

Model Selection Of Mass Transport Infrastructure Development Metropolitan Region Of Mamminasata

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ABSTRACT: *Development of Public Transport Facilities Bulk (PTFB) Metropolitan Region of Mamminasata faced election public transport in determining priorities (monorail, busway, train), in an effort to develop a means of public transport facilities and services to provide optimal urban transport, it is therefore necessary discretion to determine the means of mass transportation that will be selected are the top priority in the development of mass transportation so that the selection policy of mass transportation can be effective and efficient in this implementasinya. This study uses SMART (Simple multi - Attribute Rating Technique) is a method of decision-making multi criteria. Multi-criteria decision making techniques are based on each alternative consists of a number of criteria that have value and each criterion has a weight that illustrates how important the other criteria. The results showed that the calculation of multiple criteria for the assessment of single - attribute utilities is known that the value of the benefit single - attribute utilities Trains amounted to 2.86. Interest's single value - the attribute utilities Busway at 2.89, while the value of the benefit single - attribute utilities monorail at 3.12. In these calculations it is known that people assess the development of the monorail is a decision that has a single interest - the highest compared with the attribute utilities Busway and Train.*

Keywords - *PTFB, SMART, monorail, Busway and Train*

I. INTRODUCTION

The rapid economic growth and policies to be implemented in an area can provide a fundamental change to the development of the region. An area will be required to undergo a change of business economics, land use and social in an effort to maintain the natural balance of growth. Changes in land use may be increasing industrial area derivative (services, manufacturing), in terms of social, movement of population movement (urbanization) and welfare to be seen as a response indicator of economic growth and changes in land use of an area.

The existence of a metropolitan area's economic growth will generate demand for transportation services, while on the other hand the availability of transport facilities will affect the high levels of economic activity. Therefore, the development of transportation infrastructure needs to be implemented in a systematic and integrated in accordance with the pattern of movement of goods and / or people who can support the dynamic development of a region. On the other hand decentralization of urban areas has increased travel distances between cities and suburbs that developed very quickly, where residents travel patterns using public transport modes is a primary requirement [9].

Direct implication of the above circumstances lead to two main problems in the provision of urban transport infrastructure, in support of the movement of population and the demands of urban transport services is increasing, the problems and challenges of urban areas as a direct result of a condition of the development of the region, including in planning adequate transportation system, which is able to meet the needs of these population movements, not only in terms of the number of means of transport, but also should pay attention to and improve the quality of service level of public transport modes such as comfort, security and safety [6].

The development of urban transportation system requires a strategic move to improve the organization of public transport on existing conditions by formulating policies through the development of developing a Mass Public Transport Facilities (MPTF) which considers the scale and service capacity through the development of sustainable means of mass transportation, use of environmentally friendly vehicles, improved traffic management, creating integration between public transport modes in urban areas and the availability of facility safety, security, adequate comfort, so the development of urban transport systems are capable of producing highly skilled transportation services and its implementation can be efficient and effective in supporting and simultaneously move the dynamics development of the region, in support of the movement of people and goods as well as integrated with the development of a region.

South Sulawesi government policy to develop the Mass Public Transport Facilities (MPTF) is one of the first steps in reducing the problems of urban transport system, so that the policy for the development of mass transportation facilities to improve the quality of public transport services, that will create mass transportation services effective and efficient in order to facilitate movement of the Metropolitan Region Mamminasata.

II. STUDY OF THEORY

2.1. Urban transport

Urban transportation systems form the basis of economic development as a whole in an area [5]. The public transport system was developed to be more competitive with other modes of transport, by providing optimum service and increase the provision of facilities and infrastructure, urban transportation systems. In developing the public transport system, how to move people in large numbers in support of mobility, in particular access to employment, trade, and education. The condition and capacity of public transport modes do not meet the demand because of the inadequate public transport, poor road network, and high travel costs for people using the public transport system [1].

