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Construction of Asphalt Mixing Plan In Coastal Area in Berau District-East Kalimantan Indonesia

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ABSTRACT
In the era of regional autonomy, Improving the development of road infrastructure in a proportional area is one of the main priorities, so that rural areas can catch up from urban areas. Feasibility Study of Development of Asphalt Mixing Plant at Jalan Poros Tanjung Redeb - Talisayan (KM.78) that is in coastal area,Tabalar Village Tubaan Subdistrict of Berau Regency is conducted to know the development project can be built when viewed from technical and economical aspect besides also analyze the sensitivity with 4 kinds of economic condition . The result of analysis shows that Asphalt Mixing Plant Development in Tabalar Village, Tuba Sub District, Berau District is feasible to be implemented with assumption of 15 years investment period. Based on the Net Present Value (NPV) calculation of 5,548,989,265.00 (positive) Internal Rate of Return (14.89%> 12%), Benefit Cost Ratio (2,242> 1) with Pay Back Period is 6 years but from the analysis of the sensitivity of the state of the economy that should not happen ie Conditions Interest rate rise 20% due to uncertainty conditions of national and international economy
Keywords: autonomy, infrastructure, technical, economical, feasible.

I. INTRODUCTION

Berau Regency is one of the development gate areas in East Kalimantan Province, located north of the capital of East Kalimantan Province-Indonesia and is also a coastal area and coastal coast with natural resources, where the mainland consists of a cluster of hills that there are almost all districts, especially Kelay District which has limestone hills that cover almost 100 km2. While in the district of Tubaan there are hills known as Bukit Padai.

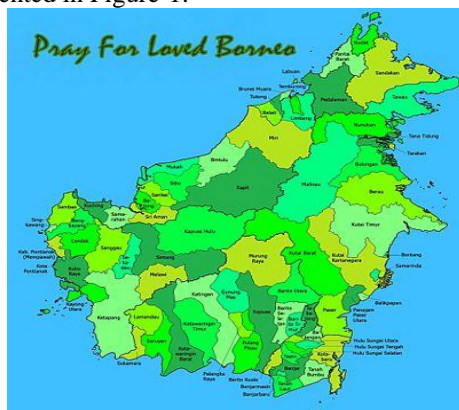The location map of Kalimantan Island is presented in Figure-1.

Figure-1. Kalimantan Island Map [1]

Berau District is one of the districts in East Kalimantan's rapid development. Its area is

mountainous and consists of beautiful islands. Berau District position seen from East Kalimantan region presented in Figure-2.

The islands located in Berau District have potential to develop tourism. Many infrastructure development are needed to support the development of tourism object.
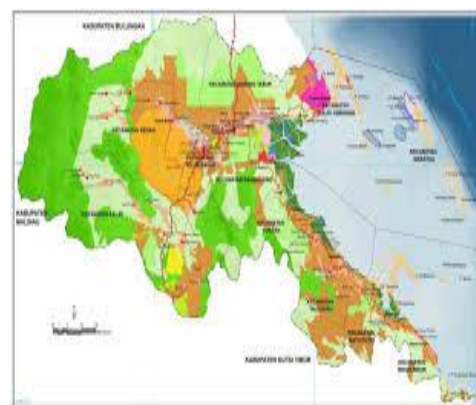

Figure-1. Berau District Map [1]

This condition becomes a challenge and development obstacle caused by transportation problem, that is the distance of transportation takes about 5 hours journey overland with distance of 180 Km. During this development in the coastal area is still lagging when compared with the mainland area

which is one of the causes due to the limited facilities and transportation infrastructure in the coastal area.

In an effort to overcome these problems, the idea came up to build hotmix (Asphalt Mixing Plan) manufacturing place in the coastal area itself, but it is still doubtful of its economic value. Therefore, it is necessary to have a special research to assess the feasibility of Asphalt Mixing Plan development in coastal areas.

II. LITERATURE REVIEW

Asphalt has been used as a construction material from the earliest days of civilization, but though it has long been used as a waterproofing material in shipbuilding and hydraulics, its use in roadway construction is much more recent [2].

Hot mix asphalt (HMA) are used for roads and motorways pavement laying. They are producing in central or mobile asphalt mixing plants. These technological equipment are named asphalt mixing plant (AMP). They are of three types: Batch plant, Drum mix plant and Continuous mixing plants. [3].

To find out whether AMP development can be implemented in the coastal areas, the feasibility analysis should be performed.

