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Assessement of heavy metals in urban aerosol samples in Sebele, Botswana

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Bush fires and dust in the dry winter months establish moderately high background levels of aerosols. Emissions into the atmosphere by copper mines, coal mines, and vehicular emissions are all possible sources of air pollution with heavy metals. Although there has been assessment and monitoring of heavy metals and their air pollution in other countries such as Brazil, Europe, and America, there is little documentation about the concentration of heavy metals in aerosols in Botswana. A total of 63 Aerosol samples were collected at the Botswana College of Agriculture and were analyzed for concentrations of Al, Co, Cu, Fe, Pb, Mn, Ni, and Zn infiltrate using a Flame Atomic Absorption Spectrometer (Varian SpectrAA 220 FS). Statistical receptor models were applied to investigate potential sources of the studied metals. Data exhibits enhanced enrichments of Zn (EFg=76), Al (EFg=14391), Co (EFg=19), Cu (EFg=5), Pb (EFg=3) and Ni (EFg=2), which was attributed to contributions from non-crustal sources, whereas Mn and Fe (EFg < 2) were attributed to crustal origin, such as airborne dust. Data were subjected to factor analysis (FA) twice. From FA-1, two Principal Components (PC) were revealed. PC-1 showed high positive loadings of Pb, Zn, Ni, and Al, whereas PC-2 had loadings for Fe and Mn. On the other hand, FA-2 had three principal components. PC-1 from FA-2 showed strong loadings for Cu, Fe, and Mn. FA-2 had strong loadings of Pb, Al, and Zn, whereas loadings for PC-3 were comprised of Ni and Co. The difference between loadings of FA-1 and FA-2 suggested possibilities of mixed origins of the studied metals. Finally, air mass back-trajectory analysis showed that during the sampling period, there were only 5 cluster groups that represented significantly different transport pathways of aerosol samples, where only Zn and Ni mean concentrations revealed a dependence on the geographical origin of aerosol samples. Results of the analyzed concentrations of Al, Co, Cu, Fe, Pb, Mn, Ni and Zn in aerosol samples showed that the presence of Fe and Mn in the atmosphere in the ambient air of Sebele is mainly due to contributions from lithogenic sources. Pb, Ni, Co, Al, and Zn exist because of anthropogenic sources, whereas, Cu, exist because

of mixed origins. Trajectory analysis further shows that the anthropogenic Zn and Ni could also be present in the air sampled due to air mass transportation from distant sources.

Biography

Sello A Likuku has completed his PhD at the age of 38 years from University of Edinburgh, Scotland and his Research Fellowship in 2016, under the Matsumae International Foundation from the University of Tsukuba, Japan. He is curretly acting Head of Department (Department of Basic Sciences) at the Botswana University of Agriculture and Natural Resources and also serving as an Editor of the Botswana Journal of Agriculture and Applied Sciences. He has published 12 papers in vrarious journals.

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