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INVESTMENT FEASIBILITY ANALYSIS FOR DISTRIBUTION NETWORK DEVELOPMENT OF PDAM TIRTA BENING LONTAR KUPANG CITY

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ABSTRACT

Clean water is the most basic need for humans and other living things. In Indonesia, the government's responsibility for fulfilling clean water is regulated in article 5 of Law Number 7 of 2004 concerning Water Resources, where the state guarantees everyone's right to obtain water for minimum daily basic needs in order to fulfill a healthy, clean life. and productive. The purpose of the research based on the formulation of the problems that occur is to determine the feasibility analysis of investment in the distribution network development of PDAM Tirta Bening Lontar in Penkase Oeleta Village, Alak District, Kupang City, in terms of financial, social and economic aspects. Data collection methods used in this research are observation and literature study. Feasibility Investment Analysis using the Pay Back Period (PBP) Method, Net Present Value (NPV) Method, Internal Rate Of Return (IRR) Method, Probability Ratio (PR) and Break Event Point (BEP). Based on the results of the analysis and discussion regarding the feasibility analysis of the investment from the financial aspect with an investment assessment: Net Present Value (NVP), Benefit Cost Ratio (BCR), Payback Period (PP) and Internal Rate Of Return (IRR) the project is feasible to implement. (NPV > 0) so the project is feasible to continue. If BCR ≥ 1, then it is said that the project is acceptable or feasible. The payback period is 4.24 years. The criteria for analyzing social and economic aspects are for regional development funds 30% and general reserve funds 15% including regional development funds of Rp. 39,515,617.00 and a general reserve fund of Rp. 19,757,809.00.

INTRODUCTION

Clean water is the most basic needs for humans and creatures life other . Man could endure without eat in period time 3 days, however they no could endure During that without consume water drinking). Water is source life for every creature life (Fazly, 2014). In Indonesia, responsibility answer government to fulfillment of clean water arranged in Article 5 of the Law Number 7 of 2004 concerning Source Water Power, where the state garantees right everyone for get water for need daily minimum To use Fulfill healthy, clean and productive life. But in fact, the government not yet could Fulfill need over the whole water society in Indonesia Sriyan, 2010). this supported by. Problems arise in fulfillment clean water needs is system clean water distribution to area the place Live resident no smoothly. For resolve matter the needed network good and capable distribution of clean water for serve clean water needs for residents in the area. Besides problem distribution is

also a problem capacity from the clean water treatment system (IPA) to constraint with keep going development total population in the future (Prihastuti , 2014). With development civilization as well as the more increase total resident with itself add activity diverse life. Previously Public local more tend domiciled on the edge river because they with easy get water on the river, will but because growth increasing population increases which is also accompanied by enhancement level economy Public so domicile residents have growing in the area land located away from the flow river (Kusuma & Sandhyavitri, 2014).

In line with growth and development total resident accompanied development and development economy so need to clean water supply also increased. Development of clean water facilities and infrastructure which is one of the sector support welfare Public must built in a manner programmed and sustainable to make it happen even distribution development. PDAM Tirta Bening Lontar as clean water manager need with quick carry out improvement and development programs network distribution of clean water in order to get expand service as well as Upgrade clean water service. Development decisions network distribution this should take into account appropriateness investment. Appropriateness investment done for evaluate is something investment worthy done or no reviewed from a number of aspect. Meaning from evaluate aspects this is detect possibility exists failure in the activity turned out to be no profitable.

The purpose of this study was to determine the feasibility analysis of the development of distribution network distribution network investment PDAM Tirta Bening Lontar in Penkase Oeleta Village, Alak District, Kupang City, in terms of financial, social and economic aspects.

The benefits of this study are to get an overview of the results of the distribution network development activities of PDAM Tirta Bening Lontar in Penkase Oeleta Village, Alak District, Kupang City, in terms of financial, social and economic aspects, as the development of knowledge in the field of Project Management in the future, the results of this study can be used as reference material for future research on the same topic and as a guide for implementing similar projects in the future.

RESEARCH METHOD

Type research used is studies case. Studies case is study with process and analyze the data obtained then interesting conclusion . Research location this are in the Village pencase Oeleta, District Alak, Kupang City, East Nusa Tenggara Province

RESULTS AND DISCUSSION

Analysis Appropriateness Investment

a. Forecasting Amount Customer

In count projection increase total customer could use equation :

Pn = Po1+ r) n

P2022 = P2021 + (1 + 2.08 % Po) 1

= 44,242 + (1 + 2.08 % Po) 1

= 45,163 SRs

Is known if total customers in Residential Areas pencase Oeleta, district Alak, Kupang City, (Po = 44.242 SR) with level rate increase customers (r = 2.08%) then projection customers in 2022 is (Pn = 45,163 SR) and at the end year calculation investment namely in 2040 (Pn = 45,226 SR). Where are the results calculation the is the next data used in analyze appropriateness investment to development network distribution of PDAM Tirta Bening Lontar then magnitude increase customer every the year could foreseen as seen in Table 1:

