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Mining Investment Feasibility based on Economic and Environmental Aspects

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Abstract: This research was conducted to analyze the feasibility of investing in the mining business that will be carried out by PT. Wijaya Karya Bitumen, which is a company with a mining plan in the IUP location of 100 hectares from an economic and environmental aspect. The method used in the economic aspect is the feasibility analysis method of Discounted Cash Flow (DCF) with the parameters of the feasibility analysis of Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PBP), while in the environmental aspect the eligibility parameter is Law No 32/2009. The results of the study obtained cash outflow of IDR 646.677.059.124 and cash in the flow of IDR 836.489.498.451. Investments in the mining business are economically feasible to run based on the Discounted Cash Flow (DCF) method with an NPV of IDR 206.854.298.263, an IRR of 15.99%, and PBP for 3 years and 3 months. Based on Law No 32/2009 on the environmental aspect it is also declared feasible with an environmental budget of IDR 18.120.448.000 from the beginning of mining to the end of mining and a planned post-mining or reclamation cost of IDR 9.862.876.984.

Keywords: Investment Feasibility, Mining, DCF, Economic Aspects, Environmental Aspects..

1. Introduction

One of the things that must be planned properly in carrying out mining activities is in the economic and environmental aspects. This is because, in the process, mining activities require enormous capital, seen from (Agboola et al, 2020) regarding mineral and coal mining, namely part or all of the stages of mining activities including general investigations, exploration, feasibility studies, construction, mining, processing and refining, transportation and sales, and post-mining activities. so that planning on the economic aspect is carried out at the beginning. Planning in a good economic aspect will make the possibility of losses smaller and the amount of profit and return on capital can be estimated.

In Antoci et al (2019) From an economic perspective, mining business activities are indeed very beneficial for the nation and state because they have a very high selling value in the world market. Even so, these activities have a bad impact on the environment, in this case, the company must have an environmental permit or have an impact analysis document of Environmental Impact Assessment (EIA) in the framework of environmental protection and management as a condition for obtaining a business license or activities.

Štreimikienė (2015) provides an understanding of the impact of a change that occurs as a result of an activity. These activities can be natural, whether chemical, physical, or biological. The impact can be positive in the form of benefits, it can also be negative in the form of risks, to the physical and non-physical environment, including the socio-economy. According to Gusman (2021), mining activities have positive and negative impacts on the environment. Gusman (2021)b stated that with this impact it is very important to conduct a study on the economic and environmental feasibility of the mining activity. PT. Wijaya Karya Bitumen is a company that plans to mine 100 hectares of IUP locations. This research was conducted to analyze the feasibility of the mining business that will be carried out by PT. Wijaya Karya Bitumen is seen from the economic and environmental aspects.

This feasibility study was conducted to avoid the risk of loss, facilitate planning which includes the amount of capital required, implementation time, location, and method of implementation, facilitate the implementation of work, facilitate supervision and control. In investing, it is very urgent to do is analyze the feasibility of investing, where an investor will know the amount of profit and be able to see how the prospects for the company to invest in in the future. For this reason, an investor must understand the methods in calculating the feasibility of investing, where the results of this analysis can be used as a parameter in determining whether the investment will be profitable or not (Sidauruk et al, 2018). Shrieves & Wachowicz (2001) state, to assess the profitability of an investment plan, the best-known method is the discounted cash flow method. The cash flow calculation method discounted cash flow is a cash flow calculation method that takes into account the time value of money where the money invested now will have different values in the future. The method used in the economic aspect analysis is the DCF feasibility analysis method to see whether the mine is feasible or not with the investment feasibility analysis parameters used, namely NPV, IRR, and PBP. Meanwhile, in the environmental aspect, the feasibility parameter is Law No 32/2009 (Sufa, 2007).

2. Method

According to Bairagi & Munot (2019); Miller & Fredericks (2003), the research method is a scientific way of obtaining data for specific purposes and uses. This research includes quantitative descriptive research, descriptive research is research that is intended to collect information about the status of an existing symptom, namely the state of the symptoms according to what they were when the research was carried out, while quantitative research is research with data in the form of numbers or qualitative data.

3. Findings and Discussions

3.1 Economic Aspects

Economic analysis on mining must pay attention to the planned technical aspects to determine the required cost components Ossa-Moreno et al (2018). The economic value in question is the investment value expressed in terms of the value of money that will be used as a material for composing cash flow with due observance of several methods of the approach used.