As the name implies, a feasibility study is an analysis of the viability of a business idea [4].
A feasibility analysis is an effective analytical tool that can be used to evaluate investments from various perspectives, e.g. technical, social, legal, financial, market, and organizational. Financial feasibility is often a predominant factor in feasibility analysis, as most investments are not realized if they do not generate profit for the venture owners. [5].

In the feasibility analysis should be reviewed tangible cost and intangible cost. The tangible costs are much easier to calculate, but the intangible ones are very difficult to evaluate and sometimes impossible. Thus, most literature suggests that we could either leave the unmeasurable intangibles or adopt non-market approaches to reveal their values, but we should further extend the categorizations of costs and benefits we have learned so far in future research. [6].

The technical feasibility assessment is focused on gaining an understanding of the present technical resources of the organization and their applicability to the expected needs of the proposed system. It is an evaluation of the hardware and software and how it meets the need of the proposed system. [7].
In general, a project feasibility study will involve three aspects, namely:
1. The economic benefits of the project for the project itself (financial benefits). Which means whether the project is deemed quite profitable when compared to project risk.
2. The economic benefits of the project to the State where the project is implemented (national economic benefits). Which shows the benefits of the project for a country's macro economy.
3. The social benefits of the project for the communities surrounding the project.

The purpose of the feasibility study is to avoid too large investment investments for activities that turn out to be unprofitable. Of course, this feasibility study will cost money, but the cost is relatively small compared to the risk of failure of a project involving large amounts of investment.
The things that need to be known in the feasibility study are:
1. The scope of project activities
   Here we need to explain / specify what field of the project will be operated. If for example the project is the establishment of AMP this is a certain stage only.
2. How the project activity is done
   Here it is determined whether the project will be handled on its own or will be submitted to (some) other parties. Who handles the Project.?
3. Evaluation of the aspects that determine the success of the entire project.
   Here we need to identify the key factors of success of this kind of business, the technique that can be used is to identify "underpinning" for this kind of business.
4. Means required by the project
   Concerning not only the needs such as: materials, labor and so on but including also supporting facilities such as: highway, transportation and etc.
5. The results of the project activities, as well as the costs - costs that must be borne to obtain these results.
6. The beneficial or non-existence of the project.
   This is often referred to as economic and social benefits and sacrifices.
7. Step - plan step to establish the project, along with the schedule of each activity, until the investment project is ready to run.

While the Asphalt Mixing Plant (AMP) component consists of :
1. Cold Bin
   This component serves as a container for each type of aid (rough, medium, smooth) in original condition.
2. Cold feed Gate
   This component is a cold bin opening door of each type of rock that large or small openings can be arranged in accordance with the number of compositions of each type required by mixed planning.

3. Cold Elevator
   This tool is a spinning chain bowl carrying a mixture of rock out of the cold bin (cold feed gate), then forwarded to the dryer.
4. Dryer
   This tool serves as a desiccant and rock heater to the desired temperature.
5. Dust Collector
   This tool serves to collect dust or ash that fly from rocks because of the heating process that comes out of the burner chimney that causes air pollution.
6. Exhaust Stock
   This tool is a burning chimney.
7. Hot Elevator
   This tool serves to transport hot rocks from the dryer and then inserted into the screening unit (vibrating screen).
8. Screening Unit
   Is a filter-shaped cleaning tool that serves to separate the various types of rock sizes each faction will directly enter the shelter (bins) in accordance with the size.
9. Hot Bin
   This tool serves as a shelter for each of the rock fraction sites according to the planned mixture composition. In this place each rock fraction is re-mixed before it is inserted into the pugmil.
10. Weight Box
    This tool serves to stir the mixture of rock and asphalt, in which the composition of the mixture in accordance with the planned.
11. Mixing Unit or Pugmi II
    This tool serves to stir the mixture of rocks and asphalt, where the composition of the mixture in accordance with the planned.
12. Mineral Filler Storage
    This tool serves to accommodate the mineral filler in its original form before use.
13. Hot Asphalt Cement Storage
    This tool is an asphalt storage tank or asphalt heater, which is heated according to the desired temperature.
14. Asphalt Weight Bucket
    This tool as a place / container asphalt hot shelter through the weighing tool which is sprayed into the pugmil that has contained rocks.

