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A regional approach to the environmental risk assessment - human health risk assessment case study in the Campania region

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Environmental quality is fundamental for the wellbeing of human life. Environmental risk assessment and analysis have a crucial role in the evaluation of human health risk, especially in intensive urbanized and industrialized areas, such as the Campania region (Italy). In Italy, after the Legislative Decree 152/2006, the environmental risk assessment has become mandatory for contaminated lands such as brownfields sites.

For the purposes of the present study 3535 topsoil samples were collected across the whole regional territory. The concentrations of 53 elements has been determined by aqua regia extraction followed by a combination of ICP-MS and ICP-AES methods.

A new approach to assess/rank environmental risk was applied by using geospatial analysis in a GIS platform to adapt a European-wide accepted methodology for the preliminary assessment of human health risks at single contaminated sites to a regional scale.

The methodology chosen for the risk assessment procedures is the PRA.MS (Preliminary risk assessment model for the identification of problem areas for soil contamination in Europe). Following the PRA.MS guidelines, a conceptual model for the human health risk assessment in the Campania region has been based on four different exposure routes: 1) dispersion of contaminants in groundwater, 2) dispersion in surface water, 3) dispersion in air, 4) direct contact with the contaminated media (soil). The source, pathway and receptor for each exposure route is scored fusing a quantitative or qualitative analysis of some characteristic features (parameters).

A total of 14 representative parameters were chosen, based on the available regional data for Campania. Starting from the values of these parameters, the information is aggregated to higher levels in several steps, adopting a mixed additive and multiplicative algorithm, up to the overall risk score. The final risk map is classified into four risk classes. This map is useful for identifying high risk areas, where monitoring and more detailed analysis has to be carried out.

Keywords: *Campania, geochemistry, soil, environmental risk, human health, GIS*

1. Introduction

In this paper a methodology for assessing the human health risk, based on spatial analysis, is presented. An existing European-wide methodology for the preliminary assessment of human health risk at single contaminated sites (PRA.MS, EEA, 2004) is adapted to evaluate the risk at the regional level, by using geospatial analysis in GIS environment. The starting point is the systematic collection of topsoil samples in the Campania Region, an intensely populated and industrialized area in Southern Italy, and the determination of potentially hazardous elements.

1.1 State of the art of soil policies

Soil is a complex mixture of mineral nutrients, organic matter, water, air, and living organisms and its function is to sustain biological productivity, maintain environmental quality, and support

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