Journal of Political Science and Governance
Volume 10 Issue 1, January-March 2022
ISSN: 2995-4193
Impact Factor: 6.41
https://kloverjournals.org/journals/index.php/psg

SHORELINE PROSPERITY: INVESTIGATING THE ECONOMIC VIABILITY OF BUBON PORT THROUGH A FEASIBILITY STUDY

Prof. Rina Darmawan Siregar
Department of Civil Engineering, Faculty of Engineering, Universitas Teuku Umar, Aceh, Indonesia

Abstract
Indonesia, with its extensive maritime territory, holds significant potential for maritime activities, and shipping plays a crucial role in driving the nation's economy and societal interactions. To facilitate sea transportation effectively, ports hold a vital position, serving as essential facilities that link various regions. The success of a port is contingent on its effectiveness, efficiency, and adequacy of facilities. Given this importance, the physical development and associated costs of ports necessitate meticulous assessment through feasibility studies, which help identify viable projects and mitigate potential losses. In this context, the Port of Kuala Bubon in West Aceh is a relevant candidate for such a study.

Located in Gampong Teungoh Village and serving as a key link for sea transportation in the west-south region, the Port of Kuala Bubon is vital in connecting communities in West Aceh to Simeuleu Island and neighboring islands. With increasing maritime activities and the rise in passenger and goods transportation through this port, the need for further development has become evident. This study focuses on evaluating the economic feasibility of constructing the Kuala Bubon Harbor Pier in the Samatiga District, West Aceh Regency.

The feasibility assessment employs four analytical methods: Net Present Value (NPV), Benefit Cost Ratio (BCR), Internal Rate of Return (IRR), and Break Even Point (BEP). By leveraging these methodologies, the study aims to determine the viability of the infrastructure development project, taking into account the involvement of various stakeholders, including the government and private sector.

The research demonstrates the significance of investing in port infrastructure, encompassing the expansion of piers, fenders, breakwaters, and warehouses, to enhance crossing activities involving passengers, goods, and services between islands. Considering the potential impact on regional connectivity and the economy, it becomes essential to ascertain the feasibility of the development project and its alignment with long-term objectives. Through the feasibility study, risks associated with the project can be assessed and mitigated, enabling informed decision-making and paving the way for an efficient and successful development process.

Keywords: Indonesia, maritime potential, shipping, port development, feasibility study, economic feasibility, analytical methods, infrastructure, West Aceh, Kuala Bubon Harbor Pier

Journal of Political Science and Governance
Volume 10 Issue 1, January-March 2022
ISSN: 2995-4193
Impact Factor: 6.41
https://kloverjournals.org/journals/index.php/psg

1. Introduction

Indonesia has high maritime potential, considering that 70 percent of its territory consists of oceans[1]. The role of shipping is significant for the economy, society, and so on. The port is one of the important facilities to expedite the mode of sea transportation. Activities between regions will be more optimal with a complete and adequate port in terms of facilities and infrastructure. A good port is considered an effective and efficient activity and sufficient facilities [2]. Several buildings at the port consist of breakwaters, wharves, terminals, storage warehouses, and other facilities. Infrastructure development efforts must involve various parties, such as the government, private sector, and others, to become more optimal [3].

Therefore, it is necessary to conduct a study to assess the feasibility of physically developing a port and the development costs. A feasibility study is an activity to determine the feasibility of a project, whether can execute it or not so that the risk of loss can be avoided [4]. This feasibility study uses 4 analytical methods, namely Net Present Value (NPV), Benefit Cost Ratio (BCR), Internal Rate of Return (IRR), and Break Event Point (BEP).

One of the ports that can study for its feasibility is the Port of Kuala Bubon, West Aceh. So that the maritime axis of the west-south area is maintained, we can realize this by building a pier at the port. This port is located in Gampong Teungoh Village and is one of the links for sea transportation modes which is located at coordinates 04°12'27" - 04°12'35" N, and 96°02'19" - 96°02'25" E is about 12 km from the City of Meulaboh. Kuala Bubon Port is one of the means to connect people in West Aceh and its surroundings to Simeuleu Island or the surrounding islands.

The Kuala Bubon Port began to be built in 2010 with one-way shipping routes from Kuala Bubon to Sinabang and vice versa. Based on data sources from the West Aceh Transportation Service, 92 ship departure trips from Kuala Bubon Port for 2018 increased to 98 in 2019. In 2020 it decreased due to the Covid pandemic, but now is the time for the number of passengers and goods distribution activities through Ports Kuala Bubon is increasing. It shows that the need for crossings through this Port is getting more intense.

