HoliSoils
Working together for forest soils

D7.7 Final dissemination package

Holistic management practices, modelling and monitoring for European forest soils, HoliSoils

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D7.7 comprises HoliSoils' outreach activities, with details on exchanges and links established with relevant European and international organisations and networks, the dissemination of protocols and manuals, and HoliSoils-related events and publications.		
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CO	Confidential, only for members of the consortium (including the Commission Services)	
CI	Classified, information as referred to in Commission Decision 2001/844/EC	
Nature of the Deliverable		
R	Document, report	x
DEM	Demonstration, pilot, prototype, plan design	
DEC	Websites, patents filing, market studies, press & media actions, videos etc.	
OTHER	Software, technical diagram etc.	
Ethics	Ethics deliverables	

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1. Introduction

This report comprises HoliSoils' outreach activities, with details on exchanges and links established with relevant European and international organisations and networks, the dissemination of protocols and manuals, and HoliSoils-related events and publications.

Over the course of the project, HoliSoils partners were actively engaged in project dissemination, while a dedicated Stakeholder and End-User Advisory Board (SEAB), established at the project outset, proved extremely successful in helping the project reach target audiences beyond the networks of project partners. Section 2 describes the SEAB and their role in multiplying HoliSoils' results to wider audiences targeted by the project.

Section 3 introduces the key messages distilled by HoliSoils partners from the project's findings which set the project's scientific results into a broader context for forest soils, demonstrating how the work carried out in HoliSoils can support recommendations that could be taken up by various stakeholders for implementation in practice, policy, industry, or for use in education.

Results and findings detailed in the Synthesis of HoliSoils' results report (D7.4) were organised into six discrete sub-sections, each targeting a specific key audience group for the project: policy; practitioner; sector; expert; education; and general. They formed the basis of various dissemination products developed at the end of the project to share materials and tools based on HoliSoils research for practical use. Section 4 uses these audience groupings to describe the main resources developed over the course of the whole project to disseminate HoliSoils' results and the dissemination pathways used.

Section 5 details the major events, workshops and conferences at which HoliSoils results and findings were disseminated.

The HoliSoils website, which is the central hub for all information related to the project was redesigned at the end of the project to feature HoliSoils' main outputs on the homepage, while main menu items toolkit, resources, and webinars facilitate easy access to all the main HoliSoils outputs for end-users.

2. Stakeholder and End-User Advisory Board (SEAB)

SEAB members were engaged and diligent throughout the project, demonstrating a high level of interest in the project's progress and results. They attended the HoliSoils annual meetings in 2023, 2024 and 2025 where dedicated sessions allowed them to explore HoliSoils results in dialogue with project partners, and to advise on how these might best reach the stakeholders they represent. They attended various other HoliSoils events, including policy events, and helped organise meetings, webinars, and workshops with their various networks, including Tornator, UPM, FSC, EUSTAFOR, JRC, FAO, UNFCCC, FOREXT, and CEPF.

The SEAB includes representatives from:

- United Nations Framework Convention on Climate Change (UNFCCC)

- Food & Agriculture Organization of the United Nations (FAO) incl. Global Soil Partnership (GSP)
- Joint Research Centre of the European Commission (JRC)
- European Environment Agency (EEA)
- Forest Stewardship Council (FSC)
- European State Forest Association (EUSTAFOR)
- Confederation of European Forest Owners (CEPF)
- Forest Owners' Association of Lithuania (FOAL)
- Forest Ownership Centre of Catalonia (CPF)
- European Network of Forest Extension Organisations (FOREXT)
- Vitoria-Gasteiz City Council
- UPM-Kymmene Oyj (UPM)
- Tornator Oyj
- Council of the Evangelical Lutheran Church of Finland
- IFER – Institute of Forest Ecosystem Research (IFER)

3. Key messages

'D7.4 Synthesis of HoliSoils results' highlights the key messages developed through the project resulting from the in-depth analysis of soil characteristics, processes, and responses to different treatments. The key messages set the project's scientific results into a broader context for forest soils, demonstrating how the work carried out in HoliSoils can support recommendations that could be taken up by various stakeholders for implementation in practice, policy, industry, or for use in education. The HoliSoils key messages were developed into an illustrated package, which can be used as a whole or individually, and are available on the project website and are included in Annex I, HoliSoils key messages.

Dissemination pathways:

- Dedicated campaign on social media (planned for Q1 2026)
- Inclusion into partner channels and by partners in their continued dissemination efforts.
- Inclusion into educational slideset
- Distribution to the project's SEAB members
- Shared in the final project newsletter to the HoliSoils mailing list.

4. Targeted products and activities for specific audiences

HoliSoils project identified nine target groups for communication and dissemination: LULUCF experts involved in GHG inventories; Forest owners and managers; Forest extension services; Forest and soil monitoring networks; Certification bodies; Industry; Scientists; Decision makers; General public.

