INTI INTERNATIONAL UNIVERSITY

Faculty of Engineering and Quantity Surveying

LOW FLOW ANALYSIS ON SEMENYIH RIVER

LIOW YUN HAU
B.Eng (Hons) in Civil Engineering

Project Supervisor
Mr.Munir Khan

Final Year Project

2018

SUPERVISOR'S DECLARATION

This project report entitled "Low Flow Analysis on Semenyih River" is prepared and submitted by Liow Yun Hau (i13003253) as partial fulfilment of the requirements for Bachelor of Engineering (HONS) in Civil Engineering, INTI International University.

APPROVED BY:

..... Date.....

Mr.Munir Khan

STUDENT'S DECLARATION

I, LIOW YUN HAU hereby declare that the art of the work that presented by this report entitled "Analysis of Low Flows in Semenyih River" is totally a record of my own independent work done and my own investigation udner the guidiance of my academic supervisor, Dr.Munir except as specified in the references. The reference that was used in this report was taken from the data and resources from journals and published data.

Signature : _____

Student Name : Liow Yun Hau

Student ID : 13003253

Date : 4/5/2018

ACKNOWLDGEMENT

I wish to sincerely acknowledge with gratitude the invaluable guidance, support and inspiration of my supervisor Dr.Munir throughout the entire stage 1 and stage 2 of this final year project.

I would like to take this opportunity to show my gratitude to the Department of Irrigation and Drainage Malaysia for providing the available data required for this study.

I also wish to acknowledge the support, both intellectually and morally, of my friends within the faculty of engineering.

ABSTRACT

Prediction of low flow of a river in magnitude as well as in frequency is necessary for the planning and design of water resource projects since low flow affects significantly in water supply, water quality and river periods of extreme hydrologic events. Semenyih River is chosen for this study. The objective of this study is to compare and identify the best fitted probability distribution used to carry out low flow analysis. The four probability distribution used in the study were Gumbel Distribution, Weibull distribution, Log-Pearson III distribution and Log-Normal distribution. The daily discharge data was collected from the Department of Irrigation and Drainage ranges from year 1975 to year 2014, 40 years of records. The Kolmogorov-Smirnov test and Chi-Squared test were used as the goodness of fit test to choose the best fit probability distribution. Flow Duration Curve method was used to compare with Q710. In overall, Log-pearson type 3 which has a statistical value of 0.08082 and Weibull distribution with 0.10713 are recommended in estimation of low flow discharges for all the rivers under study which can be used in water quality and quantity management.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Low Flow is a kind of flow, with a low base runoff condition to sustain low flow in river. Definition of low flow is given as "water flow in a stream during long period in dry weather". Many studies involve the statistic of flow design such the 7Q10 (lowest 7-day average flow that occurs on average once every 10 years) to define low flow for the purpose of setting permit discharge limits. The difference between low flow and drought is that low flow is a non-stop seasonal low-flow event that is not entirely a drought, low flow is a special phenomenon that occurs in dry season (Smakthtin, 1998). It is very important that the flow regime in any water bay. On the other hand, a drought is a period of dryness especially when prolonged in shortage of water. Some people might be mistaken that drought is actually the same thing as low flow but it's actually not.

1.2 Problem Statement

Throughout the years, tons of researchers have been trying to carry out on flood analysis and rainfall analysis to improve on how to prevent floods. However not many of the hydrologists hardly did any research on low flow & droughts analysis.0 Flood event is considered as a phenomenon that occurs more often if compared to droughts which can bring big impacts too. Low flow and drought analysis should be given extra more attention in order to improve water resources, drought management in the future. The world is currently going through rapid

economic development and population growth in order to achieve the goal in order to build a successful country by 2020. The reason Semenyih River is chosen is because of the high population and also it is one of the important water soruces to the resident. For example, September 22, 2010 in California, the Hoover Dam is drying out and is on the verge of shutting down due to low flow and drought. Since it is a hydroelectric dam, without water pressure, it is unable to generate electricity to supply for over 29 millions of people at the southwest area, which is a very severe matter. Secondly, no one has done low low analysis on Semenyih river. The analysis of low flow is conducted. In Malaysia, plantation of oil palm constructions which is causing people to gone through reduction in water flow throughout the years and slowly dying. Deforestation had made the situation worse, river streams are leaking lots of water especially during the dry periods. Not to mention that demands for water resources are decreasing due to great amount of human population. This is the reason why this research had been conducted in order to study more about low flow analysis that can greatly support the needs of water demands and drought events in the distant future.

