

ANALYSIS OF AMMONIACAL NITROGEN IN SUNGAI MAONG KIRI

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Dedicated especially to my beloved parent

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ABSTRACT

This study was carried out to document the water quality of Sungai Maong Kiri. The water quality parameter of Sungai Maong that has been chosen in this study is ammoniacal nitrogen. Water samples are monitored and collected by NREB from four selected station which is named N1 station, N2 station, N3 station and N4 station. The analysis of data concentration of ammoniacal nitrogen has been done by using Microsoft Excel. Besides that, in this study, the WASP7 is used to do trial in order to run the water quality simulation program. The high concentration of ammoniacal nitrogen is obtained at the upstream of Sungai Maong Kiri which is occurred at N1 Station. The lowest reading of ammoniacal nitrogen concentration is obtained at N4 station where it is the downstream, of Sungai Maong Kiri. From the study, the water quality of Sungai Maong Kiri is polluted with ammoniacal nitrogen. The source of ammoniacal nitrogen has been identified in this study such as the activity of agricultural development and rapid development. The reading of the concentration is high than the standard of NWQSM for Class IIB. The standard for concentration of ammoniacal nitrogen in water body is 0.3 mg/l. It is not good if the concentration of ammoniacal nitrogen is high in the water and will give negative effect to the habitat in the river especially the growth of unwanted aquatic plants such as algae.

ABSTRAK

Kajian ini dijalankan bagi mengenalpasti kualiti air yang terdapat di Sungai Maong Kiri. Parameter ammonia nitrogen telah dipilih dalam kajian ini. Pensampelan air dan pengawasan dilakukan oleh pihak NREB di empat stesen iaitu stesen N1, stesen N2, stesen N3 dan stesen N4 yang telah ditetapkan. Analisis kepekatan data telah dijalankan dengan menggunakan Microsoft Excel. Selain itu, kajian ini menggunakan WASP7 sebagai percubaan untuk menjalankan program simulasi kualiti air. Stesen N1 yang terletak di hulu Sungai Maong Kiri mencatatkan bacaan kepekatan ammonia nitrogen yang tertinggi. Bacaan kepekatan ammonia nitrogen terendah didapati berlaku di stesen N4 yang terletak di hilir Sungai Maong Kiri. Melalui kajian ini, didapati kualiti air di Sungai Maong Kiri adalah tercemar dengan ammonia nitrogen. Punca kehadiran ammonia nitrogen telah dikesan di dalam kajian ini iaitu aktiviti pertanian dan pembangunan yang pesat. Bacaan kepekatan ammonia nitrogen adalah lebih tinggi daripada bacaan piawai NWQSM untuk Kelas IIB. Bacaan piawai untuk kepekatan ammonia nitrogen di dalam air adalah 0.3 mg/l. Kepekatan ammonia nitrogen yang tinggi di dalam air adalah tidak bagus dan memberi kesan negatif kepada habitat sungai terutamanya dari segi kewujudan tumbuhan yang tidak diperlukan seperti alga.

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CHAPTER 1

INTRODUCTION

1.1 Preamble

Models are necessary to both describe and predict water quality conditions. Current modeling practice provides a rational, descriptive framework for the analysis of existing problems and provides limited predictive capability that cannot be achieved by simply monitoring or measuring water quality. Descriptive modeling is most important because it makes it possible to understand the cause- and-effect relationships that govern water quality in a river. Once cause- and- effect relationship are known, management alternatives can be explored and the result of any improvements and changes can be projected. The certainty of any projection depends upon how well the cause- and- effect relationships can be determined. By definition, river models are limited to approximate descriptions of cause and effect and if the utility of these methods is to be understood, these limitations must be understood. Descriptive modeling can be very useful for extrapolating monitoring data. The use of models to describe water quality conditions in river segments between dispersed

sampling locations or for extrapolation over periods between sampling times is superior to any crude linear extrapolation, any statistical analysis or any qualitative extrapolations. However, descriptive modeling to supplement monitoring has not been fully developed (McCutcheon, 1985).

