STUDY OF CLEAN WATER PROVISION EFFORTS IN CONSTRUCTION WORKERS' RESIDENCES IN THE NATIONAL CAPITAL DEVELOPMENT AREA (IKN) INDONESIA

ABSTRACT

Clean water is one of the basic needs to support human life. As the population grows, the need for clean water also increases. In the development of the National Capital area in North Penajam Paser, a lot of clean water will be needed. The study aims to find out alternative steps that will be taken to increase the fulfillment of clean water needs in the construction area of flats housing construction workers (HPK) in the National Capital Region (IKN) North Penajam Paser Regency, East Kalimantan Province, Indonesia. The study was carried out in the construction area of flats housing construction workers in the National Capital Region, North Penajam Paser Regency, East Kalimantan Province, Indonesia. The data collected is in the form of qualitative data, namely a description of the study location in general, and quantitative data: number of residents, water needs per person, number of flats for worker housing, and rain conditions in the study area. The techniques used to collect data that are appropriate to the object of study are observation, interviews, institutional visits, and literature review. The analytical methods used are: (1) a qualitative approach using descriptive analysis which describes the existing conditions of the study area, (2) analysis of population projections and (3) analysis of clean water supply. The study results in a show that: (1) the estimated need for clean water to meet the needs of the HPK-IKN is 544 x 60 liters = 32,640 liters/day; (2) the potential for periodic rainwater in HPK IKN that can be accommodated is 825 M2 x 22 Towers x 120.68 mm = 2,200,585 liters of rainwater; and (3) efforts to provide clean water in HPK IKN can be done other than dams and reservoirs, namely by harvesting rainwater through infiltration wells, rainwater collection ponds, biopore absorption holes, rain gardens, porous paving blocks, and storage reservoirs.

Keywords: Provision of Clean Water, Residential Flats for Construction Workers, National Capital Region (IKN)

INTRODUCTION

The development and development of residential areas is also accompanied by an increase in the need for clean water services in them. These needs tend to increase and the quality of life is increasing and activities in residential areas are also growing rapidly. Clean water is a vital need for every human being, so the availability of clean water determines the level of health and welfare of society. In reality, the limited supply of clean water is closely related to the causes of poverty, because poverty is also caused by health problems.

According to [1], water is a very important natural resource because it can satisfy the lives of many people, so it is necessary to maintain the existence of water so that it can provide benefits to all living things on earth. It is stated by [2] that clean water is water that meets the requirements of the drinking water supply system, which includes water quality requirements, including physical, chemical, biological, and radiological quality so that if you drink it, the water in pure condition does not cause side effects. The problem of providing clean water is still a concern for all parties, especially the government. This is caused by the decline in the availability of raw water for clean water, both quality and quantity, which can be influenced by various factors, such as weather, limited raw water potential, environmental conditions, industrial activities, and so on. Along with the increase in Indonesia's population, the need for clean water increases from year to year. According to the Central Bureau of Statistics (BPS), the latest data in 2010 recorded 238,518,800 people, then an increase of 255,461,700 people in 2015, and it is estimated that there will be an increase of 271,066,400 people in 2020 [2].

Massive development of IKN has begun, especially in the central government core areas, with so much development in all fields of work, it also has an impact on the number of workers which is not small. Therefore, decent and healthy housing is needed to accommodate the entire number of construction workers, for this reason, it is realized through the construction of housing for construction workers by the Ministry of Public Works and Public Housing (PUPR).

One of the problems that often occurs in residential areas is the lack of clean water supplies. Various problems then emerged related to this, both in terms of raw water sources, in terms of management, and terms of infrastructure. The development of residential areas is also accompanied by an increase in the need for clean water services in them so the government and private sector or the community are required to provide clean water infrastructure as well as possible.

These needs tend to increase and the quality of life is increasing and activities in residential areas are also growing rapidly. Providing water for residential area needs means, in this case, providing water for household needs, public facilities, and social facilities. Population activities can be accommodated in public and social facilities, but will not run well without being supported by adequate infrastructure services. Limited provision of adequate clean water infrastructure in residential areas can affect human life, economic productivity, and the quality of life of society as a whole. Therefore, there needs to be more serious efforts to handle the provision of clean water in the IKN environment so that the community's need for clean water can be met.

The study aims to find out alternative steps that will be taken to increase the fulfillment of clean water needs in the construction area of flats housing construction workers (HPK) in the National Capital Region (IKN) North Penajam Paser Regency, East Kalimantan Province, Indonesia.

METHODOLOGY

1. Study Location

The study was carried out in the construction area of flats housing construction workers (HPK) in the National Capital Region, North Penajam Paser Regency, East Kalimantan Province, Indonesia (Figure 1).

