

# The role of EU Soil Observatory (EUSO) in supporting EU policies with solid science

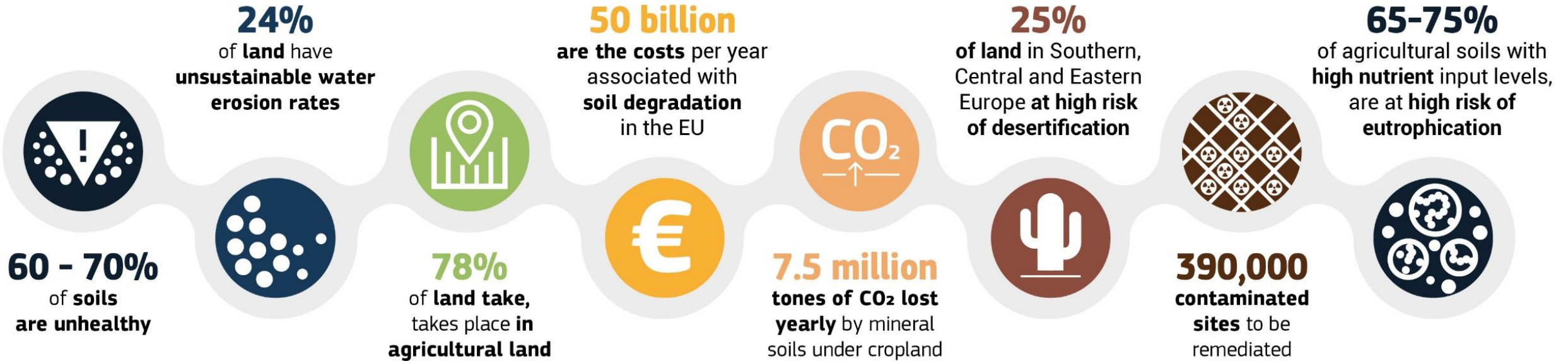
*Dr. Serenella Sala*

*Head of Unit Land Resources and Supply Chain Assessments*

European Commission  
Joint Research Centre (JRC)  
Directorate D Sustainable Resources

# Soil Degradation in the EU

*The time to act is now!*



desertification sealing land take compaction  
erosion loss of biodiversity pollution  
organic matter decline salinisation

