PRIORITY DISTRICT ROAD HANDLING MODEL WITH POWER CURVES APPROACH METHOD

LA ODE MUH. MAGRIBI
Department of Civil Engineering, Faculty of Engineering, University of Halu Oleo
Email: obi_magribi@yahoo.com ; HP +6281284229970

EDWARD NGII
Department of Civil Engineering, Faculty of Engineering, University of Halu Oleo
Email: dwrd.ngii@gmail.com; HP +6285241543259

ABD. RAHMAN
Student of Faculty of Engineering, Department of Civil Engineering, University of Haluoleo, Kendari, Hp. 085242460816

SYUKRIYANTO
Employee of Transportation Department of Southeast Sulawesi Province, Kendari
Email: lakina13@gmail.com ; Hp. +6281241902902

LA ODE MUHAMAD NURRAKHMAD ARSYAD
Department of Civil Engineering, Faculty of Engineering, University of Halu Oleo
Email: arsyadjr@gmail.com; HP +62 811402365

Abstract

In improving the handling of roads in the District with limited funds, an action and means to make priority scale in determining the handling of district roads that have economic benefits and support regional development in the region.

The purpose of this study is to calculate the influence of the development of district roads to the development of the Regency area in Muna and analyze the road segments that become the main priority to be handled in Muna Regency.

The type of data needed is secondary data. In this study, the population is the total length of the district road and the variables are: composite index of development, population, handling constraints, length of road handling, accessibility index and mobility index.

The results obtained that the method of equation between composite index development on accessibility indicators in a region is: $Y = 88{,}72X^{0{,}132}$ with $R^2 = 0.692$. Road planning in the Muna District is divided into 4 priorities. Base on this model was founded the first priority are Batu Kara, Bone, Kontu Kowuna, Maligano, Lasalepa, and Towea;

Keywords:
power curve, district road, priority, composite development index, accessibility index,

1. INTRODUCTION

Muna Regency is one of the second level region in the Provinces of Southeast Sulawesi, Indonesia, with the capital of Raha. This district has an area of 2,057.69 km2 or 205,769 ha and a population of 211612 people. Regency of Muna is adjancent to South Konawe and Tiworo Strait in the south, Central Buton regency in the west with Spelman Strait and Regency of North Buton and Kanjuangi in the east. Muna District consists of 22 kecematan and 197 villages / kelurahan.

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Road transport infrastructure has a role to encourage the development of all development areas in an effort to achieve a level of development between regions, road transport infrastructure is also a unified road network system that connects and connects growth centers with other regions (Risdiansyah, et al, 2014).
In determining the scale of priotas, the handling of road segments is often faced by complex problems in the field that are influenced by various aspects such as: road conditions (determined by survey results of Bina Marga), average daily traffic (LHR), disgusting (authority of regional head conducted during District Musrenbang as well as in provincial and supplemental budget (ABT), community aspirations (equitable distribution of roads for each kecamatan), budget (besides the cost required in road handling) and land use aspect (Magribi, 2013) . Therefore it is necessary a method that can accommodate all these aspects and can anticipate inequality. Furthermore, it is expected to reduce the problem and arrange the order of road handling according to the need and the result of the formulation of the priority of road handling.

2. REVIEW OF LITERATURE

2.1. Road

According to RI Law no. 22 In 2009, the roads shall mean all sections of roads, including their complementary structures that are undermined for public traffic, which lies below the surface of the ground, above the surface of the ground, below the water surface, and above the water surface, except rail and cable roads. Roads are basic infrastructures that need maintenance as long as to maintain road conditions to fit the age of the plan (Wahyudin, 2009).

2.2. Road Handling

According to Decree No. 77 Directorate General of Highways, 1990 road network is divided into 2 (two) parts:

a) Roads with steady conditions (steady) is a road that is always reliable to pass 4-wheel vehicle throughout the year, especially the condition is good / being that requires only maintenance.
b) Unsteady roads are unreliable roads for four-wheeled vehicles throughout the year, especially in damaged / heavily damaged conditions that require heavy work (rehabilitation, repair, construction) including dirt roads that are currently not passable by 4-wheel vehicles .

