

## ABSTRACT

Elemental analysis of sewage effluents in Kibabii sewage treatment system was done by NEX-CG Energy-Dispersive X-Ray Fluorescence (EDXRF) spectrometer at University of Nairobi with the aim of assessing the efficacy of the treatment system. This was occasioned by the fact that sewage effluents from the system are released into River Kibabii after treatment hence need to assess the efficacy of the treatment system through elemental analysis. Sediments were collected from the lagoons using a rake whose prongs were reinforced with a wire mesh of approximate area  $5\text{mm}^2$  in order to trap the sediments, a spatula, for scooping into the air-tight bottles. The sediments were dried in the oven at a temperature of  $70^\circ\text{C}$  until completely dry. The sediments were crushed to fine powder ( $< 60\mu\text{m}$ ) in a dry mortar using a pestle. Pellets were made using a die (25mm diameter) for analysis using NEX- CG spectrometer. Concentrations of lead (Pb), mercury (Hg), cadmium (Cd) and arsenic (As) were measured based on clay soil 'standards' in concentration range for Pb, Hg and As as 12.7ppm, 14.3ppm and 8.83ppm respectively for certification. Cadmium was not detected in the certified reference material. The concentration for Hg, Pb, and As in the sewage sediments were  $10.65\pm 2.28\text{ppm}$ ,  $8.86\pm 2.92\text{ppm}$  and  $3.41\pm 2.18\text{ppm}$  respectively in lagoon A. In lagoon B the levels were  $3.82\pm 0.56\text{ppm}$  for Hg,  $6.35\pm 1.50\text{ppm}$  for Pb and  $1.67\pm 0.53\text{ppm}$  for As. Lagoon C showed a reduction in the levels with  $3.74\pm 1.39\text{ppm}$  for Hg and  $2.30\pm 0.27\text{ppm}$  for Pb. As was not detected in lagoon C, on the other hand, Cd was not detected in all the lagoons. There was no detection of Hg, Pb, As and Cd in the liquid samples collected from all the lagoons and the sediments from lagoon D. Principal component analysis utilized two principal components (PCs) with PC1 and PC2 accounting for 64.8% and 33.3% variation respectively, together explaining 98.1% variation in the concentration levels of heavy metals as treatment takes place in the lagoons. Samples from lagoon A and B were clustered along PC1 suggesting similarity in their matrix composition.  $R^2$  regression analysis revealed  $R^2 = 0.34$  for Hg and  $R^2 = 0.26$  for Pb and indication of a commendable level of treatment for heavy elements in the sewage treatment system. The efficacies in the treatment varied from 30.34% - 51.78%, 37.63% - 65.41% and 76.63% - 84.81% for lagoon A, B and C respectively. The study was aimed at heavy metal concentration analysis for efficacy of Kibabii University Sewage treatment system. The study was successful in quantifying the heavy elements in the lagoons from which the efficacy in the treatment process was determined, an indicator of good treatment process by the system. From the study, continuous monitoring of the concentration levels of the heavy metals in the sewage effluents should be done regularly in order to counter the toxicity levels. Furthermore, the government should ensure compliance with environmental standards pertaining sewage treatment through enforcement of regulations governing environmental safety and standards.