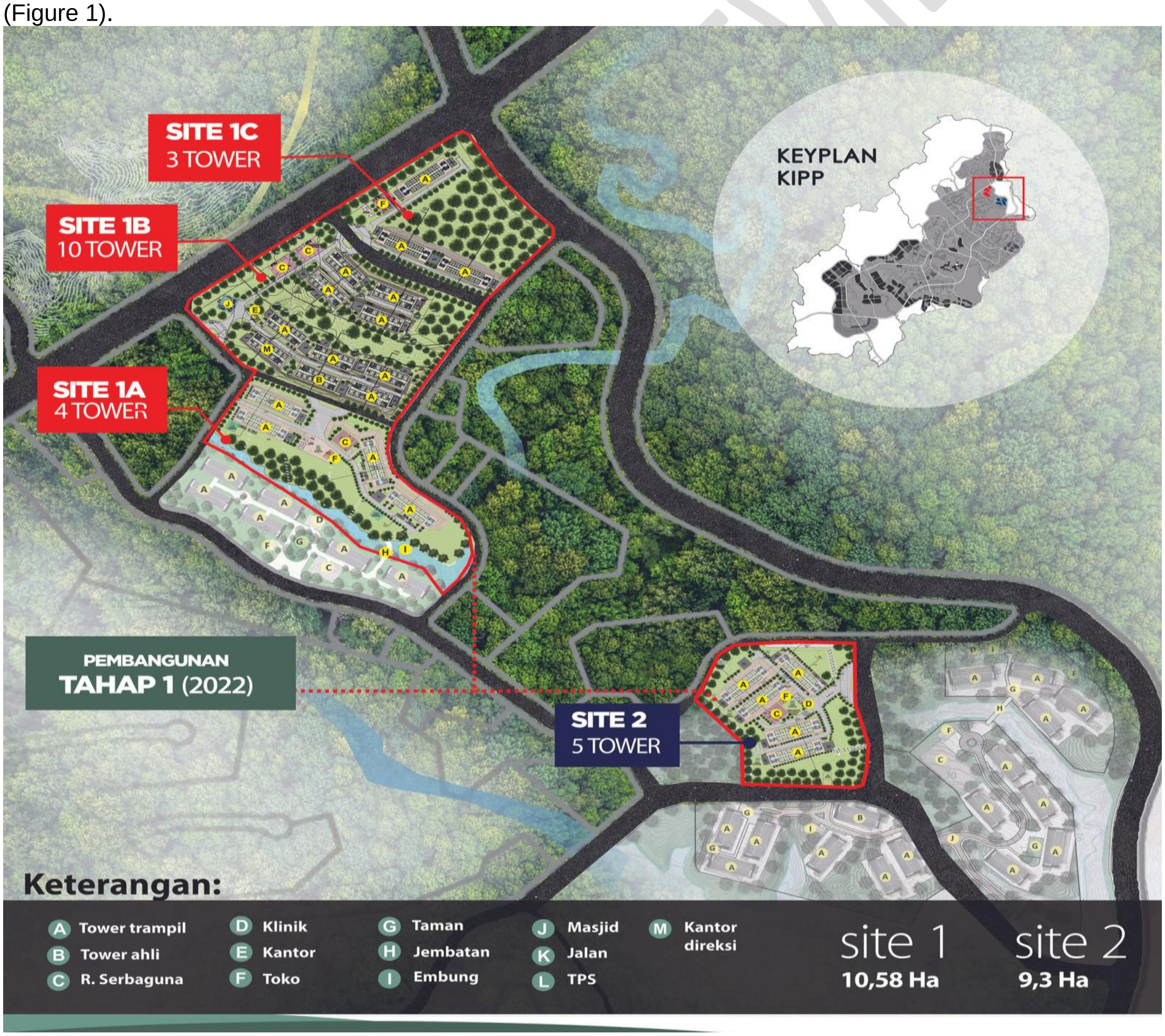

Figure 1. Residential Area for Construction Workers in National Capital Region (Source: Ministry of PUPR)

2. Types and Sources of Data

The data collected are qualitative data, namely a description of the study location in general, and quantitative data in the form of the number of residents, water needs per person, the number of workers' residential flats, and rain conditions in the study area.

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3. Data Collection Method

Data collection aims to collect data and information in the study area. The techniques used to collect data that are appropriate to the object of study are observation, interviews, institutional visits, and literature review.

