

## HoliSoils





















Holistic management practices,  
modelling & monitoring for European  
forest soils



# HoliSoils - objectives

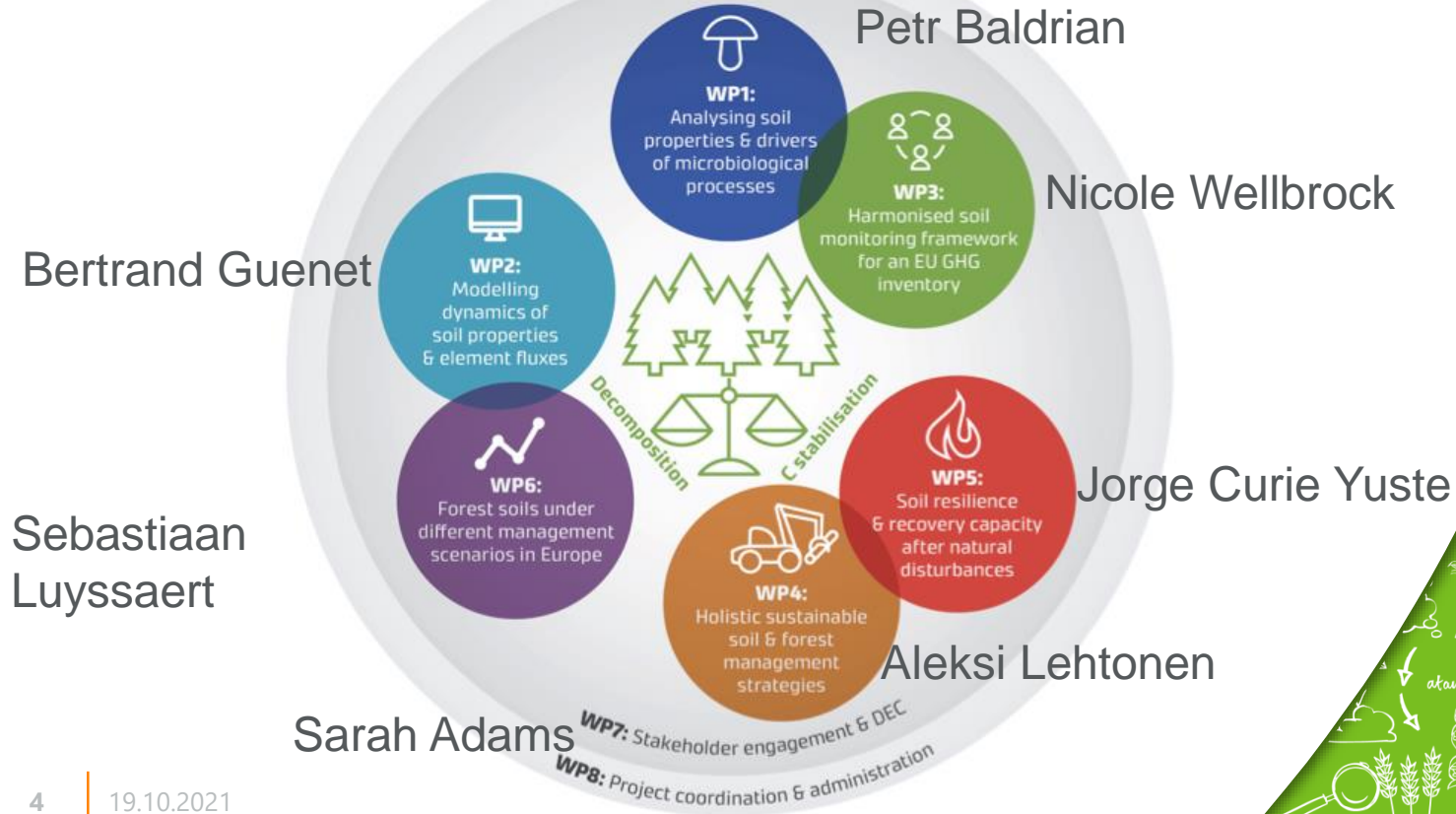
- **Advance knowledge of soil properties, processes, biodiversity, and activity of soil microbiota**, all of which influence soil-based ecosystem services
- **Develop and improve state-of-the-art soil models, harmonise them into a monitoring framework for estimation of C and GHG fluxes**, nitrogen (N), and base cation stocks in forest soils, and integrate them into forest ecosystem models
- **Develop standardised sampling and monitoring protocols for GHG reporting, harmonise legacy soil data** from multiple sources and make them available to end-users through a web portal, and develop and apply digital soil mapping methods to facilitate model upscaling to the European scale
- **Determine effects of management on soil functionality, biodiversity, nutrient stocks**, (i.e. C, N, P, K, Mg, Ca, and Mn), organic matter quality, and stabilisation processes, and integrate C and N into numerical models, and to **develop holistic CSF management**, taking into account soil productivity, GHG exchange, water availability, erosion, and soil resilience (avoidance of degradation), and study their soil-related CC mitigation and adaptation potential on mineral and organic (forested peatland) soils
- Determine effects of **natural disturbances on soil functioning and resilience, identify good management practices** for preventing soil degradation, and map soil vulnerability
- **Study the impacts, trade-offs, and synergies of CSF management scenarios for soils and forests** on the Europe- wide GHG balance and water budget under future climate conditions and disturbance regimes
- **Boost collaboration between universities, research institutes, and intergovernmental bodies such as the EU, UNFCCC, IPCC, and FAO, and facilitate the transfer of developed approaches, knowledge, and tools globally to operators within the forest sector via a multi-actor approach.**

