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Cluster on soil indicators and monitoring

WHY AN INDICATORS AND MONITORING CLUSTER?

The **indicators and monitoring cluster** was established to support Mission Soil projects in navigating the evolving policy and technical landscape of soil health assessment. Notably, defining and monitoring soil health indicators involves unique challenges. They vary across **scales** (local, national, EU-wide), differ by **land-use context** (agricultural, forest, urban soils), and need to be adapted to different **pedoclimatic conditions** and **management objectives**. Moreover, indicators must balance **simplicity and robustness** to be both useful and scientifically sound.

In this context, the cluster provides a platform for both projects **developing new indicators and monitoring frameworks** and those **using or planning to use indicators**, helping them exchange knowledge, share methodologies, and explore synergies. The cluster is thus useful for both project typologies.

A key driver for this collaboration is the forthcoming **Soil Monitoring and Resilience Directive**, which will set a harmonised framework for soil health monitoring across the EU. The cluster offers an opportunity for projects to align their efforts and contribute collectively to its future implementation
and revision.

> *"The Cluster provides a forum for investigating the evolving world of soil health indicators. Such indicators play a central role in advancing soil protection and restoration across Europe in support of the soil monitoring law."*
>
> – David Robinson, AI4SoilHealth

HOW DO WE WORK?

The cluster brings together **around 40 projects** with **40-60 participants** regularly attending meetings. While it is mainly composed of Mission Soil-funded projects, **related non-Mission Soil initiatives** also participate where relevant, broadening the knowledge base and connecting to other EU efforts.

The cluster is co-led by AI4SoilHealth and BENCHMARKS projects as **Cluster Advisers**, supported by the **Mission Soil Platform**, which facilitates meetings, manages activities, and ensures information flow. The Directorate-General for Agriculture and Rural Development (**DG AGRI**) and the European Research Executive Agency (**REA**) provide strategic input to align discussions with EU priorities. The Joint Research Centre (**JRC**) actively contributes expertise on EU-level indicators and methodologies, linking project-level discussions to wider monitoring frameworks.

Cluster meetings focus on **sharing information**, **exchanging experiences**, and exploring synergies on indicator development, selection, and use. Topics discussed include:

- integrating **local vs EU-level** monitoring approaches;
- harmonising **data collection and sampling methods** while adapting to local conditions;
- defining **thresholds and benchmarks** for soil health indicators.

This work is complemented by targeted activities, such as training sessions designed to support and help projects select and measure indicators more effectively on the ground. The following sections spotlights one example of such activities, i.e. the training workshop for Living Labs focused on practical indicator selection and use.

SPOTLIGHT: TRAINING FOR LIVING LABS ON LOCAL SCALE INDICATORS

The Mission Soil Living Labs Indicator Training, held on 15-17 September in Vitoria-Gasteiz, Basque Country, Spain, was developed in response to a concrete need identified by Mission Soil Living Labs: the practical guidance on selecting relevant soil health indicators tailored to local contexts and land-use systems. Many practitioners working on the ground face challenges in choosing indicators that are meaningful, measurable, and aligned with both local objectives and broader monitoring frameworks.

Living Labs are a central element of the Mission Soil initiative. They are open, collaborative spaces such as farms, forests, or urban areas, where researchers, land managers, local communities, and other stakeholders come together to co-create, test, and demonstrate innovative solutions for soil health. By focusing on Living Labs, real-world spaces where new ideas for soil health are tested, the training aimed to make soil health monitoring more practical and approachable for everyone working at the local scale. The event was jointly organised by BENCHMARKS and AI4SOILHEALTH with the valued contribution of NEIKER, the JRC, and the Mission Soil Platform. It also played a key role in connecting local action with broader European ambitions for healthier soils.

For more on the background and highlights of the training, see the news item published by the Mission Soil Platform.

Photo credit: Maddy Silberberg

WHAT WAS IT ABOUT?

The Mission Soil Living Lab Indicator Training brought together over 20 participants from across Europe who work with soil health at the local scale, i.e. in Living Labs. These Living Labs are pivotal parts of the Mission Soil initiative, serving as real-world spaces where new ideas and solutions for soil health are tested and refined.

Held over three days at NEIKER Arkaute campus in Vitoria-Gasteiz, the programme combined practical sessions, fieldwork, and peer exchange. Participants learned how to set clear goals for soil monitoring, use digital tools like the Eco Data Cube to identify local challenges, and select indicators that are meaningful for their own context, i.e. the specific pedoclimatic region and scale of assessment.

A key feature of the training was its hands-on approach. Attendees worked side-by-side in the field, testing soil sampling protocols and discussing how to adapt indicator selection to local needs. Sessions covered how to link soil monitoring to real-life management decisions, compare different types of indicators (physical, chemical, biological), and interpret results in a way that supports practical action. The training also introduced innovative methods such as remote sensing and landscape-scale monitoring, which complement traditional fieldwork and help visualise soil health data in new ways.

Throughout, the emphasis was on making monitoring relevant and useful for practitioners, not just researchers. Experiences from different Living Labs were shared, highlighting the diversity of soils, climates, and land uses across Europe. Trainers encouraged open discussion about challenges, successes, and lessons learned, helping participants build confidence and find practical solutions they could take home.

Importantly, the training was especially timely given the recent adoption of the EU's Soil Monitoring and Resilience Directive. By connecting local action in Living Labs with this new European framework, the event helped participants see how their efforts contribute to a healthier future for soils across Europe.

Photo credit: Maddy Silberberg

ADDED VALUE FOR PARTICIPANTS

Participants left the training with practical skills, new ideas, and a stronger sense of community.

The training helped clarify how to select indicators that are both meaningful and measurable, and how to link new soil management practices to the specific soil functions being protected or restored. Attendees valued the focus on harmonising procedures and methods across projects, which supports the comparability and usefulness of data from local to European scale.

The hands-on sessions and field visits, such as those at the NEIKER vineyard, provided concrete examples of how to address crop-specific issues, climate change impacts, and the practicalities of soil sampling in permanent crops. Many participants left inspired to develop new guidelines and tools for their own Living Labs, and to share these lessons with their teams and networks.

The event also provided a valuable opportunity to connect local work with European policy, making it clear how everyday actions in Living Labs can affect real change for soil health across Europe.

"The highlights from the course have inspired me to develop a technical guideline to help Living Lab leaders select, with their farmers, a set of biological indicators for measurement at experimental sites."

– European Research Executive Agency Ruth Pereira, LIVINGSOILL

"These interactions are vital if we want to harmonise procedures and methods and increase the added value of data, from local to continental scale."

– Ruth Pereira, LIVINGSOILL

"Through our work in the Sperchios watershed basin living lab, we manage both permanent crops on mountainous slopes and annual crops in the valley near the river. This training has helped us coordinate with other EU-funded projects, deepen our understanding of indicator pathways, and select targeted practices and indicators. These insights enable us to address specific challenges in the watershed and measure the outcomes of our solutions in the field."

– Myrto Tsiknia, Path4Med

"Hosting this training in Spain was a pleasure, bringing together Living Labs and experts for valuable exchange. The mix of hands-on fieldwork, lectures, and discussions made it dynamic and practical. I hope the Living Labs will benefit from the knowledge and tools we shared."

– Lur Epelde, AI4SoilHealth

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