



EUROPEAN MISSION SOIL WEEK

Event report
12 – 13 November 2024

*Research and
Innovation*

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Executive summary

Executive summary

The European Mission Soil Week 2024 was organised by the Directorate-General for Agriculture and Rural Development (DG AGRI) in collaboration with the Joint Research Centre (JRC) – EU Soil Observatory (EUSO), the Directorate-General for Research and Innovation (DG RTD) and the European Research Executive Agency (REA). Held in Brussels between 12 and 13 November 2024, the European Mission Soil Week attracted 280 on-site participants and over 1 300 online attendees via live streaming. The event brought together the European soil community, including researchers, policymakers, the private sector, land managers and representatives of civil society organisations, to discuss the urgent challenges of soil health and sustainable land management and how to address them. The two-day programme featured plenary sessions, co-creation breakout sessions and on-site field visits, offering a comprehensive platform for knowledge exchange and collaboration.

Day 1 opened with plenary sessions highlighting the critical role of soil health in mitigating climate change, supporting biodiversity, and ensuring food security. Discussions underscored the urgency of addressing soil degradation, with speakers calling for further research, policy alignment, and investment in sustainable soil practices and soil health restoration. The session on Living Labs (LLs) introduced five EU-funded projects (the first 25 Mission Soil LLs) demonstrating innovative solutions for soil restoration through co-creation and stakeholder engagement. Breakout sessions explored soil health in agriculture, sustainable forestry, urban land use, and soil remediation strategies, emphasising the need for standardised indicators, stakeholder collaboration, and tailored policy frameworks. A dedicated session on the proposed Soil Monitoring and Resilience Directive (Soil Monitoring Law) highlighted the importance of harmonised monitoring systems and comprehensive data collection to guide EU-wide soil protection efforts. The day concluded with a Living Labs ceremony, recognising pioneering initiatives in soil health restoration.

Day 2 featured a keynote on integrating architecture with soil health, advocating for nature-based solutions (NBS) in urban planning. A session on human-soil relations stressed the importance of interdisciplinary approaches, integrating scientific, social, and artistic perspectives to enhance public awareness and community engagement. The introduction of the new Mission Soil Ambassadors reinforced the role of grassroots initiatives in promoting sustainable soil practices. Further discussions focused on co-creation and systemic experimentation in agriculture and forestry, calling for further research on agroecological practices, carbon farming, and ecosystem service valuation. Urban soil health was also a key topic, with recommendations for integrating soil considerations into city planning, enhancing citizen participation, and leveraging financial mechanisms to support sustainable land (re)use.

The event also included four **field visits** that provided valuable insights into practical soil management solutions and innovations in soil remediation, sustainable agriculture, forestry and urban land management. The **Mission Soil Project Trail** offered an interactive platform for knowledge exchange, featuring 10 exhibitor stands where Mission Soil project representatives presented research findings, innovative tools, and solutions for soil health challenges. Participants engaged in discussions on innovative approaches, data-driven soil monitoring, and policy implementation strategies. An **interactive graphic wall** allowed participants to reflect on their personal connections to soil health, creating a collaborative illustration that captured key themes and commitments from attendees.

More information, including presentations and recordings of plenaries, are available on the Mission Soil website¹.

¹ <https://mission-soil-platform.ec.europa.eu/news-events/european-mission-soil-week-2024>



Plenary sessions

Day 1: Plenary sessions

1. High-level opening

Diego Canga Fano, Acting Deputy Director-General and Director for Directorate F at the European Commission's DG AGRI, opened the second European Mission Soil Week, putting the spotlight on the critical role of soil health in mitigating climate impacts, sustaining ecosystems and enhancing resilience to natural disasters. He reflected on the recent devastating floods in Spain, underlining the urgent need for healthy soils as natural buffers against extreme weather events. He also highlighted the findings of the 2024 State of Soils in Europe report by the JRC, which has revealed significant soil erosion across 24 % of EU soils, resulting in the annual loss of 1 billion tonnes of topsoil. He emphasised the importance of generational renewal in farming to drive innovation, ensure long-term commitment, and enhance digital skills for healthier soils. He also introduced examples from Mission Soil projects that support farmers and practitioners, such as the Soil Academy, co-created Territorial Management Agreements and the LLs.

The value of LLs, which foster on-the-ground innovation and collaboration among farmers, scientists, industry and civil society, was mentioned, with the Mission Soil objective of establishing 100 LLs by 2030, and the first 25 launched in 2024. Lastly, Canga Fano illustrated the alignment of the Mission Soil with the Common Agricultural Policy (CAP), which allocates EUR 40 billion to improve soil quality, supporting 1 000 operational groups focused on innovative sustainable soil management.



Figure 1. Diego Canga Fano during the high-level opening session

'The Mission Soil is about empowering people – farmers, foresters, and researchers – to drive the transition to healthier soils through innovation and collaboration.' – Diego Canga Fano

Joanna Drake, Deputy Director-General at the European Commission's DG RTD, stressed that healthy soils are the foundation of life, supporting food systems, regulating water, storing carbon and fostering biodiversity. However, she noted that soil degradation continues at an alarming rate due to pollution, erosion, loss of organic matter and sealing from urban expansion. These threats not only impact soil quality but also the broader ecosystems that depend on it.

She underscored that the Mission Soil is not an isolated effort but part of a broader framework of five interconnected EU Missions under Horizon Europe. These Missions tackle grand societal challenges, such as fighting cancer, adapting to climate change, restoring oceans and waters, and making cities climate neutral. Collaboration among the Missions is key to addressing these complex issues holistically. For example, The Mission Soil supports the Mission Climate Adaptation by enhancing carbon storage and resilience to extreme weather, contributes to the Cancer Mission by reducing environmental health risks, protects water quality in line with the Mission Restore our

Ocean and Waters, and enhances urban biodiversity and sustainability, benefiting the Mission Cities. Together, these Missions aim to foster long-term, sustainable change by engaging not only scientists and policymakers but also citizens, communities, and local governments.

'Healthy soils are essential for achieving our climate, biodiversity, and food security goals. Without them, our vision for a sustainable and competitive Europe remains unachievable.' – Joanna Drake

Alessandra Zampieri, Director of Directorate D Sustainable Resources at the JRC, reflected on the fundamental shift in policy focus towards soil health in recent years. Zampieri, who is responsible for the EUSO, noted that sustainably managed soils offer higher productivity, profitability, and resilience, while improving water retention, reducing erosion and enhancing plant health. She reinforced the importance of soil in Europe's future, noting that soil degradation currently affects over 60 % of EU soils, with alarming rates of erosion and carbon loss. These issues threaten EU mitigation efforts and exacerbate the challenges posed by climate change.



Figure 2. Alessandra Zampieri during the high-level opening session

'By focusing on soil health, farmers can create more competitive and sustainable agricultural systems that benefit both the environment and the economy.' –
Alessandra Zampieri

The session concluded with a call to action, encouraging participants to leverage the week's sessions, field visits and networking opportunities to co-create solutions for soil health.

2. Keynote speech

'Soil is a core issue. By taking actions at different levels of responsibility, we can ensure the recovery of degraded soil in Europe.' – Anne-Catherine Dalcq

Anne-Catherine Dalcq, Walloon Minister of Agriculture, Rural Affairs, Nature, Hunting, Fishing and Forests in Belgium, began her keynote by reflecting on her journey from a young farmer to a minister. Drawing from her past role as Vice President of the Young Farmers of Wallonia and Europe, she stressed the importance of soil health for the future. She spoke about ongoing soil degradation challenges in Belgium, including land take and soil sealing, erosion, pollution and nutrient poverty of forest soils. The severe flooding in Wallonia in 2021 further demonstrated the need for better soil management and climate resilience. Minister Dalcq called for sustainable land planning measures, such as stormwater retention basins, green roofs and permeable pavements. She conveyed her interest in launching initiatives focusing on increasing organic matter in soils, as well as promoting practices like utilising livestock effluents, applying compost, adopting cover crops, and implementing efficient monitoring systems to assess organic matter levels across the EU. Additionally, she highlighted the need for targeted training and advisory services for farmers about these practices.

She noted Belgium's commitment to improving soil quality through policies that promote organic matter, manure and compost in agriculture. Dalcq also talked about the importance of research in guiding farmers to better soil practices and advocated for more resources for research and data collection.

The minister concluded by calling for solution-based (as opposed to ban-based) soil interventions. She expressed confidence that through collaborative actions, Europe can recover degraded soils and support sustainable agriculture.



Figure 3. Anne-Catherine Dalcq during the keynote speech

3. The Mission Soil: state of play

'Agriculture is not just a sector, but a cornerstone of European identity. It plays a critical role in achieving the Green Deal's ambitious environmental goals.' – Kerstin Rosenow



Figure 4. Kerstin Rosenow during the 'Mission Soil: state of play' session

Kerstin Rosenow, Head of the Research and Innovation Unit at DG AGRI and Head of the Mission Soil Secretariat, opened her speech expressing gratitude for reconnecting with familiar soil enthusiasts and welcoming newcomers, emphasising the need to grow the soil community. She reported progress made in the Mission Soil

over the past year and encouraged the audience to use the breakout sessions to share insights on how to achieve the Mission's objectives through future research, innovation and other actions. She also referenced the Strategic Dialogue on the Future of EU Agriculture, citing Commissioner Christophe Hansen's remarks on applying measures and technologies on the ground, supported by an EU-wide benchmarking system aimed at harmonising methodologies of on-farm sustainability assessment, including soil.

