Soils for Europe

Identification and description of the KPIs to monitor the Mission R&I priorities

Deliverable D5.2

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1 Introduction

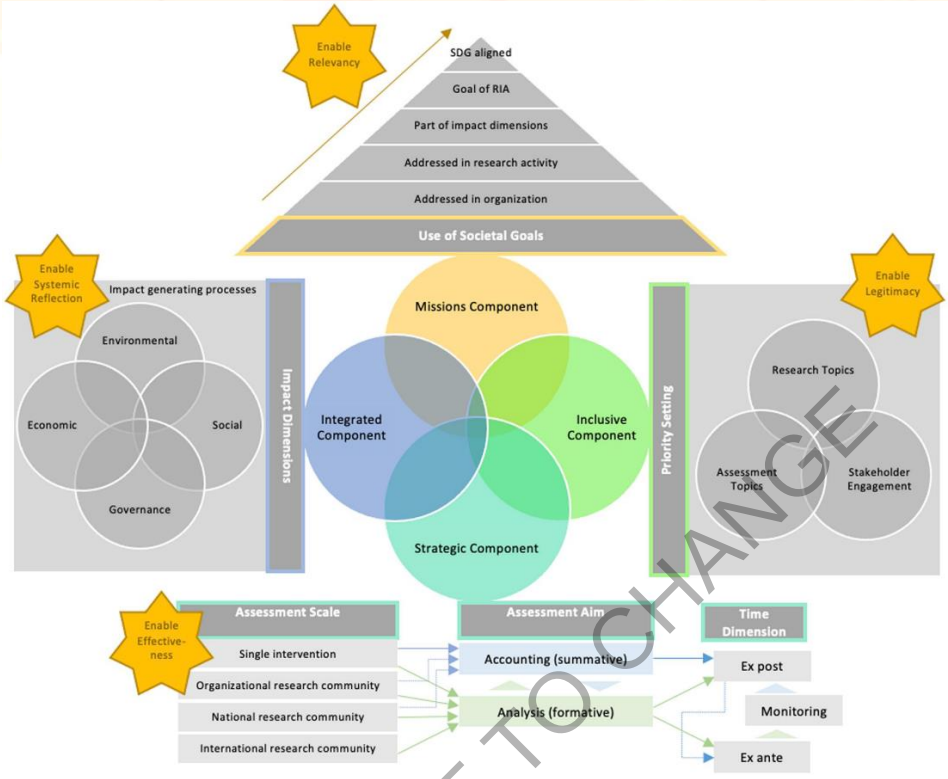
Soils for Europe - SOLO's Work Package 5 aims at developing an operational framework to assess the impact of European Mission Soil's Research and Innovation (R&I) activities. In that scope, Deliverable D5.1 – "Basis for the implementation of an Operational Framework and minimum set of KPIs to monitor the Mission R&D activities" (Guerra et al., 2023) proposed a transdisciplinary approach to assess the Mission's R&I impact, laying the foundations for a framework that allows to capture the complexity and multidimensionality of impact, as well as the multiscale level of R&I activities.

In its implementation plan, the Mission Soil acknowledges the complex and multi-dimensional scope of its action, and advocates for transformative change across land use types, societal sectors and scales, rooted in a shared sense of ownership in regards to soil health restoration (European Commission, n.d.-a). To do so, addressing policy, business models, literacy, and knowledge creation and integration is needed. And the Mission's Research and Innovation (R&I) activities must contribute to that cross-sectoral, multi-dimensional, inter- and transdisciplinary transformative change towards soil health.

Considering that overarching goal, Mission's R&I activities are expected to create impact that goes beyond the expansion of scientific knowledge, benefiting society, the economy, the environment, and public policy and services (Guerra et al., 2023; Pfeifer & Helming, 2024).

Coherently assessing different types of impact calls for a transdisciplinary and integrated approach, as had been established in the previous Deliverable. Pfeifer and Helming (Pfeifer & Helming, 2024) propose a framework for systemic research impact assessment (Figure 1) which combines: "(1) **missions component** aligning the assessment with societal goals, (2) **inclusive componen**t applying systematic and participatory priority setting, (3) **strategic component** selecting assessment types and time dimensions with (4) **an integrated component** to impact dimensions" (Pfeifer & Helming, 2024).

Figure 1 – Image from Pfeifer & Helming, 2024: Systemic RIA framework combining mission-oriented, inclusive, strategic and integrated components.



Pfeifer and Helming's (Pfeifer & Helming, 2024) framework evidences the complexity of mission-oriented research impact assessment (RIA), and its many-fold components, to be tailored to the purpose of each assessment.

To ensure that the work developed in SOLO's WP5 is tailored to the Mission's priorities, needs and expectations, SOLO entered in a dialogue with the sub-group of the Mission Soil Working Group on Business Models, which works on Key Performance Indicators to assess the practice impact of Mission Soil projects and of targeted financial mechanisms, following the Mission Secretariat (DG-Agri) and REA's agreement. This proved to be particularly relevant when considering that the Mission aims to mobilize R&I projects to self-assess their impact in practice, namely by identifying cascade mechanisms derived from R&I activities which can lead to changes in land management practices and, ultimately, soil health. The Mission therefore expects to foster a culture of impact assessment and monitoring, which is also fundamental to attract private investment and develop new business models that foster soil health.

The present Deliverable thus results from dialoguing with Mission Soil Board members and builds on the findings presented in the previous Deliverable (Guerra et al., 2023). The impact assessment framework was further developed, namely by focusing on its operationalization. Consequently, this document describes not only the framework, but also its main dimensions: the impact narratives that reflect on different types of impact and are based on findings that can hardly be single-handedly expressed by KPIs, the qualitative KPIs that allow for a qualitative analysis, and the quantitative, measurable KPIs.

2 Mission Soil's impact assessment framework

Taking the systemic RIA framework (Pfeifer & Helming, 2024) as inspiration, and considering both the specificities of Mission Soil, and the scope of SOLO and the current Deliverable, the proposed impact assessment framework **(1) aims** at assessing the impact of Mission Soil R&I activities in the real world, namely in society, the economy, policy and practice (as had been established in Deliverable D5.1, the environmental dimension is being addressed by other projects and therefore falls outside SOLO's scope); **(2)** is intended as a tool that can be **applied by Mission Soil projects**, for monitoring and evaluation (ex post) purposes, and to be adapted in the future for ex ante assessment and project design; **(3)** establishes not only the **components** of the impact assessment framework – qualitative indicators, quantitative indicators and impact narratives -, but also the mechanisms for its **operationalization**.

Considering the Mission's expectations, the assessment framework allows to evaluate 5 types of impact of Mission Soil R&I activities:

1. **Project impact in practice**: focuses primarily on impact among land managers, advisors, urban planners and other stakeholders;
2. **Project impact on policy and administration**: focuses on policy strategies and tools, and other institutional arrangements which act as drivers for land managers' decision-making;
3. **Project impact on value chain organization and practices**: focuses on market mechanisms, business models and requirements which act as drivers for land managers' decision-making;
4. **Broader societal impact**: focuses on literacy, awareness, school programmes and education;
5. **Impact on research and innovation**: focuses on academic institutions, researchers, publications and funding.

These 5 types of impact correspond to categories under which key performance indicators (KPIs), both quantitative and qualitative, are grouped. This categorization adds to the proposal of Deliverable D5.1 (Guerra et al., 2023), which classified KPIs according to their type and class; this extra layer of categorization highlights the importance of focusing on specific dimensions of impact and on having dedicated indicators to measure them.

Along with this new categorization, a reflection was made on the priority categories and respective KPIs, taking into consideration not only the Mission's priorities, but also the feasibility of the data-gathering effort by Mission Soil projects. The preliminary list of KPIs was also analysed to evaluate whether the impact would be better assessed with quantitative indicators (as was initially proposed in Deliverable D5.1) or with qualitative indicators.

The impact categories 1 to 3 will still be partially described by quantitative KPIs, and categories 4 and 5 will be addressed qualitatively, in the form of impact narratives. As explained further ahead, the latter might be supported by, but not limited to, qualitative indicators that result from the adaptation of the preliminary list of KPIs. Finally, some quantitative KPIs were adjusted, others were definitely excluded from the list, and a new KPI was added.

The updated list of KPIs – both quantitative and qualitative -, per category, is presented below.

Table 1: Updated set of Mission Soil Research and innovation Key Performance Indicators

Category	Nr.	KPI	Type of KPI
Project impact in practice	1	% of land managers having changed or adopted one or more of their practices in a direction improving soil health	Quantitative
	2	Number and type of stakeholders involved in Mission Soil projects per type	Quantitative
	3	% of private companies involved in the Mission Soil projects and % of funding allocated to private companies	Quantitative
	4	Number of soil health related trainings per type of stakeholder target and per level of learning outcomes	Quantitative
	5	Awareness of land managers with regard to soil health challenges	Quantitative
	6	Number of strategic partnerships established	Quantitative
	7	Number and percentage of land managers and advisors who are “new commers” to Horizon Europe projects	Quantitative
	8	Number of co-creation events related to soil health per type and number of stakeholders involved	Quantitative
Project impact on policy and administration	9	MS introducing evidence-based policy changes aiming to improve soil health	Quantitative
	10	Number of open access datasets related to soil health indicators to which MS R&I projects have contributed	Quantitative
	11	Number of standardized soil health indicators developed by Soil Mission Soil projects included in soil monitoring systems	Quantitative
	12	Number of Mission Soil project researchers involved in national or regional advisory boards	Quantitative
	13	Number of municipalities and regions pursuing citizen led R&I activities related to the Mission Soil	Quantitative
Project impact on value chain organization and practices	14	Number of research-innovation outputs transferred into the market	Quantitative
	15	Member States introducing a soil health certificate per type of certification	Quantitative
	16	Number of patents and other intellectual property rights (IPR) applications	Quantitative
	17	Number of businesses and companies implementing science-based strategies for regenerating soils in their production and supply chains	Quantitative
Broader societal impact	18	Soil health awareness amongst European citizens	Qualitative
	19	Citizen and end-users’ engagement mechanisms in place after the end of project funding	Qualitative
	20	Mission Soil Communities of practice created	Qualitative
	21	Experimental facilities, living labs and lighthouses created in the context of the Mission Soil	Qualitative
	22	Soil health and sustainability educational materials developed in the context of Mission Soil projects	Qualitative
Impact in research and innovation	23	Integration of early-career researchers into project activities	Qualitative
	24	Non-permanent researchers in academic careers integrated in Mission Soil projects	Qualitative
	25	Academic “new commers” in Mission Soil projects	Qualitative
	26	Participation of partners from peripherical regions in Mission Soil projects	Qualitative
	27	Research organizations involved in the Mission Soil projects	Qualitative
	28	Female researchers involved in Mission Soil projects	Qualitative
	29	Reviewers from peripherical regions involved in the project review process	Qualitative
	30	Field-Weighted Citation Index of peer-reviewed Publications resulting from the Mission Soil projects	Qualitative

	31	Open-access research outputs resulting from the Mission Soil projects	Qualitative
	32	Reflection on ratio of research expenditures and outputs per project	Qualitative
	33	Upskilled researchers involved in Mission Soil projects with increased individual impact in their R&I field	Qualitative
	34	Research and innovation roadmap milestones achieved	Qualitative

Key performance indicators are described in detail in section 3, in individual KPI sheets. The structure of these sheets was adapted from reports on indicator methodology (e.g., European Commission, 2021). The objective was to present the information in a clear, systematic and actionable manner, therefore focusing on the KPI implementation, rather than on a theoretical reflection. Implementation was placed at the centre also for the literature review, and therefore priority was given to practice- and policy-oriented sources (e.g., OECD, EC, UN, USAID, and others).

