Sediment Quality Monitoring of the Ravensbourne River

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Introduction: Sediment plays an important role in water quality due to its ability to sequester and transport contaminants. The need to monitor sediment in order to achieve good water status as required by the Water Framework Directive is now widely accepted. A major challenge in sediment monitoring for trace metal contamination is the inconsistency in sediment sampling and sediment extraction techniques. The Ravensbourne catchment is a largely understudied tributary of the Thames, most especially with respect to sediment quality. Anthropogenic activities have significantly enriched the concentration of heavy metal in the bed and bank sediment since 1st century BC.

Methods: Sediment samples were collected from the bed, bank and suspended using different sampling techniques from the month of January 2011 – December 2011. The sediment samples were oven dried at 105^{0}C for a minimum of 24hrs, and dry sieved into the <63µm and 63µm-2mm fraction. Two different digestion techniques (the HF/$HClO_3$/HNO_3 and the aqua regia -HNO_3:3HCl) were used to extract the total heavy metal concentration from the bed, bank and suspended sediment. Metal speciation was also carried out using two extraction techniques – the Maiz *et al*. (1997) and the Tessier *et al.* (1979) sequential extraction techniques.

Results: The results for the total metal extraction for selected heavy metals – Cd, Cu, Ni, Pb and Zn using aqua regia showed variation with sediment compartments. The highest metal concentration was associated with the <63µm fraction. The total heavy metal concentration follows the order: Cd<Ni<Cu<Pb<Zn. The results for the two different sequential extraction methods gave different heavy metal speciation. The Maiz *et al.* (1997) result indicated that >80% of each heavy metal was associated with the residual phase, and does not affects water quality or endanger aquatic life. The Tessier *et al.* (1979) indicated that significant percentage of each element was associated with the Fe/Mn and the exchangeable phase. These phases (exchangeable and Fe/Mn) retains potentially bioavailable heavy metals that are can be harmful to benthic and aquatic organisms at high concentration. The importance of these differences in sediment sampling and sediment extraction techniques in sediment quality monitoring is investigated.

References: . Maiz, I., Esnaola, M. V. & Millan, E. 1997. Evaluation of Heavy Metal Availability in Contaminated Soils by a Short Sequential Extraction Procedure. *Science of The Total Environment,* 206**,** 107-115.

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