Feasibility Analysis of Yogyakarta-Bawen Tollway from Economic and Financial Aspect

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ABSTRACT

Tollway is public roads that are part of the road network system and as national roads whose users are required to pay tolls. The implementation of tollway aims to increase the efficiency of distribution services in order to support increasing economic growth, especially in areas that have a high level of development. Central Java is an area that has high potential of tourism. One of those is Borobudur Temple. To increase this potential, a good road network is needed, one of which is the construction of the Yogyakarta-Bawen Tollway. The construction of the Yogyakarta-Bawen Tollway is expected to have great benefits, especially the connectivity of the Trans Java tollway which is supported by the Government. The project feasibility study is aimed to assess the carried-out project. The meaning of the assessment here is providing a recommendation whether the project is feasible to be carried out or should be postponed. In carrying out this feasibility study, various aspects will be involved to decide the feasibility of a project. The economic and financial aspects are aspects that need to be considered in the implementation of a project feasibility study. By carrying out this study, the amount of savings from VOC (Vehicle Operating Costs) and the time value when this tollway is operated, so that later on, it will be known, whether the construction of this tollway is feasible from the economic and financial perspective. The analysis results of the economic feasibility showed that the BCR value was 4.102 (BCR>1), the NPV was Rp8.824.453.255.243 (NPV> 0), while in the financial feasibility analysis showed the BCR value was 2.767 (BCR>1), NPV was Rp45.719.816.667.039, IRR of 11.24% (IRR>Interest rates), and Payback Period in the 18th year, 10th month, 21st day after the tollway is operated. Based on this analysis, it can be concluded that the Yogyakarta-Bawen Tollway is feasible from an economic and financial aspect.

INTRODUCTION

Central Java has great tourism potential as shown by the growth in the number of tourists visiting Central Java which has continued to increase in the last six years. The government will certainly continue to strive to increase economic growth on the tourism sector. The availability of a road network system that is able to improve relations between the two regions from both social and economic aspects is a key factor in increasing regional economic growth on each region. The construction of tollway is one example of a road network system that is expected to increase economic growth.

Tollways are public roads that are part of the road network system and as national roads whose users are required to pay tolls [1]. The construction of tollway is aimed to achieve equal distribution of existing infrastructure and distribution in Indonesia, as well as to increase economic growth and as a trigger for regional development because it is influenced by high accessibility. Tollways have the benefit of facilitating accessibility between activity centered in several areas. That way the economy in some areas can increase.

The Government of the Republic Indonesia has compiled a list of National Strategic Projects (NSP) stated in Presidential Regulation *(Perpres)* Number 58 of 2017 concerning Amendments to Presidential Regulation Number 3 of 2016 concerning Acceleration of Implementation of National Strategic Projects (*Perpres* 58/2017) and Regulation of the Coordinating Minister for Economic Affairs Number 5 of 2017 concerning Amendments to the Regulation of the Coordinating Minister for the Economic Affairs Number 12 of 2015 concerning Acceleration of Priority Infrastructure Preparation. Based on this regulation, the construction of the Yogyakarta-Bawen Tollway is one of the development projects of the National Strategy and Priority Infrastructure Projects. The construction of the Yogyakarta-Bawen Tollway is expected to have great benefits, especially on the connectivity of the Trans Java

tollway which is supported by the Government. For example, the trip from Semarang to Yogyakarta, which currently still has to be taken by going through the Semarang-Bawen tollway and continuing by going through the Bawen-Ambarawa road. Continued through Ambarawa-Secang, Secang-Magelang. Then pass through Magelang-Salam. Before finally end in Salam-Yogyakarta. Traveling from Semarang to Yogyakarta can be reached more quickly if the Yogyakarta-Bawen tollway is connected with the Semarang-Bawen tollway. Apart from that, the Yogyakarta-Bawen tollway will also be connected with several other planned tollways in the future, such as the Yogyakarta-Solo tollway, or the Yogyakarta-Kulon Progo tollway. The construction of the Yogyakarta-Bawen tollway has the potential to provide economic benefits to the community, especially for those who carry out activities in the Yogyakarta and Bawen areas. The construction of this tollway is expected to be able to increase regional potential such as industrial areas and tourism areas around Yogyakarta and Bawen, one of the examples is the Borobudur Temple.