# HoliSoils partners

No	Participant organisation Full English name (abbreviation) <i>Legal name (if different)</i>	Type	Country
1	Natural Resources Institute Finland (Luke) [coordinator] <i>Luonnonvarakeskus</i>	 Luke Research institute	Finland <i>FI</i>
2	Institute of Microbiology of the Czech Academy of Sciences (IMIC) <i>Mikrobiologický ústav AV ČR, v. v. i.</i>	 IMIC Research institute	Czech Republic <i>CZ</i>
3	French National Centre for Scientific Research (CNRS) <i>Centre National de la Recherche Scientifique</i>	 CNRS Research institute	France <i>FR</i>
4	Johann Heinrich von Thünen Institute (TI) <i>Johann Heinrich von Thünen-Institut</i>	 TI Research institute	Germany <i>DE</i>
5	Basque Centre for Climate Change (BC3) <i>Asociacion BC3 Basque Centre for Climate Change Klima Aldaketa Ikergai</i>	 bc <sup>3</sup> Research institute	Spain <i>ES</i>
6	Vrije University Amsterdam (VU) <i>Stichting VU</i>	 VU University	Netherlands <i>NL</i>
7	European Forest Institute (EFI)	 EFI Research institute	International <i>FI</i>
8	Wageningen Research Foundation (WR) <i>Stichting Wageningen Research</i>	 WR University	<i>NL</i>
9	International Soil Reference & Information Centre (ISRIC) <i>Stichting International Soil Reference &amp; Information Centre</i>	 ISRIC Research institute	<i>NL</i>
10	Stockholm University (SU) <i>Stockholms Universitet</i>	 SU University	Sweden <i>SE</i>
11	Transylvania University of Braşov (UTBV) <i>Universitatea Transilvania din Braşov</i>	 UTBV University	Romania <i>RO</i>
12	University of Barcelona (UB) <i>Universitat de Barcelona</i>	 UB University	<i>ES</i>
13	University of Aberdeen (UNIABDN) <i>The University Court of The University of Aberdeen</i>	 UNIABDN University	United Kingdom <i>UK</i>
14	Vytautas Magnus University (VMU) <i>Vytauto Didžiojo universitetas</i>	 VMU University	Lithuania <i>LT</i>
15	Aix-Marseille University (AMU) <i>Aix-Marseille Université</i>	 Aix-Marseille Université University	<i>FR</i>
16	Technical University of Munich (TUM) <i>Technische Universität München</i>	 TUM University	<i>DE</i>
17	Technical University in Zvolen (TUZVO) <i>Technická univerzita vo Zvolene</i>	 TUZVO University	Slovakia <i>SK</i>
18	Forest Science & Technology Centre of Catalonia (CTFC) <i>Centre de Ciència i Tecnologia Forestal de Catalunya</i>	 CTFC Research institute	<i>ES</i>
19	National Institute for Agricultural Research (INIA) <i>Instituto Nacional de Investigación Agropecuaria</i>	 INIA Research institute	Uruguay <i>UY</i>
20	Forestry & Forest Products Research Institute (FFPRI) <i>森林総合研究所</i>	 FFPRI Research institute	Japan <i>JP</i>