It is necessary to develop buildings and facilities at the Port of Kuala Bubon to facilitate crossing activities involving passengers, goods, or services between islands. Infrastructure developments that can be carried out include adding piers, fenders, breakwaters, and warehouses. A feasibility study for infrastructure development needs to be carried out to determine whether the development project is feasible to proceed. So, this research aimed to analyze the economic feasibility study on the construction of the Kuala Bubon Harbor Pier, Samatiga District, West Aceh Regency

2. Literature Review

2.1. Feasibilty Study

A feasibility study on a project needs to be carried out to become a reference that the development can be categorized as feasible [5]. Feasibility analysis/study is a thorough assessment highlighting all aspects of project or investment feasibility [6]. In addition to having a comprehensive nature, the feasibility study must also describe the results of the analysis of the value of the benefits obtained when compared with the required resources quantitatively. A Feasibility study is to determine the level of

profit that can be achieved through investing in a project and avoiding projects that do not generate profits, as well as being the basis for an assessment for existing investment opportunities so that the best alternative projects will be selected economically, also determine the priorities [8].

2.2. Project Feasibilty Analysis

Project feasibility analysis can be carried out using the "discounted cash flow" methodology [9], which is the calculation of the growth prospects of an investment in the future which is used in determining the value of NPV, BCR, IRR, and BEP taking into account the interest rate set.

2.2.1. Net Present Value (NPV)

The Net Present Value (NPV) method calculates the net value obtained at the present time [10]. The present is assumed when the start of the calculation coincides with the time of evaluation or assessment. Evaluation is carried out in the initial year period (year 0) for cash flow investment analysis [11]. The project can be economically feasible if it produces an NPV value > 0 [12].

NPV value analysis uses the following equation [13]:

$$NPV=PWB - PWC \quad (1)$$

Where:

PWB = Present Worth Of Benefit;

PWC = Pesent Worth Of Cost

2.2.2. Benefit Cost Ratio (BCR)

The focus of this method is to provide benefits and costs aspects that are borne because of the investment. The benefit cost ratio (BCR) analysis method will be explained as follows [14]:

$$BCR= \sum Benefit / \sum Cost \quad (2)$$

The criteria for knowing if an investment plan is said to be economically feasible with BCR is If the BCR value is > 1, the project is said to be feasible. Conversely, if the BCR value is <1, the project is said to be feasible [15].

2.2.3. Internal Rate of Return (IRR)

Internal Rate of Return (IRR) calculates the interest rate that equates the present value of an investment with the present value of net cash receipts in the future [16]. The equation for calculating the IRR value is as follows [17]

$$IRR=iNPV0+NPV0/((NPV0+NPV1))(iNPV0-iNPV1) \quad (3)$$

Where:

iNPV0 = the net present value interest rate at i0;

iNPV1 = net present value interest rate at 1;

NPV0 = net present value at i0;

NPV = net present value at 1.

IRR calculation steps [18], namely:

1. First, the net cash flow is calculated over the life of the project plus the residual value of the assets;

2. The comparative interest rate is determined to be greater than the rate of return, for the difference taken no greater than 5%;
3. Then, the IRR value is calculated using Equation (3) formula.

2.2.4. Break Event Point (BEP)

Break Even Point (BEP) is the period of return on capital, or the breakeven point where the expenditure and income are balanced (NPV = 0) [19] so that the investment does not experience losses or profits. This method uses a time/period trial and error technique until revenue costs = expenditure costs [20]. The formulation for BEP is as follows. [21] :

$$(n1-nx)/(NPn\_1-0)=(n1-n0)/(NPVn\_(\_1)-NPVn\_0) \quad (4)$$

Where:

nx = required year value (BEP); n0 = Year at t0; n1 = Year at t1;
NPVn_0 = net present value at t0; NPVn_1 = net present value at t1.

3. Methods

The research stage began with literature studies, collecting primary and secondary data, analyzing feasibility studies, and port wharf designs.

3.1. Methods of Data Collection

The primary data in this study are the data on the benefits of the port and the mobility of crossing routes for departure and arrival of activities at the port obtained from interview studies with the Department of Transportation, skippers, and the community of 2 people. The method for project evaluation in this development uses a comparison method between conditions before and after the project. Secondary data in this research is data obtained from other offices or agencies related to this research. Secondary data in this study are in the form of image data, calculation results of the Budget Plan (RAB), and maps related to the project's location.

