

SARI

Sungai Motui melalui 4 satuan geologi di sepanjang alirannya, yaitu Satuan Batugamping, Satuan Batulanau-Batupasir, Satuan Peridotit, dan Satuan Aluvial. Dari sisi antropogenik, aktivitas pertambangan nikel dan industri pemurnian logam serta keberadaan PLTU memberi pengaruh signifikan terhadap penurunan kualitas lingkungan akuatik khususnya pada bagian tengah dan hilir sungai. Untuk memahami tingkat kontaminasi, kemungkinan sumber utama dan sebaran spasial logam berat pada sedimen sungai Motui, dilakukan pengambilan sampel sedimen di 27 titik dari hulu ke hilir aliran utama serta beberapa aliran cabang. Analisis geokimia sedimen menggunakan *Inductively Coupled Plasma-Atomic Emission Spectroscopy* (ICP-AES). Penilaian tingkat kontaminasi menggunakan Indeks Geoakumulasi (Igeo). Identifikasi sumber utama logam berat menggunakan analisis statistik multivariat seperti *Pearson Correlation Matrix* (PCM), *Hierarchical Cluster Analysis* (HCA), *Principal Component Analysis* (PCA) dan *Factor Analysis-Multiple Linear Regression* (FA-MLR). Selanjutnya untuk memahami sebaran spasial logam berat digunakan metode Domaining, Semivariogram dan Kriging. Indeks geoakumulasi menunjukkan tingkat pencemaran untuk Al dan Fe tergolong Tidak Tercemar. Mg, Zn, dan Ni tergolong Tidak Tercemar - Tercemar Sedang. Mn, Co, Cr, dan Ti tergolong Tercemar Sedang. Pb, Cu, dan Sb tergolong Tercemar Sedang - Tercemar Tinggi. Cd tergolong Tercemar Tinggi, sedangkan As tergolong Tercemar sangat Tinggi. Berdasarkan hasil dari PCM, HCA, dan PCA, 14 parameter logam berat terbagi menjadi 3 kelompok utama yang masing-masing merepresentasikan sumber dan faktor pengontrol tertentu, yaitu proses peleburan logam dan PLTU, limbah tambang, serta pelapukan alami. Dari 14 parameter unsur logam berat, 9 unsur (Ni, Cr, As, Sb, Fe, Zn, Al, Co, dan Mn) memperlihatkan kenaikan konsentrasi signifikan pada area-area tertentu seperti pada area limpasan pertambangan nikel dan area PLTU sebelum mencapai hilir sungai. Sedangkan 5 unsur lainnya (Mg, Ti, Cu, Pb, dan Cd) memperlihatkan pola peningkatan konsentrasi yang cenderung bertahap dan teratur menuju hilir sungai Motui.

Kata Kunci : Sungai Motui, logam berat, indeks geoakumulasi, statistik, kriging

ABSTRACT

The Motui River flows through four geological units along its course, namely the Limestone Unit, the Sandstone - Silstone Unit, the Peridotite Unit, and the Alluvial Unit. Based on field observations, the presence of nickel mining, metal refining industries, and coal-fired power plants has a significant impact on the decline in aquatic environmental quality, particularly in the middle and downstream. To assess the level of contamination, the possible main sources, and the spatial distribution of heavy metals in the Motui River sediments, sediment samples were collected at 27 points from the upstream to downstream of the main stream and several tributaries. Sediment geochemical analysis was conducted using Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES). The level of contamination was assessed using the Geoaccumulation Index (Igeo). The possible main sources of heavy metals were identified using multivariate statistical analysis such as Pearson Correlation Matrix (PCM), Hierarchical Cluster Analysis (HCA), Principal Component Analysis (PCA), and Factor Analysis-Multiple Linear Regression (FA-MLR). Furthermore, to understand the spatial distribution of heavy metals, the Domaining, Semivariogram, and Kriging methods were used. The geoaccumulation index shows that the contamination levels for Al and Fe are classified as Uncontaminated. Mg, Zn, and Ni are classified as Uncontaminated - Moderately Contaminated. Mn, Co, Cr, and Ti are classified as Moderately Contaminated. Pb, Cu, and Sb are classified as Moderately Contaminated - Highly Contaminated. Cd is classified as Highly Contaminated, while As is classified as Very Highly Contaminated. Based on the results of PCM, HCA, and PCA, the 14 heavy metal parameters are divided into three main groups, each representing specific sources and controlling factors, which are metal smelting and coal-fired power plants, mining waste, and natural weathering. Among the 14 heavy metal parameters, 9 elements (Ni, Cr, As, Sb, Fe, Zn, Al, Co, and Mn) showed a significant increase in concentration in certain areas, such as nickel mining runoff areas and power plant areas before reaching the downstream. While the other 5 elements (Mg, Ti, Cu, Pb, and Cd) showed a pattern of gradual and regular increase in concentration towards the downstream.

Keywords : Motui River, heavy metal, geoaccumulation index, statistic, kriging.