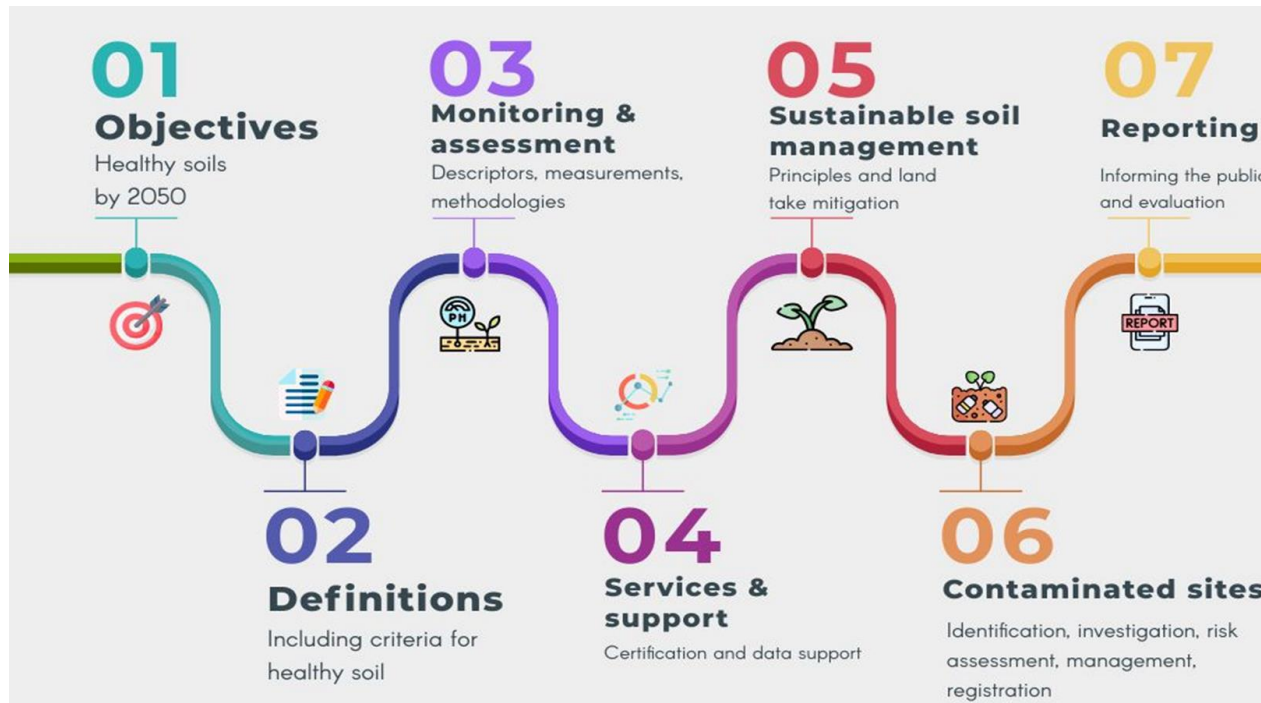
} SOIL THREATS

# Framework for Soil Protection in the EU



# Proposal for a Directive on Soil Monitoring and Resilience

Proposal for the first-ever EU legislation on soils provides a harmonised definition of soil health, puts in place a comprehensive and coherent monitoring framework and fosters sustainable soil management and remediation of contaminated sites.



- Next steps**
- trilateral negotiations on the final text and adoption of the Directive
- 17 June 2024 • Council adopts general approach
- 10 April 2024 • Parliament adopts a positive position
- 5 July 2023 • Commission adopts proposal for a Soil Monitoring Law



# The EU Soil Observatory (EUSO)

KNOWLEDGE FOR SOIL POLICY



EU-wide soil monitoring



Monitoring soil health  
and policies



Stronger European Soil Data Centre (ESDAC)



Research & Innovation



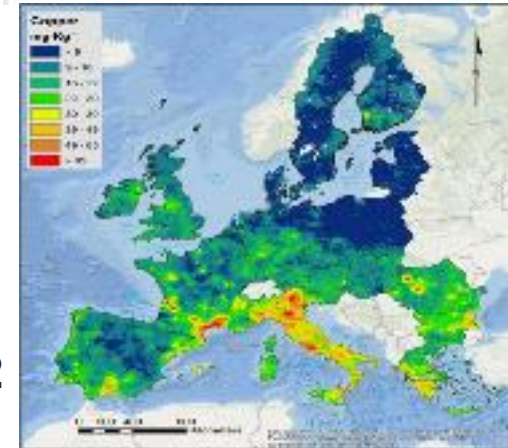
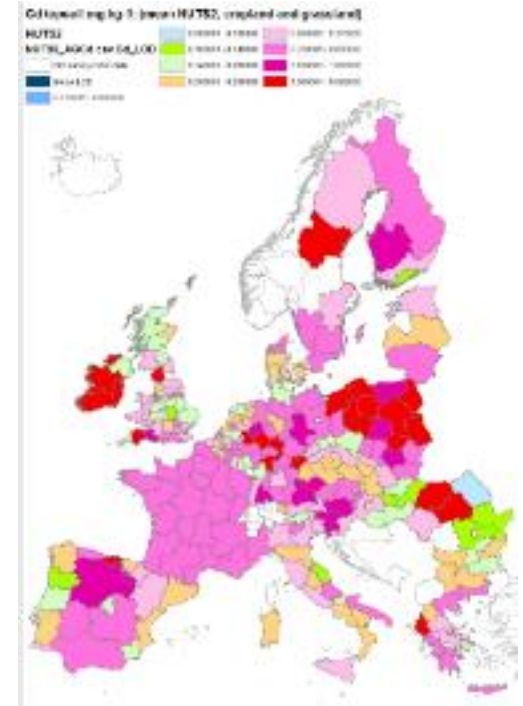
EUSO Stakeholder Forum