The final major component of the impact assessment framework, along with the key performance indicators, is the **impact narrative**. An impact narrative is a compelling, substantiated statement which reflects the contributions of R&I activities to society, the economy, policy and practice beyond numbers and quantitative targets (Guerra et al., 2023; QRiH, 2017). Instead, an impact narrative illustrates "the broader significance and societal value of research and innovation efforts" (Guerra et al., 2023: 24). In spite of their qualitative character, impact narratives are based on robust evidence which relates to the different types of impact to be assessed (Guerra et al., 2023; QRiH, 2017).

Drawing from the previous Deliverable, impact narratives should include the following elements:

Context: Provide a clear description of the societal challenge, problem, or opportunity that the research or innovation aims to address, including the accomplishment of the Mission objectives or EU policy and law goals.

Stakeholders and Beneficiaries: Identify the individuals, communities, organizations, or sectors (going beyond soil sciences) that have directly benefited or been positively affected by the R&I activities that have been funded or supported, explaining how they have experienced meaningful change.

Baseline assessment: Identify and describe the situation at the start of the project vis-a-vis the goal of the assessment.

Outcomes and Results: Describe the specific outcomes, results, or achievements of the research and innovation that has been developed, specifying measurable results and specific KPIs.

Transformation and Change: Describe changes in behaviour, practices and policies, and identify if these are i) changes of incremental nature or ii) transformative change, and justify.

Real-World Examples and Stories: Include compelling and relatable examples, case studies, or stories that illustrate the impact in practical terms.

Quantitative and Qualitative Evidence: Support the narrative with robust evidence and data. This could include both quantitative metrics, such as the KPIs proposed, statistics, or selected economic figures, as well as qualitative information, such as interviews, surveys, or expert opinions.

Broader Societal Significance: Connect the impact to broader societal goals, challenges, or priorities, namely by explaining how R&I contributes to sustainable development, societal well-being, economic growth, policy objectives, or other relevant agendas.

Future Outlook: Provide insights into the potential future implications and opportunities resulting from the developed research and innovation, highlighting how the achieved impact can be a stepping stone for further progress, and discussing future pathways to amplify said impact.

2.1 Operationalization of the impact assessment framework

Once the different elements of the impact assessment framework have been presented – types of impact, quantitative and qualitative indicators, impact narratives -, the mechanisms for its operationalization will now be described, i.e., guidelines will be set out for Mission Soil R&I project coordinators to implement the framework.

General premise: As mentioned above, the framework allows for project coordinators to make an impact assessment which is tailored to their R&I activities, therefore ensuring the meaningfulness of their assessment. This is achieved by having a certain degree of freedom in selecting and combining the framework's different elements; this **tailoring process must be aligned with each project's goals and methods**.

Minimum requirements:

- The impact assessment must include, at least, 6 quantitative KPIs and a narrative. The selection of types of impact and KPIs must be coherent with the project goals and methods (e.g., if the project deals with market take-up, it should include KPIs from category 3);
- Impact narratives should include some of the qualitative KPIs, if relevant, but no minimum number is defined; coherence with project goals and methods should be at the basis of the selection process.

- **Type of assessment:** Choosing a path for co-evaluation with stakeholders involved in the project, or others which are expected to or have been impacted by the project, is highly encouraged. This approach enriches the results of the impact assessment, and contributes to avoiding bias. Different methodologies may be applied, such as interviews or a series of workshops, as long as they provide the foundations for a guided, participative and collective reflection on the achieved impact (Ferse & Pfeifer, 2024; Swiss Academies of Arts and Sciences, 2023).

Impact assessment reporting structure: As long as all of the above is respected, project coordinators may decide how to structure their impact assessment but, below, a possible reporting structure is suggested (adapted from QRiH, 2017):

- Presentation and context
- Aimed impact of the project (including link to selected KPIs)
- Project's achievements and impact in a narrative (includes mandatory elements described above)
- Selected KPIs
- Future outlook

Structure of the impact narrative: for the impact narrative, the following template is suggested, specifying the sections and elements to include.

Table 2 - Template for the impact narrative (sections and content)

Section of the narrative	Elements to include
Stakeholders and Beneficiaries	Identification and description of impacted stakeholders Explanation of how stakeholders experienced meaningful change
Outcomes and Results	Description of specific outcomes, results, achievements Link to measurable results and selected KPIs
Transformation and Change	Description of changes in behaviour, practice, policy Identification and justification of the changes' character: incremental nature or achieved transformative change
Real-World Examples and Stories	Relatable examples, case studies, stories that illustrate impact in practice
Quantitative and Qualitative Evidence	Robust evidence and data: - Selected KPIs - Statistics, economic figures, other evidence from external sources - Interviews, surveys, expert opinions
Broader Societal Significance	Explanation of how R&I contributes to address goals, challenges and priorities in society, the economy, policy and practice

3 Identification and description of Key Performance Indicators

3.1 Quantitative Key Performance Indicators

3.1.1 Project impact in practice

1. % of land managers having changed or adopted one or more of their practices in a direction improving soil health	
Description and Importance	Accounting for the number of land managers that changed land management practices towards soil health in a significant share of the soil they manage, indicates the extent to which Mission Soil's initiatives are being up taken by practitioners; consequently, this data is indicative of the Mission's impact in supporting societal change (Pfeifer & Helming, 2024). Practices identified in literature as regenerative of soil health are (list to be completed): For farming: no-tillage or reduced tillage, intercropping, diversified crop rotation, cover crop, maintenance of crop residues (used as green manure), cultivation of nitrogen-fixing plants, mulching, and manuring and compost application (Alliance Environnement, 2021). For forestry: limit the area of compacted soils, limit impacts of roads and landings, limit soil disturbance and control erosion, maintain favourable conditions for forest growth, retain and enhance carbon storage, maintain soil productivity by soil testing and fertilization if needed, identify and retain preferred tree and understory species(USDA, 2019). For urban soils: innovative urban agriculture methods (e.g., green walls), green spaces sustainably managed, biological connectivity (i.e., blue, green and brown corridors) (BENCHMARKS, n.d.).
Definition	Number of land managers (who participate in Mission Soil projects including Living Labs or activities financed by private investment) that changed practices in at least 25% of the land they manage towards soil health per total number of land managers.
Measurement	Data is collected through a survey. In the survey, additional information is recorded: ● Land manager characterisation: type of land manager (agriculture, forest, nature conservation, urban) ● Property characterisation: total area (ha) ● Soil monitoring procedures The survey may be applied by one of the following methods: ● Determining the baseline assessment: At the start of the project, assess if land managers are applying practices for soil health and to which rate of the property (0%, 1-25%, 26-50%, 51-75%, 76-100%), at that point in time (question 2A). Towards the end of the

	project (4-year interval), assess if land managers have changed or adopted practices for soil health and in the rate of property included (question 2B). ● No baseline assessment: Assess if land managers have made changes to their practices, and to which rate of the property (0%, 1-25%, 26-50%, 51-75%, 76-100%), towards the end of the project (question 2C). Allows to bypass the inexistence of a baseline assessment. Questions 1, 3 and 4 presented below are common to both methods. Only questions 2 (A, B and C) differ. The survey is composed of the following questions: 1. Type of land manager 2. Land management practices: *(When determining the baseline assessment)* 2A. Over the last year, did you apply any practices that contribute to soil health? *(Circle all that apply)* ● Reduced tillage and no-tillage ● Intercropping ● Diversified crop rotation ● Cover crop ● Maintenance of crop residues (used as green manure) ● Cultivation of nitrogen-fixing plants ● Mulching ● Manuring and compost application ● Desealing of soil surfaces ● Installing permeable pavements ● Decontamination ● None 2B. As a result of [project/LL name], did you apply any practices that contribute to soil health over the last 4 years? *(Circle all that apply)* ● Reduced tillage and no-tillage ● Intercropping ● Diversified crop rotation ● Cover crop ● Maintenance of crop residues (used as green manure) ● Cultivation of nitrogen-fixing plants ● Mulching ● Manuring and compost application ● Desealing of soil surfaces ● Installing permeable pavements ● Decontamination ● None

	(When there is no baseline assessment) 2C. As a result of [project/LL name], did you apply for the first time, in the past 4 years this year (i.e., over the last 12 months) any practices that contribute to soil health? *(Circle all that apply)* • Reduced tillage and no-tillage • Intercropping • Diversified crop rotation • Cover crop • Maintenance of crop residues (used as green manure) • Cultivation of nitrogen-fixing plants • Mulching • Manuring and compost application • Desealing of soil surfaces • Installing permeable pavements • Decontamination • None 3. Characterisation of the property: 3A. What is the total area (ha) of your property? 3B. What's the percentage of your property in which you have applied at least one practice that contributes to soil health? • 0% • 1-25% • 26-50% • 51--100% 3C. To which type of land use have you applied at least one practice that contributes to soil health? • Crop land • Cultivated pasture • Forest • Rangeland • Conservation/protected area • Urban/industrial area • Other 4. Monitoring procedures: 3B. Did you apply any of the following soil monitoring procedures over the last 4 years? *(Circle all that apply)* • Analysis of the soil's physical properties • Analysis of the soil's chemical properties • Analysis of the soil's biological properties • Other monitoring procedure • None of the above To reach the number of land managers that changed practices towards soil health, count the land managers who have applied at least one soil-ameliorating practice (questions 2A and 2B or 2C), in at least 25% of the land they manage (question 3B).