4. Analysis Method

The analytical methods used are: (1) with a qualitative approach using descriptive analysis which describes the existing conditions of the study area, (2) analysis of the projection of residents as the main element of clean water users (consumers); (3) analysis of clean water supply, namely to calculate the amount of clean water needed in the study area, both for the daily needs of the population and other service needs. This analysis is expressed by combining the standard needs for clean water with the projected population and percentages of other needs. The need for clean water for domestic services is a household connection service, this need is calculated by multiplying the number of supporters by the standard need for clean water for the population, namely 60 liters/day [3].

RESULTS AND DISCUSSION

1. Description of the Condition of the Worker's Flats at HPK-IKN

Data on the condition of flats designated for construction workers in HPK-IKN with 4 floors per flat tower is presented in Table 1.

Table 1. Data on the condition of flats intended for construction workers in HPK-IKN with 4 floors per tower

NO.	LOKASI	JUMLAH TOWER		PERUNTUKKAN	JML LANTAI	KAPASITAS PERLANTAI	TOTAL KAPASITAS	FASUM & FASOS
1	Site 1A	4 Tower	Tower 11	Tower Terampil Laki-laki	4	190	760	Aula/Kantin, Klinik, Toko, Kantor Pengelola
			Tower 12	Tower Terampil Laki-laki	4	190	760	
			Tower 13	Tower Terampil Laki-laki	4	190	760	
			Tower 14	Tower Terampil Laki-laki	4	190	760	
2	Site 1B	9 Tower	Tower 1	Tower Terampil Laki-laki	4	192	768	Masjid, Aula/Kantin, Toko, Kantor Pengelola
			Tower 2	Tower Terampil Laki-laki	4	192	768	
			Tower 3	Hunian PUPR	4	63	252	
			Tower 4	Tower Khusus Wanita	4	63	252	
			Tower 5	Tower Ahli	4	63	252	
				Ruang Terbuka Publik				
			Tower 7	Tower Terampil Laki-laki	4	192	768	
			Tower 8	Kantor Bersama PUPR	4			
			Tower 9	Tower Terampil Laki-laki	4	192	768	
			Tower 10	Tower Terampil Laki-laki	4	192	768	
3	Site 1C	4 Tower	Tower 20	Tower Terampil Laki-laki	4	190	760	Aula/Kantin, Klinik, Toko
			Tower 21	Tower Terampil Laki-laki	4	190	760	
			Tower 22	Tower Terampil Laki-laki	4	190	760	
			Tower 6	Tower Terampil Laki-laki	4	192	768	
4	Site 2	5 Tower	Tower 15	Tower Terampil Laki-laki	4	190	760	Aula/Kantin, Klinik, Toko, Kantor Pengelola
			Tower 16	Tower Terampil Laki-laki	4	190	760	
			Tower 17	Tower Terampil Laki-laki	4	190	760	
			Tower 18	Tower Terampil Laki-laki	4	190	760	
			Tower 19	Tower Terampil Laki-laki	4	190	760	
TOTAL		22 Tower					14,484	

Source: Indonesian Ministry of Public Works and Public Housing

2. Rainfall Conditions in Sepaku District, Penajam Paser Utara Regency

In 2019 the average rainfall in Sepaku District was 120.58 millimeters. In 2018, the highest rainfall in five years in this district was 212.83 millimeters. In the previous year, the rainfall in the same sub-district was 204.17 millimeters. In 2016, Sepaku District recorded the lowest rainfall, namely 14.67 millimeters. The previous year it was 131.96 millimeters.

Table 2. Average District Rainfall in North Penajam Paser Regency in 2020

Month	District			
	Babulu	Waru	Penajam	Sepaku
January	358,00	375,00	270,00	154,00
February	142,00	145,00	115,00	43,00
March	289,00	190,00	213,00	268,00
April	283,00	260,00	297,00	181,00
May	127,00	186,00	186,00	213,00
June	575,00	556,00	556,00	149,00
July	21,00	60,00	60,00	38,00
August	77,00	29,00	29,00	15,00
Septembet	17,00	88,00	88,00	1,00
October	144,00	104,00	104,00	140,00
November	138,00	85,00	85,00	89,00
December	143,00	135,00	135,00	156,00

Source: BPS North Penajam Paser Regency

3. Forecast for the 2022-2023 Rainy Season in 20 Season Zones (ZOM)

The estimated start of the rainy season in 2022-2023 in the year-round segment is as follows:
- MH All Year : 3 ZOM (15.0% of 20 ZOM)
- July 2022: 2 ZOM (10.00% of 20 ZOM)
- September 2022: 10 ZOM (50.00% of 20 ZOM)
- October 2022: 1 ZOM (5.00% of 20 ZOM)
- Monsunal-1 ZOM Type: 4 ZOM (20.00 from 20 ZOM)