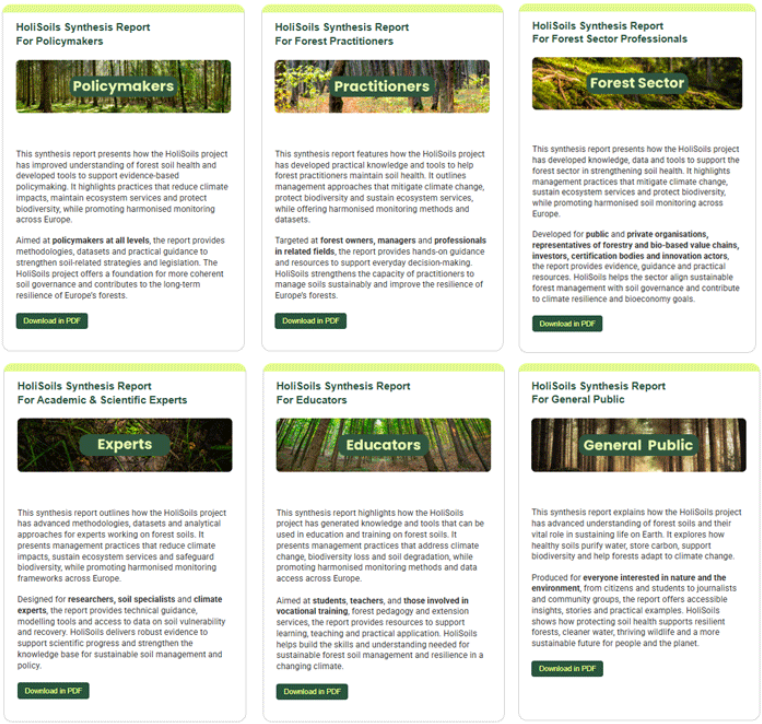
These groups were consolidated when synthesising project results, such as materials and tools based on HoliSoils research for practical use. The results section of 'D7.4 Synthesis of HoliSoils results' is divided into six discrete sub-sections, each targeting a specific audience.

- **Policy:** Local / regional / national governments and administrations, parliamentarians, political advisers, supranational institutions, NGOs;
- **Practitioner**: Forest and landowners, practitioners in forest management, environmental protection organisations;

- **Sector audience**: forest-related public and private sector organisations, representatives from forestry and bio-based value chains (incl. carbon markets), investors in the field, certification bodies, innovation acceleration endeavours;
- **Expert audience**: greenhouse gas inventory experts on land use, soil monitoring experts, researchers;
- **Education audience**: university and vocational training instructors and students, forest extension services, forest pedagogues;
- **General audience**: the general public, media, interested and informed citizens, young people, community groups, campaigners, etc.

While the report can be read as a whole, audience-specific versions were developed so that stakeholders can read the version most relevant for them. https://holisoils.eu/synthesis-reports/.

Results and findings detailed in the synthesis report formed the basis of various dissemination products developed at the end of the project. The following sub-chapters uses these audience groupings to describe the main resources developed over the course of the whole project to disseminate HoliSoils' results.



4.1 Policy audience

This audience group encompasses local / regional / national governments and administrations, parliamentarians, political advisers, supranational institutions, NGOs.

4.1.1 Policy briefs

HoliSoils produced three main policy briefs which are available from a dedicated section on the project website and are presented in D7.6 – HoliSoils Policy Brief.

#1 Forest soils can increase climate change mitigation with targeted management (May 2023).

Based on a major paper, produced by the HoliSoils project coordinator and a team of 30 researchers from Europe and Japan, exploring the effects of management on soil C sequestration and greenhouse gas fluxes in boreal and temperate forests.

Dissemination pathway

- PB1 translated into 12 languages
- Part of the European Forest Institute (EFI) Policy Brief series
- Presented at various international conferences and meetings
- Formed the basis for discussion with policy and decision makers at various events
- Shared on partner channels, with SEAB, HoliSoils newsletter
- Copies disseminated at final Policy Forum

#2 Forest soil challenges in Europe: solutions through sustainable forest management and monitoring (March 2025).

Outlines six key recommendations to support EU climate goals and the effective implementation of European regulation, through enhancing the quality of greenhouse gas (GHG) inventory reporting.

Dissemination pathway

- Policy event: Forest Soil Challenges in Europe: Solutions through Sustainable Forest Management held at the Permanent Representation of Finland to the EU, Brussels, 19 March 2025. Included presentations from HoliSoils experts focusing on forest soil management and monitoring, as well as fire management challenges. The panel debate topic was Forests and forest soils in climate change mitigation and included experts from the European Commission, EEA, IKEA and the project. Over 30 participants attended, from the European Commission, EU Member States' Permanent Representations, and other organisations interested in soil challenges.
- Published as a Natural Resources Institute Finland (Luke) policy brief
- Shared on partner channels, with SEAB, HoliSoils newsletter
- Copies disseminated at final Policy Forum

#3: How to advance the implementation of the EU Soil Monitoring Law? (July 2025)

Following provisional agreement on the EU Soil Monitoring Law (SML) by the Council and Parliament of the EU in April 2025, HoliSoils researchers produced a policy brief highlighting how its harmonised methodology can facilitate comparability of forest soil monitoring data and findings across the EU, with recommendations on how to ensure that the requirements of the EU SML are met.