	To reach the total number of land managers who participate in Mission Soil projects or activities financed by private investment, count all land managers involved. In both cases, the indicator is calculated as such: $$\frac{Nr.\,of\ land\ managers\ that\ changed\ farming\ practices}{Total\ Nr.\,of\ land\ managers\ reached\ by\ the\ project} \times 100$$
Level	NUTS level 3
Data source	Project reporting; Survey
Periodicity	Quadrennial
Type	Impact
Class	Practice take-up
References	Alliance Environnement. (2021). *Evaluation support study on the impact of the CAP on sustainable management of the soil*. https://doi.org/10.2762/799605 BENCHMARKS. (n.d.). *Urban soils: unsung heroes in the fight against climate change*. Retrieved May 21, 2025, from https://soilhealthbenchmarks.eu/urban-soils-unsung-heroes-fight-climate-change/ European Commission. (n.d.). *A soil deal for Europe: implementation plan*. Retrieved May 21, 2025, from https://research-and-innovation.ec.europa.eu/document/download/1517488e-767a-4f47-94a0-bd22197d18fa_en?filename=soil_mission_implementation_plan_final.pdf European Commission. (n.d.). *Result Indicators Dashboard*. Retrieved May 21, 2025, from https://agridata.ec.europa.eu/extensions/DataPortal/home.html European Commission. (2024). *Result indicators: version 21.0*. Nelson, S., & Swindale, A. (2013). *Feed the Future agricultural indicators guide: guidance on the collection and use of data for selected Feed the Future agricultural indicators*. Pfeifer, L., & Helming, K. (2024). Effective mission-oriented research: a new framework for systemic research impact assessment. *Research Evaluation*. https://doi.org/10.1093/reseval/rvae003 USAID. (2023). *Feed the Future indicator handbook*. USDA. (2019, August). *Maintaining and improving forest soil quality*. https://www.nrcs.usda.gov/sites/default/files/2022-11/E666A%20August%202019.pdf

2. Number and type of stakeholders involved in Mission Soil projects per type	
Description and Importance	This indicator assesses the number and type of stakeholders that are involved in Mission Soil projects. The type expresses the societal sectors and/or areas they represent. A stakeholder is any person or group directly or indirectly affected by a project/initiative/programme, as well as those who may have interests in a project/initiative/programme and/or the ability to influence its outcome, either positively or negatively (Yacoub et al., 2023). For the purposes of this indicator, only stakeholders who are actively involved in Mission Soil projects including Living labs (i. e., participated in at least one activity) are considered. Stakeholders may belong to different sectors and areas. Their diversity is acknowledged and represented in this indicator by disaggregating data per type of stakeholder and respective area of intervention. The quadruple helix model (Carayannis & Campbell, 2009) advocates for the inclusion of stakeholders from fours sectors: academia, industry, government and civil society in processes of innovative knowledge and practice co-construction (e.g., Living Labs). The quadruple helix model thus engages the ultimate end users of innovation, combining top-down and bottom-up approaches (Nguyen & Marques, 2022). Given Mission Soil's specificity, and to assess the involvement of land managers, six types of stakeholders are considered. The following types of stakeholder are considered in this indicator, according to the sector they represent: ● Government / Public Administration representatives ● Land managers / Practitioners ● Researchers ● Private Sector / Industry ● Non-Governmental Organisations ● Civil Society / Citizens Stakeholders are also characterised according to their main area / subject of intervention: ● Agriculture and forestry ● Environment / Nature conservation ● Spatial planning
Definition	Number and type of stakeholders involved in Mission Soil projects
Measurement	This indicator is measured by the number of stakeholders involved in Mission Soil projects, namely by participating in project activities (e.g., meeting, event, workshop, etc.) and their distribution per type of

	stakeholder and area of intervention. The frequency of participation is also assessed. This indicator is also disaggregated by frequency of participation in project activities: ● 1 – 3 activities ● 4 – 10 activities ● 11 – 20 activities ● > 21 activities (inclusive) Data is collected from project reports. Project reports must include the number of stakeholders involved in project activities, disaggregated by: ● Type of stakeholder (sector) ● Area of intervention ● Frequency of participation in project activities
Level	NUTS level 3
Data source	Project reporting
Periodicity	Biannual
Type	Input
Class	Governance structures
References	Carayannis, E. G., & Campbell, D. F. J. (2009). “Mode 3” and “Quadruple Helix”: toward a 21st century fractal innovation ecosystem. In International Journal of Technology Management (Vol. 46, Issues 3–4, pp. 201–234). Inderscience Publishers. https://doi.org/10.1504/ijtm.2009.023374 European Commission. (2021). *Evaluating the impact of Nature-based solutions: appendix of methods*. https://doi.org/10.2777/11361 European Commission. (n.d.). *A soil deal for Europe: implementation plan*. Retrieved May 21, 2025, from https://research-and-innovation.ec.europa.eu/document/download/1517488e-767a-4f47-94a0-bd22197d18fa_en?filename=soil_mission_implementation_plan_final.pdf Iackstock, K., Flanigan, S., Creaney, R., Matthews, K., Hopkins, J., Miller, D., Ahmed, A., Chabdu, A., Bacigalupo, A., & Thompson, C. (2022). *D4.3 - Participatory value chain analysis: report on the structure and valorisation of 23 mountain value chains across Europe, including evaluation of tele-coupling, assemblage, and enabling institutions and infrastructure*. www.moving-h2020.eu Nguyen, H. T., & Marques, P. (2022). The promise of living labs to the Quadruple Helix stakeholders: exploring the sources of (dis)satisfaction. *European Planning Studies*, *30*(6), 1124–1143. https://doi.org/10.1080/09654313.2021.1968798 Yacoub, C., Enriquez, S., & Ramirez, A. (2023). *Terms of Reference for the Soil Network of Knowledge Deliverable D2.2*.

3. % of private companies involved in the Mission Soil projects and % of funding allocated to private companies	
Description and Importance	The Mission Soil's inter- and transdisciplinary approach entails the involvement of entities and organisations from different sectors (European Commission, n.d.-a), namely as beneficiaries and affiliated entities of the Mission Soil projects. Assessing the involvement and funding of the private sector on Soil Mission projects is particularly relevant considering that it was found to be misrepresented in the EU Missions, in spite of the private companies' pivotal role in achieving the Missions' transformative goals (Karo et al., 2024). For the purposes of this indicator, all for-profit, privately-owned companies are considered.
Definition	% of partners in Mission Soil projects who are private companies and % of the total funding allocated to these companies
Measurement	This indicator is measured by calculating the proportion of partners in Mission Soil projects which are private companies, as well as the percentage of the total funding allocated to those companies. The indicator is calculated as such: $$\frac{Nr.of\ private\ companies\ involved\ in\ Mission\ Soil\ projects}{Total\ Nr.of\ partners\ involved\ in\ Mission\ Soil\ projects} \times 100$$ and $$\frac{Funding\ allocated\ to\ private\ companies\ in\ MSoil\ projects\ (€)}{Total\ funding\ allocated\ to\ partners\ in\ MSoil\ projects\ (€)} \times 100$$
Level	NUTS level 3
Data source	REA
Periodicity	Quadrennial
Type	Input
Class	Market take-up
References	European Commission. (n.d.). *A soil deal for Europe: implementation plan*. Retrieved May 21, 2025, from https://research-and-innovation.ec.europa.eu/document/download/1517488e-767a-4f47-94a0-bd22197d18fa_en?filename=soil_mission_implementation_plan_final.pdf Karo, E., Barajas, A., Sarvaranta, L., Antoniou, L., Boekholt, P., Monfray, P., Montante, S., & Subramaniam, S. (2024). *Commission Expert Group*

	to support the monitoring of EU Missions: final report of the EG. https://doi.org/10.2777/076494

4. Number of soil health related trainings per type of stakeholder target and per level of learning outcomes	
Description and Importance	Assess the capacity of the Mission Soil R&I funded projects to transfer knowledge across sectors, by measuring the number of soil health related training sessions per type of stakeholder target and per level of the learning outcomes. Training sessions refer to all activities designed to achieve particular learning objectives (UNESCO Institute of Statistics, n.d.) about soil health. To better assess the training sessions' impact, the number of participants per type of stakeholder will also be assessed, as well as the duration of the training and level of the learning outcomes. Concerning the learning outcomes, the European Qualifications Framework (EQF) will be used as reference. Even though EQF's main purpose is "to make qualifications more readable and understandable across different countries and systems" (CEDEFOP, n.d.) (e.g., determining the correspondence between master's degrees in different countries), it describes levels of learning outcomes expressing "what individuals know, understand and are able to do at the end of a learning process" (CEDEFOP, n.d.). While adapted to the context of training sessions organised in the scope of Mission Soil projects (and not to formal education degrees), the EQF's levels of learning outcomes are a useful tool to assess how specialised and/or advanced the trainings are. Learning outcomes are also directly connected to the prior level of expertise of the targeted participants (e.g., a training session targeted at participants with no knowledge of soil health is very unlikely to provide learning outcomes beyond level 3; whereas a training sessions targeted at soil health experts may result in learning outcomes of level 7 or 8). Following the European Qualifications Framework (EQF), the levels of learning outcomes are defined as follows (CEDEFOP, n.d.): ● Level 1: ○ **Knowledge:** Basic general knowledge ○ **Skills:** Basic skills required to carry out simple tasks ● Level 2

