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What is the place for soils in scenario-based ecosystem services approaches? A systematic review

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Prospective studies and scenario-based approaches are pivotal to support land planning, agricultural and environmental management. The integration of soils within such approaches have recently developed significantly, alongside the increasing attention given to soil-related ecosystem services (ES). Such interest is explained by the urgent need to assess how soil ecosystem services and their related threats (ST) (e.g. soil erosion, soil biodiversity loss, soil contamination, soil sealing) may evolve in response to potential changes in climate, production systems or land management. This generally involves describing the dynamics of soil changes over time as a function of different driving forces (e.g., climate change, public policies), but also assessing variations in space considering soil characteristics.

A group of researchers participating in the SERENA project of the EJP Soil program conducted a

meta-analysis to study the methods used in existing prospective studies focusing on six soil ES (e.g. biomass production, habitat for biodiversity, hydrological control, environmental pollution control, greenhouse gas and climate regulation, pest and disease control) and ten ST (e.g. soil erosion, soil organic carbon loss, nutrient imbalance, soil acidification, soil contamination, waterlogging, soil compaction, soil sealing, salinization, loss of diversity). Approximately 150 scientific articles referenced in Scopus and the Web of Science were selected in order to analyze how soil properties are considered in scenario-based approaches for ES and ST mapping and assessment.

The objective of this study is to show the results of this review which involved multiple researchers at the European level in order to highlight how soils are accounted for in ES and ST assessment and mapping exercises through scenario-based approaches. More particularly, the aims of the review are to: i) understand what main drivers are used in scenarization approaches (e.g. land use changes, climate change) and how the scenarios are developed; ii) what are the main soil properties and the associated metrics used to assess and map soil ES and ST, and; iii) what methodological approaches are currently chosen to assess ES and ST changes across time and space.

The outcomes of such an analysis would help highlighting the state of the art of soil ES and ST research at the European level and, therefore, establish milestones to guide future trajectories in the field.

This might support and encourage the harmonization of practices at the European level in ES-related studies and in scenarization practices, in order to create operational and homogeneous tools and frameworks to support the development of pertinent strategies and land-planning policies, with a specific focus on agricultural lands.

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