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## The Concept of Mass Transportation Development at Service Centers in the Suburban Region of Kendari City

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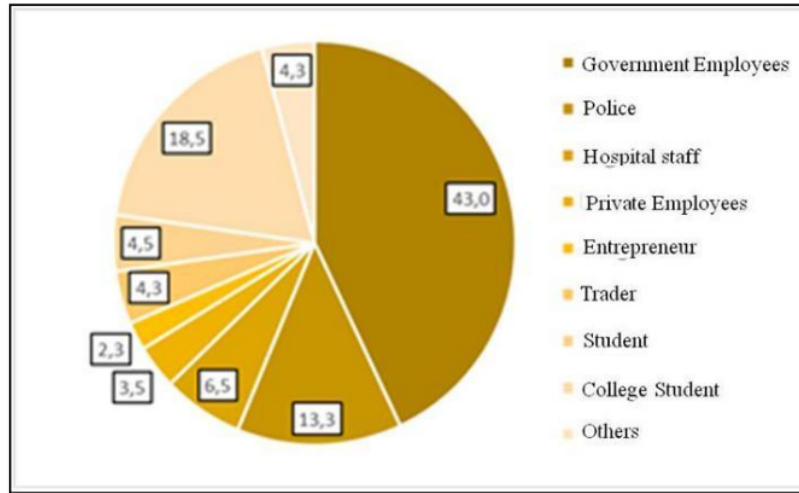
**Abstract:** Public transportation systems in cities function to connect every point of activity, as well as help accessibility for residents who still use public transportation or residents who do not have private vehicles. This study aims to analyze public transportation planning in sub-urban areas in Kendari, which is the center of education, health, and office activities. The results of this study indicate that public transportation service lines in Kendari City have not fully served service centers in the suburban areas of Kendari City, especially in Kambu District, Poasia District, and Baruga District. The road development in the city of Kendari is the Center of Settlement-Service Center A (health center, offices, trade and settlement), the Center of Settlement-Service Center B, Center of Settlement-Service Center C (Center of health, trade and services, settlement), Center Settlement-Service Center C (Health, trade and service center, settlement and Settlement Center-Service Center D (Education Center), with the addition of the First Bus Stop in Kambu District, precisely at the meeting of Malacca Street and Martandu Street. The Second Bus Stop in Kadia District, precisely at the meeting of Brigjend Madjied Joenoes and Laode Hadi Street.

**Keywords:** Public transportation lanes, Service centers, sub urban, movement patterns

### I. INTRODUCTION

At present Kendari City has a dominant public transportation route serving various service centers within the city. While the development of service centers continues into sub-urban areas, especially in Kambu, Poasia and Baruga districts. This causes some of the new service centers in sub-urban areas to be unreachable by public transportation routes and become an obstacle for people who do not have private vehicles.

Kendari City is a developing city with a high level of activity and a growing population, service centers such as hospitals, government offices, industries and settlements that were initially located in the city center began to be moved to the suburbs. This relates to the urban theory known as the urban sprawl theory (Rosul, 2008). The movement of people in the city of Kendari is carried out by various groups ranging from Civil Servants to port workers with the highest percentage of Civil Servants namely 172 respondents or 43% as in Figure 1.



**Figure 1. Number of Respondents by Occupation**

To create an integrated and interconnected service center, it is necessary to conduct research and also planning of Public Transportation Routes based on the Regional Spatial Planning Activity Center, especially in Kambu, Poasia and Baruga sub-districts which are in accordance with government standards and regulations.

## II. RESEARCH METHODS

This type of research can be classified in descriptive research and the location of this study is in the sub-urban area of Kendari City, namely Kambu District, Poasia District, and Baruga District. The population of this study is the number of residents living in the Subdistricts of Kambu, Poasia and Baruga, Kendari City with a population of 91,388 people (Kendari City in Figures 2018). The sample is taken with the Slovin formula:

$$n = \frac{N}{1+(N.e^2)} \quad (1)$$

Where;

n = Number of Samples

N = Total Population

E = Standard error used (0.05 or 5%)

Based on the slovin formula mentioned earlier we get the following sample calculation:

$$n = \frac{91.388 \text{ People}}{(1+(91.388 \text{ People} \times 0,05^2))} \quad (2)$$

n = 398,25 rounded to  
= 400

## III. RESULT AND DISCUSSION

### Existing Kendari City Roads and Community Movement Patterns with the Mode of Transportation Used

Overall road classification in Kendari City consists of arterial roads, collector roads, and local roads, see in Table 1.