	○ **Knowledge:** Basic factual knowledge of a field of work or study ○ **Skills:** Basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools ● Level 3 ○ **Knowledge:** Knowledge of facts, principles, processes and general concepts, in a field of work or study ○ **Skills:** A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information ● Level 4 ○ **Knowledge:** Factual and theoretical knowledge in broad contexts within a field of work or study ○ **Skills:** A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study ● Level 5 ○ **Knowledge:** Comprehensive, specialised, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge ○ **Skills:** A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems ● Level 6 ○ **Knowledge:** Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles ○ **Skills:** Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialised field of work or study ● Level 7 ○ **Knowledge:** Highly specialised knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or research; Critical awareness of knowledge issues in a field and at the interface between different fields ○ **Skills:** Specialised problem-solving skills required in research and/or innovation in order to develop new knowledge and procedures and to integrate knowledge from different fields ● Level 8 ○ **Knowledge:** Knowledge at the most advanced frontier of a field of work or study and at the interface between fields

	○ **Skills:** The most advanced and specialised skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice
Definition	Number of training sessions on soil health per type of stakeholder target and per level of learning outcomes
Measurement	This indicator is measured by the number of training sessions on soil health organised within the scope of projects funded by the Mission Soil. The KPI is disaggregated by: ● Number of participants per type of stakeholder: ○ Government / Public Administration representatives ○ Land managers / Practitioners ○ Researchers ○ Private Sector / Industry ○ Non-Governmental Organisations ○ Civil Society / Citizens ● Duration of the training sessions: ○ ≤ 4 hours (≈ half-day) ○ 5 – 8 hours (≈ 1 day) ○ 9 – 16 hours (≈ 2 days) ○ 17 – 24 hours (≈ 3 days) ○ 25 – 40 hours (≈ 1 working week) ○ 41 – 80 hours (≈ 2 working weeks) ○ 81 – 160 hours (≈ 1 month) ○ > 160 hours (> 1 month) ● Level of learning outcomes: ○ Level 1 ○ Level 2 ○ Level 3 ○ Level 4 ○ Level 5 ○ Level 6 ○ Level 7 ○ Level 8 Data is collected from project reports.
Level	NUTS level 2
Data source	Project reporting

Periodicity	Quadrennial
Type	Output
Class	Capacity building
References	Carayannis, E. G., & Campbell, D. F. J. (2009). “Mode 3” and “Quadruple Helix”: toward a 21st century fractal innovation ecosystem. In *International Journal of Technology Management* (Vol. 46, Issues 3–4, pp. 201–234). Inderscience Publishers. https://doi.org/10.1504/ijtm.2009.023374 CEDEFOP. (n.d.). *European qualifications framework (EQF)*. Retrieved May 21, 2025, from https://www.cedefop.europa.eu/en/projects/european-qualifications-framework-eqf Iackstock, K., Flanigan, S., Creaney, R., Matthews, K., Hopkins, J., Miller, D., Ahmed, A., Chabdu, A., Bacigalupo, A., & Thompson, C. (2022). *D4.3 - Participatory value chain analysis: report on the structure and valorisation of 23 mountain value chains across Europe, including evaluation of tele-coupling, assemblage, and enabling institutions and infrastructure*. www.moving-h2020.eu Fialho, P., Quintini, G., & Vandeweyer, M. (2019). *Returns to different forms of job related training: factoring in informal learning* (OECD Social, Employment and Migration Working Papers, Vol. 231). https://doi.org/10.1787/b21807e9-en UNESCO Institute of Statistics. (n.d.). *Glossary*. Retrieved May 21, 2025, from https://uis.unesco.org/en/glossary Yacoub, C., Enriquez, S., & Ramirez, A. (2023). *Terms of Reference for the Soil Network of Knowledge Deliverable D2.2*.

5. Awareness of land managers with regard to soil health challenges	
Description and Importance	Evaluate the contribution of R&I to the information outreach of the Mission Soil to land managers. Land managers are responsible for making decisions related to land use and management. They may be individuals or companies, landowners, tenants or employed staff.
Definition	Percentage of land managers aware of soil health challenges

Measurement	This indicator measures the number of land managers that are aware of soil health per total number of land managers who participate in Mission Soil projects, including Living Labs. Data is collected through a survey, which is applied at least twice: i) at the start of the project (baseline assessment) and ii) towards the end of the project (4-year interval). The survey may also be applied half-way through the project, to provide a mid-term assessment. The survey is composed of X questions intended to measure the level of awareness of land managers recurring to a 5-point Likert scale. The survey was adapted from the Special Eurobarometer 501 (European Commission, 2020) and People's Climate Vote (Flynn et al., 2024); statements about soil health were adapted from European Commission (n.d.-b) and (European Environment Agency, n.d.). 1. In your opinion, how important is each of the following in enhancing soil health? (Not important at all, Somewhat unimportant, Neutral, Somewhat important, Extremely important) ● People should be educated on how to implement sustainable soil management practices ● Soil sealing should be limited ● The agricultural sector should reduce the use of fertilizers and pesticides ● Soil organic matter should be conserved and, in some cases, increased ● Preventing water-induced erosion should be prioritized ● There should be plant diversity in agriculture, forest and nature soils ● Both the EU and Member States should invest in gathering more information and knowledge about soil health 2. Please state to what extent you agree or disagree with each of the following statements (Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree): ● Restoring soil health is very important to me personally ● Soil degradation is a very serious problem at this moment ● Soil has a very important role in mitigating climate change ● Soil health has affected big decisions for me, such as where to live or work, or what to buy ● I often think about the importance of soil health ● When I take land management decisions, I often take soil health into consideration ● A healthy soil can improve the wealth/economy of the country To reach the total number of land managers who participate in Mission Soil projects, count all land managers involved in the project, in the different possible ways (as partners, as consultants, as owners of experimental plots, as participating in stakeholder groups, among others). If there is a broader

	group of land managers who also are in connection to the project consider those also. In both cases, the indicator is calculated as such: $$\frac{Nr.of\ land\ managers\ aware\ of\ soil\ health\ challenges}{Total\ Nr.of\ land\ managers} \times 100$$
Level	NUTS 3 level
Data source	Project reporting; Survey
Periodicity	Quadrennial
Type	Impact
Class	Literacy
References	European Commission. (2020). *Special Eurobarometer 501: attitudes of European citizens towards the environment*. European Commission. (n.d.). *What do you know about soil?* Retrieved May 21, 2025, from https://research-and-innovation.ec.europa.eu/document/download/4250b8c8-b27f-4417-95fb-ec26d375a042_en?filename=test_your_knowledge_what_do_you_know_about_soil_ European Environment Agency. (n.d.). *Soil pollution and health*. Retrieved May 21, 2025, from https://www.eea.europa.eu/publications/zero-pollution/health/soil-pollution Flynn, C., Jardon, S. T., Fisher, S., Blayney, M., Ward, A., Smith, H., Struthoff, P., & Fillingham, Z. (2024). *Peoples' climate vote 2024: results*. Krachman, S. B., Arnold, R., & Larocca, R. (2016). *Expanding the definition of student success: a case study of the CORE districts*. Mathematica, Bill & Melinda Gates Foundation, & Mirror Group. (2016). *Education-to-workforce indicator framework: using data to promote equity and economic security for all*. Transforming Education. (2016). *Measuring MESH: student and teacher surveys curated for the CORE Districts*.

6. Number of strategic partnerships established	
Description and Importance	This KPI measures the projects' ability to establish strategic partnerships with relevant stakeholders in the soil health research and innovation domain. It can be measured by the number of partnerships formed during the project. For the purpose of this indicator - and drawing from the European Association for International Education (EAIE)'s definition of "strategic international partnership" (Engel et al., 2015) -, a strategic partnership is defined as a partnership between a Mission Soil project or initiative and other projects, institutions and other entities that promotes long-term collaboration by building sustainable networks, and encourages exchanges of knowledge and practices.
Definition	Number of strategic partnerships formed during the course of funding by Mission Soil funded projects
Measurement	This indicator is measured by the number of strategic partnerships formed during the course of funding by Mission Soil funded projects with other projects, institutions and other entities. The KPI is disaggregated by: ● Aspects covered by the strategic partnership: ○ Joint research and innovation activities ○ Research projects ○ Knowledge exchange ○ Curriculum development or teaching collaborations ○ Capacity building ○ Joint or double/ multiple degree programme ○ Joint use of facilities, research infrastructure, manpower ○ Virtual collaboration ● Type of stakeholder with which the strategic partnership is formed: ○ R&I project ○ Public / State institution ○ Private company ○ Non-governmental organisation ○ Academic institution ○ Other Data is collected from project reports. The KPI disaggregation results from the adaptation of the EAIE Barometer Survey (Engel et al., 2015).
Level	EU
Data source	Project reporting
Periodicity	Quadrennial

Type	Impact
Class	Enabling conditions
References	Engel, Leonard., Sandstrom, A.-Malin., Aa, R. van der., & Glass, Anna. (2015). *The EAIE barometer : internationalisation in Europe*. The European Association for International Education.

7. Number and percentage of land managers and advisors who are "new commers" to Horizon Europe projects	
Description and Importance	Evaluate the capacity of Mission Soil projects to engage new stakeholders, who had never participated in Horizon Europe projects, among land managers and advisors, thus extending the impact beyond the "usual suspects", and mitigating stakeholder fatigue.
Definition	Number and percentage of land managers and advisors who have participated in Horizon Europe projects, through Mission Soil projects, for the first time
Measurement	This indicator measures the number and percentage of land managers and advisors who have participated in Horizon Europe projects, through Mission Soil projects, for the first time. Data is collected through a survey. In the survey, additional information is recorded: ● Type of stakeholder: land manager, advisor ● Stakeholder characterisation according to the land use type in which they operate the most: agriculture, forest, nature conservation, urban The survey is applied at the start of the project / process of stakeholder engagement. The survey is composed of the following questions: 1. Type and characterisation of stakeholder 2. Have you ever participated in a soil health-related project? ● No ● Yes If you answered "Yes", please indicate in which projects you have already participated. 3. Previous participation: *(Only if the answer to the previous question was "Yes")* 3A. Please indicate in which projects you have already participated. 3B. For each project in which you have participated, please indicate its scale: ● Regional ● National

	● European - Horizon Europe ● European - other programmes To reach the number of land managers and advisors that have participated for the first time in a Mission Soil project, count the stakeholders who have answered “No” to question 2. To reach the total number of land managers and advisors, count all that have been reached by the project. To calculate the percentage of land managers and advisors who are “new commers” to Mission Soil projects, apply the following formula: $$\frac{Nr.of\ land\ managersand\ advisors\ who\ are\ "new\ commers"}{Total\ Nr.of\ land\ managers\ and\ advisors} \times 100$$
Level	NUTS level 3
Data source	Project reporting; Survey
Periodicity	Quadrennial
Type	Input
Class	Practice take-up
References	Nelson, S., & Swindale, A. (2013). *Feed the Future agricultural indicators guide: guidance on the collection and use of data for selected Feed the Future agricultural indicators*. USAID. (2023). *Feed the Future indicator handbook*.

