The integration level of public transportation in Makassar City

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Abstract. Multimodal transportation is transportation modes that can combine one with the other modes properly, efficiently and effectively so that people can move from one type of transportation to another modes with fast, cheap and convenient. The integration of transport services and infrastructure network is not fully realized, among others, can be seen from the public transport service between modes, one with the other modes, which makes people have to travel by other modes and is not served by public transport canal. Furthermore, intramoda displacement can not be done easily and quickly, some things that makes people tend to prefer private rather than public transport vehicles in doing movement. The main objective of this study was to determine the level of integration of modes of land transportation in the city of Makassar. By using analysis of physical alignment, non-physical, and analysis of travel time, which is then summarized into a canvas ratings to get an idea of the level of integration in general. The results showed that the level of integration of modes consist of two criteria with a very low value, 4 criteria with low and medium value, two criteria with a high value, as well as one criterion with very high value. Meanwhile, the variable of integration that influence people's preferences in order from the highest value is the number of the fleet, the availability of routes, the number of passengers compared with the load factor, the location where the stopping points up and down, and the last is the location of the terminal with the place up and down the number of the fleet, availability of service, number of passengers, the location of the terminal to place up and down the passenger, as well as the location where the up and down passengers on the origin and destination. Some of the variables that have a low and very low value, is a variable that should receive greater attention from the municipality, so the concept of the integration of transport modes could be reached, and indirectly will make the public are encouraged to use public transport.

1. Introduction

The problems that were encountered in major cities of the world, including the city of Makassar is the problem of transport. In general, problems arise when the mode is selected communities are private vehicles. The problem is increasing, while the growth of private vehicles is not balanced with increasing length of the road. Policy maker, began switching to suppress the use of private vehicles and improving public transport facilities and infrastructure. Way through the intermodal transport systems and integrated public transport system (multimodal). That is, various modes can were combined properly, efficiently and effectively so that people can move from one type of transportation to another carrier with fast, cheap and convenient.

The integration of transport services and infrastructure network is not fully realized, among others, can be seen from the public transport service between modes, one with the other modes, which causes people to have to travel by other modes and can not be served by transit the canal. In addition, the displacement intramoda can not be done easily and quickly, Likewise, the integration of network infrastructure, such as terminals, ports, airports and setting a schedule that is not satisfactory.

The integration of transport modes can be viewed from two aspects, is the integration of physical and non-physical alignment. The integration of this physical form of the integration of facilities and infrastructure, while the integration of non-physical form of the integration time, information systems, services, and ticketing. (Mulyono, Agus T. 2012). Acceleration handling in Makassar transport problems by providing for public mass transit. Integrated public transport can be a solution, (Irwan, Forum Diskusi Publik Sektor Transportasi "Percepatan Pembangunan Transpotasi Angkutan Umum di Makassar).

Network of intermodal transportation services / multimodal realized through the integration of each route / traffic / transport service road, rail, river and lake crossings, sea and air, with attention to excellence and the concept of combining modes between the main modes, feeder mode and advanced mode. And based on the suitability of the technology and the characteristics of the service area, and cross-level transport which consist Tatranas, Tatrawil and Tatralok.

Some of the problems regarding the use of public transport as well as the integration of the network is:

- The people of Makassar preferred mode of private vehicles instead of public transport in conducting the movement (RTRW Kota Makassar 2005-2025)
- System Development of intermodal transport in Makassar yet well integrated
- The number of public transport passengers who are not proportional to the number and type of public transport available in the city of Makassar

2. Methods

This research uses descriptive analysis method using several analytical tools. The level of integration is obtained based on an assessment using assessment canvas, as the overall conclusions. The assessment criteria used is to use the physical integration of variables such as facilities and infrastructure, as well as the integration of non-physical form of the travel time. The analysis used to determine the level of integration among others are the main modes and modal analysis feeders, transport performance analysis (headway and loadfactor), connectivity index, the scale stops and terminal services, and the travel time index

This study uses a mode of transport as the unit of analysis, which in Makassar City alone there are miraculous mode of transportation. The modes include public transport, namely city transport and BRT, as well as other transport tricycles, taxi, motorcycle and pedestrian paths.

3. Results

The length of roads in the city of Makassar in 2009 throughout 1593.46 kilometers; Compared to 2008, road length has not changed. In 2009, for better road conditions increased 32.82% compared to 2009. Severely damaged down 45.74% from 2008. Public transport is located in Makassar include public transit (usually called pete-pete), Bus Rapid transit (BRT) Trans Mamminasata, as well as motorcycles, tricycles and motor tricycles. City Transport contained in Makassar consists of 15 stretch in the outskirts of town and one stretch. As for the Bus Rapid Transit (BRT) Transmamminasata is a metropolitan area buses that serve Mamminasata. Mamminasata an abbreviation of Makassar, Maros, Sungguminasa, and Takalar. Maros, Sungguminasa, and Takalr a district located around the city of Makassar.