# LUCAS SOIL survey

The JRC manages the LUCAS SOIL survey: sample design, measurement protocols through integrated analysis and monitoring, training of surveyors

## EU-wide soil monitoring



- Surveys (and the resulting data) span multiple years 2009, 2015, 2018, 2022
- 40,000 observations
- Soil archive at the JRC premises in Ispra (IT)
- Close cooperation with Member States



# LUCAS Contributes to EU-Wide Soil Monitoring

From monitoring physical, chemical and biological soil properties to support EU policies



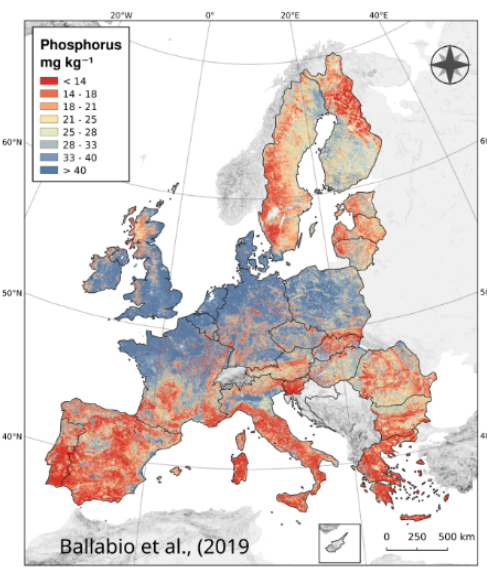
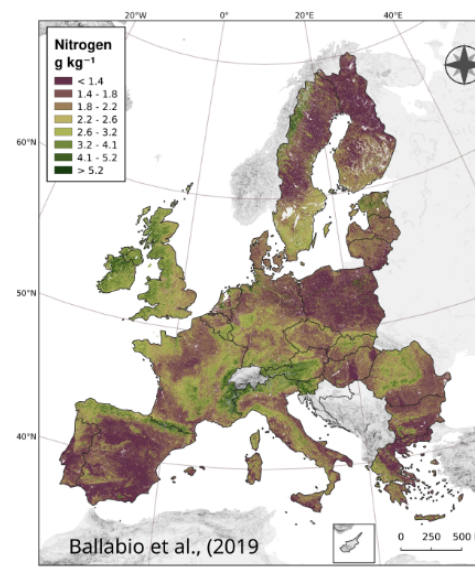
## SOIL PROPERTIES

Organic carbon  
Total nitrogen content  
Phosphorus content  
Heavy Metals  
Pesticides  
Fungicides  
Antibiotics  
Soil Biodiversity



## MODELLING + AI

DayCent  
Cubist  
Gaussian process  
GAM



**COM(2023)416 - Directive**  
**Soil Monitoring and Resilience**  
**(Soil Monitoring Law)**

## POLICY MAKING

- EU Soil Strategy 2030
- Soil Mission
- Carbon Farming Certification
- Nature Restoration Law
- Zero Pollution Action Plan
- Common Agricultural Policy (CAP)
- Biodiversity Strategy 2030
- Chemical Strategy



