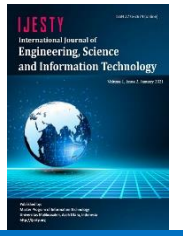
International Journal of Engineering, Science & InformationTechnology (IJESTY)
Volume 1, No. 2 (2021) pp. 47-52
eISSN: 2775-2674
Website: http://www.ijesty.org/index.php/ijesty
DOI : https://doi.org/10.52088/ijesty.v1i2.55
Research Paper, Short Communication, Review, Technical Paper



Analysis of Planning for Clean Water Needs at Grand Sagara West Surabaya Hotel With the Green Buillding Concept

Sofyan Ali Rafsanjani*, F Edy Rooslan Santosa, Ronny Durrotun Nasihien

Department of Civil Engineering, Faculty of Engineering, Narotama University, Indonesia
**Corresponding author e-mail: sofyanhoyael@gmail.com*

Manuscript received 23 Feb 2021; revised 2 March. 2021; accepted 15 March 2021. Date of publication 2 April 2021

Abstract

Water is the basic necessity of every living thing on earth. Humans depend on water not only for meeting domestic household needs but also for needs such as production needs, industrial needs and other needs. The need for clean water is the amount of water that will be used fairly for basic human needs (domestic) and other activities that require water. The hospitality industry is a commercially managed business. This study aims to determine the impact of the use of clean water that occurs during the construction and operation of the Grand Sagara West Surabaya Hotel on Tambak Wedi Village in the next 10 years. The need for clean water for Tambak Wedi Village in 2019 prior to the construction and operation of the Grand Sagara West Surabaya Hotel is 0.0566 m³ / sec, whereas after construction and operation in 2029 is 0.1118 m³ / sec. So, the amount of clean water discharge in Tambak Wedi Urban Village that must be fulfilled by the PDAM in Surabaya in 2029 is 0.0288 m³ / sec. Clean water, water needs, water discharge, hotel, PDAM Surabaya city.

***Keywords*:** *Clean Water, Water Needs, Water Discharge, Hoytel, PDAM Surabaya City.*

1. Introduction

Water is a very important need for human survival, without water there would be no life on earth. Surabaya City as the capital of East Java Province is the largest city in Indonesia [1]. The city is located 796 km east of Jakarta, or 415 km northwest Denpasar, Bali. Based on preliminary data collection at the Grand Sagara West Surabaya Hotel, it is known that the hotel is a luxury hotel with various facilities and infrastructure available. With the various facilities available, of course the hotel uses quite a lot of clean water and waste water that is released to meet daily water needs [2].

Problem

1. What is the total clean water debit required for the Tambak Wedi Village area prior to the construction of the Hotel?
2. How manyClean water debit needed for the Tambak Wedi Kelurahan area after the construction and operation of the Hotel, as well as the need for water for the next 10 years projection?
3. What is the ratio of the use of clean water in Tambak Wedi Village before the construction of the Hotel and after the construction of the Hotel?

Aim

1. Knowing the total need for clean water debit needed for the Tambak Wedi Village area before the construction of the Grand Sagara West Suraaya Hotel.
2. Knowing the amount of clean water needed by the region Tambak Wedi Village after the construction and operation of Grand Sagara West Surabaya Hotel for now and the next 10 years projections. So that the results of this study can be used as the basis for PDAM Surabaya City to meet the needs of clean water in the Tambak Wedi Village [3] [4].

2. Literature Review

The following are several studies related to analysisplanning of clean water needs at the grand sagara west Surabaya hotel with the concept of green buillding.

a. Iwan Setiyanto 2017, Analysis of clean water needs (case study of Kutoarjo water intact installation), Muhammadyah University Purworejo.

b. Ike Triani Eka Putri 2018, Analysis of clean water use in five star hotels (case study of Padma Bandung hotel), Pasundan University, Bandung.
c. Adlima Damayanti 2010, Analysis of domestic clean water needs in the village of Kedamin land and Kedamin village downstream, the State University of Islam Syarif Hidayatullah Jakarta.
d. Ika Kusumawati 2015,Analysis of clean water needs in the Nasik strait district of Kab. pickaxe prov. bangka belitung, Universitas Cikarang President.