3.2. Data Analysis

The data analysis in this study is as follows:

1. RAB (Budget Plan)

The initial data for this study used the RAB obtained from the Department of Transportation and the Office of Public Works in calculating cash flow analysis. The analysis consists of calculating the cost of capital (direct costs and indirect costs). Direct costs include land acquisition costs and construction costs. Meanwhile, indirect costs include the cost of consulting services. This fee is 4% of the direct costs, and the costs of possibilities/unforeseen matters are 5% of the direct costs (source: standard costs for project planning).

2. Cash Flow

After collecting all the data and assumptions needed, we will input the data to get cash flow.
Based on the cash flow, the data is processed into information used to analyze the feasibility study. The data analyzed in this study are as follows:

a. Net Present Value (NPV) Calculation

Journal of Political Science and Governance
Volume 10 Issue 1, January-March 2022
ISSN: 2995-4193
Impact Factor: 6.41
https://kloverjournals.org/journals/index.php/psg

The NPV calculation results are obtained using formula (1). The acquisition of NPV values for investment decisions consists of two categories: feasible and not feasible.

- If: NPV is positive, then the investment is feasible; NPVn is negative, and then the investment is not feasible.
- If: NPV > 0, then the investment is feasible;

NPV<0, then the investment is not feasible;
NPV = 0, then the investment has no effect whatsoever.

b. Benefit Cost Ratio Analysis (BCR)

BCR analysis results are obtained using equation (2). If the BCR value is ≥ 1, then the investment activity is feasible to continue development. But if not, then investment activities are not feasible to continue.

c. Internal Rate of Return Analysis (IRR).

The results of the IRR analysis are obtained using equation (3). If the IRR value is obtained ≥ the interest rate, then the investment activity is called feasible to continue development. But if not, then investment activities are not feasible to continue. d. Break Even Point Calculation (BEP)

Equation (4) is used to calculate the BEP value. From the analysis results, interpolation is then carried out to obtain the BEP value when the NPV is 0.

4. Results and Discussion

This calculation is based on the payment and methodology described in the previous chapter. The calculation results obtained can describe the level of project feasibility from an economic perspective, using 4 methods consisting of Net Present Value (NPV), Benefit Cost Ratio (BCR), Internal Rate of Return (IRR), and Break Event Point (BEP) in the study appropriateness. The four methods refer to the calculation of direct, indirect, and annual costs. This calculation is obtained from the processing of primary data, secondary data, and assumptions of interest rates and the project's economic life.

4.1. Cost

4.1.1. Direct Cost

Direct costs are required for project construction, such as the Budget Plan (RAB). This fee shows the details of the work items to be carried out, from preparation to finishing. The total value of RAB after adding 10% VAT is IDR 9.179.639.000,

The results of the calculation of the Cost Budget Plan (RAB) obtained for the construction of this port are shown in Table 1.

Table 1. Bubon Port RAB Calculation Results

No	Work Description	Initisl Contract (Rp.)	MC-0 (Rp.)
1	2	3	4
I	PREPARATION WORKS	575,060,492.10	575,060,492.10
II	TRESTLE WORKS	7,770,066,402.47	7,770,065,818.63

Journal of Political Science and Governance
Volume 10 Issue 1, January-March 2022
ISSN: 2995-4193
Impact Factor: 6.41
https://kloverjournals.org/journals/index.php/psg

A	PROCUREMENT OF PILES	3,346,323,010.00	3,346,323,010.00
B	TRESTLE WORKS 4 = 50 M	1,295,015,737.49	1,279,734,818.27
C	TRESTLE WORKS 5 = 50 M	1,523,450,046.45	1,531,090,214.14
D	TRESTLE WORKS 6 = 50 M	1,524,277,608.52	1,531,917,776.22
E	PDA TEST	81,000,000.00	81,000,000.00
	TOTAL AMOUNT	8,345,126,894.57	8,345,126,310.73
	PPN 10%	834,512,689.46	834,512,631.07
	TOTAL AMOUNT	9,179,639,584.02	9,179,638,941.81
	ROUNDUP	9,179,639,000.00	9,179,639,000.00

Source: Ministry OF Public Works and Housing West Aceh, 2022

4.1.2. Indirect Cost

Indirect costs are costs related to the overall project development process. Indirect costs include components consisting of consulting services costs and probable costs. The value of consulting services is 7% of the direct costs, while the possible fee is 5% of the direct costs. Consultant Fee = 0,07 × IDR 9.179.639.000 = **IDR 642.574.730**

Probable Cost = 0,05 × IDR 9.179.639.000 = **IDR 458.981.950**

Based on the calculation results of the two components, the total value of indirect costs is IDR 1,101,556,680.

