Feasibility Analysis Of The Road Development Plan An Economic Perspective (Overview: Jalan Air Putih-Selat Baru)

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Abstract. It is necessary to prepare a plan for building a new road that can facilitate movement from Bengkalis sub-district to Bantan sub-district, in line with the increase in population and based on the spatial layout of Bengkalis district.. The Public Works and Spatial Planning Office of Bengkalis Regency intends to construct the Air Putih-Selat Baru Road in accordance with this requirement. However, a feasibility study must be conducted before beginning the road building work in order to determine whether the planned road construction is feasible. In this research, the with and without method was used, using two feasibility indicators, namely NPV and BCR. After conducting feasibility analysis, the NPV result obtained is Rp.795.055.896.163 or a positive value and the BCR has a value greater than one, that is 25, so it is considered that the investment is feasible.

Keywords: Project, Feasibility study, Investment, Economic

1 Introduction

To support the tourism sector as one of the leading sectors, supporting infrastructure such as roads is needed. In line with the spatial plan for the Bengkalis Regency area, an Air Putih-Selat Baru Road will be built that can be accessed, leading to Selat Baru Beach. In addition to supporting tourism in the Baru Strait, this road is also expected to support regional development in two sub-districts, namely Bengkalis District and Bantan District.
However, an evaluation of the feasibility of a planned road construction project must be carried out before its implementation. The process of determining whether or not a project can be implemented is an activity carried out based on a feasibility study. Therefore, it is necessary to analyze the feasibility of the Air Putih-Selat Baru Road construction plan from an investment standpoint.

ABEC 2023, September 21, Bengkalis, Indonesia

DOI 10.4108/eai.21-9-2023.2342880

2 Research Methods

According to Husnan "an investment project is a plan to invest resources, both large and small, to benefit from it in the future". Usually, these benefits have a monetary value. [1],

2.1 Cost and Benefit Analysis

The data analysis of this research involves benefit analysis and cost analysis. Benefit-cost analysis is an analysis used to determine the amount of profit or loss in a project plan and whether it is feasible or not. The calculation of this analysis takes into account the costs and benefits resulting from project implementation. The benefit components that will be taken into account in this thesis are direct benefits and indirect benefits. The direct benefit consists of saving on vehicle operating costs and time value, and the indirect benefit consists of an increase in land and building taxes. The cost components consist of direct costs, indirect costs, and maintenance costs.[2]

2.2 Vehicle Operational Costs (VOC) Savings

Savings in Vehicle Operational Costs (VOC) is a comparison of the value of the Vehicle Operating Cost in the conditions without the Air Putih-Selat Baru Road and the conditions with the Air Putih-Selat Baru Road. The condition without the Air Putih-Selat Baru Road is the condition before the construction of the Air Putih-Selat Baru Road, while the condition with the Air Putih-Selat Baru Road is the condition after the construction of the Air Putih-Selat Baru Road. Vehicle Operating Cost Components consists of fixed costs and variable costs.

Fixed costs are costs that are routinely incurred by motorists. They consist of depreciation costs, interest costs, insurance costs, and overhead costs. While Variable costs represent the cost of fuel consumption, oil consumption, tire consumption, maintenance expenses, spare parts and mechanic's wages, as well as employee salaries.[3]

In this study, vehicle operating costs were calculated using the Pacific Consultants International (PCI) calculation method for non-toll roads. The calculation of BOK without and with projects is done using equations (2) and (3). Meanwhile, BOK savings can be calculated using equation (4).

BOK = BOK Component Price (1000 km) × Road Length × Vehicle Volume (1)

Total BOK without projects = BOK for all existing roads without projects (2)

Total BOK with project = BOK for all existing roads with project + BOK for roads with project (3)

Saving BOK = BOK without project – BOK with project (4)

Because the PCI method only covers light and heavy vehicles, the ND LEA method is needed to calculate the BOK of motorcycles (SM). [4]

Comparison of Motorcycles (MC): Class I = Volume of MC/Volume of Class I Vehicles
Adjustment Factor = 0.18 x Comparison Results MC: Class I

BOK Group I due to SM =
(Adjustment Factor x Total VOC Class I) + Total VOC Class I (5)

2.3 Time Value Savings

The amount of money road users spend to travel economically per unit of their journey period is time value[5]. Time value refers to the amount of money that road users spend while driving. The value of the profit (profit) obtained from the value of time is obtained by calculating the value of the savings (savings) from the value of time.

