

# Investment Feasibility Study Analysis on the Protected Water Supply System (SPAM) Project

Firda Rahmawati\*, Sugeng Sulistiono, Fita Setiati

Accounting Department  
State Polytechnic of Malang  
Malang, Indonesia

\*firdarahmawati1331@gmail.com, penkpoltek@gmail.com, fita.setiati@polinema.ac.id

**Abstract**—The objective of this study is to determine the feasibility of an investment in a drinking water supply system (SPAM) project in Gresik. Investment feasibility research is research into whether or not an investment project is feasible. The methodology used in this study there are three methods, namely: (1) Net Present Value (NPV) method, (2) Internal Rate of Return (IRR) method, and (3) Payback Period (PP) method. The results of the analysis of the feasibility study using the WACC. The calculation result of the Net Present Value (NPV) is positive and the value of the Internal Rate of Return (IRR) is greater than the WACC, so that the Drinking Water Supply System (SPAM) Project is declared feasible. The Payback Period for the investment using the Payback Period method is also feasible in terms of return on capital.

**Keywords**—analysis of project feasibility studies, investment

## I. INTRODUCTION

The service area of PDAM Giri Tirta, Gresik Regency, only serves 10 Districts and service coverage in 2015 only reached 35.03% of the total population of Gresik Regency. Meanwhile, service coverage in technical areas reached 58.25%. 10 Sub-district services are in the areas of South Gresik, Central Gresik and Gresik Kota. Meanwhile, North Gresik has not received service. To achieve the 2019 Sustainable Development Goals (SDG) target of 100 - 0 - 100, 100% drinking water service, 0% free from slums and 100% sanitation, it is necessary to develop services to the Gresik Kota area (Manyar District, Kebomas, Gresik, and Sit Sampeyan) and the Gresik Utara area (Kecamatan Bungah), which have not been served by PDAMs at all.

In order to improve the performance of the service system so that it can meet the needs of drinking water in the Gresik City and North Gresik areas, PDAM Giri Tirta of Gresik Regency is planning a raw water utilization project for Bengawan Solo with a capacity of 1,000 I / sec. However, in carrying out the construction of this project, PDAM Giri Tirta Gresik Regency cooperates with a third party PT. Wijaya Karya Tbk. which is one of the companies interested in collaborating in the construction of a Drinking Water Supply System (SPAM) project.

Investment in a project or a project is usually tailored to the goals of the company and its form of business. In order for the company's objectives to be achieved as desired, it should be preceded by a study that aims to assess whether the investment to be invested is feasible or not to be carried out, or if the business or project is carried out it will provide a benefit or not. This study is known as a business feasibility study. There are several aspects that need to be reviewed in a feasibility study to determine the feasibility of a business or project, one of which is the financial aspect. In this research, the financial aspect is carried out to assess the costs associated with the project. The assessment criteria that will be used are NPV (Net Present Value),

Data collection is carried out by visiting related parties who have the data needed in the research. Then make assumptions based on the data that has been collected to obtain estimates that will be used in the study. After all the data is complete, the NPV (Net Present Value), IRR (Internal Rate of Return), and PP (Payback Period) calculations are carried out for a feasibility study for investing in a drinking water supply system (SPAM) project.

Based on the description above, the objectives of this study are to analyze the feasibility of investing in a Drinking Water Supply System (SPAM) project whether the Drinking Water Supply System (SPAM) project is feasible to implement from a financial aspect; and to analyze the Drinking Water Supply System (SPAM) project in accordance with the project feasibility study criteria.

Project feasibility is an analysis to determine the feasibility level of an investment project being undertaken [1]. The existence of this analysis can be carried out at the time of running a project or business, one of which is by conducting a feasibility study to estimate future business prospects whether it is able to bring the expected benefits or not. Following are the objectives of conducting a feasibility study [2]:

- Reducing the risk of loss
- Smooth planning
- Simplify the implementation of work

- Simplify the monitoring process
- Simplify the control process

Furthermore, a feasibility study is a planning analysis regarding the feasibility of a business and company operational activities to get a profit at an uncertain time [3]. The following are the aspects of the feasibility study: Market and marketing aspects; Management and human resources aspects; Legal and legality aspects; Financial aspect; Social economic aspects; Environmental impact aspects; and technical or operational aspects.

Investments that occur in companies are investments related to the use of various company sources in the hope of being able to bring profits in the future. In accordance with this concept, investment is defined as investment in doing business today to expect future profits [4]. The objective of investment is to make life in the future better, minimize inflation, and save taxes [5].

In general, investing activity is placing an amount of money today in the hope of making a profit at a later date. Meanwhile, the definition of investment according to Martono and Harjito, [6] is the allocation of a portion of money for the procurement of assets which is expected to generate profits for the company in the future. As for the development of facilities and businesses needed by the company in the long term to increase company value. Investments according to the term consist of short, medium and long term investments.