2.2 Concept of Development of Mass Transportation

2.2.1 Mass transport system

Mass Rapid Transit is a passenger transportation service, usually with local coverage, available to anyone with a predetermined pay [14]. Transport is usually operate on dedicated lines fixed or potential common pathway that is separate and exclusive use, in accordance with the schedule set route or line designed to stop certain-stop, although Mass Rapid Transit sometimes operate in diverse traffic. It is designed to move large numbers of people at the same time. The mass transit system is a transport system for passengers that can be used by and for the public interest, with some specific requirements, such as paying the cost per unit of time or distance [13]. Mass transit system to transport passengers in large numbers in the same vehicle (such as a bus or train)

Mass public transport service system in meeting customer needs. Increased comfort, convenience and safety are more important than the vehicle technology or design special bus lanes, from the user's perspective. Clear information, map systems, hospitality professional personnel, cleanliness and ease of infrastructure is also important to note. Quality customer service is directly related to customer satisfaction, which ultimately determines the use of the customer and the financial sustainability of the long-term. Implementation public transportation can be effective in providing quality services delivered by service providers with respect to customer satisfaction

2.2.2. The development of mass transportation.

Policy development as a means of mass transportation improvement efforts of urban public transport services, the characteristics of socio-economic and demographic space to set the goal for the entire region, by evaluating the costs and give priority and to strengthen and expand the scope of the transportation system, including the addition of a separate bus lane, provide new public transport corridor, focusing on improving the ease and efficiency of the solutions to overcome the resistance to travel by public transportation and to ensure the system will get people from where they are, where to go in a reasonable amount of time [6].

Development of Mass Rapid Transit (MRT) as mass transportation is a concept transport reforms announced by the central government. MRT is purpose built to provide the transport services more secure, convenient, and timely. MRT is also expected to be one solution to tackle traffic congestion in major cities. Law No. 22 Year 2009, there were various elements of the policy include the need to formalize and consolidate the urban transport sector, among the provisions of the new legislation says that the duty of government is to develop a comprehensive transportation plan includes a large-capacity bus service.

Experience in developed cities showed that the MRT system is likely to have little impact on land use patterns. This is what leads many experts to recommend that the MRT system is "adaptive" can be used, and

instead of trying to influence land use patterns, rather than adapting the pattern of existing land use (Cervero, 2002). However, in many developing cities like MRT influence on land use is increasing, because the cities as it often run rapidly expanding space. Current trends such as people who drove to the gate and green gardening housing complex in many cities in Southeast Asia like the shape of the city is often dependent on the car, but the quality MRT system can help to sustain growth along the main corridor and service centers in the city.

Bus Rapid Transit (BRT) is a high-quality, transit-oriented client that offers speed, convenient, and affordable [15]. While [5] defines a Bus Rapid Transit (BRT) is a flexible, modes with rubber wheels that have rapid transit and the combined station (halte), vehicles, services, roads and elements of Intelligent Transportation System (ITS) in one integrated system with a strong identity. Busway is a high-quality bus-based transit system is a fast, convenient, and low cost for urban mobility by providing a way for pedestrians, infrastructure, operation fast and often, and the difference in marketing and service excellence to customers.

Transport is one of the train transportation plays an important role in serving the movement of passengers and goods, and is expected to become the backbone of land transportation. Various advantages of rail transport compared with other modes, among which are a large carrying capacity both in units of the number of passengers and goods (ton), and the use of more energy-efficient and environmentally friendly. As for long-distance passenger transport, rail transport looks increasingly left behind by air transport. Although the technology, allowing trains to support the long-range transport (land) with high speed. But the companies existing infrastructure to support it yet. Train transportation has many advantages over road transport include: large payload capacity (massal), fast, safe, energy efficient and environmentally friendly and requires relatively little land. With the growing environmental issues, the advantages train can be used as a reason to build the train transport so as to create an effective transport, efficient and environmentally friendly. Siding with the development of train transport means energy savings and improved environmental quality.

The monorail is a metro or rail with a track consisting of single track, as opposed to traditional rail has two parallel rails and consequently, wider than the train tracks. Usually made out of concrete and rail wagon wheels made of rubber, so it does not sebisng conventional trains. Advantages are 1) requires a small space both vertical and horizontal space. width required is as wide and as the train made on the road, just need space for poles, 2) look more "lightweight" than conventional rail trains terelevasi and covers only a fraction sky, 3) no noise because it uses rubber wheels running on concrete, 4) can be uphill, downhill, and turn faster than regular trains, 5) is more secure because of the rail that holds the rail, rolled the risk is much smaller. Risk of hitting pedestrians is very minimal, 6) are cheaper to build and maintain than the subway. Disadvantages are 1) compared with the subway, monorail noticeably takes place, 2) in an emergency, passengers could not be evacuated immediately because there is no way out except at the station, 3) capacity is still questionable. [16].

2.3 Decision making with multicriteria analysis

Multi-criteria analysis is a method used in decision-making and is intended to accommodate the aspects of outside economic and financial criteria. Multi-criteria analysis involving various parties that may be involved in a study of the user and the operator. This analysis is expected to reduce conflicts of interest between the parties involved and can produce optimal decisions.