# Soil Degradation processes in the Dashboard

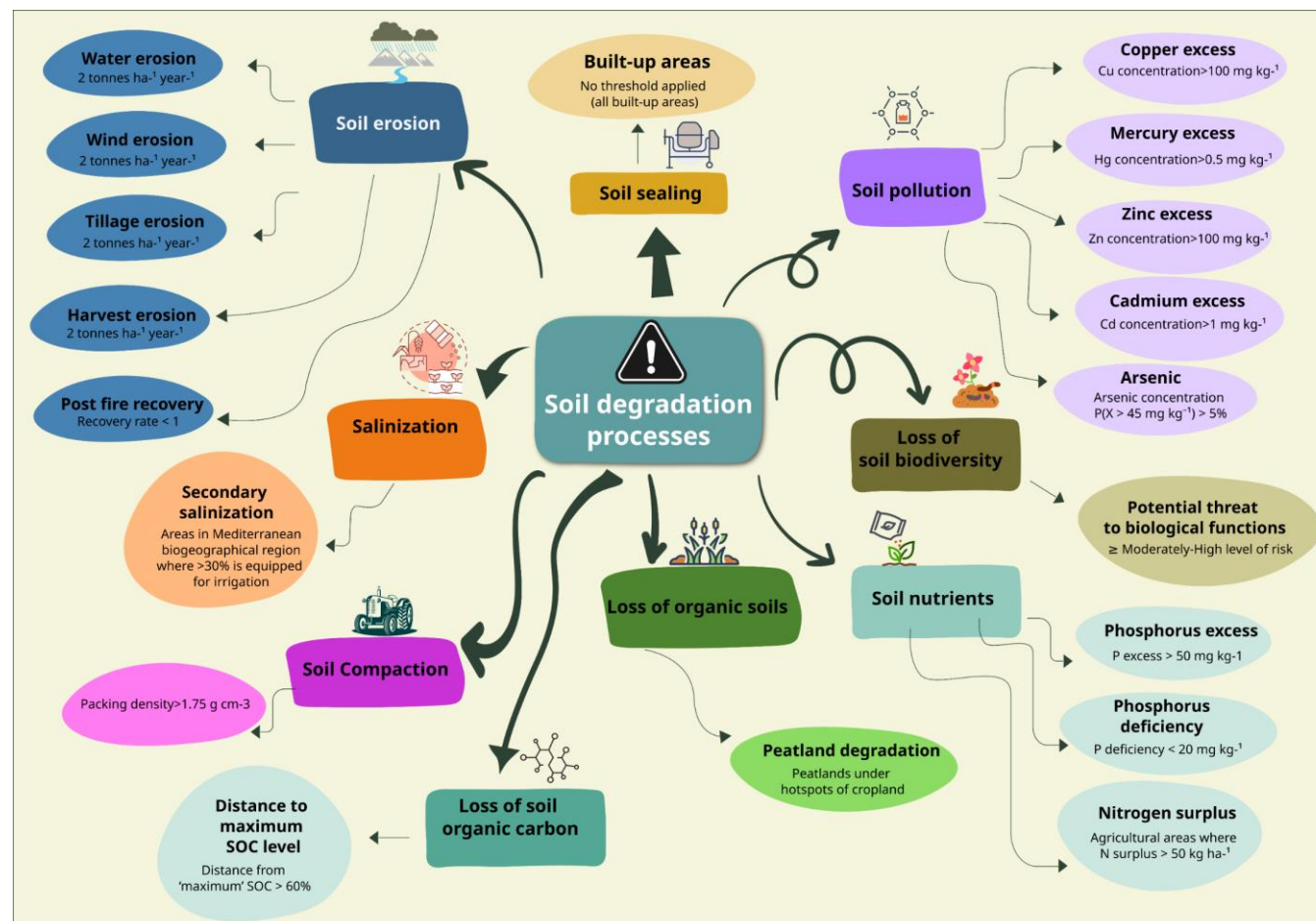
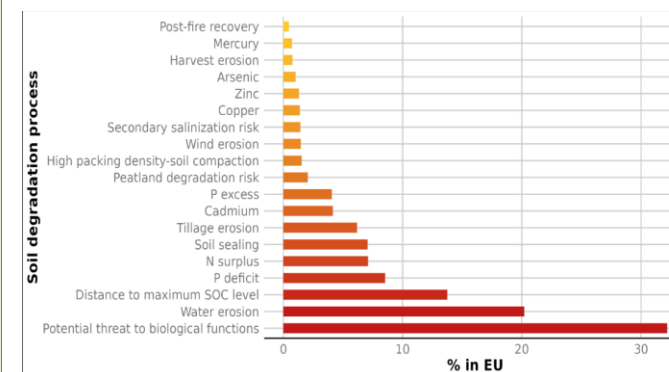
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## REVIEW ARTICLE