The financial aspect is an aspect of assessing investment planning in a commercial business. The assessment includes the source of investment financing funds, expenditure expenses throughout the current investment, and the estimated return on investment [7]. Meanwhile, according to Cashmere and Jakfar [2], the assessment of the investment aspect includes various sources, investment financing needs, estimated profit and investment financing, estimated financial position and profit and loss statements, investment value characteristics, and financial ratios.

NPV is one of the methods used to obtain the difference in today's value on net cash flows and today's value on investments [6]. NPV is the difference between the present value of net cash flows and the present value of investment [8]. Here's the formula:

$$NPV = I_0 - \left( \sum_{t=0}^n \frac{CIF_t}{1(1+k)^t} \right)$$

Explanation:

- t = Investment period
- I<sub>0</sub> = Amount of initial investment
- CIF<sub>t</sub> = Net cash flow
- K = Discount rate

IRR is the amount of discount which causes the NPV value to be zero, this is due to the presence of the present value at the discount which is the same as the initial investment [9]. IRR is able to provide information on the ability of cash flow to be

used for investment returns in the form of a percentage over a period of time. Here's the formula for calculating it:

$$IRR = i_1 + \frac{NPV_U}{NPV_U - NPV_L} (i_2 - i_1)$$

Information:

- i<sub>1</sub> = Assumed first interest rate
- i<sub>2</sub> = Second rate assumption
- NPV<sub>U</sub> = NPV positive
- NPV<sub>L</sub> = NPV negative

If the amount of IRR is higher than the amount of the cost of capital, then the rate of return obtained will be higher than what is desired, so it is possible that the proposed business or investment project can be accepted. However, if the IRR value is low, it is likely that the proposed investment project will be smaller. If the predicted return on investment is the same as what the company expects, then the IRR calculation amount is also the same as the cost of capital.

*Payback period* is the period required to close back on investment costs based on the resulting cash inflows [6]. Furthermore, Giatman [7] states that the purpose of PP analysis is to ensure that the length of investment can be returned when it reaches BOP (break event point). Here's the formula for calculating it:

$$PP = nL + \left[ \frac{(nU - nL)(kum\ pvU)}{(kum\ pvL - kum\ pvU)} \right]$$

Information:

- nL = Nth year of cumulative cash (-)
- nU = Nth year of cumulative cash (+)
- kum pvL = Cumulative cash (-)
- kum pvU = Cumulative cash (+)

As explained in the PP method, there is an assumption that the project is declared eligible if the capital is able to be returned and recovered quickly or can be done faster than the useful life of the investment, while if on the contrary there is a tendency for the project to be rejected.

Based on previous research conducted by Prananda et al. [10] in their research entitled Project Feasibility Study Analysis, Case Study on PDAM Booster Development in South Pontianak. The results of the sensitivity analysis on the amount of income and expenditure caused by the change factor increased together by + 10% in order to obtain an NPV of Rp. 4,132,516,457. Furthermore, if there is an increase of + 20% for income and expenditure, the NPV amount will be IDR 4,508,199,776.18. Meanwhile, the results of the PP Payback Period method itself show a rate of return for 20 years, then the proposed project or business is declared feasible to work in accordance with the estimated rate of return of a maximum of 20 years.

## II. METHODS

The object of this research is to conduct a case study at the Gresik PDAM, Drinking Water Supply System (SPAM)

Project. This project has a concession period of 24 years and a construction period of 1 year. Sources of data used in this study were obtained from: Secondary Data and Assumptions. The data needed in this study are cash flow, calculation of investment costs (capital expenditure), income plans and operation expenses. While the assumptions used by the author to calculate the discount rate based on the calculation of the Weighted Average Cost of Capital (WACC) are relatively fixed, namely 10.15%.

### III. RESULTS AND DISCUSSION

In this research, the things to be discussed are the level of business financial feasibility or SPAM protection in Kab. Gresik which is based on three methods such as NPV, IRR, and method PP.