The process of policy analysis requires the presence of criteria before selecting the criteria for decision-making on any issue [12], as follows:

1. Complete, so as to cover all important aspects of the problem. A set of criteria is called complete if this set can show how far the whole purpose can be achieved.
2. Operations, so it can be used in the analysis. Operational traits include some sense, among others, is that the set of criteria should have meaning to decision makers, so that they can truly appreciate the implications of the alternatives. Moreover, if the purpose of decision-making should be used as a means to convince the other party, then the set of criteria should be used as a means to provide an explanation or to communicate. Operations also include the trait of the decision-making model can be measured basically takes the concept of qualitative and quantitative measurements.

One is the method of decision-making SMART (Simple Multi - Attribute Rating Technique) is a multi-criteria decision-making method developed by Edward in 1977. Multi-criteria decision-making technique is based on the theory that each alternative consists of a number of criteria that have values and each criterion has a weight that describes how important it compared to the other criteria. Weighting is used to assess each alternative in order to obtain the best alternative.

SMART uses linear additive model to predict the value of each alternative. SMART is a method of decision-making that is flexible and widely used because of its simplicity in responding to the needs of decision makers and how to analyze the response. The analysis involved is transparent so that the method provides a high understanding of the problem and can be accepted by the decision maker. Linear utility function model used by SMART is shown in Equation (2.13).

$$\text{maximize } \sum_{j=1}^k w_j \cdot u_{ij}, \forall i = 1, \dots, n$$

with:

- w_j is the weighting of the criteria to the value of the j criteria,
- u_{ij} is the utility value of alternative i on criterion j .
- Selection of the decision is to identify which of the n alternatives that have the greatest value of the function.
- The value of this function can also be used to rank n alternatives

SMART has several advantages over other methods of decision-making are:

1. Perform addition / subtraction SMART alternative to the addition or subtraction method does not affect the calculation of the weighting alternatives for each alternative assessment are not mutually dependent.
2. simple
Calculation of the SMART method is very simple that does not require complex mathematical calculations that require a strong understanding of mathematics. Using a complex method would make it difficult to understand how the methods work.
3. Transparent
The process of analyzing the alternatives and the SMART criteria can be viewed by the user so that the user can understand how the alternative was chosen. The reasons for how the alternative chosen can be seen from these procedures are performed in the SMART ranging from the determination of the criteria, weighting, and providing value to each alternative.
4. multicriteria
The SMART method supports decision-making with many criteria. Decision-making criteria that many users make it difficult to determine the right decision.
5. flexible weighting
Weighting used in the SMART method, there are 3 types of weights directly (direct weighting), weighted swing (swing weighting) and the weighted centroid (centroid weighting). Direct weighting more flexible because the user can change the weight of the criteria in order of importance criteria.

III. RESEARCH METHODOLOGY

3.1. Research Methods

The research method is a measurement tool used by researchers to guide research so that the method used in accordance with the purposes of the study. This study categorized survey research because the basic data collection using questionnaires. Survey research is research that takes a sample from a population and use the questionnaire as a data collection tool that subject using questionnaires. In general, survey research unit of analysis is the individual [10].

3.2. Data Collection Techniques

The data used in this study are:

1. Primary data, ie data obtained directly from respondents or a sample of this research. Primary data consists of responses or judgments against the development of the transport system mass transportation Mamminasata Metropolitan Region
Sources of primary data collected through a survey by distributing questionnaires to the respondents to fill in and do the interview.
2. Secondary data, ie data obtained from the supporting documents such as an overview of the Metropolitan Region Mamminasata, data or other documentation relevant to this study.

3.3. Research variables

The research variables are an attribute, carpenter or value, object or activity that has certain specified variations researcher [11]. The research variables used in this study are based on the implementation of the national transportation system parameters shown in Table 1.

Table 1. Research variables

No.	Variabel
1	Safety
2	Accessibility
3	Integrated
4	Capacity
5	Regular
6	Swift and appropriate.
7	Easy and Fast
8	On time
9	Cozy
10	Tarif = Tariff
11	Orderly
12	Secure
13	Pollution
14	Efficient

3.4. Plan for Data Analysis

3.4.1. The probability of selection modes with SMART analysis

SMART (Simple Multi Attribute Rating Technique) is a multi-criteria decision-making methods. Multi-criteria decision-making technique is based on the theory that each alternative consists of a number of criteria that have values and each criterion has a weight that describes how important it compared to the other criteria. Weighting is used to assess each alternative in order to obtain the best alternative.