4.1.3. Annual Cost

Annual costs are costs that must incur during the life of the project. The calculated annual costs are operating costs and maintenance costs. The calculation of this cost is taken 0.5% of direct costs.

Annual Cost = 0,005 × IDR 9.179.639.000 = IDR 45.898.195

4.1.4. Cost of Total Expenses

Total expenditure costs or cash flow costs can be calculated by adding up direct, indirect, and annual costs. This total cost is used for the calculation of cash flow analysis. The overall total expenses are:

Total Cost = Direct Cost + Indirect Cost + Annual Cost
= IDR 9.179.639.000 + IDR 1.101.556.680 + IDR 45.898.195
= IDR 10.327.093.875

4.1.5. Project Benefit Cost

Benefits in project analysis can be in the form of direct benefits and indirect benefits. Related data was obtained from interview studies and primary data from the field. The results of interviews with the West Aceh Transportation Service and User Communities around the Port regarding the benefits of having a port, namely before the construction of the Port in West Aceh. In addition, other benefits were also felt by land owners, where every year, there was an increase in the selling price of land with interest rates annually by 3.50%. Based on these data, it can conclude that the magnitude of the details benefits from the development and sale of land is as follows:

Port Operational Result : IDR 736.888.320.000 / Year
Land Sale : IDR 25.000.000 / Year

Journal of Political Science and Governance
Volume 10 Issue 1, January-March 2022
ISSN: 2995-4193
Impact Factor: 6.41
https://kloverjournals.org/journals/index.php/psg

The total cost of the project benefits obtained from the two types of income by adding up the price from the port operations and the selling price of the land is IDR 736,913,320,000. Henceforth, this value will continue to increase because the 3.50% interest rate influences it.

4.1.6. Cash Flow Analysis

The cash flow analysis aims to estimate how much the project has cost or earned. The calculation of cash flow analysis is carried out using the Net Present Value (NPV), Internal Rate of Return (IRR), Break Event Point (BEP), and Benefit Cost Ratio (BCR) methods. The year period (n) or the economic life of a project is 25 years, and the percentage of interest or rate of return is 3.50%.

1. Net Present Value Calculation (NPV)

In calculating the NPV, data about the estimated investment costs, operational and maintenance costs, and estimated benefits from the planned project is needed. The NPV value obtained is positive, IDR 1.730.821.838.222. This value meets the eligibility requirements of a project, namely NPV > 0. For more details, see the calculation below:

NPV = PWB – PWC

NPV = $(Cb\ (1+i)^n) - (Cc\ (1+i)^n)$

$= ((3736.888.320.000\ (1+3{,}50\%)^{25})+(25.000.000(1+3{,}50\%)^{25})) - ((9.179.639.000\ (1+3{,}50\%)^{1})+(45.898.195\ (1+3{,}50\%)^{1}))$

NPV = IDR 1.741.510.380.383 – 10.688.542.161

NPV = IDR 1.730.821.838.222 > 0 (**FEASIBLE**)

2. Benefit Cost Ratio Calculation (BCR)

If we look at the equations in the previous chapter, the completion of the NPV method with BCR has similarities; the only differences in the division for the BCR formula and the reduction for the NPV formula. The search for the BCR value for this project was obtained at 162.93, meaning that the project is feasible to implement. For more details, see the following calculations: BCR = PWB / PWC

BCR = 1.741.506.707.329 / 10.688.542.160

BCR = 162,93 > 1 **(FEASIBLE)**

3. Internal Rate of Return (IRR) Calculation

To calculate the IRR value, a comparison of the assumptions between the interest rate of 5.10% and the interest rate of 5.20% is carried out from the assumed interest rate of 3.50%. The IRR interest rate obtained is 5.25%, which shows that the IRR is greater than the interest rate (i), which is 3.50%. This IRR value fulfills the eligibility requirements of a project, namely IRR > rate of return. More details can be seen in the following calculations:

If IRR with i = 5,10%

NPV = $(Cb(1+i)^n) - (CC(1+i)^n)$

NPV = 2.555.549.558.000 – 10.853.775.663

NPV = 2.544.695.782.337

If IRR with i = 5,20%

NPV = $(Cb(1+i)^{n)} - (CC(1+i)^{n)}$

NPV = 2.617.037.236.747 – 10.864.102.757

Journal of Political Science and Governance
Volume 10 Issue 1, January-March 2022
ISSN: 2995-4193
Impact Factor: 6.41
https://kloverjournals.org/journals/index.php/psg

