Financial feasibility study of batching plant investment on Sigli – Banda Aceh highway construction project

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Abstract. The construction of the Sigli - Banda Aceh highway project as long as 74 km stretches across two Regencies namely Pidie and Aceh Besar, generating the large demand for ready mix concrete. It is required the investors in providing ready mix concrete service and wishing adequate mutual exchange from each capital invested. The problem in this study is to investigate how the feasibility and business opportunity of a batching plant investment from its financial aspects. This study aims to determine the financial feasibility and business opportunities on batching plant investment of ready mix concrete at Sigli – Banda Aceh highway project. In this research data was collected and processed to obtain cash flow and Depreciation. The method used to determine the financial feasibility is by obtaining its investment valuation analysis from data processing. Those are Net Present Value (NPV), Annual Equivalent (AE), Internal Rate of Return (IRR), Benefit-cost ratio (BCR) and Payback Period (PBP). From the calculation, it is obtained that the profit obtained from NPV is IDR 12,145,111,515.27, the profit obtained from AE is IDR 3,818,104,138.07, IRR is above 40%, BCR is ≥ 1 as 1,10, PBP is IDR 15,104,717,354.22 in the second year or equal to the investment period. It can be concluded that batching plant investment on Sigli – Banda Aceh highway construction project is feasible to be constructed and become a business opportunity for the investors.

1. Introduction

A business feasibility study has many advantages that according to [1], it is useful for the investor, creditor, company management, government, community, economic development goal. There are several phases of study that must be carried out consisting of finding project ideas, study phase, project evaluation phase, sorting feasible proposal, planning phase of business project implementation, and business project implementation phase. There are several aspects according to [1-4] requiring to be studied in this business feasibility project including market aspect, technical aspect, and financial aspect. The financial aspect is the aspect used to assess the overall company financial [2]. According to [5] and [6], the assessment of the financial aspect consist of investment budget and production cost.

In accordance with its commercial characteristics, investors want adequate mutual exchange from any capital that has been invested. According to [7] and [8], investment in a company is the use of sources
expected to achieve the return profitable in the future. It means that investing the amount of capital to run the business or project in the future expecting the capital return profitable in the future. According to [9], investment is the capital funding for one or more assets owned in the long period to receive the profit in the future.

The construction of Trans-Sumatra Highway is carried out to provide the benefit especially economic growth in Sumatera, including increasing employments, increasing tax income contribution of the state, facilitating the development of surrounding areas, and improving property value and potential housing construction [10, 11]. The construction of Sigli – Banda Aceh Highway is one of 8 (eight) road sections of Trans-Sumatra Highway which started at the end of 2018. This construction provides many opportunities for entrepreneurs and investors in the construction sector both local and national levels. The requirements of ready mix concrete in this project which reaches 941,272 m$^3$ make investors interested in investing in ready-mix concrete production.

As stated earlier, investment decision making in a project or business sector such as the construction of the batching plant for ready mix concrete must be based on a financial feasibility study. Thus this research aims to find out financial feasibility and business opportunity in batching plant investment for ready mix concrete. The review is limiting only to the batching plant planning.

2. Data and methodology

2.1. Location
The construction of the batching plant is located on Indrapuri Sub District, at Km 49 of highway project location which is near the quarry. Data related to the factory and ready mix concrete products is obtained by observing the factory and direct interviews with the owner of the ready mix concrete batching plant in Aceh Besar District consisting of PT. Lhoknga Beton. Data related to the highway project is obtained directly from the project owner namely the project location map, the data needs of the ready mix concrete volume, work method information, project implementation time, ready mix concrete specifications.

2.2. Cash flow
According to [12], cash flow is cash in and cash out calculated for the current period. The cash flow period is determined at various time intervals starting from daily, weekly, monthly, quarterly, and annually depending on the data aggregation level required. The cost is cash out and the benefit is cash in.

