Soil Carbon
International Research Consortium

Policy brief

Towards a Harmonised Framework

For Soil Carbon Certification & Cost-Efficient Monitoring Reporting & Verification (MRV) System

Key message 1

Develop **modular, consistent and cost-effective MRV** systems compliant with international standards

Key message 2

A need for **collaborative effort** between public research and the private sector to build a scalable and practical MRV system

Key message 3

MRV system should link carbon sequestration to **agronomic strategies**

Key message 4

MRV system should be tailored to **regional contexts**, considering cultural, political, and economic differences

Key message 5

Enhance research and knowledge sharing through **international collaboration**

Abstract

Soils are the largest terrestrial reservoir of organic carbon, yet they are easily degraded. Consistent and reliable monitoring of changes in **Soil Organic Carbon (SOC) stocks** and net Greenhouse Gas (GHG) emissions along with accurate reporting and verification are essential to facilitate **investment in sustainable land use practices** that maintain or increase SOC stocks. It is also crucial for SOC integration sequestration into national GHG reduction targets.

However, **three main challenges** currently limit the investment in SOC certification schemes: **i) the heterogeneity** in Monitoring, Reporting, and Verification (MRV) robustness **ii) the cost of implementing** the MRV system i**ii) the diversity of regional contexts.**

This policy brief proposes **five key recommendations** to address these challenges. It builds on **the Policy Workshop on International Carbon Certification Schemes,** organised by the Soil Carbon International Research Consortium in Brussels on 26 September 2024. This workshop brought together international experts, researchers, and stakeholders to discuss MRV of SOC stock changes.

Introduction

Soil carbon storage is a vital component in achieving global climate neutrality goals. The workshop, organised by the ORCaSa project as part of the Soil Carbon International Research Consortium, focused on **the current status and future directions of soil carbon certification schemes.**

It brought together experts to explore **harmonised MRV systems and certification standards**, encouraging dialogue between policymakers, researchers, and practitioners. The event featured presentations from experts across Europe, the United States of America, Australia, and the Pacific region, followed by interactive discussions on the challenges and opportunities in soil carbon MRV frameworks.

Key message 1

Develop modular, consistent and cost-effective MRV systems compliant with international standards

As Batjes et al. (2023; 2024) and Ceschia et al. (2025) show, **the MRV framework should be modular** to allow :

1) **Improvements in each component** (M, R, V) independently
2) **Multi-tier approaches** for monitoring
3) **Implementation in different MRV contexts** (Nationally Determined Contributions (NDCs), Common Agricultural Policy (CAP), Voluntary Carbon Market (VCM)).

This will ensure **flexibility and adaptability as technologies evolve**. It should also be consistent and fully compliant with IPCC guidelines to ensure its reliability and global acceptance.

Models often provide more reliable estimates of Soil Organic Carbon (SOC) changes than direct measurements, as there are challenges in achieving accurate farm-level carbon measurements due to spatial and procedural variability. To implement an MRV system, there is **a need for robust, independently tested models** that account for spatial variability of carbon inputs to the soil such as biomass, using remote sensing inputs and/or stability zones.

Multi-Model Ensembles (MME) can be used to improve SOC assessments and avoid the risk of over-calibration associated with single models. The MME approach offers a way to improve model accuracy, establish reliable baselines, and **reduce uncertainty in SOC change assessments.**

Science-based soil carbon policies are needed to choose the right measurement or modelling approach depending on the project scale and requirements, with a focus on model validation and uncertainty quantification.

The Australian context

- Decades of experience with **the Australian Carbon Credit Units (ACCUs)** scheme demonstrate the importance of science-based policies and robust MRV methodologies. The Australian approach to soil carbon measurement and modelling provides a clear example of the use of data focused on offsetting and the value chain.

Key message 2

A need for a collaborative effort between public research and the private sector to build a scalable and practical MRV system

There is a need for **a collaborative effort between public research and the private sector** to build scalable and practical Monitorinfg, Reporting, Verification (MRV) tools for each ecosystem that are multi-context, accessible, reliable, and beneficial for farmers/foresters and researchers.

Both public and private actors must be involved in conceptualising those MRV tools in the future that are **transparent, robust, and adapted to regional contexts.**

This system should be **cost-effective, transparent, and robust,** with public research taking responsibility of model development, calibration, and validation, while the private sector integrates these models into end-user platforms as with **the AgriCarbon-EO processing chain** (Wijmer et al. 2024).

The end-user platform must be user-friendly to facilitate its use by farmers and increase their acceptance, and it must limit the time needed to integrate the data. This will help ensure wide adoption in different farming systems.
The MRV tool should be multi-context to ensure consistency between different Soil Organic Carbon (SOC) stock changes assessment (e.g. for the Nationally Determined Contributions (NDCs) and for the Voluntary Carbon Market (VCM)).

It should allow plot scale assessment to build a unique spatially explicit carbon registry allowing to avoid double accounting of SOC stock changes and of carbon crediting, but also offering the flexibility to combine practice-based (e.g; through agri-environmental measures such as in the Common Agricultural Policy (CAP)) and result-based payment (i.e. through the VCM).

The USA context

- The United States of America focuses on **voluntary carbon markets and Scope 3 emission reductions,** with significant investments in MRV infrastructure and technical guidelines. **Federal and state initiatives** support voluntary carbon markets, leveraging substantial investments in monitoring and climate-smart agriculture.

Key message 3

MRV system should link carbon sequestration to agronomic strategies

Effective soil carbon transition can only be achieved by **looking at the entire farm and whole crop rotation.** The Monitoring, Reporting, Verification (MRV) tool should include **a decision-support system** linking carbon sequestration to agronomic strategies, enabling farmers to manage and monitor their transition at farm level.