Rosenow continued by outlining the four key building blocks of the Mission Soil. She highlighted the progress of the Mission Soil's 50 ongoing projects, which span multiple areas including circular economy, biodiversity, carbon farming, pollution mitigation, and soil monitoring. She noted that the EU has already invested more than EUR 500 million in soil-related projects in 2021-2024 (with EUR 435 million through the Mission Soil), surpassing Horizon 2020's seven-year investment.

She presented the development of the EUSO Soil Degradation Dashboard, which serves as a baseline for future action. The Dashboard provides spatial visualisation of soil health indicators, defines thresholds for unhealthiness, and was recently updated with new features, including adjustable thresholds for soil erosion and land cover-specific percentages of unhealthy soils. Developed by the JRC in collaboration with the Mission Soil, it is a key tool for monitoring and assessment.

Rosenow also outlined the establishment of the first 25 LLs, which cover various land use types across Europe. These labs focus on soil structure improvement, biodiversity enhancement, pollution reduction, and erosion control, among others. She shared early lessons from these labs, including the high engagement of private actors and the need for broader participation from end users. She provided examples of the LLs' work in different Member States, such as Spain and Portugal, where LLs are working on reducing soil erosion in sloping soils, France's composting platform for agricultural and industrial waste, and Greece's reclamation of contaminated lignite surface mines.

Rosenow concluded with updates on the Mission Soil Manifesto, announcing that it has gathered over 3 100 signatories, with almost 600 organisations, including researchers, agricultural advisers, farmers, urban planners, and private companies. She encouraged further participation, particularly from research institutions, regional authorities, and local policymakers. She also highlighted the selection of 15 Mission Ambassadors, individuals committed to promoting soil health and land management practices. These Ambassadors, drawn from various backgrounds, play a crucial role in raising awareness and mobilising action for soil sustainability.

4. Enablers and challenges for a sustainable deployment of innovative solutions from Living Labs

LLs are expected to play a crucial role in bringing concrete solutions to one of our greatest societal challenges: restoring and maintaining soil health. This session introduced the first five LL projects of the Mission Soil, as well as the LL support structure.

Luis Sanchez Alvarez, Head of Sector at the European Commission's DG AGRI Research and Innovation Unit, set the scene with a short description of the first five LL projects, focusing on their geographical and thematic distribution, composition in terms of stakeholders, land uses covered, challenges addressed, and sites proposed.



Figure 5. Panellists during the discussion 'Enablers and challenges for a sustainable deployment of innovative solutions from LLS'

The introduction was followed by a panel where the five LL projects were represented: GOV4ALL (Governance and Business Models for Living Labs: Rural Regeneration Hubs for Tackling Soil Health Challenges in the Mediterranean Region), LivingSoiLL (Healthy Soil to Permanent Crops Living Labs), iCOSHELLs (Innovative Co-Creation Soil Health Living Labs), LILAS4SOILS (Fostering Carbon Farming Practices Through Living Labs in The Mediterranean and Southern EU for the Healthy Future of European Soils) and SOILCRATES (Soil Innovation Labs: Co-Regenerating and Transforming European Soils).

Tristano Bacchetti De Gregoris, Founder and Head of Research and Innovation at SAE Innova, began by explaining that the GOV4ALL project brings together a diverse range of stakeholders to find solutions to the various challenges associated with soil health. At GOV4ALL soils are viewed as part of a socioecological system, connecting soil management to their cultural, social, and economic contexts.

Cristina Carlos, Assistant Professor at the University of Trás-os-Montes and Alto Douro, noted that 50 % of the partners in the LIVINGSOILL project are large farming companies and their organisations, considered their industrial partners. These partners are well placed to take on the risk of testing innovative solutions which, if successful, can be scaled up into viable business models, demonstrating the practicality and economic viability of improved soil health practices. The relation between farmers and agri-businesses is well established through the involvement of the network of the European Innovation Partnership 'Agricultural Productivity and Sustainability'. She then responded to a question from the public, sharing insights from her experience working with farmers in the wine and olive sectors in northern Portugal. She noted that the diversity of farmers involved varies across different LLs in Europe. Each region is still in the process of connecting and understanding the competencies of their respective farmer associations.

Erik Sindhoj, Senior Researcher at the Research Institute of Sweden AB, acknowledged the challenge the iCOSHELLs project will face in benchmarking and monitoring soil health improvements across diverse biogeographical and pedo-climatic regions in the EU. He explained that the team is using a range of indicators to identify those that can yield short-term results, enabling comparisons across different areas. They are seeking synergies in solutions that can be applied to various land uses and farming types.

Sonia Pietosi, Project Specialist at the European Institute of Innovation and Technology Food South, acknowledged the importance of iteration and co-creation in the LL methodology as essential elements for developing robust business models for carbon farming. Sonia explained that the LILAS4SOILS project will assess and compare the environmental benefits of carbon farming against its associated costs, extending beyond farm-level business models to consider the entire value chain. The project leverages industry partners to explore how different stakeholders can support each other through cross-financing this transformation. She also noted the importance of understanding consumer perceptions of low-carbon-footprint products on store shelves and, in the long term, creating demand for these products through close collaboration with customers. She then referred to the need to keep farmers at the centre of these projects while being adaptable in how each LL engages with its stakeholders. The process is always evolving, and sharing lessons learned from different regions is essential for progress.

Emiel Elferink, Applied Research Professor on Sustainable Soil Management at Van Hall Larenstein, pointed out that advancing soil literacy is crucial not only for participants in the SOILCRATES project but for the entire soil community. SOILCRATES will promote knowledge sharing through tailored communication tools, including videos, catalogues of best practices, field demonstrations, open days and training programmes, aiming to inspire and lead by example. With a focus on farmers, the project also seeks to engage diverse stakeholders, including policymakers, industries and schools. Professor Elferink responded to a question pointing out that the types of farms involved in LLs are diverse and reflect different regional farming systems. He explained that his team works with farmer associations in various regions, each with its own agricultural practices and soil types. He also mentioned the importance of an open LL model where anyone interested can join co-creation sessions, and the value of engaging all types of farms in research.

Giulia Campodonico, Head of Projects at ENoLL – European Network of Living Labs, followed, focusing on how the Mission-funded project SOILL (Startup of the SOILL Support Structure for Soil Living Labs) can best support LLs. She mentioned that they are developing a learning journey to support both new and existing LLs throughout their lifecycle, addressing their evolving needs and varying readiness levels. Using a portfolio approach, SOILL will collaborate with other Mission projects to integrate ongoing research and facilitate the LLs' transition without duplicating efforts. Building on insights from the NATI00NS project (National Engagement Activities to Support the Launch of the Mission 'A Soil Deal for Europe' 100 Living Labs and Lighthouses), SOILL is refining its strategies to better support new applicants and LLs through hands-on learning, including targeted monitoring to identify areas for improvement and knowledge-sharing opportunities.



Figure 6. Graphic recording of the 'Enablers and challenges for a sustainable deployment of innovative solutions from Living Labs' session

All speakers agreed that the process of engaging diverse stakeholders, especially farmers, is ongoing and iterative. Their conversation highlights the importance of sharing knowledge and learning from each other's experiences to refine co-creation methods, use of technology and ways to scale up LLs for greater impact.

5. Reporting from breakout sessions



Figure 7. Panellists during the reporting from the breakout sessions

Breakout Session 1: Soil health in agriculture

Paola Migliorini, Professor at the University of Gastronomic Science, provided an overview of the breakout session on soil health in agriculture, which addressed key challenges and opportunities.

The discussion focused on gaps in knowledge of soil microbiology, particularly soil biodiversity and its role in ecosystem and functional health, carbon storage and human well-being. Participants agreed on the strong need for standardised methods to benchmark, monitor and map soil quality indicators tailored to local conditions. Practical indicators were seen as essential to support farmers in managing soils effectively.

Scalability of farming practices was another key topic, with an emphasis on approaches suitable for farms of all sizes. The socio-economic dimension was also highlighted, as linking soil health practices to farm profitability is paramount for long-term sustainability of agriculture and accelerating their uptake.

The session called for collaboration among researchers, industry and consumers to ensure a comprehensive approach to soil health. Paola closed by thanking participants for their valuable input.

Breakout Session 2: Soil health for a sustainable forest-based bioeconomy

Liisa Pietola, Mission Soil Board Member and Senior Adviser at the Finnish Innovation Fund Sitra, presented the outcomes, which explored forest soil health in relation to biomass production, climate change mitigation, biodiversity and water cycles, as well as pollution remediation. Healthy soils were recognised as vital for producing high-quality bio-based products and for improving forest resilience so to reduce risks such as fires, erosion and pest infestations.

The group examined forest regeneration practices, comparing methods like clear-cutting and continuous cover forestry, and noted the importance of tailoring approaches to local pedo-climatic conditions. Latvia's strip harvesting was cited as a promising example. The need for better indicators to monitor forest soil conditions and for research for different soil types was identified as a priority.

Discussions also addressed the need for better metrics for soil quality, to develop models to understand the impact of forest management and the monetary valuation of ecosystem services to ensure their recognition in policymaking. The session concluded by underlining the value of forests in combating climate change and biodiversity loss, and the need to raise public awareness.