A comparison of the initial forecast for the 2022-2023 rainy season with the average for the 1991-2022 period is as follows:
- MH All Year : 3 ZOM (15.00% of 20 ZOM)
- Ahead of the average: 11 ZOM (55.00% of 20 ZOM)
- Same as the average: 2 ZOM (10.00% of 20 ZOM)
- Retreat from the average: 0 ZOM (0.0% of 20 ZOM)
- Monsunal-1 ZOM Type: 4 ZOM (20.00 from 20 ZOM)

Meanwhile, the forecast for the nature of rain for the 2022-2023 rainy season is
- Above Normal (AN): 6 ZOM (30.00% of 20 ZOM)
- Normal (N): 14 ZOM (70% of 20 ZOM)
- Below Normal (BN) : 0 ZOM (0.0% of 20 ZOM)

The peak forecast for the 2022-2023 rainy season is
- November 2022 : 9 ZOM (45.00% of 20 ZOM)
- December 2022 : 2 ZOM (10.00% of 20 ZOM)
- January 2023: 1 ZOM (5.00% of 20 ZOM)
- February 2023: 2 ZOM (10.00% of 20 ZOM)
- April 2023: 6 ZOM (30.00% of 20 ZOM).

4. Estimated Clean Water Needs

The number of residents (workers) who will live in flats at the study location is estimated at 544 people, the need for clean water for each person is 60 liters [3], so the amount of clean water needed is 544 x 60 liters = 32,640 liters/day.

5. Efforts to Provide Clean Water

5.1. Rainwater Harvesting Alternatives

Geologically, the National Capital Region is said to experience water shortages, to overcome this problem the government is building dams and reservoirs. However, various alternatives are still being pursued so that the water needs of residents of the National Capital can be well prepared. One of them is an alternative provision of rainwater or what is known as Rainwater Harvesting.

Harvesting rainwater is an alternative water source that has been practiced for centuries in various countries that often experience water shortages [4]. Harvested rainwater can be used for multi-purposes such as watering plants, washing, and bathing, and can even be used for cooking if the water quality meets health standards [5] and [6].

Ecologically, there are four reasons why rainwater harvesting is important for water conservation [6], namely: (1) increasing demand for water results in increased underground water extraction thereby reducing underground water reserves. Rainwater harvesting systems are a useful alternative; (2) the presence of water from water sources such as lakes, rivers, and underground water is very fluctuating. Collecting and storing rainwater can be a solution when surface water quality, such as lake or river water, becomes low during the rainy season, as is often the case in Bangladesh; (3) other water sources are usually located far from the user's home or community. Collecting and storing water close to home will increase access to water supplies have a positive impact on health and strengthen users' sense of ownership of this alternative water source, and (4) water supplies can be polluted by industrial activities or waste from human activities, for example the entry of minerals such as arsenic, salt or fluoride. Meanwhile, the quality of rainwater is generally relatively good.

Three basic components must be present in a rainwater harvesting system, namely: (1) catchment, namely a rainwater catcher in the form of a roof surface; (2) delivery system, namely a system for channeling rainwater from the roof to the shelter through gutters; and (3) storage reservoir, namely a place to store rainwater in the form of a barrel, tub or pond.

Apart from these three basic components, it can be equipped with supporting components such as a water pump to pump water from a tank or holding pond. [4] and [6].

Obstacles faced in harvesting rainwater include the fluctuating frequency and quantity of rain and the quality of rainwater not meeting WHO clean water standard guidelines. There are two issues related to rainwater quality, namely: (1) bacteriological water quality issues, namely rainwater can be contaminated by dirt in the catchment area (roof) so it is recommended to keep the roof clean; (2) insect vector issue: insects can reproduce by laying their eggs in water. Therefore, it is best to close the water storage barrel tightly to prevent the entry of insects such as mosquitoes.

There are several simple treatment methods for using rainwater, including boiling the water will kill bacteria, adding chlorine (35ml sodium hypochlorite per 1000 liters of water) will disinfect the water, sand filtration (biosand) will remove dangerous organisms [7].

[6] stated that the Solar Water Disinfection(SODIS) technique is currently being developed, namely plastic bottles that have been painted black are filled with water and dried in the sun for several hours to kill bacteria and microorganisms in rainwater. In Taiwan, traditionally the practice of harvesting rainwater is mostly carried out in areas that have limited supplies of surface or underground water sources [4].

Field observations show that although rainwater harvesting is a simple, cheap technique and does not require special skills or knowledge, it is not widely practiced in Indonesia. Even though the practice of harvesting rainwater is important as an alternative water source.

It is estimated that most people do not realize the importance of harvesting rainwater as an effort to save water due to a lack of knowledge and information. Apart from that, it is possible that people also feel confident that they will not experience water shortages because water is generally abundant in Indonesia. To find out more details about this, of course, further research is needed.