The stages in the SMART analysis in this study as follows:

1. Identify the decision problem

The decisions will be taken in this study is the existence of alternative modes within the Metropolitan Mamminasata (Makassar, Maros, Sungguminasa and Takalar)

2. Identify the criteria - the criteria used in making the decision making. Criteria used in the SMART analysis in this study refers to the National Transportation System which consists of 14 variables

3. Identify alternatives - alternatives evaluated. Alternative modes developed in this study are: a) monorail, b) busway and, c) train

4. Identify constraints relevant criteria for the assessment of alternatives. Limitation of the criteria used is an indicator of the variables contained in the National Transport System.

5. Doing ranked against the criteria of the position of interest. In this case assessed fairly easy compared to the development of weight. It is necessary to give weight to each criterion. Because of the weight given to the criteria depend on the rating criteria.

6. Giving weight to each criterion

Giving weight to be given to the value that can be specified by the user itself, in this case made twice the weighting based on criteria deemed most important and based on the criteria that are considered least important. The most important criteria is given a value of 100 while the next important criterion is assigned a value that describes the comparison of the relative importance to the least important dimension. This process continued until the weight given to the criteria that are not essential to obtain.

The same step was also carried out by comparing the least important criterion is given a value of 10. The next most important criterion is assigned a value that describes the comparison of the relative importance to the most important dimension. This process continued until the weight given to the criteria deemed most important obtained.

(Criteria-j)		C ₁	C ₂	C ₃	...	C _m
Weight-j		W ₁	W ₂	W ₃	...	W _{1m}
S ₁	a ₁	X ₁₁	X ₁₂	X ₁₃	...	X _{1m}
S ₂	a ₂	X ₂₁	X ₂₂	X ₂₃	...	X _{2m}
S ₃	a ₃	X ₃₁	X ₃₂	X ₃₃	...	X _{3m}
....
S _m	A _n	X _{n1}	X _{n2}	X _{n3}	...	X _{nm}

With:

S_i ($i = 1,2,3 \dots m$) = scenario modal options available

C_j ($j = 1,2,3 \dots m$) = criteria with weights W_{ij}

a_{ij} ($i = 1,2,3 \dots m$ & $j = 1,2,3 \dots m$) = measurement of a variety of scenarios A_i by C_j .

In this study, the selected criteria are safety, accessibility, integrity, capacity, orderly, smooth and precise, easy and fast, timely, convenient, affordable rates, orderly, safe, low pollution, efficient. Sub criteria selected as assessors for each criterion in each scenario taken from the indicator criteria.

7. Calculating normalization criteria weight

Normalized weights obtained where the weight of each criterion obtained shared with any number of criteria weight results. Normalization was also performed based on the criteria most important and unimportant criteria. The value of the two normalized values obtained to search his average.

8. Developing single - attribute utilities that reflect how well each alternative views of each criterion. This stage is to provide a value on all the criteria for each alternative.

9. Calculating valuation / utility for each alternative. The calculation is done using the existing functions are:

$$\text{maximize } \sum_{j=1}^k w_j \cdot u_{ij}, \forall i = 1, \dots, n$$

with:

w_j is the weighting of the criteria values of j to k criteria,

u_{ij} is the utility value of alternative i on criterion j .

The selection decision is to identify which of the n alternatives that have the greatest value of the function.

Value of this function can be used to rank alternative n

10. Deciding alternative modes

Utility value of each alternative is obtained from step nine. If a single alternative is selected, then select the alternative with the greatest utility value.

IV. DATA ANALYSIS AND RESULTS

4.1. Data Analysis and Results

Mamminasata Metropolitan area, also called the Metropolitan Mamminasata, includes the city of Makassar, Maros, Gowa and Takalar established by decree the Governor of South Sulawesi province in 2003. Mamminasata region covering all districts in the city of Makassar and Takalar, except six of the 14 districts in Maros and 6 of the 16 districts in Gowa. Exceptions are made considering the distance the remote districts of the metropolitan area. The total area is 2462.3 km² Mamminasata (246.230 hectares) with a total population of approximately 2.04 million people [2].