Breakout Session 3: Healthy soils for healthy communities

Pandi Zdruli, Senior Research Scientist at the International Centre for Advanced Mediterranean Agronomic Studies in Bari, summarised the third breakout session on healthy soils and their role in fostering healthy communities. The discussion focused on the rapid growth of urban populations, the increasing pressure on food systems, the need for sustainable urban planning and the potential of urban farming to enhance food security and increase green spaces. Zdruli stressed that healthy soils are essential for resilient food systems as they support local food production, improve access to fresh produce, and contribute to climate-smart cities by enhancing soil-based carbon sequestration and biodiversity.

The group stressed the importance of involving citizens in addressing challenges such as the urban heat island effect and called for urgent action to prevent worsening environmental issues. Key topics included monitoring urban soils for contaminants, scaling up urban projects, strengthening soil governance, and engaging citizens in governance.

Concerns were raised about the impact of land take on prime agricultural land, threatening food security, biodiversity and carbon sequestration, particularly given Europe's no land take by 2050 policy. The session concluded with a call to prioritise research on urban soils in future projects, recognising their vital role in supporting urban food systems, and urban and environmental well-being.

Breakout Session 4: Soil protection and remediation: strategies for contaminated sites

Johan de Fraye, Mission Soil Board Member and President of NICOLE (Network for Industrially Coordinated Sustainable Land Management in Europe), recounted the fourth breakout session on soil protection and remediation strategies for contaminated sites, covering technical challenges, policy solutions and stakeholder engagement.

The technical discussions focused on improving approaches to soil contamination, including designing chemicals to prevent pollution at the source. However, this was acknowledged as a long-term goal, not an immediate solution. Participants raised concerns about chemical cocktails – mixtures of pollutants like hydrocarbons and metals – and the need for better risk assessments to address these. The group also called for standardised soil sampling methods and consistent pollutant thresholds across the EU to improve monitoring and remediation efforts.

Policy-related discussions proposed business models that integrate technical remediation with stronger stakeholder involvement and transparency around polluter accountability. Environmental forensics was suggested as a way to trace unclear pollution sources, alongside a proposal to make industries bear the future costs of contamination. The importance of proving the effectiveness of remediation technologies to build trust and understanding among stakeholders was also underlined.

The session also explored the need to build soil literacy and strengthen stakeholder capacity, linking soil remediation to environmental justice by prioritising communities affected by long-term pollution. Finally, participants noted the interconnectedness of soil and water, advocating for a unified approach to address both in remediation efforts.



Figure 8. Graphic recording of the reporting from the breakout sessions

6. Making the Soil Monitoring Law work

In light of ongoing global challenges such as climate change, **Mirco Barbero, Team Leader for Soil Protection at the European Commission's Directorate-General for Environment**, reinforced the urgent need to address soil health. To manage soil effectively, he called for cooperation across all levels, including policymakers, researchers, and soil managers. He stressed the importance of a clear direction, as outlined in the proposed Soil Monitoring Law, which aims to achieve healthy soils by 2050. According to Barbero, the proposed directive relies

heavily on common definitions, methodologies, and indicators to guide decision-making. However, he noted that implementing the future law must be a collaborative effort, with significant contributions from research, data sharing, and knowledge transfer. Despite challenges in reaching an agreement on the final legal text, he remained optimistic about the potential for cooperation between the European Commission, Member States, and other stakeholders, working towards a future where soil health is fully integrated into existing policies.

Esther Goidts, Senior Adviser in the Soil Protection Direction at the Ministry of Environment and Agriculture in Wallonia, Belgium, then shared insights from the Member State level, discussing the challenges and opportunities of implementing current and forthcoming soil legislation. She reflected on the long and complex journey toward dedicated soil legislation, pointing out the initial failures of past attempts and the gradual shift toward a more comprehensive approach.

Goidts explained that managing healthy soil, regardless of land use, is now a priority, with growing recognition of the need to treat soil as an integral part of land management. The proposed Soil Monitoring Law defines soil health in terms of its physical, chemical, and biological conditions, as well as its ability to provide ecosystem services.

Noting the challenge of aligning communities with differing perspectives on soil health, she called for stronger collaboration between stakeholders, increased capacity building, and enhanced support to enable public authorities, industries, and other sectors to assess and manage soil health effectively within a unified framework, such as the proposed European Soil Monitoring Law.

Arwyn Rhys Jones, Deputy Head of the Land Resources and Supply Chain Assessments Unit and EUSO Project Leader at the European Commission's JRC, highlighted the JRC's role in providing up-to-date knowledge and data to inform policy development, particularly in the context of the Soil Monitoring Law. He described EUSO as a key tool for monitoring soil health, offering indicators to assess progress towards policy goals.

Jones also outlined the JRC's efforts to develop the EU digital soil health data portal, which will consolidate data from Member States and other sources to create a comprehensive overview of soil health across Europe. He touched on the portal's future applications, including integrating diverse data streams, improving interoperability, and tracking sustainable soil management practices. To conclude, he noted the JRC's ongoing efforts to address knowledge gaps, promote research and innovation, and support Member States through the development of guidelines and best practices in soil management.



Figure 9. Panellists during the discussion 'Making the Soil Monitoring Law work'

7. Closing remarks and Living Labs ceremony



Figure 10. Alexander Bernhuber during the closing remarks and Living Labs ceremony

Closing day one of the event, **Alexander Bernhuber, Member of the European Parliament**, reflected on the importance of dialogue between farmers, landowners and policymakers, particularly in relation to soil health. He pointed to the need for practical and inclusive approaches, such as those promoted by the Mission Soil. Bernhuber cautioned against oversimplified messaging, like labelling soil conditions as ‘good’ or ‘bad’, which can overlook the complex challenges faced by farmers, and urged support for farmers through appropriate resources and regulations, ensuring

that policies remain relevant and achievable. Bernhuber also recognised the role of science in advancing better soil management practices and advocated for a shift towards bottom-up approaches in policy development.

Following him, **Peter Wehrheim, Head of Unit for Bioeconomy & Food Systems at the European Commission’s DG RTD and Deputy Mission Manager**, praised the range of topics covered during the first day of the event, from soil biodiversity conservation to soil monitoring innovations. Wehrheim celebrated the growing recognition of soil health as a societal priority, linking it to broader EU objectives like climate resilience and sustainability. He discussed how Horizon Europe supports these initiatives and noted the vital role of innovation in addressing Europe’s environmental and economic challenges before thanking all participants for supporting a European vision for healthier soils.



Figure 11. Peter Wehrheim during the closing remarks and Living Labs ceremony

Following this, a ceremony was held in which LL managers attending the conference received a custom-designed wooden plaque created by SOILL-Startup (Startup of the SOILL Support Structure for Soil Living Labs). The plaque symbolised recognition of their status as the first 25 EU-funded soil health LLs of the Mission Soil, marking the start of their transformative journey towards soil health.

Day 2: Plenary sessions

1. Keynote speech: DIG IT! Building bound to the ground

'We need to stop fighting the land and instead design in harmony with it, taking inspiration from both ancient wisdom and the patterns of the natural world.' – Bjarne Mastenbroek

Bjarne Mastenbroek, Founding Architect of SeARCH, explored the relationship between architecture, the built landscape, and soil, highlighting how conventional building methods often disrupt natural ecosystems. He emphasised the need to integrate architecture with nature rather than allowing buildings to passively sit on paved surfaces that damage the soil.

Drawing from his book *Dig it! Building Bound to the Ground*, he outlined six strategies for reconnecting buildings with their environment: embedding structures into hillsides, absorbing natural terrain into design, spiralling forms that merge with the landscape, carving spaces from the earth, and mimicking natural systems to develop sustainable materials beyond concrete and steel.

He traced the evolution of shelter from protective caves to urban fortifications and the domestication of nature. He examined how industrialisation, the Dust Bowl, and mechanised excavation have widened the disconnect between modern life and soil, warning that today's machinery could mine the entire earth in just two and a half years.

Bjarne showcased his own projects that embrace nature, such as a coastal housing block redesigned with staggered towers that mimic pine trees, increasing the number of homes with sea views from 40 % to 85 %. He also shared Hotel Jakarta, the first wooden hotel in the Netherlands, built with pre-fabricated units and featuring a garden with Javanese species that reflect the country's colonial past. Advocating for sustainable materials, he reaffirmed his commitment to constructing 80 % of his projects in wood, urging the industry to move away from concrete.



Figure 12. Bjarne Mastenbroek during his keynote speech – 'DIG IT! Building bound to the ground'

2. Human-soil relations

Hans Dencker Thulstrup, Chief of Section for Networking, Biosphere Reserves and Capacity Building at the United Nations Educational, Scientific and Cultural Organization (UNESCO), opened the session on human-soil relations by highlighting our shared responsibility to address the deep connections between human well-being and soil health. He reaffirmed UNESCO's commitment to contributing to this crucial mission. For more than 60 years, since the creation of the Soil Map of the World in collaboration with the Food and Agriculture Organization of the United Nations (FAO), UNESCO has been actively engaged in global soil conservation efforts, recognising

that soil degradation is not just an environmental threat but also a risk to the cultural and social fabric of communities worldwide.

Thulstrup stressed that while soil scientists have long been raising concerns about soil degradation, awareness and education on the importance of soils for humans and ecosystems remain insufficient. This lack of awareness hinders the critical transition towards sustainable soil governance and underscores the urgent need to enhance soil literacy.



