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An Analysis of Grey Water Treatment System In The National University of Malaysia Mosque

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Abstract. This paper is trying to analysis and proposes some design of grey water system in The National University of Malaysia (UKM) mosque in order to save environment. With proper grey water treatment, UKM Mosque will contribute to save water and UKM's environment. This successful water treatment is also can be an alternative model to apply in another building. This environmental issue, especially water was realized by Universiti Kebangsaan Malaysia (UKM) by starting to be a first pioneer in Green & Sustainability Campus in Malaysia. Although UKM is located in water-rich country, still UKM try to commit to save environment as well as manage its environment aspect. The usage of water in UKM itself is categorized in high level. UKM have around 20.000 students and most of them are dwelling in campus. For big campus like this, UKM had one main Mosque which accommodates some daily worship of Moslem as the majority one. For activities like ablution, washing and bathing, UKM Mosque had produce quite big amount of grey water. Grey water itself is residual water that still fresh and can be recycled for some purposes such as landscape irrigation and cleaning service. One alternative method to treats the grey water is by the usage of filter wells.

Introduction

Water is one of the natural resources that support entire creature's needs in earth. It was also a key element of sustainable living. The important of water is proved by fact that human body were consists of 80% water which makes daily water needs is definitely important. Same thing was happen on earth which also consists of 71 % water. Unfortunately, nowadays qualities as well as quantities of water is getting poor caused many environmental decline. Those situation is feel quite irony, first is because in one side human are depending on water badly, and in another side, qualities and quantities water have been decreasing because of their own. The declining of environmental quality that accompanied with environmental pollution and loss of natural of natural resources are brings critical issues today. These issues were not only occurring in developing countries, but also become big global issues that concerns of all countries in the world. Currently, the global warming issues become the main agenda of our everyday conversation that ultimately bring us to think and act more wisely in treat nature and environment. The availability of water in tropical countries like Malaysia and Indonesia actually are pretty good and adequate. However it will not be sustained indefinitely without any effort to maintain, protect and preserve.

As we know, to keep environment from all declining, sustainable development becomes important concept. Sustainable is development that meets current needs without compromising the ability of future generations to meet their own needs. Basically, concept of sustainable development includes several fields, namely a social sustainable, economic sustainable and environmental sustainable. Water is one of resource that supports the humans need and other creatures; it is also one of a key element of sustainable living [1].

The important of water is proved that the human body is consists 80% of water which makes the daily water needs for human beings is definitely important. Same happen in earth. Earth also consist around 71 % of water, unfortunately the qualities of water is getting poor nowadays because many environmental decline. Chemically water molecule has a simple formula H2O. Pure water has a neutral nature and a universal solvent for most mineral [1]

Improving of water quality for humans can be done by conducting a water management. This management is possible from simple one to another complex way depend on the water quality from its source. More and more lower the resources of water quality will makes more and more techniques required for treating it. The enhancement of the water quantity is second requirements after the quality ones [2]

On the other hand, the effort to water conservation is one of the important ways to maintain and keep quality and quantity of water well. Conservation is an act to save water that falls to the ground and manage its timing flow. These efforts will save enough water in the dry season and avoids destructive flooding. Any treatment given to a plot of land will affect the water system on it and the places downstream. Conservation of soil and water are two things that are closely related, the various soil conservation is also a part of water conservation or vice versa. Another important of conservation water is by recycling the residual water; by it residual water can be reuse and also can minimize the usage of water. While the purpose of water conservation is as follows:

1. Increase the volume of groundwater, adds to the capacity of groundwater and surface water by storing water when excessive.
2. Increase the efficiency of water usage, using as little as possible for specific purposes.
3. Improve the quantity and quality of water as intended.

Methodology

Definition of Grey Water

The residual water divide into two designations, the one is the grey water and the other ones is black water. While, drinking water or clean water is called white or fresh water. The naming of grey water obtained from its grey appearance, but still has a fresh nature, while the black water is a designation for wastewater. Grey water is water that has a lower quality than white water (fresh water) but has higher quality than black water (sewage) [3], refer on Table 1.

Tabel 1, Type of Water and Possible Use

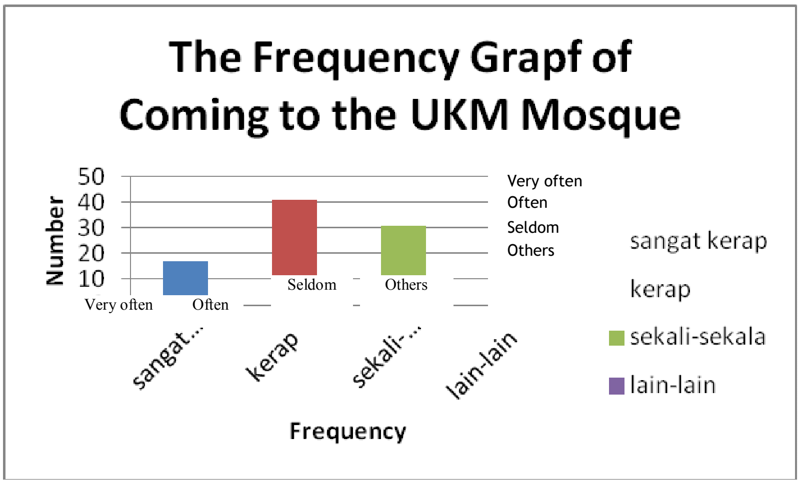
Water	Sources	Possible uses
Fresh water	Ground & surface water	Drinking, cooking, bathing
Greywater	Bathing, cloth washing	Toilet cleaning, irrigation, floor washing, construction after treatment
Black water	Toilet, urinal	No use in majority of the cases and requires extensive treatment - ECOSAN toilet can be an option