Market Aspect
        Data required in the analysis of market aspects of the proposed project, among others:
1. Past and present consumption / demand trends, and influential variables that can be used as the basis for formulating future market forecasting models.
2. Supply of past and present similar products and future trends including the possibility of expanding the product of the competitor company and the limits affecting it.
3. Import and export conducted by the country concerned for the proposed product in the project feasibility study.
4. Competition structure that is knowing the position of the project in the structure of competition, including within it can be found out the cost structure of a competitor company in producing and marketing its products.
5. Consumer behavior, motivation, habits and preferences.
6. Selection of "marketing efforts" made and selection of priority scale and marketing mix available.
        In measuring the market opportunity of the planned product it is necessary to take into account the shape and nature of the product produced. If the idea of a planned project is of national standard then the market opportunity is also calculated on a national basis. The method used in measurement and demand forecasting is Linear Trend. Trend equation by using least squares method is described as follows:

$$Y = a + b$$

Where :
Y = Estimated value
a,b = Value of constant and coefficient in a trend equation

$$a = \frac{\sum\limits_{i=1}^{n} Y_1}{n}$$

$$b = \frac{\sum\limits_{i=1}^{n} X_1 Y_1}{X^2}$$

X   = A series of years

Technical Aspects of the Project
        The technical aspect is an aspect pertaining to the construction process of the completed project.
1. Project Location
   The location of the project for an industrial company includes two terms ie the location and land of the AMP and the location not the AMP. The second term refers to the location for activities that are directly unrelated to the production process, which includes the location of the administrative office building and marketing.
2. Area of Product
   Production area is the product that should be produced to achieve optimal profit. This understanding is different from the broad understanding of the company that the area of production is only one measure of the size of the company.

Management Aspect

The various variables affecting the factors are identified in the previous section. Variables within each group are interrelated and intrarelated. A variable in one group can influence a variable inthe others, and vice versa. [8]

1. Project Development Management
    The project development plan is to prepare the project completion plan on time. In other words It must be coordinated various activities and resources.
    Steps in preparing the project completion plan are:
a. Designing the execution of a project is to divide it into various activities. Based on this division also can be allocated resources and time.
b. Planning the implementation of the project (ie until the project can perform commercial production) is to determine the schedule / schedule of activities within the project.
2. Management in Operations
    Management in operations aims to organize or make steps in the operation of the company. Tasks performed in operations management are:
a. Create a work completion plan by compiling a Gantt Chart.
b. Assess the cost required to complete the job.
c. Assess the need for "man hours" to complete the job and so on.

Financial Aspect

1. Funding Need
    Once it is known how much funding will be required and when the funds will be needed for the investment. The main sources of funds are:
a. Own capital paid by the owner of the company.
b. Common stock or preferred stock (which is also its own capital) derived from the issuance of shares in the capital market.
c. Bonds, issued by the company and sold in the capital market.
d. Bank Credit
e. Leasing
f. Project finance is a form of credit whose payments are based on the project's ability to pay off its financial obligations.

Project Cash Flow

Cash flow associated with a project can be grouped into 3 parts:

1. Initial cash flow
    The cash flow patterns associated with investment spending should be identified, such as land payments, handling, manufacturing and equipment.
2. Operational cash flow
    The determination of how much operational cash flow is every year that is the starting point for

the profitability assessment of the proposed investment.
3. Cash flow terminal
    Cash flow terminals are generally self-contained from the cash flow of the residual value of the investment and the extraction of working capital.

Investment Appraisal Criteria

The cash flows used in the NPV rule of capital budgeting should be different from the cash flows used in the Payback Period rule of capital budgeting. This is because the NPV rule involves discounting whereby the cost of debt and equity are accounted for, however the Payback Period rule does not involve discounting and therefore the cost of debt and equity should be accounted for in the cash flows. [9]

Assessments that can be used in assessing investment or project proposals, among others :

1. The concept of time value of money
a. Compound interest
    Compound interest, often also referred to as flowering interest, indicates that interest from a loan principal.
b. Present value
    The present value indicates how much money is currently valued for a certain value in the future.
2. Payback Method
    This method measures how quickly the investment can return. The unit of results is the unit of time (month, year and so on). If this payback period is shorter than what is required, then the project is said to be profitable.

$$PBP = T_{p-1} + \frac{\sum_{i=1}^{n} \overline{I}_I - \sum_{i=1}^{n} \overline{B}_{icp-1}}{\overline{B}_p}$$

