

# WATER ECONOMIC VALUE OF FRESH WATER SYSTEM IN THE TANGGUNGGUNUNG VILLAGE, INDONESIA

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**ABSTRACT:** One of the factors causing the increasing demand for fresh water on Indonesian society is the very rapidly population growth. Therefore, it is needed to solve this problem by increasing the water source for fulfilling the fresh water need. One of the efforts is by carrying out the rehabilitation and develop the freshwater distribution network. The accurate water economic analysis is very necessary to solve the problem. This study intends to analyze the construction and operational cost, benefit, and the minimum water price. The result shows that the minimum water price in Tanggunngunung Village is Rp. 2,280.-/m<sup>3</sup> with the total cost of Rp. 6,591,350,562.00 and the benefit is Rp. 8,469,104,820.00. The value of water price is included in the water price classification which is still able to be paid by the local society. Based on the analysis, it can carry out the development efforts which are useful for increasing or improving the function of the fresh water distribution network in the Tanggunngunung Village.

*Keywords: Tanggunngunung village, Water price, Benefit, Construction cost*

## 1. INTRODUCTION

The management of irrigation system is essential when attempting to increase the irrigation production [1]. Therefore, the operation of irrigation network has to consider the water availability, water need, and how to allocate the water fairly and equally so the irrigated crop can be well grown [2]-[3]. The acquisition of fresh water in the villages or highlands area is generally easier because there are fresh water sources which are clear and safe to be consumed by the society. Therefore, all efforts on the design and management of water resources are needed so the water supply can be well distributed [4].

Tulungagung region is the lowland and part of it includes a cool highlands area. The resident population in the Tulungagung also requires water and needs to be addressed. The water usage and regulation is needed so the water in the highlands can be maximally used by the society. However, nowadays the water discharge is increasingly diminishing from the previous one. The society in surrounding it is depended on the fresh water supplying which is managed by the institution of Bapel Hippiam Sumbersongo that has been built since 2005 for fulfilling the daily water need.

In order to be able to well distribute the water to the society, it is needed some cost [5]. The cost includes the water management process, the water distribution to society, the pump installing, the pipe installing or the connection and the other administration cost. Besides the general water management cost, there is needed the maintenance cost during the system usage of

the available fresh water. To study the society consciousness due to the willingness to pay fresh water for increasing the service or the development is also an important factor that has to be considered in determining the water price. Related to the effort on developing the facility of the freshwater availability, it can not be denied that the increasing of freshwater price will happen periodically. Therefore, it is increasingly needed the study about the determination of water price based on the economic feasibility of the population in the Tanggunngunung Village. This study intends to evaluate the existing condition and the happened problem of the freshwater availability in the local region, to know the general illustration of the construction technique system on using the fresh water, to know the economic feasibility value for determining the freshwater price in the Tanggunngunung Village now and in coming period, and to predict the feasible water price economically for in coming 15 years.

## 2. MATERIALS AND METHODS

### 2.1. Location of study

The Tulungagung Regency geographically is located between the east longest of 111° 43' to 112° 7' and south longest of 7° 51' to 8° 08'. The area is 1,055.65 km<sup>2</sup>. The location of study is in the Tanggunngunung Village, Tanggunngunung District, Tulungagung Regency. The area of Tanggunngunung Village is 47 km<sup>2</sup>. The Tanggunngunung Village is as a lowland which is

