

UNIVERSITI TEKNOLOGI MARA

**SEASONAL VARIATION OF
PHYSICO-CHEMICAL
PARAMETERS
IN UPSTREAM RIVERS OF
TIMAH TASOH LAKE, PERLIS**

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ABSTRACT

Increasing anthropogenic activities have led to increase heavy metal contamination level in upstream rivers of Timah Tasoh Lake, Perlis. At present, very few studies were reported on the level of heavy metals contamination in this area. Therefore, a study on seasonal variation of physico-chemical parameters was conducted to investigate the effect of season on the level and distribution pattern of these heavy metals. The surface water sample was taken at eleven sampling stations which cover three main regions which are Padang Besar, Wang Kelian and Timah Tasoh in North of Perlis. Samples were analysed using Inductively Coupled Plasma Mass Spectrometry (ICP-MS) for heavy metals such as Lead (Pb), Copper (Cu), Zinc (Zn), Lithium (Li), Chromium (Cr), Cadmium (Cd), Nickel (Ni), Cobalt (Co), Arsenic (As), Aluminium (Al) and Manganese (Mn). Overall, the water from all sampling stations was within the acceptable limit except for Cd (>1ppb), Al (>56 ppb), Mn (>100 ppb) in the dry and the wet season which have recorded elevated concentration above the Interim National Water Quality Standard (INWQS) limit set by the Department of Environmental (DOE) Malaysia. The thematic map generated by integrating Geographical Information System (GIS) with heavy metals data has illustrated the distribution pattern of these metals during seasonal changes. The dataset of physico-chemical obtained were subjected to Principal Component Analysis (PCA) and Multiple Linear Regression (MLR). PCA score plot showed that the heavy metals spread homogeneously indicating no differences in their distribution in both seasons. The presence of heavy metals in upstream rivers has high potential to increase heavy metal loading to the Timah Tasoh Lake. MLR analysis was produced model equations in predicting the influence of heavy metals in surface water towards Dissolved Oxygen (DO), Total Dissolved Solid (TDS), Salinity (S) and Electrical Conductivity (EC) as water quality parameters. The coefficient determination (R^2) value was in the range of 0.75-0.81 (dry season) 0.75-0.88 (wet season) suggesting that concentration of the heavy metals are correlated to the changed of water quality parameters. The results demonstrated that the application of multivariate and GIS mapping techniques were successfully elaborate the level of heavy metals contamination in upstream rivers of the Timah Tasoh Lake, Perlis.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY

Environmental pollution is one of the major problems throughout the world. The introduction of different harmful pollutants such as heavy metals, organic pollutants into the environment, whether into the air or soil, has made the environment detrimental to live in. Inland Water which is the most important resource in human life will also be affected by those pollutants. According to Section 2 of the Environment Quality Act 1974, 'inland waters' mean: Any reservoir, pond, lake, river, stream, canal, drain, spring or well, or any part of the sea above the low water line along the coast, or any other bodies of natural or artificial surface or subsurface water [1].

The addition of numerous kinds of pollutants and nutrients through sewage, industrial effluents, and agricultural runoff into the water bodies has brought a series of changes in the physico-chemical and characteristic of water [2-5]. Direct exposure of this contamination into surface waters with metals, as a consequence from mining, smelting and industrial manufacturing discharged, is a long standing phenomenon [6]. Furthermore, with the application of organic manures, fungicides and pesticide, the soil has received repeated amount of a high concentration of heavy metals. At the same time, without being noticed their concentrations have increased in runoff during rainfall water picks up small amount of gases, ions, dust, and particulate matter from the atmosphere [7, 8].

Due to this exposure, surface waters are subjected to direct deposits from the atmosphere, runoffs, erosion of the geology, and anthropogenic activities [9, 10]. Rivers and streams play a major role in the transportation and distribution of materials of all kinds originated, eroded and/or deposited at different levels along their course. These deposits and exchanges affect the quality of the water and may be unsafe for aquatic life and human use [11].