

Karakteristik Endapan Aluvial Kuarter Sungai Ciliwung: Analisis Distribusi Ukuran Butir, Geomorfologi, Geokimia, dan Indikasi Aktivitas Antropogenik = Characteristics of Quaternary Alluvial Deposits of the Ciliwung River: Analysis of Grain Size Distribution, Geomorphology, Geochemistry, and the Indication of Anthropogenic Activities

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Abstrak

Sungai Ciliwung yang melintasi wilayah Jabodetabek menghadapi pencemaran akibat aktivitas antropogenik dan proses geologi. Penelitian ini menganalisis karakteristik fisik endapan aluvial Kuarter serta kandungan logam berat (Pb, Cu, Cd) di tiga segmen sungai, yaitu hulu (Bogor), tengah (Depok), dan hilir (Jakarta Utara), dengan sembilan sampel sedimen. Analisis kandungan logam berat dilakukan menggunakan metode Atomic Absorption Spectrophotometry (AAS), sedangkan analisis ukuran butir dan geomorfologi dilakukan menggunakan metode granulometri dan interpretasi morfologi tapak sungai. Hasil menunjukkan bahwa distribusi logam berat dipengaruhi oleh variasi ukuran butir dan dinamika geomorfologi sungai. Ukuran butir halus mendominasi wilayah tengah (Depok) dan hilir (Jakarta), terutama pada fitur point bar, sedangkan sedimen kasar banyak ditemukan di hulu (Bogor) dan mid-channel bar. Akumulasi logam berat tertinggi berada pada fitur cutbank. Pb cenderung terakumulasi pada sedimen halus, Cu memiliki pola yang bervariasi, dan Cd tidak terdeteksi dalam sampel. Aktivitas manusia berkontribusi terhadap akumulasi kontaminan di sedimen, dibuktikan melalui analisis menggunakan Sediment Quality Guidelines dan Biological Effect Range Criteria. Hasilnya, kontaminasi Pb meningkat dari hulu ke hilir, sementara Cu bervariasi namun cenderung tinggi di hilir akibat urbanisasi dan industrialisasi. Temuan ini penting untuk pengelolaan sungai yang berkelanjutan serta memahami pengaruh ukuran butir dan geomorfologi terhadap konsentrasi logam berat.

.....The Ciliwung River, which flows through the Greater Jakarta area (Jabodetabek), is experiencing pollution driven by anthropogenic activities and geological processes. This study examines the physical characteristics of Quaternary alluvial deposits and the concentrations of heavy metals (Pb, Cu, Cd) across three river segments—upstream (Bogor), midstream (Depok), and downstream (North Jakarta)—using nine sediment samples. Heavy metals were analyzed using Atomic Absorption Spectrophotometry (AAS), while grain size and geomorphology were assessed through granulometric analysis and interpretation of river landforms. Results show that heavy metal distribution is influenced by grain size variations and fluvial geomorphology. Fine sediments dominate the midstream and downstream areas, particularly in point bars, whereas coarse sediments are prevalent upstream and in mid-channel bars. The highest heavy metal accumulation was found in cutbank features, with Pb accumulating in fine sediments, Cu displaying variable patterns, and Cd remaining undetected. Human activity contributes to contaminant buildup, as supported by Sediment Quality Guidelines and Biological Effect Range Criteria. Pb contamination increases downstream, while Cu levels vary but are generally higher in urbanized downstream areas. These findings highlight the importance of grain size and geomorphology in controlling heavy metal concentrations and provide insights for sustainable river management.