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Economic Feasibility Analysis of The Construction of the Tanjung Kramat (HM. Agus) Road Section of East Kutai District

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ABSTRACT

Purpose: Road construction is very much needed in an effort to improve the regional economy, open access to the distribution of goods/services & people as well as in regional development efforts. This activity requires technical and economic planning to ensure that the activity is feasible to carry out. For this reason, it is necessary to conduct an analysis of the economic feasibility of constructing the Tanjung Keramat (HM. Agus) road in East Kutai Regency.

Design/methodology/approach: This analysis uses the compound interest calculation method, Net Present Value (NPV) and Benefit Cost Ratio (BCR).

Findings: The results obtained from the BOQ and RAB calculations showed that the total construction costs were Rp. 46,600,000,000.00. The results of the present value calculation over a 20 year life of construction costs + routine & periodic maintenance costs are Rp. 65,677,946,740.00. The results of calculating the benefits of Vehicle Operational Costs (BOK) for BENEFITS' current value are IDR 276,921,095,567.00. The results of the economic feasibility are declared "WORTH IT" to run because the results of the calculation of the NPV value are IDR 276,921,095,567.00 > than 1 and the BCR value is 4.22 > 1 NVP>1 so that the investment in road construction is a "WORTH IT" investment to carry out.

Keywords: *Economic Feasibility, Road Development, East Kutai.*
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I. INTRODUCTION

In supporting the development of East Kutai Regency as a whole, the road infrastructure sector is one of the lifeblood of people's economic growth, so the accuracy of providing community needs and economic products is very important. In connection with economic development, investment in roads and/or bridges has a broad influence both on road and/bridge users and on the region as a whole. For this reason, appropriate policies are needed in road management so that they can support regional development and economic growth.

Strategic issues faced in road management, especially urban or district roads include the inadequacy of primary and collector road network systems in serving continuous traffic flow and/or urban/district traffic flow. There are many obstacles or problems faced by regions in efforts to fulfill these road traffic facilities and infrastructure. These problems include funding, priority scale for road handling, land acquisition and other problems of high social concern. This has led to increasingly higher economic and social costs in providing road infrastructure in regions (cities/districts).

One of the successes of city/district development is the availability of good transportation facilities and infrastructure in the area. Apart from playing a role in supporting the smooth running of socio-economic activities, it will also support physical development in the area concerned. The development of the city of Sangatta, East Kutai is very rapid, both in terms of population growth and the urban facilities and infrastructure it has. To further optimize activities including road construction, improvement and maintenance, the East Kutai Regency Government, through the Public Works Department, considers it necessary to have systematic and effective

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planning for these activities, with the hope that thorough planning results will be obtained that meet technical requirements and rules and can applied in the field as part of quality transportation development activities to support community economic development and mobilization.

The target of developing transportation infrastructure in long-term development is to support the creation of an independent and reliable economy through the implementation of a transportation system, while the target to be achieved is to increase the role of the national transportation system in meeting the mobility needs of people, goods, services and realizing an effective and efficient national transportation system. Effective and efficient means the arrangement of a service system or connectivity of the road infrastructure in an effort to fulfill the community's need for transportation. In the end, a transportation system that is connected, cheap, safe, comfortable and will have an impact on improving the economy and development of a region will be created.

To support transportation development in East Kutai Regency and accelerate the development of the people's economy and regional development in the Sangkulirang District area, the Public Works Department (especially the Highways Sector) of East Kutai Regency plans to build the Tanjung Keramat (H.M. Agus) road section which is a new access road. connecting the Mandu village areas in Sangkulirang District. With the construction of the new Tanjung Keramat (H.M. Agus) access road, it is hoped that it will be able to provide better transportation services in terms of quantity, quality and benefits which will have an impact on the economy of the region as well as regional development efforts in Sangkulirang District, East Kutai Regency.

A. Objectives

The main objectives of the research we conducted are:

1. Obtain a calculation of project costs and benefit costs in implementing the construction of the new Tanjung Keramat access road (HM. Agus).
2. Obtain an investment decision for the new Tanjung Keramat access road construction project (HM. Agus).

