



***COMPARISON OF RIVER WATER QUALITY STATUS BETWEEN URBAN
AREA AND SECONDARY FOREST***

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**Faculty of Forestry
Universiti Putra Malaysia**

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AREA AND SECONDARY FOREST**



By

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for the Degree of Bachelor of Forestry Science in the
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DEDICATION

In The Name of Allah, the most benevolent the most merciful

My beloved Parents,

Mazlan b Ali (Ayah), Noor Kasmah bt Hamzah (Mama)

Sister and Brothers,

Siti Nooraisah bt Mazlan, Muhd Amirul b Mazlan and Muhd Ariffin b

Mazlan

My Supervisor,

Dr Mohamad Roslan Mohamad Kasim

My beloved friends, Final Year Project team mates, course mates, members and people who had contributed in project success and for their encouragement, understanding and endless support.

Thank you so much for your support

ABSTRACT

Water is a basic need of humans and living organisms. However, urbanization process is often linked to river pollution. This study aimed to compare the water quality between Sungai Jelok that flows through the urban areas in Kajang and Sungai Rasau that flows through the Ayer Hitam Forest Reserve using DOE-WQI index and quantify the severity of the water quality in this urban rivers, if any. Three sampling stations were selected at each river. Statistical analyses of one way ANOVA and Independent samples T-Test was used and it was found that there was a significantly lower quality in Sungai Jelok with p-value less than 0.001 with the percentage of 32.10%. The water quality status of Sungai Jelok is under class III which means only it was suitable for aquatic life and needs intensive treatment for public water supply. Sungai Rasau is class II, which was suitable for water recreational activities and needs minor treatment for public water supply. This indicates urbanization process has dwindled the water quality in the studied area.

ABSTRAK

Air adalah keperluan asas manusia dan organisma hidup. Walau bagaimanapun, proses perbandaran selalu dikaitkan dengan pencemaran sungai. Kajian ini bertujuan untuk membandingkan kualiti air antara Sungai Jelok yang mengalir melalui kawasan bandar di Kajang dan Sungai Rasau yang mengalir melalui Hutan Simpan Ayer Hitam dengan menggunakan indeks DOE-WQI dan mengira kemerosotan kualiti air di sungai-sungai bandar ini. Tiga stesen pensampelan dipilih di setiap sungai. Analisis statistik ANOVA dan sampel bebas T-Test telah digunakan dan didapati terdapat kualiti yang jauh lebih rendah di Sungai Jelok dengan p-nilai kurang daripada 0.001 dengan peratusan 32.10%. Status kualiti air Sungai Jelok berada di bawah kelas III yang bermaksud hanya sesuai untuk kehidupan akuatik dan memerlukan rawatan intensif untuk bekalan air manakala Sungai Rasau adalah kelas II, yang sesuai untuk rekreasi air dan memerlukan rawatan kecil untuk bekalan air. Ini menunjukkan proses perbandaran telah merosotkan kualiti air di kawasan yang dikaji.

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APPROVAL SHEET

I certify that this research entitled “Comparison of River Water Quality Status Between Urban Area and Secondary Forest” by Siti Nadzirah binti Mazlan has been examined and approved as a partial fulfillment of the requirement for the degree of Bachelor of Forestry Science in the Faculty of Forestry, Universiti Putra Malaysia.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
DOE-WQI	Department of Environment-Water Quality Index
EPA	Environment Protection Agency
Mg/L	Milligrams per Liter
NH ₃ -N	Ammonia Nitrogen
SIAN	Sub-Index of Ammonia-Cal Nitrogen
SIBOD	Sub-Index of Oxygen Requirement for Biochemical Process
SICOD	Sub-Index of Oxygen Requirement for Chemical Process
SIDO	Sub-Index of Dissolved Oxygen in Percentage
SIpH	Sub-Index of pH Value
SISS	Sub-Index of Total Suspended Solid
TSS	Total Suspended Solid

CHAPTER 1

INTRODUCTION

1.1 General Background

Water is the basic source of human life and an abundant compound on the earth's surface. According to Ruslan and Zullyadini (1994) and Rozita (2008), water is also one of the most essential of the human environment. Human needs it for the physiological existence and many purposes such as domestic consumption, industrial application, recreation, generation of power, and propagation of fish and other aquatic life. It is also essential in the food production and transportation (Mansell, 2003).

Approximately 98% of water is seawater which is high in concentration of salt that unusable for drinking. About 2% of the planet's water is fresh but 1.6% is locked up in polar ice cap and glaciers. 0.36% found underground in aquifers and wells but only 0.36% of the total water supply is accessible in lakes and rivers (Reddy and Lee, 2012). In the other hand, water is the most abundant material on the earth's surface. It covers over 70% of the surface of the planet and also makes up more than 70% of our body (Mansell, 2003).

Hydrology is the study of the global water cycle. Physical, chemical and biological process continuously involved in the different reservoirs and fluxes of water within this cycle that consists of three phases which are vapor, liquid and solid (Marshall, 2013). Exchanging the water between land, water bodies and the atmosphere. Approximately 98% of the earth's water is stored in the oceans and the remaining portion is usable freshwater. When precipitation

fall, it follow various routes which are either evaporates to the atmosphere, seep into ground to become ground water, form a runoff of surface water or travelling to ocean and lakes by way of rivers and stream (Hollis, 1975).

Water quality is a description of chemical, physical and biological characteristic of water and therefore being used as the indicator of the water suitability for particular purpose are determine by the water quality. Water quality can be defined by a range of variables which limit water use (Bartram et al., 1996a).