From these facts, it can be stated that the government's role is needed so that the practice of rainwater harvesting can be carried out widely. The government needs to carry out communication, information, and public education so that people can be interested, understand, be aware, and be willing to do it in their own homes. If rainwater harvesting is widely practiced, then the problem of water shortage at the household level can be avoided. The following is an example of a simple rainwater harvesting system design that people can apply at the household level.

To meet the water demand, the supply of which is increasingly limited, water conservation efforts are needed. Harvesting rainwater is one method of water conservation that can be done by people in their households.

Water conservation efforts require commitment from all parties to the issue of water sustainability. If rainwater harvesting is practiced sustainably, it will help maintain water sustainability and environmental sustainability to support the lives of current and future generations.

5.2. Is Rainwater Drinkable

Researchers from Monash University, Melbourne, Australia conducted a study to find out the impact of using rainwater for daily needs. This research was carried out by monitoring around 300 households that used collected rainwater as a source of daily drinking water. The results of research conducted for more than a year show that the risk of developing gastroenteritis and stomach flu, which are usually triggered by viruses or bacteria, in people who consume rainwater tends to be no different compared to people who use quality tap water as a source of drinking water. The researchers also concluded that rainwater is safe for daily consumption. Researchers say rainwater has an acidity level that is still safe for the body, namely a pH of 5.6. This figure can be considered neutral and does not have a bad effect on body health.

We can collect rainwater in containers such as tubs or buckets. If this water is to be consumed as drinking water, ensure that the containers are clean, and not filled with dirt.

Before processing it, make sure to let the rainwater sit for an hour to make heavy particles settle into the bottom of the reservoir. This can also help prevent the growth of microorganisms.

To make rainwater safer to consume, we have to filter it or boil it first. We can use a homemade water filter or a special filter tool that can make rainwater free of bacteria, dirt, dust, mold, chemicals, and various other contaminants.

It's just that it's best to still boil rainwater to kill various kinds of bacteria and make it calmer for us to drink it. Health experts say there is rainwater that is not safe for consumption. The following are the types of rainwater.

If the environment where we live has many factories or industrial areas, the air pollution problem is usually quite serious. This will affect the process of forming rain in the sky. It is feared that rainwater in this area contains high levels of chemicals, pollutants, and dangerous chemicals that are not suitable for consumption.

Rainwater that is stagnant in dirty places such as streets, plant pots, or other places is mixed with various kinds of dirt and other things that make it no longer suitable for consumption. If we don't take good care of the water storage containers, the collected rainwater will be mixed with various unhealthy dirt and contaminants.

5.3. Rainwater Potential in IKN

The Construction Worker Residential Center (HPK) is currently equipped with Flats for Construction Workers (TKK) with 22 four-story towers the number of beds provided is 14,484 beds and the roof area of these 22 towers is 825 square meters. The water that can be accommodated by the roof area is 825 M2 x 22 Towers. The area of 22 Towers = 18,150 M^2 with rainfall of 120.68 mm. Using the rainfall volume formula: V = rainfall (1 mm) x length (1 m) x width (1 m), then periodically in HPK IKN there will be around 2,200,585 liters of clean rainfall water. Meanwhile, the clean water requirement for 544 workers with each person's clean water requirement being 60 liters/day is 32,640 liters/day [8].

The results of manual water monitoring at the HPK tower tank in February, March, and April 2023 are presented in Tables 3, 4, and 5.

Table 3. Manual Water Monitoring Results at the HPK Tower Tank - February 2023

No	Date	Day	Time	Start	Stop
1	1/2/2023	Wednesday	Evening	04:14	09:33
2	3/2/2023	Friday	Evening	21:14	02:31
3	4/2/2023	Saturday	Afternoon	09:17	16:40
4	6/2/2023	Monday	Afternoon	10:11	15:29

5	9/2/2023	Thursday	Afternoon	12:12	18:23
6	11/2/2023	Saturday	Afternoon	09:00	17:00
7	14/2/2023	Tuesday	Evening	21:21	04:12
8	21/2/2023	Tuesday	Evening	19:30	20:10
9	23/2/2023	Thursday	Afternoon	12:37	16:22

Table 4. Manual Water Monitoring Results at the HPK Tower Tank - March 2023

No	Date	Day	Time	Start	Stop
1	4/3/2023	Saturday	Evening	22:11	01:04
2	6/3/2023	Monday	Afternoon	11:05	13:06
3	7/3/2023	Tuesday	Afternoon	09:37	14:00
4	8/3/2023	Wednesday	Afternoon	10:10	13:23
5	14/3/2023	Tuesday	Afternoon	13:17	17:23
6	15/3/2023	Wednesday	Afternoon	11:03	13:07
7	20/3/2023	Monday	Evening	00:26	04:13
8	22/3/2023	Wednesday	Afternoon	13:11	14;16
9	25/3/2023	Saturday	Afternoon	13:29	16:12
10	29/3/2023	Wednesday	Evening	00:41	03:21

