Laura Poggio and Fenny van Egmond on behalf of the project consortium
Frascati, March 2024

ESA SYMPOSIUM ON EARTH OBSERVATION FOR SOIL PROTECTION AND RESTORATION
ID-card of the project

• BENCHMARKS: Building a European Network for the Characterisation and Harmonisation of Monitoring Approaches for Research and Knowledge on Soils
• 5 years (1\textsuperscript{st} January 2023 – 31\textsuperscript{st} December 2027)
• Budget (EU contribution): \(~12\text{ M }\text{€}\)
• Coordinated by Wageningen University (WU), Prof. Rachel Creamer
Building a European Network for the Characterisation and Harmonisation of Monitoring Approaches for Research and Knowledge on Soils
Key objectives

1) Co-develop a coherent Integrated Soil Health Monitoring Framework

2) Test and validate the SH&F mission indicators and alternative/additional ones for different land uses and for different scales

3) Develop a European broad sampling framework, methodology and protocols, to support relevant EU policy (and global initiatives), regulation and monitoring needs

4) Co-Develop a Soil Health Dashboard with the JRC
Key aspects of the methodology
Working across scales and land uses
**BENCHMARKS Monitoring Framework**

**Context**
- **Objective**
- **Soil functions** which support the objective
- **Land use** under consideration
- **Pedo-climatic region** within Europe
- **Scale of assessment** of the application of the indicator measurements
- **User type** the type of information required

**Monitoring Metrics**
- **Practice** – defines which management practices can be implemented to respond to the objective set out in the context.
- **Result** – are useful to monitor and report a change in the short term as a result of the implementation of a practice/new technology.
- **Outcome** – are useful to monitor and report the extent to which the intervention/initiative has delivered on its goals.

**Indicator Measurements**
- **Sample** – field and lab based measurement
- **Stats** – existing data on; soils, management practices, socio-economic factors & model derived measurements.
- **Space** - digital technologies, e.g. remote sensing, satellite technology, lidar, drones
Key exploitable results and outputs

**Co-develop and communicate | WP1**
- Define indicators | WP2
- Integrate data | WP3

**Testing and upscaling | WP4**
- Monitoring, Reporting & Verification | WP5

**24 Landscape Case Studies**

**Integrated Soil Health Monitoring Framework**

**Key results and outcomes**
- Dashboard w/ JRC
- Harmonised indicator selection framework
- Soil Health Assessment and Index
- Management practices for optimisation
- Link soil health, functions and ecosystem services
- Scientific underpinning of soil health schemes

**Key impacts**

**Scientific:**
Framework for soil health in Europe to support soil strategy and SH&F mission

**Economic:**
Support sustainability strategies for businesses of 24 value-chains

**Societal:**
480 land managers engaged towards 75% healthy soils by 2030

**Input**
Existing 8 EU Mission indicators and datasets

**TRL 2-3**
Delivering on Soil Health | WP6

**TRL 4-5**
How do we monitor soil health?

1. **Identify the objective and contextualization of assessment**
2. Understanding the drivers of soil functioning
3. Soil functions, processes and parameters of interest
4. Select indicator measurements to measure change in time
5. Assess logistical considerations for indicator selection
24 Landscape Case Studies

- Agriculture: 12
- Forest: 7
- Urban: 5
Multi-stakeholder Workshops
How do we monitor soil health?

1. Identify the objective and contextualization of assessment
2. **Understanding the drivers of soil functioning**
3. Soil functions, processes and parameters of interest
4. Select indicator measurements to measure change in time
5. Assess logistical considerations for indicator selection
Goal / Objective
i.e. reduce erosion, improve water infiltration, improve yield

Soil functions
Identify functions which support objective

Soil properties
- Chemical
- Physical
- Biological

Soil processes
- Erosion
- Aggregation
- Bioturbation

Soil functions
- Climate regulation
- Habitat provision
- Nutrient cycling
- Water regulation

Ecosystem services
- Food, fibre and energy

Understanding the drivers of soil functioning
Understanding the drivers of soil functioning

Coomber et al., 2022

The life of soils: Integrating the who and how of multifunctionality

Soil Biology and Biochemistry 166 (108561)

Cognitive models
How do we monitor soil health?

1. Identify the objective and contextualization of assessment
2. Understanding the drivers of soil functioning
3. Soil functions, processes and parameters of interest
4. Select indicator measurements to measure change in time
5. Assess logistical considerations for indicator selection
Testing of indicators across Europe – sampling campaign starting this week
Defining Soil Health across Europe from the Local to European Scale of Assessment
Collaboration with other projects and initiatives

1) AI4SoilHealth
2) Soilwise
3) BioServices
4) SoilGuard
5) others
6) Mission Cluster on Indicators and Monitoring
7) Mission Cluster on Stakeholder Engagement and Communication
8) Mission Cluster on Data Management
Thank you!

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