**Table 2. Kendari City Road Classification**

Road Classification	Length of the Road (km)
Arterial Road	71,41
Road Collector	136,53
Local Road	1198,9
<b>Total</b>	<b>1406,84</b>

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Kendari City is served by 4 public transportation lines in cities and sub-urban areas, namely:

1. Lane A; HEA Mokodompit Street-M.T.Haryono Street - Ahmad Yani Street - Drs. H. Abdullah Silondae Street - Dr. Sam Ratulangi Street - Major S. Parman Street - Maeyjen. Sutoyo Street - Sultan Hasanuddin Street - Diponegoro Street - Dr. Moh. Hatta Street - Ir. Sukarno Street - Wr. Soepratman Street – Kongoas Street.
2. Lane B; Jend. AH. Nasution Street - Bunggasi Street - Anoa Street - Badak Street - Panglima Polim Street – Tourism Street.
3. Lane C; Ahmad Yani Street - DI Panjaitan Street - Jenderal Ahmad Yani Street (Poros Haluoleo Airport Street) - Captain Piere Tendean Street (Poros Haluoleo Airport Street).
4. Lane D; Raden Soeprapto Street –Pattimura Street –Prof. M. Yamin Street

Modes of transportation in the sub-urban area of Kendari are still dominated by private vehicles with a percentage of motorcycle users 210 respondents or 52.5%, cars as many as 138 respondents, or 34.5%, as in Figure 2.

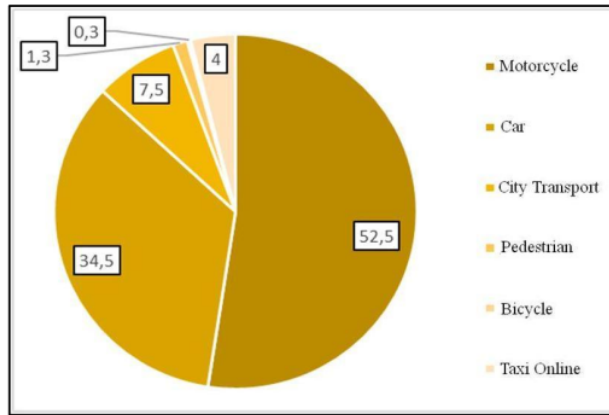


Figure 2. Percentage of Respondents Based on the Mode of Transportation Used

The distance from each service center in each district through public transportation can be seen in Table 2.

Table 2. Mileage Using Public Transportation Lines to the Sub-Urban Service Center in Kendari

Districts	Kambu		Poasia		Baruga					
	Education		Office		Health					
	Afford-able	Un-reach-able	Afford-able	Un-reach-able	Afford-able	Un-reach-able				
	km	km	km	km	km	km				
Abeli	4,9	4,7	2	6	2	7	2	7	12,6	4,7
Baruga	10,1	0	10,7	1,3	10,7	2,3	10,7	2,3	-	-
Kadia	5,8	0	5,8	1,3	5,8	2,3	5,8	2,3	8,5	0
Kambu	-	-	-	-	-	-	2	2,3	8,9	0
Kendari	14,1	0	14,7	1,3	14,7	2,3	14,7	2,3	17,7	0
Kendari Barat	8,2	0	8,8	1,3	8,8	2,3	8,8	2,3	11,8	0
Mandongga	6,6	0	7,2	1,3	7,2	2,3	7,2	2,3	10,3	0
Nambo	4,9	8,9	2	10,2	2	11,2	2	11,2	12,6	8,9
Poasia	3	0	0	1,3	0	2,3	-	-	10,7	0
Puuwatu	12,9	0	13,5	1,3	13,5	2,3	13,5	2,3	15,5	0
Wua-wua	5,5	0	6	1,3	6	2,3	6	2,3	4,9	0

Table 2 shows Kendari District having the farthest access distance to education, health and office facilities located in Kambu District, with a total distance of 14.1 Km for educational facilities, 16 km for city-level health facilities, and 17 km for regional office areas.

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Meanwhile, to see the travel time from each district to the service center can be seen in Table 3.

**Table 3. Travel time to the Sub-Urban Service Center in Kendari**

Districts	Kambu		Poasia		Baruga
	Education	Health	Office	Office	Health
Minute					
Abeli	19	15	18	15	34
Baruga	22	25	28	26	-
Kadia	13	18	27	18	18
Kambu	-	-	-	7	19
<b>Kendari</b>	<b>37</b>	<b>40</b>	<b>44</b>	<b>42</b>	42
Kendari Barat	23	26	29	29	27
Mandongga	20	24	26	25	24
<b>Nambo</b>	26	23	25	24	<b>43</b>
Poasia	7	4	6	-	24
Puuwatu	31	34	38	18	37
Wua-wua	13	17	19	21	8

The longest travel time to get to the service center in Kambu District is Kendari District, with an average travel time of 35 to 45 minutes. While the service center located in Poasia District which has the longest travel time is Kendari District with a time of around 40 to 45 minutes. While in Baruga District there are provincial-level health service facility centers, Kendari and Nambo Districts have the longest travel time, which is around 40 to 45.