B. Literature Review

1. Feasibility Study

Every project activity for any purpose will definitely have a negative impact, the most important thing is that it must be carried out in such a way that the negative impact that arises is as small as possible and a solution must be found. The bigger the project, the bigger the investment, so the wider the scope and deeper the nature of the assessment and the greater the negative impact.

The purpose of conducting a feasibility study is to avoid investing too much capital in activities that turn out to be unprofitable. Of course, this feasibility study will cost money, but this cost is relatively small when compared with the risk of failure of a project involving large investments.

2. Definition of highway

Roads are land transportation infrastructure which includes all parts of the road, including complementary and complementary buildings intended for traffic, which are on the ground surface, above the ground surface, above the water surface and below the ground and water surface, except railways. , lorry roads and cable roads (Government Regulation Number 34 of 2006).

Highways are land paths on the surface of the earth made by humans with the shape, size and type of construction so that they can be used to channel traffic, people and vehicles that transport goods from one place to another easily and quickly. (Clarkson H. Oglesy. 1999).

3. Investment Calculation Method

a. Cash Flow

Cash flows related to a project can be grouped into 3 parts, namely:

1. Initial Cash Flow
   Cash flow patterns related to investment expenditure must be identified, such as payments for land, embankments, plant and equipment.
2. Operational Cash Flow
   Determining how much operational cash flow will be each year is the starting point for assessing the profitability of the investment proposal.
3. Terminal Cash Flow
   Terminal cash flow generally consists of cash flow of the residual value of the investment and working capital withdrawals.

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b. Net Present Value (NPV) Method

This method calculates the difference between the present value of an investment and the present value of net cash receipts (operational and terminal cash flow) in the future. If the present value of future net cash receipts is greater than the present value of the investment, then the project is said to be profitable and therefore accepted.

$$NPV = \sum NB_i (1 + i)^{-n} \quad \ldots\ldots (1)$$

Where:

NB= Net Benefit – Cost
i = Discount factor
n = Year (time)

c. Benefit Cost Ratio (BCR) Method

Benefit Cost Ratio (BCR) is an analysis method used to assess the feasibility of an investment project. BCR is a comparison between the total expected benefits of a project and the total expected costs of the project. The formula for calculating BCR is:

BCR = PWB / PWC …… (2)

Where:

PWB: Present value of income
PWC: Present value of expenditure costs

BCR greater than 1 indicates that the expected benefits exceed the costs incurred, which indicates the project has positive economic value. In this case, the investment is considered feasible. Conversely, a BCR of less than 1 indicates that the investment is unfeasible.

II. METHODS

The economic feasibility study is one of the stages in determining whether a project is economically profitable to carry out or not. Of course, the economic feasibility study activity involves several technical studies of the planning results of the road sections that will be studied. Where the budget value used for development (Construction Costs) is required which will then be compared with the value of the benefits that will be generated from the road operational activities, so that the comparison of costs and benefits generated can be known using investment calculations such as NPV, IRR, BCR and so forth.

The location of this investment feasibility study is in the Sangkulirang District area, precisely connecting the road access to Mandu village. Geographically, the coordinates of the feasibility study location are at the work starting point 0°59'09.517" North Latitude 117°58'29.658" East Longitude and the work ending point 0°59'56.613" North Latitude 117°58'42.906" East Longitude.

