Journal of Environment and Earth Science
ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online)
Vol.5, No.22, 2015

Constructed Wetland as Natural Waste Water Treatment and Public Park in Urban Area – An Overview

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Abstract

This paper highlighted the current issue of the scarce of freshwater resources due to pollution especially in river area. By treating the raw effluent before entering the catchment area could help in reducing the pollution and improve water quality. Constructed wetland is a method of natural wastewater treatment being used especially in urban area by using wetland vegetation. Waste water treatment by wetlands vegetation have a few advantages due to its cost efficient and required less technology as well as improve surface water quality and effluent discharged to catchment area. Apart from that, the aesthetic value of the wetland attracted wildlife to come and make their new habitat especially for birds and insects. With the proper design, this wetlands have a potential as public parks for the urban dwellers mainly as the decreasing of total number of green area due to rapid urbanization in urban area.

Keywords: Constructed wetland, Urban park, Waste water treatment

1. Introduction

Water is among the most valuable and important resources in the world, but it has been widely mismanaged, depleted, wasted, polluted and changed beyond what is clearly recognizable as water. The pressure on existing freshwater resources has increased because of rapid urbanization and industrialization

According to Department of Environmental of Malaysia, 40% of the river in Malaysia (a total 426 river) were polluted although there has been an improvement in increasing of 11 clean riven from the year 2006 to the year 2007 (Department of Environmental, 2015). This pollution caused by discharge of growing volumes of wastewater into the receiving waters has further reduced the availability of freshwater resources. Thus, freshwater has become a limiting factor. For example Kuyoh River in Serdang area being polluted by industrial and residential waste nearby (See Figure 1).

Hence, with increasing pressures on water resources, the concept of beneficial use of treated wastewater has rapidly become an imperative for water agencies around the world. Water reclamation, recycling and reuse are now recognized as key components of water and wastewater management. However, the idea of natural wastewater treatment in Malaysia is still new compare to other country in the world.

Figure 1. Polluted Kuyoh River in Serdang Area, Malaysia.

1.2 Wetland as wastewater treatment

Wetland creation refers to the construction of wetlands where they did not exist before and can involve much more of engineering of hydrology and soils (Mitsch and Gosselink, 1993). Created wetlands are also called constructed wetland or artificial wetlands although the last term is not referred by many wetland scientists. The use of wetlands for wastewater treatment (a.k.a. constructed wetlands) was stimulated by a number of studies in the early 1970s that demonstrated the ability of natural wetlands to remove suspended sediments and nutrients, particularly nitrogen and phosphorus, from domestic wastewater. Wetlands are altered by pollutants from upstream or local runoff and, in turn, change the quality of the water flowing out of them which cheaper than conventional wastewater treatments well as energy efficient (Sim, et al., 2008). The ability of wetlands to cleanse water has received much attention in the research and development and is discussed elsewhere.

In addition, Kivaisi (1999) stated that constructed wetlands are among the recently proven efficient technologies for wastewater treatment. Compared to conventional treatment systems, constructed wetlands are low cost, are easily operated and maintained, and have a strong potential for application in developing countries, particularly by small rural communities. Breaux (1995) indicates 4 advantages of using wetland as wastewater treatment; 1. cost efficient, 2.effluents discharged could benefits the wetland, 3. natural wetland have a potential for advance water treatment at low cost and 4. better quality of surface water.

It is proven than constructed wetlands offer better opportunities for wastewater treatment than natural wetlands (Verhoeven, J. T. A. and Meuleman, A. F. M., 1999). This can be achieved by designing the wetland for optimal performance in reducing the BOD, COD and nutrient removal with the right species selection with water purification purposes. Among the species used for this purposes were *Phragmites australis*, *Typha spp*. and *Scirpus spp.* Research done by Coleman et al., (2001) stated that Typha's clearly reduced BOD, TKN, ammonia, phosphate, and fecal coliform concentrations in effluent as compared to *Scirpus* and *Juncus,* however its aggressive growth and colonizing ability has make it less been used.

1.3 Wetland as Public Park

Constructed wetlands can be an aesthetically pleasing and functional wastewater treatment in urban area especially if properly design. Since the total green area in urban area is decreasing due to rapid urbanization, creating wetland as wastewater treatment could be the solution. Wetland were known for its rich biodiversity ranging from plants and serve as a home for birds and other wildlife. High biodiversity values can make them valuable sites for nature education and research.

1.3.1 Constructed Wetlands in Malaysia

For example, in Malaysia the largest man made constructed wetland is Putrajaya Wetland which comprises 2650 ha consisting of 24 cells, was created in 1999 and is believed to be one of the largest constructed freshwater wetlands in the tropics Its main function is to treat surface runoff caused by development of Putrajaya City as well as agricultural activitie before entering the 400 ha Putrajaya Lake. This wetland also designed to mitigate stormwater, flood control and amenity use.

The system can tolerate various pollutants and could be used by various users including governmental departments and agro-based industries in treating wastewater before it is discharged into natural waterways. Apart of water purification, constructed wetlands also serve as a wildlife sanctuary and provide habitat for wildlife. The system can be aesthetically pleasing and serve as an attractive destination for tourists with a 18 metre lookout tower, plant nursery, nature trails, flamingo pond, picnic areas as well as other interesting attractions.

Conclusion

Better understanding on how wetland can do to treat wastewater among dweller could help in constructing a wetland as natural wastewater treatment in neighborhood area as well as making it as a public park. The advantages of wetland as natural wastewater treatment such as cost effective and low technology needed make it practical to construct and liable for water treatment. Further research on how urban dwellers perceive wetland as wastewater treatment need to be done to understand better and can make it a successful small scale neighborhood project.

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