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The distribution of heavy metals in the Lower River Basin, Lebanon

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Abstract

The distributions of heavy metals were measured in the bed sediments of the Lower Litani River Basin (LLRB). The main objectives of this study were to identify possible sources of metals (i.e. geological and/or anthropogenic) and then to investigate the effect of the seasonal variations in content of metals in the bed sediments. The heavy metal concentrations in the river sediments were remarkably high according to the permissible limits. The metal contents in bed sediment were highest during dry seasons. This was accomplished by applying the correlation coefficient analysis applied to total heavy metal contents as a tool for studying metal pollution in the LLRB and their origins. It was useful to distinguish between anthropogenic and natural sources.

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Keyword: LLRB, heavy metals, sediment,seasons

1. Introduction:

Heavy metals are among the most common environmental pollutants, and their occurrence in water and sediments indicates the presence of natural or anthropogenic sources. The main natural sources of metals in waters are chemical weathering of minerals in rocks and soil leaching. The anthropogenic sources are

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associated mainly with industrial and domestic effluents, urbanism, water runoff, landfills sources and inputs rural areas [1] ,[2] ,[3].

The Litani River Basin (LRB) is the largest in Lebanon, of the country summing up to 2088 km^2; hence 20% of the total area of the Lebanese territory with a river system serving for irrigating some 77,000ha of current, ongoing and proposed schemes, as well as for tourism and domestic water. The basin encompasses a variety of climates ranging from costal subtropical to dry continental.

Studies have shown no evidence of possible climatic evolution related climate change so far. From the environmental dimension, the LRB ecosystem suffers actually from severe stress both on its surface and underground water. Studies concur to conclude that quality of the Litani water system is on the borderline of being unusable and there is still room to reverse the pollution effects [4].

The LLRB extends from Qelia village, after the Qaraoun Lake, down to the Qasmieh outlet at the Mediterranean Sea north to Tyre. It encompasses eight district or administrative caza (Bekaa West, Marjeyoun, Nabatiyyeh, Saida, sour, Jezzine, Hasbaya, Bent Jbail; Figure 1) hosting a population of 132924 capita living in 104 communities [5]

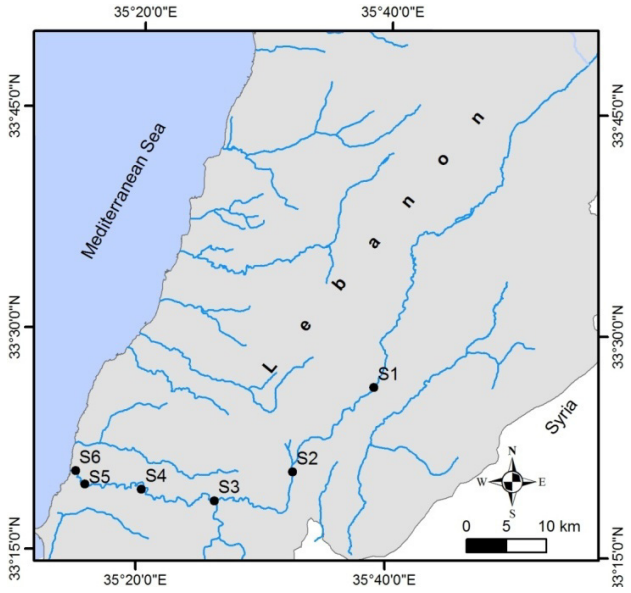

Figure 1: The study area, and the selected sites, of the Lower Litani River Basin (LLRB).

The aim of the current study is to investigate the variations in heavy metal concentrations including, Iron (Fe), Cadmium (Cd), zinc (Zn), Plomb (Pb), Nickel (Ni) and Chrome (Cr), in surface water and bed sediments in LLRB in Lebanon. Furthermore, the role of pollution sources in the LLRBL on the bed sediment and the relationship with the season.

2. Materials and methods

2.1. The study area

For bed sediments sampling, six sampling sites were selected along the LLRB, as shown in Table 1, which describe the major activities. This was done during the rainy and dry seasons.These sites were selected because they receive considerable amounts of waste water from the surrounding industrial areas, as well as from intensively cultivated agricultural areas and domestic wastes from the surrounding towns and villages.