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Figure 1 University Mosque Pond



Figure 2 Greywater installation at Kinanti Residence



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Figure 3 Greywater installation at Faculty of Economics and Business



Figure 4 Greywater installation at Faculty of Engineering (SGLC building)

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Figure 5 Canal at Faculty of Animal Science



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Figure 6 Underground collector tank at UGM Residence

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Figure 7 Ground Water Tank in Center for Environmental Study

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Figure 8 Ground Water Tank in Center for Environmental Study

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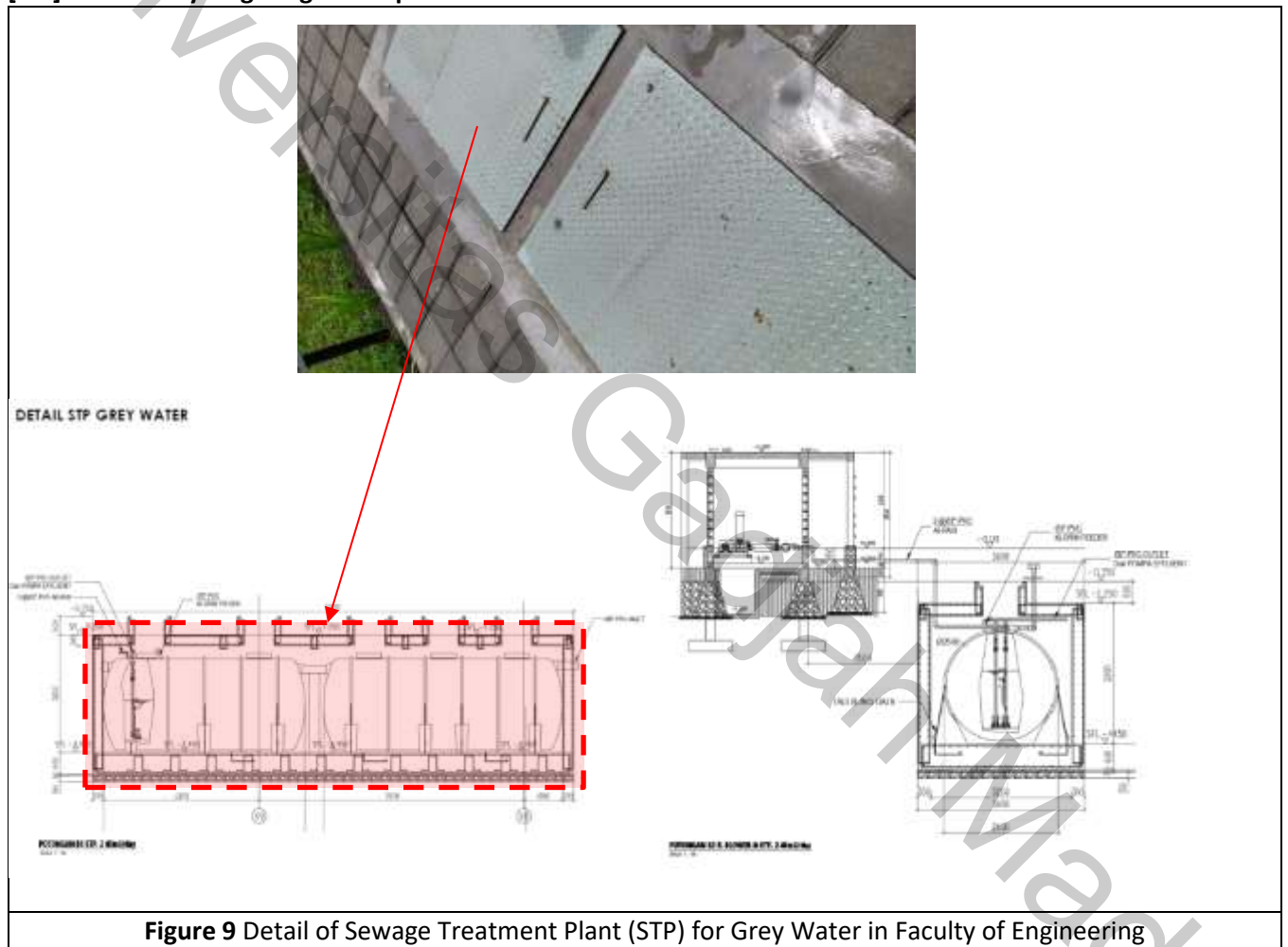