1.3 Research Objective

1. To carry out low-flow frequency analysis with the 4 chosen probability distributions
2. To identify the most appropriate probability distribution for the basins under study
3. To determine the best fitted probability distribution to carry out low flow analysis in specific stations in the river catchments in Malaysia.

1.4 Scope of Study

The range of this research includes a Semenyih River Basin (Figure 1.1). It is stationed at the state of Selangor. Results will be gathered from the department of irrigation and drainage (DID). An utmost suited method shall be selected to run the low flow analysis in specific river station. Stream data used is from year 1979 to 2018.

Among all the methods of probability for analysing low flow analysis. Weibull distribution, Gumbel distribution, Log-Pearson type III distribution and Log-normal distribution shall be used. These 4 distributions shall be compared by using the software to carry out the goodness of fit test called (EasyFit). This software is able to choose the best probability distribution. Chi-square test and Kolmogorov-Smirnov test will be selected for comparison methods. These 2 tests are to find out and choose the best fit probability distribution among the probability distribution that has been proposed.

Figure 1. 1 Semenyih River Basin

1.5 Significant of Study

As mentioned from the problem statement, the reason this study is conducted is to be able to carry out methods for low flow analysis that can greatly support in improving water resources and drought management in the coming future. When facing natural disaster such as low flow, it can affect our business and economy and all the other living habitats.

Low flow investigations have been used since old times for hydrology research. Low flow index are used and are considered for the purpose of water management and enhancement. This will greatly provide a convenient desktop method to assess flow thresholds (Rich Pyrce, 2004).Using various good methods. This final year project will greatly help the environment and the people within the area to understand more about low flow.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In this chapter, the literature review for this research was being conducted. The definition and everything about low flow was be explained and stated out. Probability distributions and frequency analysis was be explained in detail as well.

2.1 Low Flow

Low flow is a natural occurrence which has a low sustaining flow whenever base runoff conditions happens in a river. It is related to the research of the minimal flow in a river stream or catchment area during the non-wet seasons of the year. The low-flow regime of a river can be described in other various ways. These characteristics consist of multiple uses in different kind of areas, a lot of related practice and common researches that has uncertainty often exist. The characteristic of low-flow is the most suitable for a certain purpose (Smakthtin, and Toulouse, 1998). Furthermore, the idea of this title is proposed is to grasped by researcher in certain degree of management of water and also engineers like planning of hydropower, allow allowable water transfers in and out. Besides, ecological research will also depends on low flow statistics. This is because low-flow conditions can affect and disturb the ecosystems that might create poor habitat and changes the biological responses as it will reduce populations of both aquatic and land species (Golladay and Miller, 1996)

Next, the important knowledge for low flow magnitude, direction and frequency is essential for water sustainability and design, storage design for reservoir, dam design maintenance and the quantity and quality of water for reservation, recreation and natural water reservation. Water supply and demands often has conflicts, this is why low-flow statistics are able to show the availability of water in streams. Thus, statistic of low-flow is required by the government and the local state of national and water agency supply normal activities and water quantity planning.(Kernell & Paul). The statistics and data can be proposed as base for setting up waste water-treatment plans and allowable waste loads to encounter quality water regulations. Statistic of low-flow is used for proper observation for low flow data that existed for low flow frequency. Furthermore, low flow can be used for commercial and factory purpose, and other factories to estimate the reliability of water for water supply, waste in and out, and also power generator (Eash, D.A.Barnes, K.K, 2012). Next, the insignificant amount of proper observation for low flow frequency analysis should be deployed in decision making because of the probability for environment impacts. A great environment value is associated with the activities for low flow and analysis for prediction of river and the long-term of droughts. Not to mention that serious droughts cases have severe consequences, they are often cost more compared to flood cases. Results caused by droughts cost up to USD 60 million occurred during the USA droughts, while Missisippi area occurs flood that cost around USD 18million to 28millions of financial cost (Demuth, 1974).

It is expected that the stream flows are essential towards low-flow timings when company needed to evaluate pollutant load allocations for '"National Pollution Discharge Elimination System" to provide permits for companies, lands, and other places with facilities that release treated wastewater into the open stream. Low flow frequency statistics are quite useful for determining the chances of water availability in water streams during critical low-flow season when conflicting demands for water, for example the demands of water supply versus ecosystem needs, are likely to exist. A pollutant allocation is the maximum capacity or loading quality of a waste, each source of point discharger is permitted to release them into a specific stream.