in the range of 0-18 m over the sea level. Map of

the location is presented as in the Fig. 1

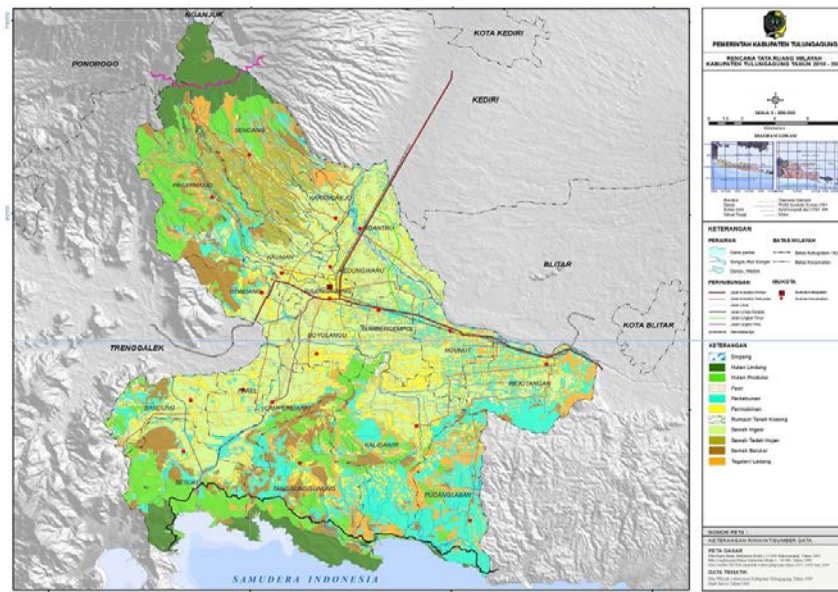


Fig. 1 Map of the study location

## 2.2. Analysis of Economic Feasibility

### 2.2.1. Benefit-Cost Ratio (BCR)

Benefit-Cost Ratio (BCR) is as the ratio between the present value of gross profit on every period (year) and the present value of cost and investment which is issued [6]. The analysis method of the Benefit-Cost Ratio (BCR) is as follow [1]:

$$BCR = \text{Benefit} / \text{Cost} \quad (1)$$

After analysis by using the formula above, there is needed to know the condition for knowing an investment plan is feasible or unfeasible, the condition is as follow: If  $BCR \geq 1$ , it means the investment is feasible, and If  $BCR < 1$ , it means the investment is unfeasible

### 2.2.2. Net Present Value (NPV)

The Net Present Value (NPV) is the difference between benefit and cost. This criteria says that the project will be selected if  $NPV > 0$ . Therefore, if a project has the  $NPV < 0$ , it will not be selected or unfeasible to be carried out. The formula of NPV is as follow:

$$NPV = \sum n (B_t - C_t) \quad (2)$$

Where:  $B_t$  = benefit on year- $t$ ;  $C_t$  = cost on year- $t$ ; and  $n$  = economic life of project

### 2.2.3. Internal Rate of Return (IRR)

The Internal Rate of Return (IRR) can be defined as the interest rate which makes the benefit and cost have the same value or  $B-C = 0$

or the interest rate that makes  $B/C = 1$ . If the annual benefit and cost are constant, so the analysis of Internal Rate of Return can be carried out as the annual base, but if it is not constant, it can be carried out with the present value base and it is found by the trial and error. The parameter of Internal Rate of Return (IRR) is not influenced by the applicable commercial interest, so it is often mentioned as the Internal Rate of Return. If the value of Internal Rate of Return (IRR) is the same as the applicable commercial rate, so the project reaches the break event point and if the IRR is more than the applicable commercial rate, so the project is profitable. There are not the best among the three parameters as above because on a condition with the detailed analysis will be obtained one of the parameters which will be used. Besides it, there is often happened the consistency about the relation of the three parameters so it can happen that the IRR is high but  $B/C$  is low or vice versa, it can happen that the  $B/C$  is high but  $B-C$  is minimum. The formula of IRR is as follow:

$$IRR = I' + \frac{NPV'}{NPV' - NPV''} (I'' - I') \quad (3)$$

where:  $I'$  = interest which gives positive NPV;  $I''$  = interest which gives negative NPV;  $NPV'$  = positive NPV; and  $NPV''$  = negative NPV

$$k(PBP) = (\text{investment} / \text{annual benefit}) \times \text{time periode} \quad (4)$$

Where:  $k$  = return period; investment = investment which is needed; annual Benefit = annual (benefit - cost) per-year; and time period in year