2.3. Linear Regression

Linier Regression can be formulated as follows:

$Y = b_0 + b_1 X$ ..... (1)

Where :
Y = the dependent variable
X = independent variable
b_0 = regression constant for X = 0
b_1 = linear regression direction constant and denotes the average change of variable Y for each change variable X for one unit.

2.4. Transportation Demand Elasticity

Elasticity is defined as a percentage of output change as a result of percentage change from input (Soekartawi, 1993: 55).

$$e = \frac{\frac{\Delta Y}{Y}}{\frac{\Delta X}{X}} - \frac{\Delta Y}{\Delta X} \times \frac{X}{Y} \quad \text{..... (2)}$$

In the concept of elasticity is known terms of demand elasticity and supply elasticity According to Prathama R and M. Manurung in Lukiana (2010: 356) demand elasticity measures the relative change in the number of units of goods purchased as a result of changes in one of the factors that influence it.

$$E = \frac{Presentase\ \ Perubahan\ \ jumlah\ yang\ diminta}{presentase\ perubahan\ harga} \quad \text{..... (3)}$$

2.5. Determination of Priority Scale Road With Power Curve Method

In the priority of road handling, it can simply be differentiated into two types, namely: scoring technique (scoring method) and non-scoring technique. The power curve method is the method included in the scoring technique classification (scoring method). Power Equation Model is:

$DCI = a.X1^b$ ..... (4)

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Where:
DCI = Development Composite Index
a = Coefficient of model
b = Value of elasticity of each independent variable
X = Accessibility Index or mobility
The power curve method was introduced by Magribi (2004: 385-388) in a research study entitled Influence of Physical Accessibility to Rural Development. In his research, Magribi uses several variables such as rural development variables, rural community mobility, and quality of pavement types. Through the power curve approach the Magribi (2004) offers the priority of road handling by dividing the range of values (using the normal curve) of independent variables based on at least 2 categories ie the main priority and not the priority.
Through the power curve approach the Magribi (2004) offers the priority of road handling by dividing the range of values (using the normal curve) of independent variables based on at least 2 categories ie the main priority and not the priority. The simple logic of Power curve utilization in determining the priority of handling a problem can be seen in Figure 1.
The simple logic as seen in Figs is taken on the basis of the curve philosophy formed, ie in the first range (R1) until the third span (R3) shows the angular difference formed on each tangent line (a, b and c) with the Power curve. It is clear that the angle α> angle θ> angle φ. Larger angles reflect a more progressive development acceleration when compared to smaller angles. In the range / distance / range (divided by using the most normal curve method) the most distant (R3) indicates that there is a change in aspects of development but relatively very slow and tends to stagnate.
What are the criteria that will be used as consideration in making a decision are:

a) The number of people indicating how many beneficiaries if the district roads are handled.
b) The urgency of road conditions, where for road handling activities selected road segments with minor damage and serious damage. The size of the indicator is the length of the road (km) that is in the condition of minor or heavy damage.
c) Long criteria for handling of district roads, where the requirements determined by SK No 77 / KPTS / Db / 1990 Method from the Directorate General of Highways show that the priority district road is a district road less than 15 km long.
d) Strategically valued road section criteria, ie the length of the district roads through a kecamatan administration area capable of serving many rural areas (including rural areas that have economic potential, tourism or natural resources).
e) Accessibility criteria, namely the comparison between the length of the district road with the area of the district in its path.
f) Mobility criteria, namely the comparison between the length of the district road with the number of residents in each of the district areas in its path.

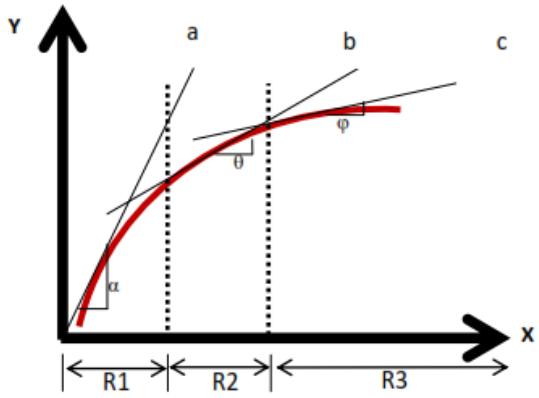

Figure 1. Curves and Tangent Lines On Curves For Each Distance Coordinate X Shared By Normal Curve.