The Yogyakarta-Bawen tollway has a length of approximately 72.85 km. It is planned that this tollway will have 2 lanes. The Yogyakarta-Bawen tollway is planned to be operated in 2024. This tollway consists of 6 sections, namely the Yogyakarta-SS Banyurejo Section with a length of 8.25 kilometers, SS Banyurejo-SS Borobudur with a length of 15.26 kilometers, and SS Borobudur-SS Magelang with a length of 8.08 kilometers. Then, SS Magelang-SS Temanggung is 16.64 kilometers long, SS Temanggung-SS Ambarawa is 22.56 kilometers long, and SS Ambarawa-Interchange (IC) Bawen stretches 5.21 kilometers. This tollway has a total investment of IDR 12.138 trillion. The estimation of concession period for this tollway is be up to 40 years. It is expected that the construction of the Yogyakarta-Bawen tollway will not suffer losses.

Currently, there is no feasibility study to assess the development of Yogyakarta-Bawen tollway project. The feasibility study of this tollway project is very important for the government, investors, and road users, because this feasibility study will review the traffic conditions of the existing road along Yogyakarta-Bawen, estimate the number of vehicle transitions from the existing route to the tollway, and determine the tollway's tariff, and you will get large savings on Vehicle Operating Costs (VOC) and time value. Therefore, this feasibility study can help and become material for evaluating whether the Yogyakarta-Bawen Tollway is feasible from an economic and financial perspective.

METHODOLOGY

On the stage of Methodology, the activities done to analyze the feasibility of Yogyakarta-Bawen Tollway from the economic and financial aspect was started by problem identification, followed by Literature Study, and then collecting secondary data which consisted of gross regional domestic product data, and the total number of population, road geometry data, and approximate daily traffic data, component prices for vehicle operating cost, investment value data and operational maintains, then followed by analyzing the performance of the road without project, trip assignment analysis using *Smock*, *JICA 1, Diversion Curve,* and *Davidson method.* Moreover, it will be followed by existing road performance analysis and the planned road with project, and then counting the savings of Vehicle Operating Costs (VOC) and time value, before finally analyzing the feasibility from economic and financial aspect using parameter such as *Benefit Cost Ratio* (BCR), *Net Present Value* (NPV), *Internal Rate of Return*(IRR) and *Payback Period* (PP) so that the savings obtained by the road users when passing the road can be seen, so as the profits that will be obtained by investors from the construction of Yogyakarta-Bawen Tollway.
Those stages are attached in the Diagram that can be found on Image 1.

DATA ANALYSIS

A. Traffic Data Analysis

The traffic data used was the secondary data which obtained from the National Road Implementation Center, namely real traffic counting data for vehicle which pass through Yogyakarta-Bawen National Road from both directions which are recorded every 15 minutes for 24 hours. After that, the peak traffic on that hour can be obtained. The unit of traffic on the peak hour can be converted into light vehicle units by multiplying it with the EKR (Light Vehicle Equivalence) value after which it is used to analyze the road performance.

B. GRDP Data Analysis and Total Population

The traffic growth on the following years will be counted with the growth rate of population, GRDP at constant price, and GRDP per capita of Semarang Regency and Yogyakarta Special Region as growth rate factors.

The growth of population is assumed to be equivalent to the growth of public transportation and buses, GRDP according to the business field at constant prices is assumed to be equivalent to the growth of goods and truck vehicles, while GRPD per capita is assumed to be equivalent with the growth of passengers' transportation type.

C. Data Collection

The performance of the road which is being analyzed is the road capacity, degree of saturation, free flow speed, travel speed, and travel time.