In masterplan, this BRT corridor will have 11 buses with a capacity of 33 people. BRT uses a mix lines, yaiut mixed with other vehicles, but for setting up and down passengers were required off at the stop that has been provided. For existing conditions, BRT Transmamminasata which has been operating as many as 1 corridor, namely corridor II (GTC Mall - Mall Panakkukang) 11 units bis.

Makassar City has two terminals, namely the Regional Power Terminal northern part of the city, as well as Terminal Mallengkeri in the south. Another terminal is located in the Makassar Mall, but the terminal is just a place up and down the ordinary passengers, and no buildings. Regional Power Station

is the terminal with type A, as well as terminal mallengkeri who have type B. Regional Power Terminal 3 is traversed by city transportation route (route D, G, W), while for Terminal Mallengkeri traversed by four designated route (route B, B1, F, and F1). Also there are 27 stops, spread over 11 streets..

3.1 The physical integration (infrastructure)
Physical The primary survey results show that the type of Moda contained in Makassar, consists of a Bus Rapid Transit (BRT), Public Transportation, tricycles and motor tricycles, motorcycles, as well as pedestrian paths. The fifth mode will be classified according to the type of use, route determination, the determination of the schedule, determination of tariffs, the area of operation, density service areas, service configuration, the right of priority roads, as well as the travel route. Based on this analysis, it can be concluded that the mode of the main mode is the mode BRT and urban transport, while the rest tricycles / motor tricycles, motorcycles, as well as pedestrian / sidewalk a feeder mode. Analysis of the main modes and feeder modes are described in Table 2.

Shown in Table 1 below, note that 12.59% of people using the 3 modes in one trip, namely public transportation, walking, and pedicabs / rickshaws motors. Meanwhile, sisasnya using two modes of public transportation or a mix between BRT and walk, rickshaw / bentor, motorcycles, as well as private vehicles. People who use public transportation with two different routes that are as many as 20 passengers. Based on the concept, the more selection modes and more modes are used, then the condition is already integrated mode. The average usage mode is as much as 2.38 with the use of at least 1 mode and up to 4 modes.

Table 1. Main and Feeder Mode in Makassar

Feeder	Main	
	City Transport	BRT
Walk/Pedestrian	88	0
Pedicab	18	0
Motorcycle Taxi	7	0
Private Vehicle	4	0
Walk/Pedestrian and Pedicab	17	1
Total	134	1

3.2 Index of Connectivity
Value connectivity or public transportation route network complexity and BRT in Makassar City is 1.36 for the beta value, gamaa value of 0.46, and an alpha value of 0.18 with the average value of the index is 0.67. The greater the value of this index, the network will get better service.

Table 2. Road Connectivity Index in Makassar

Region	Node	Internode	Beta	Gamma	Alpha
Biringkanaya	11	12	1,09	0,44	0,12
Bontoala	21	36	1,71	0,63	0,43
Makassar	10	19	1,90	0,79	0,67
Mamajang	9	13	1,44	0,62	0,38
Manggala	13	16	1,23	0,48	0,19
Mariso	7	7	1,00	0,47	0,11
Panakkukang	23	30	1,30	0,48	0,20
Rappocini	13	19	1,46	0,58	0,33
Tallo	16	22	1,38	0,52	0,26
Tamalannrea	11	12	1,09	0,44	0,12

Region	Node	Internode	Beta	Gamma	Alpha
Tamalate	16	20	1,25	0,48	0,19
Ujung Pandang	25	30	1,20	0,43	0,13
Ujung Tanah	4	4	1,00	0,67	0,33
Wajo	25	37	1,48	0,54	0,29
Total	204	277	1,36	0,46	0,18

3.3 Travel Time Index

The average total time spent by passengers using public transport was 41 minutes, compared with a total time of use of private vehicles is 27 minutes, meaning there is a time difference of about 14 minutes between the use of private vehicles and public. But, when are compared only time in public transport and private vehicles, public transport passenger menghabuskan a time of 26 minutes, whereas for private vehicles menghabuskan 21 minutes. This means that the difference between the total time is more influenced as the use of public transport, people will use a lot of time because there is extra time to walk to the shuttles, waiting, and walk to the destination. Table 3 below describes the condition of an average travel time of passengers