Table 1
Projection of the Number of Customers in Kec. Alak Year 2021 Until 2040

No	Year	Customer (SR)
1	2021	45.163
2	2022	45,167
3	2023	45,170
4	2024	45,173
5	2025	45,176
6	2026	45,180
7	2027	45,183
8	2028	45,186
9	2029	45,190
10	2030	45,193
11	2031	45,196
12	2032	45,200
13	2033	45,203
14	2034	45,206
15	2035	45,210
16	2036	45,213
17	2037	45,216
18	2038	45,219
19	2039	45,223
20	2040	45,226

Source: Data Processing, (2022)

Based on Table 1, it can be seen that the number of customers in 2040 is 45.226 SR.

b. Estimation of Production and Distribution Costs and Selling Price of Water

The amount of production costs and sales revenue can be calculated by the equation:

$$\text{Cost of Production} = \frac{\text{Expenditure Cost}}{\text{Production Volume}}$$

$$= \frac{5,726,209,226.00}{1,627,284}$$

$$= 3518.00 \text{ /m3}$$

$$\text{Revenue} = \frac{\text{Sales}}{\text{Distribution Volume}}$$

$$= \frac{10,150,125,001.73}{1,476,292}$$

$$= 6,875.00/\text{m3}$$

Consequence leakage 9.28 % then cost production to be:
Pn = Po (1 + r) 1 = 3,518 (1 + 9.28 %) 1 = 3,846.00 / m3
So sales and costs operational from 2022 to _ in 2040 can seen in Table 2:

Table 2
Sales and Costs operational

Year	Amount Customer	Consumption(m3/ year)	selling price (m3)	Cost shrinkage (m3)	Income From Sales Water (C)t	Cost Production and operational (C)o
A	B	C	D	E	F= C x D	G = C x E
2021	45.163	695,774	6,875	3,846	4,783,446,594	2,675,946,996
2022	45,167	701524	6,875	3,846	4,822,977,500	2,698,061,304
2023	45,170	723,876	6,875	3,846	4,976,649,150	2,784,028,019
2024	45,173	752,872	6,875	3,846	5,175,995,138	2,895,545,789
2025	45,176	787,821	6,875	3,846	5,416,269,513	3,029,959,643
2026	45,180	815551	6,875	3,846	5,606,912,114	3,136,608,581
2027	45,183	846198	6,875	3,846	5,817,610,205	3,254,476,923
2028	45,186	876,845	6,875	3,846	6,028,308,296	3,372,345,266
2029	45,190	907,492	6,875	3,846	6,239,006,386	3,490,213,609
2030	45,193	938,139	6,875	3,846	6,449,704,477	3,608,081,952
2031	45,196	968,786	6,875	3,846	6,660,402,568	3,725,950,294
2032	44,287	999,433	6,875	3,846	6,871,100,658	3,843,818,637
2033	45,203	1,030,080	6,875	3,846	7,081,798,749	3,961,686,980
2034	45,206	1,060,727	6,875	3,846	7,292,496,839	4,079,555,323
2035	45,210	1,091,374	6,875	3,846	7,503,194,930	4,197,423,666
2036	45,213	1,122,021	6,875	3,846	7,713,893,021	4,315,292,008
2037	45,216	1,152,668	6,875	3,846	7,924,591,111	4,433,160,351
2038	45,219	1,183,315	6,875	3,846	8,135,289,202	4,551,028,694
2039	45,223	1,213,962	6,875	3,846	8,345,987,293	4,668,897,037
2040	45,226	1,244,609	6,875	3,846	8,556,685,383	4,786,765,379

Source: Data Processing, (2022)

Based on Table 2 is known income and expenses operational experience enhancement every 5 years by 10%.

Discussion

Financial Aspect

Analysis based on financial aspects on evaluation with use method *Net Present Value* (NPV), Benefit Coast Ratio (BCR), *Internal Rate Of Return* (IRR), *Payback Period* e (PP).

a. *Net Present Value* (NPV)

Net Present Value (NPV) is based on the concept discount whole cash flow to mark now. With discount all cash inflow and cash outflow During age project to mark now then count number net so will is known the difference.

NPV year 2021:
= 4,783,446,594 / (1 + 5.25 %) - 2,675,946,996 / (1 + 5.25 %)
= Rp. 131,718,725 **(NPV > 0)**

From the results project NPV calculation development network distribution obtained NPV value of Rp. 131,718,725 (NPV > 0). So invest development network distribution area housing area sub-district reason city kupang worthy for continued . Positive NPV value or more big of (> 0) indicates that reception more big compared to with invested value.