3. RESEARCH METHODS

3.1. Types and Techniques of Data Collection

a) Data Type

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The type of data required in this study is secondary data. Secondary data include data on customs documents, regional data (Muna District Spatial Plans), supporting maps relevant to this study, and village data in the Muna district.

b) Data Collection Technique
Technique of data collecting is done by way of instansional survey to visit some government offices in Muna Regency like Public Works Department, Central Bureau of Statistic Office and other related institution providing data as needed in this research.

3.2. Data Analysis Technique

a) Calculates the relative weight (composite index) of development

b) Analyze the index of accessibility and or mobility index of each sub-district as independent variables of transportation aspect as measured by the following formula:

$$A = \frac{Road\ Lenght}{Large\ of\ Teritory} \quad \text{.....(5)}$$

c) Rank and / or weight calculation on sectors having ordinal data quality based on the assumption of quality level of service level with the following approach formula:

Total Value = JK X BO..... (6)

Where :

JK = Total Availability of Object Observed in an Area

BO = Ordinal Weight of Each Object Observed

d) Making a regression analysis and calculating the elasticity value of each dependent variable change on the change of each independent variable by first analyzing the data that is outlier. Regression Equation Model:

DCI = f (Accessibility)

Where :

DCI = Development Composite Index

f = The function of the independent variable affecting the change of DCI

Power Equation Model:

$DCI = a.X_1^b$ ..... (6)

Where :

a = Coefficient of model

b = Value of elasticity of each independent variable

X = Accessibility index

4. RESULTS AND DISCUSSION

4.1. Composite Index Development Resume Composite Development Index

Table 1. Resume Results of Composite Index Analysis of Development Between Districts

No.	Indikator	Nama Kecamatan										
		Tonkuno	Tongkuno S	Parigi	Bone	Marobo	Kabawo	Kabangka	Kontu Kowuna	Kontunaga	Watopute	Katobu
1	Kependudukan dan Ketenagakejaan	14	9	10	5	9	11	8	4	9	11	65
2	Pendidikan dan Kesehatan	46	23	52	35	47	41	62	44	34	40	68
3	Pertanian, Perikanan, dan Peternakan	32	10	36	40	69	23	30	24	24	24	4
4	Perindustrian	28	8	29	34	13	14	26	27	40	27	22
5	Transportasi	5	7	2	2	6	24	16	2	6	13	23
6	Perdagangan	22	24	12	16	31	19	21	7	17	25	37
JUMLAH		147	81	141	132	175	132	163	108	130	140	219

Table 1. Advanced

No.	Indikator	Nama Kecamatan										
		Lohia	Duruka	Batalaiworu	Napabalano	Lasalepa	Towea	Wakorumba S	Pasir Putih	Pasi Kolaga	Maligano	Batu Kara
1	Kependudukan dan Ketenagakejaan	16	31	21	10	9	7	4	4	4	5	3
2	Pendidikan dan Kesehatan	43	37	65	39	33	33	44	48	22	38	52
3	Pertanian, Perikanan, dan Peternakan	13	24	13	27	30	42	23	34	38	41	32
4	Perindustrian	32	22	23	12	24	10	33	21	38	23	66
5	Transportasi	9	12	20	16	4	11	3	2	2	14	3
6	Perdagangan	24	30	57	29	28	17	10	27	20	30	24
JUMLAH		137	156	199	133	128	120	117	136	124	151	180

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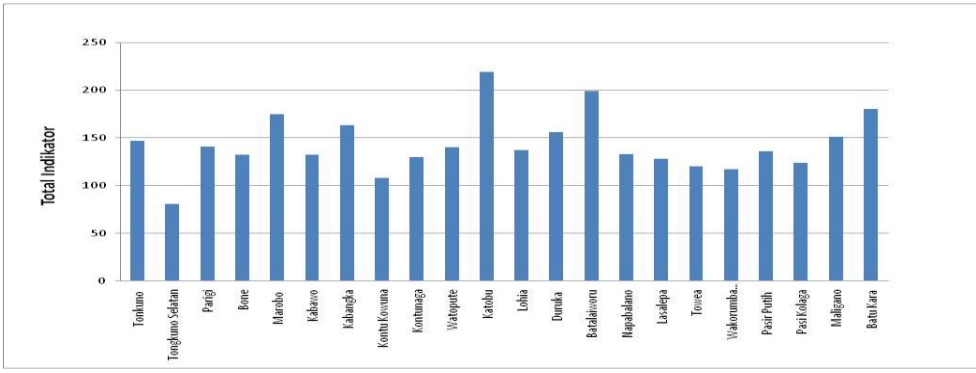