Figure 9 Detail of Sewage Treatment Plant (STP) for Grey Water in Faculty of Engineering

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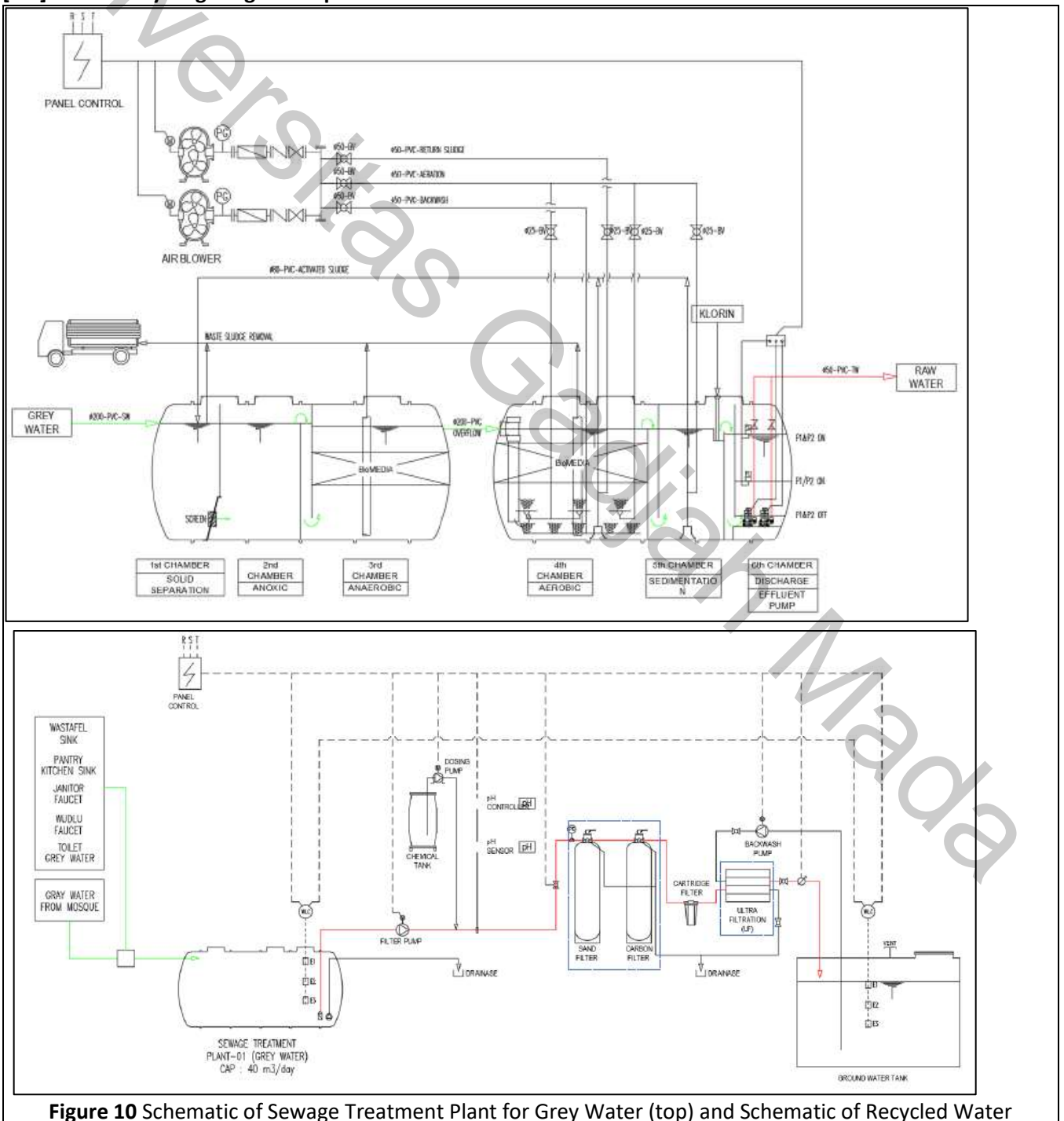


Figure 10 Schematic of Sewage Treatment Plant for Grey Water (top) and Schematic of Recycled Water

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Treatment Plant (bottom) in Faculty of Engineering