Table 3. Comparison of average travel time of passengers

Public Transport (PT)						Private Vehicle			
To PT	Waiting	Transfer	In Vehicle	To Destination	Total	In Vehicle	Parking	To Destination	Total
4.61	3.30	2.31	26.04	4.89	41.16	21.19	3.49	2.99	27.67

3.4 Level of Integration

The level of integration of land transport modes Makassar City based on 13 criteria (Figure 1), there are two categories that have a very low value, is the number of passengers up and down the terminal and passenger waiting time index (PWI). Moreover, there are four criteria that are at a low value, ie the number of modes, the index alpha route, the number of the route which passes through the terminal, and the ratio OVTT / IVTT. For that is in the medium category, there are also four criteria: the number of modes used, the index alpha, gamma index, as well as the number of passengers up and down at the stop. As for the rest, two criteria are at high criteria, namely the ratio of travel time (RWP) and Running Index, as well as one criterion on the value is as high as the number of passengers.
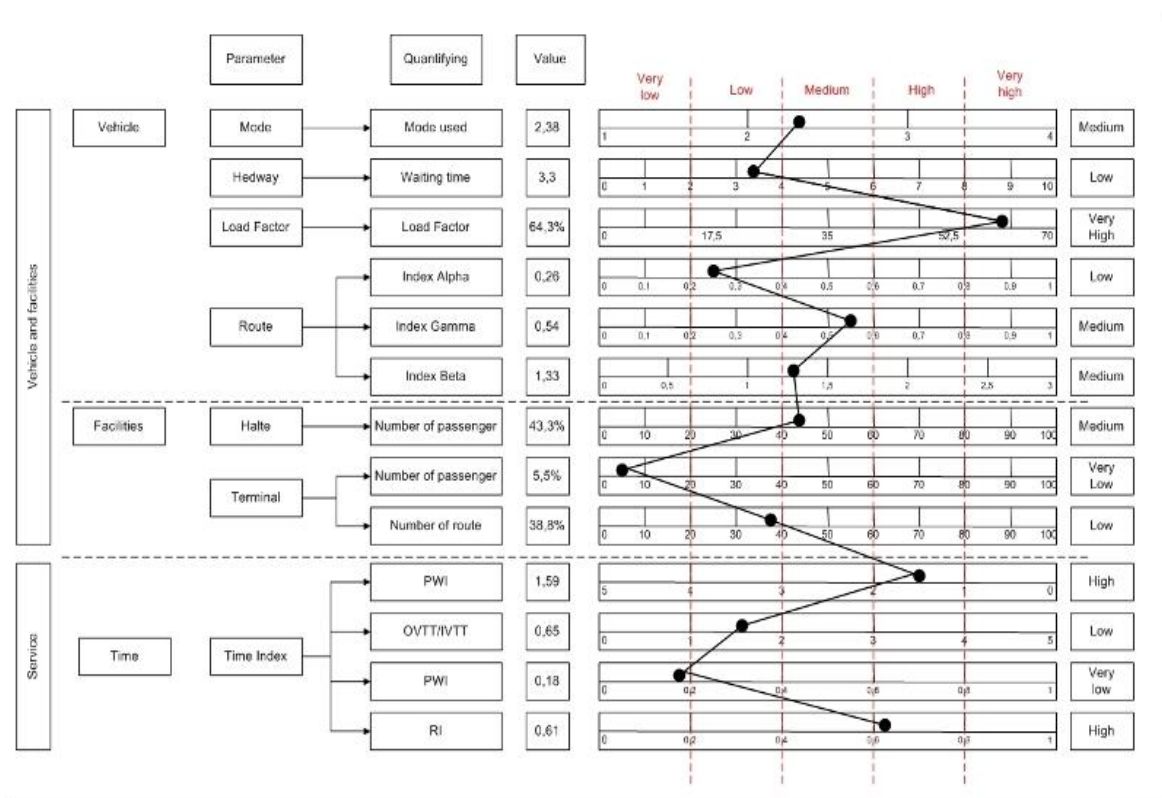
Figure 1. Integration Mode Level in Makassar

4. Conclusions

The level of integration of transport modes Makassar City based on 13 criteria, there are two categories that have a very low value, ie the number of passengers up and down the terminal and passenger waiting time index (PWI). Thus, there are four criteria that are at a low value, ie the number of modes, the index alpha route, the number of the route which passes through the terminal, and the ratio OVTT / IVTT. For that is in the medium category, there are also four criteria: the number of modes used, the index alpha, gamma index, as well as the number of passengers up and down at the stop. As for the rest, the two criteria that are in the high criteria: The ratio of travel time (RWP), and Running Index (RI) and 1 criteria with a very high value on the criterion of the number of passengers. Increased integration of land transport modes can be done by improving variables that have a low coherence value, as well as having a great influence based on public perception.

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