Figure 2. Total Per District Indicator Value

Based on the Table it is seen that the area of Katobu sub-district is a region with a composite index of development value (DCI) of 219 means that this district has a probability level of regional development is relatively better when compared with some other districts in Muna District. In the second rank occupied territory by District Batalaiworu with IKP of 199, and then respectively can be seen in the previous table.

4.2. Accessibility Index and Mobility Index

The variables associated with road construction can be seen by knowing sub-variables such as the length of the road and the number of population and the length of the road and the area that can both be used as the mobility index and the accessibility index.

Table 2. Acessibility Index

Num	District	Acessibility Index	Mobility Index
1	Tongkuno	0.2436	0.0069
2	Tongkuno selatan	0.4762	0.0048
3	Parigi	0.3705	0.0039
4	Bone	0.0561	0.0013
5	Marobo	0.4823	0.0030
6	Kabawo	0.3718	0.0058
7	Kabangka	0.3068	0.0030
8	kontu kowuna	0.1303	0.0023
9	Kontunaga	0.4717	0.0029
10	Watopute	0.2650	0.0021
11	Katobu	6.7741	0.0029
12	lohia	0.8966	0.0031
13	Duruka	0.9692	0.0009
14	Batalaiworu	2.0903	0.0035
15	Napabalano	0.3675	0.0033
16	Lasalepa	0.1772	0.0018
17	Towea	0.1826	0.0010
18	wakorumba selatan	0.3085	0.0065
19	pasir putih	0.1988	0.0041
20	pasi kolaga	0.2332	0.0027
21	Maligano	0.1468	0.0026
22	batu kara	0.0203	0.0006

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4.3. The Influence of Road to Development in Muna Regency

The graphic form as well as the equations formed from the data as shown in table 3, the relationship between Composite Development index (IKP) with Accessibility Index. Can be seen in figure 3. The sensitivity analysis measured from its elasticity value can be explained in the following description:

$Y = 88.72\ X^{0,132}$

$\frac{dy}{dx} = (88.72)(0.132)X^{(0.132-1)}$

$\frac{dy}{dx} = 11.71104X^{(-0.868)}$

$e = \frac{dy}{dx}.\frac{x}{y} = 11.71104X^{(-0.868)}.\frac{x}{88.72X^{0.132}}$

$$e = 11.71104x^{(-0.868)}.\frac{1}{88.72X^{0,132}.X^{-1}}$$

$$e = 11.71104X^{(-0,868)}.\frac{1}{88.72X^{-0,868}}$$

$$e = \frac{11.71104}{88.72} = 0,132$$

Based on these calculations, it can be concluded that the relationship between road handling (IA) and development (IKP) is not elastic, but road and development handling has a positive relationship. A 1% increase in the value of road handling will raise the composite index by 0.132%. Based on the result, it can be said that there is an influence between the improvements of road construction towards composite index of development positively but the result is not significantly changed. The change of the accessibility index has an effect on the composite index of development value of 69.2%.

Table 3. Accessibility Index and IKP

No	Nama Kecamatan	Indeks Aksesibilitas	Indeks Mobilitas	IKP
1	Tongkuno	24.36	6.93	147
2	Tongkuno selatan	47.62	4.80	81
3	parigi	37.05	3.89	141
4	bone	5.61	1.32	132
5	marobo	48.23	3.05	175
6	kabawo	37.18	5.83	132
7	kabangka	30.68	3.03	163
8	kontu kowuna	13.03	2.29	108
9	kontunaga	47.17	2.93	130
10	watopute	26.50	2.11	140
11	katobu	677.41	2.86	219
12	lohia	89.66	3.13	137
13	duruka	96.92	0.93	156
14	batalaiworu	209.03	3.49	199
15	napabalano	36.75	3.35	133
16	lasalepa	17.72	1.78	128
17	towea	18.26	1.04	120
18	wakorumba selatan	30.85	6.49	117
19	pasir putih	19.88	4.05	136
20	pasi kolaga	23.32	2.73	124
21	maligano	14.68	2.61	151
22	batu kara	2.03	0.58	180

