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The Study of Economic Feasbility Project of Embung's Establishment in The Case to Supply People Needs of Water Sources

(Study Case Project of Embungkalimati, Bapangan-Jepara District)

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Abstract **-** Embungkalimati was a water building which utilize the stream water remains. Embung is located in Bapangan village, Jepara district. Embung establishment is functionate to supply people needs of water sources. Embungkalimati has 280 m of length with depth excavation upstream between 4,80 m and downstream about 2,60 m with wide of pool storage 22.950 m^2. Embungkalimati could save 115.890 m^3 of water volume. The capacity of water storage is 107.000m^3. this study is purpose to calculate the costs of embung's establishment, to find out the benefits and analixing the economic feasibility. Economic feasibility is calculated by comparing the benefits and the costs of benefits and costs rasio (B/C). The result of this study found that the costs of establishment is Rp 21.964.132.000,00. The calculate of the costs based on the price tag of water is B/C>1, it can be obtained the costs water Rp2.280/m^3 for B/C 1,07, IRR 11%, the sensitivity is increase up to 10% and the benefits decrease up to 10% which is can be said that it was impact to the value of the costs and benefits. The Payback Period is still the same with the 8th year. So, it can be concluded that the project of Embungkalimati's establishment project was appropriate for economics.

Keywords: *Costs of establishment, Price tag of water, B/C, IRR*

1. Introduction

1.1 Background of the Study

Prolonged drought can be impact to lack supply of water sources in some areas. One of the many ways to solve this problem, is establish Embung as media to save water sources. The district government are going to establish Embung to supply water resources. The water sources supply is located in the existing of Wiso stream Bapangan village. The former flow could save rainwater for storage of water sources also to decrease flood risk in Wiso stream while high intensity rain. By the establishment of Embung, the economic feasibility will be analyzed to find out the value of benefits. The other hand it could be suggestion for the government. So that the economic feasibility Embung's establishment analyzes in Bapangan village-Jepara district needs to get result as consideration of government's decision.

1.2 Statements of The Problem

Embungkalimati's establish is the government's effort to solve the problem about water sources for the people there. In case, PDAM Jepara district are expected to improve their quality services forthe villagers. In this study, the writer will discuss about the economic feasibility of Embung's establishment. The statement of the problem such as:

a. To find out the economic feasibility project of Embungkalimati's establishment?
b. To find out how much the costs of the water sources?
c. To find out about the benefits value of Embung's establishment?

2. Significances Of The Study

2.1 Economic Feasibility

1) BCR Value

BCR is a comparison present value of benefits value with present cost of investment costs incurred(Giatman,MSIE ,Drs. M. , 2006). While the method of analyze benefits costs ratio (BCR) as follows:

$$BCR = \frac{NPB}{NPC} \qquad (1)$$

To know how an investment plan is proper or not. The writer used the method such as:

BCR > 1 mean an investment is feasible
BCR < 1 mean an investment is not feasible

2) IRR Value

IRR method is used to find out interval rate that equals with the present value of the future cash flow, ortake the cash by issuing initial investment. Internal method rate return(IRR) as follows :

$$IRR = i' + \frac{NPV''}{NPV'-NPV''}\ (i' - i') \qquad (2)$$

To know how an expected investment are feasible or not by doing this method first:

IRR ≥ Suku bunga mean a project is feasible
IRR ≤ Suku bunga mean a project is not feasible

3) NPV Value

NPV is differences of present value of investasi withpresent value of income cash future. Net present value (NPV) method as follows:

$$NPV = C0 + (C1 / (1 + r)) \qquad (3)$$

Where C0 = The amount of invested money (because of this is outcome so that the writer used negative numbers).

If :

NPV >0 (nol) → a project is feasible to do
NPV <0 (nol) → a project is not feasible to do

4) Payback period

Payback period analyze method is purpose to find out how long (periode) investment will giving back when break even-point is happen (the calculate cash flow income equals with cash flow outcome). Payback period methodas follows:

$$\text{payback period} = \frac{Nilaiinvestasi}{prosceed} \qquad (4)$$

5) Analysis Sensitivity Value

Analisis sensitivity is done by changing the value from a parameter in a time to know how the impact to the accepbility of some alternative investment fo the next. The analysis of sensitivityas follows:

$$NPV = -I + Ab\ (P/A,i,n) + S\ (P/F,i,n) - Ac\ (P/A,i,n) \quad (5)$$

2.2 The analysis of the growth population projection

The growth of the population is one of the important factors of planning needs water sources. In this case, the projection of total population which is used to calculate interval needs of pure water for the future. In this research geometric method is used to calculate population growth. The geometric method as follows:

$$Pn = Po\ (1 + r)^{n} \quad (6)$$

2.3 The pricing of water

The main pricing of water is done by dealing models by divide total outcome costs for production process with the total product produced. Kusuma (2006) said that it is include to the costs of water produce process of PDAM is a source costs, processing costs. While it is included to the other costs if the administration costs and general costs which consist of employees costs and office expenses.