8. Number of co-creation events related to soil health per type and number of stakeholders involved	
Description and Importance	This KPI measures the extent to which projects and initiatives under the Soil Mission are fostering collaborative, participatory processes through co-creation events focused on soil health. It is assessed by tracking the number of such events and the number and diversity of stakeholders involved. Co-creation is a core principle of the Soil Mission, which emphasizes participatory innovation and stakeholder engagement to address fragmented research and promote coordinated action for soil health (Bioengineer.org, 2025; European Commission, n.d.). By bringing together these stakeholders, co-creation events serve as platforms for integrating scientific research with local knowledge and policy needs, facilitating the development and adoption of sustainable soil management practices that are more likely to be adopted and sustained over time (Räsänen et al., 2024). This KPI provides a valuable indicator of how well projects are engaging key actors, it reflects the Mission’s commitment to cross-scale, inter- and transdisciplinary research and innovation, ensuring that solutions are co-developed with input from all relevant sectors and knowledge systems (Räsänen et al., 2024).

Definition	Number of co-creation events related to soil health (since September 2019)

Measurement	This KPI measures the frequency and diversity of co-creation events organized within EU Soil Mission projects, categorizing them by event type (e.g., workshops, living labs, stakeholder forums) and quantifying the participation of different stakeholder groups based on the quadruple helix model. The indicator captures both the range (number and types of events) and the inclusivity (number and diversity of stakeholders) of collaborative activities aimed at improving soil health.
	
	This indicator is disaggregated by:
	
	• **Number of events per project** (Title of the event)
	• **Type of stakeholder involved**
	• **Number of stakeholders involved per event** (ranges are provided)
	
	For this KPI, the following measurement methodology can be applied:
	
	1. Event Identification
	
	Define and catalogue all co-creation events organized within the project period. Please include all the following types of events: workshops, living labs, stakeholder forums, training sessions, demonstration events, and other participatory formats.
	
	2. Stakeholder Mapping and Quantification
	
	• Categorize participants by stakeholder group:
	  ○ Government / Public Administration representatives
	  ○ Land managers / Practitioners
	  ○ Researchers
	  ○ Private Sector / Industry
	  ○ Non-Governmental Organisations
	  ○ Civil Society / Citizens
	
	• Track the diversity of stakeholder groups present at each event to assess inclusivity and breadth of engagement.
	
	3. Frequency and range
	
	• Count the total number of co-creation events held within a defined reporting period (e.g., annually or per project phase).
	• Calculate the average and range of stakeholder groups represented per event.
	
	Aggregate data to provide:
	
	• Number of unique stakeholders per type and event.

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Total and unique stakeholder participation across all events.
Data for this KPI is collected from project reports. Project reports must document the following:

A list and description of each co-creation event conducted (including date, format, and purpose)
The number of participants per event
A breakdown of participants by stakeholder type and area of intervention
The frequency of participation for each stakeholder, where applicable

<table>
<tr><th rowspan="2">Event No.</th><th rowspan="2">Stakeholder Type</th><th colspan="3">Number of Stakeholders</th></tr>
<tr><th><10</th><th>10-50</th><th>>50</th></tr>
<tr><td rowspan="6">1</td><td>Government/Public administration</td><td></td><td></td><td></td></tr>
<tr><td>Land Managers/Practitioners</td><td></td><td></td><td></td></tr>
<tr><td>Researchers</td><td></td><td></td><td></td></tr>
<tr><td>Private-Sector/ Industry</td><td></td><td></td><td></td></tr>
<tr><td>Non - Governmental Organisations</td><td></td><td></td><td></td></tr>
<tr><td>Civil Society/ Citizens</td><td></td><td></td><td></td></tr>
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<tr><td>Level</td><td>NUTS level 3</td></tr>
<tr><td>Data source</td><td>MS reporting; Project reporting</td></tr>
<tr><td>Periodicity</td><td>Quadrennial</td></tr>
<tr><td>Type</td><td>Output</td></tr>
<tr><td>Class</td><td>Capacity building</td></tr>
<tr><td>References</td><td>

European Commission. (n.d.). A soil deal for Europe: implementation plan. Retrieved May 21, 2025, from https://research-and-innovation.ec.europa.eu/document/download/1517488e-767a-4f47-94a0-bd22197d18fa_en?filename=soil_mission_implementation_plan_final.pdf

Bioengineer.org. (2025, April 22). PREPSOIL final event: advancing the deployment of Mission Soil across European regions. https://bioengineer.org/prepsoil-final-event-advancing-the-deployment-of-mission-soil-across-european-regions/#google_vignette

Räsänen, T. A., Raffa, D. W., Delin, S., Jouini, M., Kasparinskis, R., Dirnēna, B., Trinchera, A., Ooms, D., Saarloos, A., Kukuļs, I., Baratella, V., Erdal, Ü., Demir, Z., Simonse, D., & Hanegraaf, M. (2024). PRAC2LIV final report: stocktake and stakeholder exchanges on decision support tools for soil organic matter, nutrient use efficiency, and water retention across EJP SOIL countries. https://doi.org/10.5281/zenodo.14197806

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3.1.2 Project impact on policy and administration

9. MS introducing evidence-based policy changes aiming to improve soil health	
Description and Importance	Assessment of the Mission Soil's impact on Member States' policies and regulations, including the provision of scientific outputs and outcomes introduced into policy making. For the purposes of this indicator, the introduction of policy changes to improve soil health must be traceable to Mission Soil, both directly (e.g., scientific evidence comes directly from Mission Soil funded projects) or indirectly (e.g., scientific initiatives that have gained from the Mission Soil activities). To evaluate whether policy changes are traceable to the Mission Soil, it is recommended to apply the Process Tracing methodology. This monitoring and evaluation methodology has the purpose of establishing how a cause influenced a specific change (INTRAC, 2017). Although there are specific tests that may be applied to the existing evidence which links potential causes to the change ("Straw in the wind", "Hoop", "Smoking gun", "Doubly Decisive"), the methodology may be summarised in 5 analytical steps (INTRAC, 2017): ● Step 1: Identify the change or changes to be explained ● Step 2: Establish the evidence for the change ● Step 3: Document the processes leading to the change ● Step 4: Establish alternative causal explanations ● Step 5: Assess the evidence for each causal explanation Traceability to Mission Soil also ensures that policy changes are evidence-based. The concept of evidence-based policy is drawn from the OECD's definition of evidence-informed policy-making: "a process whereby multiple sources of information, including statistics, data and including the best available research evidence and evaluations, are consulted before making a decision to plan, implement, and (where relevant) alter public policies, programmes and deliver quality public other services" (OECD, 2020a) 12). For the purposes of this indicator, the only types of public policy instruments to be considered are regulations and legislation.
Definition	Number of MS introducing evidence-based soil health-related legislation or specific regulations in their regulatory bodies, including specific legislation on soil related topics (direct or indirect) with demonstrable use of scientific evidence
Measurement	This indicator measures the number of Member States that have introduced or are in the process of introducing soil health-related legislation or specific regulations in their regulatory bodies, which are evidence-based. Only policy changes which are traceable (directly or indirectly) to Mission Soil are considered.

	OPTION 1 To ascertain whether policy changes are to be considered for this KPI, an analysis should be conducted to evaluate if those policies i) are traceable to the Mission Soil (see Description and Importance), and ii) abide by the principles and standards for the good governance of evidence (OECD, 2020b). The OECD (OECD, 2020b) recommends the following principles and standards for the good governance of evidence in the context of policy design, implementation and evaluation: ● Principles: ○ Appropriate evidence for the policy concern ○ Ensuring integrity (honest brokerage) ○ Accountability ○ Contestability ○ Public representation in decision-making ○ Transparency in the use of evidence ○ Building evidence through emerging technologies and mobilising data ● Standards: ○ Standards concerning evidence synthesis ○ Theory of change and logic underpinning an intervention ○ Design and development of policies and programmes ○ Efficacy of an intervention ○ Effectiveness of interventions ○ Cost effectiveness of interventions ○ Implementation and scale up of interventions *OPTION 2* To ascertain whether policy changes are to be considered for this KPI, an analysis should be conducted to evaluate if those policies i) are traceable to the Mission Soil (see Description and Importance), and ii) present a set of core characteristics of evidence-based policy instruments (OECD, 2020a). The OECD (OECD, 2020a) mentions the following aspects as being characteristically present in evidence-based policy instruments: ● “Policy memory” ● Evidence synthesis (systematic reviews) ● Implementation science and evidence on factors that help and hinder implementation ● Policy evaluation system and its strategic use ● RIA ● Transparency

	COMMON TO BOTH OPTIONS In order to provide additional information, the indicator disaggregates by: ● Number and type of policy instruments: ○ Taxes and fees ○ Environmentally beneficial subsidies and payments ○ Tradable permits and offsets ○ Deposit-refund schemes ○ Voluntary approaches ● Geographic scope: ○ Local / city ○ State / Provincial ○ National / Federal ○ Supranational / International ○ Other ● Impacted economic sector: ○ Laws without direct impact ○ Agriculture, forestry, livestock, fishing and food system ○ Real estate / Properties binding ○ Mining and quarrying ○ Waste ○ Energy ○ Industry and manufacturing ○ Transport ○ Tourism ○ Public sector ● Status: ○ Planned ○ Adopted (approved as a directive or a parliamentary decision) ○ Effective The survey results from the adaptation of measurement methodologies for indicators on environmental policy instruments (OECD, EEA, UN).
Level	MS
Data source	MS reporting; Consulting; Project reporting
Periodicity	Quadrennial
Type	Impact
Class	Enabling conditions
References	European Environment Agency. (n.d.). *Number of countries that have adopted a climate change adaptation strategy/plan*. Retrieved May 21, 2025, from European Environment Agency.