Figure 11 Greywater Installation (with Panel Control) in Faculty of Engineering

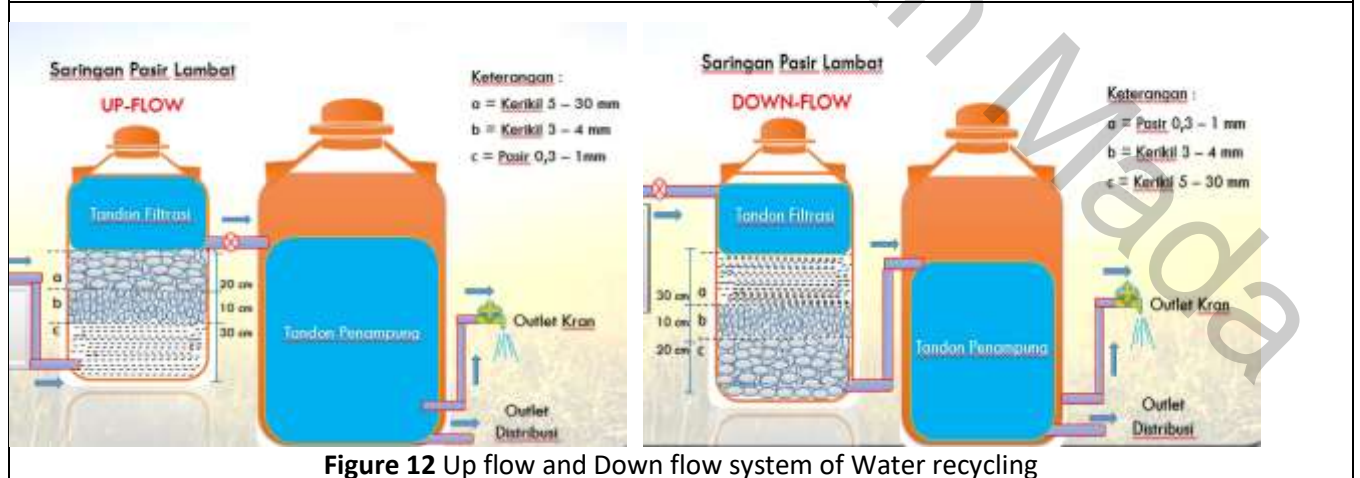


Figure 12 Up flow and Down flow system of Water recycling

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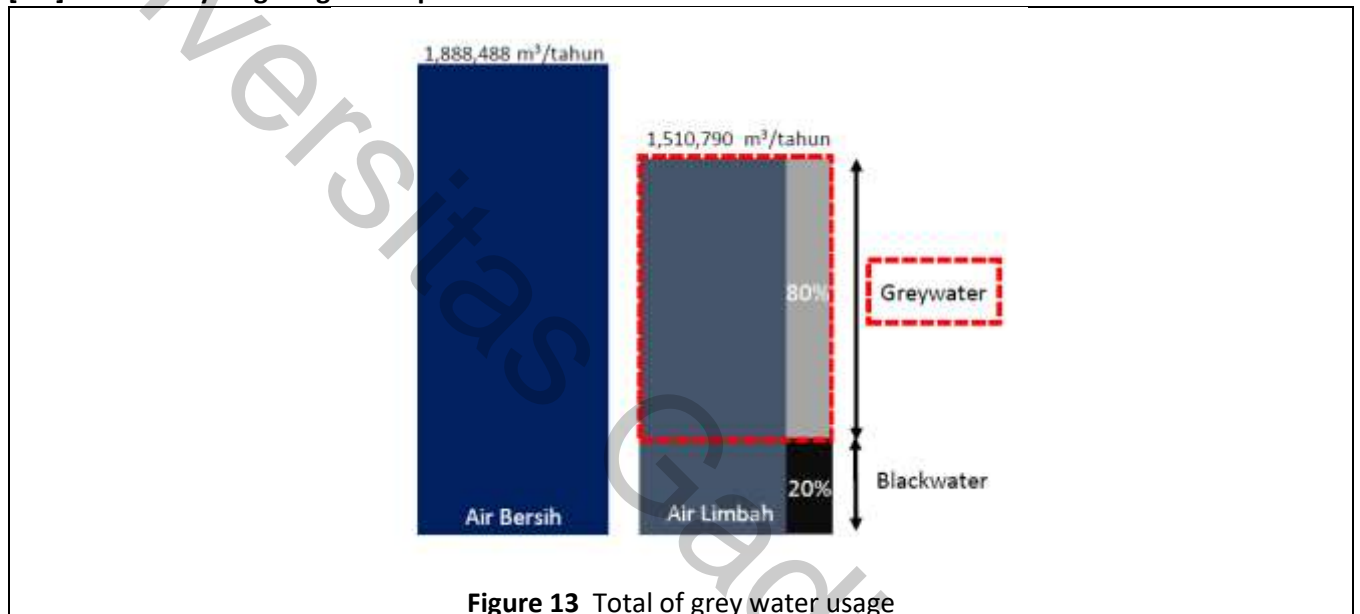


