



## **Detection and spatial distribution of multiple-contaminants in agro-ecological Mediterranean wetlands (Marjal de Pego-Oliva, Spain)**

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Socio economic activities are more and more producing amounts (in quantity and quality) of non desirable chemical substances (contaminants) that can be found in open air environments. As many of these products persist and may also circulate among environmental compartments, the cumulative incidence of such multiple contaminants combination may be a cause of treat that should not exists taking only in consideration concentrations of each contaminant individually because the number and the type of compounds are not known, as well as their cumulative and interaction effects. Thus prior to any further work analyzing the environmental risk of multiple contaminants their identification and level of concentration is required.

In this work the potential presence of multiple contaminants of anthropogenic origin in a protected agro-ecological Mediterranean wetland is studied: the Pego-Oliva Marsh Natural Park (Valencian Community, Spain), which is characterized by a long history of human pressures, such as marsh transformation for agricultural uses.

Two major groups of relevant pollutants have been targeted according o two distinct environmental matrices: seven heavy metals in soils (Cd, Co, Cr, Cu, Ni, Pb and Zn) and fourteen emerging contaminants /drugs of abuse in surface waters of the natural lagoon, rivers and artificial irrigation networks (6-ACMOR, AMP, BECG, COC, ECGME, HER, KET, MAMP, MDA, MDMA, MET, MOR, THC, THC-COOH). The wetland was divided in nine representative zones with different types of land cover and land use. For soils, 24 samples were collected and for waters 33 taking in consideration the spatial representativeness of the above mention nine environments. Spatial analysis applying Geographical Information Systems to determine areas with greater incidence of both types of contaminants were also performed.

With regard to heavy metals, Zn showed values under the detection limits in all samples, the remainder metals appeared in concentrations surpassing the WHO and EU limits for drinking waters, and all except Pb exceed the limits established for irrigation waters. For drugs of abuse 3,4-Methylenedioxymethamphetamine, ketamine, morphine, benzoylecgonine, cocaine, methadone, 6-acetylmorphine and nor-9-carboxy-tetrahydro-cannabinol were detected. The mean concentrations were 0.62, 21.33, 1.30, 1.92, 2.25, 0.32, 0.04 and 0.07 ng l, respectively. Almost all samples had at least one substance.

In the natural park a spatial trend in the number of contaminants and concentrations can be identified. Such pattern is more evident when analyzing heavy metals in soils. The presence of multiple contaminants is greater in agriculture fields devoted to citrus farming with decreasing intensities for rice fields and natural areas. Connectivity between urban, agriculture and natural lands produced by water flows may be part of the processes that introduce contaminants in the marsh land.

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