To know an investment plan economically feasible or unfeasible, it is needed a certain

criteria size. In the method of Payback Period, an investment plan is said feasible if:  
 $k \leq n$  and vice versa; where  $k$  = number of the return period and  $n$  = investment age

#### 2.2.4. Sensitivity analysis

The sensitivity analysis intends to see what happens with the project result if there is a change possibility on the assumption base of benefit and cost analysis. In the determination of benefit and cost is still as an estimation, so there may be the real condition will be happened not the same as the assumption which has been made when the time that is planned. The other aim of this analysis is to reduce the loss by showing some actions of the prevention which have to be carried out. Theoretically, there are three items which are necessary to be attending such as 1) The change in price comparison to the general price rate such as the decreasing of income product due to the decreasing of usage or consumption number of water irrigation; 2) The decreasing of river water discharge from the dependable analysis; and 3) Based on the provision as above, so the sensitivity analysis of project will be analyzed due to the excused condition in this project feasibility study.

The sensitivity analysis is generally carried out by changing one of the project elements (such as yield, price, cost) and to analyze the value of EIRR due to the price. Some conditions which are generally carried out in the sensitivity analysis of water resources project are as follow: 1) There is 10% decreasing on the estimated benefit value; 2) There is 10% increase on the estimated project cost; 3) To be delayed project finishing during two years, and 4) some other conditions based on the economic judgment ongoing or has been happened.

Table 1. The projection of population growth (Geometric Method) in the Tanggunggunung Village

No	Year	Resident population
1	2014	3,776
2	2015	3,804
3	2016	3,833
4	2017	3,862
5	2018	3,891
6	2019	3,920
7	2020	3,949
8	2021	3,979
9	2022	4,009
10	2023	4,039
11	2024	4,069
12	2025	4,099
13	2026	4,130
14	2027	4,161
15	2028	4,192
16	2029	4,224

### 2.3. Analysis of population growth projection

To project the number of population for an incoming year, it is used the Geometrical Increase method. The formula of the Geometrical Increase method is as follow [7]:

$$P_n = P_0(1 + r)^n \quad (5)$$

Where:  $r$ = population growth;  $P_0$ = number of population in the beginning of data year;  $P_n$ = number of population in the end of data year; and  $n$ = time (year)

### 2.4. Water Need

To determine the water need, there is needed the projection analysis every year [8]. In this study, the method which is used for the projection is the Geometric method (formula 5) and then multiplied by the domestic water need per-person per-day.

## 3. RESULTS AND DISCUSSION

### 3.1. Water Need

The analysis of population growth by using the Geometric method in the Tanggunggunung Village is as follow: the population growth rate ( $r$ ) = 0.75 %; the number of projection year ( $n$ ) = 1 year; number of population in the beginning of projection year ( $P_0$ ) = 3,776 persons. To calculate the number of population in 2015 ( $P_n$ ) with the formula as follow:  $P_n = P_0(1 + r)^1 = 3,776(1 + 0.0075)^1 = 3,804.32 = 3,804$  Person. For the next result is presented as in the Table 1

The projection of fresh water need is based on the analysis result and condition as follow: 1) Population service = 100%; 2) Domestic water need = 60 l/person/day; 3) Projection of population number in 2015 = 3,804 persons; 4) Domestic water need = 2.50 l.s<sup>-1</sup>; 5) Hydrant water need = 0.07 l.s<sup>-1</sup>; 6) Total water need = 2.83 l.s<sup>-1</sup>; 7) Water losses = 0.57 l.s<sup>-1</sup>; and Peak hour need = 5.09 l.s<sup>-1</sup>

### 3.2. The characteristic of respondent

The characteristic of the respondent in the Tanggunggunung Village is based on some conditions such as age, education level, income level, and the number of water user for daily need every month. Table 3 presents the respondents based on the group of water user society in the

Tanggunggunung Village. The number of the respondent is hoped to be able to illustrate the whole water user society in the Tanggunggunung Village. The information related to this case is as follow: 1) The number on the respondent distribution of the water user group in the Tanggunggunung Village is 124 persons; 2) The water user respondents are in the range of 20 – 70 years old; 3) Part of the respondents has the education level as follow: the elementary is 60 persons, the junior high school is 26 persons, the senior high school is 30 persons, and the university is 8 persons; and 4) The average of income level is in the range of Rp. 500,000.- - Rp. 2,000,000.-. The average value of the Willingness to Pay (WTP) [10] for the society group of the Tanggunggunung Village is presented as in Table 2.