Dissemination pathway

- Part of the EFI Policy Brief series
- Shared on partner channels, with SEAB, HoliSoils newsletter
- Copies disseminated at final Policy Forum

4.1.2 Policy engagement

HoliSoils experts took part in several meetings and discussion with policy makers on the development of the EU Soil Monitoring Law, using HoliSoils publications to underscore discussions. An opinion paper on the topic was published in June 2024 and shared on HoliSoils and partner channels.

A final Policy Forum: Forest soils for a climate-smart future: The relevance of soils in policy and practice for forest management in Europe was held at the Palace of the Academies in Brussels, 10 October 2025 to highlight the final HoliSoils results and recommendations. Presentations were given by HoliSoils' leading researchers and a representative from DG Clima. Participants included representatives from the main EC Directorate Generals, forest attachés to the EU, and industry and forest owner representatives.

4.1.3 Web portal

See below (4.3.5)

4.2 Practitioner audience

This audience group encompasses forest and landowners, practitioners in forest management, environmental protection organisations.

4.2.1 Factsheets

HoliSoils factsheets were developed from synthesised results presented in D7.4 – Synthesis of HoliSoils results and D4.7 – Good practice guidance for CSF including ecosystem services by soils

#1. Climate-Smart Forestry for Soil Health

Explains how CSF practices such as continuous-cover forestry, mixed-species stands, peatland rewetting and controlled fuel management reduce emissions, enhance carbon storage and protect soils from disturbance. Includes clear comparisons, practical tools and guidance to help forest managers, practitioners and policymakers optimise decisions across Europe's diverse ecosystems.

#2 How can forest management practices decrease emissions in boreal drained peatland forests? (coming early in 2026)

#3 How can forest management reduce the risk of forest fires and its impact on soils in the Mediterranean basin? (EN version coming early in 2026, CAT and FR versions available)

#4 What is are the consequences of tree species composition in Central Europe in the face of a changing climate? (coming early in 2026)

#5 How does thinning intensity affect soil properties and carbon stock? (EN version coming early in 2026, CAT and FR versions available)

#6 How can appropriate nitrogen fertilisation increase the forest carbon sink in boreal forests? (coming early in 2026)

#7 How can forest management practices support soils in mitigating climate change? (coming early in 2026)

Dissemination pathway

- Practitioner workshops in France and Spain

- Dedicated section on HoliSoils website
- Share on partner channels, with SEAB, HoliSoils newsletter
- Practice abstracts in DG Agri database
- Share on EU FarmBook

4.2.2 Handbook

Good forest management starts in the soil – A practical handbook on managing forest soils in the face of climate change and restoring soil health after disturbance.

The handbook, intended for forest owners and managers, uses the main findings from HoliSoils experimental sites to provide practical recommendations for improving forest soil health and ecosystem services under climate change and for restoring soil health after disturbances. Based on several years of data collection in the test sites, the impact of climate-smart forestry (CSF) on soil processes and functioning has been evaluated through measurements of soil greenhouse gas (GHG) emissions, soil physical and chemical properties, litter inputs, root biomass quantity, soil microbial populations, and soil fauna.

The handbook is being finalised and will be disseminated in early 2026.

Dissemination pathway

- Share on partner channels, with SEAB, HoliSoils newsletter
- Share with HE-funded projects ForestPaths, Forwards, OptFor-EU
- Share on EU FarmBook

4.2.3 I+ app

The mobile phone I+ App, geared towards including biodiversity conservation considerations in forest management training, provides users with the opportunity to understand the future impact of different management practices on different kinds of forest ecosystems, by performing virtual tree selection exercises. The App is based on a large network of well-understood test sites called Marteloscopes.

It now features a new module to demonstrate soil carbon effects of Climate-Smart Forestry compared to conventional forest management.

Dissemination pathway

- Practitioner workshop in Spain, and online webinar
- Shared on partner channels, with SEAB, HoliSoils newsletter
- Share with HE-funded projects ForestPaths, Forwards, OptFor-EU
- Interactive flyer (coming in 2026)

4.3 Sector audience

This audience group encompasses forest-related public and private sector organisations, representatives from forestry and bio-based value chains (incl. carbon markets), investors in the field, certification bodies, innovation acceleration endeavours.

4.3.1 Protocols

A comprehensive soil monitoring framework has the potential to inform sustainable forestry and bio-based industries. It facilitates practice optimisation for long-term soil productivity and resilience, particularly on the basis of improved understanding of microbial distribution across Europe, and site-specific composition and its impacts. Moreover, it also enables standardised and realistic reporting as well as enhancement of the sector's increasingly scrutinised contribution to environmental goals, such as maintaining and protecting biodiversity, and effectively sequestering and storing carbon for climate change mitigation.