European Journal of  
Soil Science WILEY

## How the EU Soil Observatory is providing solid science for healthy soils

Panos Panagos<sup>1</sup> | Nils Broothaerts<sup>1</sup> | Cristiano Ballabio<sup>1</sup> |  
Alberto Orgiazzi<sup>2</sup> | Daniele De Rosa<sup>3</sup> | Pasquale Borrelli<sup>4</sup> |  
Leonidas Liakos<sup>5</sup> | Diana Vieira<sup>1</sup> | Elise Van Eynde<sup>1</sup> |  
Cristina Arias Navarro<sup>1</sup> | Timo Breure<sup>1</sup> | Arthur Fendrich<sup>6</sup> |  
Julia Köninger<sup>7</sup> | Maeva Labouyrie<sup>8</sup> | Francis Matthews<sup>9</sup> |  
Anna Muntwyler<sup>10</sup> | Juan Martin Jimenez<sup>11</sup> | Piotr Wojda<sup>1</sup> |  
Felipe Yunta<sup>1</sup> | Anne Marechal<sup>12</sup> | Serenella Sala<sup>1</sup> | Arwyn Jones<sup>1</sup>





# Contribution to soil related policies

- Soil Mission
- Carbon Removal Certification
- Nature Restoration Law
- Development of **Clean Soil Outlook**
- Review of **CAP Performance indicators** (Soil Organic Carbon, Soil Erosion)
- **Farm2Fork**: pesticides & nutrient management indicators



COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL,  
THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE  
REGIONS

EU Missions two years on: assessment of progress and way forward

{SWD(2023) 260 final}

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EU Missions two years on: assessment of progress and way forward



# JRC is part of the Horizon Europe Soil Mission

## Soil Mission Building Blocks

- Support to citizen science initiatives for soil monitoring
- Promote self-assessment of soil health by land managers and citizens
- **Building on JRC Awareness and Education WG**

4. Soil literacy, communication citizen engagement

1. R&I programme

- Support validation of soil health indicators;
- Further develop technologies for soil monitoring
- **EUSO as beneficiary**

- Harmonisation of indicators, measuring and reporting for soil health across Europe;
- **Managed by European Soil Observatory**

3. Soil monitoring

2. Living labs and lighthouses

- A network of real-life sites to
- test and validate novel measuring techniques
  - **LL Portal on EUSO**

JRC/EU Soil Observatory



First 25 LLs kick off



# Carbon farming and nature based solutions



Use of **conservation tillage, catch crops, cover crops** and increasing **landscape features**



**Agroforestry** and other forms of mixed farming



Restoration, rewetting and conservation of **peatlands and wetlands**



**Precision farming** and more efficient use of fertilizers



**Forest Management and Reforestation** according to ecological principles



**Blue carbon:** coastal wetlands

Emissions reductions

- Soil
- Rewetting of peatlands
- Reductions of fertilizer use

Temporary carbon removals in soils and forests

- Time-limited certificate (e.g. 5 or 10 years)
- Certification period can be renewed