Table 2 The value of Willingness to Pay for the society group in the Tanggunggunung Village

No.	Group of water user	The frequency of respondent (person)	Average WTP of the customer group ( Rp/m <sup>3</sup> /month)
1.	Group-1 ( ≥ Rp 2,000,000)	14	8,200
2.	Group-2 (Rp. 500,000 – Rp. 2,000,000)	70	6,200
3.	Group-3 ( ≤ Rp 500,000 )	40	4,050

### 3.3. Project cost

#### 3.3.1. Investment cost

There are two types of cost such as the direct and the indirect one. Direct cost on the design project of the fresh water supply in the Tanggunggunung Village is presented as in Table 3

Table 3 Project cost of fresh water supply in the Tanggunggunung Village

No	Description of activity	Unit	Vol	Unit price	Total
1.	Preparation work				Rp. 10,258,793.00
	Management	LS	3	Rp. 1,800,000.00	Rp. 5,400,000.00
	Activity of name board	LS	3	Rp. 500,000.00	Rp. 1,500,000.00
	Activity of photo	page	300	Rp. 2,500.00	Rp. 750,000.00
	Demolition and cleaning	LS	3	Rp. 869,931.00	Rp. 2,609,793.00
2.	Buis concrete well work				Rp. 29,320,000.00
	Soil excavation	m <sup>3</sup>	6.14	Rp. 55,000.00	Rp. 337,700.00
	Mashed concrete	m <sup>3</sup>	5.16	Rp. 1,500,000.00	Rp. 7,740,000.00
	Procurement and installation of buis concrete	m	4	Rp. 250,000.00	Rp. 1,000,000.00
	Bron-capturing installation	m <sup>3</sup>	33.8	Rp. 670,000.00	Rp. 20,242,300.00
3.	Panel housework				Rp. 56,985,800.00
	Soil work	m <sup>3</sup>	5.14	Rp. 55,000.00	Rp. 282,700.00
	Brick and plastering work	m <sup>2</sup>	35.15	Rp. 150,000.00	Rp. 5,272,500.00
	Concrete work				Rp. 51,430,600.00
4.	Reservoir work				Rp. 378,787,073.00
	Entrenchment and land fill	m <sup>3</sup>	32.8	Rp. 55,000.00	Rp. 2,500,000.00
	Brick and plastering work	m <sup>2</sup>	394	Rp. 750,000.00	Rp. 295,500,000.00
	Concrete work				Rp. 72,437,073.00
	Painting work	m <sup>2</sup>	167	Rp. 50,000.00	Rp. 8,350,000.00
4.	Procurement and				Rp. 591,036,000.00

installation of pipe					
Pipe pf GI diameter 2"	m	132	Rp.	112,000.00	Rp. 99,872,000.00
Pipe of PVC diameter 3"	m	588	Rp.	61,891.00	Rp. 65,556,000.00
Pipe of PVC diameter 2.5"	m	344	Rp.	36,975.00	Rp. 58,644,000.00
Pipe of PVC diameter 2"	m	312	Rp.	24,545.00	Rp. 13,804,000.00
5. Procurement and Installation of accessories					Rp. 39,043,034.00
6. Mechanical and electrical work					Rp. 97,045,000.00
Electrical power	watt	41,500	Rp.	1,300.00	Rp. 53,950,000.00
Procurement and Installation of pump	unit	1	Rp.	22,000,000.00	Rp. 22,000,000.00
Procurement and Installation of control panel	unit	1	Rp.	5,000,000.00	Rp. 5,000,000.00
Total					Rp. 1,402,477,278.00
PPN 10%					Rp. 140,247,727.00
Total + PPN					Rp.154,272,500,580.00

