World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Spatial Variability of Soil Metal Contamination to Detect Cancer Risk Zones in Coimbatore Region of India

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Abstract : Anthropogenic modification of the urban environment has largely increased in the recent years in order to sustain the growing human population. Intense industrial activity, permanent and high traffic on the roads, a developed subterranean infrastructure network, land use patterns are just some specific characteristics. Every day, the urban environment is polluted by more or less toxic emissions, organic or metals wastes discharged from specific activities such as industrial, commercial, municipal. When these eventually deposit into the soil, the physical and chemical properties of the surrounding soil is changed, transforming it into a human exposure indicator. Metals are non-degradable and occur cumulative in soil due to regular deposits are a result of permanent human activity. Due to this, metals are a contaminant factor for soil when persistent over a long period of time and a possible danger for inhabitant's health on prolonged exposure. Metals accumulated in contaminated soil may be transferred to humans directly, by inhaling the dust raised from top soil, or by ingesting, or by dermal contact and indirectly, through plants and animals grown on contaminated soil and used for food. Some metals, like Cu, Mn, Zn, are beneficial for human's health and represent a danger only if their concentration is above permissible levels, but other metals, like Pb, As, Cd, Hg, are toxic even at trace level causing gastrointestinal and lung cancers. In urban areas, metals can be emitted from a wide variety of sources like industrial, residential, commercial activities. Our study interrogates the spatial distribution of heavy metals in soil in relation to their permissible levels and their association with the health risk to the urban population in Coimbatore, India. Coimbatore region is a high cancer risk zone and case records of gastro intestinal and respiratory cancer patients were collected from hospitals and geocoded in ArcGIS10.1. The data of patients pertaining to the urban limits were retained and checked for their diseases history based on their diagnosis and treatment. A disease map of cancer was prepared to show the disease distribution. It has been observed that in our study area Cr, Pb, As, Fe and Mg exceeded their permissible levels in the soil. Using spatial overlay analysis a relationship between environmental exposure to these potentially toxic elements in soil and cancer distribution in Coimbatore district was established to show areas of cancer risk. Through this, our study throws light on the impact of prolonged exposure to soil contamination in soil in the urban zones, thereby exploring the possibility to detect cancer risk zones and to create awareness among the exposed groups on cancer risk.

Keywords : soil contamination, cancer risk, spatial analysis, India
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020