Guidelines on sampling and analysis of forest soils for GHG reporting based on D1.1, 1.2, 1.3 and 1.4 were developed and published in the Thuenen Working Paper series.

Dissemination pathway

- Practical workshop for LULUCF experts and people working in the field of forest soil monitoring, Eberswalde, Germany, September 2024
- HoliSoils webinar series
- Training & capacity building programme (D7.5) workshops and webinars
- Website with links to tools
- Newsletter

4.3.2 Factsheets

As above (4.2.1).

4.3.3 Webinars

The HoliSoils Webinar Series was launched in 2025 to enhance stakeholder engagement and disseminate project findings on forest soils, biodiversity, monitoring, and climate processes. The series was initiated in collaboration with IUFRO Task Force to strengthen synergies between global soil research communities. Between September and December 2025, HoliSoils organised eight webinars, each featuring experts from within the consortium and partner organisations. The sessions addressed a wide range of topics—from microbial interactions in soil carbon decomposition and advanced biochemical tools, to harmonised monitoring of mineral and peatland soils, methane emissions from forestry-drained peatlands, soil biodiversity, foundational soil science, and long-term nitrogen fertilisation experiments.

See Annex II: HoliSoils webinar series report for more details.

Dissemination pathway

- The webinars themselves
- Website and social media campaign
- Shared on partner channels, with SEAB
- HoliSoils newsletter special edition

4.3.4 Model ensemble prediction tool

See below (4.4.2)

4.3.5 Keylink model

See below (4.4.3)

4.3.6 Forest soils gateway

A web portal of open maps hosted by Theunen Institute, that will be maintained and updated for ten years following the project's conclusion. The portal presents a continuously updated resource of data and information about the condition of European forest soils across different temporal and spatial scales to learners and future experts interested in soils – be they soil scientists, foresters, natural resource managers, environmentalists, or other relevant researchers or professionals.

By the end of the project, the portal contains the following content, with more to be added as information becomes available.

- Europe-wide maps of forest soil properties in 100x100m resolution
- Map of drained peatlands of the Baltic Sea region
- Link to the Global Fungi Database
- Map of European forest soil microbial diversity and guilds
- Maps on soil vulnerability
- Maps illustrating future climate resilience, carbon sequestration and storage optimisation via CSF
- Guidelines for Soil Sampling for GHG reporting

Dissemination pathway

- Website and social media campaign
- Interactive flyer (coming in 2026)
- Shared on partner channels, with SEAB
- HoliSoils newsletter special edition

4.4 Expert audience

This audience group encompasses greenhouse gas inventory experts on land use, soil monitoring experts, researchers. Input on needs was sought from LULUCF stakeholders and end-users at the beginning of the project through a targeted survey conducted in WP3 and WP7.

4.4.1 Protocols

Guidelines on sampling and analysis of forest soils for GHG reporting based on D1.1, 1.2, 1.3 and 1.4 were developed and published in the Thuenen Working Paper series. They comprise a set of methodologies for soil sampling and assessing soil properties (nutrient stock assessment, organic matter characterisation, etc.), dynamics, microbial biomass and activity, and biodiversity.

The guidelines can be used to optimise land use and improve soil conditions for the benefit of forests' productivity, long-term sustainability, biodiversity, and contribution to ecosystem services, not least climate change mitigation. Incorporating and building on a variety of

existing approaches and methods to create a pan-European standardised protocol, they facilitate high-quality, comparable carbon reporting.

Dissemination pathway

- Practical workshop for LULUCF experts and people working in the field of forest soil monitoring, Eberswalde, Germany, September 2024
- HoliSoils webinar series
- Annual JRC and EEA workshops
- Training & capacity building programme (D7.5) workshops and webinars
- Website with links to tools
- Newsletter

4.4.2 Model ensemble prediction tool

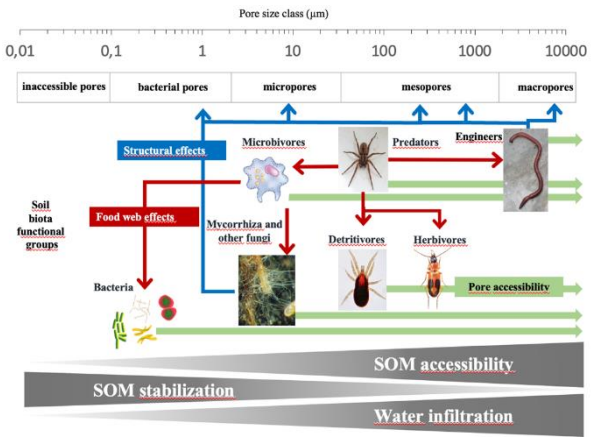
A multi-model ensemble interface for Soil Organic Carbon predictions - is a webtool designed to run a multi-model ensemble over European forest sites. It allows to predict the effect of climate, land-use and land management changes on soil organic carbon (SOC) stocks and greenhouse gas (GHG) emissions. By benefitting from the complementarity of structurally different SOC models, it provides the level of uncertainty of the predictions.