Road capacity is the maximum flow that can be maintained per unit hour that passes through a road segment under the existing conditions [2]. The road capacity which is being reviewed is assumed to be constant and there is no change in geometry during the life of the plan. The equation (1) is a formula to count the capacity of Yogyakarta-Bawen National Road and Yogyakarta-Bawen Tollway.

$$C = C_0 * FC_W * FC_{PA} * FC_{HS} \quad (1)$$

Description:
C = Road Capacity (lvu/hour)
C_0 = Base Capacity (lvu/hour)
FC_W = Traffic lane width adjustment factor
FC_{PA} = Directional separator adjustment factor

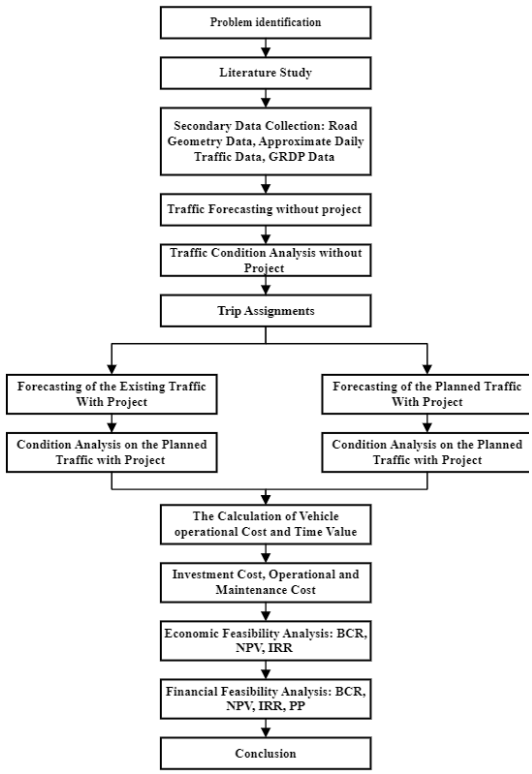

Figure 1. Flow Diagram

FC_{HS} = Adjustment factor due to the obstacles

After figuring out the capacity, the Degree of Saturation of the road can be counted. The Degree of Saturation will show whether there is a problem on the road or no. The calculation results on the Degree of Saturation of Yogyakarta-Bawen National Road are attached on Table 1.

The equation (2) is the formula to count the Degree of Saturation (Ds)

$$Ds = {}^{Q}/_{C} \quad (2)$$

Description:
Ds = Degree of Saturation
Q = Traffic (lvu/hour)
C = Road Capacity (lvu/hour)

The calculation results of the Degree of Saturation of Yogyakarta-Bawen National Road before the existence of Yogyakarta-Bawen Tollway can be seen from Table 1.

Beside the Degree of Saturation, another factor that need to be analyzed before the project (without project) is the free flow speed. The free flow speed can be described as the vehicle speed which is not affected by the existence of other vehicles [2]. The equation (3) is a formulation to count the free flow speed at Yogyakarta-Bawen National Road.

$$V_B = (V_{BD} + FV_{B-W}) * FV_{B-HS} * FV_{BFJ} \quad (3)$$

Description:
V_B = Field Condition KR Free Flow Speed (km/hour)
V_{BD} = KR Free Flow Speed on the observed road and alinement (km/hour)

Table 1. Degree of Saturation of National Road *Without Project in* 2024.

Road	Q (lvu/hour)	C (lvu/hour)	Ds
Yogyakarta-Banyurejo National Road	3.126	3.063	1,02
Banyurejo-Borobudur National Road	1.258	3.063	0,41
Borobudur-Magelang National Road	2.689	2.642	1,02
Magelang-Temanggung National Road	1.959	2.642	0,74
Temanggung-Ambarawa National Road	1.201	2.539	0,47
Ambarawa-Bawen National Road	2.036	2.624	0,77
Banyurejo-Yogyakarta National Road	3.157	3.063	1,03
Borobudur-Banyurejo National Road	1.321	3.063	0,43
Magelang-Borobudur National Road	2.888	2.887	1,00
Temanggung-Magelang National Road	2.350	2.642	0,89
Ambarawa-Temanggung Road	2.228	2.539	0,27
Bawen-Ambarawa National	2.228	2.642	0,84

FV_{B-W} = Adjustment factor due to the width of the road (km/hour)
FV_{B-HS} = Speed Adjustment factor for the side obstacles condition
FV_{BFJ} = Speed Adjustment factor due to the road function class

The equation (4) is used to count the free flow speed vehicle type KR at Yogyakarta-Bawen Tollway.