# Starting up carbon farming

## Green business model



Increased carbon removals



Additional income for land managers



More biodiversity and nature

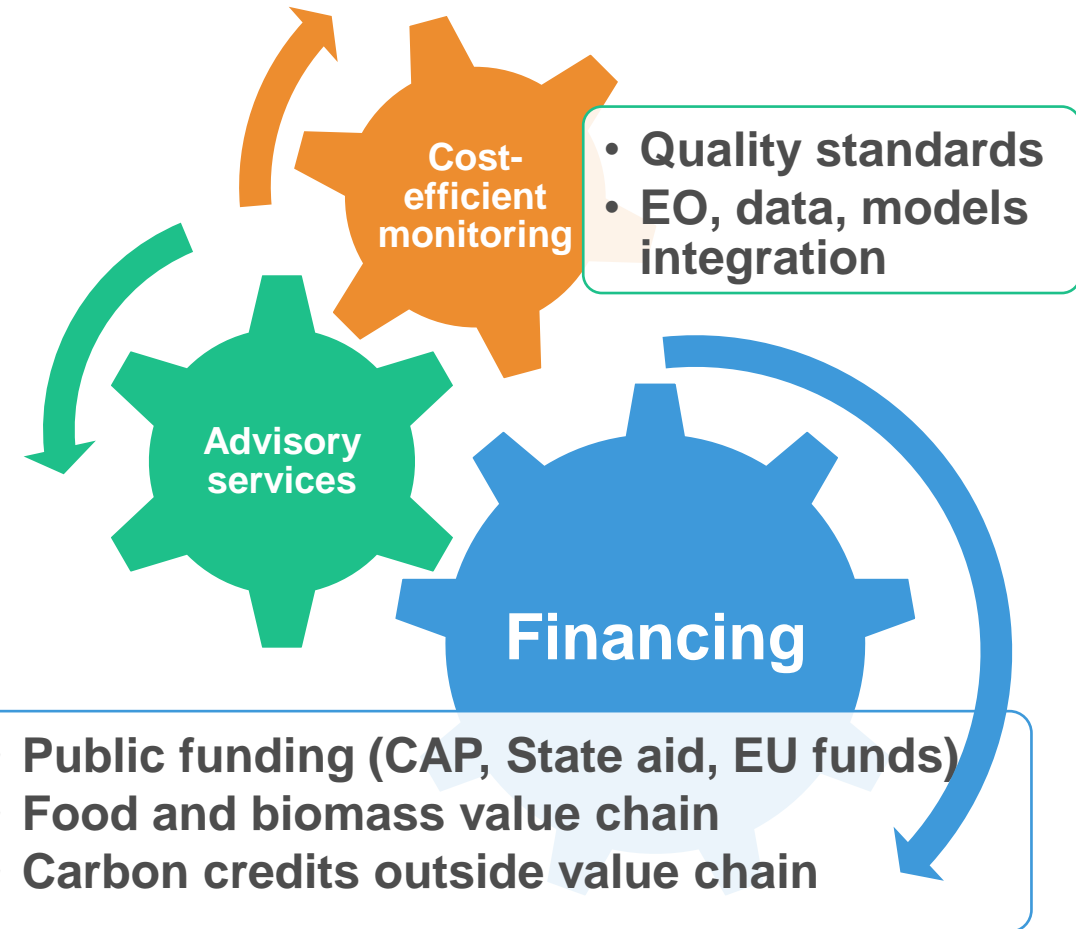


Increased climate resilience of farm and forest land

Mandatory sustainability requirements



## Challenges





# EUSO Stakeholders Forum

- 1,000 participants in 2021, 2022, 2023 & 2024
- Establishment of 7 Technical Working Groups - Lead to a more complete knowledge base for policy

## EU Soil Observatory Working Groups



EUSO Annual Bulletin

*A review of 2022 activities*

Marichal, A.; Panagos, P.; Jones, A.; Aiaz, Navarro, C.; Ballabio, C.; Bellarand, D.; Breure, T.; De Medici, D.; De Rosa, D.; Fendrich, A.; Koeniger, J.; Labeyrie, M.; Liakos, L.; Martin Jimenez, J.; Matthews, F.; Montanarella, L.; Munteyer, A.; Orgiazzi, A.; Scarpa, S.; Schiavini, C.; Simoes Vieira, D.; Van Eynde, E.; Van Liedekerke, M.; Wajda, P.; Yunta Macquias, F.

2023



EUSO annual bulletin 2023

Broothaerts, N.; Panagos, P.; Arias Navarro, C.; Ballabio, C.; Bellarand, D.; Breure, T.; De Medici, D.; De Rosa, D.; Fendrich, A.; Havenga, C.; Koeniger, J.; Krossinweier, J.; Labeyrie, M.; Liakos, L.; Marichal, A.; Martin Jimenez, J.; Matthews, F.; Michailidis, V.; Montanarella, L.; Munteyer, A.; Orgiazzi, A.; Scarpa, S.; Schiavini, C.; Simoes Vieira, D.; Van Eynde, E.; Van Liedekerke, M.; Wajda, P.; Yunta Macquias, F.; Jones, A.