The indirect cost of project work consists of 1) Engineering cost (5% of construction cost); 2) Administration cost (2.5% of construction cost); and 3) Overhead cost (2.5% of construction cost)

To analyze the investment cost for the whole project plan of fresh water supply in the Tanggunggunung Village is as follow: 1) Construction cost = Rp. 1,542,725,005.80; 2) Administration cost = 2.5% x Rp. 1,542,725,005.80 = Rp. 38,568,125.15; 3)

Engineering cost = 5% x Rp. 1,542,725,005.80 = Rp. 77,136,250.29; 4) Overhead cost = 5% x Rp. 1,542,725,005.80 = Rp. 77,136,250.29

#### Annual cost

The annual cost of the project plan of fresh water supply consists of the operation and maintenance cost analysis and it can be seen as in Table 4.

Table 4 Operation and maintenance cost of fresh water supply system in the Tanggunggunung Village

No	Item	Total
1	Variable cost	
	Cost of pump improvement	Rp 1,767,299.00
	Cost of pipe improvement and assessors	Rp 9,300,000.00
	Cost of reservoir maintenance	Rp 750,000.00
	Cost of work safety tool provision	Rp 1,050,000.00
2.	Fixed cost	Rp 3,655,035.00
	Staff salary of 16 persons	Rp 20,000,000.00
	Cost of general administration	Rp 1,677,900.00
	Electrical account	Rp 3,655,035.00
The total cost of operation and maintenance per-month		Rp 41,855,269.00
PPN 10 %		Rp 4,185,526.90
The total cost of operation and maintenance per-year		Rp 552,489,550.80

#### 3.3.2. Benefit analysis

The direct benefit is appearing due to the development of the freshwater supply system in the Tanggunggunung Village. However, the indirect benefit causes the increasing on fulfilling the water need for the society and the decreasing of the disease that is caused by the water.

#### Benefit-Cost Ratio (B/C)

To analyze the Benefit-Cost Ratio, each component of benefit and cost is become as the

present value. The interest rate that is used is 7.5% and the age of the project is 15 years. The example of B/C analysis for the fresh water supply system in the Tanggunggunung Village is as follow: 1) Factor of conversion (F/P, 7.5%,1) = 1.075; 2) Determined interest = 7.5 %; 3) Construction cost = Rp. 1,909,122,194.68 x 1.075 = Rp 2,052,306,359.00; 4) Operation & maintenance cost = Rp. 552,489,550.80; 5) Factor of conversion (P/F, 7.5%,1) = 0.930; 6) Factor of conversion (P/A, 7.5%,15) = 8.834; 7) Operation & maintenance cost = Rp 4,539,044,203.00; 8)

Total of design cost= Rp 6,591,350,562.00; 9) Domestic water need = 167,028.48 m<sup>3</sup>/year

Determination of minimum water price if B/C = : 1) Benefit = water price x water need; 2) Cost = total of cost allocation; 3) The components of benefit are as follow: a) Total domestic water benefit = Rp. 1,353,682,800.00; b) Factor of conversion (P/A, 7.5%, 15) = 8.834; c) Benefit value = Rp 8,469,104,820.00. Therefore, BCR = 1.285, because Benefit Cost ratio  $\geq 1$ , so the project is feasible to be implemented.

#### Net Benefit (B-C)

The second method is the economic analysis by using the difference between benefit and cost

(B-C). In this evaluation, the value of (B-C) on the applied interest rate and it has to have the value  $> 0$ . If the value of  $(B - C) = 0$ , so the benefit of the project is the same as the investment cost. If  $(B-C) \leq 0$ , so the project is unfeasible in the economic side and it is unfeasible to be implemented. The analysis is as follow:

PV Benefit =Rp 8,469,104,820.00

PV Cost =Rp 6,591,350,562.00

B - C =Rp 1,877,754,259.00

Analysis of (B-C) for some interest rate is presented as in Table 5.