Table 5. Manual Water Monitoring Results at the HPK Tower Tank - April 2023

No	Date	Day	Time	Start	Stop
1	9/4/2023	Sunday	Afternoon	11:11	13:17
2	10/4/2023	Monday	Afternoon	14:10	16:39
3	11/4/2023	Tuesday	Afternoon	13:37	18:20
4	12/4/2023	Wednesday	Afternoon	16:27	17:11
5	15/4/2023	Saturday	Afternoon	09:00	12:02
6	17/4/2023	Monday	Afternoon	11:11	13:38
7	19/4/2023	Wednesday	Evening	02:30	04:15
8	22/4/2023	Saturday	Afternoon	11:29	17:03
9	23/4/2023	Sunday	Afternoon	10:11	13:29
10	25/4/2023	Tuesday	Afternoon	08:29	10:17
11	29/4/2023	Saturday	Evening	03:24	09:20

5.4. Diversity of Rainwater Harvesting Patterns

The potential for rainwater is enormous as an alternative water source. Where rainwater tends to contain relatively low levels of pollutants. Especially those that flow from the roof of the building, so they do not require a complicated management process. Rainwater as an alternative source of water in buildings can be used both as drinking water and for other needs.

Implementation of rainwater harvesting in various types of buildings has also been explored throughout the world. These include residential buildings (single-family), multi-story residential buildings, office buildings, schools, dormitories, sports facilities, hospitals, airports, and gas stations.

Rainwater harvesting is nothing new for the government. Since 2009 there have been efforts to encourage rainwater harvesting activities through the issuance of Minister of Environment Regulation Number 12 of 2009 concerning Rainwater Utilization [9].

Apart from that, the Ministry of Public Works and Spatial Planning (PUPR) has also issued Minister of Public Works Regulation (PermenPU) Number 11/PRT/M/2014 concerning Rainwater Management in Buildings and Their Plots [10].

According to [9], rainwater utilization is carried out by creating: rainwater collection ponds; infiltration wells; and/or biopore absorption holes. Apart from that, according to [11] other methods for harvesting rainwater are rainwater absorption ditches, infiltration areas, yard embankments, yard fences, earth excavation holes, landscape modifications, establishing groundwater conservation areas, conservation ponds, revitalization of lakes, ponds, and lakes as well as plantation forests.

Some ways to harvest rainwater that can be done are:

1. Infiltration Well

Infiltration wells are holes made to absorb rainwater into the soil and/or water-bearing rock layers. Currently, various types or models of infiltration wells have been developed, such as open and closed channel infiltration wells. For the general public, infiltration wells can also be built in yards, guided by SNI No.03-2453-2002 concerning technical planning procedures for rainwater infiltration wells for yards in Figure 2 and Figure 3.

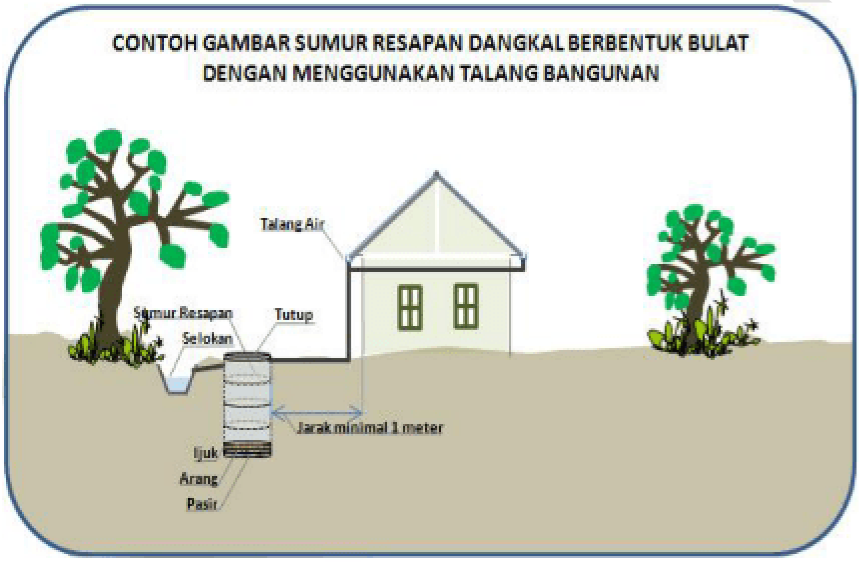

Figure 2. Infiltration Well 1

Figure 3. Infiltration Well 2

2. Rainwater Collection Pond

A rainwater collection pond is a pond or container used to collect rainwater that falls on the roof of a building (house, office, or industrial building) which is channeled through gutters. In principle, this pool is not much different from a Detention Pool, which should have a filtering and processing or soil absorption system, as referred to in Ministerial Decree 11/2014 [10]. Examples of images of rainwater collection ponds are presented in Figure 4 and Figure 5.

