Assessment of restoration measures efficiency for soil contamination in Mediterranean Ecosystem. The case study of Guadiamar Green Corridor in the context of RECARE project

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Restoration of soil ecosystems contaminated by heavy metals requires their characterization and the assessment of measures for risk reduction. Particular soil traits and history define different levels of resilience, so soil contamination assessment needs to take into account a site-by-site approach, which considers both the particular environmental characteristics of soils and the human activities. Nevertheless, current approaches for soil contamination assessment developed as academy and market solutions continue to be rather qualitative, and they do not allow as far the selection of efficient remediation measures to solve soil contamination at the long-term and extensively over larger áreas.

In this context, under the framework of RECARE (Preventing and Remediating degradation of Soils in Europe through Land Care) project, we are designing a Decision Support System (DSS) which automatically assess soil contamination values by heavy metals in the topsoil and evaluate the efficiency of soil remediation measures under scenarios of climate and land-use change. The DSS works by simulating the spatio-temporal efficiency of three widely applied remediation measures (compost, sugar beet lime and iron-rich clayey materials). Input variables are divided into: (I) climate variables (mainly precipitation and temperature), (II) site variables (elevation, slope and erodibility), (III) soil (heavy metal content, pH, sand/clay content, soil organic carbon and bulk density), (IV) land use and (V) remediation measures. The predictor variables are related to soil functions expressed by % of change of heavy metal content (Currently the DSS consider cadmium dynamics due to the worldwide distribution in agricultural system and toxicity impact on health and plants), soil carbon and erosion dynamics.

The pilot study area is the Guadiamar valley (SW Spain) where the main threat is soil contamination, after a mine spill occurred on April 1998. Since that time, a huge soil databse of more than 30 Gbytes, has been produced by different stakeholders (administration, scientist and private sector), which covered the spatial-temporal evolution of soil contamination by specific soil remediation measures, so the affected area has become the "virtual lab" to develop and test the DSS. Further development of the DSS tool includes its validation/calibration in other European climate zones, such as Copsa Mica in Romania, and the inclusion of new input and output variables to improve the accurancy of results.