NPV = 2.606.173.133.990

Then the IRR is calculated using Equation (3), namely:

$$IRR = iNPV_0 + \frac{(NPV_0 - NPV_1)}{(NPV0+NPV1)}$$

$$IRR = 5{,}20\% + \frac{2.606.173.133.990}{2.544.695.782.337} \times (0{,}10\%)$$

IRR = 5,25% > 3,50% **(FEASIBLE)**

4. Benefit Cost Ratio Calculation (BCR)

The BEP calculation is obtained from a comparison experiment, and if the IRR formula uses a comparison of other interest rates, the BEP method uses a year comparison. From the results of this comparison, interpolation is carried out on the value to obtain the BEP. From the results of completing this formula, the BEP value obtained is the 4th year and the 39th day, which means that the BEP occurs before the economic life of the project, which is 30 years. Then the BEP value meets the eligibility requirements of a project. The calculations can be seen in the following calculation:

NPV at 24 Years

$NPV = (Cb(1+i)^{n)} - (CC(1+i)^{n)}$

NPV = 1.682.638.720.450 – 10.688.542.161

NPV = 1671.950.178.290

NPV at 25 Years

$NPV = (Cb(1+i)^{n)} - (CC(1+i)^{n)}$

NPV = 1.741.532.285.078 – 10.688.542.161

NPV = 1.730.843.742.918

From the calculation above, interpolation is carried out to get the value of NPV = 0 as follows:

$$\frac{n1 - n \times}{NPV\,n1 - 0} \quad \frac{n1 - n0}{NPV\,n1 - NPV\,n0} =$$

$$-BEP = \frac{1.730.843.742.918 \; x \; (25 - 24)}{31.730.843.742.918 - 1.730.843.742.918} - 25$$

-BEP = -4,39 BEP = 4,39

4.2. Discussion

Based on the completion of the project feasibility analysis in the Project Feasibility Study on the Port Development of Bubon Village, Samatiga District, West Aceh Regency obtaining completion of the four methods, it can be concluded that the results for the assumption of an interest rate of 3.50% fulfill the eligibility requirements of a project, with the overall value of the four methods consisting of NPV, BCR, IRR, and BEP are safe/feasible. The following table presents a recapitulation of calculating the project age per year from the cash flow analysis of the NPV, IRR, BEP, and BCR methods.

Table 2. Recapitulation of Cash Flow Analysis Calculations

Capital Cost	Annual Cost	Project Benefit	*Cash Flow* Analysis

Journal of Political Science and Governance
Volume 10 Issue 1, January-March 2022
ISSN: 2995-4193
Impact Factor: 6.41
https://kloverjournals.org/journals/index.php/psg

0	-	-	-	718,529,042,000	25,000,000
	9,179,639,000	1,101,556,680			

Year	Direct Cost (IDR)	Indirect Cost (IDR)	OP Cost (IDR)	Port Operational Result	Land Sale (IDR)	NPV (IDR)	BCR	IRR	BEP
4.39									
25	-	-	45,898,195	2,433,194,371,556	80,627,498	2,422,431,550,486	162.93	5.25	

Based on the table above, several cash flow analysis graphs can be made, starting from NVP, BCR, IRR, and BEP. The NVP graph can be seen in Figure 1 as follows.

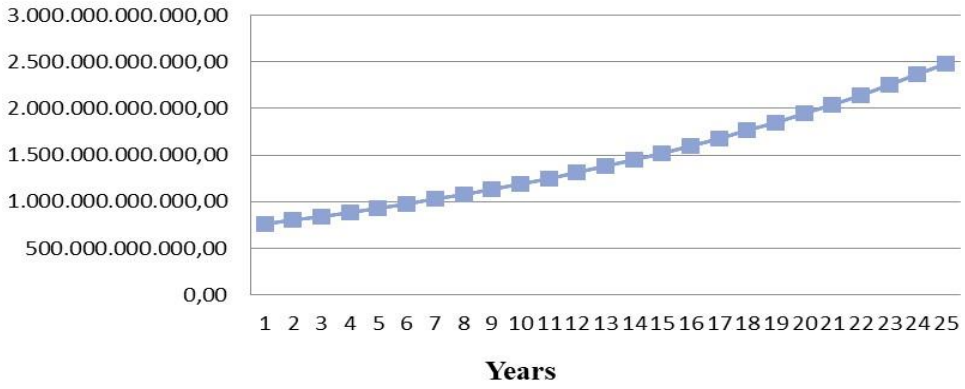

Fig 1. Graph of NPV in Project Life Period

The NPV graph for the project life period shows the movement of the NPV value, which increases every year. In year 4, day 39, the NPV value obtained is zero, which means the project is at the break even point, and in the following year until year 25, the NPV value obtained is positive NPV> 0, which means the project is feasible to implement.

