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Soil priorities in the European Union

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ABSTRACT

Soils provide crucial ecosystem services such as the provision of food, carbon sequestration and water purification. Soil is the largest terrestrial pool of carbon, hosts more than 25% of all biodiversity and provides 95–99% of food to 8 billion people. The European Union (EU) puts the concept of healthy soils at the core of the European Green Deal to achieve climate neutrality, zero pollution, sustainable food provision and a resilient environment.

Given the European Union's objective to become the first climate neutral continent by 2050, the European Commission adopted a series of communications for a greener Europe. In 2020, an ambitious package of measures were presented within the Biodiversity 2030, Farm to Fork and Chemicals Strategies, as well as the Circular Economy Action Plan and the European Climate Law, which included actions to protect soils (Montanarella and Panagos, 2021). In 2021, these were followed by the Fit for 55 package, the Zero Pollution Action Plan and the EU Soil Strategy for 2030. All these policies include provisions relevant to soils to achieve the ambitious objectives of the EU Green Deal.

1. Soil condition in EU

A large proportion of EU soils is currently subject to unsustainable management practices, jeopardizing the soil health of the Union. The report proposing a Horizon Europe mission on soil health and food "Caring for soil is caring for life"(European Commission, Directorate-General for Research and Innovation, 2020) highlighted that 60–70% of EU soils are in an unhealthy condition.

As examples of soil degradation in the EU, we estimated that 13% of soils suffer from high erosion with on-site costs of 1.25 billion Euro due to yearly losses in agricultural productivity (Panagos et al., 2018). Every year, mineral soils lose 7.4 million tonnes of carbon due to non-sustainable management (Lugato et al., 2014). According to the Court of Auditors report (ECA, 2018), 25% of land in Southern and Eastern Europe is at high risk of desertification. Land take and soil sealing continue, predominantly at the expense of agricultural land, with annual net land take estimated at 440 km^2/year in the period 2012–2018 (EEA, 2020). As for local contamination, in a larger area which includes EU countries plus 12 neighbouring ones (EEA39), JRC reported around 2.8 million potentially contaminated sites (Payá Pérez and Rodríguez Eugenio, 2018).

Land degradation is clearly a transboundary issue affecting climate change, food security and well-being of millions of citizens. Therefore, this challenge should be faced with solutions at EU scale taking into account regional conditions.

2. EU Soil Strategy for 2030

The EU Soil Strategy for 2030 contributes to the objectives of the EU Green Deal and is part of the Biodiversity Strategy. The new strategy updates the 2006 EU Soil Thematic Strategy (Panagos and Montanarella, 2018) and intends to address land degradation in a comprehensive way. The ambitious vision of the Strategy is to have all EU soil ecosystems in a healthy condition by 2050. The Strategy proposes specific actions in relation to climate change mitigation, circular economy, biodiversity, desertification, soil restoration, soil monitoring, and citizen engagement to enable the transition to healthy soils.

The Strategy considers proposing legally binding objectives in the context of the Nature Restoration Law to limit the drainage of wetlands and restore drained peatlands, as well as measures to enhance biodiversity in agricultural land that would contribute to conserving and increasing soil organic carbon. Additionally, the Commission would join

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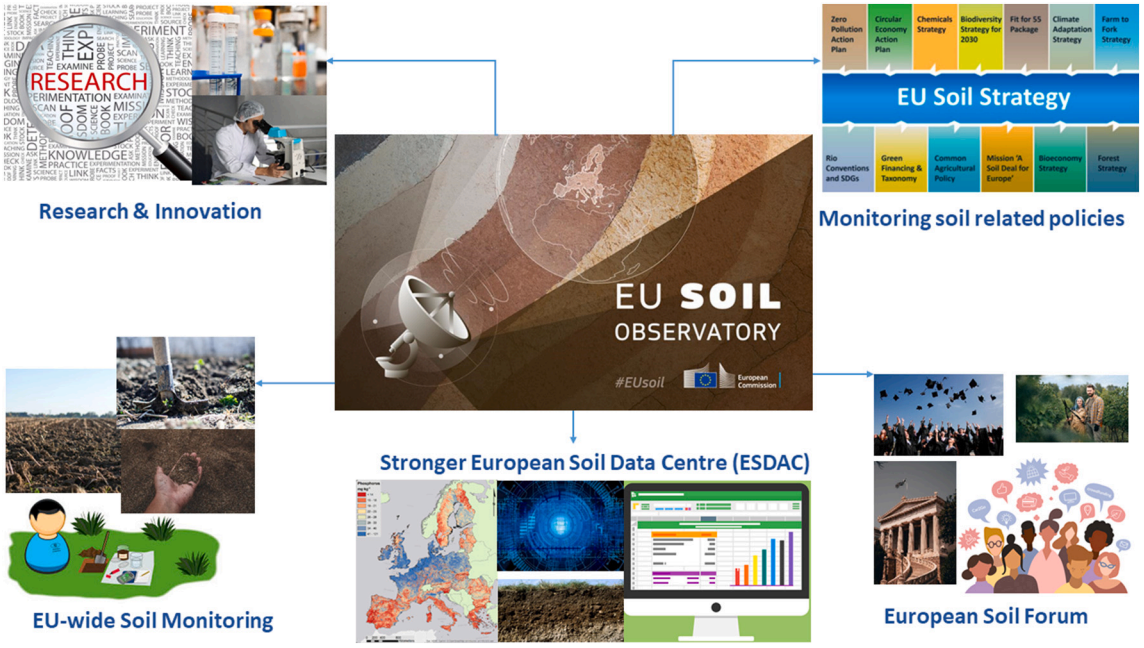