Mamminasata Spatial Plan (2003-2012) has been formulated by the government of South Sulawesi province through Mamminasata Metropolitan Agency for Development Cooper (MMADC). Spatial Plan aims to create a more optimal utilization of space through the synergistic aspects of economic, social, and environmental and human resources empower the global perspective and local nuances. Special attention is directed at (i) determining the basis for spatial planning policy, (ii) create coherence in the development of urban areas, (iii) determination of integrated programs between sectors and between regions, (iv) establishment of investment guidelines, and (v) the preparation mechanisms for implementation by government and private parties. Spatial Plan describes the sectoral scenarios and urban structure. Proposed spatial structure is as shown in Figure 1.



Figure1. Regional spatial planning plans Mamminasata

4.2. Mass Transportation Development Plan

1) Busway

Department of Transportation South Sulawesi and Makassar City Government will develop a transportation system that is intended to replace Busway minibuses and private vehicles and buses on major urban roads. Plan each specified corridors will be integrated with other transportation plans that monorail and commuter rail and regional rail plan.

2) Regional Train

Rail transportation system between the regions along the 60 km and the urban rail transport system along 120 km of interconnected.

There are 8 stations namely CBD plan Maros, Marusu, Tallo River, CBD Makassar, Tanjung Bunga, Sungguminasa town, CBD of Takalar city and Galesong (Presidential Regulation Draft of Mamminasata).

3) Train monorail

Train overpass with a monorail system to be one of the Mamminasata alternative transportation systems. The plan, the train connect the Sultan Hasanuddin International Airport-Daya, Daya-Center Point of Indonesia (CPI) in the Tanjung Bunga area.

Table 2. Plan monorail lines

Phase	Road Name	(Km)
Phase I	Line Karebosi-Mount Bawakareng-Urip Sumoharjo-Perintis Kemerdekaan (Daya Market)	13.06
Phase II	Line Perintis Kemerdekaan (Daya Market) Line Airport Sultan Hasanuddin- Terminal of Maros	15.76
Phase III	Alauddin Street (Junction PT.Telkom) - Balla Lompoa of Gowa Regency	4.64
Phase IV	Phase IV. Line GTC Makassar -Barombong –Taeng- ST. Hasanuddin Street (Balla Lompoa) Gowa	15,05

Sources: Regional Technical Unit of Mamminasata)

Busway transport networks, regional rail, commuter rail and monorail trains, is a unit that are connected to each other. Rail network is a network that connects major regional networks and network Mamminasata Sulawesi, while the monorail network and feeder busway would be to serve the movement of passengers in Makassar. Similarly, multi-modal nodes exist; connect the busway, rail, monorail. Where node regional and commuter trains become primary node, node monorail and busway serve trips to the surrounding area that can not be reached by train.

SMART Analysis Results

SMART Analysis is a method of multi-criteria decision-making for the mode type desired by the community. Multi-criteria decision-making technique is based on that each alternative consists of a number of criteria that have values and each criterion has a weight that describes how important it compared to the other criteria. Weighting is used to assess each alternative in order to obtain the best alternative. The steps in the SMART analysis as follows:

1. Respondents to the assessment criteria

Based on the results of the study, respondents' assessments of the criteria needed for decision making kinds of modes that are developed as follows;

Table 3. Assessment result of respondents' decision-making criteria

No.	Criteria	Scenario		
		Busway	Monorel	Train
1	Safety	2,92	3,41	2,88
2	Accessibility	3,03	3,42	2,64
3	Integrated	2,82	2,82	2,62
4	Capacity	2,93	2,93	2,82
5	Regular	2,72	3,29	2,97
6	Swift and appropriate.	2,94	2,92	3,05
7	Easy and Fast	2,73	2,73	3,05
8	On time	2,89	2,79	3,04
9	Cozy	2,91	3,33	2,81
10	Tariff	2,82	3,19	2,92
11	Orderly	2,90	3,41	2,85
12	Secure	2,87	3,44	2,78
13	Pollution	2,93	2,85	2,49
14	Efficient	2,88	2,94	2,99

In table above shows that the respondents' assessment of the criteria specified in the decision making kinds of modes are desired by the community. This assessment is based on distributing questionnaires to 40 respondents of the study.

2. Respondents' assessment of the criteria weight

Giving weight to be given to the value that can be determined by the respondent, in this case would be based on criteria deemed most important and based on the criteria that are considered least important. Which is considered the most important criteria is given a value of 10. Next important criterion is assigned a value that describes the comparison of the relative importance to the least important dimension. This process will continue until the weight given to the criteria that are considered least important obtained. The results of the assessment of the weight of importance of each criterion can be seen in Table 4.

