
ANALYSIS CONCERNING CLEAN WATER NEEDS ON MOJOSARI VILLAGE, KECAMATAN MANTUP

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Abstract

In Lamongan Region, especially in areas with high groundwater levels, during the dry season most of the community wells dry up. This causes people to spend more time and energy to meet the needs of clean water. The study was conducted in the village of Mojosari District, Mantup. Mojosari Village is divided into 4 (four) hamlets: Mojoroto, Belud Sarirejo, Sendangsari, and Sidobinangun. To meet the needs of the population in Mojosari Village, it is necessary to plan a clean water distribution system. In term of calculating the clean water needs for households, there are several factors that must be considered: planning period, estimated population in the planning period and population growth rate per year. The data processing phase starts from the calculation of the projected population for the next 10 years, then the projection of the need for clean water is based on the population projection and the amount of the discharge is calculated until the year of projections. Furthermore, water fluctuations were calculated so that daily and hourly debit can be found. From the results of data analysis, the projection of population in 2027 would be 2546 people. The average need for clean water is 107415.3 l / second with a service percentage of 60% with a maximum hour requirement of 160,585.9 liters per day or 1.86 liters per second.

Keywords: *Clean Water Distribution, Water Needs, Mojosari Village, Mantup District*

Introduction

Water is a very vital aspect in human's life. Therefore, any attempt to develop plumbung system is generally urged by the needs of sustaining and improving a society's prosperity. It all started with a fountain, like wells or lakesm by which then developed to be a clean water system to facilitate water access and bring easiness to the community's life.

In Lamongan, especially those in high groundwater levels, during the dry season the community's wells tend to get dried up. This cause the people to spend more time and effort to get access to clean water. Such thing happen at Mojosari Village that has high groundwater level.

According to the survey conducted and the situation and circumstances within, it is known that the level of water needs in Mojosari Village is quite high. Due to the lack of clean water in the village, people of the community make use of the water obtained from conventional wells to fulfill their needs. This is because the former network system that was built before is already damaged and deemed as insufficient. Around the village there's a river that hasn't been yet functioned as a clean water distribution. With such condition, Mojosari Village as of now can not provide clean water needs for all of its inhabitants. To fix that, it is needed to create a water distribution system for Mojosari Village. This research aims to acquire the basic knowledges needed to examine clean wter needs in Kecamatan Mantup.

Research method

A. Research Location

This research is conducted in Mojosari Village, Mantup, Kabupaten Lamongan, where its inhabitants are direly in need of sufficient amount of clean water, especially during the dry season.

B. Geographical Location

Geographically, Mojosari Village located alongside the other villages around Mojosari. North border is Pelabuhan Rejo Village, while the south is Sidomulyo Village, and the west side is Sukosari Village. The last, east, is Rumpuk Village.

C. Data Collection Stage

There are two groups of data used in this research:

1. Primary data
 - Location Survey
 - Data on inhabitants' survey
2. Secondary data
 - Location map – village map
 - Data on number of inhabitants

D. Data Processing Stage

The data processing stage, include:

- a. Calculating projection on the number of inhabitants:
 - Arithmetic method
 - Geometric method

Calculation on clean water needs projection is based on the projection on the number of its inhabitants and counting the amount of accumulated debit in the projected year. Next, water fluctuation is calculated so as to find the daily and hourly debit.

Research Result and Discussion

Mojosari Village Consists of 4 (four) hamlets: Moajoroto, Belud Sarirejo, Sendangsari, and Sidobinangun.

The data on the number of inhabitants from 2008 to 2017, as shown in the table below:

Table 1 Number of inhabitants in Mojosari 2008-2017

Year	Inhabitants in Each Hamlet				Σ
	Mojo roto	Belud sarirejo	Sendang sari	Sido binangun	
2008	551	821	529	435	2336
2008	552	823	531	438	2344
2009	558	826	533	439	2356
2010	561	830	537	441	2369
2011	562	835	543	440	2380
2012	568	842	547	438	2395
2013	574	845	550	440	2409
2014	578	848	552	440	2418
2015	580	850	553	441	2424
2017	584	852	554	443	2433

Source: Archive of Mojosari Village, 2018

Table 2. Percentage of the Community's Development circa 2007-2008

Year	% Inhabitants Growth Number in Each Hamlet			
	Mojo roto	Belud sarirejo	Sendang sari	Sido binangun
2007-2008	0,18	0,24	0,38	0,69
2008-2009	1,09	0,36	0,38	0,23
2009-2010	0,54	0,48	0,75	0,46
2010-2011	0,18	0,60	1,12	-0,23
2011-2012	1,07	0,84	0,74	-0,45
2012-2013	1,06	0,36	0,55	0,46

2013-2014	0,70	0,36	0,36	0,00
2014-2015	0,35	0,24	0,18	0,23
2015-2016	0,69	0,24	0,18	0,45
Rata-rata	0,65	0,41	0,51	0,20

Source: Data Analysis, 2018

Example on calculating the projection of number of inhabitants year 2018:

$$\begin{aligned}
 P_{2018} &= P_{2017} (1+r)^n \\
 &= 2433 (1+0,0046)^1 \\
 &= 2433 (1,0046) \\
 &= 2444 \text{ people}
 \end{aligned}$$