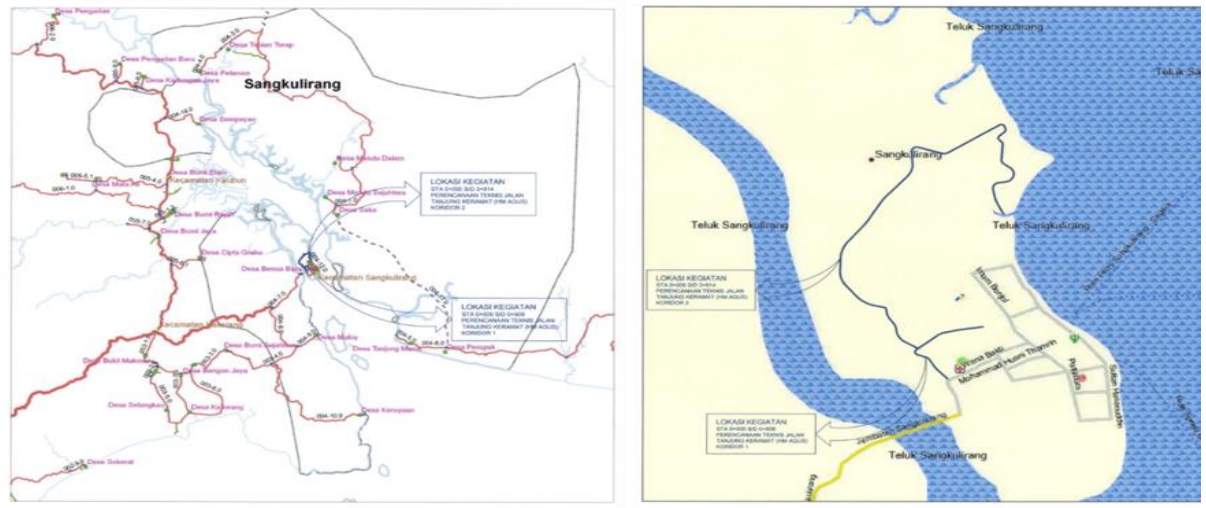

Figure 1. Research location

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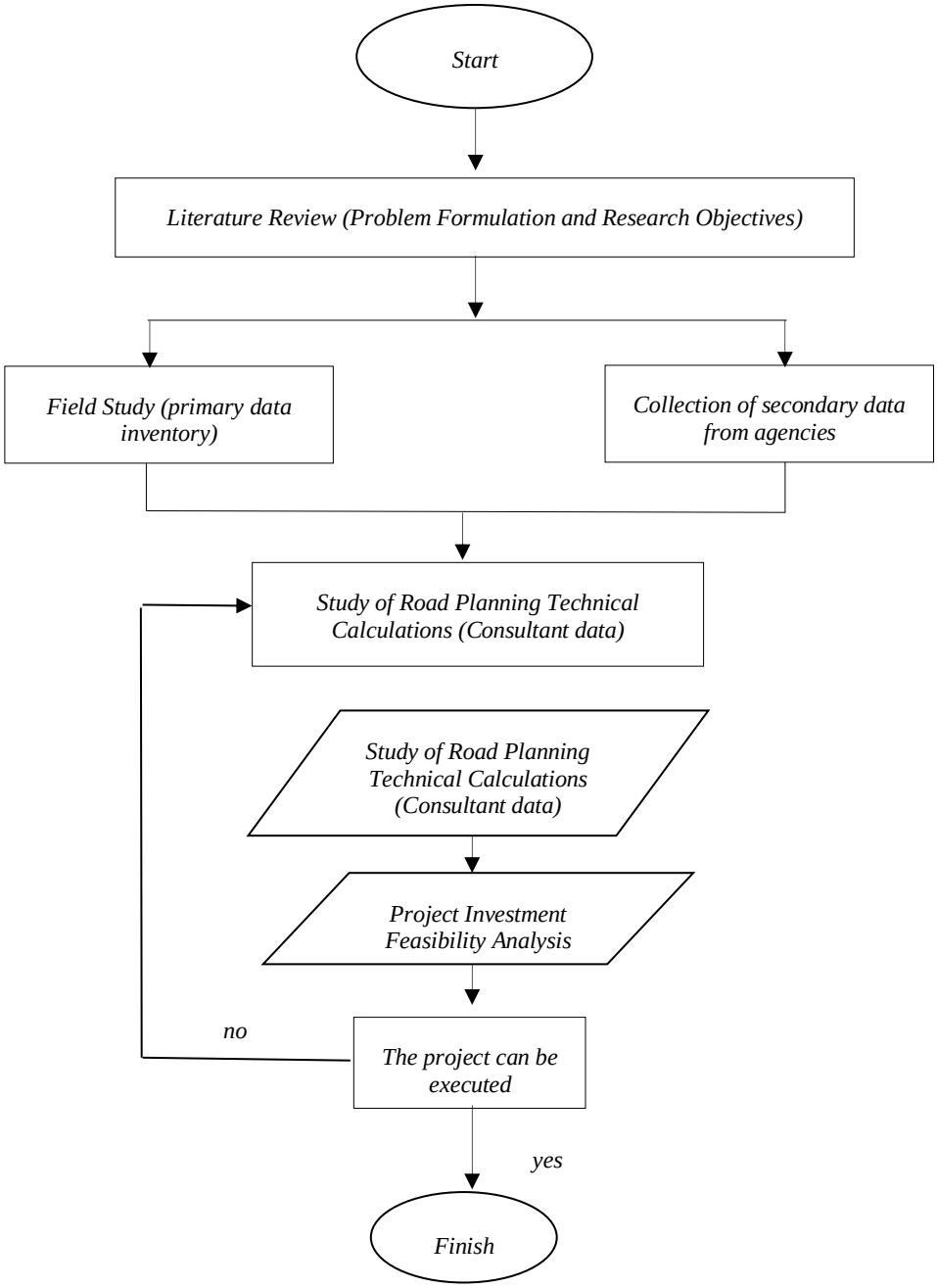