	(n.d.). Number of countries that have adopted a climate change adaptation strategy/plan. INTRAC. (2017). *Process tracing*. https://www.intrac.org/app/uploads/2017/01/Process-tracing.pdf Mourelatou, A. (2018). *Environmental indicator report 2018: in support to the monitoring of the Seventh Environment Action Programme*. OECD. (2024). *The Policy Instruments for the Environment (PINE) database questionnaires*. OECD. (2020a). *Building capacity for evidence-informed policy-making: lessons from country experiences*. OECD Publishing. https://doi.org/10.1787/86331250-en OECD. (2020b). *Mobilising evidence for good governance: taking stock of principles and standards for policy design, implementation and evaluation*. OECD Publishing. https://doi.org/10.1787/3f6f736b-en United Nations Parliamentary Observatory on Climate Change and Just Transition. (n.d.). *Environmental legislation*. Retrieved May 21, 2025, from https://opcc.cepal.org/en/tracker/environmental-legislation Princen, S. (2022). The use of evidence in evidence-based legislation. *European Journal of Law Reform*, *24*(1), 147–160. https://doi.org/10.5553/ejlr/138723702022024001010

10. Number of open access datasets related to soil health indicators to which MS R&I projects have contributed	
Description and Importance	This KPI measures the number of open access datasets related to soil health indicators that have benefited from the direct contribution of Mission Soil research and innovation (R&I) projects. Contributions may include the provision of original data, validation, harmonisation, or enhancement of existing datasets. The datasets must be datasets accessible through recognized platforms or repositories and publicly available. This KPI reflects the role of Mission Soil projects in advancing data openness and interoperability, in line with the FAIR (Findable, Accessible, Interoperable, Reusable) principles. It also highlights the Mission's impact on strengthening shared data infrastructures and promoting knowledge exchange across scientific, policy, and practitioner communities engaged in soil health.
Definition	Number of open access datasets related to soil health indicators to which MS R&I projects have contributed

Measurement	This indicator is measured by counting the number of open access datasets related to soil health indicators that include contributions from Mission Soil R&I projects. Contributions may take the form of newly generated data, methodological development, data harmonisation, validation, metadata enhancement, or integration of project results into existing public datasets. The indicator is disaggregated by: ● Type of contribution (data generation, data harmonisation, data validation, integration of new KPIs, data analysis and visualisation) ● Type of dataset (where applicable: soil properties, soil threats, soil functions, soil point data) [Based on the ESDAC Category system and assuming the integration of data into the ESDAC Datasets] ● Hosting platform or repository ● Geographic scope of the dataset (EU, NUT level 1 - 3, local) Data is collected from: ● Project deliverables and data management plans ● Reports and documentation of dataset submissions or contributions Only datasets that are fully accessible to the public and clearly acknowledge the contribution of one or more Mission Soil projects are included in the count.
Level	EU, MS, NUT level 1 -3, local
Data source	Survey
Periodicity	Quadrennial
Type	Output
Class	Enabling conditions
References	European Soil Data Centre. (n.d.). *Soil Mission projects*. Retrieved May 29, 2025, from https://esdac.jrc.ec.europa.eu/projects/soil-mission-projects Hengl, T. (n.d.). *Soil health data cube for Europe*. https://doi.org/https://zenodo.org/records/13838797 Panagos, P., Broothaerts, N., Ballabio, C., Orgiazzi, A., de Rosa, D., Borrelli, P., Liakos, L., Vieira, D., van Eynde, E., Arias Navarro, C., Breure, T., Fendrich, A., Köninger, J., Labouyrie, M., Matthews, F., Muntwyler, A., Jimenez, J. M., Wojda, P., Yunta, F., … Jones, A. (2024). How the EU Soil Observatory is providing solid science for healthy soils. In *European Journal of Soil Science* (Vol. 75, Issue 3). John Wiley and Sons Inc. https://doi.org/10.1111/ejss.13507

11. Number of standardized soil health indicators developed by Soil Mission Soil projects included in soil monitoring systems	
Description and Importance	This KPI quantifies the number of standardized soil health indicators that have been integrated into soil monitoring systems as a result of development and proposals by Mission Soil projects. Standardized soil health indicators are scientifically validated, harmonized metrics that enable consistent assessment of soil condition, degradation, and ecosystem service provision across different land uses and geographic regions. These indicators are selected based on their relevance to soil functions, feasibility of measurement, and alignment with Mission Soil objectives. Standardization ensures that indicators are comparable across sites, projects, and countries, facilitating data integration and supporting evidence-based decision-making at local, national, and EU levels.
Definition	Number of standardized soil health indicators included in national soil monitoring systems that were developed by Mission Soil Projects
Measurement	This indicator is measured by counting the number of soil health indicators that have been developed by Mission Soil projects and formally included in local, regional, national, and EU-level soil monitoring systems. The indicator is disaggregated by: ● Type of soil health indicator: physical, chemical, biological ● Level of standardisation: project-level standard, national-level adoption, proposed to EU-wide frameworks Stage of adoption: ● Developed and validated by project ● Formally proposed to relevant monitoring bodies ● Under review ● Adopted by a monitoring system ● Geographic scope of the proposed application (EU, NUT level 1-3, local) Data can be collected from project deliverables detailing the development and validation of soil health indicators. Only indicators that demonstrate formal proposal, submission for integration or actual adoption — beyond internal project use — are counted.
Level	**EU,** MS, NUTS level 2-3
Data source	MS reporting; EUSO; Project reporting
Periodicity	Quadrennial
Type	Outcome
Class	Enabling conditions

References	Huber, S., Syed, B., Freudenschuβ, A., Ernstsen, V., Loveland, P., & Gentile, A. R. (2001). *Proposal for a European soil monitoring and assessment framework*. Pavlu, L., Sobocka, L., Boruvka, L., Penizek, V., Adamczyk, B., Baumgarten, A., Castro, I. V., Cornu, S., de Boever, M., Don, A., Feiziene, D., & Vervuurt, W. (2021). *Stocktaking on soil quality indicators and associated decision support tools, including ICT tools*. https://doi.org/10.18174/563875 ISO. (2022). *Soil quality: framework for detailed recording and monitoring of changes in dynamic soil properties (ISO 23992:2022)*. https://www.iso.org/standard/77569.html

12. Number of Mission Soil project researchers involved in national or regional advisory boards	
Description and Importance	This Key Performance Indicator (KPI) tracks the extent to which researchers involved in Mission Soil projects contribute to national and regional policy and decision-making processes. Specifically, it measures the number of researchers who formally participate in advisory boards—such as Mirror Groups, policy committees, or stakeholder panels—focused on soil health and land management. This participation reflects the researchers' role in providing scientific consultancy, strategic guidance, and evidence-based input into governance and policy development related to soil. The KPI highlights the influence of Mission Soil research beyond academia by capturing how soil health-related research outcomes are integrated into territorial planning, environmental regulation, and sustainable land management strategies. It serves as a proxy for assessing both the policy relevance and practical impact of Mission Soil-funded research in shaping decisions at various levels of governance. This indicator is important for three main reasons. First, it strengthens the science-policy interface by ensuring that up-to-date scientific knowledge informs policy and implementation. Second, it accelerates the uptake of research results by leveraging researchers' expertise to turn Mission objectives into concrete strategies and actions. Third, it enhances stakeholder engagement and awareness by fostering collaboration among governments, industry, civil society, and local actors.
Definition	Number of Mission project researchers involved in national or regional advisory boards
Measurement	This indicator is measured by counting the number of researchers affiliated with Mission Soil projects who are formally appointed to national or regional advisory boards related to soil, agriculture, environment, land use, or sustainability

	policy. Advisory boards are defined as official or semi-official bodies that provide strategic advice, policy recommendations, or scientific guidance to public authorities or governmental institutions. This indicator is disaggregated by: • Country of operation • Level of advisory board (national or regional) • Type of advisory board (e.g., environmental, agricultural, land management, soil health-specific) • Role of the researcher (e.g., member, chair, expert consultant) • Researcher's field of R&I o Natural sciences o Engineering and technology o Medical and health sciences o Agricultural and veterinary sciences o Social sciences o Humanities and arts

Member state	Role of the researcher	Researcher's field (e.g. Natural sciences, engineering & tech, medical & health, agricultural & veterinary, social science, humanities & arts)	Type of advisory board (e.g., environmental, agricultural, land management, soil health-specific)	Level of advisory board	
				National	Regional
	Member				
	Chair				
	Expert				
	Consultant				
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.

	Data is collected from project reports and verified through: • Researcher self-reporting within project deliverables or CVs • Minutes or membership lists of advisory board meetings • Official appointment letters or public records from relevant institutions To ensure consistency, only advisory roles that are formally recognized and involve active participation (e.g., attendance, contribution to recommendations) during the reporting period are counted.
Level	MS
Data source	Project reporting; MS reporting
Periodicity	Quadrennial
Type	Outcome
Class	Public take-up
References	Mission Soil Board. (2024). *Mission Soil Board's set of recommendations for the establishment of national Mirror Groups*.

