620/E2

Study of the heavy metal distribution in the Gampaha district using moss (*Barbula* sp1) as a bioindicator

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The main objective of this study was to monitor the atmospheric distribution of the heavy metals; cadmium (Cd), chromium (Cr) and lead (Pb) in the Gampaha district. The measurement of atmospheric heavy metal concentrations was performed using moss **(***Barbula* sp1**)** as the bioindicator which has been identified only to the genus level and which has a wide distribution within the study area. Samples were collected from 102 sampling sites scattered throughout the Gampaha district, during a relatively dry period from February to April 2009. Background samples were collected from Sinharaja, which is about 100 km away from the study area. After thermal processing and acid digestion, the moss samples were analyzed for the selected heavy metals using the atomic absorption spectrometer (AAS). Using the concentration data from each site, contour maps were constructed using a software package (Surfer 8, Golden Software Inc. USA). Locations of possible emission sources and monsoon wind patterns were incorporated to the contour map to examine any correlations (Fig. 1). Elements Cd and Cr suggested long range distribution by wind, while Cr suggested high localization around the emission sources. Cd concentrations were extremely high near Katunayake, Biyagama, Makola areas whereas Cr and Pb concentrations were markedly high in Biyagama and Makola areas.

The effect of washing the moss samples thoroughly with water was monitored separately. The thoroughly washed moss samples showed a statistically significant decrease in heavy metal amounts at the 99 % confidence level. Hence unwashed samples collected during a fairly dry period were used in this study. The 102 sampling sites chosen were broken to four clusters using cluster analysis taking Cd, Cr and Pb concentrations as variables. According to the positions of the cluster centers, the four clusters of sampling sites were graded. Giriulla and Biyagama were shown as outliers, which suggest that these sites should be marked as "extremely non-polluted" and "extremely polluted" respectively, with respect to the distribution of the above heavy metals, which agrees with the concentration data and the locations of the possible emission sources.

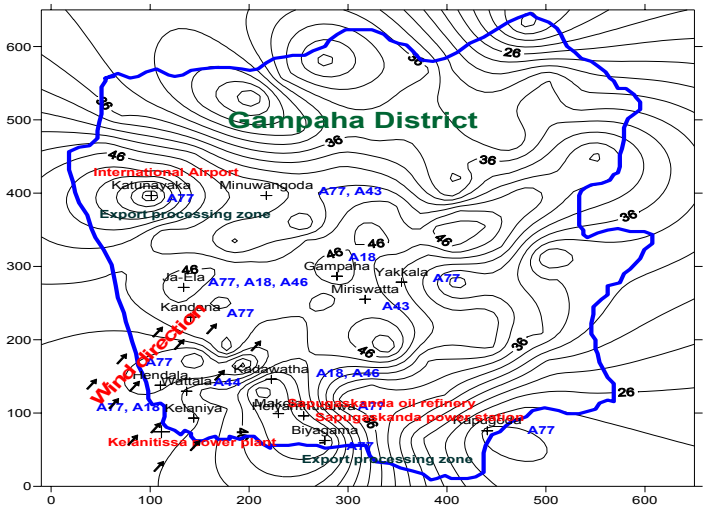

Fig. 1: Distribution of atmospheric cadmium in the Gampaha district

A18 - Industries involved in manufacturing or reconditioning of batteries
A43 - Industries involved in surface treatment of metal or plastic including electroplating, galvanizing and powder coating industries
A44- Iron & steel mills
A46- Non-ferrous metal processing industries including secondary process, smelting and recovery metals
A77- Industrial estates approved under the part IVC of the National environment act including Katunayake and Biyagama Export processing Zones

X and Y axes are marked in distance map units.

Keywords: Heavy metals, bioindicators, moss