$$V_B = V_{BD} + V_{BL} \quad (4)$$

Description:
V_B = Field Condition KR Free Flow Speed (km/hour)
V_{BD} = KR base free flow speed on the observed road and alinement (km/hour)
V_{BL} = Adjustment factor due to the width of the road (km/hour)

For the other types of vehicle beside R free flow speed at Yogyakarta-Bawen Tollway is counted with the equition (5)

$$V_{B,KS} = V_{BD,KS} + V_{BL} * {}^{V_{BD,KS}}/_{V_{BD}} \quad (5)$$

Description:
V_{BD} =KR base free flow speed (km/hour)
$V_{BD,\ KS}$ =KS (Medium Vehicle) base free flow speed (km/hour)
$V_{B,KS}$ =KS (Medium Vehicle) free flow speed (km/hour)

After obtaining the free flow speed for each class of vehicles on all roads, therefore, the travel speed of a vehicle can be analyzed using the free flow velocity and Degree of Saturation (Ds) contained in 2014 PKJI. Then the travel speed for each vehicle can be counted with the equation (6)

$$T_T = {}^{L}/_{V_T} \quad (6)$$

Description:
T_T = Travel time (hour)
L = Road Length (km)

Table 2. The Results of *Trip Assignment* with *Diversion Curve Method*

Start	Destination	Not moving	Moving
Yogyakarta-Banyurejo National Road (Yogyakarta direction)	Section 1 Tollway Yogyakarta direction	50%	50%
Banyurejo-Borobudur National Road (Banyurejo direction)	Section II Tollway Banyurejo direction	50%	50%
Borobudur-Magelang National Road (Borobudur direction)	Section III Tollway Borobudur direction	50%	50%
Magelang-Temanggung National Road (Magelang direction)	Section IV Tollway Magelang direction	50%	50%
Temanggung-Ambarawa National Road (Temanggung direction)	Section V Tollway Temanggung direction	50%	50%
Ambarawa-Bawen National Road (Ambarawa direction)	Section VI Tollway Ambarawa direction	50%	50%
Yogyakarta-Banyurejo National Road (Banyurejo direction)	Section I Tollway Banyurejo direction	50%	50%
Banyurejo-Borobudur National Road (Borobudur direction)	Section II Tollway Borobudur direction	50%	50%
Borobudur-Magelang National Road (Magelang direction)	Section III Tollway Magelang direction	50%	50%
Magelang-Temanggung National Road (Temanggung direction)	Section IV Tollway Temanggung direction	50%	50%
Temanggung-Ambarawa National Road (Ambarawa direction)	Section V Tollway Ambarawa direction	50%	50%
Ambarawa-Bawen National Road (Bawen direction)	Section VI Tollway Bawen direction	50%	50%

V_T = Vehicle travel speed (km/hour)

D. Trip Assignment Analysis

Assignment trip analysis is carried out to determine the percentage of vehicle movements from Yogyakarta-Bawen National Road to Yogyakarta-Bawen Tollway when the tollway is operated, which is planned to be in 2024.

On this study, the calculation of trip assignment was carried out using Smock, Davidson, JICA 1, and diversion curve methods [3], however, on this study, diversion curve method was chosen by considering the most suitable results. Below are the calculation steps of Trip Assignment with Diversion Curve Method:

1. Determining the length of the existing road and the planned tollway, to calculate the amount of distance which can be decreased when going through the new road.
2. Determining the amount of travel time. In calculating the travel time of tollway, it is necessary to add the travel time due to the need of paying toll rates.
3. Determining the percentage (P) of vehicles that moved from National Road to the Tollway.

The results of Trip Assignment with Diversion Curve Method are shown on the Table 2.

E. With Project Road Performance Analysis

From the results of the trip assignment analysis, the numbers of vehicle in Yogyakarta-Bawen National Road and those which moved to Yogyakarta-Bawen Tollway. The percentage in Table 2 is used to obtain the amount number of vehicle which are still on the existing road or move to the tollway of each section. After that, the amount of Degree of Saturation (Ds) of Yogyakarta-Bawen National Road and Yogyakarta-Bawen Tollway can be calculated, the travel speed and travel time of the vehicles on the condition with project.

The Degree of Saturation (Ds) at Yogyakarta-Bawen National Road and Yogyakarta-Bawen Tollway in 2024 is shown in Table 3 and Table 4.

