THE WATER FOOTPRINT ASSESSMENT OF WATER SUPPLY TREATMENT PROCESS (WSTP) – COMPARISON BETWEEN SEMAMBU, KUANTAN WSTP AND PERAMU, PEKAN WSTP

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SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Bachelor (Hons) of Civil Engineering.

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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LIST OF ABBREVIATIONS

ANN	Artificial Neural Network
CO_2	Carbon Dioxide
DO	Dissolved Oxygen
H_2S	Hydrogen Sulfide
LCA	Life Cycle Assessment
MLD	Million Litres per Day
NH_3	Ammonia
PAIP	Pengurusan Air Pahang
PIs	Performance Indicators
TP	Total Phosphorus
TSS	Total Suspended Solid
UMP	Universiti Malaysia Pahang
WF	Water Footprint
WFA	Water Footprint Assessment
WHO	World Health Organization
WQI	Water Quality Index
WSTP	Water Supply Treatment Process

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ABSTRACT

The competition of water needs is increasing as the numbers of population increases as well as the increase demand of clear water, and the effect of climate change. This phenomenal will induce water scarcity if no precautions are taken. Thus, the sustainability of our water resources is in jeopardy. An application of Life Cycle Assessment (LCA) has long been used to determine water sustainability. However, this application is limited to the impact of the products to the environment. In this study, Water Footprint (WF) approach was utilized to determine the sustainability of our water supply. The objectives of this study are to determine WF at Semambu, Kuantan Water Supply Treatment Process and Peramu, Pekan Water Supply Treatment Process (WSTP). Besides that, this study also to investigate the effect of population, land use and monsoonal changes to the WF accounting for both WSTP. Another than that, this finding also to compare the efficiency of different types of WSTP in terms of WF. The last but not least, is to predict the WF for both WSTP from year 2016 until 2020 by using Artificial Neural Network (ANN) which is an artificial intelligence application so that the effective ways can be taken to ensure the sustainability of water at the end of findings.

ABSTRAK

Serangan permintaan air semakin meningkat apabila kenaikan penduduk dan permintaan air yang semakin meningkat adalah jelas, dan akibat dari kesan perubahan iklim. Ini akan menggalakkan kekurangan air yang luar biasa jika tiada langkah berjaga-jaga diambil. Oleh itu, kelestarian sumber air dunia kita sejak kebelakangan ini dalam bahaya. Permohonan Penilaian Kitar Hayat (LCA) telah lama digunakan untuk menentukan kemampanan air. Walau bagaimanapun, permohonan ini adalah terhad kepada kesan produk kepada alam sekitar. Dalam kajian ini, pendekatan Jejak Air (WF) telah digunakan untuk menentukan kemampanan bekalan air kita. Objektif kajian ini adalah untuk menentukan WF di Semambu, Kuantan Proses Rawatan Air dan Peramu, Pekan Proses Rawatan Bekalan Air (WSTP). Di samping itu, kajian ini juga untuk mengkaji kesan penduduk, tujuan penggunaan tanah dan perubahan kepada monsoon yang perlu diambil kira dalam perakaunan WF untuk kedua-dua WSTP. Selain daripada itu, dapatan ini juga untuk membandingkan kecekapan WSTP WF. Yang terakhir tetapi tidak kurang pentingnya, adalah untuk meramalkan WF untuk kedua-dua WSTP dari 2016 sehingga tahun 2020 dengan menggunakan Rangkaian Neural Buatan (ANN), yang merupakan aplikasi kepintaran buatan dengan cara yang berkesan boleh diambil untuk memastikan kemampanan air pada akhir penemuan itu.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

As move on towards a new modernization and millennium era in this world today, the competition of water needs is increasing along with the increasing of the technologies. Nowadays, the increasing of demand over the clean water resources lately which will be aggravated in the future and even today the competition of the freshwater needs is one of the issue that need to be concern about. This problem might due to the growing numbers of population, economic growth, increasing of water demand for agricultural products uses, and meat and sugar based products also (Ercin et al., 2011).

The main problem faced globally that related to water that covers about 71% of the Earth's surface is water scarcity. Water scarcity can happen when a large number of individual or community in an area are water insecure which is an individual does not have access to safe and affordable water to satisfy his or her needs for their daily use for a certain period of time. Gleick (2002) explored that a relationship between water availability and human population on a national scale which is water availability per capita per year that water use has been increasing more than twice than the rate of population growth. This water shortage issue may effect to the water that treated at water treatment process since total amount of water for each stages of water treatment process can be defined as Water Footprint (WF).

1.2 PROBLEM STATEMENT

Previously, Life Cycle Assessment (LCA) has been conducted to assess water supply sustainability. However, LCA only assess the impact of pollution to the environment but does not cover the amount of water utilization and / or consumption during the whole process. Thus, if does not visualize the amount of water that has been wasted for the amount of water that has been wasted for each processes. An accounting of these wasted water is needed to be managed as Water Footprint Assessment (WFA). The WFA can visualize all the amount of wasted water for each processes by its different types that can be assess at Water Supply Treatment Process (WSTP) which are blue WF, green WF, and grey WF.

1.3 RESEARCH OBJECTIVES

The focus of this study is the Water Footprint (WF) assessment that accounting for two Water Supply Treatment Process (WSTP) in Pahang and also the prediction for WF for future WF. This study embarks on the following objectives:

1. To determine WF at Semambu, Kuantan Water Supply Treatment Process and Peramu, Pekan Water Supply Treatment Process.
2. To investigate the effect of population, land use and monsoonal changes to the Water Footprint accounting for both Water Supply Treatment Process (WSTP).
3. To compare the efficiency of different types of WSTP in terms of Water Footprint (WF).
4. To predict the WF for both WSTP from year 2016 until 2020 by using Artificial Neural Network (ANN) – an artificial intelligence application.

1.4 SCOPE OF STUDY

The study is to evaluate WF for different types of water supply treatment process. In order to compare the efficiency of different types of water treatment process in terms of Water Footprint Assessment (WFA), this study has need to investigate the

effect of seasonal changes of Water Supply Treatment Plant (WSTP) at the research area that need to consider the effect of the WF by population, land use, and monsoonal changes. This study also is conducted to predict the WF for both WSTP for five years' prediction from year 2016 until 2020 by using Artificial Neural Network (ANN) which is an artificial intelligence application.

1.5 SIGNIFICANCE OF STUDY

In this study, amount of freshwater involves in the process of producing clean water to be supplied will be able to visualize by using Water Footprint Assessment (WFA). WFA is a four-phase process that includes quantifies and maps green, blue, and gray Water Footprint which to assess the sustainability, efficiency, and equitability of water use and also to identifies which strategic actions should be prioritized in order to get a footprint sustainable. Besides that, manage the uses of water resources in the effective, and specific ways especially to the local authorities. This research is useful for the prediction of water resources quantity and also to ensure the sustainability of water usage for future generation.

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