

THE EFFECTIVENESS OF RIVER WATER TREATMENT PLANT IN  
IMPROVING WATER QUALITY IN SUNGAI KEMENSAH

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Specially dedicate to my beloved father, mother, wife and children

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## ABSTRACT

The government of Malaysia has spent huge amount of money to improve the river quality under the Malaysian Economic Transformation Program (ETP) with the intention of bringing river back to life and to 'bring' people towards the river. The main purpose of the treatment plant is basically to improve the river water from polluted state to the state where the water can be contacted with human skin without any harm that is Class II Water Quality Index (WQI). This study is conducted to determine the effectiveness of River Treatment Plant (RWTP) that are implemented in Sungai Kemensah in year 2012. The River Water Treatment Plant is technically similar to the sewerage treatment plant but it has been further enhanced to suit the river water condition where it consist of biomedial filter, extended aeration and proper aeration system. The study involved grab sampling which were conducted three times; pre, during and post project stage. The idea of taking these samples in phases was to determine the difference or the improvement made by the RWTP once has it has been fully operated towards the water quality. The samples were then analysed using the WQI formula to determine its class. Based on the final findings, it found that the concentration of dissolve oxygen is somehow maintained but both Biochemical Oxygen Demand (BOD) and Ammoniacal Nitrogen (AN) decreased tremendously from 19.20 mg/L to 2.33 mg/l and 5.31mg/l to 0 mg/l respectively. It can be concluded that the RWTP is proven to be effectively improving the water quality from polluted to safe state.

## ABSTRAK

Kerajaan Malaysia telah membelanjakan sejumlah wang yang besar untuk meningkatkan taraf sungai di bawah Malaysia Program Transformasi Ekonomi (ETP) dengan tujuan untuk membawa sungai kembali kepada kehidupan dan untuk menarik minat semua kepada sungai. Tujuan utama rawatan air pada asasnya adalah untuk mempertingkatkan kualiti air sungai yang tercemar kepada keadaan di mana air boleh bersentuhan dengan kulit manusia tanpa menyebabkan sebarang apa-apa kemudaratan. Kajian ini telah dijalankan untuk menentukan keberkesanan Loji Rawatan Sungai (RWTP) yang dilaksanakan di Sungai Kemensah pada tahun 2012. RWTP adalah secara teknikalnya mempunyai sistem serupa dengan loji rawatan pembetulan tetapi ianya telah dipertingkatkan untuk disesuaikan dengan keadaan air sungai di mana ia terdiri daripada penapis biomedial, pengudaraan dilanjutkan dan sistem pengudaraan yang berkesan. Kajian yang melibatkan pengambilan sampel air telah diadakan sebanyak tiga kali; sebelum, semasa dan selepas projek siap. Tujuan pengambilan sampel ini secara berperingkat-peringkat adalah kerana untuk menentukan perbezaan atau pembaikan oleh RWTP setelah ia telah beroperasi sepenuhnya. Sampel tersebut kemudiannya dianalisis dengan menggunakan formula Index Kualiti Air (WQI) untuk menentukan kelasnya. Adalah didapati bahawa kepekatan kadar enap oksigen (DO) masih dikekalkan tetapi kedua-dua *Biochemical Oxygen Demand* (BOD) dan *Ammonical Nitrogen* (AN) berkurangan dengan ketara daripada 19.20 mg/L kepada 2.33 mg/l dan 5.31mg/l kepada 0 mg/l. Dengan ini dapat disimpulkan bahawa RWTP adalah amat berkesan dalam meningkatkan kualiti air dari peringkat tercemar kepada keadaan selamat.

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 General**

River can be said as the main source of water supply beside ground water for most countries in the world. Klang River or in Malay word is called Sungai Klang which located in Klang Valley which is 52km in length. Klang River flows to the heart of Kuala Lumpur and is one the most popular and well known river in Malaysia. Klang River flow from the Klang Gate Dam towards downstream in Klang, Selangor that passes Masjid Jamek, Kampung Baru and Midvalley where all of these are tourist attraction point. The study area lies in between 3°14.11' N, 101° 44.55' E and 3° 11.45' N, 101° 45.41' E, covers three major tributaries, namely Sg. Gisir, Sg. Sering, and Sg. Kemensah.

By referring to a successful story on river rehabilitation project in developed countries such as Korea, China and Japan, the Malaysia government are intend to initiated urban river rehabilitation program, called River of Life Program as one of the main key initiative in Malaysian Economic Transformation Program (ETP). Through Department of Irrigation and Drainage Wilayah Persekutuan, the government is desirous to mitigate the quantity and quality problems in the Klang River primarily the upstream portion.

The design of the Malaysian River Water Treatment Plant is basically an adaptation from Cheonggyecheon River in Seoul, Korea where there are minor adjustment made to suit Malaysian river condition. The treatment in Korea really

have successfully changed the river condition from polluted to class IIB. The government have finally realized that river is actually a country's asset and shall be appreciated by restoring to its natural state condition and the government had put a lot of effort in bringing the river back to life.