Dissemination pathway

- Information and training webinars
- Website and social media campaign
- Shared on partner channels, with SEAB
- User video (coming in 2026)

4.4.3 Keylink model

Findings from test site experiments informed a new soil model, Keylink, that brings together soil functional diversity and food webs to predict soil carbon and soil water balances. By integrating KEYLINK into a land-surface model (ORCHIDEE), it becomes possible to predict soil health and forest health while paying due attention to soil biodiversity as an important factor in the functioning of forest ecosystems.



Dissemination pathway

- Information and training webinars
- Website and social media campaign
- Shared on partner channels, with SEAB

4.4.4 Publications

Partners published a total of 51 papers in peer-reviewed journals with open access over the course of the project, with further manuscripts in the pipeline. Publications are listed on the

project website and uploaded to a dedicated section on the HoliSoils website, as well as to the open-access repository in Zenodo where HoliSoils has established a community site.

Dissemination pathway

- News items and blog posts on publications on project website, project social media channels, and partners channels
- Several papers were developed into policy briefs or briefing notes for further dissemination.
- Presentations and posters at international events

4.4.5 Web portal

See above (4.3.6)

4.4.6 Webinars

As above (4.3.2)

4.5 Education audience

This audience group encompasses university and vocational training instructors and students, forest extension services, forest pedagogues.

4.5.1 Slide set

Universities and vocational training instructors as well as students in forestry and related disciplines, forest extension services and forest pedagogues can make a contribution to enhancing, maintaining and protecting forest soil health. Educators and learners are encouraged to learn from the project and use the materials and tools presented here to equip themselves to make this contribution.

Dissemination pathway

- Coming in early 2026

4.5.2 HoliSoils essential reading

An overview of several key HoliSoils publications with plain English summaries compiled into a PDF for easy sharing with university students studying forest and soil-related subjects.

Dissemination pathway

- Coming in early 2026

4.6 General audience

This audience group encompasses the general public, media, interested and informed citizens, young people, community groups, campaigners, etc.

4.6.1 Videos

HoliSoils interviews with its project coordinators and members of the SEAB offer an audiovisual and easily understandable insight into the HoliSoils project and how its results are relevant for different stakeholders and for a general audience.

Dissemination pathway

- Website, social media
- Shared on partner channels

4.6.2 HoliSoils results for general audiences

HoliSoils' complicated methodologies, models, guidelines and are explained in plain English in the synthesis report tailored for a general public, so that a lay reader can understand what the project has done to advance understanding of forest soils and their vital role in sustaining life on Earth, offering accessible insights, stories and practical examples.

Dissemination pathway

- Website, social media
- Shared on partner channels

4.6.3 Newspaper article

The focus and complexity of HoliSoils research means that few topics are of interest to the general public. However, HoliSoils research was picked up in an article in the New York Times, exploring how climate change is impacting invertebrates in soil. The article was based on the paper Meta-analysis reveals that the effects of precipitation change on soil and litter fauna in forests depend on body size.

Dissemination pathway

- International newspaper
- Website, social media

5. Events

Major events, beyond those organised by the project directly and described above, at which HoliSoils results and findings were disseminated:

Date	Event	Reach	HoliSoils input
Dec 21	BES Annual Meeting 2021, Liverpool, hybrid	1000 +	Presentation: Interactive effects of climate change drivers and litter nutrient diversity on soil organisms
Jun 22	Ecology of Soil Microorganisms 2022, Prague	400+	Co-organised event and presentations
Mar 23	3rd Global Soil Biodiversity Conference, Dublin	1000+	Posters: Forest management impact on soil food web (winner of best student poster); Climate change impact on Collembola and their responses to predation
Apr 23	EGU 2023, Vienna	100	Poster: Biodiversity and soil C modeling
Aug 23	IBFRA 2023 , Finland	200	Co-organised event and presentation: Soil microbial diversity and functioning of boreal managed peatlands
Apr 24	EGU 2024, Vienna	100	Organised a session: The management of agricultural and forest soils in meeting global change mitigation goals" with various HoliSoils presentations and posters
Apr 24	Soil organic carbon (SOC) in the reporting and monitoring system in developing countries, online	371 participants from 69 countries across Africa, Asia-Pacific and Eastern Europe, Latin America and the Caribbean.	Organised in collaboration with UNFPCCC on SOC to Support National Greenhouse Gas Inventories from Developing Countries under the Enhanced Transparency Framework of the Paris Agreement
Jun 24	26th IUFRO World Congress, Stockholm	1000+	4 posters + 2 sessions
Jul 24	21st Workshop on Greenhouse Gas Inventories in Asia, online	132 participants from 15 Asian countries, + reps from int. orgs	Presentation: Challenges and Strategies for Nationwide SOC Monitoring and Modelling
Nov 24	Mission Soil Week, Brussels	280+	Breakout session on soil health for a sustainable forest-based bioeconomy + project trail stand