The NPV is adjusted according to the concept of discounting all cash flows at their true value to obtain a net value. Furthermore, to calculate the size of the SPAM project, it is carried out with WACC (Weighted Average Cost of Capital) worth 10.15% and an estimate for the use of the investment is around 25 years while ensuring the feasibility of investing the company according to different capital structures, and always connecting with debt and capital. The following is the NPV amount:

TABLE I. NET PRESENT VALUE CALCULATION RESULTS

Year	Free Cash Flow (A)	Discount Factor (B)	Present Value (C = A x B)
2019	(849,977)	0.9078	(771,636)
2020	42,287	0.8242	34,852
2021	23,624	0.7482	17,676
2022	34,618	0.6792	23,514
2023	47,758	0.6166	29,449
2024	50,465	0.5598	28,250
2025	65,979	0.5082	33,530
2026	81,502	0.4614	37,602
2027	98,118	0.4188	41,095
2028	116,473	0.3802	44,287
2029	126,408	0.3452	43,634
2030	203,641	0.3134	63,815
2031	227,796	0.2845	64,805
2032	247,219	0.2583	63,849
2033	264,334	0.2345	61,977
2034	282,502	0.2129	60,131
2035	301,764	0.1932	58,311
2036	322,191	0.1754	56,520
2037	343,799	0.1593	54,752
2038	366,775	0.1446	53,027
2039	391,039	0.1313	51,325
2040	416,840	0.1192	49,668
2041	444,162	0.1082	48,046
2042	473,103	0.0982	46,460
2043	503,919	0.0892	44,925
<b>Total NPV</b>			<b>339,864</b>

As the result of the NPV calculation above, the profit is around IDR 339,864,000,000, assuming the WACC amount is around 10.15%.

The method used is to determine the amount of the IRR value to equity, and to find out the calculation can be done using excel or formulas. If the formula is used, it must be tested first. The calculation assumption is  $i_1 = 11.05\%$ ,  $i_2 = 13.5\%$  according to the estimated interest rate. Here are the results of the IRR calculation:

TABLE II. IRR CALCULATION RESULTS WITH AN INTEREST RATE OF 11.05%

Year	Free Cash Flow (A)	Discount Factor (B)	Present Value (C = A x B)
2019	(849,977)	0.9078	(771,636)
2020	42,287	0.8242	34,852
2021	23,624	0.7482	17,676
2022	34,618	0.6792	23,514
2023	47,758	0.6166	29,449
2024	50,465	0.5598	28,250
2025	65,979	0.5082	33,530
2026	81,502	0.4614	37,602
2027	98,118	0.4188	41,095
2028	116,473	0.3802	44,287
2029	126,408	0.3452	43,634
2030	203,641	0.3134	63,815
2031	227,796	0.2845	64,805
2032	247,219	0.2583	63,849
2033	264,334	0.2345	61,977
2034	282,502	0.2129	60,131
2035	301,764	0.1932	58,311
2036	322,191	0.1754	56,520
2037	343,799	0.1593	54,752
2038	366,775	0.1446	53,027
2039	391,039	0.1313	51,325
2040	416,840	0.1192	49,668
2041	444,162	0.1082	48,046
2042	473,103	0.0982	46,460
2043	503,919	0.0892	44,925
<b>Total NPV</b>			<b>339,864</b>

TABLE III. IRR CALCULATION RESULTS WITH AN INTEREST RATE OF 13.05%

Year	Free Cash Flow (A)	Discount Factor (B)	Present Value (C = A x B)
2019	(861,107)	0.8992	(774,322)
2020	28,542	0.8086	23,079
2021	2,401	0.7271	1,746
2022	10,428	0.6538	6,818
2023	20,350	0.5879	11,964
2024	19,414	0.5287	10,263
2025	30,975	0.4754	14,725
2026	44,805	0.4275	19,153
2027	60,699	0.3844	23,333
2028	78,972	0.3457	27,297
2029	87,657	0.3108	27,245
2030	162,221	0.2795	45,340
2031	183,582	0.2513	46,139
2032	207,555	0.2260	46,907
2033	224,670	0.2032	45,657
2034	242,838	0.1827	44,376

Table 3. Cont.

2035	262,101	0.1643	43,069
2036	282,528	0.1478	41,746

2037	304,136	0.1329	40,410
2038	327,112	0.1195	39,083
2039	351,376	0.1074	37,751
2040	377,177	0.0966	36,438
2041	404,499	0.0869	35,140
2042	433,439	0.0781	33,859
2043	464,255	0.0702	32,611
<b>Total NPV</b>			(40,172)

The IRR formulation can use the following formulas:

$$IRR = i1 + \frac{NPV_U}{NPV_U - NPV_L} (i2 - i1)$$

$$IRR = 11.05\% + \frac{339,864}{339,864 - (40,172)} (13.5\% - 11.05\%)$$

$$IRR = 11.05\% + \frac{339,864}{379,856} (2.01\%)$$

$$IRR = 11.05\% + 0,0129$$

$$IRR = 11.05\% + 2,19\%$$

$$IRR = 13,24\% > 11,05\% \text{ (feasible)}$$

The IRR calculation yields a value of 13.24%, so the investment is feasible to be made based on an IRR value that is greater than the WACC, namely 10.15%.

