Enhancing Engineering The Groundwater Reserves An Environmental of Life

by Jaka Purwanta

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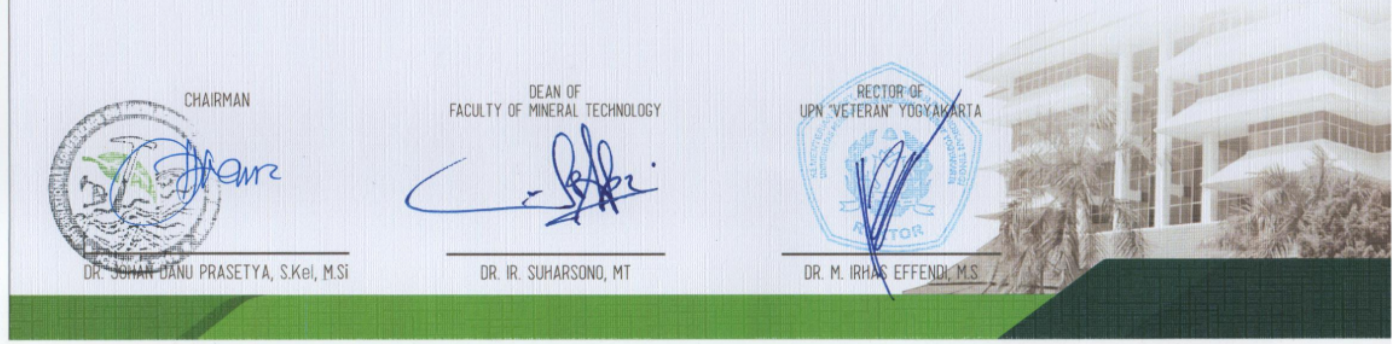

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Enhancing Engineering The Groundwater Reserves An Environmental of Life

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Abstract. The purpose of this study was to engineer increase in groundwater reserves. The background of this study is the rapid physical development in the region Bedreg Hamlet, Maguwoharjo, Depok, Sleman, Yogyakarta make the conversion of land use significantly, from their yards and fields, into houses and businesses. This resulted in the reduction of green open areas and ainwater catchment area. Fewer groundwater reserves he continuing impact of fewer ainwater catchment area. It is necessary for the engineering study of the increase in reserves of groundwater in the region. This research was conducted by observation and using the map to determine the allocation of land and in the region, then performed calculations to determine the volume needs recharge of rain. It can be recommended to the local area stakeholders that to restore many groundwater reserves in the region will require some infiltration wells of ainwater that must be made are distributed in the region. Based on this study, volume recharge of rain needed to equalize with a land area that has been hardened and existing buildings that 1,855.1193 m^3. Hile the amount of rainwater infiltration wells recommended Bedreg made in the region that is at least many of 1,231 units. He community makes these recomendations and supported by stakeholders in the region, the groundwater reserves Bedreg region will increase.

Keywords : groundwater reserves, infiltration wells, increase, stakeholders

INTRODUCTION

Rapid physical development in the region Bedreg, Maguwoharjo village, Depok, Sleman, Yogyakarta, making the conversion of land use significantly, from their yards and fields, into houses and businesses. Similarly, the road which was nitially the ground was hardened by the cast, block paving or asphalt. This resulted in the reduction of green open areas and ainwater catchment area. Though the land has the right to store water in particular from the rain that falls on the location of the land. Fewer groundwater reserves he continuing impact of fewer rainwater catchment area. It is necessary for the engineering study of the increase in reserves of groundwater in the region. According to Gui-ong Zhang et al. [1], rainfall infiltration capacity is an important issue that depends on the intensity of the rainfall. To model the effectiveness of rainfall depends on the rainfall and infiltration models depend on the comprehensive factors. Ainwater recharge is not only related to precipitation, the characteristics of rock and soil, but relates to the level of underground water, the moisture content before, vegetation, and so ie. Therefore, crucial factors can be divided into external factors and intrinsic factors. External factors are the extreme climatic conditions that he state as the intensity and duration of rainfall, precipitation patterns, the speed of evaporation, the underground water level, and the initial water content. While the intrinsic factor is soil hydraulic properties, including the characteristics of the ainwater, flat land coefficient, gradient slope, and plants/vegetation. Igor Pelisek [2] explains that the permeability of the resulting specification channel / hole earthworms for soil separation arrangement of impact compaction. His research shows that the surface macropore natural earthworms are more resistant to erosion than other macropore complexion. Examining the effects of lenders effects produced some

conclusions based on the difference in value several sizes of volositas and erosion in the channel wall earthworms and other makropre. According to Ladislav Koutny et al. [3], that storage intensive rainfall depends on soil moisture and the soil suction pressure. Continuous observations show that the stormwater runoff in large quantities and can not be absorbed by the soil will result in flooding. It shows the relationship between soil moisture, soil suction pressure and quantity of storm water runoff on the effectiveness of soil on the absorption of ainwater. According to Sayana et al. [4] that each 4-year period, the charging/absorption of rainwater runoff by land will be very useful for improving high groundwater table. It is crusial for the sustainable management of water as the provision of resources that should be present and abundant, but with the conversion land use of vacant land and paddy fields into residential and road, we need a way to be able to restore/increase groundwater reserves.