Figure 13. Hans Dencker Thulstrup during 'Human-soil relations' session

Thulstrup then introduced SOILSCAPE (Spreading Open and Inclusive Literacy and Soil Culture through Artistic Practices and Education), a Mission Soil-funded project in which UNESCO participates. Spanning 19 partners across 11 countries, the project promotes soil literacy through education, creativity, and collaboration, aiming to strengthen connections between communities and the land.

Finally, through networks such as the Man and the Biosphere Programme and the Global Geoparks, UNESCO integrates local, national, and global efforts

to promote sustainable soil practices. Thulstrup called for systemic, interdisciplinary approaches and collective action to prioritise soil health as a cornerstone of sustainable development.

Following his presentation, **Alexandra Toland, Professor of Arts and Research at Bauhaus Universität Weimar**, explored the role of artistic research in deepening human-soil relationships, emphasising that art extends beyond illustrating scientific facts. She argued that artists offer new ways of seeing and sensing soil, moving beyond generic imagery to highlight its site-specific, geopolitical, and cultural dimensions. By engaging multiple senses – sight, sound, smell and taste – artists provide a more immersive understanding of soil's complexity.



Figure 14. Alexandra Toland during 'Human-soil relations' session

She demonstrated how artistic practices can foster participation and action, citing projects such as Agnes Denes' wheat field in New York and Roxanne Swentzell's Indigenous Food Sovereignty Initiative. Other examples included performance artists Annie Sprinkle and Beth Stephens' ritualistic soil weddings and the Flatbread Society's urban agriculture advocacy in Oslo. She also highlighted creative methodologies that investigate soil processes, from Daro Montag's microbial film prints to Marcus Maeder's soil sonification and Deborah Solomon's chromatography for visualising soil health.

To conclude, Toland urged the Mission Soil to integrate artists into research consortia, support artistic residencies and exhibitions, and recognise artistic outputs as legitimate deliverables on equal terms with scientific research.



Figure 15. Anna Krzywoszynska during 'Human-soil relations' session

Anna Krzywoszynska, Mission Soil Board Member and Associate Professor of Transdisciplinary Environmental Research at the University of Oulu, highlighted the essential connection between healthy communities and healthy soils, stressing that soil care depends on the well-being of land workers. She explained that agricultural workers across Europe face economic pressures, alienation and declining mental health, leading to a loss of soil guardians. With the average EU farmer now 57 years old and small farms disappearing, she called for policies that empower farmers, attract new talent, and improve working conditions. She argued that soil care is not just about knowledge but about creating the right cultural and economic conditions for farmers to act as stewards of the land.

She emphasised the need for research that is relevant and actionable for land workers, pointing out that much academic research fails to translate into practical solutions. Drawing on examples such as SoilSafe Aotearoa and participatory projects in Italy and the US, she showcased how transdisciplinary approaches – combining social sciences, humanities, and artistic research – can create knowledge that drives real-world change. She urged researchers to embed values at the core of their projects, ensuring that their methods lead to meaningful and equitable outcomes. Ultimately, she argued that caring for soil carers is a necessary step in caring for soil itself.

Panel discussion on human-soil relations

The panel discussion explored the importance of integrating social sciences, humanities, and artistic research into projects focused on soil health and community engagement. Hans Dencker Thulstrup emphasised the necessity of a multi-disciplinary approach when working with local and indigenous communities. He argued that researchers should not impose a single knowledge system but instead foster an equitable exchange of ideas. He stressed that while scientific research carries urgency, it is crucial to listen to and value the knowledge embedded in local practices. By establishing a meaningful dialogue between scientific and traditional knowledge, researchers can build trust and create more impactful outcomes.

Alexandra Toland encouraged project leaders to recognise the contributions of artists already engaged in environmental issues beyond agriculture, such as plastics and water conservation. She pointed to past initiatives like the Soil Culture Programme in the UK and the Coal Initiative in France as examples of successful collaborations. She suggested including art universities and academies in research consortia to strengthen the role of artistic research in understanding soil-related challenges.

Anna Krzywoszynska reinforced the importance of bold decision-making within the Mission Soil, urging researchers to critically assess where change should come from. She questioned whether the burden of transformation should rest solely on farmers and land managers or whether more powerful actors should also be involved. She called on researchers to engage with social scientists, humanists, and artistic researchers, who possess the tools and methods needed to drive meaningful societal change.

3. Mission Soil Ambassadors

Sheila Damos, Managing Director at The Southern Lights, Karine Paris, Urban Gardening Coordinator at Citizens for Ecological Learning and Living (CELL) asbl, and Attila Szocs, President of Access to Land for Agroecology (ALPA) – Land for Life, were introduced as the latest nominated Mission Soil Ambassadors in Greece, Luxembourg and Romania respectively. This new cohort of ambassadors builds on last year's initiative, which nominates passionate individuals from across the EU and beyond to promote soil conservation and sustainable practices.

Sheila Damos shared her journey from sociology to farming, taking over her family farm in rural Greece. She now leads The Southern Lights, a non-profit organisation focused on promoting regenerative farming through pilot farms, training programmes and peer-to-peer learning networks. She pushed the need for better advisory systems for farmers, particularly through innovative solutions like farmer helplines and localised training efforts.

Karine Paris represents the Luxembourg-based CELL asbl and explained her role in urban gardening and capacity building initiatives. She is part of a broader movement focused on sustainability, starting with urban gardens in Luxembourg City. Paris' work revolves around supporting the transition to a more sustainable and regenerative food system through training, conferences and collaborative governance models.

As the third new Mission Soil Ambassador, Attila Szocs contributed with a video message where he presented his work in Transylvania, Romania, where ALPA focuses on securing land for future agroecological farmers. He shared the organisation's mission of using agroecology to regenerate landscapes and protect biodiversity while producing food.

Each new ambassador shared their ambitions to leverage their positions to create more impactful, visible change in their respective fields. They also explored the role of social media in amplifying their messages and engaging wider audiences on soil health and sustainable land management practices.



Figure 16. Graphic recording of the 'Mission Soil Ambassadors' session

4. Closing remarks

Closing the 2024 European Mission Soil Week, **Diego Canga Fano, Acting Deputy Director-General and Director for Directorate F – Outreach, Research and Geographical Indications at the European Commission's DG AGRI**, celebrated the significant progress made in soil health initiatives and reiterated the critical need for continued action. He praised the successful collaboration seen during the event, with 280 participants on-site and more than 1 300 online, representing 36 countries worldwide.

Mr Canga Fano strongly expressed the importance of scaling up investments from both public and private sectors to achieve the Mission's goals by 2030. He also stressed the necessity of greater awareness and involvement across all levels – from national soil hubs to individual citizens.

'This week has shown the enthusiasm and power of collective and diverse expertise breaking down silos to work together on one of the greatest challenges of our time – soil health, caring for soils, caring about life.' – Diego Canga Fano

In his final remarks, he applauded the collective expertise gathered, urged continued collaboration and thanked the speakers, participants and the team that organised the event.



Breakout sessions

Co-creation breakout sessions

1. Soil health in agriculture

The session provided an overview of the current state of EU-funded research on soil health, discussed key challenges and opportunities for improvement while identifying research gaps. It was structured into two parts: a presentation followed by a panel discussion.

Susana Gaona Saez, Research Programme Officer in DG AGRI's Research and Innovation Unit at the European Commission, opened the session with an overview of EU-funded initiatives addressing soil health, including soil degradation, sustainable practices and biodiversity. She highlighted key tools under Horizon Europe, including the Mission Soil and the Partnership 'Agroecology'. Approaches such as agroecology, agroforestry and organic farming were discussed, with an emphasis on integrating research outcomes into practical farming systems.

In the panel discussion, moderated by **Vincent Tchedry (Research Programme Officer in DG AGRI's Research and Innovation Unit at the European Commission)**, experts shared insights on implementing soil health practices and the associated challenges. **Paola Migliorini, Professor at the University of Gastronomic Science**, highlighted the role of agroecology and its holistic approach to enhancing soil health and biodiversity. **David Fernández Calviño, Associate Professor at the University of Vigo**, addressed scientific challenges, particularly the lack of knowledge within deeper soil layers, focusing on soil quality and biodiversity. **Frederik Vilhelm Larsen, Farmer and Agronomist at Agrognic**, shared practical difficulties farmers face, such as the importance of increasing carbon stocks on farmland, stressing the need for support structures to help them adopt soil-friendly practices without compromising profitability.

Key topics included the impact of farming practices on soil health, trade-offs between adoption and practical realities, the slow formation of healthy, carbon-rich soils, and the potential of technology for soil monitoring and precision farming. The discussion underscored the importance of providing farmers with tools, knowledge and incentives to implement soil health practices effectively. The absence of baseline data on soil health, indicators, and knowledge of soil biodiversity was also emphasised. The need to develop site-specific practices that account for pedo-climatic parameters was underlined.

During the question-and-answer (Q&A) session, participants from policy, research and practical backgrounds raised concerns about the costs of adopting soil health-improving practices, especially for smaller farms. Panellists discussed the role of policy incentives in overcoming financial barriers. There was also a consensus on the need to research the economic viability of soil health practices, better inclusion of practitioners in research design, and the importance of facilitating access to emerging technologies, particularly in rural areas.

The session concluded with a co-creation activity where participants identified and developed research gaps and priorities. Facilitators guided discussions to cluster ideas and determine top priorities through voting.



