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Detection of Anthropogenic pressures on western Mediterranean irrigation systems (La Albufera de Valencia agriculture system, eastern Spain)

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Irrigation systems are considered as one of the major landscapes features in western Mediterranean environments. Both socio-economic and cultural elements are interrelated in their development and preservation. Generally, due to their location in flat lands and close to major urban-industrial zones, irrigation lands are suffering of intense pressures that can alter their agricultural values, environmental quality and, consequently, the sustainability of the systems.

To understand the nature of anthropogenic pressures on large Mediterranean water agricultural systems a methodology based on environmental forensics criteria has been developed and applied to La Albufera Natural Park in Valencia (Eastern Spain), a protected area where traditional irrigation systems exists since Muslim times (from 8th to 15th centuries). The study analysed impacts on water and soils, for the first case the fate of emerging contaminants of urban origin (pharmaceuticals and illegal drugs) are analysed. Impact on soils is analysed using the dynamics urban expansion and the loss and fragmentation of soils. The study focused is organised around two major procedures: (1) analysis of 16 water samples to identify the presence of 14 illicit drugs and 17 pharmaceutical compounds by Liquid Chromatography-Mass Spectrometry techniques; (2) spatial analysis with Geographical Information Systems (GIS) integrating different sources and data formats such as water analysis, social, location of sewage water treatment plan and the synchronic comparison of two soil sealing layers -for the years 1991 and 2010.

Results show that there is a clear trend in the introduction of pharmaceutical in the irrigation water through previous use of urban consumption and, in many cases, for receiving the effluents of wastewaters treatment plants. Impacts on soils are also important incidence in the fragmentation and disappearance of agricultural land due to soil sealing, even within the protected area of the Natural Park. In consequence, effort will have to be put to avoid the interconnection of urban and irrigation waters through sewage and irrigation networks and to prevent or minimize the enlargement of build-up areas.

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