

UNIVERSITI TEKNOLOGI MARA

**ASSESSMENT OF ARSENIC, HEAVY
METALS AND NATURAL
RADIONUCLIDES IN ESTUARIES
OF SUNGAI LANGAT, SELANGOR**

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ABSTRACT

Human and aquatic lives are affected by water pollution. This global issue which has also taken place in Sungai Langat, Selangor that covers two estuaries of Area A and Area B. The activities of agricultural, housing, industrial and domestic sewage are the possibility sources released pollutants into water of Area A while the activities of shipping, housing and industrial are the possibility sources that contribute pollutants into the river water of Area B. The present study focused on elements of heavy metals (Mn, Cr, Ni, Cd, Hg, Cu and Zn), As, U, Th and natural radionuclides (^{226}Ra , ^{228}Ra and ^{40}K). Twenty five sampling points of Area A were taken for the water samples while twelve sampling points for the Area B. The concentration of heavy metals in water samples were measured using Inductively Coupled Plasma Mass Spectrometer (ICP-MS) which the concentration trend is $\text{Cu} > \text{Mn} > \text{As} > \text{Cr} > \text{Zn} > \text{Ni} > \text{Cd} > \text{Hg}$ in Area A while for water of Area B, the concentration trend is $\text{Cu} > \text{Hg} > \text{Mn} > \text{As} > \text{Zn} > \text{Cr} > \text{Ni} > \text{Cd}$. From the concentration of heavy metals, the value of Enrichment Factor (EF), Contamination Factor (CF) and Pollution Load Index (PLI) were obtained to determine the status of water pollution. For Principal Component Analysis (PCA), elements of heavy metals, arsenic, U and Th are related to each other. For the activity concentration of ^{226}Ra , ^{228}Ra and ^{40}K in water samples, gamma spectrometry was used. The activity concentrations of ^{40}K are higher in water for both areas than ^{226}Ra and ^{228}Ra in Area A and Area B. For radiological assessment, the value of radium equivalent, absorbed dose rate, hazard index and annual effective dose in water of Area A and Area B are below the maximum limit.

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CHAPTER ONE

INTRODUCTION

1.1 Research Background

River water around the world has variety purposes either to the human or aquatic life. Therefore, it is very important to ensure the river ecosystem is in the best condition. However the elevated concentration of pollutants in the surface water tends to affect human health as well as disturb the natural value of the river system and aquatic populations (Nor et al., 2015). Furthermore, the pollutant in the river system will flow from upstream area to the downstream area via estuary. Estuary acts as a place for wildlife animals and aquatic organisms. The impact of water pollution can be seen clearly in an estuarine and surrounding coastal area rather than in an open ocean (Ip et al., 2007; Mazlin et al., 2009).

The Sungai Langat, Selangor is located at west coast of Peninsular Malaysia. The river flows into south and north directions at Segenting. The south direction of river water flows through Kampung Kelanang area while the north direction of river water flows through Telok Gong and Pulau Lumut (Lim et al., 2012; Mazlin et al., 2009). Pollutants from upstream area flow into the Straits of Malacca mainly through Kampung Kelanang area while on top of upstream pollutant the Telok Gong area also contribute to the pollutants of the river since the area is intensively with housing area and port activities. Population of Selangor is depends on the river for their water supply as well as for the activities of agricultural and manufacturing (Lim et al., 2013).

Among the pollutants in these estuaries are heavy metals and radionuclides. The present of elevated concentration of heavy metals and radionuclides in water, biota and sediment are considered as pollutants to the environment. Since the water pollution due to the anthropogenic activities is a dynamic process, continuous study to determine the level of contamination from heavy metals and radionuclides in the water is important to be carried out especially in estuaries of Sungai Langat.