Feb 25	6th edition of the Forest Innovation Workshop, Brussels	70+	Presentation on HoliSoils innovations and findings + panel discussion on sci. perspective on the future of forests
May 25	Annual LULUCF workshop, Ispra	200+	Strategies for soil carbon sequestration and GHG mitigation to contribute to sustainable forest management
Jun 25	Ecology of Soil Microorganisms 2025, Helsinki	270+	Organising committee; Session on forest and peatlands soils + poster session on microbial networks and habitats (3 posters) + poster session on European soil health, biodiversity, and sustainable management (1 poster) + excursion to HoliSoils test site

Annex I: HoliSoils Key messages

Annex 2: HoliSoils webinar series report

Topic 1

Forest soil health impacts ecosystem services

Forest soils provide multiple ecosystem services. For this, forest soils rely on complex interactions, interdependencies and feedbacks between many components and processes of soil biology, soil physics and soil chemistry – creating a unique balance that varies according to forest type.

KEY MESSAGES

01

Accelerated climate change and growing timber demand are putting forest ecosystems under increasing strain.

Improved measures are needed to protect, maintain, and enhance soil health (stability, structure, fertility, biodiversity, etc.) and to promote forests' recovery after natural and human-caused disturbances such as clearcuts.

D4.4/4.7, D.5.2-5.3, D6.3, D2.1-2.3, D1.1-1.3, D3.5
Bosela et al. 2025

02

Forest management practices affect soil characteristics and processes, which in turn affect forest structure and growth.

Site-specific Climate-Smart Forestry practices include optimised thinning regimes, selection harvesting, selection of tree species and mixed-stands, as well as disturbance recovery activities. Such practices protect and enhance forests' potential to provide multiple ecosystem services, such as carbon storage, biodiversity preservation and long-term productivity.

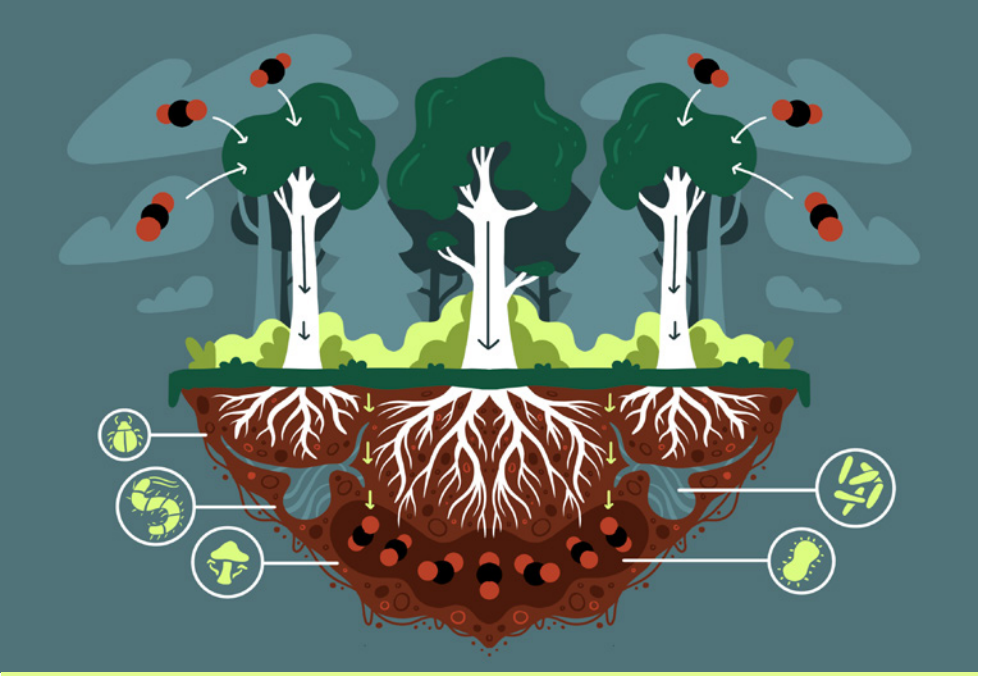
D2.1-2.3, D4.2/4.4/4.7, D5.2-5.3, D6.3
Johannnesson et al. 2025; Menichetti et al. 2025; Tikkasalo et al. 2025; Mäkipää et al. 2023

03

Forest soils are complex and vulnerable to many kinds of degradation and disturbance - both natural ones and those caused by humans.

To protect or restore them, practical tools informing interventions need to consider soil microbiology, soil biogeochemistry, soil physics, and soil hydrology, as well as the complex feedbacks between them. It is essential to protect soil biodiversity and especially soil fauna that facilitate soil water access, carbon sequestration and top-down trophic effects. Once the damage is done, recovery will require intervention and time.