3.3.1 Inflation dan Escalation

Inflation is the average increase in the price of goods and services continuously (Islam et al, 2017) namely 1) The price of diesel (fuel) per liter, in 2020 is IDR 10.838, the average increase in diesel fuel for the last 5 years from 2016-2020 is IDR 785 or 7.24% from 2020. The increase assumption is considered the same for the next several years, namely from 2021-2036; 2) Salaries have increased according to the increase in the average UMP (Provincial Minimum Wage) in Southeast Sulawesi, which is 6.88%; and 3) The rupiah exchange rate has increased according to the exchange rate of the United States dollar (US) against the rupiah, which is 2.66%.

Table 1: Assumption of Increase

Descriptions	*Price 2020 (IDR)*	*Assumption of Increase*	
		IDR	*%*
Diesel (Fuel)	10.838	785	7,24%
UMP (Salary)	2.552.014	175.504	6,88%
Rupiah Exchange Rate	14.653	390	2,66%

Prices for the years 2021-2036 are assumed to increase (escalation). The price that has been escalated can be determined by a formula:

Price yearn = Initial year price x $(1+\text{Assumption of increase})_n$

Price assumptions for 2021 to 2036 after being calculated using the above formula, diesel prices, salaries, and currency exchange rates.

Table 2: Assumption of Increase 2021-2036

Escalation Diesel (*Fuel*)			
Price 2020 (IDR)	7,24%	Year	Diesel (IDR)
10.838	0,0724	2021	11.623
10.838	0,0724	2022	12.464
10.838	0,0724	2023	13.367
10.838	0,0724	2024	14.334
10.838	0,0724	2025	15.372
10.838	0,0724	2026	16.485

Escalation Diesel (*Fuel*)			
10.838	0,0724	2027	17.679
10.838	0,0724	2028	18.958
10.838	0,0724	2029	20.331
10.838	0,0724	2030	21.803
10.838	0,0724	2031	23.382
10.838	0,0724	2032	25.074
10.838	0,0724	2033	26.890
10.838	0,0724	2034	28.837
10.838	0,0724	2035	30.924
10.838	0,0724	2036	33.163
Escalation UMP (Salary)			
UMP 2020 (IDR)	6,88%	Year	Salary (IDR)
2.552.014	6,88%	2021	2.727.593
2.552.014	6,88%	2022	2.915.251
2.552.014	6,88%	2023	3.115.820
2.552.014	6,88%	2024	3.330.189
2.552.014	6,88%	2025	3.559.306
2.552.014	6,88%	2026	3.804.186
2.552.014	6,88%	2027	4.065.914
2.552.014	6,88%	2028	4.345.649
2.552.014	6,88%	2029	4.644.629
2.552.014	6,88%	2030	4.964.180
2.552.014	6,88%	2031	5.305.715
2.552.014	6,88%	2032	5.670.749
2.552.014	6,88%	2033	6.060.896
2.552.014	6,88%	2034	6.477.886
2.552.014	6,88%	2035	6.923.564
2.552.014	6,88%	2036	7.399.906
Escalation Currency Exchange Rates			
Price 2020 (IDR)	2,66%	Year	Price (IDR)
14.653	0,0266	2021	15.043
14.653	0,0266	2022	15.443
14.653	0,0266	2023	15.854
14.653	0,0266	2024	16.275
14.653	0,0266	2025	16.708
14.653	0,0266	2026	17.153
14.653	0,0266	2027	17.609
14.653	0,0266	2028	18.077
14.653	0,0266	2029	18.558
14.653	0,0266	2030	19.052
14.653	0,0266	2031	19.559
14.653	0,0266	2032	20.079
14.653	0,0266	2033	20.613
14.653	0,0266	2034	21.161
14.653	0,0266	2035	21.724

Escalation Diesel (*Fuel*)			
14.653	0,0266	2036	22.302

3.3.2 Cash Flow

Cash flow is a company's funds consisting of cash inflow and cashes outflow. In the first year (2020) production has not been carried out because the company is still in the construction stage and from the second year (2021) to the 17th year (2036) the company has cash in the flow of IDR 2.088.966.982.500. Meanwhile, cash outflow at the construction stage costs IDR 66.155.108.769, at the production stage is IDR 564.314.726.751, and IDR 16.207.223.604 at the post-mining stage.

3.3.3 DCF

Using the parameters of net present value, internal rate of return, payback period, and profitability index.

1. NPV, a project can be accepted if its NPV is greater than zero (NPV> 0), which states that the value of the project is economically profitable and less than zero (NPV <0) for projects that are not economically feasible (Islam & Prasetyo, 2020).