F. Vehicle Operational Cost Analysis

Vehicle Operational Cost is the total cost required to operate vehicle under certain traffic and road conditions for one type of vehicle per kilometer of traveled distance, in units of rupiah per kilometer [4]. On this study, *Jasa Marga* method is used to calculate the VOC.

The following is the assumption of the types and prices for the vehicle components for each class used in the study.

1). Class I (passenger car, microbus, and big bus)
   a. Vehicle Type : Mitsubishi X-pander
      a) Vehicle Price : Rp 208.010.000
      b) Fuel : Rp 7.650/liter (Pertalite)
      c) Lubricant : Rp 88.000/liter (TOP1 HP Plus)
      d) Tire Type : Bridgestone
      e) Tire price : Rp 616.165
      f) Maintenance cost : Rp 15.000/hour
   b. Vehicle Type : Izuzu ELF NLR 55B
      a) Vehicle Price : Rp 453.700.000
      b) Fuel : Rp 5.150/liter (biosolar)
      c) Lubricant : Rp 50.000/liter (cartago)
      d) Tire Type : Bridgestone
      e) Tire price : Rp 975.000

Table 3. Degree of Saturation of National Road *With Project* in 2024

Road	Q (lvu/hour)	C (lvu/hour)	Ds
Yogyakarta-Banyurejo National Road	2.543	3.063	0,83
Banyurejo-Borobudur National Road	1.022	3.063	0,33
Borobudur-Magelang National Road	1.693	2.642	0,58
Magelang-Temanggung National Road	1.068	2.642	0,40
Temanggung-Ambarawa National Road	880	2.539	0,34
Ambarawa-Bawen National Road	1.075	2.624	0,40
Banyurejo-Yogyakarta National Road	2.537	3.063	0,83
Borobudur-Banyurejo National Road	1.050	3.063	0,34
Magelang-Borobudur National Road	1.833	2.887	0,63
Temanggung-Magelang National Road	1.627	2.642	0,62
Ambarawa-Temanggung National Road	1.424	2.539	0,56
Bawen-Ambarawa National Road	1.424	2.642	0,54

f) Maintenance cost: Rp. 15.000/hour

c. Vehicle Type : Hino busA215
   a) Vehicle Price : Rp 654.750.000
   b) Fuel : Rp 5.150/liter (biosolar)
   c) Lubricant : Rp 50.000/liter (cartago)
   d) Tire Type : Bridgestone
   e) Tire price : Rp 2.250.000
   f) Maintenance cost: Rp 15.000/hour

2). Class II (2-axle Truck)

d. Vehicle Type : Hino dutro 130HD
   a) Vehicle Price : Rp 268.900.000
   b) Fuel : Rp 5.150/liter (biosolar)
   c) Lubricant : Rp 50.000/liter (cartago)
   d) Tire Type : Bridgestone
   e) Tire price : Rp 1.375.000
   f) Maintenance cost: Rp 15.000/hour

3). Class III (3-axle Truck)

Vehicle Type : Hino FL235JW
   a) Vehicle Price : Rp 702.000.000
   b) Fuel : Rp 5.150/liter (biosolar)
   c) Lubricant : Rp 50.000 (cartago)
   d) Tire Type : Bridgestone
   e) Tire price : Rp 2.925.000
   f) Maintenance cost: Rp 15.000/hour

4). Class IV (4-axle Truck 4)

Vehicle Type : Hino SG 285J ABS
g)
   a) Vehicle Price : Rp 715.000.000
   b) Fuel : Rp 5.150/liter (biosolar)
   c) Lubricant : Rp 50.000/liter (cartago)
   d) Tire Type : Bridgestone
   e) Tire price : Rp 2.925.000
   f) Maintenance cost: Rp 15.000/hour

5). Class V (5-axle Truck)

Vehicle Type : Hino FM 265 T/H
   a) Vehicle Price : Rp 917.000.000
   b) Fuel : Rp 5.150/liter (biosolar)
   c) Lubricant : Rp 50.000/liter (cartago)
   d) Tire Type : Bridgestone