Studies on water quality deterioration have also been performed to determine the causes of water quality change in urbanized catchments (Ren et al., 2003). It is well known that population growth and industrial activities are drivers of water quality change. Groppo et al. (2008) found that population growth and increases in untreated sewage were the main causes of water quality deterioration in rivers in the State of Sao Paulo, Brazil. Ma et al. (2009) found that sharp increases in industrial pollution and domestic discharge were the major causes of water quality deterioration in the Shiyang River, Northwest China. Suitable water management measures, however, may also be included in the urbanization process to mediate water quality deterioration such as installing wastewater infrastructure (e.g., wastewater treatment plant (WWTP) and urban drainage system) to increase wastewater treatment capacity. Although many policies and measures have been enacted, water quality degradation continues to be a serious problem in some rapidly urbanizing areas. However, most research addressed water

quality change in urbanized areas rather than catchments in the process of rapid urbanization.

1.2 Problem Statement

One of the factors that affecting the water quality is types of land use. The recreational, deforestation, urbanization, industrialization and economic development can be an influencing factor to water quality. This activity can disrupt the hydrological process by the transformation of natural vegetation area to concrete bank that blocking the water seeping into the river. In the scope of urbanization, land use would be changed drastically since the highly dense vegetation area being developed into housing and commercial areas complete with a good infrastructure and concrete pavement walkways that leads to the blocking of water from seeping into the ground but forms a flow of runoff into the stream. In a larger runoff flow scale, higher sediment concentration would also discharged into the stream as erosion occurred and when this flows exceeding the stream capacity, it brings the event of flash flood. Besides that, urbanization process also involving the transformation of river bank from the natural vegetation area into a concrete bank which changed the hydrological characteristic of the river. The urbanization process gives a seriously and negative effect on the water quality, thus constituting a sanitary risk and may have a major impact on the trophic (Almeida et al., 2007). The biggest impact of urban development on water resources is an increase in surface runoff and the flashiness of the storm hydrograph. The increase in impervious surface area associated with urban development also contributes to degradation of water quality as a result of non-point source pollution (Praskievicz & Chang, 2009).

The relationship between urbanization and water pollution is complex. As urban area has high density of population, there are many sources that can lead to water pollution such as solid waste, industrial waste and commercial waste. As an area is urbanized, the land is altered to meet the needs of the people. This alteration of the land accelerates the nonpoint source pollution because it changes the way water moves, increase surface runoff, and causes erosion.

This is what happening in the study area which is Sungai Jelok that started developed rapidly into urban in 1986. Water quality deterioration of Sungai Jelok has been occurred due to long period of urbanization. However, the deterioration rate is not well known as it is not documented (Trevett, 2004). Nevertheless, the information on this water quality deterioration rate is useful in future planning of having an environmentally friendly city which harmonizing the peoples well-being and environment conservation.

This deterioration also can affect people daily life since Sungai Jelok is one of Sungai Langat tributaries. Sungai Langat is source of water supply to residence in some area of Selangor for domestic usage. It flows through urban and residential area. The process of modernization and the rapid development around Sungai Jelok was threatening Sungai Langat with excessive pollution rate that contributed to the water crisis. The water status of Langat River has been said as not so well. According to the report of Malaysia Environment Quality Report (DOE, 2006), tributaries of Sungai

Langat that are Sungai Balak, Sungai Batang Benar, Sungai Batang Nilai, Sungai Lui and Sungai Pajam were highly contaminated and classified as class III in Water Quality Status. Suki et al (1988) found that the WQI of Kajang town is classified as slightly polluted since the most polluted section of the river is Cheras and Kajang town in Sungai Langat River Profile.

According to Kaur (2016), government take initiative to inject life back into the heart of Kuala Lumpur through the River of Life (RoL) project involve river cleaning, river master planning and beautification, and river development. The project aims to transform the Klang and Gombak rivers into vibrant and bustling waterfronts. The RoL also aim to bring the river from Class III - Class IV water quality which is not suitable for body contact to Class II that suitable for body contact and recreational purposes by year 2020. Justifiably, as Kajang is quite near to Kuala Lumpur, the information or results from this study could be used as a supporting facts if this project expands involving Kajang areas in future.

1.2 Justification

How serious is deterioration of water quality in Sungai Jelok due to urbanization? To determine this case, another river namely Sungai Rasau in compartment 13, Ayer Hitam Forest Reserve which is located in forest reserve area is used as a benchmark. Through this comparison, the deterioration rate of Sungai Jelok water quality due to urbanization could be determined.

This forest reserve namely Ayer Hitam Forest reserve was last logged about 52 years ago and nearly rehabilitated in term of water quality. Forest that already logging for more than 30 years can be assume as a rehabilitated forest since the forest already complete it's rotation age and can be logging again. According to Lamb and Gilmour (2003), any biodiversity benefit is then lost from the site, it can presumably be re-established in the second rotation.

Deteriorating happen due to human activities and industrial waste in the urbanization process so it is important to determine the deterioration of water quality. It is an importance to monitor and simulate the water quality parameter of Sungai Jelok to ascertain whether the water is still suitable for various uses. Determining deterioration could help to maintaining the river water quality in urban to reduce the effect of urbanization process to river.

1.3 Objectives

This study was conducted:

1. To determine the river water quality status of Sungai Rasau, Ayer Hitam Forest Reserve and Sungai Jelok, Kajang.
2. To compare the water quality between Sungai Rasau, Ayer Hitam Forest Reserve and Sungai Jelok, Kajang
3. To quantify the severity of water quality in Sungai Jelok.

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