Table 3: Calculation NPV

Periode (t)	Net Cash Flow (IDR)	Discount Factor (10%)	PV Net Cash Flow (IDR)
1	(66.155.108.769)	0,9091	(66.155.108.769)
2	19.263.620.426	0,8264	17.512.382.205
3	22.490.703.711	0,7513	18.587.358.439
4	28.272.706.639	0,6830	21.241.702.959
5	19.819.213.235	0,6209	13.536.789.314
6	21.210.294.163	0,5645	13.169.923.914
7	35.048.965.495	0,5132	19.784.227.297
8	37.210.486.230	0,4665	19.094.863.092
9	37.915.740.078	0,4241	17.687.972.573
10	38.279.987.616	0,3855	16.234.451.579
11	36.151.821.519	0,3505	13.938.092.187
12	76.314.868.686	0,3186	26.747.895.914
13	105.513.293.718	0,2897	33.619.787.057
14	107.470.736.570	0,2633	31.130.444.248
15	109.908.584.767	0,2394	28.942.365.486
16	110.188.493.006	0,2176	26.378.249.158
17	113.792.314.965	0,1978	24.764.523.165
18	(16.207.223.604)	0,1799	(3.206.512.788)
	Total		273.009.407.032

Calculating NPV can be used the following formula.

NPV = PV Net Cash Flow – Initial Expenditures

= IDR 273.009.407.032 – IDR 66,155,108,769

= IDR 206,854,298,263

From the above calculations, it can be seen that the net present value of this project is greater than 0, it can be concluded that this project is economical and feasible to mine.

2. IRR, IRR is the value of the discount rate that makes the NPV of the project equal to zero.

$$\text{IRR} = \text{Ir} + \left(\frac{\text{NPV}_{\text{Ir}}}{\text{NPV}_{\text{Ir}} - \text{NPV}_{\text{It}}}\right) \times (\text{i}_{\text{r}} - \text{i}_{\text{t}})$$

$$10\% + \left(\frac{\text{IDR } 273.009.407.032}{\text{IDR } 273.009.407.032 + \text{IDR } 391.280.276}\right) \times (10\% - 40\%)$$

$$0{,}10 + \left(\frac{\text{IDR } 273.009.407.032}{\text{IDR } 273.400.693.308}\right) \times (0{,}060)$$

$$0{,}10 + 0{,}998568818 \times 0{,}060$$

$$0{,}10 + 0{,}059914129$$

$$0{,}159914129 \times 100\%$$

$$15{,}99\%$$

From the above calculations, the IRR value of the company is 15.49%.

3. PBP, the results of the calculation show that the time required for the company to return on investment is in a period of 3,3 years or 3 years 3 months based on the calculation with the payback period method where the calculation results show that the length of return is smaller than the project implementation period.. According to (Soegoto, 2019), if the payback period <duration of the project, the project is feasible.

$$\text{Payback period} = 3 \text{ Year} + \frac{\text{IDR } 2.841.621.269}{\text{IDR } 9.717.512.500} \times 1 \text{ Year}$$

$$3 \text{ Year} + 0{,}292422703 \text{Year}$$

$$3{,}292422703 \text{ Year}$$

$$3 \text{ Year } 3 \text{ Month}$$

3.2 Environmental Aspects

The feasibility of investing from an environmental aspect can be seen from the costs that have been planned by the company based on concerning protection and management of the environment and regarding environmental permits where at the construction stage there are permit and EIA costs, land compensation costs, reclamation guarantees, environmental processing, and monitoring, at the production stage there are processing and environmental monitoring costs every year and at the post-mining stage, there are reclamation costs and environmental monitoring costs (Dixon et al, 2013).

Table 4: Environmental Planning Costs

No		Cost	Total (IDR)
	Construction Stage		
	a	Licensing Fees and EIA	800.000.000
1	b	Land Compensation	13.280.000.000
	c	Reclamation Guarantee	800.000.000
	d	Environmental Processing and Monitoring	181.136.000
2	Production		
	a	Environmental Processing and Monitoring	2.898.176.000
	Post Mining		
3	a	Reclamation	9.862.876.985
	b	Environmental Processing and Monitoring	161.136.000

Based on Government regulation Indonesia concerning B3 waste management, Government regulation Indonesia concerning water quality management and water pollution control, and Government regulation Indonesia regarding air pollution control, the company has also planned environmental management and monitoring costs.