The movement pattern is divided into 2, namely on weekends and weekdays. The total movement on holidays can be seen in Table 4.

**Table 4. Movements in Suburban District on Holidays**

Districts	Holiday Movement							
	Kambu		Poasia		Baruga		Total	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Abeli	8	5,4	8	5,8	1	1,0	17	4,4
Baruga	6	4,0	8	5,8	39	37,9	53	13,6
Kadia	31	20,8	17	12,3	26	25,2	74	19,0
Kambu	40	26,8	30	21,7	0	0,0	70	17,9
Kendari	3	2,0	2	1,4	1	1,0	6	1,5
Kendari Barat	5	3,4	9	6,5	2	1,9	16	4,1
Mandongga	23	15,4	15	10,9	23	22,3	61	15,6
Nambo	3	2,0	1	0,7	1	1,0	5	1,3
Poasia	15	10,1	41	29,7	0	0,0	56	14,4
Puuwatu	7	4,7	1	0,7	10	9,7	18	4,6
Wua-wua	8	5,4	6	4,3	0	0,0	14	3,6
<b>Total</b>	<b>149</b>	<b>100</b>	<b>138</b>	<b>100</b>	<b>103</b>	<b>100</b>	<b>390</b>	<b>100</b>

In Table 4, the largest movements towards service centers in sub-urban areas are from Kadia District, Mandonga District, and Interzone movement in suburban sub-urban areas, including Kambu, Poasia, and Baruga District.

To see patterns of community movement on weekdays, see Table 5.

**Table 5. Movements in the Sub-Urban District on Weekdays**

Districts	Workday Movements							
	Kambu		Poasia		Baruga		Total	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Abeli	4	2,7	6	4,3	2	1,9	12	3,1

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	6	4,1	5	3,6	23	21,7	34	8,7
<b>Baruga</b>	6	4,1	5	3,6	23	21,7	34	8,7
<b>Kadia</b>	31	21,1	22	15,7	25	23,6	78	19,8
<b>Kambu</b>	34	23,1	29	20,7	8	7,5	71	18,1
Kendari	4	2,7	0	0,0	3	2,8	7	1,8
Kendari Barat	7	4,8	8	5,7	6	5,7	21	5,3
<b>Mandongga</b>	22	15,0	24	17,1	21	19,8	67	17,0
Nambo	3	2,0	2	1,4	2	1,9	7	1,8
<b>Poasia</b>	17	11,6	35	25,0	8	7,5	60	15,3
Puuwatu	9	6,1	2	1,4	6	5,7	17	4,3
Wua-wua	10	6,8	7	5,0	2	1,9	19	4,8
<b>Total</b>	<b>147</b>	<b>100</b>	<b>140</b>	<b>100</b>	<b>106</b>	<b>100</b>	<b>393</b>	<b>100</b>

The pattern of movement of the people of Kendari City on weekdays in Kambu, Poasia, and Baruga Districts is quite dense. Total movements in the three Districts reached 393 movements originating from various sub-districts in Kendari City.

**The Concept of Development of Mass Transportation Lines in the Sub-Urban Regional Service Center that is adjusted to the regulations**

The service center points and the shortest route using Network Analyst with the help of the ArcGIS application at the service center in the sub-urban region of Kendari are;

a. Settlement Center - Service Center A (Health, office, trade and settlement center) with the shortest lane is Drs. H. Abdullah Silondae Street (Settlement Center) - Tebaununggu Street - Tebaununggu II Street - Lr. Morini - Made Sabara Street - Buburanda Street - Z.A. Sugianto Street - Malacca Street.

**Table 6. Comparison of Distance and Time of Settlement Centers - Service Centers A**

Public Transportation Lanes		Shortest Path	
Mileage	Traveling time	Mileage	Traveling time
km	Minutes	km	Minutes
7,1	18-20	3,5	6-9

It is not in accordance with. Morini Street is a local road. The solution is to replace the Lorong Morini road with the following path: Drs. H. Abdullah Silondae Street (Settlement Center) - Tebaununggu Street - Tebaununggu II Street - H. Supu Yusuf Street - Made Sabara Street - Buburanda Street - Z.A. Sugianto Street - Malacca Street.

b. Settlement Center - Service Center B (Regional office and settlement center), with the following road section being Drs. H. Abdullah Silondae Street (Settlement Center) - Tebaununggu Street - Tebaununggu II Street - Lr. Morini - Made Sabara Street - Buburanda Street - Z.A. Sugianto Street - Malacca Street - Martandu Street - Haluoleo Street.