Source: National Environmental Engineering Research Institute & UNICEF, 2007

In the context of household, the grey water is residual water from bathing, washing clothes, washing dishes, includes ablution. Ablution activity in the mosque had result large amount of grey water. In Indonesia for example, a country which has more than 700,000 mosques with the majority is Muslim sure have produced grey water [4]. These amounts does not include grey water that produced by another activities except ablution. For Muslim countries like Indonesia, Malaysia or Middle East countries can be ascertained that ablution and mosque is one of big producer of grey water in the country. Grey water regulations vary from state to state and it’s important to be aware of local state and council rules [5]. The benefit of a grey water treatment system is that it improves the quality of water, and in another side it can also be used for surface irrigation or diverted inside the house for flushing the toilet, and washing clothes. Grey water divided into two designations that are first grey water that free from chemicals likes from ablution and second is grey water that contains chemicals like from bathing or washing [6]. Grey water which is containing of these chemicals can be categorized into inorganic waste. Another benefits of grey water treatment is also can reduce fresh water requirement at once reduces sewage generations.

Results and Discussion

UKM Mosque is located in Universiti Kebangsaan Malaysia (The National University of Malaysia). The mosque is cultivated in 2 Ha areas and located in front of the main entrance of university. This mosque has breadth of 25.713,41 square meters (74.500 square feet) and accommodates around 5.000 peoples. Based on research result noted that from 110 respondents, more than 40% indicated frequently go the mosque, and about 17% indicated very often go in it. From these findings, it may be noted that more than 50% of respondent were regularly coming to the mosque (Graphic 1).



Graphic 1. The Frequency Graph of Coming to the UKM Mosque (Source: Observation, 2011)

UKM Mosque has some issues likes wastewater issue which quite common in many mosques, while in another side, the availability of water moreover limited in this world. Moreover, to know the level of waste water, researchers are also doing another research on naturalistic method. This observation made to the water users in the UKM mosque, especially in ablution activity. The selection of naturalistic method is to know the real results on the behavior of waste water, because the respondents did not feel monitored and will performs as normal as usual. The result is known that the average of ablution water consumption is around 1,5 – 2 liter per person. Meanwhile, the most big number of visitors per day is in Zuhur and Ashar Prayer times, whereas in a week, the number of visitors is on Friday Prayer. Based on its observations,the act of waste water during ablutions due when visitors turn the water on with in great & big flow and let the water run all the time for ablution even when not doing it. From these issues, the effort of grey water treatment in this mosque is quite urgent [7].

Propose Design to Grey Water Treatment in UKM Mosque

The design is proposed by the previous literature and precedent study. The grey water treatment will divide into three tanks which embedded in soil. Firstly grey water (ablution water) will be accommodated in first tank that is filtration tank. This filtration tank is filled by activated sand. Secondly, water will flow to second tank that is absorption tank. This second tank is filled by activated carbon to absorb the pollutant contained in ablution water. The last, grey water will flow to final thank that is the chlorination tank. This final step is done to make ablution water free from harmful microorganisms. The process to removal harmful microorganisms is called disinfection, this process using chlorine (Figure 1).

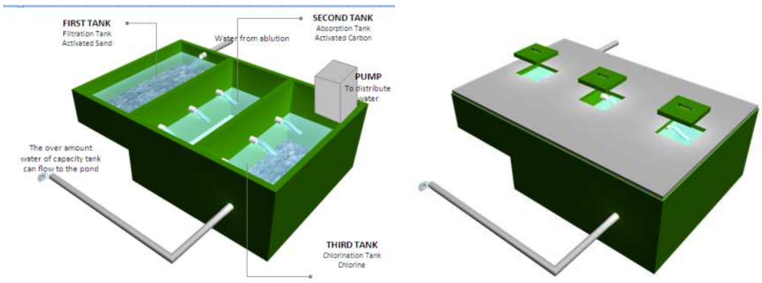


Figure 1. Propose Design of Grey water treatment in UKM Mosque and Small cover in each tank for maintenance process

Grey water treatment installation system will completed with small covers in top of it to maintenance process. The mediums inside can replaced and added every time with open its cover.

Conclusion

Grey water treatment is an effort to treat grey water into clean water so can reuse for other needs. The aim of this treatment is to minimalist the usage of fresh water for some need in UKM Mosque like fill pond, irrigation the landscape and flushing toilet. This effort is quite urgent in UKM because there is issue wastewater in UKM. The amount of grey water in this mosque is in high level. The grey water installation system is dividing into three steps. Firstly grey water (ablution water) will be accommodated in first tank that is filtration tank. This filtration tank is filled by activated sand. Secondly, water will flow to second tank that is absorption tank. This second tank is filled by activated carbon to absorb the pollutant contained in ablution water. The last, grey water will flow to final thank that is the chlorination tank. This final step is done to make ablution water free from harmful microorganism. For maintenance process, this installation completed with small cover that can open every time it needed.

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