Figure 2. Research flow chart

A. Data Collection

1. Method of collecting data

In conducting research, the data collected will be used to solve existing problems so the data must be truly trustworthy and accurate. In scientific research, data collection methods are intended to obtain materials that are relevant, accurate and reliable. The data collection method used in this research is:

a. Interview
   Interviews as a technique for searching and gathering information are carried out by visiting directly the relevant agencies such as several implementing contractors at the project location, planning consultants, MK consultants, community leaders and related agencies to ask for information about something they know.
b. Observation
   Observation is careful and systematic observation and recording of the symptoms (phenomena) being studied. Observations were carried out in the field involving several project supporting elements.

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c. Literature review
Data collection was carried out by reading literature books, journals, the internet, magazines, and previous research related to the research being carried out.

2. Data Types and Sources

The data needed in this research are:

a. Primary Data
Raw data obtained from researchers' observations of research study locations in the field regarding technical conditions, environment, land, soil condition data, LHR data, hydrological data, local price data, geometric condition data, documentary photographs and others that are used as a basis for planning.

b. Secondary Data
Data obtained by researchers from several books, research and articles related to research material, as well as processing data obtained from related agencies or data related to planning that has been carried out as a basis for the further research process carried out by researchers.

III. RESULTS AND DISCUSSION

A. Results

1. Construction Cost Budget

Cost estimates are made based on the division of functional elements so that they can provide an overview of the costs required for each of these elements. Basically, cost estimation is the process of calculating the volume of work, estimated prices for various kinds of materials and work that will be carried out in road construction. In this feasibility study stage, the calculation process is not carried out in detail, especially regarding the unit costs of work. The cost calculation results show that the cost of carrying out physical work for the construction of the Tanjung Keramat Road Section (HM. AGUS) is worth IDR. 46,600,000,000.00 (Forty-Six Billion Six Hundred Million Rupiah).

2. Maintenance Costs

To ensure that the flexible pavement structure remains durable for the life of the plan, maintenance is carried out periodically, planned for 5 years, with an overlay (re-coating) with a thickness of 4 cm. During the life of the new road, routine and periodic maintenance needs to be carried out. The large percentage of routine and periodic maintenance costs to the project value is shown as follows:

Table 1. Skema Anggaran Perawatan Rutin dan Berkala

Years	*Routine Maintenance (%)*	*Periodic Maintenance (%)*
1	*1,92*	-
2	*1,86*	-
3	*1,81*	-
4	*1,75*	-
5	-	*10,47*
6	*1,65*	-
7	*1,60*	-
8	*1,55*	-

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Years	*Routine Maintenance (%)*	*Periodic Maintenance (%)*
9	*1,51*	-
10		*9,01*
11	*1,42*	-
12	*1,38*	-
13	*1,34*	-
14	*1,30*	-
15		*7,76*
16	*1,22*	-
17	*1,19*	-
18	*1,15*	-
19	*1,12*	-
20		*6,68*

Source: ITS Surabaya research, 2016

From the table above, a calculation is then carried out by entering the cost value from the routine and periodic budget which is multiplied by the financing scheme in the table above to produce the following amount of maintenance financing for 20 years:

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Tahun	n	Cost						Future Value (FV)	Present Value (PV) = FV x [1/(1+i)^n]
		Initial Cost	Routine maintenance		Periodicall maintenance		Total Cost		
			(%)	(Rp)	(%)	(Rp)	(Rp)	(Rp)	(Rp)
2023	0	46,600,000,000					46,600,000,000		46,600,000,000
2024	1		1.92%	894,720,000			894,720,000	894,720,000	864,463,768
2025	2		1.86%	866,760,000			866,760,000	866,760,000	809,129,735
2026	3		1.81%	843,460,000			843,460,000	843,460,000	760,752,595
2027	4		1.75%	815,500,000			815,500,000	815,500,000	710,661,137
2028	5		-		10.47%	4,879,020,000	4,879,020,000	4,879,020,000	4,108,003,921
2029	6		1.65%	768,900,000			768,900,000	768,900,000	625,500,645
2030	7		1.60%	745,600,000			745,600,000	745,600,000	586,034,860
2031	8		1.55%	722,300,000			722,300,000	722,300,000	548,522,967
2032	9		1.51%	703,660,000			703,660,000	703,660,000	516,297,136
2033	10		-		9.01%	4,198,660,000	4,198,660,000	4,198,660,000	2,976,509,066
2034	11		1.42%	661,720,000			661,720,000	661,720,000	453,242,278
2035	12		1.38%	643,080,000			643,080,000	643,080,000	425,579,603
2036	13		1.34%	624,440,000			624,440,000	624,440,000	399,269,529
2037	14		1.30%	605,800,000			605,800,000	605,800,000	374,252,209
2038	15		-		7.76%	3,616,160,000	3,616,160,000	3,616,160,000	2,158,451,979
2039	16		1.22%	568,520,000			568,520,000	568,520,000	327,868,845
2040	17		1.19%	554,540,000			554,540,000	554,540,000	308,991,784
2041	18		1.15%	535,900,000			535,900,000	535,900,000	288,507,735
2042	19		1.12%	521,920,000			521,920,000	521,920,000	271,479,658
2043	20		-		6.68%	3,112,880,000	3,112,880,000	3,112,880,000	1,564,427,290
									65,677,946,740

Figure 2. Routine and Periodic Maintenance Budget Calculation

Source: calculation results

3. Benefit Analysis

The benefits that will be analyzed here are savings on non-fixed BOK (running costs). The analysis of pavement benefits will compare the BOK between existing road pavement (without project) and new road pavement (with project).

Table 2. Non-Permanent BOK Recapitulation Without Project

	Component BOK Not Fixed (Rp/Km)					
Vehicle type	*BBM*	*Oil*	*Part*	*Wages*	*Tire*	*Not Fixed BOK (Rp/Km)*
Sedan	*635*	*175.02*	*1368.73*	*2724*	*201,195.00*	*206,097.75*
Pass. Car	*735*	*140.02*	*920.49*	*2724*	*328,937.00*	*333,456.51*
Small Bus	*1,034*	*210.04*	*2488.77*	*8304*	*621,075.00*	*633,111.81*
Big Bus	*1,519*	*420.05*	*1928.80*	*5527*	*660,030.00*	*669,424.85*
Light Truck	*1,274*	*210.05*	*1699.05*	*6342*	*745,290.00*	*754,815.10*
Medium Truck	*1,621*	*420.06*	*5613.35*	*8207*	*429,140.00*	*445,001.41*
Heavy truck	*3,198*	*840.11*	*5602.98*	*8510*	*1,227,450.00*	*1,245,601.09*

Source: calculation results

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Table 3. Non-Permanent BOK Recapitulation With Project

	Component BOK Not Fixed (Rp/Km)					
Vehicle type	*BBM*	*Oil*	*Part*	*Wages*	*Tire*	*Not Fixed BOK (Rp/Km)*
Sedan	*560*	*175.02*	*463.85*	*1507*	*74,630.00*	*77,336.259*
Pass. Car	*679*	*140.02*	*311.94*	*1507*	*151,746.00*	*154,383,868*
Small Bus	*875*	*210.04*	*836.37*	*4715*	*302,325.00*	*308,961.332*
Big Bus	*1,202*	*420.05*	*700.37*	*3274*	*660,030.00*	*665,626.227*
Light Truck	*1,186*	*210.05*	*508.42*	*3391*	*362,790.00*	*368,084.847*
Medium Truck	*1,671*	*420.06*	*1,556.38*	*4228*	*429,140.00*	*437,015.841*
Heavy truck	*2,569*	*840.11*	*1,571.21*	*4399*	*1,227,450.00*	*1,236,828.915*

