LRT and mono rail).
3. To support the revitalization plan for other lyn public transportation, which is in the category of route cuts, the Government needs to provide sub-terminal infrastructure, so that the performance of mass public transportation in the Porong-Purabaya Corridor-Terminal is not compromised. Regarding the route cut, the routes served will remain the same or add routes to areas that have not been served by public transportation. (needs further study related blankspot).
4. *Scraping*existing public transportation that has the potential to coincide with mass transportation, and reduce existing public transportation that is no longer feasible to operate. The actions taken were by rerouting routes, selling them out of town, rejuvenating them, and selling scrap metal using the kilo method.
5. Establishment of a consortium or cooperative that serves as the manager of mass transportation.

REFERENCES

Arikunto, S. 2010. Research Procedures A Practical Approach. Jakarta; Rineka Cipta

Decree of the Director General No.687/AJ.206/DRJD/2002 concerning Technical Guidelines for the Implementation of Public Transport in Fixed and Regular Routes.

Ministerial Regulation No. 98 of 2013 concerning Minimum Service Standards for Transportation of People by Motorized Vehicles.

Setiawan, N. (2007). Determination of sample size using the slovin data table krejecte-morgan formula to study the concept and its application. Bandung; UNPAD

Saaty, TL (1990). Decision Making The Analytical Hierarchy Process. United States of America; McGraw-Hill

Warpani, Suwardjoko, 1990. Planning a Transportation System. Bandung ; ITB