Table 4. Degree of Saturation of Tollway *With Project in 2024*

Road	Q (lvu/hour)	C (lvu/hour)	Ds
Yogyakarta-Banyurejo Tollway	583	4.655	0,12
Banyurejo-Borobudur Tollway	236	4.655	0,05
Borobudur-Magelang Tollway	997	4.655	0,21
Magelang-Temanggung Tollway	892	4.655	0,19
Temanggung-Ambarawa Tollway	321	4.655	0,06
Ambarawa-Bawen Tollway	961	4.655	0,20
Banyurejo-Yogyakarta Tollway	625	4.655	0,13
Borobudur-Banyurejo Tollway	272	4.655	0,05
Magelang-Borobudur Tollway	1.055	4.655	0,22
Temanggung-Magelang Tollway	723	4.655	0,15
Ambarawa-Temanggung Tollway	804	4.655	0,17
Bawen-Ambarawa Tollway	804	4.655	0,17

e) Tire price : Rp 5.868.000
f) Maintenance cost: Rp 15.000/hour

Per year VOC can be calculated by VOC for each class of vehicles in one year multiplied by the length of the road and the volume of each class of vehicle, when added up will get the total VPC on a year.

G. Time Value Analysis

Time value is the amount of money provided by someone to be used (or saved) in order to save one unit travel time [5]. On this study, the time value was analysed by using Jasa marga Method as in the equation (8)

$$Time\ Value = Max\{(K * Base\ time\ value); Minumum\ time\ value\} \quad (7)$$

Based on the equation above, the time value on this study can be obtained on this study in 2020, as can be seen below:

Class I = Rp46.967,51/hour/vehicles
Class IIa = Rp70.850,49/ hour/vehicles
Class IIb = Rp52.627,10/ hour/vehicles

The time value is increased in every year due to the inflation, therefore, in order to obtain the time value in 2021 and the following year, the equation (9) is being used with2,49% increases on the inflation which is gained from the approximate number of inflations from the last 3 years as stated on the legal site of Indonesia Bank (www.bi.go.id).

$$P_n = P_0 (1 + i)^n \quad (8)$$

Description:

a. P_n = n-year of time value data sought (2021)
b. P_0 = Known year time value data (2019)
c. i = growth rate factor = inflation rate
d. n = (n-year) – (known year)

To calculate the value of time in every year, simply, it can be calcyated by the travel time (hour) multiplied by the time value (Rp/vehicle/time) and vehicle vilume per year.

H. Economic Feasibility Analysis

The economic aspect is an investment review from the

government or the community point of view who will get the benefit later on [6]. The parameters used in the analysis of this study include *Net Present Value* (NPV) and *Benefit Cost Ratio* (BCR).

The value of the benefits in the economic aspect is the sum of the VOC savings and the time value savings each year. Meanwhile, the costs used are investment costs and tollway operational and maintenance costs.

1. VOC Savings

VOC *without project* = VOC for all existing road sections in without project condition.
VOC *with project* = VOC for existing road with project + VOC for Yogyakarta-Bawen Tollway
VOC savings = VOC *without project* – VOC *with project*

In 2024, VOC savings of- Rp61.133.325.771,72 were gained

2. Time Value Savings

Time Value Savings =
Time value without project – Time value with project

In 2024, time value savings of Rp547.225.910.596,53 were obtained.

3. The Economic Feasibility

The calculation of economic feasibility is given in the form of cash-flow during the Tollway concession period (40 years). The amount of investment and maintenance costs are:

Investment cost = Rp 17.419.000.000.00
Maintenance cost = Rp 308.634.594.929,95
Interest rate = 4,61%

Then the calculation is conducted until it showed a result of:

a. Benefit = Rp34.704.474.672.734
b. Cost = Rp8.461.021.417.491

So that the BCR and NPV values are obtained as follows:

a. BCR $= \frac{\text{Rp34.704.474.672.734}}{\text{Rp8.461.021.417.491}}$
= 4,102 (BCR >1)
b. NPV =Rp31.100.543.909.697 – Rp25.186.562.365.831
= Rp8.824.453.255.243 (NPV >0)

Therefore, it was concluded that the Yogyakarta-Bawen Tollway is feasible from an economic aspect.