Where :
PBP   =   Pay Back Period
T_{p-1} =   Year before PBP

$\overline{I}_I$ =   The amount of investment that has been discounted

$\overline{B}_{icp-1}$ =   Number of benefits that have been discounted before pay back period

$\overline{B}_p$ =   The amount of benefits on Pay Back Period

3. Net Present Value Method
    This method calculates the difference between the present value of the investment and the present value of revenue - net cash receipts (operational and min-petal cash flow) in the future. If the present value of income - future net cash receipts is greater than the present value of the

investment, then the project is profitable so it is accepted.

$$NPV = \sum_{i=1}^{n} NB_i \, (1+i)^{-n}$$

NB   = Net Benefit
I   = Discount factor
n   = Year (Time)

4. Internal Rate of Return Method

This method calculates the interest rate that equates the present value of the investment with the present value of revenue - net cash receipts in the future. If the interest rate is greater than the relevant interest rate (the required rate of return), then the investment is profitable.

$$IRR = i_1 + \frac{NPV_1}{(NPV_1 - NPV_2)} \, (i_2 - i_1)$$

Where :
i_1 =   resulting discount rate NPV_1
i_2 =   resulting discount rate NPV_2

5. Provitability Ratio (PR)

The ratio of the comparison between benefit difference with operating and maintenance costs compared to the amount of investment. Decisions can be taken if PR> 1 then the project is acceptable.

$$PR = \frac{\sum_{i=1}^{n} \overline{B_1} - \sum_{i=1}^{n} \overline{OM_i}}{\sum_{i=1}^{n} \overline{I_1}}$$

where :
PR   = Profitability ratio

$\overline{B_i}$ = The amount of benefits that have been in the discount

$\overline{OM_i}$ = The amount of operating and maintenance costs that have been in the discount
i_1 = The amount of investment that has been discounted

6. Break Event Point (BEP)

Measures the return point where the total revenue equals the total cost.

$$BEP = T_{p-1} + \frac{\sum_{i=1}^{n} \overline{TC_i} - \sum_{i=1}^{n} \overline{B_{icp-1}}}{\overline{B_p}}$$

where :
BEP   = Break Even Point
T_{p-1} = Year before BEP

$\overline{TC_1}$ = The total amount of cost that has been discounted

$\overline{B_{icp}} - 1$ = Number of benefits that have been discounted before the break even point

$\overline{B_p}$ = The number of benefits at the break even point

7. Benefit Cost Rasio (BCR)

BCR needs to incorporate all costs and all benefits in order to determine whether there are any net benefits. On the cost side, the opportunity cost, and not the actual financial cost, must be taken into account. On the benefit side, the increase in value of consumption of local residents, including the public good value of the event and the consumer surplus, needs to be taken into account. [10]

In accordance with the name of the project evaluation by Benefit Cost Ratio method or commonly abbreviated with B / C Ratio done by comparing the benefits and cost. Of course all the benefits and all costs that are spread out and its expenditure during the life of the project must be equated first to its present value. Thus, the formula used is:

$$B/C = \frac{PV \,(Benefit)}{PV \,(Cost)}$$

The B / C Ratio of the calculation by the formula above determines the feasibility of the project in accordance with the following provisions:
If B / C> 1 then the project is feasible.
If B / C <1 then the project is not feasible.

Sensitivity Analysis

The sensitivity analysis can suggest the range of return on assets with the given independent variables. [11]. Sensitivity analysis is an analysis used to determine the impact that will occur if the variables assumed in the investment analysis changed. [12]

The ultimate goal is to estimate the decision to be taken. If the change of variables that will be assumed will change the decision ya-ng will be taken, then it is said that the decision is sensitive to the change of variable. So the sensitivity analysis

is done by varying the amount that will determine the decisions of whether or not the investment is feasible or not.

III. MATERIAL AND METHOD

Currently roads can also be hardened with ready-mix concrete. Ready mix concrete that is concrete that is manufactured in a factory or batching plant, according to a set recipe, and then delivered to a work site by truck mounted in transit mixers.[13]

In this research, the cost of development of Asphalt Mixing Plant (AMP), including the value of development benefit of Asphalt Mixing Plant (AMP), economic value of Asphalt Mixing Plant (AMP) development based on Net Present Value (NPV), Internal Rate of Return (IRR) And Benefit Cost Ratio (BCR) and the sensitivity of development feasibility.