There are many river water quality models that can be found and can be used in order to keep a good health for our lives. The water quality models are found useful depending on their different application in water resources problem solving, such as WASP, Infoworks River Simulation (RS) models, EPA QUAL, QUAL2E, MIKE II, and Soil and Water Management Model (SWMM).

1.2 Study Area

For the purpose of this study, the WASP7 model has been use as the river water quality model and chooses Sungai Maong as study area. This study is used to try the model as to build the water quality modeling. The ammoniacal nitrogen has been chosen as the parameter in order to check the status of water quality of the river.

1.3 Background of Sungai Maong

The state of Sarawak is the largest state of Malaysia with an area of 124 450 km². There are altogether 22 major river basins in Sarawak alone. One of the rivers that can be found in Sarawak is Sungai Maong which is located at the centre of the urban area (Kuching City). Sungai Maong flows through the south- western parts of Kuching City and confluence with the Sarawak River about 37 km from the river mouth. It is one of the tributaries of Sungai Sarawak and the largest sub- catchment draining the city into Sungai Sarawak. Sungai Maong consists of two tributaries, namely the Sungai Maong Kiri and Sungai Maong Kanan. The Maong Kiri River has a catchment area about 19.94 km² and the length of the river is 8.3 km which conference with 3rd Mile Bridge where the catchment area is 10.55 km². The Maong Kanan River has a catchment area about 19.05 km² and the length of the river is 7.5 km which conference with Batu Kawa Road Bridge where the catchment area is 12.20 km².

The area of Sungai Maong catchment (Figure 1.1) coverage is about 47 km² passing through the sub- urban Batu Tiga and Batu Kawa areas. The Maong River serves 51 subcatchments which have undeveloped land on the both sides of the river. There are approximately 73 000 people living along Maong River area. Maong River Kiri which at the eastern position of Maong River catchment which have 41 urbanised subcatchments. Figure 1.2 shows location of Sungai Maong and Table 1.1

shows the characteristics of Sungai Maong. The Sunagi Maong is located 37 km from the river mouth which is upstream of Kuching Barrage and located upstream of Sarawak River Barrage. It is influenced by the Barrage but not fully control depends on the operation of the gate. The operation of the gate systems have reduced the tidal flushing, thereby partly caused the deterioration of water quality. The situation is caused by the narrow fluctuation range of river water level and meandering nature of river.

Name of River	Catchment Areas (km ²)	Length of River (km)
Sungai Maong Kiri <ul style="list-style-type: none"> • At confluence • At Batu Tiga Bridge 	19.94 10.55	8.3
Sungai Maong Kanan <ul style="list-style-type: none"> • At confluence • At Batu Kawa Road Bridge 	19.05 12.20	7.5

Table 1.1: Characteristic of Sungai Maong

Source: Department of Irrigation & Drainage Sarawak

According to the Drainage and Irrigation Department contoured Topographical Plan, the major part of the Sungai Maong Catchment is low-lying and flat. The ground levels of the Sungai Maong are normally range from below 2.5 m LSD to 5.0 m LSD. At the north eastern and southern part of the catchment, there is a hilly terrain which the ground levels range from 7.5 m LSD to 20 m LSD.

The area along Sungai Maong Kiri is mainly residential and commercial establish such as houses, shop houses, school, mosque and etc. Sungai Maong Kanan is located at the western position of Sungai Maong catchment which has 9 subcatchments. The area along Sungai Maong Kanan is mainly residential which Desa Wira residential and undeveloped land except the Muda Jaya City Development at Batu Kawa. In the Muda Jaya City Development (MJC), there a lot of shop houses located in that area. This is because that area is the commercial area where a lot of business activities are being run. There are three main roads that across Sungai Maong Kanan which are Batu Kawa Road, Kung Phin Road and Semaba Road. In Sungai Maong Kanan, besides residential and commercial establish, there also many school that have been constructed at the area such as SMK Cung Hua. Most of the people in area of Sungai Maong are Malay and Iban.