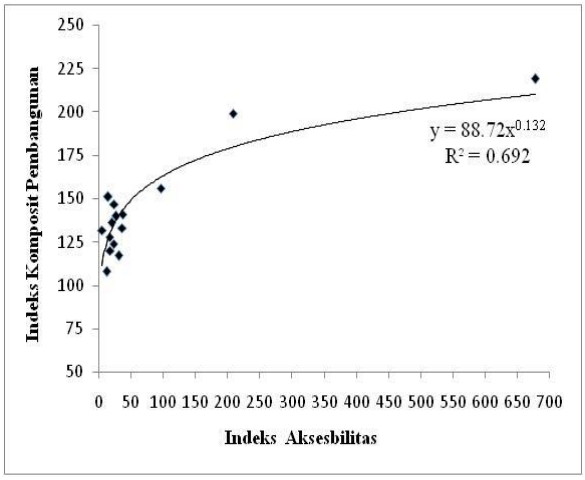

Figure 3. Relationship between Composite Development Indexes with Accessibility Index

4.4. Criteria for Priority of Road Handling

a. Total population

The number of residents indicates the number of beneficiaries when a road segment is handled. Subdistrict areas that have relatively more population when compared with other districts will be a priority in the handling of roads.

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Based on the table that District Katobu with a population of 30524 people became the main priority of road handling. Large population generates a large number of problems Because it will have a negative impact on many people who need road access.

b. Ermegency Handling

Based on road condition data, it is seen that there are 305 road segments in Muna Regency. For the national road, there are no passes, the provincial roads are 7 sub-districts, namely Tongkuno Sub-District, Kabawo Sub-District, Katobu Sub-District, Batalaiworu Sub-District, Napabalano Sub-District, Lasalepa Sub-District, South Wakorumba Subdistrict and Maligano Sub-District, and the total length of the existing road in Kabupaten Muna is 701.7 km and the road width is 4 m (road width less than 4 meters, assumed to be 4 meters). Road condition in Muna Regency consisted of 46,31% good condition, 6,08% moderate condition, 12,23 with minor damage condition and 35,39% heavy damage condition (all condition only for district road).

c. Length of Road Handling

The length criteria for road handling constitute one of the criteria indicated by SK No 77 / KPTS / Db / 1990 Directorate General of Highways. One criterion is to avoid a very long project, one of which avoids a very long project (generally a project that is more than 15 km long) should have been avoided during the project determination phase. Based on these criteria, the next step is to indicate the district road segments that have a length of more than 15 km.

d. Temporary Priority of District Road

The three previous criteria are: population criteria, handling criteria for handling, and long criteria for handling of district roads in the meantime, generally have been able to describe the priority of which sub-districts are included in the handling, but in detail it has not been able to determine which sections of the road of the sub-districts included in the priority to be addressed because it is still worth checking the availability of road development budget in Muna Regency.

e. Normal Curve Slice Method (Power Curve Method)

To prioritize using the power curve approach on pre-made models (relationships and effects between accessibility index and composite development index), SPSS v.16 tool analysis tools Cutting with quaertiles method is done because the categories taken in this study are enough 4 (four) pieces, namely: First Priority (Most Urgent), Second Priority (More Urgent), Urgent 3, and Four Urgent (Less Urgent).

able 4. Classification of Handling Priorities Street

DCI Value Range	Access Value Range	Priority
97-130	2.03 - 18.26	Most Urgent
131-140	18.26 - 30.85	More Urgent
141-148	30.85 - 48.23	Urgent
>148	>48.23	Less Urgent