2024

JRC TECHNICAL REPORTS

EU Soil Observatory 2021

*Review and reflections*

Marichal, A.; Jones, A.; Panagos, P.; Bellarand, D.; De Medici, D.; De Rosa, D.; Jimenez, J.M.; Koeniger, J.; Labeyrie, M.; Liakos, L.; Lugato, E.; Matthews, F.; Montanarella, L.; Munteyer, A.; Orgiazzi, A.; Scarpa, S.; Schiavini, C.; Wajda, P.; Van Liedekerke, M.; Vieira, D.

2022

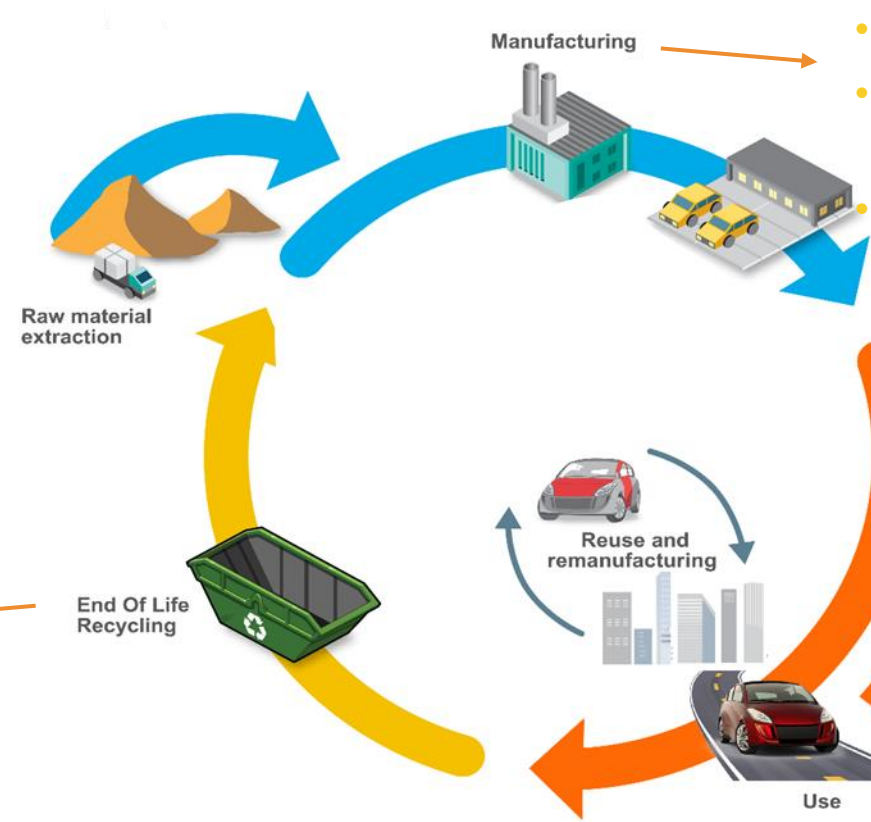


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# Several impacts on soils happen along the production and consumption systems

- Land use change and related soil impacts
- Release of toxic metals, soil ecotoxicity
- Soil productivity losses (e.g., agriculture intensification)
- .....
- Soil littering
- Unwanted releases of polluting substances during recycling
- Deposition of ashes
- Leakages from landfills
- .....  
18  
.....



- Emission of toxic substances
- Soil sealing for manufacturing plants
- .....
- Land use for fuel extraction
- Release of toxic substances in soil
- ....
- Soil litter (tyre abrasion)
- Soil sealing (infrastructure)
- ....



# SOILS

The State of  
in Europe

Fully evidenced, spatially organised assessment  
of the pressures driving soil degradation.

Arias-Navarro C., Bartz R., Jones A. (Eds)

2024



European  
Environment  
Agency

## Just launched!

Create an **updated assessment** of  
the condition of soils in Europe

**Inform a broad audience** (policy  
makers and the public) about the  
importance, role and sensitivity of soils

**Advance the knowledge base** about  
soils with a comprehensive collection  
of latest evidence

Enable scientists and other experts to  
present and exchange their  
knowledge in a **united writing  
process**



European  
Commission

# Thank you

## Contacts



EU Soil Observatory: <https://esdac.jrc.ec.europa.eu>