In the following graph, you can see a graph regarding the Benefit Cost Ratio (BCR), namely in Figure 2 below

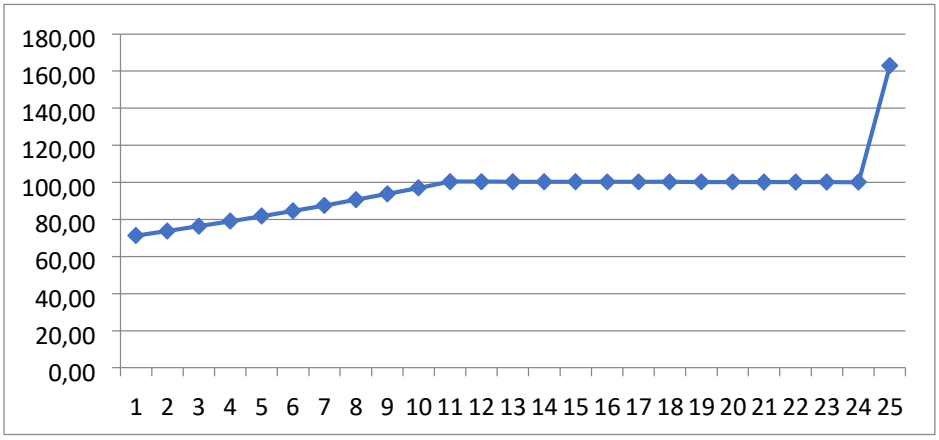

Fig 2. Graph of BCR in Project Life Period

The Benefit Cost Ratio (BCR) graph in Figure 2 shows the BCR value, which also increases every year and at the end of the building's economic life period, namely in the 25th year, the BCR value is 162.93%. Then the following graph is a graph regarding the Internal Rate Of Return (IRR), which can be seen below:

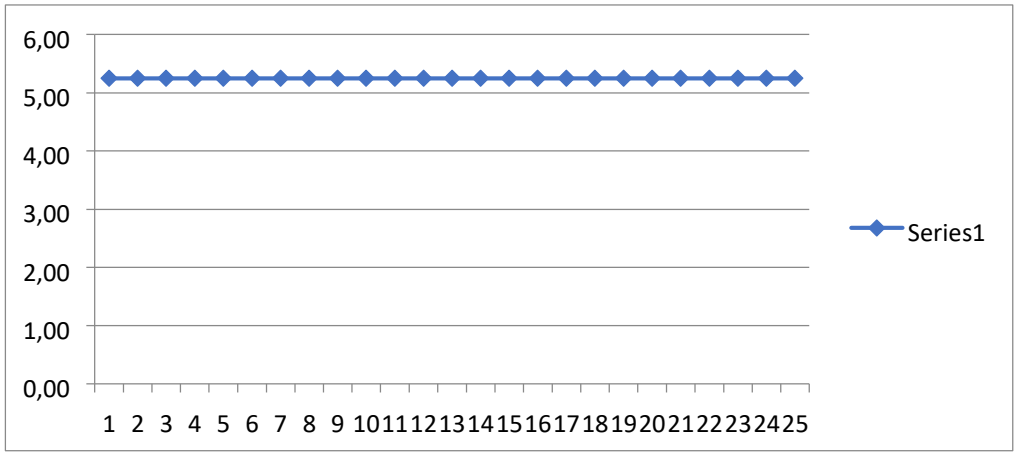

Fig 3. Graph of Internal Rate of Return (IRR) in Project Life Period

The Internal Rate of Return (IRR) graph in Figure 3 shows that the IRR value is always stable every year, namely at 5.25 > 3.50% rate of return.