1. The concept of time value of money
a. Compound interest
   Compound interest, often also referred to as flowering interest, indicates that interest from a loan principal.
b. Present value
   The present value indicates how much money is currently valued for a certain value in the future.
2. Payback Method
   This method measures how quickly the investment can return. Unit resulted in time units (month, year and so on). If the payback period is shorter than required, then the project is said to be profitable.
3 Net Present Value
   This method calculates the difference between the present value of the investment and the present value of revenue - net cash receipts (operating and cash flow terminals) in the future. If the present value of revenue - net cash receipts in the future is greater than the present value of the investment, then the project is said to be profitable so it is accepted.
4. Internal Rate of Return Method
   This method calculates the interest rate that equates the present value of the investment with the present value of revenue - net cash receipts in the future. If the interest rate is greater than the relevant interest rate (the required rate of return), then the investment is said to be profitable..
5. Provitability Ratio (PR)
   The ratio of the comparison between benefit difference with operating and maintenance costs compared to the amount of investment. Decisions can be taken if PR> 1 then the project is acceptable, while PR, 1 then the project is rejected.

6. Break Event Point (BEP)
   Measures the return point where the total revenue equals the total cost.
7. Benefit Cost Rasio (BCR)
   Results B / C Ratio of the calculation by the formula determines for the feasibility of the project

Sensitivity Analysis
1. The amount condition of MARR set at 13% derives from 11% of the interest rate, and 2% comes from the risk
2. Initial investment conditions rose 25% and fixed benefits 12% due to rising material prices and work delays due to natural conditions.
3. The interest rate rise 20% due to uncertainty conditions of national and international economy.
4. Cash flow condition fell by 10% due to decreased Asphalt Mixing Plant (AMP) revenue.

IV. RESULT AND DISCUSSION

Based on the results of analysis and discussion can be concluded as follows:
1. The cost value of Asphalt Mixing Plant (AMP) development in Tabalar Village, Tubaan District is :
a. Funds needed in the construction of AMP projects amounted to IDR. 17,126,001,026.50 AMP project development is done in 1 year in 2016.
b. Total Cost of Investment + Operational Cost + Bank Loan (Principal Loan + Bank Interest) Up to 2031 is IDR. 52,409,059,808. 00
2. The value of the benefit of Asphalt Mixing Plant (AMP) development in Tabalar Village, Tubaan District is :
a. Estimated hot mix price in 2016 amounted to IDR. 1,272,700.00 / ton and in the following years it is assumed that there is a variation of hot mixed price increase adjusted to the need and road construction on the axis of Jalan Tanjung Redeb - Talisayan, so that the income obtained in 2017 is IDR. 6,160,000,000.00 from hotmix sales.
b. Benefit from Selling Price + residual value up to 2031 is IDR.73,683,328,495.00.
3. The development of the AMP project is economically feasible to build, with the following economic analysis:
a. Net Present Value> 0 is IDR. Rp. 5,548,989,265.00
b. Value of Internal Rate of Return> 12% ie 14.89%
c. Benefit Cost Ratio> 1 is 2.242
4. The sensitivity values in the AMP study were reviewed in 4 (four) circumstances, the analyzes presented in Table 1.

Table 1. Results of AMP Development Sensitivity Analysis

No	Condition	EIRR	BCR %	NPV (IDR)
1	The defined MARR is 13%	13.94	2.085	3,560,558,753
2	Initial investment rise 25% and fixed interest rate 12%	12.95	2.020	2,018,122,871
3	Interest rates rise 20% economic uncertainty	11.07	1.830	248,500,000
4	Cash flow fell 10% due to decreased AMP revenue	12.82	2.174	3,638,371,450

V. CONCLUSIONS

From the results of the analyzes that have been described can be proved that the development of Asphalt Mixing Plan in the coastal area is very possible to be built for supporting the asphalt needs of the continuity of the implementation of road infrastructure development, bridges, housing and airports. Prior to its development, it must first be carried out with careful economic analysis.

Given the development of Asphalt Mixing Plan in this study only assess the feasibility based on economic analysis. For further research it is expected. If the Asphalt Mixing Plant (AMP) is to be carried out in Tabalar Village, Tubaan Sub-district, it will first be studied in depth to the local people, from the economic, social, environmental and other aspects. Market share should be expanded, not only limited in Tabalar Village, Tubaan Sub-District. Therefore, it is necessary to prepare supporting infrastructure such as transportation modes to transport hotmix and other infrastructure. So the future prospects will be more promising.

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