Geochemical Assessment of Heavy Metals Concentration in Surface Sediment of West Port, Malaysia

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Abstract—One year (November 2009-October 2010) sediment monitoring was used to evaluate pollution status, concentration and distribution of heavy metals (As, Cu, Cd, Cr, Hg, Ni, Pb and Zn) in West Port of Malaysia. Sediment sample were collected from nine stations every four months. Geo-accumulation factor and Pollution Load Index (PLI) were estimated to better understand the pollution level in study area. The heavy metal concentration (Mg/g dry weight) were ranged from 20.2 to 162 for As, 7.4 to 27.6 for Cu, 0.244 to 3.53 for Cd, 11.5 to 61.5 for Cr, 0.11 to 0.400 for Hg, 7.2 to 22.2 for Ni, 22.3 to 80 for Pb and 23 to 98.3 for Zn. In general, concentration some metals (As, Cd, Hg and Pb) was higher than background values that are considered as serious concern for aquatic life and the human health.

Keywords—Heavy metals, Sediment Quality, geo-accumulation index, Pollution Load Index

I. INTRODUCTION

Life is widely influenced by type of pollutants thus many researcher have focused on assessing contamination to understand source, concentration, distribution and effects in environment especially in the estuarine and coastal water [1] [2]. Heavy metals from lithogenic and anthropogenic sources extensively enter into marine environment; their concentration and distribution are affected by sedimentary structure, mineralogical compound, hydrodynamic transports, industrial discharges, effluents and shipping activities [1] [3] [4]. Adsorption, biological-uptake and accumulation are three mechanisms that cause an important variation of heavy metals concentration in sediment [1] [5].

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Information of concentration and distribution of heavy metals are useful to distinguish the source of contaminates in the marine environment [1] [6] [7]. Heavy metals contamination is a great worldwide problem and it can directly and indirectly cause adverse effects on aquatic life and the human population because of their bioaccumulation and toxicity during long period [3] [4] [8]. Moreover, it is a serious threat for different marine ecosystems like coral reef, mangrove and sea-grass also increase the human health risk specially for the human population that depend on fishery sources [1]. Several chemical and physical parameters of marine sediment have been frequently applied as environmental indicator to monitor contamination sources and their effects because sediment have high ability to accumulate contaminates in long term to comparison with water [3] [8]. There are many methods to assess sediment quality such as background enrichment index, contamination indexes and risk assessment indexes. Only a few are practical for coastal and estuarine environment like enrichment factor and geo-accumulation index [9] [10]. Hence, the main objectives of present research are: (1) to estimate heavy metals concentration (Al, As, Cd, Cr, Cu, Co, Fe, Hg, Mn, Ni, Pb, Zn) and their relate geochemical index to evaluate the status of contamination level. (2) To prepare a distribution pattern of heavy metals to distinguish vulnerable stations. West Port is the main international ports in west of Malaysia coastal water. It is surrounded by mangrove forest where is known as ecological and biological hot spots in marine environment. The live of people who live around West Port to some extent depend on fishery, tourism and other related activities. Therefore shipping activities and industrial discharges may severely cause adverse effect on marine organisms and human life. There is limit information about heavy metals in West Port. This information just include some trace metals such as copper, zinc, lead and cobalt thus geochemical assessment is essential in order to estimate heavy metals concentration and distribution, contamination degree and protect living organisms.

II. MATERIAL AND METHODS

A. Study area

West Port is the busiest port of the Malaysia with 22 berths. This port is well developed along mangrove forest and Klang strait. In this research study area is restricted as narrow strait between mangrove forest and coastline, nine stations were selected from three transects parallel to the coastline with three