	OECD (2015) Frascati Manual 2015: guidelines for collecting and reporting data on research and experimental development, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264239012-en

13. Number of municipalities and regions pursuing citizen led R&I activities related to the Mission Soil	
Description and Importance	This KPI measures the number of municipalities and regions that actively implement research and innovation (R&I) activities aligned with the objectives of the Mission Soil and that have been initiated by citizen input. Citizen-led activities are actions or initiatives that are initiated, designed, governed, and often implemented primarily by ordinary citizens or community groups. It reflects the extent to which local and regional authorities are empowered to take action on soil health by integrating citizen-driven priorities into their soil-related R&I agendas. The KPI captures both the diffusion of Mission Soil principles at the territorial level and the role of public engagement in shaping place-based solutions. It also serves as an indicator of how Mission Soil fosters inclusive, bottom-up approaches that enhance the relevance, legitimacy, and uptake of soil health innovations.
Definition	Number of municipalities and regions pursuing citizen-led R&I activities related to the Mission Soil objectives. These activities may include local soil monitoring programs, citizen driven environmental assessments or experiments, or other R&I activities.
Measurement	This indicator is measured by counting the number of municipalities and regions that have initiated or are actively implementing R&I activities related to soil health that were proposed, co-designed, or strongly influenced by citizen input. Citizen-led R&I activities refer to actions that emerge from participatory processes which may include public consultations, citizen science initiatives, co-creation workshops or other forms of structured community engagement, local soil monitoring programmes, among others. This indicator is disaggregated by: ● Country ● Administrative level (municipality or region) ● Type of initiative ● Connection to Mission Soil objectives (e.g., soil restoration, organic matter management, erosion prevention) Data is collected from: ● Project reports and deliverables describing citizen engagement outcomes and follow-up actions ● Official documents from municipalities or regional authorities (e.g., action plans, policy briefs, funding decisions) ● Stakeholder interviews or surveys verifying citizen involvement and local authority commitment

	Only activities that demonstrate a clear link between citizen input and the resulting R&I actions are counted under this indicator.
Level	NUTS level 3
Data source	MS reporting; Reporting through the Council of Cities Living Labs
Periodicity	Quadrennial
Type	Outcome
Class	Public take-up
References	European Commission. (n.d.-c). *EU Missions & citizen engagement activities*. Retrieved May 29, 2025, from https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/eu-missions-citizen-engagement-activities_en Schwanitz, V. J., Wierling, A., Arghandeh Paudler, H., von Beck, C., Dufner, S., Koren, I. K., Kraudzun, T., Marcroft, T., Mueller, L., & Zeiss, J. P. (2023). Statistical evidence for the contribution of citizen-led initiatives and projects to the energy transition in Europe. *Scientific Reports*, *13*(1). https://doi.org/10.1038/s41598-023-28504-4

3.1.3 Project impact on value chain organization and practices

14. Number of research-innovation outputs transferred into the market	
Description and Importance	Evaluation of the efficiency of the innovation process in the context of the Mission Soil. In the Oslo Manual, the OECD defines an innovation as “a new or improved product or process (or combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)” (OECD & Eurostat, 2018). For the purposes of this indicator, “unit” is either a consortium of partners or individual partners which have produced an innovation in the scope of a Mission Soil-funded project or initiative.
Definition	Number of research-innovation outputs transferred into the market per type of target audience
Measurement	This indicator measures the number of research-innovation outputs transferred into the market, per type of target audience.

	This indicator disaggregated by: ● Type of research-innovation: ○ Concept ○ Product ○ Process ○ Service (non-consulting) ○ Consulting service ● Target audience: ○ Government / Public Administration representatives ○ Land managers / Practitioners ○ Researchers ○ Private Sector / Industry ○ Non-Governmental Organisations ○ Civil Society / Citizens Data is collected from project reports. The KPI disaggregation results from the adaptation of the Innovation Radar Questionnaire (De Prato et al., 2015).
Level	EU
Data source	Project reporting
Periodicity	Quadrennial
Type	Impact
Class	Market take-up
References	de Prato, Giuditta., Nepelski, Daniel., & Piroli, Giuseppe. (2015). *Innovation radar: identifying innovations and innovators with high potential in ICT FP7, CIP & H2020 projects* (E. O'Neill, Ed.). JRC-IPTS. OECD, & Eurostat. (2018). *Oslo Manual 2018: guidelines for collecting, reporting and using data on innovation* (4th ed.). OECD Publishing. https://doi.org/10.1787/9789264304604-en

15. Member States introducing a soil health certificate per type of certification	
Description and Importance	Assess the level of market integration of soil health requirements, by considering various types of certifications resulting from the Mission Soil's action. The creation of a "voluntary soil health certification for land-owners and managers" (Halleux, 2024) as initially proposed in the early versions of the Soil Monitoring Law has been dismissed in the current proposal (European Commission, 2024). The fact that evidence suggests that certification

	schemes are not appealing to farmers, particularly small-scale producers (Vanzini et al., 2024), may have weighed in the decision. Considering this potential limitation, this indicator accounts not only for certifications that attest to a healthy soil, but also for other types of related certification, such as accredited training in soil health (e.g., London College of Foreign Trade), soil science professionals (e.g., Soil Science Society of America, 2023) and sectoral certifications (e.g., environment, agriculture) that, in spite of not being focused on soil, explicitly encompass soil health standards (e.g., Soil Association, 2024). For the purposes of this indicator, the introduction of soil health certificates must be traceable to Mission Soil, both directly (e.g., certificate as an outcome of a MSoil project) or indirectly (e.g., certificates that have been introduced due to the MSoil activities). To evaluate whether the introduction of soil health certificates is traceable to the Mission Soil, it is recommended to apply the Process Tracing methodology. This monitoring and evaluation methodology has the purpose of establishing how a cause influenced a specific change (INTRAC, 2017). Although there are specific tests that may be applied to the existing evidence which links potential causes to the change ("Straw in the wind", "Hoop", "Smoking gun", "Doubly Decisive"), the methodology may be summarised in 5 analytical steps (INTRAC, 2017): ● Step 1: Identify the change or changes to be explained ● Step 2: Establish the evidence for the change ● Step 3: Document the processes leading to the change ● Step 4: Establish alternative causal explanations ● Step 5: Assess the evidence for each causal explanation
Definition	Number of MS with a soil health certificate, per type of certification
Measurement	This indicator measures the number of Member States that have introduced soil health-related certifications. In order to provide additional information, the indicator disaggregates by: ● Type of certification: ○ Soil health certificate ○ Accredited training ○ Soil science professionals ○ Sectoral certifications encompassing explicit soil health standards ○ Other ● Level of certification: ○ National / Federal ○ Supranational / International ○ Other ● Type of entity issuing the certification: ○ Public / State institution

	○ Private company ○ Non-governmental organisation ○ Academic institution ○ Other • Type of target audience (multiple option) ○ Producers / Farms ○ Private companies / Brands ○ Soil professionals
Level	MS
Data source	MS reporting
Periodicity	Quadrennial
Type	Outcome
Class	Market take-up
References	European Commission. (2023). *Annex to the Commission decision on the publication of the user's guide setting out the steps needed to participate in the EU eco-management and audit scheme (EMAS) pursuant to Regulation (EC) No 1221/2009 of the European Parliament and of the Council* (C(2023) 7207 final). European Commission. (2024). *Proposal for a directive of the European Parliament and of the Council on soil monitoring and resilience (Soil Monitoring Law)* (COM(2023) 416 final). https://sdgs.un.org/goals Halleux, V. (2024). *Briefing: Soil monitoring and resilience directive*. INTRAC. (2017). *Process tracing*. https://www.intrac.org/app/uploads/2017/01/Process-tracing.pdf ISO. (n.d.). *14000 family: environmental management*. Retrieved May 22, 2025, from https://www.iso.org/standards/popular/iso-14000-family London College of Foreign Trade. (n.d.). *Certified professional in soil health monitoring protocols*. Retrieved May 22, 2025, from https://ca.lcft.org.uk/Home/CourseDetail?courseId=1094513 Regenified. (2024). *6-3-4 ™: Verification standard for regenerative agriculture*. https://s3.amazonaws.com/media.regenified.com/wp-content/uploads/2024/08/18191226/Final-4-10-2024-2024-Revision-Regenified-6-3-4-Verification-Standard-1.pdf Regenified. (2023). *6-3-4™: Verification standard for regenerative forestry*. https://s3.amazonaws.com/media.regenified.com/wp-content/uploads/2024/03/21022745/Regenified-6-3-4-Forestry-Standard.pdf Soil Association. (2024). *Soil Association Organic Standards for Great Britain farming and growing*. https://www.soilassociation.org/media/25986/sa-gb-farming-growing.pdf

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16. Number of patents and other intellectual property rights (IPR) applications	
Description and Importance	This KPI measures the applied impact of Soil Mission projects in market and society, and monitors the increase in the number of invention disclosures after the common IPR strategy is piloted. For the purpose of this indicator, only patents and other IPR applications which are expected to have a direct impact in land management for soil health (e.g. farming machinery) are considered. Also, the following types of industrial property IPR applications are considered (Bernard et al., 2024; European Parliament, 2025): ● Patents ● Trademarks ● Industrial designs and models Information is also gathered about the type of Horizon Europe projects that submit the applications (European Commission, 2025): ● Research and innovation action (RIA) ● Innovation action (IA) ● Coordination and support action (CSA) ● Programme co-fund action (COFUND)

Definition	Number of patents and other intellectual property rights (IPR) applications resulting from the projects funded by the Mission Soil
Measurement	This indicator is measured by the number of patents and other IPR applications filed as a result of projects funded by the Mission Soil, and which are expected to be relevant for land management for soil health The KPI is disaggregated by: ● Type of project: Research and innovation action (RIA), Innovation action (IA), Coordination and support action (CSA), Programme co-fund action (COFUND) ● Type of IPR application: patents, trademarks, industrial designs and models; ● Status of the IPR applications: pending, awarded. Data is collected from project reports.
Level	EU
Data source	Project reporting
Periodicity	Quadrennial
Type	Outcome
Class	Market take-up
References	Bernard, H., Markianidou, P., Pétré, H., & Rosenfeld, D. (2024). *European innovation scoreboard 2024 methodology report*. http://data.europa.eu/eli/dec/2011/833/oj European Commission. (2025). *Horizon Europe programme guide (V5.0)*. https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/programme-guide_horizon_en.pdf European Parliament. (2025). *Fact Sheets on the European Union: intellectual, industrial and commercial property*. https://www.europarl.europa.eu/erpl-app-public/factsheets/pdf/en/FTU_2.1.12.pdf