Payback period is the estimated payback period for investment. The value of PP can be determined by the cumulative negative and positive cash flow value formula as shown in the following table:

TABLE IV. THE RESULTS OF THE CUMULATIVE FREE CASH FLOW CALCULATION

Year	Free Cash Flow (IDR Million)	Cumulative (IDR Million)
2019	(849,977)	(849,977)
2020	42,287	(807,690)
2021	23,624	(784,065)
2022	34,618	(749,448)
2023	47,758	(701,690)
2024	50,465	(651,225)
2025	65,979	(585,247)
2026	81,502	(503,745)
2027	98,118	(405,627)
2028	116,473	(289,154)
2029	126,408	(162,747)
2030	203,641	40,894
2031	227,796	268,690
2032	247,219	515,909
2033	264,334	780,242
2034	282,502	1,062,744
2035	301,764	1,364,509
2036	322,191	1,686,700
2037	343,799	2,030,499
2038	366,775	2,397,274
2039	391,039	2,788,314
2040	416,840	3,205,154
2041	444,162	3,649,316
2042	473,103	4,122,419
2043	503,919	4,626,337

As with the above results, it will then be done using interpolation. The cumulative negative cash amount is

IDR162,747,000,000, p in the 11th year which coincides with 2029. Meanwhile, the cumulative positive cash amount occurs in 2030 with a total amount of IDR 49,894,000,000, - in the 12th year. The following is the calculation of the PP value:

$$PBP = nL + \left[ \frac{(nU - nL)(kum\ pvU)}{(kum\ pvL - kum\ pvU)} \right]$$

$$PBP = 11 + \left[ \frac{(12 - 11)(49,894)}{((162,747) - 49,894)} \right]$$

$$= 11 + \left[ \frac{49,894}{(212,641)} \right]$$

$$= 11 + (0,2346)$$

$$PBP = 10,76 \rightarrow 11 \text{ tahun}$$

As the results of the calculation using the NPV method, it is known that investments will tend to generate substantial profits and meet the elements of feasibility and investors can also judge for themselves on this investment plan to produce good returns, and there are no signs of losses.

Meanwhile, the IRR itself is a level of cash flow capability to provide return on capital from investors which is calculated based on a percentage. The results of this calculation show that the percentage size is greater than the WACC percentage, so that there is a greater tendency for companies to be able to return capital from investors, and this is beneficial for investors to decide on investments. The higher IRR value makes the resulting profits higher, and vice versa, a low IRR value makes the company get low profits. While the PP method shows that the time limit for returning the capital is below the investment validity period, This means that the company's ability to give back to investors' capital can be done faster than investors have expected. A high percentage of return on capital will bring investor expectations in determining investment in this business or project.

#### IV. CONCLUSION

The results of the calculations that have been carried out can conclude that the drinking water supply system (SPAM) project is financially feasible. Based on the methodology used, namely: Net Present Value (NPV) Method, Internal Rate of Return (IRR) Method, and Payback Period Method. The results of the investment feasibility analysis during the project using WACC obtained a positive Net Present Value (NPV) and the Internal Rate of Return (IRR) calculation value is greater than WACC. The payback period calculation results are also feasible in terms of return on capital. For further research, it is possible to add sensitivity analysis and break event points to determine the extent to which the impact of the investment parameters that have been previously determined may change due to the situation and conditions during the investment life, so that these changes will have a significant effect on the decisions that have been taken.

## REFERENCES

- [1] Suratman, Project Feasibility Study: Report Preparation Techniques and Procedures. Yogyakarta: J&J Learning. 2006.
- [2] Cashmere and Jakfar, Business Feasibility Study. Jakarta: Golden. 2003.
- [3] H. Umar, Business Feasibility Study Edition 3. Jakarta: PT. Gramedia Pustaka Utama. 2005.
- [4] Suratman, Project Feasibility Study: Report Preparation Techniques and Procedures. Yogyakarta: J&J Learning. 2001.
- [5] Tandelilin, 2010: 8-9
- [6] Martono and A. Harjito, Financial management. Yogyakarta: Ekonisia. 2005.
- [7] A.R.L.L. Gaol, "Technical and Financial Feasibility Analysis on the Dian Regency Apartment Project". Pomits Engineering Journal, 2 (1). 2013.
- [8] Santoso, Project Feasibility Analysis (Investment) on the expected income at PT. Sinar Waluyo Bandar Lampung. Thesis not published. Lampung University. Lampung. 2008.
- [9] M. Giatman, Engineering Economics, PT. Raja Grafindo Persada, Jakarta. 2007.
- [10] A.S. Prananda, Syahrudin, and M.S. Nuh, "Feasibility Study Analysis for Case Study Project: PDAM Booster Development in South Pontianak". UNTAN Civil Engineering Student Journal, 3 (4), 27-35. 2015.