Source: calculation results

4. T Total BOK Savings

From the results of the calculation of Vehicle Operational Costs (BOK), the savings values are as follows:

n	Tahun	LHRT Golongan Kendaraan (kend/tahun)				Penghematan BOK Without Projet (Rp/kend)				Penghematan BOK With Projet (Rp/kend)				Total Penghematan	(P/F, 3,5%, n)
		Sedan / Jeep	Truk Ringan	Truk Sedang	Truk Berat	Sedan/Jeep	Truk Ringan	Truk Sedang	Truk Berat	Sedan/Jeep	Truk Ringan	Truk Sedang	Truk Berat		
	a	b	c	d	e	f	g	h	i	j = b x f	k = c x g	l = d x h	m = e x i	n = j + k + l + m	
0	2,022	10,595	2,950	555	380	206,098.31	333,456.37	445,001.38	1,245,601.19	2,183,611,621.60	983,696,285.07	246,975,767.63	473,328,450.32	3,887,612,124.62	3,887,612,125
1	2,023	10,966	3,054	575	393	213,311.75	345,127.34	460,576.43	1,289,197.23	2,339,176,688.91	1,054,018,898.48	264,831,448.13	507,041,269.19	4,165,068,304.71	4,310,845,695
2	2,024	11,350	3,161	596	407	220,777.66	357,206.80	476,696.61	1,334,319.13	2,505,826,496.33	1,129,130,687.28	284,111,177.55	543,155,283.59	4,462,223,644.75	4,780,045,524
3	2,025	11,748	3,272	617	421	228,504.88	369,709.04	493,380.99	1,381,020.30	2,684,475,367.19	1,209,687,964.27	304,416,069.51	581,841,518.67	4,780,420,919.64	5,300,138,124
4	2,026	12,160	3,387	639	436	236,502.55	382,648.85	510,649.32	1,429,356.01	2,875,871,057.32	1,296,031,660.98	326,304,917.03	623,283,180.83	5,121,490,816.16	5,877,028,509
5	2,027	12,586	3,506	662	451	244,780.14	396,041.56	528,522.05	1,479,383.47	3,080,802,885.43	1,388,521,714.94	349,881,596.25	667,676,525.39	5,486,882,722.01	6,516,695,470
6	2,028	13,027	3,629	686	467	253,347.45	409,903.02	547,020.32	1,531,161.89	3,300,357,211.19	1,487,538,045.96	375,255,939.81	715,231,785.91	5,878,382,982.88	7,226,033,592
7	2,029	13,483	3,757	711	483	262,214.61	424,249.62	566,166.03	1,584,752.56	3,535,439,575.37	1,593,905,829.16	402,544,048.49	766,174,169.86	6,298,063,622.89	8,012,895,743
8	2,030	13,955	3,889	736	500	271,392.12	439,098.36	585,981.84	1,640,218.90	3,787,277,041.37	1,707,653,516.52	431,282,636.26	820,744,925.11	6,746,958,119.26	8,884,455,423
9	2,031	14,444	4,026	762	518	280,890.84	454,466.80	606,491.21	1,697,626.56	4,057,187,360.88	1,829,683,341.35	462,146,299.92	879,202,482.40	7,228,219,484.55	9,851,321,204
10	2,032	14,950	4,167	789	536	290,722.02	470,373.14	627,718.40	1,757,043.49	4,346,294,262.79	1,960,044,870.92	495,269,817.20	941,823,679.21	7,743,432,630.12	10,922,876,471
11	2,033	15,474	4,313	817	555	300,897.30	486,836.20	649,688.54	1,818,540.01	4,656,084,744.63	2,099,724,526.46	530,795,540.02	1,008,905,070.76	8,295,509,881.87	12,111,193,217
12	2,034	16,016	4,464	846	574	311,428.70	503,875.47	672,427.64	1,882,188.91	4,987,842,066.33	2,249,300,080.26	568,873,785.55	1,080,764,334.42	8,886,780,266.57	13,428,535,126
13	2,035	16,577	4,621	876	594	322,328.70	521,511.11	695,962.61	1,948,065.52	5,343,242,942.14	2,409,902,826.92	609,663,246.35	1,157,741,774.14	9,520,550,789.54	14,889,723,105
14	2,036	17,158	4,783	907	615	333,610.21	539,764.00	720,321.30	2,016,247.82	5,724,083,976.91	2,581,691,193.22	653,331,420.31	1,240,201,932.01	10,199,308,522.45	16,509,564,838
15	2,037	17,759	4,951	939	637	345,286.57	558,655.74	745,532.55	2,086,816.49	6,131,944,142.85	2,765,904,548.62	700,055,061.52	1,328,535,314.61	10,926,439,067.61	18,305,596,916
16	2,038	18,381	5,125	972	659	357,371.60	578,208.69	771,626.19	2,159,855.07	6,568,847,321.07	2,963,319,519.31	750,020,652.82	1,423,160,242.40	11,705,347,735.59	20,296,909,565
17	2,039	19,025	5,305	1,007	682	369,879.60	598,445.99	798,633.10	2,235,449.99	7,036,959,441.45	3,174,755,980.81	804,223,534.25	1,524,524,830.66	12,540,463,787.18	22,506,063,760
18	2,040	19,691	5,491	1,043	706	382,825.39	619,391.60	826,585.26	2,313,690.74	7,538,214,730.84	3,401,079,277.82	862,128,427.35	1,633,109,111.73	13,434,531,547.74	24,954,497,197
19	2,041	20,381	5,684	1,080	731	396,224.28	641,070.31	855,515.75	2,394,669.92	8,075,446,997.83	3,643,843,621.68	923,957,004.88	1,749,427,308.21	14,392,674,932.60	27,669,936,518
20	2,042	21,095	5,883	1,118	756	410,092.13	663,507.77	885,458.80	2,478,483.37	8,650,893,421.51	3,903,416,194.10	989,942,934.32	1,874,030,268.24	15,418,282,818.17	30,679,127,445
													TOTAL PENGHEMATAN (BENEFIT)		276,921,095,567