2.3. Depreciation
According to [13], depreciation is an asset value decrease due to the time period. The asset is divided into the current asset and fixed asset, but the asset of depreciation is only fixed asset including building, machine/equipment, fleet, and others. The depreciation in this study is calculated by using the Straight of line Depreciation Method as the following equation:

$$ SLD = \frac{1}{N} (I - S) $$

Description:
- $SLD$ = The total of depreciation per annual.
- $I$ = The investment (initial asset value)
- $S$ = The residual asset value of final production period
- $N$ = The asset period of depreciation
2.4. **Data processing**

Data processing is performed on the financial/financial aspects as follows:

a. Determine the amount of sales value or revenue target, obtained from the multiplication between the volume of ready mix concrete with the unit price of sales for each type of concrete.

b. Determine the amount of the cost of production, obtained from the multiplication of the volume of ready mix concrete with the cost of production for each type of concrete.

c. Determine the amount of operational and maintenance costs during the investment period.

d. Determine the investment value plan and the fund.

e. Determine a bank loan return plan for investment costs.

f. Depreciation calculation using Equation (1).

g. Develop the plan of cash in and cash out.

2.5. **Investment assessment**

Investment is a long period capital fund realized that the investment will be followed by other periodic expenditures required to be prepared. The expenditures consist of operational cost, maintenance cost, and other costs that cannot be avoided [14].

The investment opportunity management is developed by using the method in analyzing the project. The method is investment criteria. An investment criterion is used in determining a project proposal after evaluation. All criteria use a comparison or relation between all benefits and all costs both in quality and quantity [15, 16]. Investment assessment analysis is carried out on five assessment criteria including Net Present Value (NPV), Annual Equivalent (AE), Internal Rate of Return (IRR), Benefit-cost ratio (BCR) and Payback Period (PBP).

2.6. **Net Present Value (NPV) method**

NPV is a method used in calculating the net value at present. The present assumption explains the initial time of calculation in accordance with the evaluation time carried out in the annual period of zero (0) of the investment flow cash calculation [13, 17, 18]. The cash flow of benefit calculation is Present Worth of Benefit (PWB), while the cash-out calculation is Present Worth of Cost (PWC), so NPV is the calculation of PWB minus PWC (PWB – PWC).

If: NPV > 0 meaning that investment will be profitable (feasible).
NPV < 0 meaning that investment will not be profitable (unfeasible)

2.7. **Annual Equivalent (AE) method**

The concept of the AE Method is opposite to NPV Method. The cash flow of the NPV method is in the present position. Meanwhile, the cash flow of the AE Method is distributed equally in each period of total investment both cash in and cash out [13].

The equal distribution output of cash in produces mean benefits per annual called Equivalent Uniform Annual of Benefit (EUAB). While equal distribution output of cash out is called Equivalent Uniform Annual of Cost (EUAC). EUAB is reduced by EUAC called Annual Equivalent (AE).

If: AE > 0 meaning that investment will be profitable (feasible).
AE < 0 meaning that investment will not be profitable (unfeasible)

2.8. **Benefit-cost ratio (BCR) method**

BCR is one of the methods often used in the initial evaluation phases of investment planning or as additional analysis invalidating evaluation inputs carried out using other methods. BCR method emphasizes the comparison value between benefit aspect received and cost and lost aspects assumed of the investment [13, 19].
If: \[ BCR \geq 1 \] meaning that investment will be profitable (feasible).
\[ BCR < 1 \] meaning that investment will not be profitable (unfeasible)

2.9. **Internal Rate of Return (IRR) method**
Different from the previous method in which the equivalent value of cash flow is found out by using interest rates as the main determining factor, IRR Method will find out the interest rate when NPV is zero [13]. The simple logic explains how the cash flow ability can return the capital and how many obligations it must have complied with. This ability is IRR, while the obligations are Minimum Attractive Rate of Return [20, 21].

2.10. **Payback Period (PBP) method**
Payback Period Method aims to find out how long the period of the investment will be returned to break-even point condition. PBP Method is used by inserting interest factors in the calculation or named as a discounted payback period. To find out whether it is feasible or not, the return period (k) must lower than the investment period (n) [22].

