Heavy metal pollution assessment in sediments from Kilindini-Port Reitz creek system, Kenya

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Kilindini-Port Reitz creek ecosystem controls intense maritime activities from Mombasa port and receives large amount of effluents from industrial activities within the city of Mombasa and around the creek system, leading to pollution by toxic chemicals such as heavy metals. Therefore, a study was conducted at six sampling stations to investigate the concentrations of eleven metals (As, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, V, and Zn) in surface sediments from Kilindini-Port Reitz creek system in order to assess their quantity, distribution, contamination levels, anthropogenic impacts, ecological risks and speciation of sediment components as well as their sources. ICP-MS was used to analyze the concentration of metals and the results were ranked in descending order as follows: Fe > Mn > Zn > V > Cr > Pb > Ni > Cu > Co > As > Cd. Sediment ecological risk assessment was summarized as; metal > LAL < ERL. CF and PLI values categorized the sediments as polluted, whereas Igeo values indicated unpolluted sediments. Calculated EF values showed that there was evidence of anthropogenic impact on metal pollution. Strong correlations among metal concentration values showed that ten metals (As, Co, Cr, Cu, Fe, Mn, Ni, Pb, V, and Zn) except, Cd, may be originating from common sources, which include industrial effluents, maritime traffic, oil transportation and urban effluents from Mombasa city. Cd appears to be originating from different, most likely fluvial sources. Larger portions of metals were bound to the residual fraction, F4 (75%), followed by F1 (9%), with F2=F3 (8%), suggesting that sediments were still safe from heavy metal bioavailability, however, the situation might worsen in future if Kilindini-Port Reitz creek ecosystem controls intense maritime activities from Mombasa port and receives large amount of effluents from industrial activities within the city of Mombasa and around the creek system, leading to pollution by toxic chemicals such as heavy metals. Therefore, a study was conducted at six sampling stations to investigate the concentrations of eleven metals (As, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, V, and Zn) in surface sediments from Kilindini-Port Reitz creek system in order to assess their quantity, distribution, contamination levels, anthropogenic impacts, ecological risks and speciation of sediment components as well as their sources. ICP-MS was used to analyze the concentration of metals and the results were ranked in descending order as follows: Fe > Mn > Zn > V > Cr > Pb > Ni > Cu > Co > As > Cd. Sediment ecological risk assessment was summarized as; metal > LAL < ERL. CF and PLI values categorized the sediments as polluted, whereas Igeo values indicated unpolluted sediments. Calculated EF values showed that there was evidence of anthropogenic impact on metal pollution. Strong correlations among metal concentration values showed that ten metals (As, Co,
Cr, Cu, Fe, Mn, Ni, Pb, V, and Zn) except Cd, may be originating from common sources, which include industrial effluents, maritime traffic, oil transportation and urban effluents from Mombasa city. Cd appears to be originating from different, most likely fluvial sources. Larger portions of metals were bound to the residual fraction, F4 (75%), followed by F1 (9%), with F2=F3 (8%), suggesting that sediments were still safe from heavy metal bioavailability, however, the situation might worsen in future if not managed given that there is evidence of the presence of bioavailable metals in the system.