One way is to create a ainwater catchment wells (SPAH). SPAH is the tools that be used for receive runoff. Benefits of using SPAH is to reduce run-off and the load of the river during heavy rains, increase the amount of water that goes into the ground, maintain a high groundwater level, lowering the concentration of pollution of groundwater, improve the quality of groundwater is shallow, reducing the rate of erosion and sedimentation, reduce the dimension drainage network, preventing soil degradation, and the stock of water in the dry season. (Http://.kelair.bppt.go.id/sitpapdg/Patek /Spah/spah.html) [5]. Besides SPAH can be made in an open area in settlements for example in roads, parking areas, and parks, as well as the existing roof areas eg garage, and the rest of the house. The relationship between SPAH with each other is then underlying management of rainwater with interconnection method is the method of managing rainwater that its equipment consists of two parts, namely the rainwater collector consisting of gutters, water pipes and manholes, as well as parts water storage rain is SPAH. Based on the Regulation of the Minister of Environment No. 12 Year 2009 on Rain Water Utilization [5], that the land covered material will be made well recharge of rain (SPAH) that number is adjusted with an area of land covered by buildings and roads are hardened. Any land covered street paving material and measuring 60 m^2 then to be made SPAH with volume 1.5 m^3.

MATERIALS AND METHODS

Research ites : The research location Bedreg, Maguwoharjo village, Depok, Sleman, Yogyakarta.
Material and quipment : This study using materials and equipment such as documentation tools, maps, and counters.
Doing the work process : Conduct field observation in the study site and identify the type of land use and breadth, Calculate the volume needs recharge of rain, and determining the amount of rainwater catchment wells that will be created.
Data Analysis : Based on field observations would be associated with the data type of land use and breadth. Next calculated volume of ainwater infiltration is required based on the data area is used for buildings and roads. Refers to Regulation of the Minister of Environment No. 12 Year 2009 on Rain Water Utilization land covered every street paving material and measuring 60 m^2 then to be made SPAH with volume 1.5 m^3. By determining the volume of the wells recharge of rain it will be calculated the amount of ainwater catchment wells that will be created.

RESULTS AND DISCUSSION

The results of the field observations: obtained illustration/picture on the study site.

FIGURE 1. Conversion of land use in the region Bedreg, Maguwoharjo
(Source: Primary data, 2019)

Then made maps of the area for the location of the research is as follows.

FIGURE 2. Map of the area Bedreg, Village Maguwoharjo
(Source: Data processing constituent, 2019)

Based on the map of the region, can then be the determined area of each land use.

TABLE 1. The type and extent of land use in the study site

No.	Function Type Land	Large	
		m^2	Ha
1	Settlement	65,933.91	6.59
2	Pavement	2,994.22	0.30
3	Street paving block and cast	5,276.64	0.53
4	Vacant land	35,932.92	3,59
	Total	110,137.68	11.01

(Source: Data processing constituent, 2019)

The calculation of the volume of ainwater infiltration : Refers to Regulation of the Minister of Environment No. 12 Year 2009 on Utilization of ainwater that any land covered street paving material and measuring 60 m^2 then to be made SPAH with volume 1.5 m^3.
Based on **TABLE 1** that the area of the settlement, road asphalt and road paving blocks and asphalt are 74,204.77 m^2.
The volume of ainwater infiltration required are:
= [(74,204.77 m^2) / (60 m^2)] x 1.5 m^3 = 1,855.1193 m^3

Determining the amount of ainwater catchment wells that will be created :

$$\text{Amount of SPAH (unit)} = \frac{\text{Minimal volume of PAH } (m^3)}{\text{Volume of a SPAH } (m^3/\text{unit})}$$

Note :
Volume of a SPAH = 0.25 x 3.14 x $((0.8m)^2)$ x 3 m = 1.5072 m^3.

Volume of ainwater infiltration required = 1,855.1193 m^3
Amount of SPAH = [(1,855.1193 $m^{3)}$/[1.5072 m^3] = 1,230.84 units = 1,231 units

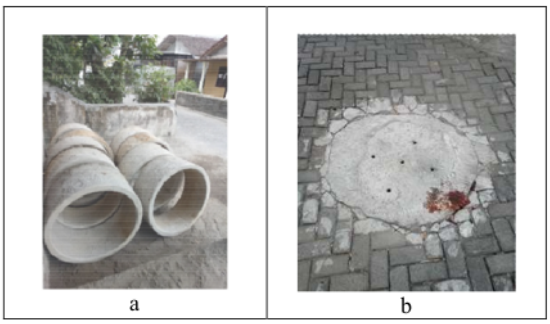

FIGURE 3. a. Well bus for make the SPAH; b. Well bus for make the SPAH
(Source: Primary Data, 2019)

Based on field observations it can be concluded that the conversion of land use is already running fast and rain water catchment areas are very low. This caused by all the roads are paved with paving blocks, cast, as well as on the asphalt. Similarly, in the garden soil and paddy already built houses and places of business so that the rain water which was originally down and seep into the earth, into rainwater runoff and a river. It reflects poorly on the increased rainfall runoff and can result in flooding, declining water quality of nearby rivers because of the eroded soil material and carried by stormwater runoff into the water bodies. This will disrupt the lives of marine organisms, especially fish.

CONCLUSIONS

Volume recharge of rain needed to equalize with a land area that has been hardened and existing buildings that 1,855.1193 m^3. While the amount of ainwater infiltration wells recommended Bedreg made in the region that is at least many of 1,231 units. If these recommendations are made by the community and supported by stakeholders in the region the groundwater reserves Bedreg region will increase.

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Recommendations from this study are very useful to increase the reserves of groundwater thinning was particularly felt during the dry season.

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