Figure 3. Calculation of BOK Saving Costs

Source: Calculation Results

Based on the table above, the total non-fixed BOK savings if new road pavement is built is IDR 276,921,095,567.00.

5. Economic Feasibility Analysis

Based on the cost and benefit calculations above, the net present value cost (NPV) of new road pavement is IDR 65,677,946,740.00. Meanwhile, the net present value benefit / NPV is IDR 276,921,095,567.00 (positive value). So the value of the B/C ratio = 276,921,095,567/ Rp. 65677,946,740.00 = 4.22 is obtained. So based on the results of the B/C calculation it is "WORTH IT" because the calculation value is 4.22 > 1

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IV. CONCLUSION

The conclusions from the research conducted on the economic feasibility investment analysis for the construction of the new Tanjung Keramat (HM. Agus) access road, Sangkulirang District, East Kutai Regency are as follows:

1. Based on technical data for the construction of the new Tanjung Keramat (HM. Agus) access road, Sangkulirang District, East Kutai Regency as well as BOQ and RAB calculations, it was found that the total construction cost (cost of construction) was IDR. 46,600,000,000.00 (Forty-Six Billion Six Hundred Million Rupiah). Then a calculation is carried out on the present value over a 20-year life of construction costs + routine & periodic maintenance costs to Rp. 65,677,946,740.00 (Sixty-Five Billion Six Hundred Seventy-Seven Million Nine Hundred Forty-Six Thousand Seven Hundred and Forty Rupiah). The results of calculating the benefits from Vehicle Operational Costs (BOK) for the present value benefit are IDR 276,921,095,567.00 (Two Hundred SeventySix Billion Nine Hundred Twenty-One Million Ninety-Five Thousand Five Hundred Sixty-Seven Rupiah).
2. From the results of the financial economic analysis of the construction of the new Tanjung Keramat (HM. Agus) access road, Sangkulirang District, East Kutai Regency, it is "WORTH" to be implemented. These eligibility conditions can be seen from the calculation results of the NPV value of IDR 276,921,095,567.00 (Two Hundred Seventy-Six Billion Nine Hundred Twenty-One Million Ninety-Five Thousand Five Hundred Sixty-Seven Rupiah) in the 20th year and the BCR Value of 4.22 > 1 NVP>1 means the investment is feasible.

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