D2.1-2.3, D1.5, D5.4
Martin et al. 2024; Pérez-Izquierdo et al. 2025



Topic 2

Forest soils contribute to reaching environmental goals

Forest soils play a crucial role in reaching goals on climate change mitigation and halting biodiversity loss. They host essential biodiversity, and they store and sequester significant amounts of carbon.

By accumulating organic matter from decomposing plant material and root systems, forest soils act as long-term carbon sinks, stabilising carbon for decades to centuries. In contrast, vegetation—such as trees and undergrowth—stores carbon more dynamically, with faster uptake during growth and more rapid release through decay or disturbance. While vegetation is vital for capturing atmospheric carbon through photosynthesis, forest soils provide a stable and enduring reservoir, making both components essential but complementary in the global carbon cycle.

KEY MESSAGES

01

It is often overlooked that forest soils are a locus of both carbon sequestration and storage, and important biodiversity.

Adjusting forest management practices, e.g. varying stocking density, thinning intensity and frequency, and rotation length, as well as adopting sustainable post-fire management practices, can increase soil carbon stocks or reduce greenhouse gas emissions and foster biodiversity.

D4.2/4.4/4.7, D4.6, D.5.2-5.3, D6.3
Mäkipää et al. 2023; Pérez-Izquierdo et al. 2025

02

Forest soils across Europe hold varying yet significant potential to contribute to reducing net greenhouse gas emissions, and play a role in addressing other urgent environmental concerns, such as biodiversity loss.

To harness this potential, science-based long-term and multi-scale soil monitoring of soil carbon sequestration and greenhouse gas emissions is recommended, along with policy-backed and locally-tailored practices. These can include restoration of carbon-rich soils, protection and promotion of biodiversity, and sustainable forest management practices such as mixed stands, selection harvesting, and continuous cover forestry.

D1.1-13, D2.1-2.3, D3.5, D4.4/4.7, D5.2-5.3, D6.3
Lehtonen et al. 2023

03

Forest soils across Europe face the risk of becoming net carbon sources.

Carbon stocks in Mediterranean forest soils are acutely vulnerable to climate change induced changes in precipitation. Carbon stocks in boreal peatland forest soils are vulnerable due to deep drainage that has reduced water content and increased aeration, making organic matter more prone to decomposition.

Strategies for soil health conservation and disturbance recovery, including thorough regulation of forest management practice, are critical to ensure continued soil function and carbon storage.

D5.2-5.3, D6.3
Escobar et al. 2022

Topic 3

Forest management impacts soil health

Forest management practices affect soil health, carbon storage, and greenhouse gas emissions differently across diverse forest ecosystems.

Climate-Smart Forestry practices and other alternative practices, such as prescribed burning, can have beneficial impacts when compared to conventional forestry for soil function, resilience, and sustained productivity, as well as for carbon sequestration and emissions reduction.

Forest management can be optimised according to these considerations.

KEY MESSAGES

01

Clearcuts have a strong negative effect on soil carbon and soil functioning, notably in forests on peatlands.

Regulating forest management and replacing conventional practices with locally tailored Climate-Smart Forestry and disturbance recovery activities can help prevent this.

D4.2/4.4/4.7, D5.3
Johannnesson et al. 2025; Menichetti et al. 2025; Tikkasalo et al. 2025

02

In fire-prone regions, prescribed burning increases resistance to wildfires as well as to severe drought, but, depending on the fire intensity of the prescribed burn, may have neutral or negative impacts on soil carbon stocks.

Well-informed, sustainable pre-and post-fire forest management practices can enhance soil recovery after wildfire events.

D4.2, D5.3, 5.2

03

Most forest owners consider soil health important. Moreover, a sizable majority of forest owners who are not already applying Climate-Smart Forestry practices are open to testing or adopting such practices.

Carefully designed financial incentives may support wider adoption of practices to enhance soil health, but full adoption may require additional interventions.

D4.6

Topic 4

Advanced forest soil monitoring is needed

Critically, 60–70% of EU soils are degraded. This affects soil's ability to contribute to climate change mitigation, but also soil's importance for provisioning of ecosystem services and biodiversity.

Soil degradation costs the EU tens of billions annually, and healthy soils are vital for achieving SDGs and the EU Green Deal goals. In order to inform realistic policy and strategic action, reliable data and information is indispensable – particularly about forest soils.

KEY MESSAGES

01

There is growing recognition of forest soils' capacity to sequester and store carbon.

This means that harmonised soil monitoring, reporting and compliance standards, and data sharing are fundamental for comparability and reliability of assessments of progress towards these targets.

D1.1-1.3, D3.5

02

The EU Soil Monitoring Law is a welcome initiative.

For its effective implementation, a methodology that captures the features and dynamics of forest soils (including forest floor and peat soils) alongside other soil types is needed.

D1.1-1.3, D3.5
Wellbrock et al. 2024; Mäkipää et al. 2023

03

Forest soil processes take time and are subject to great variability.