Table 1. Base time value

Reference	Time Value (IDR/Hour/Vehicle)		
	Class I	Class II A	Class II B
Jasa marga (1990-1996)	12.287	18.534	13.768
Padalarang-Cileunyi (1996)	3.385-5.425	3.827-38.344	5.716
Semarang (1996)	3.411-6.221	14.541	1.506
PCI (original,1979)	1.341	3.827	3.152
JIUTR northern extension (PCI,1989)	7.067	14.670	3.659
Surabaya-Mojokerto (JICA,1991)	8.880	7.960	7.980

Table 2. Correction value (k)

Location	(PRDB) per capita Million (IDR)	Correction value (k)
DKI Jakarta	6,65	1,00
Jawa Barat	1,55	0,23
Kodya Bandung	2,59	0,39
Jawa Tengah	1,32	0,20
Kodya Semarang	3,48	0,52
Jawa Timur	1,69	0,25
Kodya Surabaya	4,91	0,74
Sumatera Utara	1,96	0,29
Kodya Medan	3,04	0,46

Table 3. Minimum time value (IDR/hour/vehicle)

No.	District/municipality	Jasa Marga			JIUTR		
		Gol. I	Gol. IIA	Gol. IIB	Gol. I	Gol. IIA	Gol. IIB
1.	DKI Jakarta	8.200	12.369	9.188	8.200	17.022	4.246
2.	Besides the city of Jakarta	6.000	9.051	6.723	6.000	12.455	3.107

In order to obtain the value of time savings, compare the value of time before road construction (without a project) with the value of time after road construction (with a project). Use the formula to get the time value, which is:

Time Value = Max {(k × Base Time Value); (Time value)} (6)

Note: k is the correction factor according to the level of regional income (PRDB) per capita.

The time value of one year is Travel Time x Time Value x Number of vehicles (7).

Saving Time Value = Time Value without project - Time Value with project (8)

2.4 Increase in Properties Tax (PBB)

The increase in Properties tax that is included in Bengkalis Regency is beneficial for the regional government because it is one of the Regional Original Revenues. The increase in Properties tax begins with an increase in land value, which automatically results in an increase in the NJOP (Sales Value of Tax Objects), so that the value of land and building tax increases.[2]

PBB = 0,5% × NJKP (9)
NJKP = 40% × (NJOP-NJOPTK) if NJOP ≥ Rp. 1.000.000.000,- (10)
NJKP = 20% × (NJOP-NJOPTK) if NJOP < Rp. 1.000.000.000,- (11)
NJOP of land = land area × land price/m^2

Where :

PBB	= Properties Tax
NJKP	= Taxable Selling Value
NJOP	= Selling Value of Tax Objects
NJOPTKP	= Selling Value of Non-Taxable Tax Objects
	= Rp. 12,000,000,- [6]

2.5 Cost

Direct costs, indirect costs, and maintenance costs shall be included in the cost components of the construction of Jalan Air Putih-Selat Baru.. Direct costs are costs incurred in constructing projects, such as road construction costs and land acquisition costs. Indirect costs consist of supervision and supervision costs, and maintenance costs are costs incurred to carry out road maintenance either routinely or periodically.[3], [7]

2.6 Investment Feasibility Analysis

Two feasibility indicators, namely Net Present Value (NPV) and Benefit Costs Ratio (BCR), have been applied to this study. The net present value can simply be regarded as an estimate of the return on investment generated by the project. Meanwhile the benefit cost ratio is a calculation which shows the project's advantages obtained from its overall costs [3].

If the NPV produces positive value and the BCR is more than 1 (BCR > 1), a project can be considered to be investmentable. The calculation of NPV and BCR can be done using the equation (12) and (13).