$$\text{Harga pokok air} = \frac{Totalbiayaproduksiair}{Jumlahairyangdiproduksi} \quad (7)$$

3. Research Methodology

3.1 Steps of the research

There are some steps of the research such as:

1) First is statements of the problems
2) Next is collect the bibliography of the study
3) After that discuss the economic feasibility method
4) Then, analyze the data
5) The last is conclude the result and suggestion

3.2 The Flowchart of Research

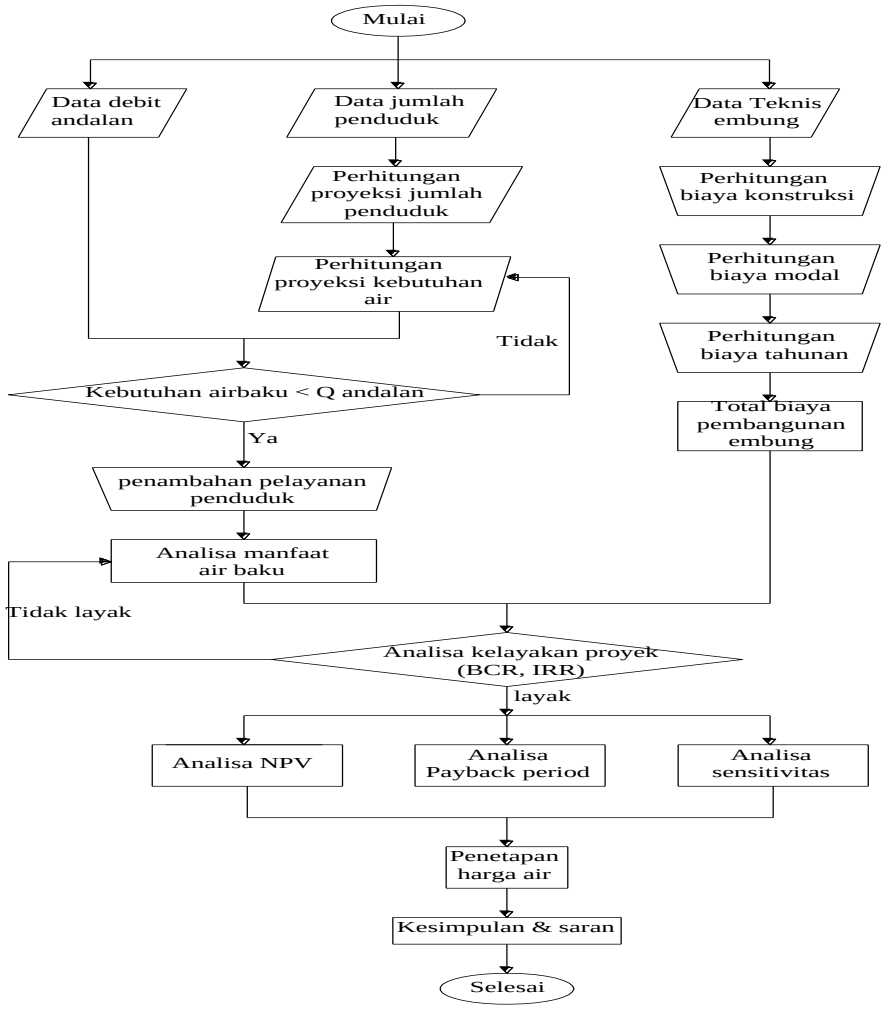

Figure 1. Flowchart of Research

4. Research Findings and Discussion

4.1 Water Needs

In this study is assumed that the consumer of the PDAM water was in BWK II areas with total population 19.823 people in year 2013. We know that the usage of the water in small town is less than about 60 lt/person/day.By take the growth numbers in BWK II areas so, the averages of population growth is 3,41% per year, then the population growth prediction until 20 years later appropriate with geometric calculate method, and the population growth in some areas could be calculated by formulas as follows: it is calculate the population in year 2018(Pn) dengan persamaan $Pn = Po\ (1 + r)^n$

$$Pn = Po\ (1 + r)^n$$
$$Pn = 19.823*(1+0,0341)^5$$
$$Pn = 23.441$$
$$Pn = 23.441 \text{ (tahun 2018)}$$