I. Financial Feasibility Analysis

Financial feasibility analysis is the basis for determining the financial resources required for a certain level of activity and expected profit. Financial analysis aims to find out the estimation of cash flow funding, so that it can be seen whether the business is feasible or not [7].

The financial feasibility parameters used in this study are Benefit Cost Ratio (BCR), Net Present Value (NPV), Payback Period, and Internal Rate of Return (IRR).

The value of benefits in the financial aspect is the annual toll fee revenue. Meanwhile, the costs used are investment costs and tollway operational and maintenance costs.

1. Tollway Tariff Revenue

Yogyakarta-Bawen Tollway with a road length of 75 km, is planned to operate in early 2024 assuming the initial tariff per vehicle km is as follows:

a. Class I = Rp. 1.178/km/vehicle
b. Class II = Rp. 1.7676/km/ vehicle
c. Class III = Rp. 1.767/km/ vehicle
d. Class IV = Rp. 2.363/km/ vehicle
e. Class V = Rp. 3.363/km/ vehicle

According to the per kilometer toll rate, the toll rate for the Yogyakarta-Bawen Tollway in each section can be calculated by multiplying per kilometer rate by the toll road length. Meanwhile, revenue per year is obtained by multiplying the toll revenue per vehicle by the volume per year.

2. Financial Feasibility

The calculation of financial feasibility is given in the form of cash flow during the Tollway concession period (40 years). The amount of investment and maintenance costs are:

Investment cost = Rp 17.419.000.000.00
Maintenance cost = Rp 308.634.594.929,95
Interest rate = 4,69%

Then the calculation is conducted until it showed a result of:

c. Benefit = Rp71.599.838.084.531
d. Cost = Rp25.880.021.417.491

So that the BCR, NPV, IRR, and Payback Period values are obtained as follows:

a. BCR = Rp71.599.838.084.531/ Rp25.880.021.417.491
= 2,762 (BCR >1)
b. NPV = Rp71.599.838.084.531- Rp25.880.021.417.491
= Rp45.719.816.667.039 (NPV >0)
c. IRR = 11,24% (IRR > Interest Rate)
d. PP = Year of 21st, month of the 6th, day of the 21st (before the concession period ends)

Therefore, it can be concluded that the Yogyakarta-Bawen Tollway is feasible from a financial aspect.

CONCLUSIONS AND SUGGESTIONS

A. Conclusions

Based on the analysis of traffic volume calculations in the without project condition, the Degree of Saturation (Ds) was obtained on the Yogyakarta-Bawen National Road in 2024 prior to the construction of the Yogyakarta-Bawen Tollway on the first year, shown in Table 1.

Based on the analysis of traffic volume calculations in with project conditions, the Degree of Saturation (Ds) obtained on the Yogyakarta-Bawen National Road in 2024 after the construction of the Yogyakarta-Bawen Tollway on the first year, shown in Table 3 and Table 4.

Based on the calculation results and feasibility analysis from the economic aspect, the following results are obtained:

a. *Present worth benefit* = Rp34.704.474.672.734
b. *Present worth cost* = Rp8.461.021.417.491

Therefore, the results obtained are:

c. BCR = 4,102 > 1 (Feasible)
d. NPV = Rp8.824.453.255.243> 0(Feasible)

From the results of feasibility analysis, it can be concluded that the construction of Yogyakarta-Bawen

Tollway is feasible from economic aspect.

Based on the calculation results and feasibility analysis from the financial aspect, the following results are obtained:

a. *Present worth benefit* = Rp71.599.838.084.531
b. *Present worth cost* = Rp25.880.021.417.491

Therefore, the results obtained are:

c. BCR = 2,762 > 1 (Feasible)
d. NPV = Rp45.719.816.667.039 > 0 (Feasible)
e. IRR = 11,24% > Interest rate (Feasible)
f. PP = Year of 21st, month of the 6th, day of the 21st (before the concession period ends)

From the results of feasibility analysis, it can be concluded that the construction of Yogyakarta-Bawen Tollway is feasible from financial aspect.

B. Suggestions

The results analysis on this study shown that Yogyakarta-Bawen Tollway is feasible from the economic and financial aspect, therefore, the construction of the tollway should be done fast to solve the existing problems.

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