Figure 17. Co-creation activity during the 'Soil health in agriculture' breakout session

Conclusions

The participants:

- ▶ emphasised research on the impact of CAP measures on soil health and food quality, knowledge transfer and monitoring;
- ▶ focused on communication, economic aspects and strengthening the soil-health-to-food-quality link;
- ▶ highlighted scalable and harmonised protocols for monitoring, benchmarking;
- ▶ emphasised agro-industry's and consumer's role in ensuring soil health;
- ▶ addressed policy coherence at EU, regional and local level, and overcoming barriers to agro-ecological adoption, stressing soil biodiversity research;
- ▶ suggested site-specific practices, along with measurable and comparable indicators across various pedo-climatic regions, and cost-effective monitoring methods.

The session concluded with a summary of discussions. Next steps involve internal follow-ups based on participants' contributions.

2. Soil health for a sustainable forest-based bioeconomy

This session focused on sustainable forest soil management, exploring its role in climate change mitigation, ecosystem services and the production of bio-based products.

The session was moderated by **Liisa Pietola, Mission Board Member and Senior Adviser at the Finnish Innovation Fund Sitra**. The session began with an opening presentation by **Laura Liepiņa, Research Programme Officer at the European Commission's DG AGRI**, who provided an overview of EU-funded research programmes addressing forest soils. She highlighted the importance of forest soil health in climate strategies and ecosystem preservation.

The panel discussion featured insights from three experts. **Aleksi Lehtonen, Research Professor at the Natural Resources Institute Finland**, discussed sustainable management practices such as afforestation, mixed forests and ash fertilisation. He emphasised the need to avoid clear-cutting on peatlands to reduce greenhouse gas emissions and fire risk. **Ieva Līcīte, Researcher at the Latvian State Forest Research Institute**, highlighted the potential of forest soils as carbon sinks and discussed strategies like strip harvesting on peatlands to reduce methane emissions, though she noted that more research is needed to optimise this approach. **Andrea Martos, Project Coordinator of pHYBI (Phytomanagement as a Sustainable Feedstock Source of Lignocellulosic-based High-value Bio-based Products for Textile Applications)**, spoke about the role of healthy forest soils in supporting bio-based products through nutrient cycling, carbon sequestration and water availability. She also shared insights from the pHYBI project on utilising degraded soils for bioeconomy applications.

The panellists addressed several key challenges and opportunities. On holistic management, Aleksi Lehtonen advocated for continuous cover forestry, natural regeneration and site-specific approaches tailored to minimise emissions and maximise ecosystem services. Ieva Līcīte highlighted the dual role of forest soils in climate change mitigation and biodiversity preservation, emphasising the importance of research into optimal harvesting practices. Andrea Martos discussed the potential of phytoremediation and advanced modelling tools to support forest regeneration and improve policymaker understanding of soil management impacts.

Participants engaged in breakout group discussions that explored tailored, site-specific management practices and the recognition of ecosystem services provided by healthy forest soils. Discussions touched on the impact of harvesting strategies on soil health and emissions, the potential for innovative approaches like phytoremediation to address soil degradation, and the need for enhanced modelling to better communicate the benefits of sustainable forest soil management. Participants also highlighted critical research gaps in place-based soil monitoring and the development of soil quality metrics.



Figure 18. Co-creation activity during the 'Soil health for a sustainable forest-based bioeconomy' breakout session

Conclusions

- ▶ Sustainable forest soil management requires tailored, site-specific approaches that prioritise ecosystem services.
- ▶ Recognising and rewarding the ecosystem services provided by healthy forest soils can incentivise better practices.
- ▶ Innovations like phytoremediation offer promise for addressing degraded and polluted soils.

- ▶ Continuous cover forestry and natural regeneration methods can reduce emissions and support ecosystem resilience.
- ▶ Advanced modelling and research into soil management impacts are crucial for effective communication with policymakers.
- ▶ Further research is needed to address critical gaps in soil monitoring, metrics development and harvesting strategies.

The session concluded with a Q&A session where audience queries on forest fire management, soil biodiversity and the greenhouse gas impacts of forestry practices were addressed. The discussions underscored the importance of integrating scientific research with policy and practice to maximise the benefits of healthy forest soils.

3. Healthy soils for healthy communities

This breakout session explored the role of urban soil health in sustainable development, focusing on research gaps, citizen and policymaker engagement and innovative solutions. The session began with presentations by **Luis Sanchez Alvarez, Head of Sector at the Research and Innovation Unit of the European Commission's DG AGRI**, and **Giulia Meloni, Policy Officer at the Bioeconomy & Food Systems Unit of the European Commission's DG RTD**, followed by a panel discussion and a co-creation session.

Mr Sanchez briefly introduced the co-creation process of the Horizon Europe work programmes before presenting the main challenges facing urban soils in the European Union. He then reviewed key projects funded by the Mission that address soil in urban environments, such as SPADES (Spatial Planning and Design with Soil), focused on spatial planning, EDAPHOS (Advanced Mapping, Risk Assessment and Nature-based Depollution Methods are Combined to Accelerate the Recovery of Contaminated Soils and Ensure that Ecological Restoration Enters Mainstream Business), ARAGORN (Achieving Remediation and Governing Restoration of Contaminated Soils Now), and ISLANDR (Information-based Strategies for Land Remediation), which tackle remediation strategies, methods, and financial models for decontaminating and reusing land in urban and rural areas. He also highlighted SOILPROM, which focuses on modelling pollutant transport across the soil-water-atmosphere continuum and its impact on ecosystem services. Mr Sanchez also introduced the iCOSHELLs project, which will establish six soil health LLs focused on pollution and urbanisation. Finally, he noted the specific 2024 topic on urban LLs, which was under evaluation.

Ms Meloni provided an overview of Horizon Europe's alignment with the Mission Soil goals. She highlighted systemic approaches to soil and food systems through the European Partnerships and Food 2030, the EU's research and innovation policy framework supporting the transition towards sustainable, healthy and inclusive food systems, focusing on scaling up research and innovation to inform policies and develop practical solutions for soil and food systems. Ms Meloni also pointed out that innovative governance models are essential for transforming food systems, particularly in urban and polluted environments, where the responsibility for soil restoration cannot rest solely on farmers. To complement the efforts in rural areas, urban agriculture presents a unique opportunity to integrate soil restoration with food production in cities, fostering closer ties between communities, sustainable practices and local food systems.

The panel featured three experts:

Linda Maring, Expert Researcher at Deltares and Coordinator of the Mission-funded project SPADES, discussed the importance of recognising soils as critical assets in urban planning. She emphasised the

multifunctional benefits of soils in urban environments, such as improving sustainability and supporting urban resilience. Drawing on the PREPSOIL project and studies in Amsterdam, she advocated for integrating soils into planning processes through collaboration between authorities, urban planners and citizens.

Michel Chalot, Professor at the University of Franche Comté and Coordinator of the Mission-funded project EDAPHOS, addressed urban soil pollution, stressing the need for advanced risk assessment tools that integrate chemical, ecological and functional soil data. He highlighted the potential of NBS, such as plant-microbe assemblages, for managing complex pollutants. Chalot underscored the importance of community involvement and education, proposing dedicated research and pedagogical sites to foster awareness and adoption of NBS.

Karine Paris, Mission Soil Ambassador and Urban Gardening Coordinator at CELL asbl, introduced CELL, a Luxembourg-based movement promoting regenerative practices and ecological lifestyles. She highlighted CELL's initiatives in urban gardening, capacity building and citizen science projects, focusing on reconnecting communities with nature. CELL plans to expand its impact through the Mission Soil's Living Lab call, further advancing soil health in urban environments.

The Q&A session highlighted key themes: the undervaluation of soils in urban decision-making, challenges in prioritising soil health amidst competing land uses, the critical role of healthy soils in supporting sustainable food systems, and the potential of innovative technologies like drones and sensors for soil monitoring. Panellists also emphasised the importance of engaging citizens and policymakers through clear communication and practical examples.



Figure 19. Co-creation activity during the 'Healthy soils for healthy communities' breakout session

The co-creation session that followed identified research and innovation gaps, focusing on sustainable urban planning, citizen engagement, decision-maker involvement, urban soil indicators, the preservation and development of food systems rooted in healthy soils, and reconciling urban development with soil health principles. Participants also discussed the need to engage the private sector in financing soil health initiatives, highlighting opportunities for public-private partnerships and investment in sustainable urban infrastructure. Clear financial incentives and risk-sharing mechanisms

were proposed to encourage private sector involvement.

Key takeaways included the need to engage citizens through monitoring systems and urban gardening networks, promote soil literacy linked to cultural heritage and involve citizens in soil measurement through accessible and interpretable data. Participants also emphasised the importance of cost-benefit analyses to highlight the cost of inaction, scaling up small-scale projects and developing actionable soil health indicators. Furthermore, advancing research on how soil health directly influences the nutrient density of crops, particularly focusing on soil microbial activity, organic matter, and mineral availability, was identified as a critical area for future study.

The session concluded with discussions on integrating soil health into urban infrastructure to support resilient food systems and aligning Mission Soil projects with the New European Bauhaus initiative to explore innovative urban living approaches. There was a strong call for greater engagement with the finance sector to mobilise resources for

scaling successful urban soil projects and developing innovative funding models that reward sustainable land use practices.