NPV = Present Value Benefit – Present Value Cost (12)

BCR = (Present Value Benefit)/(Present Value Cost) (13)

3. Result and Discussion

3.1 Vehicle Operational Costs (VOC) Savings

Table 4. Price list of vehicle components

No.	Component	Unit	Unit Price
1	Type of Vehicle		
1.1	Motor Cycle	IDR/vehicle	19,172,000
1.2	Car (sedan, wagon, hatchback, SUV, coupe, convertible and vans)	IDR/vehicle	135,000,000
1.3	Bus	IDR/vehicle	426,321,000
1.4	Truck	IDR/vehicle	465,000,000
2	Fuel		
2.1	Motor Cycle	IDR/liter	10,000
2.2	Car (sedan, wagon, hatchback, SUV, coupe, convertible and vans)	IDR/liter	10,000
2.3	Bus	IDR/liter	6,800
2.4	Truck	IDR/liter	6,800
3	Lubricants/Oil		
3.1	Motor Cycle	IDR/liter	63,000
3.2	Car (sedan, wagon, hatchback, SUV, coupe, convertible and vans)	IDR/liter	85,000
3.3	Bus	IDR/liter	85,000
3.4	Truck	IDR/liter	85,000
4	Vehicle Tires		
4.1	Motor Cycle	IDR/tire	482,000
4.2	Car (sedan, wagon, hatchback, SUV, coupe, convertible and vans)	IDR/tire	2,115,000
4.3	Bus	IDR/tire	4,932,000
4.4	Truck	IDR/tire	7,455,000
5	Maintenance (Mechanical Wages)		
5.1	Motor Cycle	IDR/hour	22,494
5.2	Light Vehicle	IDR/hour	22,494
5.3	Heavy Vehicle	IDR/hour	22,494
6	Worker		
6.1	Bus Driver	IDR/hour	22,494
6.2	Truck Driver	IDR/hour	22,494
7	Maintenance (Spare Parts)		
7.1	Light Vehicle	IDR/vehicle	10,544,000
7.2	Heavy Vehicle	IDR/vehicle	44,736,000

Vehicle operating costs are calculated by entering the component prices of each type of vehicle listed in Table 4 and speed into Equation (1), which is calculated per 1000 Km. In calculating the VOC of the PCI method, the formula used is adjusted to the class of vehicle according to Minister of Public Works Decree No. 370 of 2007. Then the calculation of VOC for motorcycles is carried out using the ND LEA method. The calculation of the ND LEA method begins by comparing the volume of class I motorcycles and vehicles and determining the value of the adjustment factor, then Class I BOK due to Motor Cycle (SM) is added to class I VOC. [8]

Furthermore, the total VOC for Light Vehicles (LV) is added up with the total VOC for Heavy Vehicles (HV) to get the total VOC for the road. Then, VOC calculations are carried out in the same way for existing roads and main roads in With Project conditions, so that VOC calculation results are obtained for Without and With Project conditions. From the value of the VOC without the project and with the project, the value of the savings in vehicle operating costs can be calculated. Vehicle operating cost savings result from the difference in the VOC value without project and with project conditions, which can be seen in Figure 1.

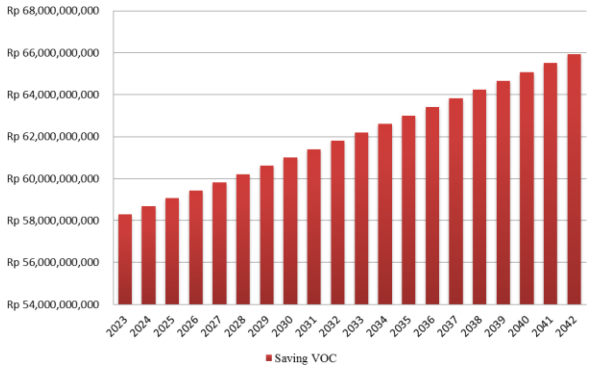

Fig. 1. Saving vehicle operating cost (VOC) diagram

3.2 Time Value Savings

Time value is the amount of money spent by road users on a journey. To get the time value using equation (6), the time value is determined by choosing the maximum value between the Base Time Value (table 1) multiplied by the Correction Factor according to PDRB (table 2) and the Minimum Time Value (table 3). From the two time values, the largest value is taken, namely the minimum time value, and corrected by the inflation value from the official website of the Central Bureau of Statistics for Riau Province [9], so that the time value is obtained:

Class I : Rp. 6.248 / hour / vehicle
Class IIB : Rp. 3.235 / hour / vehicle

The time value over the life of the plan will increase, therefore, it is necessary to calculate the time value within one year each year using equation (7), which is carried out in conditions without and with the project. After calculating the Time Value without and With projects, the time value savings calculation can be performed. Time value savings are obtained from the difference in the calculation of travel time for conditions with a project (with a project) and

without a project (without a project). The calculation of time value savings is carried out using equation (8), whose results are shown in Figure 2.

