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Assessment of the Klang river quality using the water quality indices

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Abstract. The Klang river basin is located within the state of Selangor and Kuala Lumpur, Malaysia. The Klang River drains an area of 1,288 km2 from the steep mountain rain forests of the main Central Range along Peninsular Malaysia to the river mouth in Port Klang, covering a distance of 120 km. It originates from the northern part of Selangor, drains the Klang Valley, and finally discharges itself into the Straits of Malacca. The pollution discharges for various locations along the river basin was obtained from the Water Quality and GIS group. The pollutants can come from point sources (PS) such as industrial wastewater, municipal sewers, wet market, sand mining and landfill. Pollutants can also come from non-point sources (NPS) such as agricultural or urban runoff, and commercial activity such as forestry, and construction due to rainfall event. Mathematical–computational modeling of river water quality is possible but requires an extensive validation. Besides it requires previous knowledge of hydraulics and hydrodynamics. To overcome these difficulties, a water quality index (WQI) was developed. The water quality index (WQI) is a mathematical instrument used to transform large quantities of water quality data into a single number. The purpose of this research is to classify the upstream and downstream of the Klang main river based on WQI value.

Introduction

Clean, abundant water provides the basis for agriculture, industry, commerce and transportation, energy production and recreation [1]. Over the past several decades, humans concerned with the environment have embraced the notion that one of the most important indicators of the health of natural resources is the quality of the water. It follows that when the quality of rivers, lakes, streams, ponds and wetlands is improved and protected, there will be more healthy lands, wildlife, air and overall environment [2].

Water quality is generally ascertained based on physical, chemical, and biological indicators, using indicators such as pH, electrical conductivity (EC), etc. based on guidelines provided by agencies such as the World Health Organization (WHO) (1984). However, quality is a vague term that cannot easily be described using a crisp data set; e.g. good quality water cannot simply be described as having a pH value of 7.0 or above. Instead, it makes sense to consider water quality data to be a fuzzy set, which provides the mathematical foundation to express the term quality in a linguistic way, e.g. very poor, poor, decent, good, and very good [3].

Several reports on river water quality assessment using physico–chemical and biological parameters have been published elsewhere [4]. Different water quality parameters are expressed in different units. For example temperature is expressed in degree Celsius, coliforms in numbers and most chemicals in milligram per liter, etc. In other words different parameters occur in different ranges are expressed in different units, and have behavior in terms of concentration–impact relationship. Before an index can be formulated, these parameters have to be transformed into a single scale usually beginning with zero and ending at 1. Some index scales have the range 0–100.

Computer models are used extensively for water-quality management of rivers and streams. These models must typically be calibrated by adjusting a large number of parameters to attain optimal agreement between model output and field measurements [5]. Mathematical or computational