Lastly is the BEP graph, which can be seen as shown below:

Journal of Political Science and Governance
Volume 10 Issue 1, January-March 2022
ISSN: 2995-4193
Impact Factor: 6.41
https://kloverjournals.org/journals/index.php/psg

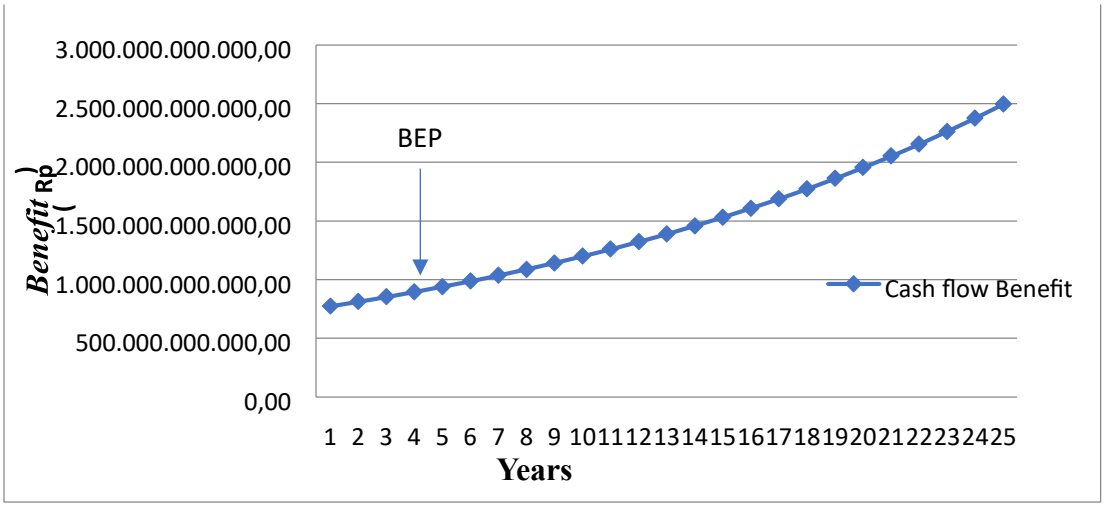

Fig 4. Graph of Break Even Point (BEP) in Project Life Period

The BEP graph in Figure 4 shows that in year 1, the benefit obtained is IDR 150.518.846.100,- by adding up the rice yields and the selling price of the land. In the following year, there was an increase in the chart due to an increase in the year. In the following year, on the 4th year and the 39th day, with a cash flow of IDR 743,637,045,531, there is a break even point or payback time, marked by the confluence of the two graphs. That means that the BEP is balanced between expenditure and income (NPV = 0) so that the investment does not experience losses or profits at that time. The graph is straight or parallel for expenses or cash flow costs and does not experience an increase or decrease because the results of cash flow costs are obtained from the sum of direct, indirect, and annual costs.

5. Conclusion

The results of the cash flow analysis in the preparation of the Economic Feasibility Study on Port Development in Bubon Village, Samatiga District, and West Aceh District used an approximation approach. Based on the results obtained from the RAB calculation, the investment costs incurred amounted to IDR 9,179,639,000, as well as operational and maintenance costs of IDR 45,898,195. Data on project cost benefits can generate revenue costs or cash flow benefits of IDR 736,913,320,000. which is the sum of the rice yields and the selling price of the land. Investment in a project is feasible if the NPV is positive, BCR > 1, IRR > rate of return and BEP is obtained before the project's economic life.

The calculation of cash flow analysis in this study uses an interest rate (i) of 3.50% and a year period (n) of 25 years. The results of the NPV value obtained were IDR 1,730,821,838,222, BCR 162.93%, IRR value 5.25% > rate of return (3.50%), and BEP occurred in the 4th year and 39th day, which showed the payback period of the investment obtained is less than the economic life of the project.

Based on the four cash flow analysis methods, the Port construction project in Bubon Village is economically feasible because it has met the eligibility requirements and can be implemented in the project.

Acknowledgement

We are grateful for the help of various parties in completing this research. Our thanks to students involved in data collection: Septia Dwi Amalda, Miswar, Riza Fahmi, Dahnul Luis. Our gratitude to the

Director of Bubon Port, West Aceh Regency, for providing data for the smooth running of the research. This research was funded by an Internal Grant from Teuku Umar University for the 2022 Fiscal Year with Contract Number 085/UN59.7/SPK-PPK/2022.

References

Sukamto, "Pengelolaan Potensi Laut Indonesia (Studi Terhadap Eksplorasi Potensi Hasil Laut Indonesia)," *Mail. J. Ekon. Islam*, vol. 9, no. 1, pp. 35–62, 2017, [Online]. Available: http://yudharta.ac.id/jurnal/index.php/malia [2] E. Gultom, "Pelabuhan Indonesia," vol. 19, no. 3, pp. 419–444, 2017.