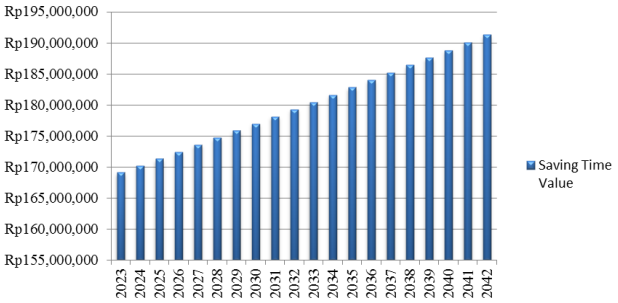

Fig. 2. Saving time value diagram

3.3 Increase in Properties Tax

The increase in the value of properties tax was obtained from land acquisition money used for construction on this project. The Air Putih-Selat Baru Road construction project will be 13,74 km long and 6 m wide, so it requires an area of 82440 m^2. With the price of Rp. 150,000 per meter of land, the amount of properties tax can be found using equation (9), which can be described as follows:

NJOP of land = land area × land price per square meters
NJOP of land = 82440 m^2 × Rp.150.000 = Rp.12.366.000.000 > Rp.1.000.000.000
Because the NJOP of land is more than Rp. 1,000,000,000, then the formula is used:
NJKP = 40% × (Rp.12.366.000.000 – Rp. 12.000.000) = Rp.4.941.600.000
PBB = 0,5% × NJKP
PBB = 0,5% × Rp.4.941.600.000 = Rp.24.708.000

So that the increase in properties tax is Rp.24,708,000 after land acquisition was carried out for the construction of Jalan Air Putih-Selat Baru.

3.4 Road Construction Costs

In road construction, there are a number of costs that must be estimated, starting from the beginning of road construction up to the life of the road plan. The road construction costs that are taken into account in this study are direct costs, indirect costs, and maintenance costs.
Direct costs consist of land acquisition costs and construction costs. For projects where the state is the owner, only 60–70% is included in the calculation of the construction cost investment analysis. This is because the goal of state project development is not based on financial gain but on promoting regional development or community welfare. And the construction cost used in this study is 65%. [2]
Maintenance costs include routine and periodic maintenance. Periodic maintenance costs are costs that start after 5 years of road operation, which is assumed to be 10% of construction costs, and routine maintenance is assumed to be 10% of periodic maintenance costs. Based on

the results of the calculation of the total costs, the costs required during construction until the end of the project period are estimated to reach Rp. 32,364,980,247.

3.5 Investment Feasibility Analysis

This analysis aims to determine the feasibility of the Air Putih-Selat Baru Road project from an investment perspective. The two indicators used in this research are the Benefit Cost Ratio (BCR) and Net Present Value (NPV). After adding up the total benefits and costs, you get a Present Value Benefit of Rp.828,801,122,556 and a present value cost of Rp.33,745,226,393. The results of these two values will then be used to calculate the NPV and BCR, which are as follows:

NPV = Rp.828.801.122.556 - Rp.33.745.226.393 = Rp.795.055.896.163 (positive value)
BCR = (Rp.828.801.122.556)/(Rp.33.745.226.393) = 25 (more than 1)

From the calculation results, the NPV value obtained is positive and the BCR has a value of more than one, so that Jalan Air Putih-Selat Baru can be declared "FEASIBLE" economically.

4. Conclusion

The results of the NPV and BCR analysis show that the planned construction of Jalan Air Putih – Selat Baru is economically feasible. This is shown from the positive NPV of Rp.795,055,896,163 and BCR has a value of 25 or a value of more than one.

Acknowledgements

The author would like to thank the Department of Public Works and Public Housing of Bengkalis Regency, which has provided assistance and support in the form of supporting data needed in this research.

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