3. **Results and discussion**

3.1. **Analysis of market price**
The market price targeted can be observed from the projection of benefits planning (selling price). The annual benefit is received from the multiplication between the design volume and the selling price of each concrete quality qualification. So it is received that the benefit design of 2019 is IDR 94,574,079,285.71 and 2020 is IDR 47,747,359,642.85. Total benefit is IDR 140,480,158,928.57.

3.2. **Production cost**
The planning of production cost is received from the multiplication between the volume and the basic unit price of each concrete quality qualification. So the multiplication of each concrete quality is received that is the production cost of 2019 is IDR 80,157,807,392.85 and 2020 is IDR 40,355,095,696.42. The total production cost is IDR 119,408,135,089.28.

3.3. **Operational and maintenance costs**
Operational and maintenance costs become the routine costs expended monthly during the production period. In this study, operational and maintenance costs of batching plant of ready mix concrete calculated are head of batching plant, production manager, financial administration, operator of batching plant, operator of the loader, operator of the laboratory, mechanic, workers, security, water, and electricity. The total monthly expenditure is IDR 57,500,000.00. So the operational cost required in 2019 is IDR 575,000,000.00 and in 2020 is IDR 690,000,000.00, the initial license cost is IDR 100,000,000.00. The maintenance cost required in 2019 and 2020 are IDR 160,000,000.00 of each.

3.4. **Investment cost**
The planning of investment cost is IDR 15,185,150,000.00, and 30% of the investment cost is funded by its own capital. While 70% is funded from bank loan capital using effective interest loan type as 7% per annual or 0.58% per month and the return period is 22 months.

The equipment types invested are 1 unit batching plant, 8 units mixer truck of 8m³, 959 hours of concrete pump, 1 unit wheel loader, 1 unit weighing scale, and 1 unit strength test. While the building types are land lease for 3 years, 1 unit temporary office, 1 unit laboratory, 1 unit employee mess, and 1
unit temporary fence. The total capital cost is IDR 4,555,545,000.00, and total bank capital is IDR 10,629,605,000.00 from total investment requirement as IDR 15,185,150,000.00.

3.5. Investment loan return
The investment capital is funded from bank loan using an effective interest loan system which is 70% of the total capital required; the bank loan return consists of the main loan return and loan interest return. The loan interest is 7% per annual or 0.58% per month and the interest return is 22 months. The monthly main repayment is received from the output of the main loan divided by the return period. The amount of interest repayment is calculated by interest percentage per annual or per month multiplied by the remaining main loan in the current period.

The total interest of 2019 is IDR 493,229,777.46, and in 2020 is IDR 219,839,557.95. The total interest is IDR 713,069,335.41. The loan for investment cost is IDR 10,629,605,000.00, and if it uses the bank loan, the investment cost becomes IDR 11,342,674,335.42.

3.6. Depreciation
The depreciation as the set value of batching plant equipment and other supporting tools invested by new purchases must be calculated by the production period completion or investment period. The investment value of equipment purchases using the Straight of line Depreciation (SLD) Method is achieved by the equipment depreciation in the second year of investment period which is IDR 490,133,333.33.

3.7. Cash flow
The components of cash in and cash out are managed in one cash flow. It is summarized that investment cost and license cost planned in 2019 which is IDR 15,285,150,000.00 become cash out that must be expended at the beginning of the year when starting the development of batching plant. At the end of 2019, it is planned the cash in of business income which is IDR 94,574,079,285.71, and cash out of production cost, operational and maintenance costs, and loan interest return which is IDR 81,386,037,170.31. Meanwhile, at the end of 2020, it is planned cash in of business income which is IDR 47,747,359,642.86, and the equipment remaining value recorded as cash in which is IDR 10,971,733,333.33. The production cost, operational and maintenance costs, and loan interest return in 2020 is IDR 41,424,935,254.38 recorded as cash out.