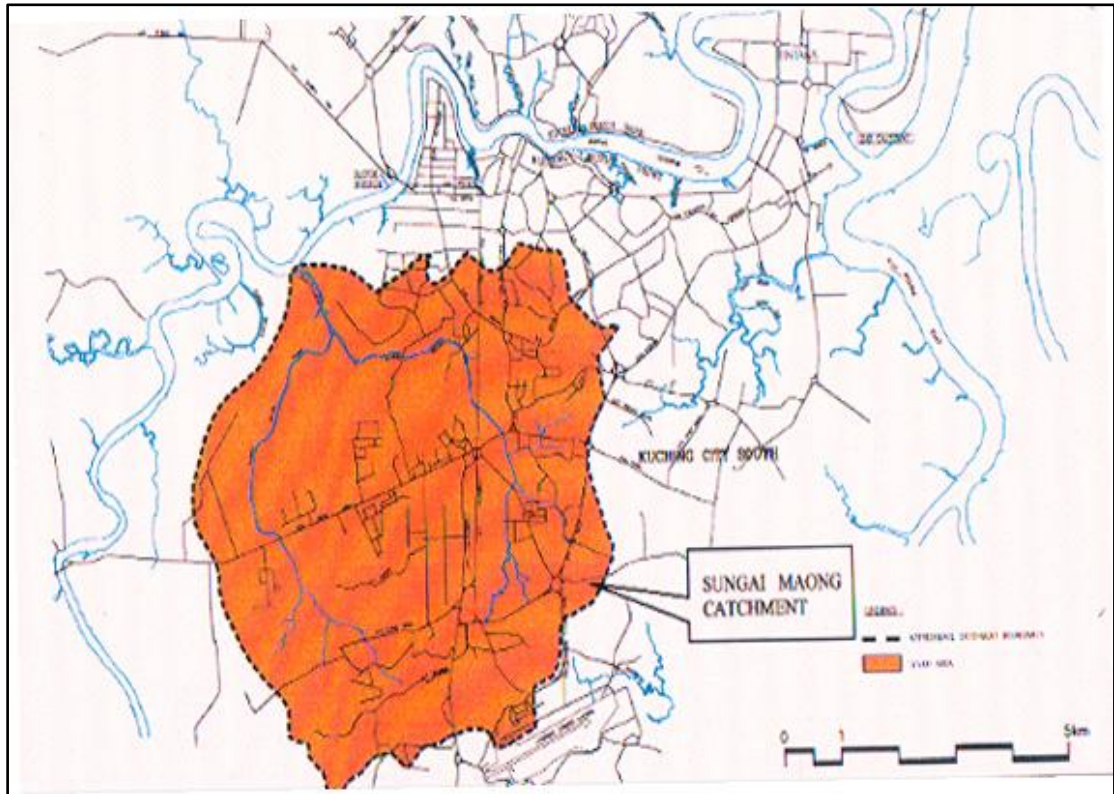


Figure 1.1: Catchment Map of Sungai Maong

Source: Department of Irrigation & Drainage Sarawak



Figure 1.2: Location of Sungai Maong

Source: Natural Resources and Environment Board

1.4 Problem Statement

The existing Sungai Maong is greatly affected by land use and activities of the area. Urbanization has been linked to the degradation of the urban waterways which has adverse impact on the quantity, quality and distribution of the Sarawak's water resources (Memon and Murtedza, 1999). Many problems occurred such as flash flooding, poor water quality and poor river aesthetics as the public perceives the Sungai Maong as a waste dumping conduit. It heavily polluted by organic matter. BOD levels and ammoniacal nitrogen concentrations are high and the oxygen conditions or levels are very poor. In addition, the river is highly polluted with faecal- derived coliform bacteria (NREB, 2002). The water quality of Sungai Maong is greatly affected by land use and activities of the area.

1.5 Objectives

1.5.1 General Objectives

The general objective was to study and to do trial of the water quality for the parameter of ammoniacal nitrogen of Sungai Maong by using the WASP7 software and the analysis by Microsoft Excel 2007. For that purpose, the analysis of water quality in Sungai Maong was built to provide information about what has happened, what is happening, and what might happen out there in the network along the river.

1.5.2 Specific Objectives

The objectives of this study are to study and determine the trend of the river water quality for the parameter of ammoniacal nitrogen and to analyze the water quality of Sungai Maong using the Microsoft Excel.