Conclusions

- ▶ Urban soils are critical assets that require better integration into planning processes and decision-making.
- ▶ NBS and innovative technologies offer effective tools for addressing soil pollution and degradation.
- ▶ Citizen engagement, through gardening, monitoring and educational initiatives, is essential for fostering awareness and stewardship of urban soils.
- ▶ Policymakers and developers must be provided with clear incentives, guidelines and cost-benefit analyses to prioritise soil health in urban projects.
- ▶ Collaboration with the private sector and financial institutions is necessary to secure long-term investments and foster innovation in urban soil management.
- ▶ Research gaps, such as developing urban soil indicators, advancing sustainable food systems, and understanding drivers of citizen engagement, must be addressed to advance sustainable urban soil management.
- ▶ Collaboration across sectors, including social sciences, is critical for co-creating actionable insights and policies.
- ▶ Understanding, promoting, and enhancing the sustainability of food systems rooted in healthy soils, along with recognising the crucial role of communities in preserving and developing them, must be a priority for urban resilience.

The discussions underscored the need for systemic approaches that align urban development with the principles of no net land take, leveraging urban soils to build resilient and sustainable cities. Strong partnerships with the private sector and the development of financial instruments will be key to achieving these goals.

4. Soil protection and remediation: strategies for contaminated sites

This session focused on the state of soil protection and remediation across Europe, identifying strategic challenges, innovative approaches and research gaps.

The session was opened by **Gisela Quaglia, Research Programme Officer at the European Commission's DG AGRI**, and moderated by **Iustina Popescu, Mission Soil Board Member and Senior Scientific Researcher at the Geological Institute of Romania**, who welcomed participants and set the stage for an in-depth exploration of the challenges and opportunities in improving soil health.

Benjamin Van Doorslaer, Programme Officer at the European Commission's DG AGRI, presented an overview of the EU-funded and co-funded research and innovation (R&I) activities in the area of soil protection and remediation. He first put the area into perspective referring to the recognition as an innovation hotspot for the Mission Soil and to the broader policy context of the Green Deal targets. The presentation covered the following funding instruments, although not in an exhaustive way: the Mission Soil, Horizon 2020 and Horizon Europe, Marie Skłodowska-Curie, Interreg and CBE-JU. Projects were clustered in several groups. The main objectives of these thematic clusters were to improve the understanding of basic processes, to increase the modelling capacity of soil pollution processes, to further develop biosensors and user-friendly diagnostic tools to detect contaminants, to develop and assess (bio) remediation strategies, and to enhance input management and reduce pressure on soils.

Also, certain LLs develop and test new solutions for soil restoration. This overview was used in the following discussions to define R&I gaps and needs.

The panel comprised experts including **Xenia Trier, Mission Soil Board Member and Associate Professor at the University of Copenhagen, Efthymia Alexopoulou, responsible for the Energy Crops Unit in the Biomass Department of the Centre for Renewable Energy Sources and Saving, and Johan de Fraye, Mission Soil Board Member and President of NICOLE**, who explored challenges and opportunities in soil remediation. Professor Trier provided valuable insights into the challenges posed by persistent pollutants such as Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) and heavy metals, noting that estimates suggest there are 2.8 million potentially contaminated sites in the EU requiring remediation. She stressed the need for national-level mapping to better understand the extent of contamination. The Mission Soil project ARAGORN will help with this identification.

She underscored the urgency of stopping pollution at its source to minimise future remediation needs and emphasised that many emerging pollutants are not covered by current monitoring frameworks, leaving large gaps in understanding and managing contamination.

She called for harmonised regulations and the development of advanced monitoring tools capable of addressing pollutant mixtures, rather than focusing solely on individual compounds.

Professor Trier advocated for 'fit-for-purpose' regulations, designed to align with practical tools that land managers can implement efficiently and cost-effectively. She also emphasised a shift from complete decontamination efforts to risk-based management approaches, prioritising sites based on their potential impact on ecosystems and human health rather than pursuing unrealistically low contamination thresholds. She suggested scalable technologies, such as biochar, for containment and strongly recommended to establish minimum pollutant limit values across Europe. On financial tools and applying the polluter pays principle, she referenced the example of the pharmaceutical industry contributing to water treatment costs. This approach, she suggested, could be explored as a model for addressing soil pollution, ensuring that polluters take responsibility for remediation costs.

Professor Trier also emphasised the importance of co-creation in the development of remediation strategies and tools. She highlighted the need for close collaboration between researchers, land managers, and remediators.

Ms Alexopoulou shared her expertise in using industrial crops to remediate contaminated soils. Currently industrial crops grow in marginal lands, with for example salinity problems, and in areas polluted with heavy metals. However, she cautioned against transferring contaminants into the final products, stressing the need for proper selection of crops and conversion technologies, to ensure that pollutants are not simply shifted to another form or medium.

She also highlighted the lack of comprehensive mapping of contaminated agricultural lands across Europe. Without such data, it is challenging to prioritise and address soil contamination effectively. She called for national-level initiatives to complement EU efforts and for harmonised limits on heavy metals in agricultural soils. She noted that agricultural soils are often contaminated due to intensive management practices, including the use of fertilisers and pesticides aimed at increasing yields but inadvertently degrading soil quality. She stressed the importance of training farmers in sustainable practices to prevent further contamination and integrate remediation techniques into their management approaches.

To enhance soil health and remediation efforts, she advocated for including phytoremediation practices within the framework of the CAP.

Mr De Fraye assessed the current approaches to soil prevention and protection versus remediation. He noted that while Europe has robust regulatory frameworks, enforcement remains inconsistent across regions, leading to gaps in identifying and addressing contaminated sites. The Mission Board Member emphasised the complexity of managing regional pollution from agriculture and legacy industrial activities, which often involve multiple polluters and diffuse contamination. He pointed out the economic challenges of remediation, particularly for emerging contaminants like PFAS.

To overcome these challenges, he advocated for collaborative, long-term strategies, citing the example of the 'Valley of Chemistry' in Lyon, France. This initiative integrates municipalities, industries, and local communities to address pollution while creating green corridors and sustainable urban development.

Scaling up soil remediation requires innovative business models and financial mechanisms. Mr De Fraye noted that while effective technologies are likely to gain market traction, regional pollution and diffuse contamination require broader societal investment. He stressed the importance of creating financial tools that align with the 'polluter pays' principle, ensuring that industries take responsibility for the pollution they cause. Professor Trier shared this perspective, advocating for research that is responsive to the needs of land managers. She proposed involving stakeholders in designing solutions that are practical and scalable. Technologies like biochar, while promising, require significant development to meet the needs of large-scale remediation projects. Additionally, she suggested adopting the ALARA (as low as reasonably achievable) principle for setting contamination thresholds, balancing scientific rigour with practical feasibility.

The panellists emphasised a multi-disciplinary approach to tackle soil protection and remediation. While strong policies exist, there is a pressing need for better enforcement, stakeholder collaboration, and innovative technologies to achieve practical and sustainable solutions.

Conclusions

The co-creation exercise delivered the following main research needs:

- Prevention of pollution to avoid remediation

Participants emphasised the need for R&I to prioritise pollution prevention, reducing the necessity for future remediation efforts. This includes the development of safe and sustainable chemicals by design as a proactive approach to mitigate pollution risks. Additionally, there is a critical need for research on the risks and impacts of chemical mixtures, which are often overlooked in current frameworks.

- Standardisation of monitoring and remediation

The need for R&I to support the standardisation of sampling methods and pollutant thresholds was strongly highlighted. Participants called for collaborative approaches to establish consensus on monitoring tools and methodologies, ensuring consistency and reliability in assessing the effectiveness of remediation practices.

Additionally, the creation of comprehensive databases to monitor and trace pollution sources was identified as a priority. These databases should also support the establishment of open-access platforms to promote transparency in remediation processes and outcomes, facilitating knowledge sharing and fostering trust among stakeholders.

- Broader approaches to remediation strategies

Participants stressed the importance of adopting a wider perspective in remediation strategies, focusing not only on remediation itself but also on redevelopment and long-term land use. R&I should explore innovative business models that include diverse stakeholder participation in designing and implementing these strategies.

A key focus is the identification of pollution sources and holding polluters accountable. This requires R&I to develop advanced forensic tools and methodologies for source attribution, alongside frameworks that internalise the costs of pollution or creation of 'anticipatory insurance funds', ensuring the burden of remediation does not fall disproportionately on communities or governments.

Participants also mentioned the need for increased investment in Proof-of-Concept studies under real-world conditions to demonstrate what works effectively and at what scale, identifying the best available technology techniques or technologies. Furthermore, they emphasised the need for multi-stakeholder engagement and collaboration between various sectors and disciplines to ensure inclusive solutions and successful outcomes.

Participants called for transparent strategies to communicate the risks, harms, and benefits of remediation to the public and stakeholders, building trust and informed decision-making.

Acknowledging that remediation alone cannot address all soil health challenges, participants underscored the importance of integrated and sustainable management strategies that align remediation efforts with broader environmental and societal goals.

- Soil literacy and capacity building

Participants emphasised the critical need to enhance soil literacy, education and capacity building among a wide range of stakeholders, including policymakers, land managers, citizens, and consumers. Soil health was framed as a fundamental issue of environmental justice, with long-term implications for future generations.

During the discussions, participants highlighted the strong interconnection between soil and water systems, urging R&I to address these links holistically, particularly in the context of extreme weather events and water scarcity. Research is needed to understand how these conditions exacerbate contamination issues and impact soil and water health.