So NPV value of 2022 to in 2040 can seen in Table 3:

Table 3
***Net Present Value* from 2022 to year 2040**

Year	Revenue From Sales Water (C)t	Production and Operational Costs (C)o	Interest rate	NPV 1
2021	4,783,446,594	2,675,946,996	0.0625	131,718,725
2022	4,822,977,500	2,698,061,304	0.0625	132,807,262
2023	4,976,649,150	2,784,028,019	0.0625	137,038,821
2024	5,175,995,138	2,895,545,789	0.0625	142,528,084
2025	5,416,269,513	3,029,959,643	0.0625	149,144,367
2026	5,606,912,114	3,136,608,581	0.0625	154,393,971
2027	5,817,610,205	3,254,476,923	0.0625	160,195,830
2028	6,028,308,296	3,372,345,266	0.0625	165,997,689
2029	6,239,006,386	3,490,213,609	0.0625	171,799,549
2030	6,449,704,477	3,608,081,952	0.0625	177,601,408
2031	6,660,402,568	3,725,950,294	0.0625	183,403,267
2032	6,871,100,658	3,843,818,637	0.0625	189.205.126
2033	7,081,798,749	3,961,686,980	0.0625	195,006,986
2034	7,292,496,839	4,079,555,323	0.0625	200,808,845
2035	7,503,194,930	4,197,423,666	0.0625	206,610,704
2036	7,713,893,021	4,315,292,008	0.0625	212,412,563
2037	7,924,591,111	4,433,160,351	0.0625	218,214,423
2038	8,135,289,202	4,551,028,694	0.0625	224,016,282
2039	8,345,987,293	4,668,897,037	0.0625	229,818,141
2040	8,556,685,383	4,786,765,379	0.0625	235,620,000

Source : Processing Data, (2022)

b. Benefit Cost Ratio (BCR)

The use of *the Benefit Cost Ratio* (BCR) is very often used in evaluating projects for the public interest and not the company's financial interests, in this case the emphasis is on benefits *(* Soeharto, 1997). For knowing the B/C *ratio* , there is formula certain can _ used for count it . Required data including the total cost expenditure and amount income per year .

B/C *ratio* formula for year 2021 is as following this :

B/C *ratio* = amount revenue / total cost product

BCR = 4,783,446,594 / 2,675,946,996

= 1.78 **(BCR > 1)**

If BCR ≥ 1, then it is said that the benefits of the project are greater than the sacrifices incurred. So that the project can be accepted or *feasible* . A positive BCR value or greater than 1 (> 1) indicates that the income is greater than the value invested. So the distribution network development activities are considered to be able to provide benefits in the future so that this project is feasible to run.

c. Payback Period (PP)

The payback period or payback *period* (PP) is the time required for the return on investment capital, calculated from net cash flow. (Suharto, 1997).

PP = (n-1) + (net cash investment / year cash flow) x 1 year

Information:

PP = *Payback Period*

n = terms of return on investment capital

Cash flow = Revenue - Production

Then the value of cash flows from 2021 to 2040 can be seen in Table 4:

Table 4
Cash Flow from 2021 to 2040

Year	Revenue from Water Sales (C)t	Cost Production and Operations (C)o	Cash Flow
2021	4,783,446,594	2,675,946,996	2,107,499,597
2022	4,822,977,500	2,698,061,304	2,124,916,196
2023	4,976,649,150	2,784,028,019	2,192,621,131
2024	5,175,995,138	2,895,545,789	2,280,449,349
2025	5,416,269,513	3,029,959,643	2,386,309,870
2026	5,606,912,114	3,136,608,581	2,470,303,534
2027	5,817,610,205	3,254,476,923	2,563,133,282
2028	6,028,308,296	3,372,345,266	2,655,963,029

2029	6,239,006,386	3,490,213,609	2,748,792,777
2030	6,449,704,477	3,608,081,952	2,841,622,525
2031	6,660,402,568	3,725,950,294	2,934,452,273
2032	6,871,100,658	3,843,818,637	3,027,282,021
2033	7,081,798,749	3,961,686,980	3,120,111,769
2034	7,292,496,839	4,079,555,323	3,212,941,517
2035	7,503,194,930	4,197,423,666	3,305,771,264
2036	7,713,893,021	4,315,292,008	3,398,601,012
2037	7,924,591,111	4,433,160,351	3,491,430,760
2038	8,135,289,202	4,551,028,694	3,584,260,508
2039	8,345,987,293	4,668,897,037	3,677,090,256
2040	8,556,685,383	4,786,765,379	3,769,920,004

Source : Processing Data, (2022)

PP = (n-1) + (net cash investment / year cash flow) x 1 year
= 4 + (523,253,380 / 2,107,499,597) x 1 year
= 4 + (0.24) x 1 year
= 4. 24 years