Sungai Kemensah were focused on in this study since the river water treatment plant is located exactly just after the most polluted area on the Sungai Klang upstream portion which is the Kampung Fajar. Kampung Fajar is an illegal squatter's area which is said to be one the most pollution contributor as it does not have any proper sewerage system and domestic waste management system. The treatment plant were expected to receive high concentration of Biochemical Oxygen Demand, Chemical Oxygen Demand and Ammonical Nitrogen.



**Figure 1.1** Location of River Water Treatment Plants

## 1.2 Statement of Problem

The need for watershed management to non-point source (NPS) pollution is gaining much attention throughout the world (Debo and Reese, 2003; USEPA, 1999b; NWQMS, 2000). Urban stormwater gives significant threat to the environment if left without control. Urban stormwater pollution arises from point source to non-point source.. While it is easier to manage effectively pollution from point sources, meanwhile NPS pollution control are difficult and this calls for a holistic approach that considers the catchment as a system (Harrell and Ranjithan, 2003; Rathnan *et al.*, 2004). Urbanization of watershed causes increased imperviousness and pollutant build-up through anthropogenic activities. The consequences are that of increased surface runoff which is also associated with pollutant wash-off process. The effect is felt mostly by the communities living at the downstream of the catchment (Burton and Pitt, 2002).

River Water Treatment Plant (RWTP) are never used in treating non-point source in a river before but were only used in sludge and waste water treatment system. They are treatment technologies used for the control of urban stormwater quantity as well as quality problem.

Researches in the area of treatment and control of wet weather flow are very scarce in this part of the world. More research in urban stormwater management becomes very crucial. This research intends to address the effectiveness of the River Water Treatment Plant in improving the water quality from polluted state to Class IIA WQI

## 1.3 Objectives of the Study

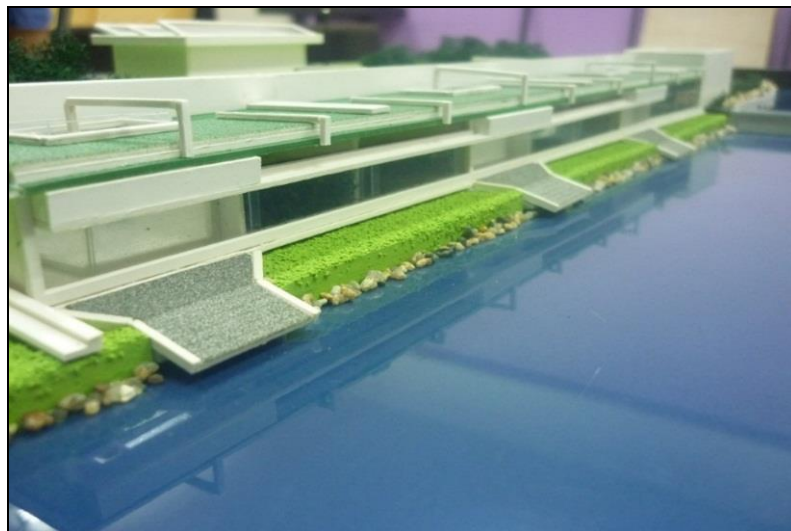
The main objective of the research is to observe the effectiveness of Sungai Kemensah River Water Treatment Plant in:-

- i) Increasing of Dissolve Oxygen using aerator from class Class IV to Class II
- ii) Reducing the Ammoniacal Nitrogen concentration Class IV to Class II

#### 1.4 Scope of Study

The scope of the study consist of design calculation of the River Water Treatment Plant which includes design of aeration system and biomedica, water sampling before and after the construction of the plant, and analysis of the sampling data. Four RWTP will be proposed for the project and of the RWTP are sited at the end of each river tributaries but only Sungai Kemensah will be focused on. The purpose of these treatment systems are to treat the river water during the low flow. This research will only focusses on Sungai Kemensah Treatment Plant.

The proposed biological system comprised of series of aerated chamber (equipped with biofilter media) followed by sedimentation and filtration chamber. The treated water will be discharged back to the river. The conceptual design of River Water Treatment Plant is shown in Figure 1.2



**Figure 1.2** Conceptual Design of River Water Treatment Plant

## **1.5 Significance of the Study**

- i. The research has explored the effectiveness of River Water Treatment Plant in improving the river water quality
- ii. To prove that River Water Treatment Plant (RWTP) are capable of in improving the river water from existing Class V to Class IIB based on Water Quality Index (WQI)

## **1.6 Findings and Contributions of the Study**

The research has come up with the following findings:

- i. River Treatment Plant shows significant improvement in treating polluted water. This aspect is novel and will be a significant contribution towards addressing river water quality issues in Malaysia.
- ii. The research involved detailed calculations on water treatment especially in reactor design and media filter . The research will open the way to the application of this approach at planning stage of any river restoration study endeavor in Malaysia.

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