Figure 13 Total of grey water usage

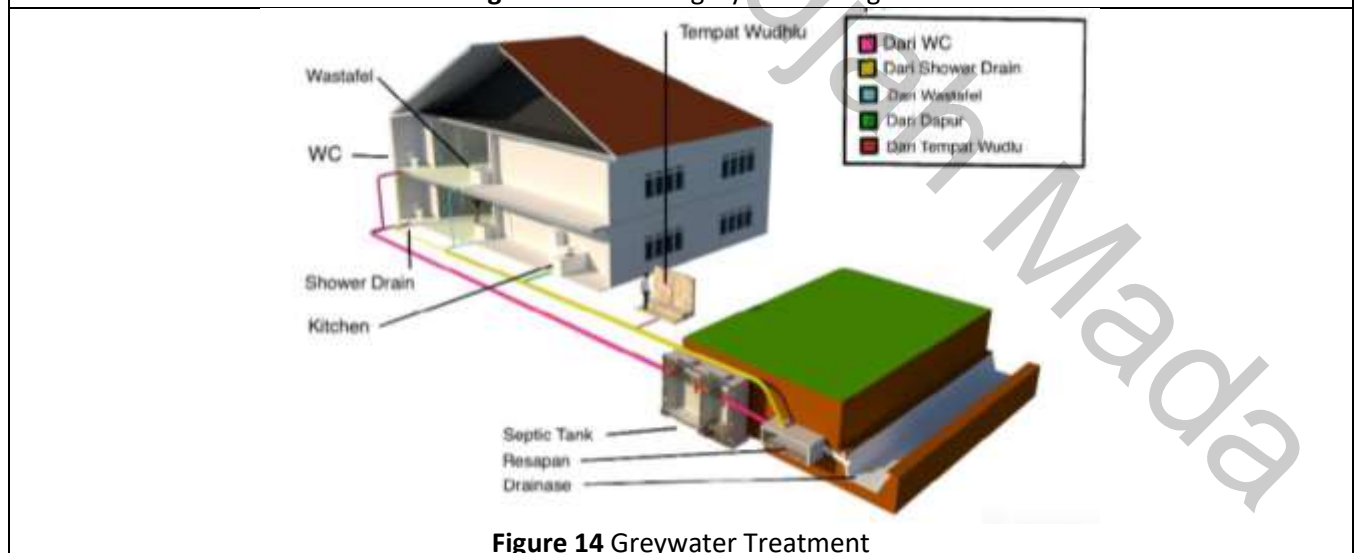


Figure 14 Greywater Treatment

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15(a) Infiltration Well in Faculty of Cultural Science



15(b) Infiltration Well in UGM Residence



15(c) Infiltration Well in Faculty of Cultural Science



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15(d) Underground collector tank at UGM Residence

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15(e) Porous Pavements in UGM

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15(f) Rainwater Reservoir in Faculty of Biology



15(g) Rainwater Reservoir in Library of UGM



15(h) Rainwater Reservoir in Faculty of Engineering



15(i) Rainwater Reservoir in UGM Residence



15(j) Rainwater Reservoir in Field Research Center



15(k) Rainwater Reservoir in Faculty of Engineering

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15(l) Injected Rain Water Harvesting UGM Residence



15(m) Injected Rain Water Harvesting in Department of Civil Engineering and Environmental Engineering