From calculations *Payback* Period above , get is known period return on capital ie of 4.24 years or exactly 4 years more than 2 months so that still are below _ period time return ie 5 years . So that project the could accepted or worthy run.

e. *Internal Rate Of Return* (IRR)

Is calculation analysis appropriateness where level ethnic group interest allowed on a project or NPV=0. First of all level ethnic group flower raised from 5.25% to 10%. So NPV value of 2021 to year 2040 with increase 10% interest get seen in Table 5

Table 5
NPV of 2021 to _ year 2040 with increase 10% interest

Year	Revenue from Water Sales (C)t	Production and Operational Costs (C)o	Interest Rate (1+10%)	NPV2
2021	4,783,446,594	2,675,946,996	0.11	231,824,956
2022	4,822,977,500	2,698,061,304	0.11	233,740,782
2023	4,976,649,150	2,784,028,019	0.11	241,188,324

2024	5,175,995,138	2,895,545,789	0.11	250,849,428
2025	5,416,269,513	3,029,959,643	0.11	262,494,086
2026	5,606,912,114	3,136,608,581	0.11	271,733,389
2027	5,817,610,205	3,254,476,923	0.11	281,944,661
2028	6,028,308,296	3,372,345,266	0.11	292,155,933
2029	6,239,006,386	3,490,213,609	0.11	302,367,206
2030	6,449,704,477	3,608,081,952	0.11	312,578,478
2031	6,660,402,568	3,725,950,294	0.11	322,789,750
2032	6,871,100,658	3,843,818,637	0.11	333,001,022
2033	7,081,798,749	3,961,686,980	0.11	343,212,295
2034	7,292,496,839	4,079,555,323	0.11	353,423,567
2035	7,503,194,930	4,197,423,666	0.11	363,634,839
2036	7,713,893,021	4,315,292,008	0.11	373,846,111
2037	7,924,591,111	4,433,160,351	0.11	384,057,384
2038	8,135,289,202	4,551,028,694	0.11	394,268,656
2039	8,345,987,293	4,668,897,037	0.11	404,479,928
2040	8,556,685,383	4,786,765,379	0.11	414,691,200

Source : Processing Data, (2022)

IRR = I2 + ((NPV2 / (NPV2 – NPV1)) + (I1 – I2))
=10% + {(231,824,956 / (231,824,956 - 131,718,725)} + (10% - 5.25%))
= 17.07 % **(IRR > 5.25%)**

With thereby level ethnic group allowable interest on Development network distribution this is 17.07%. this _ signify that project this worthy for run because have more IRR tall from level ethnic group flower deposit .

Aspect Social And Economic

Feasibility analysis from aspect social and economic done with hope could Upgrade tarp life Public in need enhancement welfare nor health impacted society to maximum service, including :

a. For development funds area 30%
= 30% x NPV = 30% x Rp. 131,718,725 = Rp. 39,515,617.00
b. For reserve funds general 15 %
= 15% x NPV = 15% x Rp. 131,718.72 = Rp. 19,757,809.00

CONCLUSION

Aspect Financial

Kiteria analysis the financial aspect is with evaluation investment: *Net Present Value* (NVP), Benefit Cost Ratio (BCR), *Payback Period* e (PP) and *Internal Rate Of Return* (IRR).

a. *Net Present Value* (NPV)
   Obtained results NPV calculation of Rp. 131718725 with level ethnic group flower deposits 5.25% per annum, (NPV > 0) with thereby appropriateness investment development network distribution of PDAM Tirta Bening Lontar Residential Area Ward Oeleta City of Kupang, worth it for carried out.
b. *Benefit Cost Ratio* (BCR)
   Obtained results BCR calculation of 1.78 with level ethnic group flower deposit 5.25 % per annum, BCR ≥ 1 with thereby appropriateness investment development network distribution of PDAM Tirta Bening Lontar Residential Area Ward Oeleta City of Kupang, worth it for carried out.
c. *Payback Period* e (PP)
   Obtained results calculation of PP in the year 4th (4 years 2 months) where more small from age planned investment ie 5 years with thereby appropriateness investment development network distribution of PDAM Tirta Bening Lontar Residential Area Ward Oeleta City of Kupang, worth it for carried out.
d. *Internal Rate Of Return* (IRR)
   Obtained value 17.07 % more big from current desired return that is by 5.25% (17.64% > 5.25%) with thereby appropriateness investment development network distribution of PDAM Tirta Bening Lontar Residential Area Ward Oeleta City of Kupang, worth it for carried out.

Aspect Social and economic

Kiteria analysis aspect social and economic is for development funds area 30% and reserve fund general 15% including :

a. Development fund area Rp. 39,515,617.00
b. Reserve fund general Rp. 19,757,809.00

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