Table 5: Planning for Environmental Monitoring and Processing Costs/Year

No	Cost	Price (IDR)	Total (IDR)
1	Construction Stage (1 Year)		
	Environmental Processing and Monitoring		181.136.000
	a Groundwater	22.800.000	
	b Air quality	10.000.000	
	c Soil quality	2.000.000	
	d B3 waste management	28.800.000	
	e Other costs (adjusted for existing environmental management activities)	13.536.000	
	f Procurement of monitoring equipment	20.000.000	
	g Sampling samples	12.000.000	
	h Laboratory analysis	30.000.000	
	i Other costs (adjusted for laboratory analysis activities)	12.000.000	
	j Implementation of monitoring (work wages)	30.000.000	
2	Production (16 Years)		
	Environmental Processing and Monitoring		2.898.176.000
	a Groundwater	364.800.000	
	b Air quality	160.000.000	
	c Soil quality	32.000.000	
	d B3 waste management	460.800.000	
	e Other costs (adjusted for existing environmental management activities)	216.576.000	
	f Procurement of monitoring equipment	320.000.000	
	g Sampling samples	192.000.000	
	h Laboratory analysis	480.000.000	
	i Other costs (adjusted for laboratory analysis activities)	192.000.000	
	j Implementation of monitoring (work wages)	480.000.000	
3	Post Mining (1 Year)		
	Environmental Processing and Monitoring		161.136.000

a	Groundwater	22.800.000	
b	Air quality	10.000.000	
c	Soil quality	2.000.000	
d	B3 waste management	28.800.000	
e	Other costs (adjusted for existing environmental management activities)	13.536.000	
f	Sampling samples	12.000.000	
g	Laboratory analysis	30.000.000	
h	Other costs (adjusted for laboratory analysis activities)	12.000.000	
i	Implementation of monitoring (work wages)	30.000.000	
	Total		3.240.448.000

Based on Government regulation Indonesia regarding reclamation and post-mining, the company has also planned a reclamation cost of IDR 9.862.876.985, of which the reclamation plan will be carried out every five years.

Table 6: Reclamation Cost Planning

Year	Cost (IDR)
Reclamation 1 (Year 6, 2025)	1.522.128.136
Reclamation 2 (Year 11, 2030)	1.522.128.136
Reclamation 3 (16th year, 2035)	1.522.128.136
Post Mining Reclamation 4 (Year 18, 3037)	5.296.492.576
Total	9.862.876.984

In this environmental aspect, the PT. Wijaya Karya Bitumen was declared feasible because he had a plan for environmental costs from the first year to the end of mining activities of IDR 18,120,448,000 and post-mining (reclamation) costs of IDR 9,862,876,984.

4. Conclusion

PT. Wijaya Karya Bitumen has a cash flow of cash outflow of IDR 646.677.059.124 with details of costs, the construction stage of IDR 66.155.108.769, the production stage of IDR 564.314.726.751 and the post-mining stage of IDR 16.207.223.604, and cash in the flow of IDR 2.088.966.982.500. The total profit obtained by PT. Wijaya Karya Bitumen is calculated based on cash flow (cash in - cash out) of IDR 836.489.498.451. Total environmental management and monitoring costs planned by PT. Wijaya Karya Bitumen is IDR 18.120.448.000. Based on the calculation of investment analysis using the discounted cash flow method, the NPV is IDR 206.854.298.263, IRR 15.99%, and PBP for 3 years 3 months. PT. Wijaya Karya Bitumen which in Law No 32/36 paragraph (1) of 2009 concerning environmental protection and management and has been legalized in the company's EIA document, PT. Wijaya Karya Bitumen has a plan for environmental costs from the first year to the end of mining activities of IDR 18.120.448.000 and post-mining (reclamation) costs of IDR 9.862.876.984, this is also reviewed from Government Regulation Indonesia No 101/2014 concerning B3 waste management, Government Regulation Indonesia No. 82/2001 concerning the management of water quality and control of water pollution, Government Regulation Indonesia No. 41/1999 concerning air pollution control companies and the Government Indonesia No 78/2010 concerning reclamation and post-mining, it can be said that the PT. Wijaya Karya Bitumen is environmentally feasible. In determining further investment decisions, it is necessary to carry out a deeper analysis by considering the internal and external conditions of the company so that it can provide better analysis results such as the use of the discounted payback period calculation method to see the year of return on investment more accurately. The need for detailed exploration or further exploration for the mining stage. The need for companies to conduct a more detailed study of environmental management and monitoring.

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