Table 5 Net benefit of domestic water price on the various interest rate

Interest rate	PV Benefit	PV Cost	B-C
6%	Rp8,469,104,820	Rp6,562,713,730	Rp1,906,391,090
7%	Rp8,469,104,820	Rp6,581,804,952	Rp1,887,299,868
7.5%	Rp8,469,104,820	Rp6,591,350,563	Rp1,877,754,257
8%	Rp8,469,104,820	Rp6,600,896,174	Rp1,868,208,646
10%	Rp8,469,104,820	Rp6,639,078,617	Rp1,830,026,203
20%	Rp8,469,104,820	Rp7,211,815,276	Rp1,257,289,544
30%	Rp8,469,104,820	Rp8,070,920,264	Rp398,184,556
31%	Rp8,469,104,820	Rp8,548,200,812	-Rp79,095,992
35%	Rp8,469,104,820	Rp9,311,849,690	-Rp842,744,870

#### Internal Rate of Return (IRR)

Internal Rate of Return is defined as the interest rate which makes the benefit and cost have the same value or  $(B-C) = 0$  or the interest rate that makes  $B/C = 1$  [9]. The example is for the Internal Rate of Return analysis as follow:

$$IRR = I' + \frac{(B-C)'}{(B-C)' - (B-C)''} (I'' - I') \quad (7)$$

where:  $I'$  = interest rate that causes the positive NPV = 30%;  $I''$  = interest rate that causes the negative NPV = 31%

$(B-C)'$  = positive  $(B-C) = 398,184,556$ ;  $(B-C)''$  = negative  $(B-C) = -79,095,992$ , however,

$$IRR = 30\% + \frac{398.184.556}{(398.184.556 + 79.095.992)} (31\% - 30\%)$$

$$= 30.834\%$$

Based on the Internal Rate of Return analysis as above, it can be concluded that the project of

fresh water supply in the Tanggunggunung Village is feasible economically because the value of IRR is more than the value which is used in this study such as 7.5%.

#### 3.3.3. Sensitivity analysis

Sensitivity analysis is an analysis which is used for knowing what happens with the project result if there is a change in determining the values of cost and benefit which is still as a possibility. Based on the Indonesian Bank, the inflation of interest rate from 2006 until 2015 is stable in the value of 10%. In this analysis, there is used the percentage of inflation in the project development of fresh water as is 10%. The sensitivity analysis is presented as in Table 6.

Table 6 Recapitulation on the sensitivity analysis of the existing water price

No	Condition	B/C	B-C
1	Cost is up to 10%, benefit is fixed	1.168	Rp 1,218,619,201
2	Cost is up to 10%, benefit is down to 10 %	1.051	Rp 371,708,719
3	Cost is fixed, benefit is up to 10%	1.413	Rp 2,724,664,739
4	Cost is down to 10%, benefit is up to 10%	1.570	Rp 3,383,799,796
5	Cost is fixed, benefit is down to 10%	1.156	Rp 1,030,843,775
6	Cost is down to 10%, benefit is fixed	1.428	Rp 2,536,889,314

### 3.3.4. Break-even point investment

Break Even Point (BEP) is used to determine the time duration for returning the investment. On the interest rate of 7.5%, the breakeven point of the investment happens in the

14.8<sup>th</sup> year. It indicates that on the 14.8<sup>th</sup> year, the annual benefit of domestic water can return the investment. To analyze the breakeven point of investment after being trialed of B/C = 1 and then to be interpolated from the plural interest table completely is presented as in Table 7.

Table 7 Recapitulation of investment breakeven point

Interest rate	Investment breakeven point on year-
6%	2.60
7%	2.75
7,5%	2.80
8%	2.83
10%	3.10

### 3.4. The mean respondent value of Willingness to Pay (WTP) in the Tanggunggunung Village

The mean of Willingness to Pay (WTP) for every group and all of the water user respondents in the Tanggunggunung Village is presented as in Table 8.