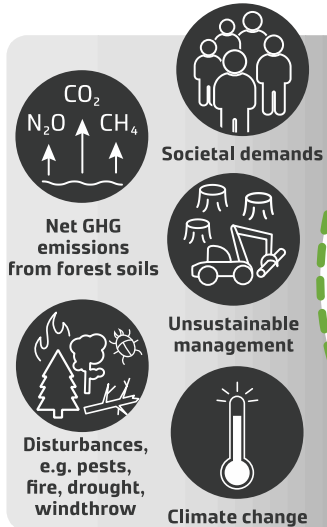


# HoliSoils – work packages

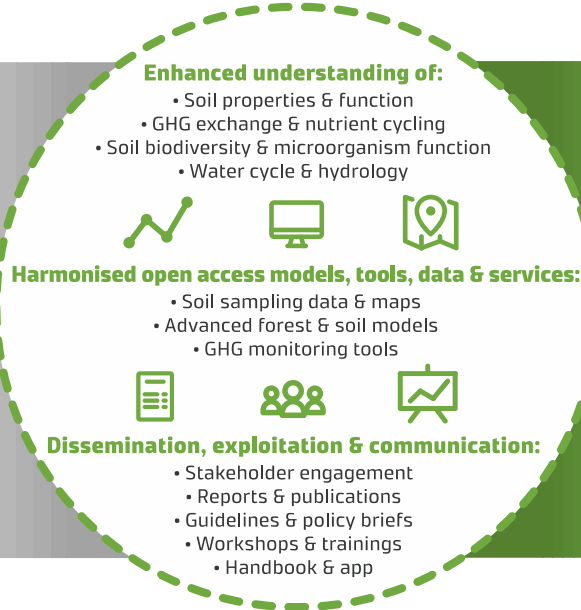


# HoliSoils – challenges – outputs – impacts

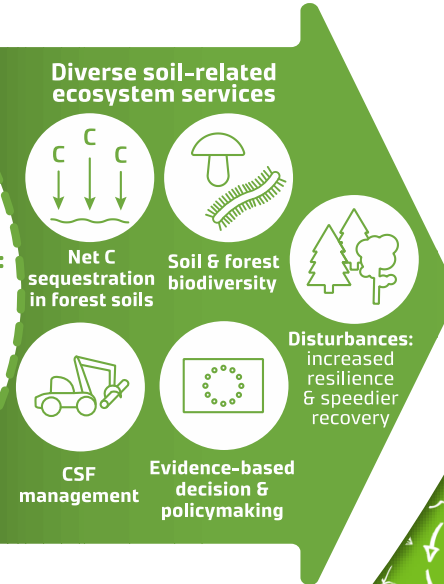
**Current challenges:**  
unsustainable forest soils



**HoliSoils' outputs**



**HoliSoils' long-term impacts:**  
healthy, sustainable forest soils



# HoliSoils – outputs for GHG inventories

## Outputs

Reviewing (representativeness  
at different scales)



Monitoring programmes  
Guidelines  
Protocols



Soil sampling  
Monitoring  
Analyses

Harmonisation



Harmonisation of a Europe-wide GHG inventory  
guideline of a harmonised GHG monitoring