Table 3. Projection on the Number of Inhabitants 2018-2027

Year	Number of Inhabitants in Each Hamlet				Σ
	Hamlet				
	Mojo roto	Belud sarirejo	Sendang sari	Sido binangun	
2018	588	856	557	444	2444
2019	589	858	559	447	2452
2020	595	861	561	448	2465
2021	598	865	565	450	2479
2022	600	870	572	449	2490
2023	606	877	576	447	2506
2024	612	881	579	449	2521
2025	617	884	581	449	2530
2026	619	886	582	450	2537
2027	623	888	583	452	2546

Sumber: Analisa Data, 2018

Calculation on the Clean Water Needs

There are some factors that must be examined before calculating the clean water needs for households:

1. Time range during the planning
2. Estimation on the number of the inhabitants during the planning time range.
3. Yearly percentage of the inhabitants' growth.

Tabel 4. Standard of Personal Water Needs

No.	Category	(l/head/day)
1	Metropolitan with 1 million inhabitants	120
2	Big city with 0,5 – 1 million inhabitants	100
3	Medium city with 0,1 – 0,5 million inhabitants	90
4	Small city with 20.000 – 100.000 inhabitants	60
5	Semi-urban with 3.000 – 20.000 inhabitants	45

Source : PU. Cipta Karya Kabupaten Lamongan. (On Prasetyo 2016).

From the table above it can be calculated that the average water needs for Mojosari Village is around 45 litres/day/head.

Table 5 Criterias for Planning Clean Water Service

No.	Information	Mark per Unit
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1.	Rate of Service: a. Number of inhabitants for each plumbing	5 heads/plumbing unit
2.	Clean water needs a. Domestic b. Non domestic	45 litre/head/day 25 (%) x domestic needs
No.	Information	Mark per Unit
3.	Water loss	25 (%)
4.	Maximal factor	1,15 x total needs
5.	Peak hour factor	1,3 x maximal day factor
6.	Service target	60 %

Source: P.U Cipta Karya Kabupaten Lamongan. (At Rosita 2016).

By 2027, the number of the inhabitants will be: 2546 people.

The calculation of plumbing units needed would be targeted in form of 1 unit for 5 people.

$$= \frac{\text{Number of inhabitants by 2027}}{5}$$

$$= \frac{2546}{5} = 509 \text{ unit}$$

Service target = 60 % = 0,60

Inhabitants' water needs = 45 lt/day/head

Calculation for domestic needs :

$$= \text{Number of inhabitants} \times \text{service percentage} \times \text{inhabitants' water needs}$$

$$= 2546 \times 0,60 \times 45$$

$$= 68.745,8 \text{ lt/day}$$

Calculation for non-domestic needs:

$$= 25\% \times \text{domestic needs}$$

$$= 0,25 \times 68.745,8$$

$$= 17.186,4 \text{ lt/day}$$

Calculation for water loss cause:

$$= 25\% (\text{domestic needs} + \text{non domestic needs})$$

$$= 25\% (68.745,8 + 17.186,4)$$

$$= 21.483,1 \text{ lt/day}$$

Total calculation on average needs

$$= \text{domestic needs} + \text{non domestic needs} + \text{total water loss}$$

$$= 68.745,8 + 17.186,4 + 21.483,1$$

$$= 107.415,3 \text{ lt/hr}$$

Calculation on the maximal daily needs

$$= 1,15 \times \text{average total needs}$$

$$= 1,15 \times 107.415,3$$

$$= 123.527,6 \text{ lt/day}$$

Calculation on the peak hour needs

$$= 1,3 \times \text{daily maximal factor}$$

$$= 1,3 \times 123.527,6$$

$$= 160.585,9 \text{ lt/day}$$

Hence, it is then obtained that minimal debit needed is 160,589 lt/day or 6.691 lt/hr = 111,51 lt/min. = 1,86 lt/scd = 0.00186 m3/scnd.

Table 6 Water needs in Mojosari Village Planning

Details	Unit	Year	
		2018	2027
Number of Inhabitants (A)	Jiwa	2444	2546
Service Percentage (B)	%	60	60

Domestic Needs C			
(AxBx45)	Lt/dt	65992,0	68745,8
Details	Unit	Year	
		2018	2027
Non-domestic Needs D			
(0,25xC)	Lt/dt	16498,0	17186,4
Water Loss (E)			
(0,25x(C+D))	Lt/dt	20622,5	21483,1
Average Needs (F)			
(C+D+E)	Lt/dt	103112,6	107415,3
Maximum Daily Needs			
(G) (1,15xF)	Lt/dt	118579,5	123527,6
Maximum Hourly Needs			
(H) (1,3xG)	Lt/dt	154153,3	160585,9

a. Source: Data Analysis, 2018.

Conclusion and Recommendation

From the explanation above we can obtain informations that can be concluded as the fact that clean water debit needs needed or Mojosari Village by year 2027 with estimation of number of inhabitants 2546 people is 160.585,9 lt/day atau 1,86 lt/scnds.

As for the advice that the writer can give in this report, it is better for the irrigation parties to immediately provide services for the needs of clean water for the people of Mojosari Village who have never existed before, in order to reduce the risks such as lack of water for the community.

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