15(n) Injected Rain Water Harvesting in Laboratory of Environmental Engineering



15(o) Injected Rain Water Harvesting in Faculty of Agriculture

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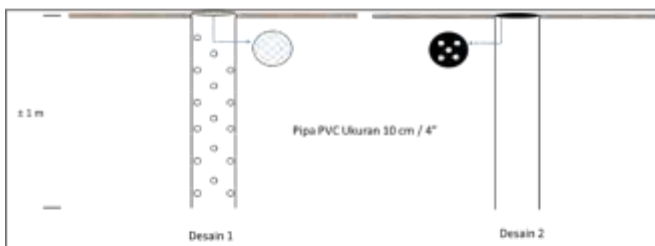
15(p) Injected Rain Water Harvesting in Learning Centers



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No	Kawasan	Jumlah Titik Aktual
1	Gedung Pusat	50
2	Asrama Bulaksumur	50
3	Asrama Kinanthi	50
4	Wisdom Park	50
Total Keseluruhan Titik		200 titik



15(q) Installation of Bio-pores

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15(r) Stormwater retention in wisdom park UGM



15(s) Stormwater retention in Pascasarjana School



Figure 16 Water and Waste Water Technology and Activity



Figure 17 Water Recycling Implementation in Faculty of Engineering

Description:

There are several faculties and units in Universitas Gadjah Mada that implement water recycling programs, including:

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1. The University Mosque (Masjid Kampus UGM) reuses ablution water by draining it into a pond and reusing it for plant watering (Figure 1).
2. Kinanti Residence Dormitory: Has implemented and uses grey water harvesting for reuse in the building (Figure 2).
3. Faculty of Economics and Business: Already implemented and using grey water harvesting installation for reuse in the building (Figure 3).
4. Faculty of Engineering SGLC Building: Already implemented and using grey water harvesting installation for reuse in the building (Figure 4).
5. Faculty of Animal Science: used water from the canteen is recycled. Used water from the canteen is channeled through a channel to the garden. It is then used to irrigate plants in the garden (Figure 5).
6. UGM Residence (dormitory): the waste treatment process is carried out with a multilevel system. Initially, waste is collected in an underground collection tank. In this tank, wastewater will be separated and absorbed into a second tank. In the second tank, solid materials are allowed to settle, while the liquid phase is diverted to the third tank. In the third tank, the liquid waste undergoes a filtering process and is then utilized for watering the surrounding vegetation (Figure 6).
7. The Faculty of Engineering has a grey water recycling system. Based on the scheme, firstly, grey water from the building (ablution water and wastewater from bathtubs, showers, bathroom sinks) is channeled to the underground Sewage Treatment Plant (STP). The STP has several chambers for the grey water treatment process. Treated water from the STP goes to the Water Treatment Plant for a second treatment process. After that, recycled water is channeled to the Recycle Water Ground Tank. The recycled water in the Recycle Water Ground Tank is pumped into the building to use the recycled water for flushing or watering the garden (Figure 10).
8. In Figure 12, UGM implements a water recycling program with two methods: up-flow filtration and down-flow filtration. In up-flow filtration, a slow sand filter is used in the storage tank with a filter aggregate order consisting of several layers. The first layer is 5-30 mm diameter gravel, the second layer is 3-4 mm gravel, and the last layer is 0.3-1 mm diameter sand. The water inlet is installed in the last layer, while the water outlet is installed above the first layer. Therefore, this system is called up-flow filtration. Meanwhile, down-flow filtration consists of the same components; however, it is installed in reverse.
9. UGM has deep wells, shallow wells, and groundwater tanks as recyclable water sources shown in (Figure 14). Of the total wastewater available (Figure 13), 80% is grey water that can be used for watering plants.
10. Figure 15 present the best practices for rainwater harvesting which will be reused can be classified as several water conservation technology such as:
 - a. Infiltration wells
 - b. Underground collector tank
 - c. Porous Pavements

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- d. Rainwater storage
 - e. Injected Rainwater Harvesting
 - f. Bio-pores
 - g. Stormwater Retention
11. UGM water and wastewater technology (Figure 16 and Figure 17) is closely related to the availability of clean water and prevention of pollution of clean water sources. One of the activities is grey water treatment and the manufacture of portable WWTP tanks. The manufacture of a portable WWTP tank capable of greywater treatment uses the principle of microbubble nozzle. The final product of the preparation is used for watering plants

Additional evidence link (i.e., for videos, more images, or other files that are not included in this file):

<https://wastewater.wg.ugm.ac.id/>