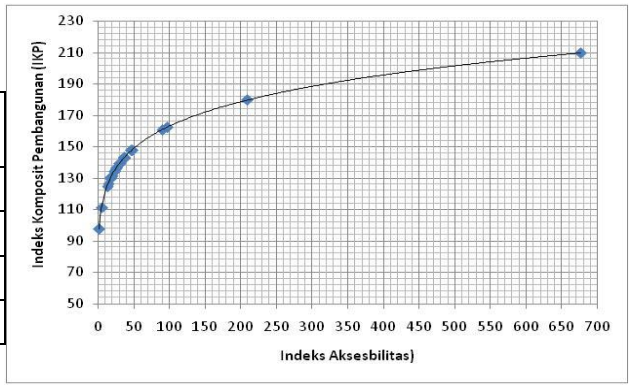

Figure 4. Priority Determination Analysis Results Using the Power Curve

Based on the results of analysis by using power curve with cutting techniques, it can be known priority handling district roads. Based on the results of the analysis using the power curve, it can be known priority handling district roads as the details can be seen in Table 4 and Table 5.

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Table 4. Priority of District Road Handling

Priority	District	Road Name	Lenght (km)	Road Condition (Km)			
				Good	Moderate	Light Damage	Heavy Damage
First Priority	Batu Kara	District Capital Road	1.406	0.094	-	0.5	0.406
	Bone	Bonekacintala - Bonetondo	7.3	-	-	-	7.3
	Kontu Kowuna	Bahutara -Kabangka	9.193	2.95	-	-	6.45
	Maligano	Komp. Kec. Maligano	2.846	-	0.3	1.8	0.746
		Maligano - Lapole	2.854	-	-	0.854	2
		Raimuna - Batu Rumbu	4.7	-	1	1.2	2.5
		Raimuna - Pasar Latompa	4	0.852	-	-	3.148
	Lasalepa	Jalan Depan Akper	0.35	-	-	0.35	-
		Labunti – Bonea	0.92	-	-	0.92	-
		Bonea-Berumembe	1.85	-	-	0.65	1.2
		Jl.Labunti - Bonea	1.1	-	-	1.1	-
		Jln. Rezki bonea	2.3	-	-	-	2.3
		Lingkar Bonea Labone	2.45	1	0.5	0.5	0.45
		Ibu kota kec. Lasalepa	1.35	-	-	-	1.35
		Poros ibukota kecamatan	1.35	-	1.35	-	-
		Jl. Desa kombungo	4.35	-	-	4.35	-
		Lambiku – Lakode	3.1	-	-	-	3.1
	Towea	Moasi-Lakarama	5.0	3	2	-	-
		Desa Bahari	0.3	0.3	-	-	-

Table 5. Road Handling Costs to be Prioritized

No	Nama Kecamatan	Nama Ruas Jalan	Panjang Jalan (Km)	Kondisi Jalan (KM)				Jenis Penanganan		Anggaran Penanganan (RP)		Biaya Penanganan (Rp)		Total Biaya Penanganan (Rp)
				Baik	Sedang	Rusak		Pemeliharaan	Rehabilitasi	Pemeliharaan	Rehabilitasi	Pemeliharaan	Rehabilitasi	
						Ringan	Berat							
1	Batu Kara	Jl. Ibu Kota Kecamatan	1,406	0,5	0	0,5	0,406	0,5	0,406	500.000.000	865.854.000	601.536.724	351.536.724	953.073.448
2	Bone	Bonekacintala - Bonetondo	7,3	0	0	0	7,3	0	7,3	0	865.854.000	6.320.734.200	0	6.320.734.200
3	Kontu Kowuna	Bahutara - Kabangka	9,193	2,743	0	0	6,45	0	6,45	0	865.854.000	5.584.758.300	0	5.584.758.300
4	Maligano	Komp. Kec. Maligano	2,846	0	0,3	1,8	0,746	2,1	0,746	500.000.000	865.854.000	1.050.000.000	645.927.084	1.695.927.084
		Maligano - Lapole	2,854	0	0	0,854	2,00	0,854	2,00	500.000.000	865.854.000	427.000.000	1.731.708.000	2.158.708.000
		Raimuna - Batu Rumbu	4,7	0	1	1,2	2,5	2,2	2,5	500.000.000	865.854.000	1.100.000.000	2.164.635.000	3.264.635.000
		Raimuna - Pasar Latompa	4	0,852	0	0	3,14	0	3,14	0	865.854.000	0	2.718.781.560	2.718.781.560
5	Lasalepa	Jalan Depan Akper	0,35	0	0	0,35	0	0,35	0	500.000.000	0	175.000.000	0	175.000.000
		Labunti - Bonea	0,92	0	0	0,92	0	0,92	0	500.000.000	0	460.000.000	0	460.000.000
		Bonea - Berumembe	1,85	0	0	0,65	1,2	0,65	1,2	500.000.000	865.854.000	325.000.000	1.039.024.800	1.364.024.800
		Jl. Labunti - Bonea	1,1	0	0	1,1	0	1,1	0	500.000.000	0	550.000.000	0	550.000.000
		Jl. Rezki Bonea	2,3	0	0	0	2,3	0	2,3	0	865.854.000	0	1.991.464.200	1.991.464.200
		Lingkar Bonea - Labone	2,45	1	0,5	0,5	0,45	1	0,45	500.000.000	865.854.000	500.000.000	389.634.300	889.634.300
		Ibukota Kec Lasalepa	1,35	0	0	0	1,35	0	1,35	0	865.854.000	0	1.168.902.900	1.168.902.900
		Jalan Poros Ibukota Kec. Lasalepa	1,35	0	1,35	0	0	1,35	0	500.000.000	0	675.000.000	0	675.000.000
		Jl. Desa Kombungo	4,35	0	0	4,35	0	4,35	0	500.000.000	0	2.175.000.000	0	2.175.000.000
		Lambiku - Lakode	3,1	0	0	0	3,1	0	3,1	0	865.854.000	0	2.684.147.400	2.684.147.400
6	Towea	Moasi - Lakarama	5	3	2	0	0	2	0	500.000.000	0	1.000.000.000	0	1.000.000.000
		Desa Bahari	0,3	0,3	0	0	0	0	0	0	0	0	0	0
Jumlah												20.944.029.224	14.885.761.968	35.829.791.192