Upscaling

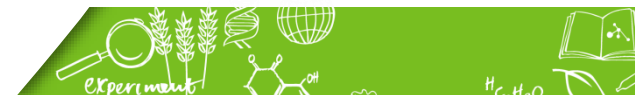


High-resolution maps of key model inputs  
Model upscaling to the European scale

Database



Harmonised soil data and associated web portal

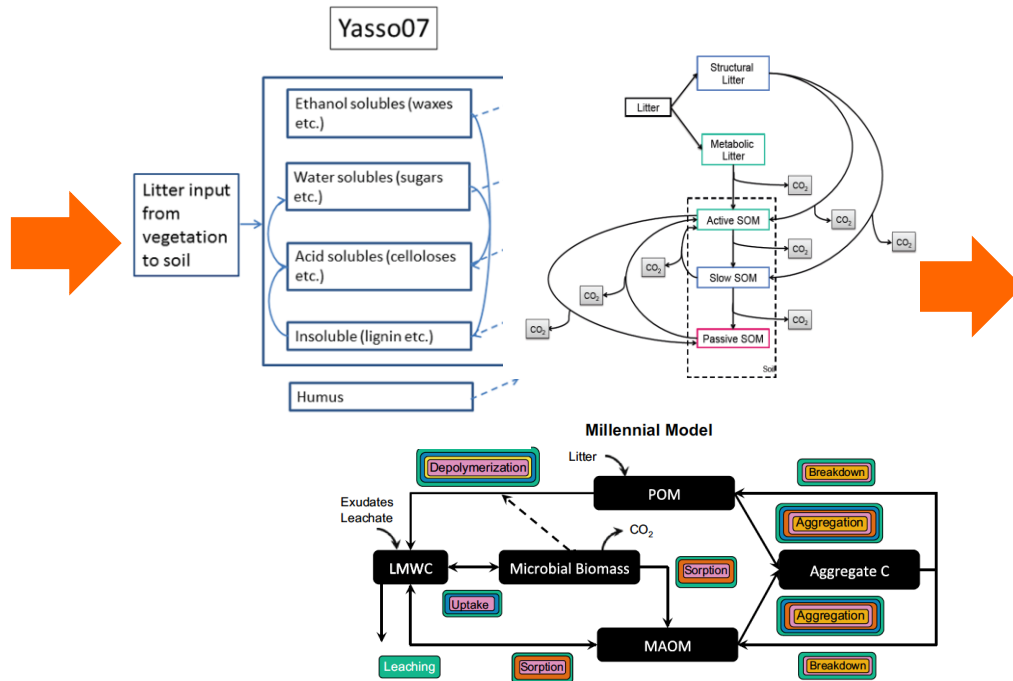


# HoliSoils – outputs for GHG inventories

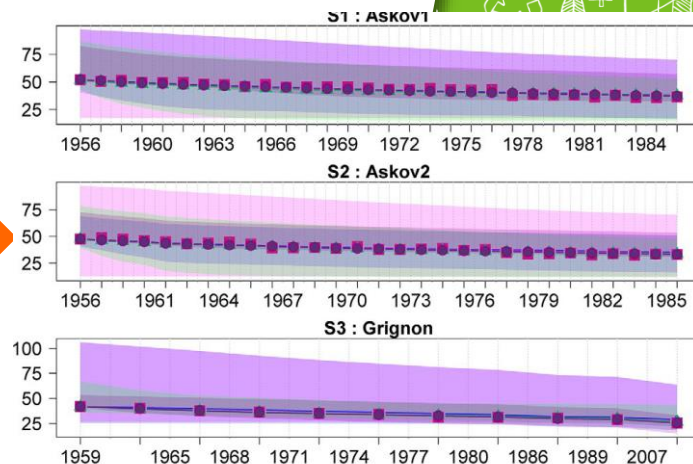
A collection of models - > uncertainty due to limited understanding taken into account

## Multi model ensemble

Input data:  
Climate  
Litter inputs  
Etc.