Z. Soares Lopes, F. Kurniawan, and J. Tistogondo, "Case Study of Public-Private Partnership on Infrastruc-ture Projects of Tibar Bay Port in Timor-Leste," *Int. J. Eng. Sci. Inf. Technol.*, vol. 1, no. 3, pp. 11–16, 2021, doi: 10.52088/ijesty.v1i3.79.

Kasmir dan Jakfar, *Studi Kelayakan Bisnis*. Jakarta: Kencana Prenada Media Grup, 2013.

J. E. Susanti and M. Maini, "Analisis Kelayakan Ekonomi Proyek Pembangunan Gedung Olahraga (Gor) Kabupaten Bangka," *FROPIL (Forum Prof. Tek. Sipil)*, vol. 7, no. 1, pp. 54–63, 2019, doi: 10.33019/fropil.v7i1.1404.

I. Suharto, *Manajemen Proyek (Dari Konseptual Sampai Operasional) jilid I. Konsep, Studi Kelayakan dan Jaringan kerja*. Jakarta: Erlangga, 1999.

L. Sulastri, *Studi Kelayakan Bisnis Untuk Wirausaha*. 2016.

D. Suryana, *Studi Kelayakan Bisnis*. Bandung, 2013.

Z. Zakia, M. Safriani, N. Radianica, and M. F. Ikhwali, "Economic Feasibility Study on The Development of Irrigation Channels," *Int. J. Eng. Sci. Inf. Technol.*, vol. 2, no. 1, pp. 131–138, 2021, doi: 10.52088/ijesty.v2i1.217.

A. Amir and D. Sikhhy, "Studi kelayakan investasi dan optimalisasi keuntungan developer dengan proporsional jumlah tipe rumah," *J. Tek. Sipil*, vol. 2, no. 2, pp. 21–32, 2016.

M. Giatman, *Ekonomi Teknik*. Jakarta: PT. Raja Grafindo Persada, 2006.

Amirullah, S. M. Saleh, and R. Anggraini, "Analisis Kelayakan Ekonomi Pembangunan Jalan Krueng Mane - Buketrata Dengan

Consumer Surplus," *J. Tek. Sipil*, vol. 1, no. 2, pp. 305–316, 2017, [Online]. Available: http://www.jurnal.unsyiah.ac.id/JTS/article/view/9905

L. A. Assoraya, N. Kholis, T. Yulianto, and M. W. Nugroho, "Analisis Investasi Pada Proyek Pembangunan Perumahan Subsidi Kabupaten Jombang (Studi Kasus PT. Sami Karya)," *Indones. J. Eng. Technol.*, vol. 4, no. 1, pp. 41–49, 2021, doi: 10.26740/inajet.v4n1.p41-49.

I. Sururi and H. R. Agustapraja, "Studi Kelayakan Investasi Perumahan Menggunakan Metode Benefit Cost Ratio," *J. Tek.*, vol. 18, no. 1, pp. 52–61, 2020, doi: 10.37031/jt.v18i1.68.

A. Choliq, R. A. R. Wirasasmita, and S. Hasan, *Evaluasi Proyek*. Bandung: Pionir Jaya, 1999.

Sutrisno, *Manajemen Keuangan Teori, Konsep, dan Aplikasi*. Yogyakarta: Ekonisia, 2009.

S. B. Bahar, "Analisis Biaya Investasi Rumah Kos di Kota Baubau Ditinjau dari Aspek Teknis dan Aspek Finansial," *SCEJ (Shell Civ. Eng. Journal)*, vol. 7, no. 1, pp. 15–21, 2022.

D. Sinaga, *Studi kelayakan bisnis dalam ekonomi global : teori dan aplikasinya dalam evaluasi proyek*. Jakarta: Mitra Wacana Media, 2009.

R. Ramadhan, *Analisis Teknis dan Ekonomis Pembangunan Galangan Bangunan Baru dan Reparasi Khusus Kapal Penunjang Migas (Offshore Support Vessel)*. 2018. [Online]. Available: https://repository.its.ac.id/59063/%0Ahttps://repository.its.ac.id/59063/1/4113100002-Undegraduate_Theses.pdf Kuswadi, *Analisis Keekonomian Proyek*. Jakarta: Andi Offset, 2007.

H. Maruta, "ANALISIS BREAK EVEN POINT (BEP) SEBAGAI DASAR PERENCANAAN LABA BAGI MANAJEMEN Oleh:

Heru Maruta 1 Abstrak," *J. Akuntasi Syariah*, pp. 9–28, 2018.