Table 1. Daily Water Needs

NO	Building Type	Average daily water use (liters)	Duration of water use on average a day (hours)	Comparison of effective / total floor area (%)	Information
1	Real estate	250	8--10	42-45	Every occupant
2	Ordinary house	160-250	8--10	50-53	Every occupant
3	Apartment	200-250	8--10	45-50	Luxurious 250 lt. Intermediate 180 lt. Bachelors 120 lt.
4	Dormitory	120	8		Bachelor
5	Hospital	Luxury> 1000 Intermediate 500-1000 General 350-500	8--10	45-48	(each patient bed) Patient outside 8 lt. Staff / employee 120 lt. 160 lt family.
6	Primary school	40	5	58-60	Teacher: 100 lt.
7	JSS	50	5	58-61	Teacher: 100 lt.
8	SLTA and higher	80	6		Teacher / Lecturer: 100 lt.
9	Shophouse	100-200	8		Its occupants are 160 lt.
10	Office building	100	8	60-70	Every employee
11	Department Store (convenience store)	3	7	55-60	Water usage is only for latrines, not including the restaurant section
12	Factory / Industry	Male laborers: 60 Women: 100	8		Individual each turn (if you work more than 8 hours)
13	Station / Terminal	3	15		Each passenger (arriving or departing)
14	Restaurant	30	5		For occupants 160 lt.
15	Public restaurant	15	7		For occupants 160 lt; waiter: 100; 70% of guests need 15 lt / org for latrines, hand washing etc.
16	The theater	30	5	53-55	If used day and night, the water usage is calculated per viewer the hours of water usage in the table are for one show
17	Movie theater	10	3		If used day and night, the water usage is calculated per viewer the hours of water usage in the table are for one show
18	Retail store	40	6		Large traders 30 lt / guest, 150 lt / staff or 5 lt / day per m3 of floor area
19	Hotel / Lodging	250-300	10		For each guest, for staff 120-150 lt, lodging is 200 lt

20	Worship building	10	2	Based on the number of worshipers per day
21	Library	25	6	For every reader who lives
22.	Bar	30	6	Every guest
23.	Social gathering	30		Every guest
24	Night dark	120-350		Every seat
25	Clubhouse	150-200		Every guest
26.	Laboratory	100-200	8	Every staff

Sources: Soufyan M. Noerbambang and Takeo Morimura, 1993: 48

Green buiding provides a final advantage that is not presented by conventional buildings. These benefits include energy and water savings, waste reduction, as well as lower personal and maintenance costs. Greenship rating system is a tool for building industry players, both entrepreneurs, engineers and other actors in implementing best practices and achieving measurable standards that can be understood by the general public, especially tenants and building users. A building will be judged by the Greenship by a Professional Greenship (GP). With this appraisal system, each building that proclaims itself as a Green Building will be certified based on the standard criteria contained in the appraisal system, which is grouped into six categories, namely:

1. Appropriate Site Development (Right Cave Land)
2. Energy Efficiency and Conservation
3. Water Conservation
4. Material Resources and Cycle
5. Indoor Air Health and Comfort (Air Quality and Room Comfort)
6. Building Environmantel Management (BEM)