17. Number of businesses and companies implementing science-based strategies for regenerating soils in their production and supply chains	
Description and Importance	Assess the capacity of Mission Soil outcomes in providing evidence-based instruments to be directly or indirectly used by the market in production and/or supply chain solutions. The United Nations Global Compact advocates for supply chain sustainability, defined as the “the management of environmental, social and economic impacts and the encouragement of good governance practices, throughout the

	lifecycles of goods and services." (United National Global Compact Office & BSR, 2015: 5). By taking up such a sustainable approach, "companies act in their own interest, the interests of their stakeholders and the interests of society at large." (United National Global Compact Office & BSR, 2015: 5). This indicator falls under the same scope, but focuses specifically on production and supply chain management practices that have a positive impact on soil health, and which result from scientific outcomes of Mission Soil projects.
Definition	Number of businesses and companies implementing science-based strategies for regenerating soils in their production and supply chains. Ideally, the specific scientific contributions should be tracked by survey.
Measurement	This indicator measures the number of businesses and companies implementing science-based strategies for regenerating soils in their production and supply chains, which result from Mission Soil projects and initiatives. This indicator is disaggregated by: ● Business or company's economic sector (drawn from United Nations, 2024): ○ Agriculture, forestry and fishing ○ Mining and quarrying ○ Manufacturing ○ Electricity, gas, steam and air conditioning supply ○ Water supply; sewerage, waste management and remediation activities ○ Construction ○ Wholesale and retail trade ○ Transportation and storage ○ Accommodation and food service activities ○ Publishing, broadcasting, and content production and distribution activities ○ Telecommunications, computer programming, consultancy, computing infrastructure, and other information service activities ○ Financial and insurance activities ○ Real estate activities ○ Professional, scientific and technical activities ○ Administrative and support service activities ○ Education ○ Human health and social work activities ○ Arts, sports and recreation ○ Other service activities ● Type of company by business size (drawn from OECD): ○ Micro (< 10 employees) ○ Small (10 – 49 employees) ○ Medium-sized enterprises (50 – 249 employees) ○ Large (≥ 250 employees)

	• Stage of the supply chain to which the strategy is applied (drawn from United National Global Compact Office & BSR, 2015):
	  ○ Material input
	  ○ Manufacturing
	  ○ Distribution
	  ○ Use
	  ○ End of life
	• Type of scientific outcome which informs the strategy:
	  ○ Concept
	  ○ Product
	  ○ Process
	  ○ Service (non-consulting)
	  ○ Consulting service
	• Type of strategy (drawn from OECD, 2023 and Science Based Targets Initiative, 2024):
	  ○ Near-term targets
	  ○ Long-term targets
	  ○ Remediation actions
	  ○ Lobbying and/or awareness-raising actions
	  ○ Contingency plans for preventing, mitigating, and controlling soil-health related damages
	  ○ Capacity building directed at workers
	
	Data is collected through a survey. The KPI disaggregation results from the adaptation of different documents (OECD, n.d., 2023; Science Based Targets Initiative, 2024; United National Global Compact Office & BSR, 2015; United Nations, 2024).

Level	MS
Data source	MS reporting; Survey
Periodicity	Quadrennially
Type	Outcome
Class	Market take-up
References	OECD. (2023). *OECD guidelines for multinational enterprises on responsible business conduct*. OECD. https://doi.org/10.1787/81f92357-en OECD. (n.d.). *OECD indicators: enterprises by business size*. Retrieved May 22, 2025, from https://www.oecd.org/en/data/indicators/enterprises-by-business-size.html Science Based Targets Initiative. (2025). *SBTi Services criteria assessment indicators (version 1.4)*. https://docs.sbtiservices.com/resources/CriteriaAssessmentIndicators.pdf Science Based Targets Initiative. (2024). *Above and beyond: an SBTi report on the design and implementation of beyond value chain mitigation (BVCM) (version 1.0)*. https://files.sciencebasedtargets.org/production/files/Above-and-Beyond-Report-on-BVCM.pdf

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3.2 Qualitative Key Performance Indicators

3.2.1 Broader societal impact

18. Soil health awareness amongst European citizens	
Description and Importance	Evaluate the contribution of R&I to the information outreach of the Mission Soil to European citizens
Definition	Assessment of European citizens' awareness of soil health related issues per country or region
Level	MS or NUTS level 2
Data source	Project reporting; Survey
Periodicity	Quadrennial
Type	Impact
Class	Literacy

19. Citizen and end-users' engagement mechanisms in place after the end of project funding	
Description and Importance	Assess the level of post-project continuity and societal/market impact. This is also important to evaluate the permanence of capacity building and public engagement activities with continuity beyond the Mission Soil
Definition	Citizen and end-users' engagement mechanisms in place after the end of project funding
Level	MS
Data source	Project reporting
Periodicity	Quadrennial

Type	Outcome
Class	Literacy

20. Mission Soil Communities of practice created	
Description and Importance	Reflect the engagement of multiple sectors on the Mission Soil objectives and R&I activities
Definition	Mission Soil Communities of practice created and respective characterisation
Level	MS
Data source	Project reporting
Periodicity	Quadrennial
Type	Output
Class	Capacity building

21. Experimental facilities, living labs and lighthouses created in the context of the Mission Soil	
Description and Importance	Assess the capacity of MS to implement and maintain experimental facilities in support of R&I activities. Given the local expression of such activities, a sub-national level of representation is encouraged
Definition	Experimental facilities, living labs and lighthouses created in the context of the Mission Soil
Level	MS or NUTS level 2
Data source	Project reporting; Living Labs
Periodicity	Quadrennial
Type	Output
Class	Enabling conditions

22. Soil health and sustainability educational materials developed in the context of Mission Soil projects	
Description and Importance	Assess the capacity of European education institutions to integrate knowledge related to soil health in their curriculums and how this knowledge is being updated by using new research
Definition	Educational materials developed in the context of Mission Soil projects, including courses/modules in soil health education for primary and secondary schools, farmers and land managers, as well as for universities and the general public
Level	MS; EU

Data source	Project reporting
Periodicity	Quadrennial
Type	Output
Class	Literacy

3.2.2 Impact in research and innovation

23. Integration of early-career researchers into project activities	
Description and Importance	Integrating early-career researchers into project activities fosters knowledge exchange, promotes innovation, and cultivates future research talent. This indicator allows to track this integration within Mission Soil.
Definition	Early-career researchers integrated into project activities
Level	EU
Data source	Project reporting
Periodicity	Quadrennial
Type	Impact
Class	Academic

24. Non-permanent researchers in academic careers integrated in Mission Soil projects	
Description and Importance	Assess the impact, over time, of the Mission Soil in the career development of young researchers in Europe
Definition	Non-permanent researchers (at the time of funding) that stayed in academic institutions years after the first project funding
Level	MS
Data source	Project reporting
Periodicity	Quadrennial
Type	Impact
Class	Enabling conditions

25. Academic “new commers” in Mission Soil projects	
Description and Importance	Evaluate the attraction and involvement of new participants in Mission Soil projects
Definition	Integration in Mission Soil projects of researchers that haven’t received funding in the past 10 years
Level	EU
Data source	Project reporting; REA
Periodicity	Quadrennial
Type	Input
Class	Enabling conditions

26. Participation of partners from peripherical regions in Mission Soil projects	
Description and Importance	Assess the integration and involvement of peripherical regions on Mission Soil projects
Definition	Participation of partners from peripherical regions in Mission Soil projects, as identified by the European Council of Regions, and characterisation of their role in the project (e.g., coordinators)
Level	EU
Data source	Project reporting; Horizon dashboard
Periodicity	Quadrennial
Type	Input
Class	Enabling conditions

27. Research organizations involved in the Mission Soil projects	
Description and Importance	Assess the involvement and funding of the academic-research sector on Soil Mission projects
Definition	Research organizations involved in the Mission Soil projects and their characterisation
Level	MS or NUTS level 2
Data source	Project reporting; Horizon dashboard
Periodicity	Quadrennial
Type	Input
Class	Enabling conditions

28. Female researchers involved in Mission Soil projects	
Description and Importance	Assess gender balance in Mission Soil R&I projects
Definition	Female researchers involved in Mission Soil projects, relatively to male researchers, and considering their roles and positions
Level	MS
Data source	Horizon dashboard
Periodicity	Quadrennial
Type	Input
Class	Enabling conditions

29. Reviewers from peripherical regions involved in the project review process	
Description and Importance	Assess the geographic equity in the distribution of scientific reviewer roles in the context of the Mission Soil
Definition	Reviewers from peripherical regions involved in the project review process
Level	EU
Data source	REA
Periodicity	Quadrennial
Type	Input
Class	Governance structures

30. Field-Weighted Citation Index of peer-reviewed Publications resulting from the Mission Soil projects	
Description and Importance	Measure the impact of Soil Mission projects in producing relevant scientific knowledge and its impact on the scientific community
Definition	Peer-reviewed scientific publication in indexed journals attributable to the Member State by corresponding author
Level	MS
Data source	Scopus
Periodicity	Quadrennial
Type	Outcome
Class	Academic

31. Open-access research outputs resulting from the Mission Soil projects	
Description and Importance	Assess the level of open R&I promoted by the Mission Soil
Definition	Open access publications, datasets or other scientific outputs openly available (at least CCBY) to be used in public repositories, and produced in the context of Mission Soil projects
Level	EU
Data source	Project reporting; Horizon dashboard; Google scholar
Periodicity	Quadrennial
Type	Outcome
Class	Academic

32. Reflection on ratio of research expenditures and outputs per project	
Description and Importance	Supports the assessment of the efficiency of the research expenditure
Definition	Evaluating the ratio of research output (such as publications, patents, or innovations) to the amount of funding invested in research activities
Level	EU
Data source	Horizon dashboard
Periodicity	Quadrennial
Type	Outcome
Class	Academic

33. Upskilled researchers involved in Mission Soil projects with increased individual impact in their R&I field	
Description and Importance	Measure the level of excellence in Soil Mission projects in terms of expertise, improving the scientific community and developing academic careers
Definition	Researchers engaged with the Mission Soil R&I projects that by the end of funding, have completed an academic degree (Master, PhD, or post-graduation) and/or have increased their individual citation score
Level	MS
Data source	Project reporting; Horizon dashboard
Periodicity	Quadrennial
Type	Outcome
Class	Capacity building

34. Research and innovation roadmap milestones achieved	
Description and Importance	This KPI tracks the progress of the Mission Soil in achieving the milestones defined in the research and innovation roadmap
Definition	Based on the Mission Soil R&I roadmap developed, milestones achieved
Level	EU
Data source	Project reporting; Mission Secretariat
Periodicity	Quadrennial
Type	Outcome
Class	Practice take-up

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