Table 8. The value of Willingness to Pay (WTP) of the society in the Tanggunggunung Village

No.	Group classification of water user based on the income	The frequency of respondent (person )	WTP mean of the user group( Rp/m <sup>3</sup> /month)
1.	Group-1 ( ≥ Rp 2,000,000.00)	14	8,200,00
2.	Group-2 (Rp 500,000.00 – Rp 2,000,000.00)	70	6,200.00
3.	Group-3 ( ≤ Rp 500,000.00 )	40	4,050.00

Table 8 shows that the WTP mean of the group-1 is in the amount of Rp. 8,200.00, however for the

group-2 is Rp. 6,200.00, and for the group-3 is Rp. 4,050.00

### 3.5. Determination of water price

Water price-per-unit is total of the cost allocation divided by the water need multiplied by the factor of conversion. Analysis of water price is presented as in Table 9. The range in the water

price is determined as follow: the minimum price is based on the B = C regarding each condition, however, the maximum price is estimated due to the society ability to pay and regarding the government role in Indonesia.

Table 9 Water price when B = C

No	Condition	Water price per-m <sup>3</sup>
1	Cost is up to 10%, the benefit is fixed	Rp. 2508.06 - Rp 7768.11
2	Cost is down to 10%, the benefit is fixed	Rp. 2052.05 - Rp 6355.73
3	Cost is fixed, the benefit is up to 10%	Rp. 2544.39 - Rp 7846.57
4	Cost is fixed, the benefit is down to 10%	Rp. 2072.77 - Rp. 6419.92
5	Cost is up to 10%, the benefit is down to 10%	Rp. 2786.73 - Rp. 8631.23
6	Cost is up to 10%, the benefit is down to 10%	Rp. 1865.50 - Rp. 5777.93

Table 10 presents the recapitulation of economic analysis result and the sensitivity

analysis and Table 11 presents the water price in several conditions.

Table 10 Recapitulation of the economic analysis result

Water price	B/C	B-C	IRR	Break-even point of investment
Existing price Rp. 8,500.00	1.285	Rp. 1,877,754,259.00	30.834%	2.8 years
Price on B = C Rp. 2,280.00	1	0	7.5%	14.8 years

Table 11 Water price in several conditions

No	Condition	Water price per-m <sup>3</sup>
1.	Existing water price	Rp. 8,500.00
2.	Water price when B=C	Rp. 2,280.05 - Rp 7,061.92
3.	Cost is up to 10%, benefit is fixed	Rp. 2,508.06 - Rp 7,769.11
4.	Cost is up to 10%, benefit is down to 10%	Rp. 2,786.73 - Rp 6,355.73
5.	Cost is fixed, the benefit is up to 10%	Rp. 2,544.39 - Rp 7,846.57
6.	Cost is down to 10%, benefit is up to 10%	Rp. 1,865.50 - Rp.6,419.92
7.	Cost is fixed, the benefit is down to 10%	Rp. 2,072.77 - Rp.8,631.23
8.	Cost is down to 10%, benefit is fixed	Rp. 2,052.05 - Rp 5,777.93
9.	The average value of Willingness to Pay (WTP)	Rp. 4,050.00 - Rp 8,500.00

#### 4. CONCLUSION

Based on the result of data analysis as above, the following conclusion can be drawn.

Real benefit: Benefit with the existing water price: Rp. 8,469,104,820,00 /year and Benefit with the water price when B=C: Rp. 3,128,712,948.00 /year. Not real benefit: the increasing on fulfilling fresh water need and the decreasing of disease.

Based on the water price analysis when B=C, it is obtained the minimum price such as Rp. 2,280.05; however, the Willingness to Pay (WTP) of the society is in the price range of Rp. 4,050.00 – Rp. 8,500.00. Therefore, based on the obtained value, the society still has the ability to pay the water price which is determined.

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