3. Method

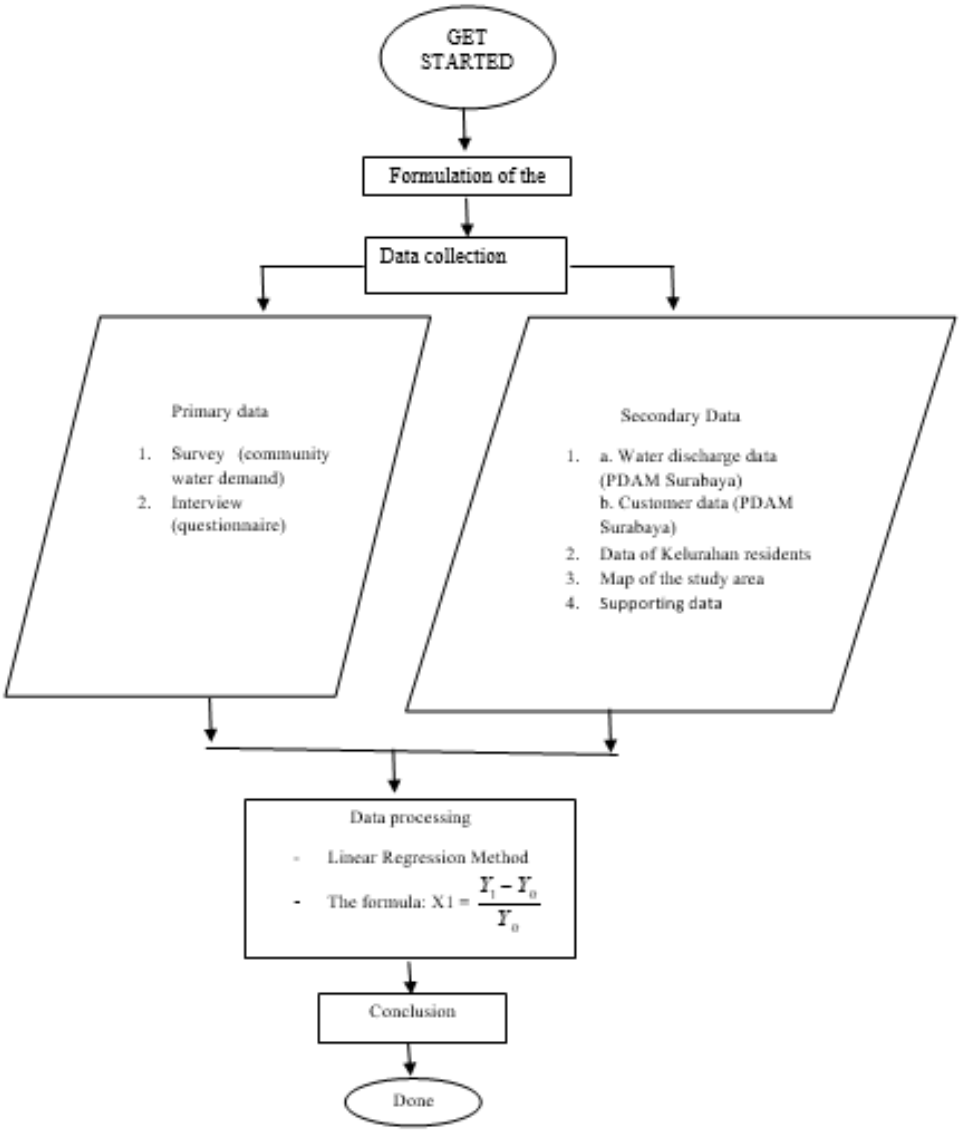


Fig 1. Research Flow Chart

4. Results and Discussion

Table 2. Population Data of Tambak Wedi Village for the past 5 years

No	Year	amount
1	2015	14,550
2	2016	15,194
3	2017	16244
4	2018	17,192
5	2019	17,754

Source: [5]

Table 3. PDAM Pipe Capacity Data Available

Ø pipe	Network Pipe Diameter	Discharge (liter / sec)
1	Ø 110 mm pipe	15
2	Ø 200 mm pipe	27
3	Ø 300 mm pipe	41
	Amount	83

Source: [6]

Population Prediction

Estimated population of Tambak Wedi Village are analyzed using the Linear Regression method with data on population obtained from the Tambak Wedi Kelurahan Office from 2015 to 2019 with predictions until 2029. With the formula:

$X_1 = \frac{Y_1 - Y_o}{Y_o}$ ..... (1) Where : X1-5 = Years 1 - 5

$X_5 = \frac{Y_5 - Y_4}{Y_4}$ ..... (2) Y = Total Population

Table 4. Linear Regression Methods

n	X	Y	R^2	Pers. Regression	i	i mean	i (%)
1	2015	14550	.9861	14562	0	0.051	5
2	2016	15194		15402,6	0.055		
3	2017	16524		16243,2	0.052		
4	2018	17192		17083,8	0.049		
5	2019	17754		17924,4	0.047		
					.202		
6	2020			18765			
7	2021			19605,6			
8	2022			20446.2			
9	2023			21286.8			
10	2024			22127.4			
11	2025			22968			
12	2026			23808,6			
13	2027			24649.2			
14	2028			25489,8			
15	2029			26330.4			

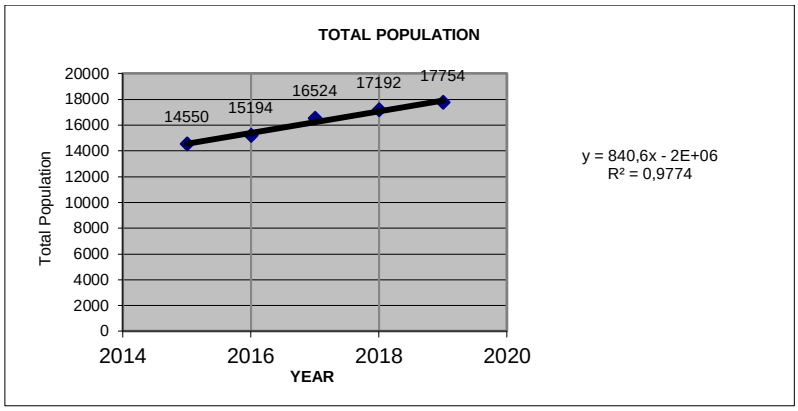


Fig 2. Total Population

The predicted increase in PDAM customers is calculated by the Linear Regression method for each type of customer, from 2015 to 2019 is 455 SR, the following results are obtained:

Table 5. needs for clean water in 2019

Customer Group Name	Volume	Unit
I	.150	m³ / hour
II (2A1)	4,756	m³ / hour
III (2A2)	0.019	m³ / hour
III (2B)	.108	m³ / hour
IV (3A)	10,625	m³ / hour
V (3B1)	11,200	m³ / hour
VI (3C1)	6,250	m³ / hour
VI (3C2)	0.833	m³ / hour
VII (4A)	86,166	m³ / hour
VIII (4B1)	0.066	m³ / hour
VIII (4B2)	64,160	m³ / hour
IX (4C)	5,000	m³ / hour
X (4D)	14,660	m³ / hour
amount	203,993	m³ / hour

From the above table, the amount of clean water needed in 2019 or before the construction of Grand Sagara West Surabaya Hotel is obtained is 203.9927 m³ / hour or equal to 0.0566 m³ / second. For the water needs of Grand Sagara West Surabaya Hotel in the operation phase, it is described in the table below.

Table 6. Hotel Water Needs

User	Volume	Unit
Occupant	31,890	m³ / hour
Employee	0.750	m³ / hour
Canteen	.150	m³ / hour
Musolah	0.075	m³ / hour
RTH	.161	m³ / hour
Swimming pool	1,210	m³ / hour
amount	34,236	m³ / hour

So from the table above, the amount of clean water needs of Grand Sagara West Surabaya Hotel is 34,236 m³ / hour or equal to 0,00951 m³ / sec. The predicted clean water needs of Tambak Wedi Village in 2029 are 757 SR, consisting of 10 customer groups.