3.8. The assessment of investment criteria
The benefit in 2019 and 2020 and the remaining value of the investment in the second year are recorded as the Present Worth of Benefit (PWB). While investment cost, license cost, production cost, operational and maintenance costs, and loan interest return are recorded as Present Worth of Cost (PWC). The calculation of NPV on two years production of investment period by using the coefficient value of 7% interest table is received PWB value as IDR 139,674,190,305.83 and PWC value as IDR 127,589,167,706.04. NPV value is IDR 12,085,022,599.79 > 0. It means that the investment is feasible.

The benefit in 2019 and 2020 and the remaining value of the investment in the second year which is recorded as Equivalent Uniform Annual of Benefit (EUAB) is achieved IDR 77,255,113,488.98. While investment cost, license cost, production cost, operational and maintenance costs, and loan interest return which are recorded as Equivalent Uniform Annual of Benefit (EUAC) is achieved IDR 73,773,521,509.40. The calculation of AE on two years' production of investment period by using the coefficient value of 7% interest table is received AE value as IDR 3,481,591,979.57 > 0. It means that the investment is feasible.

Benefit-cost ratio is the concept emphasizing the comparison value between benefit aspect received and cost and lost aspects assumed of the investment. BCR Analysis is carried out in the present so PWB and PWC are used to analyze BCR. BCR value is the output of the PWB value divided by PWC value. BCR is
1.10. If BCR analysis is carried out manually, the values of EUAB and EUAC are used to find out BCR. BCR value is the output of EUAB value divided by EUAC value. BCR is 1.05 ≥ 1. It means that the investment is feasible.

Internal Rate of Return is the concept to find out equivalent value by using interest rates as the main determinant of the interest when NPV value is zero. Because the NPV value of 7% interest is still very much as IDR 12,085,022,599.79, it needs to find out NPV value which is close to or equal to zero. By using a maximum interest of 40%, it is received the NPV value as IDR 2,709,954,589.78. Thus NPV is higher than zero and it is feasible.

For PBP Method, cash in and cash out on two years’ production of investment period by using the coefficient value of 7% interest table has not resulted in return value in the first year of the investment period. The return period is in the second year of the investment period as IDR 15,076,885,666.18.

4. Conclusion
The investment planning in the batching plant business of ready mix concrete must notice market price as the target of concrete produce selling during the investment period. The market price calculated in batching plant planning of plant ready mix concrete on Sigli – Banda Aceh Highway Project reviewed is IDR 140,480,158,928.57 during two year investment period planned.

The production cost of the market planned is IDR 119,408,135,089.28. The production cost intended is the material cost (fine aggregate, coarse aggregate, and cement), the operational cost of batching plant equipment including loader and transportation cost of ready mix to the location (consist of fuel and driver salary). While the operational cost during the investment period is IDR 1,585,000,000.00 and the maintenance cost is IDR 320,000,000.00.

The initial investment value required is IDR 15,185,150,000.00 received from its own capital as 30% and bank capital loan as 70%. The capital loan return is planned for two years by bank interest of 7% per annual. The bank interest return during the two years period is IDR 713,069,335.41. The depreciation of the batching plant and its supporting equipment during the investment period is IDR 490,133,333.33.

The investment feasibility study by using cash flow during the investment period planned is in 2019 and 2020. The output of the study concludes that investment criteria value is NPV as IDR 12,145,111,515.27 higher than zero meaning the investment is feasible; AE as IDR 3,481,591,979.57 which is higher than zero meaning the investment is feasible; BCR as 1.10 which is higher than 1 meaning the investment is feasible; IRR with NPV value which is zero is higher than 40% of interest meaning that the investment is very feasible; and PBP return period lower than investment period meaning that the investment is feasible.

The benefits of two years investment period are mostly in the remaining equipment value of the investment. Therefore, the equipment economic period is still long and it is possible to continue other businesses in the following years. Finally, it can be concluded that Sigli – Banda Aceh Highway Construction Project becomes the opportunity for the investors and entrepreneurs to invest in batching plant procurement to serve the requirement of ready mix concrete during the project construction.

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