Key priorities include fostering transparency, accountability, and active stakeholder engagement in remediation efforts.



Figure 20. Presentation of key priorities from the co-creation activity during the 'Soil protection and remediation: strategies for contaminated sites' breakout session

The background features several overlapping, organic shapes in various shades of orange and yellow. A large, light yellow shape is in the upper left, while darker orange shapes are scattered throughout, creating a layered, abstract effect.

Exhibitors

Exhibitors

During Day 1, four exhibitors hosted stands at the venue, engaging with participants during breaks. The exhibitors included the International Federation of Organic Agriculture Movements (IFOAM) Organics Europe, Living Soils Workshop, the European Commission's Research Enquiry Service, and UNESCO representing also the Mission Soil SOILSCAPE project.

During Day 2, a dedicated session featured 10 exhibitor stands where Mission Soil projects presented their objectives and results in five-minute slots as described below.

1. Mission Soil Project Trail

This session provided participants with an interactive opportunity to network with project representatives and learn about the work and outcomes of Mission Soil-funded projects. Attendees were guided around 10 exhibitor stands, where each project's objectives and results were presented in brief five-minute talks.



Figure 21. Carlos Guerra, SOLO coordinator presenting during the Mission Soil Project Trail

Group numbers were assigned to participants on their delegate badges to facilitate the activity. Below are the 10 projects that participated as exhibitors in the Mission Soil Project Trail and showcased their stands throughout Day 2 of the event, along with a brief description of their presentation content:

- ▶ HoliSoils – Holistic Management Practices, Modelling and Monitoring for European Forest Soils (<https://holisoils.eu/>) – Project overview, policy brief, tools and methods;
- ▶ AI4SoilHealth – Accelerating Collection and Use of Soil Health Information Using Artificial Intelligence Technology to Support the Soil Deal for Europe and EU Soil Observatory (<https://ai4soilhealth.eu/>) – Soil health indicator selection framework, EcoDataCube and the progressive web application;
- ▶ SOLO – Soils for Europe (<https://soils4europe.eu/>) – European R&I roadmap, drivers of soil health and think tanks;
- ▶ SoilValues – Enhancing Soil health Through Values-based Business Models (<https://soilvalues.eu/>) – Project overview, current progress;

- ▶ BENCHMARKS – Building a European Network for the Characterisation and Harmonisation of Monitoring Approaches for Research and Knowledge on Soils (<https://soilhealthbenchmarks.eu/>) – Project overview, stakeholder focus and impacts, soil health indicator framework and a sampling campaign;
- ▶ SOILL-Startup (<https://www.soill2030.eu/>) – Project overview, project offering, SOILL community;
- ▶ HuMUS – Healthy Municipal Soils (<https://humus-project.eu/>) – Project overview, objectives, results and future plans;
- ▶ InBestSoil (Monetary Valuation of Soil Ecosystem Services and Creation of Initiatives to Invest in Soil Health: Setting a Framework for the Inclusion of Soil Health in Business and in the Policy Making Process) (<https://inbestsoil.eu/>) – Project overview and first results;
- ▶ NBSOIL – Nature Based Solutions for Soil Management (<https://nbsoil.eu/>) – NBSOIL academy, knowledge base and marketplace;
- ▶ SOIL O-LIVE – The Soil Biodiversity and Functionality of Mediterranean Olive Groves: A Holistic Analysis of the Influence of Land Management on Olive Oil Quality and Safety (<https://soilolive.eu/>) – Project overview, main results, sustainability protocol & workshops.



Figure 22. Diego Soto Gómez, InBestSoil coordinator presenting during the Mission Soil Project Trail



Interactive wall

Interactive wall

The interactive wall was a dynamic and engaging activity that invited participants to reflect on their personal and collective connections to soil. Attendees were encouraged to answer two key questions – ‘What does soil mean to me?’ and ‘What can I do for soil?’ – by writing their responses on sticky notes and placing them on a large canvas. This collaborative exercise captured a diverse range of perspectives, from scientific and policy-driven insights to deeply personal reflections on soil’s role in daily life, culture and sustainability.

As the wall filled with contributions, a graphic recorder transformed the collective responses into a visual representation, weaving together ideas, emotions and commitments into a single illustration. This evolving artwork served as both a reflection of the event’s discussions and a creative reminder of the shared responsibility to protect and restore soil health.



Figure 23. Photo of the interactive wall



Field visits

Field visits

1. Field visit on remediation of a polluted site at Santerra, Halle

This field visit was hosted by Joris Crynen, Executive Director of Santerra, a private company, specialised in the acquisition and the remediation of polluted sites. The visit took place at one of the project sites, currently under remediation, in the city of Halle, situated next to the local brewery Boon.

The site belonged originally to a factory producing soap. After the factory closed, the site was bought by the local brewery. Santerra was asked to remediate the different contaminations on the site and an agreement to redevelop the site into an industrial space for small and medium-sized enterprises was reached. In addition, a small land strip next to the riverbank was kept for natural flooding and pedestrians to pass.

After careful investigation of the site, several contamination spots were found, caused by mineral oils at one side, and solvents on the other side. Several possible causes were put forward, such as mismanagement and ignorance of the potential danger of the products used, leaking storage tanks and pipes, spilling during refill, but also new regulations and threshold for dangerous substances.

Different techniques were used to decontaminate the site. Excavation and biological treatment of the places where mineral oil pollution was found, while biological injections of microbes on the spot were used to remediate the pollution caused by solvents. Lactate was added to stimulate the growth of the microbes.

Asking for the costs of remediation, Mr Crynen answered that the excavation and the treatment of the soil is the biggest cost, but still nothing compared to the cost of inaction. Around 80 % of the excavated soil can be recuperated, the other 20 % need to be dumped.

Another aspect is the national and/or regional legislation on soil pollution. There are many differences within the European Union, which make the work more or less tidy and difficult. In Flanders, the concept of 'innocent ownership' is at the base and as a result, the risk of redevelopment for potential investments becomes much lower.

To conclude, the lessons learned are the following: i) business models for remediation exist but legislation plays an important role; ii) a polluted site will never be completely clean after remediation.



Figure 24. Field visit at Halle

2. Field visit on sustainable land management in agriculture at Walloon Centre for Research in Agriculture (CRA-W), Gembloux

The field visit to CRA-W in Gembloux provided an opportunity for participants to explore ongoing research and practical applications in soil management and innovative cropping systems. The agenda included presentations from key researchers and directors, a demonstration of the QuantiSlake test, and an on-site visit to experimental plots.



Figure 25. Field visit presentation at Gembloux

Dr Georges Sinnaeve, Director-General of CRA-W, commenced the field visit with a warm welcome and an introduction to the institution. Following this, **Dr Bruno Huyghebaert, Scientific Director at CRA-W**, provided an overview of the [Research Unit for Soil, Water, and Integrated Production](#). His presentation highlighted the unit's commitment to advancing sustainable agricultural practices and its pivotal role in supporting regional farming communities. Key areas of focus included their extensive research into soil health, crop management and the development of innovative agricultural techniques. Through its multi-disciplinary approach, CRA-W actively collaborates with farmers and stakeholders, providing practical solutions that bridge the gap between research and application. The presentation highlighted the organisation's commitment to addressing challenges such as climate change, soil degradation and biodiversity loss, with a special emphasis on fostering resilience in Walloon agriculture.

The **QuantiSlake test** was introduced by **Dr Frédéric Vanwindekens, Senior Researcher at CRA-W**, as an effective and straightforward technique for evaluating soil structure and stability. During the test, soil aggregates (small clumps of soil particles) are carefully placed in water to observe their reaction. The test reveals how well the aggregates hold together under water stress, providing insights into soil health. Healthy soil aggregates, enriched with organic matter and stabilised by strong biological activity, retain their structure and resist disintegration. In contrast, degraded soils lacking organic cohesion quickly break apart into fine particles. This phenomenon was visually demonstrated during the presentation, highlighting the critical differences between soils under diverse management practices. The test serves as a diagnostic tool for farmers and agronomists, linking soil stability to factors such as compaction, erosion risk and water infiltration capacity. The presentation emphasised its practical value in encouraging sustainable farming practices. Techniques such as maintaining soil cover, incorporating organic amendments and adopting conservation tillage were recommended as strategies to improve soil health and resilience, as evidenced by slake test outcomes.

Following this, **Aline Fockedey, Junior Researcher, CRA-W**, presented the project 'Collaborative approach farmers-advisers-researchers on long-term systemic experimentation: low-till organic cropping systems'. The project involves experimentation on eight different farms to explore new cropping systems that reduce tillage, maintain soil health and improve efficiency in organic farming, all through a collaborative approach across different actors. The collaborative approach seeks to integrate various perspectives and skills to experiment with innovative systems in cropping, particularly focusing on the long-term systemic effects of these systems. The goal is to identify the consequences, benefits and limitations of these systems, including logistical challenges and barriers at both the farm scale and within the broader food system. One of the key challenges identified in this project is the complexity of working with a variety of actors, including farmers, advisers, researchers and other stakeholders. Each group has its own constraints, priorities and ways of interpreting the project's goals, which can sometimes create misunderstandings. Despite the challenges, this collaborative approach is seen as essential for addressing the systemic issues faced in agriculture and for fostering innovation that is both practical and sustainable.