Table 7. needs for clean water in 2029

Customer Group Name	Volume	Unit
I	0.275	m³ / hour
II (2A1)	9,650	m³ / hour
III (2A2)	0.056	m³ / hour
III (2B)	0.430	m³ / hour
IV (3A)	15,790	m³ / hour
V (3B1)	25,200	m³ / hour
VI (3C1)	12,500	m³ / hour
VI (3C2)	2,910	m³ / hour

VII (4A)	148,500	m³ / hour
VIII (4B1)	.166	m³ / hour
VIII (4B2)	120,166	m³ / hour
IX (4C)	8,330	m³ / hour
X (4D)	24,330	m³ / hour
amount	368,303	m³ / hour

From the above table, the amount of clean water needed in 2019 or before the construction of Grand Sagara West Surabaya Hotel is 368.3032 m³ / hour or equal to 0.1023 m³ / second. The PDAM Surabaya pipeline network data in the Tambak Wedi Kelurahan is 110mm, 200mm and 300mm in diameter. Existing water discharge at Ø110 mm is 15 ltr / sec, Ø200 mm pipe is 27 ltr / sec and Ø300 mm pipe is 41 ltr / sec. So, the total water debit of PDAM in Surabaya in Tambak Wedi Village is 83 liters / second or equal to 0.083 m³ / sec.

5. Conclusion

From all of the calculations, the data processing, and the discussion, the following conclusions were drawn:

1. The largest free speed (S_{ff}) was on the fragment of road before narrowing and decreased on the fragment of road during narrowing and increased one more time on the fragment of road after narrowing. The biggest density (D_j) was on the fragment of road during narrowing and then decreased on the fragment of road after narrowing. The highest maximum volume (Vm) was found on the fragment of road after narrowing.
2. There was a significant correlation ($R^2 > 0.5$) between flow, speed, and density.
3. Based on the survey conducted on Wednesday and Saturday, there were shock waves as follows: on Wednesday at 06:00 to 09:00 (the backward forming shock wave was 0.51992 km/hour, the forward recovery shock wave was 0.10742 km/hour), 16:00 - 18:00 (the backward forming shock wave was 0.30675 km/hour, the forward recovery shock wave was 0.59993 km/hour). Moreover, on Saturday 07:00 - 09:00 (the backward forming shock wave was 0.51601 km/hour, and the forward recovery shock wave was 0.06270 km/hour), 16:00 - 18:00 (the backward forming shock wave was 0.25655 km/hour, the forward recovery shock wave was 0.92341 km/hour).

References

[1] S. Tyagi, B. Sharma, P. Singh, and R. Dobhal, "Water Quality Assessment in Terms of Water Quality Index," *Am. J. Water Resour.*, vol. 1, no. 3, 2020, doi: 10.12691/ajwr-1-3-3.

[2] L. E. Armstrong and E. C. Johnson, "Water intake, water balance, and the elusive daily water requirement," *Nutrients*, vol. 10, no. 12. 2018, doi: 10.3390/nu10121928.

[3] S. Yudo and N. I. Said, "Kondisi Kualitas Air Sungai Surabaya Studi Kasus: Peningkatan Kualitas Air Baku PDAM Surabaya," *J. Teknol. Lingkung.*, vol. 20, no. 1, 2019, doi: 10.29122/jtl.v20i1.2547.

[4] N. SUDAPET, "Analisis Service Quality terhadap Kepuasan Pelanggan pada PDAM Kota Surabaya," *BISMA (Bisnis dan Manajemen)*, vol. 2, no. 1, 2018, doi: 10.26740/bisma.v2n1.p42-47.

[5] E. Suprayitno and N. Huzaimah, "PENDAMPINGAN LANSIA DALAM PENCEGAHAN KOMPLIKASI HIPERTENSI," *SELAPARANG J. Pengabdi. Masy. Berkemajuan*, 2020, doi: 10.31764/jpmb.v4i1.3001.

[6] E. M. Ulfah and T. A. Auliandri, "Analisis Kualitas Distribusi Air Menggunakan Metode Six Sigma DMAIC Pada Pdam Surya Sembada Kota Surabaya," *INOBIS J. Inov. Bisnis dan Manaj. Indones.*, vol. 2, no. 3, 2019, doi: 10.31842/jurnal-inobis.v2i3.93.