**Table 8. Comparison of Distance and Time of Settlement Centers - Service Centers B**

Public Transportation Lanes		Shortest Path	
Mileage	Traveling time	Mileage	Traveling time
km	Minutes	km	Minutes
9,5	26-30	7,2	11-15

This is appropriate, but it needs to stop or stop while moving from mass transit to public transportation using this route is Drs. H. Abdullah Silondae Street (Settlement Center) - Tebaununggu Street - Tebaununggu II Street - H. Supu Yusuf Street - Made Sabara Street - Buburanda Street - Z.A. Sugianto Street - Malacca Street (Service Center A) - (Passenger transit stop) - Martandu Street - Haluoleo Street (Service Center).

c. Settlement Center - Service Center C (Health, trade and services center, settlement), with roads: Drs. H. Abdullah Silondae Street (Settlement Center) - Abunawas Street - Made Sabara Street - Laode Hadi Street - Brigjend Madjied Joenoes Street - Jend. Ahman Yani Street - Captain Piere Tendean Street.

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**Table 9. Comparison of Distance and Time of Settlement Centers - Service Centers C**

Public Transportation Lanes		Shortest Path	
Mileage	Traveling time	Mileage	Traveling time
km	Minutes	km	Minutes
9-10	18-24	8,9	14

This is appropriate, but the need for additional stops is needed because in the transportation lane plan there are also intersecting roads. The route should be Drs. H. Abdullah Silondae Street (Settlement Center) - Abunawas Street - Made Sabara Street - Laode Hadi Street - (Passenger transit stop) - Brigjend Madjied Joenoes Street - Jend. Ahman Yani Street - Captain Piere Tendean Street.

d. Settlement Center - Service Center D (Education Center), with the route: Drs. H. Abdullah Silondae Street (Settlement Center) - Abunawas Street - Made Sabara Street - Brigjend Madjied Joenoes Street - M.T. Haryono Street - HEA Mokodompit Street (Service Center D).

**Table 10. Comparison of Distance and travel time of Settlement Centers-Service Centers D**

Public Transportation Lanes		Shortest Path	
Mileage	Traveling time	Mileage	Traveling time
km	Minutes	km	Minutes
6,6	20	5,5	9-13

Table 10 shows it is not suitable because there are also roads that are simultaneously used by existing public transport, namely the M.T. Haryono and HEA Mokodompit Street. Therefore, the road lane solution is Drs. H. Abdullah Silondae Street (Settlement Center) - Abunawas Street - Made Sabara Street - Laode Hadi Street - Passenger transit stop (Switching modes of public transport) - M.T. Haryono Street - HEA Mokodompit Street.

From the results of the analysis a bus stop point will be built because there are mass transit route plans that intersect with the existing public transport lines. The stop point is at: a) The First Bus Stop in Kambu District, precisely at the meeting Malacca Street and Martandu Street, and b) The second Bus Stop in Kadia District, precisely at the meeting Brigadier Madjied Joenoes Street and Laode Hadi Street.

## **IV. CONCLUSION AND RECOMMENDATIONS**

### **Conclusion**

Public transportation service lines in Kendari City have not fully served service centers in the sub-urban areas of Kendari City, especially in Kambu District, Poasia District, and Baruga District. The pattern of movement of the people of Kendari City towards service centers in sub-urban areas (Kambu Subdistrict, Poasia Subdistrict, and Baruga Subdistrict) predominantly originated from the central area of Kendari City, namely Kadia Subdistrict and Mandonga Subdistrict and the sub-urban itself, namely Kambu and Poasia Districts. Roads used for the concept of developing mass transit lanes in the sub-urban service center of Kendari City must use the classification of arterial roads and collector roads, avoiding mass transit lines not coinciding with existing public transport lanes.

### **Recommendations**

The concept of developing mass transit lines should be implemented immediately, bearing in mind the growing and increasing population in Kendari City, causing the existing public transport service path conditions to be unable to service the existing service centers. The concept of developing mass transit lines needs to be done so that the people of Kendari City are accustomed to using public transportation rather than private vehicles. This was done because the condition of the road in the city of Kendari especially at several service points began to occur in vehicle congestion

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