Table 4. The results of respondents' assessment of the weight to the interests of the criteria

No.	Criteria	Weights
1	Safety	7,08
2	Accessibility	7,23
3	Integrated	7,50
4	Capacity	7,15
5	Regular	7,05
6	Swift and appropriate.	7,43
7	Easy and Fast	6,83
8	On time	7,50
9	Cozy	7,13
10	Tariff	7,10
11	Orderly	7,05
12	Secure	6,93
13	Pollution	6,70
14	Efficient	6,63

In the table above shows that the assessment weighting is known to the highest weight of 7.50 on the criterion time. While the lowest weight that is owned by the efficient criterion of 6.63. From the results of this weighting can be known in normalization weighting. As for the search for the normalization of the weighting as follows:

Highest Weight + Low Weights

$$= \frac{2}{7,50 + 6,63}$$

$$= 7,063$$

3. Multi-criteria assessment

In the multi-criteria assessment is to develop a single - attribute utilities that reflect how well each alternative views of each criterion. This phase is to provide a value on all the criteria for each alternative. As for how to get this value is to multiply the assessment of the respondents to the weighting of each criterion. The results of the calculation of single - attribute utilities can be seen in Table 5

Table 5. Assessment of Multi-Criteria Decision-Making Mode Type

No	Criteria	Scenario		
		Busway	Monorel	Train
1	Safety	20,64	24,11	20,40
2	Accessibility	21,92	24,69	19,09
3	Integrated	21,13	21,13	19,63
4	Capacity	20,91	20,91	20,16
5	Regular	19,18	23,19	20,90
6	Swift and appropriate	21,86	21,67	22,65
7	Easy and Fast	18,66	18,66	20,82
8	On time	21,70	20,95	22,83
9	Cozy	20,71	23,69	20,04
10	Tariff	20,00	22,66	20,71
11	Orderly	20,42	24,06	20,06
12	Secure	19,88	23,84	19,22
13	Pollution	19,63	19,10	16,69
14	Efficient	19,10	19,49	19,82

In the table above shows that in every scenario kind of mass transportation has a single assessment - attribute utilities. But before this assessment is used for decision making, the first of single assessment - attribute utilities should be normalized based on the weighting process.

To search for multi-criteria assessment results are normalized by dividing the multi-criteria assessment of the rate normalization weighting. The results normalized to the multi criteria assessment shown in Table 6

Table 6. Assessment of Multi-Criteria Decision-Making Mode type that has been normalized

No.	Criteria	Scenario		
		Busway	Monorel	Train
1	Safety	2,92	3,41	2,89
2	Accessibility	3,10	3,50	2,70
3	Integrated	2,99	2,99	2,78
4	Capacity	2,96	2,96	2,85
5	Regular	2,72	3,28	2,96
6	Swift and appropriate.	3,09	3,07	3,21
7	Easy and Fast	2,64	2,64	2,95
8	On time	3,07	2,97	3,23
9	Cozy	2,93	3,35	2,84
10	Tariff	2,83	3,21	2,93
11	Orderly	2,89	3,41	2,84
12	Secure	2,82	3,38	2,72
13	Pollution	2,78	2,70	2,36
14	Efficient	2,70	2,76	2,81
Average		2,89	3,12	2,86

Based on the calculation of multiple criteria for the assessment of single - attribute utilities are known that the value of the benefit single - attribute utilities Trains amounted to 2.86. Interests' single value - the attribute utilities Busway at 2.89, while the value of the benefit single - attribute utilities monorail at 3.12. In these calculations it is known that the public considers that the development of the monorail is a decision that has a single interest - the highest compared with the attribute utilities Busway and Train.

V. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The main priority in the development of mass public transport metropolitan area of Mamminasata the monorail at 3.12. People consider that the development of the monorail is a decision that has a single interest - the highest compared with the attribute utilities Busway and Train. Selection of Monorail by respondents as a priority in the development of mass transportation metropolitan area of Mamminasata in the hope of effectively and efficiently in these systems ability implementation. Superiority of this system carrying passengers in large, fast, and reliable in different situations, and the space road is more efficient.

Recomendations

Suggestions related to the selection model mass transportation development metropolitan areas of Mamminasata are `1) For further research is needed economic studies, environmental studies, and legal studies, a more thorough examination of the implementation of the monorail and, 2) for further research is needed to study the effect of monorail toward the changing of space structure patterns and regional growth that may occur in the Mamminasata area.

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