For the pure water needs can be calculated such as :

1. People sevices = 100%
2. Water sources needs = 60 lt/org/hari
3. The projection of population in year 2018 = 23.441 jiwa
4. Water sources needs = 23.441x 100% x 60 x 10^{-3}
   = 1.406 m³/hari
5. Losewater = 25% x kebutuhan air baku
   = 25 % x 1.406
   = 352 m³/hari
6. Total of lose water needs about = 1.406 + 352
   = 1.758 m³/hari x 365
   = **641.706 m³/tahun**

The projection of water needs based on the total population is calculated by geometric method as follows on table 4.1.

Tabel 1. The Total Population and Water Needs

No	Year	Total Population (person)	Water Needs (ltr/th)
1	2018	23.441	641.706
2	2023	27.720	758.838
3	2028	32.780	897.349
4	2033	38.763	1.061.144
5	2038	45.839	1.254.836

Sumber : the result of analysis

4.2 The Costs of Construction

The costs of construction while EmbungKalimati's establishment consist of construction costs, study costs, DED and supervision. In this case, Embung's project used price numbers of 2017 works. There are some details of construction costs on table4.1 :

Tabel 2. Total population and water needs

No	Details	Price numbers (Rp)
A	ESTABLISHMENT	
1	Construction	21.324.400.000,00
2	DED dan Supervision	639.732.000,00
Total		**21.964.132.000,00**

Sumber : the result of analysis

4.3 Operational and Maintenance Costs

The operational and maintenance costs of Embungkalimati is calculated when the first operational and the use of water as water sources. Embungkalimati already operated in year 2018. Based on the table 4.2, the operational and maintenance costs in the beginning is Rp. 119.672.000, then it is increase in year by years about 5.9% inflation caused.

Table 3. Details of Operational and Maintenance Costs

No	Details	Volume	Price (Rp)	Total
1	Operational Costs			
	• Staff experts	1	5.400.000,00	5.400.000,00
	• Administration	1	3.600.000,00	3.600.000,00
	• Mechanic	1	4.050.000,00	4.050.000,00
	Sub Total			12.050.000,00

No	Details	Volume	Price (Rp)	Total
2	Maintanance Cost			107.662.000,00
3	Total Cost O & P			**119.672.000,00**

Sumber : the result of analysis

4.4 Financial Analyze

The financial evaluate by calculate economic feasibility project. The method that is used to calculate the value of BCR, IRR, NVP. For the payback project is used payback method period and analysis riskin project is used sensitivity analysis. Based on table management the planning costs by inflation increase up to 5,9% and local credit 8,01%.

A. BCR Value

When calculate the benefit cost ratio, the benefits value of every single value of components became a present value. The level of credit which is used is about 8,01% and economic age project up to 20 years. Convertion factors (F/P, 8,01%, 1).

Construction costs = Rp. 21.964.132.000,00 x(F/P, 8,01%, 1)
= Rp. 21.964.132.000,00 x 0,925
= Rp. 21.249.686.946,00

OP costs = Rp. 119.672.000,00 x (P/A, 8,01%, 1)
= Rp. 119.672.000,00 x 10,566
= Rp. 931.339.860,00

Total costs = 21.249.686.946,00 + 931.339.860,00 =22.181.026.806
Benefits value (1 s/d 20) = Rp. 23.665.621.396
B/C value = (23.665.621.396 : 22.181.026.806)
= 1,07

Because the valueof B/C > 1, so the Embung's project is feasible to do.

B. NPV value

The calculating of NPV Embungkalimati's establishment project by credit8,01% per year can be known by calculate total value of benefits minus total cost value.

Total benefits value = Rp. 23.665.621.396
Total costs = Rp. 22.181.026.806
NPV value = B – C
= Rp. 23.665.621.396 - Rp. 22.181.026.806
= Rp. 1.484.594.589,00

Because the value of NPV > 0 so the Embungkalimati's project is feasible to do.