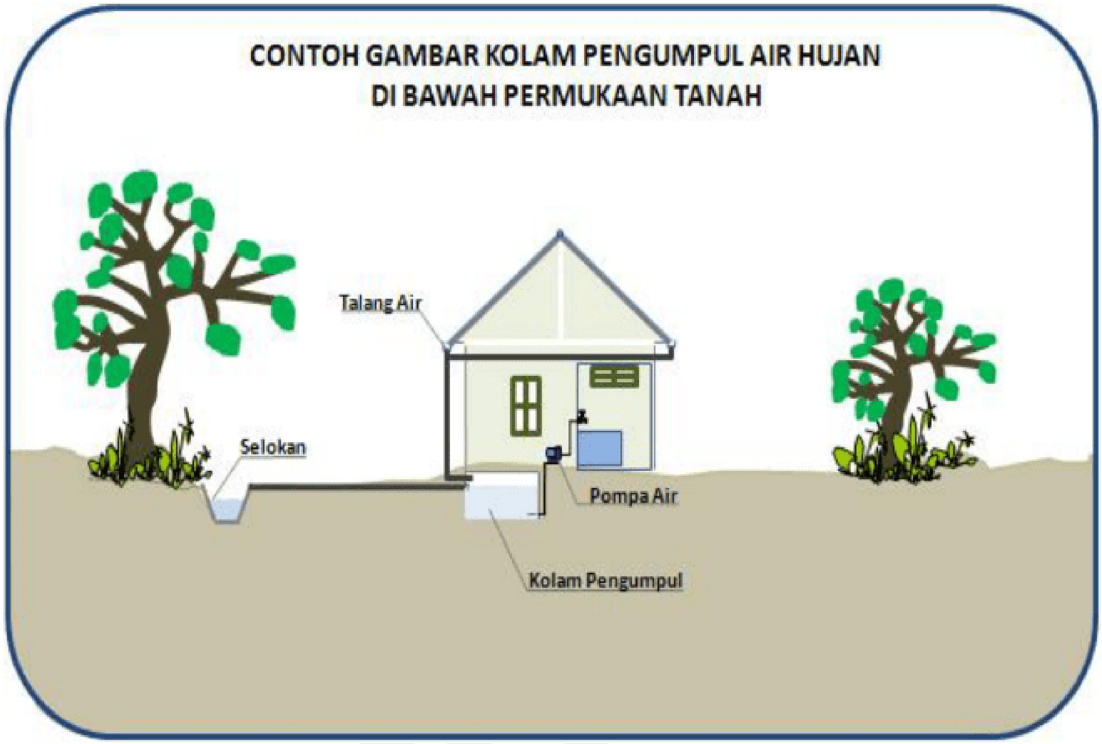

Figure 4. Rainwater Collection Pond 1

Figure 5. Rainwater Collection Pond 2

3. Biopore Absorption Holes

Biopore infiltration holes are holes made perpendicularly (vertically) into the ground, with a diameter of 10 – 25 cm and a depth of around 100 cm or not exceeding the depth of the groundwater table. Technically, biopore holes are similar to infiltration wells, only their diameter is much smaller. This is what the term Biopori might be used for.

4. Rain Garden

A rain garden is a garden with vegetation designed to collect rainwater runoff. In 2018 UGM built a rainwater harvesting facility in the form of a Rain Garden, in AGS Park (short for Architectural, Geodetic, Civil Park) which was built in 2018.

Rain Garden is a type of green infrastructure that has proven effective in managing rainwater runoff in urban areas. In the 2600m² AGS Park, six rain garden basins were built in the center of the park and several elongated basins at the edges of the park. Examples of rain gardens are presented in Figure 6 and Figure 7.