Fig. 1. The five main objectives of the European Soil Observatory.

the "4 per mille" initiative (Minasny et al., 2017) and table a legislative proposal on carbon removal certification. The European Commission aims to publish the first assessment of EU soil biodiversity and antimicrobial resistance genes based on LUCAS topsoil survey and support the establishment of the Global Soil Biodiversity Observatory. As sustainable soil management should become the norm in the future, the Strategy will publish a set of "Sustainable Soil Management Practices" and provide assistance to Member States to develop a "test your soil for free" campaign. Following the recommendation from the EU Court of Auditors, the Strategy aims to establish a methodology and indicators assessing the extent of desertification and land degradation. Those are few among the many actions that will be carried out for implementing the Strategy (European Commission, 2021).

At the core of the Strategy is the concept of soil health, as an emerging new paradigm for addressing sustainable soil management. Soil health is by now a popular metaphor (Janzen et al., 2021) of a rather complex issue. The strength of this metaphor lies in its powerful message associating soils with the concept of health that strongly resonates in today's social context: Healthy soils for healthy people!

Moving from the emotional sphere into a legally binding political sphere requires a translation of the metaphor in hard facts and data, possibly applicable for a quantitative assessment of soil health relevant for policy making purposes. The ambitious target that by 2050, all soils in EU Member States are healthy, i.e. are able to provide as many essential ecosystem services as possible, needs to be substantiated by measurable indicators based on reliable data. Therefore, a central role in the implementation of the Soil Strategy will be assigned to the newly established EU Soil Observatory, providing the necessary data and indicators for the regular assessment of soil health in the EU (Fig. 1).

3. EU Soil Observatory

The recently established EU Soil Observatory will support the implementation of the EU Soil Strategy 2030 and other relevant EU policies, such as the monitoring of agricultural soils in the context of the Common Agricultural Policy (CAP) or the Clean Soil Outlook of the Zero Pollution Action Plan. In this policy context, the EU Soil Observatory has as objectives: 1) to monitor soil related EU policies with an enhanced EU Soil Indicator Dashboard, 2) an open Forum for increasing awareness, 3) a stronger European Soil Data Centre, 4) an integration of national soil monitoring systems with EU monitoring programmes (e.g. LUCAS) and 5) support to Horizon Europe Research and Innovation programmes (Fig. 1).

4. Common Agricultural Policy

The Common Agricultural Policy (CAP) is a key EU land management policy and a central driver for the management of agricultural land. In the current CAP, under cross-compliance rules, the beneficiaries of the CAP have their payments linked with good agricultural and environmental conditions (GAECs) such as minimum soil cover, minimum land management to limit erosion and maintenance of soil organic matter (Borrelli et al., 2016).

Among the key priorities for the CAP 2023–2027, the support for the sustainable growth of food production and the greener farm practices through eco-schemes are particularly relevant to soils. Under these schemes, specific payments will be provided to farmers that adopt climate-sensitive and nature-sensitive practices in line with the European Green Deal objectives. Examples of these actions include organic farming, crop rotation, and preservation of carbon rich soils. In the CAP 2023–2027, the enhanced conditionality includes more GAECs relevant to soil protection such as: protection of wetlands/peatlands, ban of burning arable stubble, buffer strips, tillage management to reduce soil erosion, a minimum soil cover and crop rotation.

5. Zero Pollution Action Plan

A significant policy development has been the adoption of the EU Action Plan: "Towards a Zero Pollution for Air, Water and Soil". This Action Plan recognises that soil pollution harms human, soil and environmental health, as well as being one of the main reasons for the loss of biodiversity and the ability of ecosystems to provide services such as carbon sequestration. The Action Plan contains a number of measures specifically targeting soils, including a framework to regularly assess the status of EU soils with regards to pollutants. At the heart of such a framework will be the development of a priority watch list for soil contaminants as well as guidance for the safe, sustainable and circular use of excavated soils. To better understand the scale of diffuse soil

pollution in the EU as for copper (Ballabio et al., 2018)and mercury (Ballabio et al., 2021), the Commission will work towards better integrating a zero pollution module in the future LUCAS soil survey (Orgiazzi et al., 2018). In order to track progress, and anticipate trends, the European Commission, together with the European Environment Agency will publish every two years a Zero Pollution Monitoring and Outlook Report.

6. Mission 'A Soil Deal for Europe'

In September 2021, the European Commission adopted five Research and Innovation Missions to bring concrete solutions in response to major societal challenges. The Mission "A Soil Deal for Europe" will support the EU's ambition to manage land in more sustainable ways, thereby meeting global commitments such as the Sustainable Development Goals (SDGs) (Bouma et al., 2019) and contributing to a number of European Green Deal targets on sustainable farming and forestry, climate resilience, biodiversity, zero-pollution and resilient rural areas. In addition to advancing our knowledge on soils, the Mission will establish 100 living labs and lighthouses to co-create, test and pioneer innovations for soil health at local level. Furthermore, the Mission will support the development of a harmonised framework for soil monitoring in Europe and raise people's awareness on the vital importance of soils. Altogether, these activities will support the transition towards healthy soils in Europe.

7. The way forward

The European Commission will propose a Soil Health Law in 2023. Such a legal framework will contribute to the achievement of the Soil Strategy 2030 objectives, grant soils the same level of protection as water and air and radically improve the condition of soils to better provide the ecosystem services that we depend on.

Declaration of Competing Interest

None.

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