Finally, a presentation by **Morgan Abras, Senior Researcher, CRA-W**, shed light on the **Experimental Plot SYCI: An Innovative Cropping Systems Trial in the Loamy Region of Gembloux**. The SYCI project, whose name in French stands for 'aims to design, implement and compare innovative cropping systems', compared systems designed for different objectives: conventional cropping; SOIL, which prioritised conserving and enhancing soil capital through practices like permanent soil cover and reduced use of plant protection products (PPPs); GHG, aimed at minimising greenhouse gas emissions by integrating energy production, double cropping and biomass valorisation; and NoPPP, targeting a zero-PPP approach supported by synthetic fertilisers and mechanical weeding. Each system was assessed for its ability to meet medium-term challenges such as input reduction, climate change mitigation, biodiversity preservation and economic viability. The presentation concluded with an analysis of how these systems impacted key indicators, such as root length and crop yield, demonstrating their evolution and potential trade-offs over time in balancing environmental and agricultural priorities.

During the coffee break, participants observed a live demonstration of the QuantiSlake test, which measures soil structural stability using a simple and effective method. This hands-on demonstration allowed attendees to see the tool's practical applications and its potential for adoption in various agricultural contexts.

After the break, participants toured several experimental plots, showcasing the research discussed in the earlier presentations. These plots illustrated CRA-W's work on innovative cropping systems, soil management techniques

and collaborative approaches to systemic experimentation. The practical insights gained during the visit reinforced the theoretical knowledge shared in the presentations.

3. Field visit on sustainable land management in forestry at Tivoli Park, Mechelen

This field visit was led by **Nicolas De Brabandère, Founder of Urban Forests**. The visit took place in Tivoli Park, Mechelen, a city in the province of Antwerp in the Flemish Region of Belgium. The park features an innovative example of an urban forest, showcasing how reforestation techniques can transform urban spaces and improve soil health.

De Brabandère started the visit by giving a quick overview of the park's history. Originally a car park, the site underwent extensive soil restoration before the forest was planted. The City of Mechelen managed the de-paving process and provided logistical support, working alongside three partners with diverse expertise and the help of volunteers. Urban Forests, a specialist in constructing such forests in Belgium and abroad, was responsible for developing the planting plan, enhancing the soil and providing the forest property.



Figure 26. Field visit presentation in Mechelen

This urban mini-forest was planted using the Miyawaki method, a pioneering reforestation technique developed by Japanese professor Akira Miyawaki. The method involves enriching the soil with large amounts of organic material and planting small trees and seedlings very close together. As a result, the forest grows rapidly in its early years. This fast growth and natural approach to soil health offer numerous ecological benefits, including enhanced biodiversity, carbon sequestration and protection against soil erosion.

Since its planting in March 2022, the forest has exhibited exceptional growth, transforming into a thriving ecosystem. A total of 23 native tree species were planted, comprising over 4 000 plants. Initially planted at a density of three trees per square metre, the forest now supports seven trees per square metre, thanks to natural self-seeding and the high fertility of the soil. Some of the tallest trees have already reached heights of six metres.

The project originated from the city's demand to establish low-maintenance native ecosystems that generate positive impacts on the population and biodiversity. By restoring the soil and creating a biodiverse ecosystem, the initiative not only enhances the landscape but also delivers essential ecosystem services such as air purification, climate regulation and improved biodiversity.

Since establishing its first Miyawaki forest in 2016, Urban Forests has planted over 60 000 square metres across more than 120 projects in Belgium and France.

Mr De Brabandère explained their usual approach: they focus on degraded soils, such as lawns, brownfields and schoolyards, where soil compaction, low biological activity, or a lack of oxygen are common issues. Their work is typically carried out on small plots of land requiring intensive regeneration, often in urban areas and occasionally in rural settings, where expectations are high.

The speaker highlighted three key elements for the success of these projects: thorough soil preparation, selecting tree species based on Potential Natural Vegetation and providing good maintenance for two to three years (while preserving spontaneous biodiversity). After approximately three years, these forests become self-sustaining, with biodiversity and ecological complexity developing naturally.

Mr De Brabandère also emphasised the many advantages of Miyawaki forests. For example, they are highly resilient to drought and have proven effective even on severely degraded soils.

He also shared results from his experience, noting that the proximity of existing forests accelerates the process. Various parameters are used to assess and monitor forest and soil health, including soil biology, which has shown significant improvements within the forest. Water infiltration is six times faster inside the forest compared to outside, and temperatures are much lower within the forest – up to 35°C cooler than nearby hard surfaces.

The forest has also received overwhelmingly positive public feedback. People value and request more similar environments, recognising them as sources of well-being, inspiration and a connection to nature in urban settings. The forest attracts daily visitors, offering a peaceful green oasis where people can relax and participate in nature education activities centred on biodiversity.

4. Field visit on sustainable land management in spatial planning at the City of Leuven at Park Abbey, Leuven

This field visit was hosted by the City of Leuven, the capital of Flemish Brabant in the Flemish Region of Belgium. The visit took place at Park Abbey and the recently de-paved Spaanse Kroon district.

The City of Leuven, represented by **Geert Vanhorebeek, Sustainability Adviser**, and **Baptist Vlaeminck, Life Pact Project Coordinator**, is striving to become a climate-neutral and climate-adaptive city. To achieve this, the city has developed an ambitious climate change mitigation and adaptation strategy under which several initiatives are being implemented.

The strategy includes a climate action plan, a rainwater plan, a drought plan, a green plan, an erosion plan and an integrated vision for managing publicly owned spaces.

Key activities undertaken by the City of Leuven include the ecological management of public land, using public spaces as demonstration sites for implementing climate-friendly practices, and participation in European projects such as the Life Pact project (focused on both public and private domains) and the EU Mission Cities initiative. To achieve its climate goals, the city collaborates with civil society organisations, nature conservation groups, the Flemish Brabant Province and the Brabantse Wouden National Park.

The representatives of the City of Leuven identified resistance from some members of the population as one of the key challenges in implementing their projects. This resistance is primarily attributed to a lack of information and involvement. A best practice to address these challenges is to share knowledge and information while actively engaging citizens in the co-creation of projects.

After an initial introduction to the City of Leuven's activities, participants were guided through the Spaanse Kroon district. This quiet neighbourhood is home to approximately 550 residents living in around 250 housing units. As part of the Mission Cities and Life Pact projects, the Spaanse Kroon district underwent a renovation process to enhance its sustainability. The project began with the involvement of local residents, who were informed through workshops and dialogues and given the opportunity to review scenarios illustrating varying levels of sustainability measures, ranging from minimal to significant changes. Several additional engagement activities were held throughout 2022, including surveys and the implementation of temporary green infrastructures as demonstration sites.



Figure 27. Field visit presentation in Leuven

Renovations in the district included de-paving 4 120 m² of sealed surfaces, which were transformed into green areas, boosting climate mitigation and biodiversity. A further 2 050 m² were converted into water-permeable surfaces. These changes represent a 36 % shift in land management within the district, equivalent to 31.6 tennis courts, and allow over 16 million litres of water to re-enter the water cycle rather than being lost.



Figure 28. Example of a before and after of a public domain

The City of Leuven also supports residents who wish to manage their private land more sustainably. This support includes personalised garden advice, joint purchasing schemes for planting materials, collaboration with ecological gardening contractors, financial assistance through grants, and services such as the collection of removed tiles, concrete and foundations from de-paved surfaces.

In conclusion, the City of Leuven exemplifies how the public sector can play a pivotal role in sustainably managing public land while supporting private landowners in adopting soil-friendly practices.



Annexes

Annex: Statistics from the event

Across both days, **280 participants attended the event in person**, with an additional **1 312 unique viewers online**. Social media monitoring on Instagram, Facebook, X, and YouTube showed that the hashtags #MissionSoilWeek and #MissionSoil appeared in a total of 532 posts from 284 users. Combined, these posts reached nearly **1.1 million people**. Statistics suggest that overall there were 3 448 312 impressions and 1 384 engagements.

Attendees by country of origin

The on-site audience was predominantly female, with women representing 57.1 % of the participants, while men accounted for 41.8 %. A small proportion, 1.1 %, of attendees did not identify their gender. The on-site audience was highly international, with the largest share of participants coming from Belgium (33 %). Spain followed with 15 %, while France, Italy, Germany and the Netherlands each accounted for 6 % of attendees. The UK, Greece, Portugal, Denmark and Finland each represented 3 % of the audience. The remaining 12 % came from other countries, mainly within the EU.

Attendees by organisation type

The largest represented group at the event was the research community, accounting for 18 % of participants, followed by the education (higher education) category at 15 %. Non-governmental organisations, civil society organisations, and associations made up 12 %, while EU institutions accounted for 11 % of the attendees. Public research funders (public agencies and institutions) represented 8 %, and policymakers and governance made up 7 % of the overall participants. Farmers comprised 4 % of the on-site audience. The private sector, businesses, industries, supply and retail actors, together with the service providers category, collectively accounted for 10 % of attendees. Other represented stakeholder groups, including foresters, artists, cultural and creative industries, soil advisers, private research funders, investors, and philanthropic organisations, together made up 4 % of the on-site audience.

Attendees' affiliation with projects

Attendees' affiliation with projects was balanced, with participation almost evenly split. Overall, **140 out of the 280 participants** declared to be affiliated with projects, while the other **140 were not affiliated** with any projects.