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Heavy Metals Assessment in an Urban Artificial Lake in Chennai, India

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Extended Abstract

Chennai, the fourth-largest urban agglomeration in India, faces several water-related risks [1]. Water for human consumption is scarce out of the monsoon season. Wetlands and rivers are commonly polluted because of the frequent uncontrolled discharge of untreated sewage and industrial wastewater. Furthermore, garbage dumping adds another source of pollution to many urban lakes, threatening its biodiversity [2]. Many tanks (artificial lakes) were constructed in Chennai in former times to store rain water during the monsoon season that was used for irrigation during the dry season. The tanks were usually made by damming intermittent streams using crescent-shaped earthen bunds in a cascade down the axes of shallow inland valleys. However, tanks were abandoned and consequently degraded when they became exclusively ornamental due to the shift to groundwater as a source for water provision [3]. Little is known about pollution in the tanks of Chennai, particularly heavy metals. Thus, this study focuses on analysing heavy metal pollution in one of the urban tanks of the city, the Sembakkam Lake, and evaluate their potential effects on the ecosystem.

During four sampling campaigns in 2019, pH, and conductivity were measured in situ in the water, and samples of water, and sediment were collected to measure Al, As, Cr, Cu, Fe, Mn, Ni, Pb, and Zn with an inductively coupled plasma optical emission spectrometer (ICP-OES). The results indicated that the average pHs in the four campaigns were in the range of neutral-alkaline (7.9-8.5) and conductivities were relatively high (1560-2860 µS/cm). Regarding heavy metals in water, there is a risk for aquatic life, since some Pb measurements are classified as class IV by the United Nations Economic Commission for Europe, i.e. above the midpoint between natural and chronically toxic levels and excursions beyond chronic criteria. As other elements, Pb is known to bioaccumulate in organisms and cause toxic effects. Cu and Cr were in the range of class II, indicating below the midpoint between natural and chronically toxic levels. In sediment, concentrations of Ni were above the effects range-median (ERM), a probable-effects range within which effects would frequently occur. Cr and Cu were between effects range-low (ERL) and ERM, a possible-effects range within which effects would occasionally occur. Untreated sewage and wastes in the lake could be attributed to these values. Therefore, proper management of sewage and waste is necessary to diminish the potentially deleterious effects of metals on aquatic life.

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