C. Nilai IRR

IRR calculate is for Embungkalimati's project by using the credit 8,01 % per year as follows:

$$\text{IRR} = i' + \frac{NPV''}{NPV' - NPV''} (i' - i')$$

After done the calculating by using Microsoft excel software, the writer gets IRR value 11 %. The value is up on credit which is determined 8,01%. So Embungkalimati's project is feasible to continue.

D. Payback Period Value

By the graphic ways it is easy to describe *cash flow* condition while describe by analysis ways. Payback period is done after BCR,NPV and IRR analysis done fist and get feasibility value as the result. By graphic analysis Embungkalimati's project will get the payback in 2025 or in the 8th year, it still in beginning of the planning so Embung's project is feasible to do. The description is appropriate by the picture as follows 2:

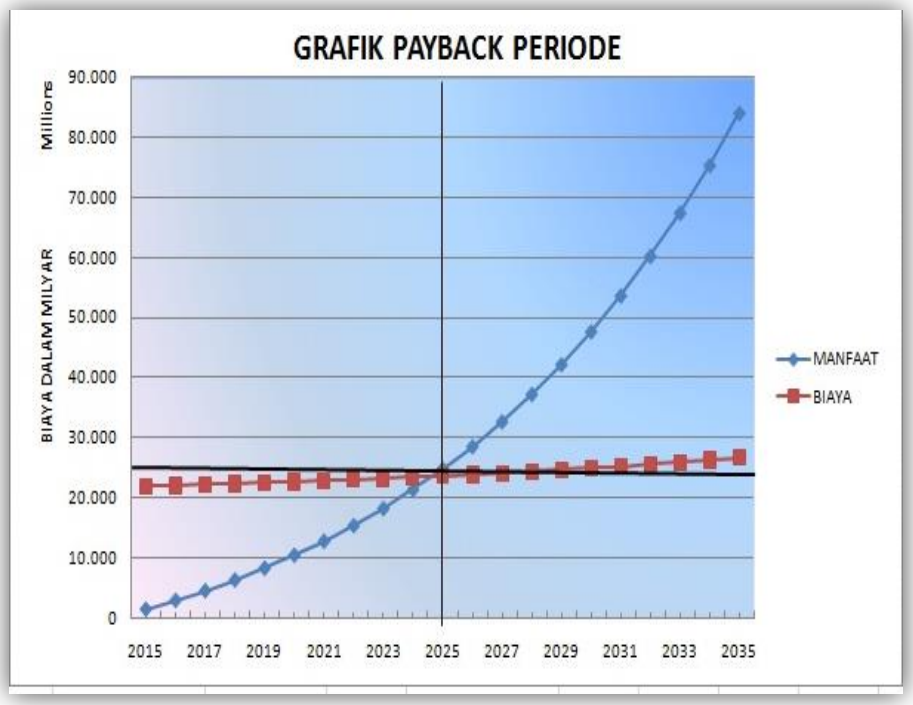

Figure 2. Payback period graphic

E. Analysis of sensitivity

This analyze is purpose to find out what happen to the result of the project if there are some possible changing in case to determine the costs of the values and benefits of some estimationso that if there assume happened is not the same with the real condition. This is the parameter of analysis sensitivity Embungkalimati's establishmentfeasibility formulas as follows (5). The investment sensitivity, cost and benefit 3.