To understand them and their impacts in terms of ecosystems service provision – such as carbon storage – more fully, a science-based, long-term, multi-scale (forest) soil monitoring framework is needed.

D1.1-1.3, D3.5, D5.3-5.4, D4.4/4.7

HoliSoils Webinar Series

The HoliSoils Webinar Series, organised under Task 7.5, ran from September to December 2025 to strengthen knowledge exchange on forest soils, biodiversity, soil monitoring and climate-related processes. The series was initiated jointly with the IUFRO Task Force led by Lorenzo Menichetti, providing additional scientific visibility and helping connect HoliSoils to a wider international audience.

In total, **eight webinars** were delivered, featuring speakers from the HoliSoils consortium and partner organisations. Across all sessions, the **series attracted more than 500 live participants**, and the **recordings reached over 540 YouTube views by the end of 2025**. Engagement remained steady throughout, with active Q&A sessions and strong interest in the presentation materials.

- **Webinar 1: Challenges in modelling microbial interaction in SOC decomposition (17 September 2025)**

Speakers: Stefano Manzoni, Elisa Bruni, Erik Schwarz. **Participants**: 105. **YouTube views**: 120

The webinar was jointly delivered with IUFRO and examined the conceptual and methodological challenges involved in integrating microbial processes into soil carbon models.

Recording link: https://youtu.be/rnWU58R8xJ8?si=W65ikn9QLxV1LSCF

- **Webinar 2: How biochemistry may support microbiology? (23 September 2025)**

Speaker: Bartosz Adamczyk. **Participants**: 53. **YouTube views**: 54

The session introduced advanced biochemical tools, including LC–MS techniques and new molecular markers, for assessing fungal biomass and necromass.

Recording link: https://youtu.be/FjvgGb6aQPE?si=xeKIiH3IVWRt9pug

- **Webinar 3: Monitoring of mineral forest soils (8 October 2025)**

Speakers: Vera Makowski, Nicole Wellbrock. **Participants**: 84. **YouTube views**: 81

The session presented the HoliSoils framework for harmonised monitoring of mineral forest soils and its relevance for EU soil policy and LULUCF reporting.

Recording link: https://youtu.be/LFM2-ydmzTI?si=zocCZ7GJiwwbb_XR

- **Webinar 4: Monitoring of peatland forest soils (15 October 2025)**

Speaker: Aleksi Lehtonen. **Moderator**: Vera Makowski. **Participants**: 45. **YouTube views**: 80

The session highlighted the importance of peatland soil monitoring for assessing management impacts and supporting climate mitigation.

Recording link: https://youtu.be/LP7avckcn8c?si=_1s6F13gbF3xoNuk

This project has received funding from the European Union's H2020 research and innovation programme under grant agreement No 101000289.

- **Webinar 5: Ditch methane emissions from boreal forestry-drained peatlands (20 October 2025)**

Speakers: Tuula Larmola, Leena Stenberg. **Participants**: 29. **YouTube views**: 35

The webinar explored vegetation-driven methane emissions in peatland ditches and their relevance for GHG inventories.

Recording link: https://youtu.be/SuTFUMqCl40?si=H-VGwmknmgayK2ML

- **Webinar 6: Importance of forest soil biodiversity monitoring (22 October 2025)**

Speaker: Tijana Martinović. **Moderator**: Vera Makowski. **Participants**: 66. **YouTube views**: 76

The session showcased microbial responses to disturbance and emphasised the need for harmonised biodiversity data.

Recording link: https://youtu.be/dKjXXNm6Xds?si=zhCF96GnVGnLkvJb

- **Webinar 7: Introductory lecture on forest Soils, monitoring and mapping (18 November 2025)**

Speakers: Stephan Mantel, Laura Poggio. **Moderator**: Vera Makowski. **Participants**: 70. **YouTube views**: 52

The webinar provided an overview of forest soil science, classification and mapping challenges across Europe.

Recording link: https://youtu.be/WXGBGkbfjps?si=P84MdfCfYLDRciq2

- **Webinar 8: Long-Term Nitrogen fertilisation in boreal forests (5 December)**

Speakers: Anni Palvi, Dr Boris Tupek. **Moderator**: Dr Aleksi Lehtonen. **Participants**: 60. **YouTube views**: 44

The session presented long-term findings on the effects of sustained nitrogen additions on productivity, soil processes and carbon retention.

Recording link: https://youtu.be/tMrxVNZCFRA?si=nSFeY7oh4ZEplKM1

Overall engagement and impact

Participation across the series was diverse, drawing researchers, policy actors, LULUCF practitioners, forest managers and students from across Europe. **Average live attendance was 63 participants per session, complemented by an average of 68 YouTube views per webinar**, indicating sustained engagement across formats.

The range of topics presented, together with the strong involvement of partner institutions and active Q&A sessions, enhanced the visibility of HoliSoils and facilitated broader understanding of soil processes, monitoring practices and their relevance to climate mitigation and sustainable forest management.