5. CONCLUSIONS

Based on the results of the analysis and discussion in the previous chapters it can be concluded as follows:

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a) The effect of road handling on development in Muna Regency is 69.2%. There is a positive relationship between road handling and development but the relationship is not elastic.
b) The handling of district roads in the priority Muna Regency is Batu Kara Sub-district consists of 1 road segment along 1.406 km, Bone Sub-district consists of 1 road segment along 7.3 km.
c) The Power Curve Method will make it easier for the government to allocate road development budget every year.

6. ACKNOWLEDGMENT

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Biographies

La Ode Muhamad Magribi is a lecturer in engineering faculty, civil engineering studies program, Halu Oleo University. Teaching experience since 1994 up to now at various universities in Southeast Sulawesi Province. Undergraduate education completed at Hasanuddin University in Civil Engineering Department, master's program was completed in Master of Transportation System and Engineering Gadjah Mada University in Yogyakarta. Doctoral education was completed at the Faculty of Geography at Gadjah Mada University Yogyakarta in 2004. His current position is Chairman of Engineering Management Concentration at Doctoral Program at Halu Oleo University.

Edward Ngii is also a lecturer in engineering faculty, civil engineering studies program, Halu Oleo university. Experience teaching since 1998 until now at various universities in Southeast Sulawesi Province. Undergraduate education completed at Hasanuddin University in Civil Engineering Department, master's program was completed in Master of Transportation System and Engineering Gadjah Mada University in Yogyakarta. Doctoral education was completed at the Faculty of Engineering at Gadjah Mada University, Yogyakarta in 2004. His current position is the vice dean of academics at the Faculty of Engineering, Halu Oleo University.

Abdul Rahmad is a freshman who has just completed his bachelor's education at the Faculty of Engineering, Civil Engineering University of Halu Oleo.

Syukriyanto is a s one of the employees of the Department of Transportation of Southeast Sulawesi Province who is currently completing his doctoral education at the management science management science concentration at Halu Oleo university. His master's education is also completed in the Regional Planning and Development Study Program, post-graduate of Halu Oleo University.

La Ode Muhamad Nurrakhmad Arsyad s one of the lecturers at the Faculty of Engineering, Civil Engineering course, Halu Oleo University. His master's education was completed at Gadjah Mada University, Yogyakarta, in UGM's master degree program and transportation engineering, currently completing his doctoral education in Engineering Engineering program at Halu Oleo University.

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