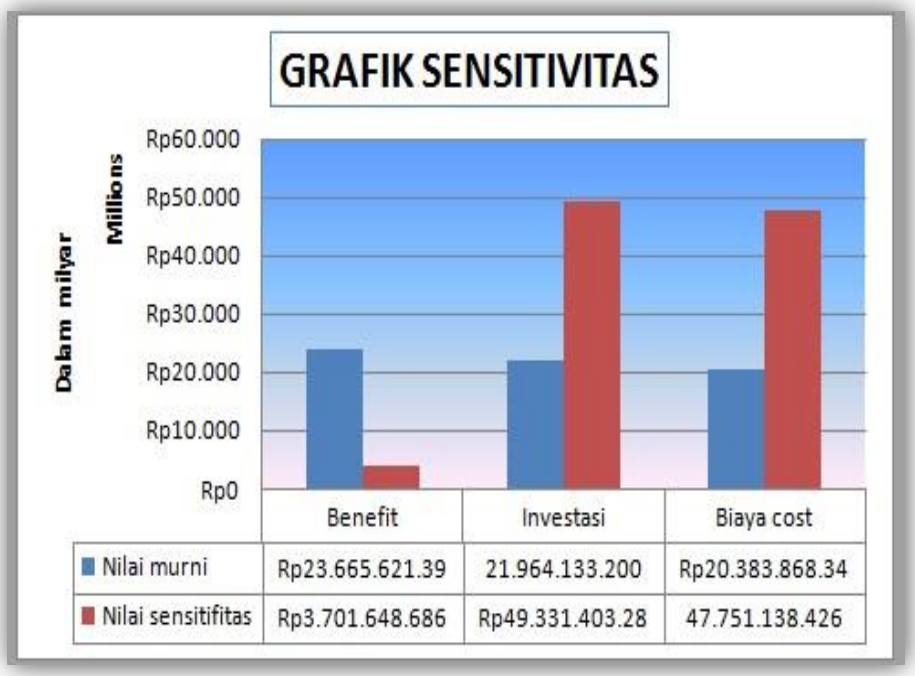

Figure 3. Grafik sensitifitas

F. The Determine of Pricing Water

The determine of pricing water in this study was analyze by some conditions of sensitivity on economic analysis while B / C. This are some example of the calculating analysis of water price in rate 8,01% by total population undeserved 100%. After done the calculate by assume determine pricing wateris appropriate with B/C value 2.280/ lt. The result of analysis of water price to B/C value can be seen on the picture 4.5 below.

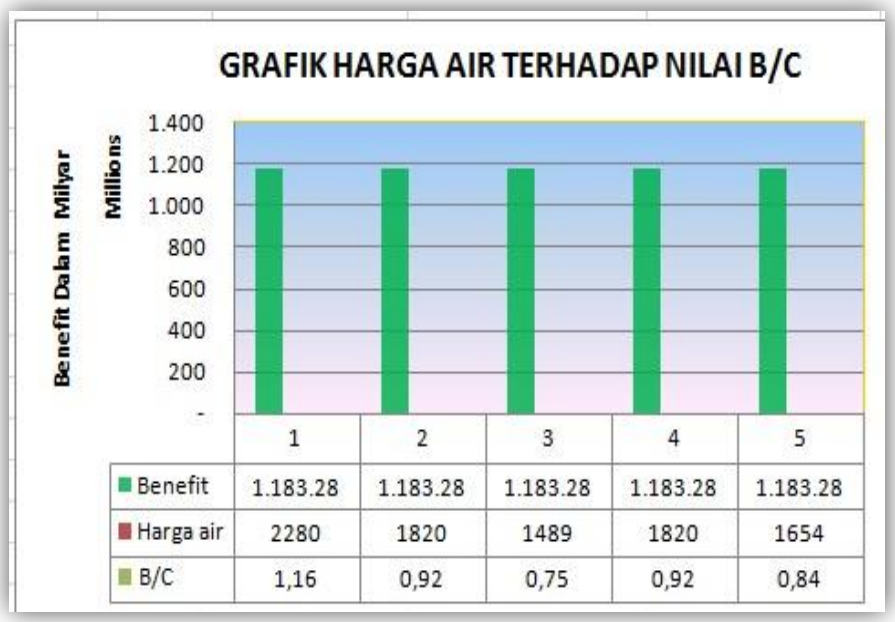

Figure 4. Graphic of water price to B/C

5. Conclusion and Suggestion

5.1 Conclusion

The benefits in real can be felt by the people by increase the water sources service from PDAM Jepara district. Based on the analysis of feasibility which has been done so the writer got the result as follows:

1) After done the calculating, it can be known that the total costs of Embungkalimati's project is Rp. 21.964.132.000.000,00.
2) OP costs of Embung kalimati is determined in the beginning of operational in year 2018 will Rp. 119.672.000,00
3) The economic feasibility BCR value = 1,07, NPV value = Rp. 1.484.594.589,00, IRR value = 11% . Payback period is getting back in 8^{th} year of economic life. Less thaneconomic age. Based on the analysis of sensitivity for all aspects of feasibility is no more than sensitivity value itself.So the project can be said that it is feasible.
4) The water price is appropriate with 2.280 because that price is appropriate with B/C value.

5.2 Suggestion

As the result of this study could be suggest as follows:

1) The supply of water sources when dry season is decrease. To minimalize that condition, the people should use the water wisely.
2) The people near Embung have to participate to maintenance and care for Embung which already established.
3) When the dry season there is a problem of water supply, so it is good for the people take turns to use the water flow.
4) Make sure do the payment in every month on time to get Embung's operational and maintenance which is determined in the beginning of the plan.

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