



## **Use of quality indicators for long-term evaluation of heavy metals content in soils of an agro-ecological protected wetland: L'Albufera de Valencia Natural Park, Valencia, Spain**

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Due to the social, economical and environmental importance of agro-ecological wetlands, strategies for periodical evaluation of their environmental quality should be developed, particularly in those areas where a mixture of land uses are supporting the survival of wildlife and migrant species as is the case of most Mediterranean coastal wetlands.

The aim of this work is to develop a strategy for a long-term assessment of the environmental quality of soils in a rice-wetland: L'Albufera Natural Park, Spain, in the surroundings of the metropolitan area of Valencia. The area was officially declared as Natural Park in 1986, integrating both the traditional irrigation system and the ecological importance derived from being a Mediterranean Wetland that is now transformed to a large extent in a rice-wetland allowing the presence of a large variety of migrant species.

The methodology consisted in the monitoring of 20 sites distributed in 5 sectors in and around the natural park of potentially contrasting anthropogenic pressure and land use. Soil samples collection were instrumented in two campaigns. The first one was in 1989 (three years after the official declaration as Natural Park of the wetland), and the second 19 years later in 2008. Seven heavy metals (Cd, Co, Cr, Cu, Ni, Pb and Zn) were analyzed to determine its total and extractable fractions by treatment with EDTA. Atomic Absorption Spectrometry, using graphite furnace when necessary, was used for the determination of metals.

To evaluate the quality of soils at each sampling date four indicators were obtained, namely, Contamination Factor (CF), Geoaccumulation Index (Igeo), Pollution Load Index (PLI) and Potential Ecological Risk Index (PERI). Results obtained with quality indicators were further compared to obtain temporal and spatial trends using Geographical Information systems procedures.

In general, there is a reduction of metal contents in the study area in both dates. The trend of metals according to average concentration (mg/kg) in 1989 and 2008 were Zn (60.38) > Pb (47.50) > Ni (29.10) > Cu (25.82) > Cr (16.04) > Co (11.40) > Cd (0.50) and Zn (68.82) > Cr (48.12) > Cu (34.93) > Pb (24.60) > Ni (22.49) > Co (6.58) > Cd (0.42), respectively. Average increments were found in Zn, Cr and Cu, which are related with high point (individual location and/or sector) values rather than a general trend in the area.

With regard to soil quality, in general heavy metals loads are smaller in 2008 than in 1989, reflected by the low degree obtained with PERI. Nonetheless both Igeo and CF indicate that in 2008 Cd and Cr had still some degree of moderate contamination, and PLI highlight that the area where heavy metal presence were more relevant was the northern which is very close to the city of Valencia.

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