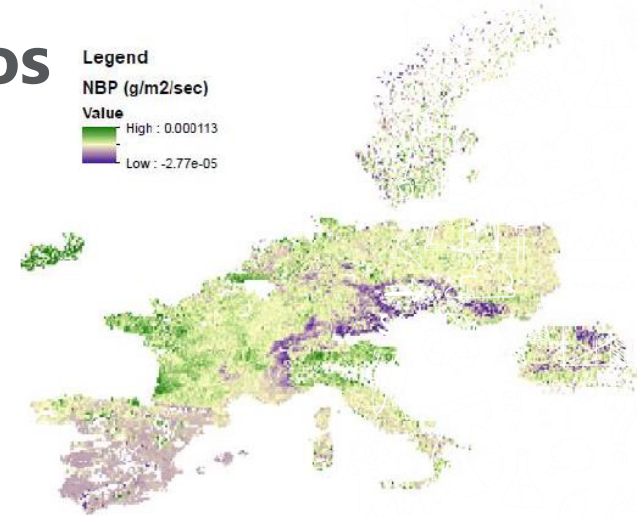
Farina et al. (2020)



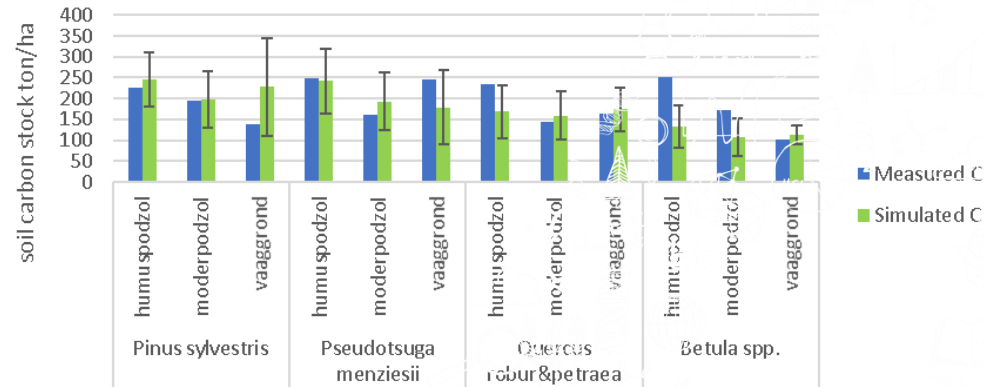
# HoliSoils – outputs for future scenarios

- Assess effects of different CSF management scenarios on forest soils in Europe, by coupling a soil model to a detailed forest resource model (EFISCEN Space)
- Quantify impacts, trade-offs and synergies of management on Europe's GHG balance, soil quality and water budget under future climate conditions and disturbance regimes using the global coarse-scale ORCHIDEE model
- Produce a European atlas on optimal CSF choices (on mineral and organic soils) over coming decades to achieve long-term EU/PA climate objectives using the synergy between ORCHIDEE and EFISCEN Space

Legend  
NBP (g/m<sup>2</sup>/sec)  
Value  
High : 0.000113  
Low : -2.77e-05



Comparison of soil carbon stocks per species in NL by EFISCEN Space/YASSO vs. measurements





# HoliSoils – interaction with LULUCF experts & JRC

Novel and reliable methods developed and tested in HoliSoils  
We need to ensure these reach the experts who will use them

## How?

Work with **JRC** and **UNFCCC** to support **LULUCF expert networks** in Europe and globally  
Dissemination and training to support new methods be recognised and implemented in **GHG inventories** globally

**Iterative process** to define user needs and tailor outputs

## Activities:

- Review GHG inventory methods and data for LULUCF sector (late 2021)
- Survey of LULUCF experts' user needs (early 2022)
- Analysis of results provided to **WPs 1 – 6** (Report, April 2022)
- **Training programme of workshops & webinars** on outputs from **WPs 2, 3 and 6** – Held in conjunction with LULUCF annual meeting at JRC (2022 – 2025)

## Who?

Thünen Institute and EFI, along with other HoliSoils partners, in collaboration with JRC LULUCF experts' will be invited to contribute to the survey and participate in the training programme

# HoliSoils

Project management contacts:

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