Figure 6. Rain Garden 1

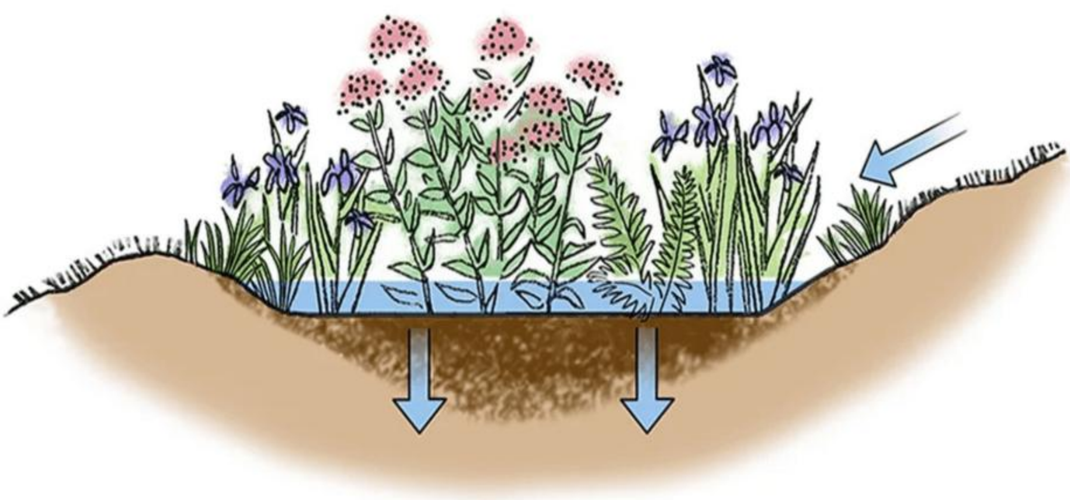

Figure 7. Rain Garden 2

5. Porous Paving Blocks

Paving blocks are known in Indonesia as building materials to pave land surfaces. Meanwhile, porous paving blocks are pavement materials that have pores, allowing more rainwater to seep into the ground. Image: Green porous paving blocks are visible for parking lots and non-porous paving blocks for roads [12].

6. Storage Tank

The simplest rainwater harvesting system is a system that has been commonly used since ancient times. Rainwater containers can be in the form of ponds, barrels, or other similar containers intended as rainwater reservoirs.

In principle, this model does not have a system for filtering or a system for absorbing water into the soil. People generally use rainwater from storage containers for washing or watering plants in their yards. However, in several areas with low rainfall, people have used rainwater as a source of drinking water.

Apart from the various rainwater harvesting models that have been presented, it is worth reminding yourself of the key role of plants. The ability of plants to absorb and release water back into the environment through the transpiration process has made plants the main players in the rainwater harvesting stage.

5.5. Change the Rainwater Installation Design

In the 22 HPK Flat Towers in the Indonesian capital, there are 44 rainwater reservoirs with a capacity of 22,000 liters. Referring to the IKN Law, rainwater that is absorbed or channeled to the ground will be done through 3 methods, namely:

1. Green and blue open spaces that are widely spread, evenly distributed, and connected in one hydrological system to hold and store water and improve the quality of urban ecosystems and biodiversity, thereby creating comfortable cultural and recreational spaces
2. Design of urban facilities, such as micro-scale green roofs on buildings and structures to retain rainwater before it is absorbed by the soil or before it becomes runoff into drainage channels and rivers
3. Design of urban facilities on a macro scale, such as the application of porous roads and sidewalks, biosaves, and bioretention systems to hold or absorb rainwater quickly, thereby facilitating the smooth and safe movement of vehicles and people.

The function of reservoirs in HPK Flats needs to be optimized by rebuilding rainwater harvesting patterns. For example, by not disposing of rainwater at the HPK location which is received by the roof area and stored in a special place that meets the volume of rainwater. The water that flows through the gutter is collected in a reservoir which functions as a control tank and adds oxygen by making a protein skimmer head which will function as an air sucker to reach the underground water tank.

In the manual observation phase reservoir for 30 days in February, March, and April 2023 for 24 hours with a dynamic observation pattern, there was always a disproportionate discharge of rainwater through the drain pipe. This also refers to the IKN city target which is a sponge city which refers to cities and acts a sponge thatcan hold rainwater so that it does not run directly into drainage channels and which can improve the function and use of natural water so that the danger of flooding can be reduced as well as the quality and Water quantity can be increased through filtering and storage in underground water reservoirs.

CONCLUSION

Based on the results of the study and discussion, it can be concluded as follows:

1. The estimated need for clean water to meet the needs of HPK-IKN is 544 x 60 liters = 32,640 liters/day.
2. The potential for periodic rainwater in HPK IKN that can be accommodated is 825 M2 x 22 Towers x 120.68 mm = 2,200,585 liters of rainwater.
3. Efforts to provide clean water in HPK IKN can be made other than dams and reservoirs, namely by harvesting rainwater through infiltration wells, rainwater collection ponds, biopore absorption holes, rain gardens, porous paving blocks, and storage reservoirs.

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