If farmers are expected to adapt to a different cropping system, we need to understand **the power dynamics in the MRV value chain** between farmers, cooperatives, and the agri-food industry.

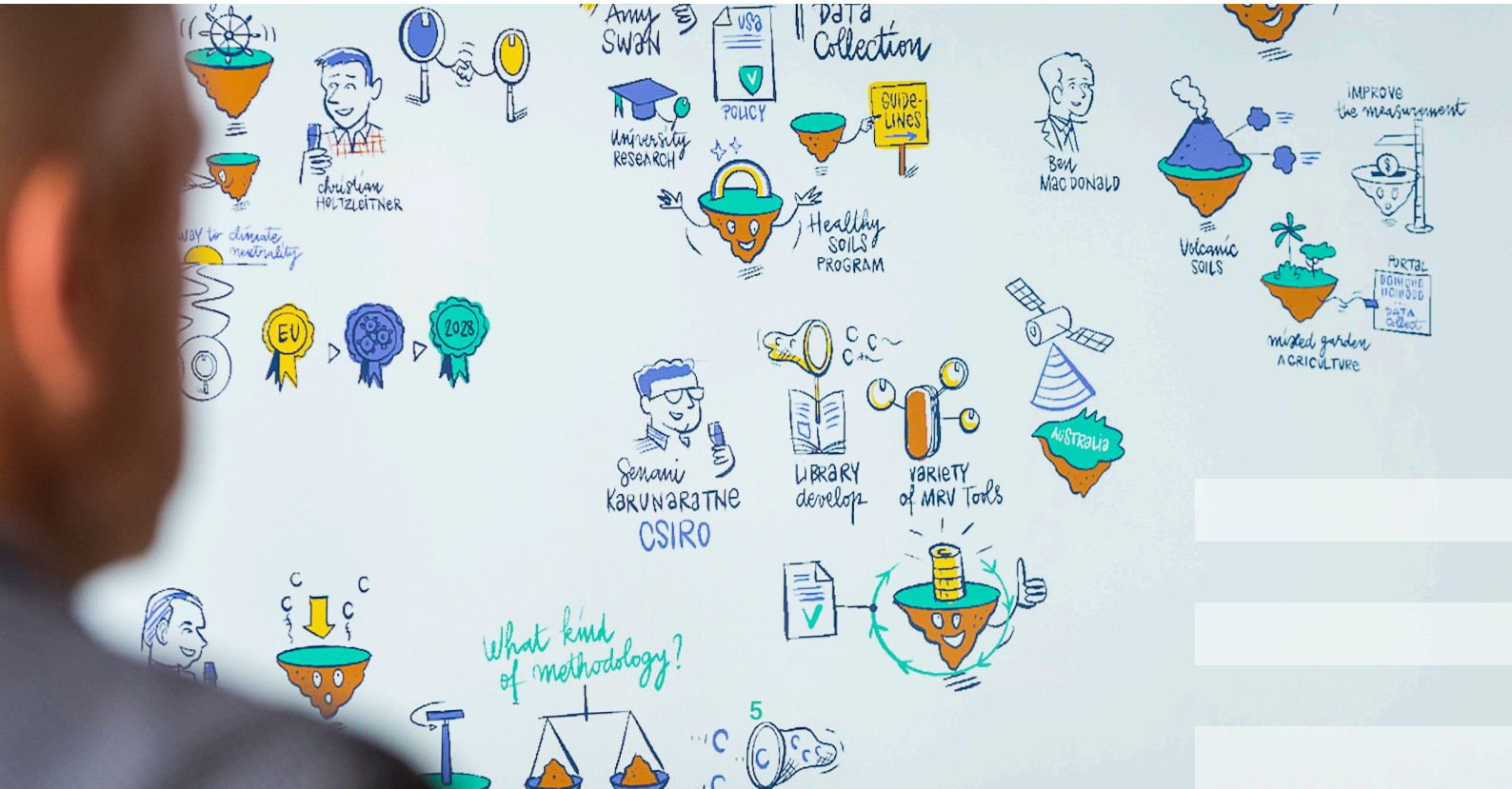
Through the implementation of multi-context MRV tools allow hybrid payment schemes (e.g. combining Common Agricultural Policy (CAP) subsidies and carbon credits from the Voluntary Carbon Market (VCM)) to enhance farmer's incomes and **ensure a fair revenue distribution** in carbon credit systems.

The European context

- A key issue in Europe is **the avoidance of double-counting and ensuring additionality.** Agri-food companies often discourage farmers from joining carbon credit schemes, fearing that this will limit their access to data.

The Latin American context

- Many Brazilian companies are launching **soil regeneration programmes,** influenced by Environmental, Social, and Governance. (ESG). Appropriate MRV systems for soil carbon could increase the interest of both large companies and smaller producers in sustainable agricultural practices.



Key message 4

MRV system should be tailored to regional contexts, considering cultural, political, and economic differences

The Monitoring, Reporting, Verification (MRV) framework should be flexible enough to **adapt to regional contexts** and MRV tools should be tailored to these contexts, taking into account cultural, political, and economic differences. This includes **understanding the power dynamics in the MRV value chain** and ensuring that farmers and local stakeholders are adequately supported.

There are **regional differences** (cultural, political, economic, etc.) that need to be overcome when conceiving a harmonised global MRV framework.

Policymakers should **address economic and policy barriers** by providing guidance on the quality of methods and ensuring proper implementation. This includes developing tiered methods for measuring soil emissions and carbon sequestration, as outlined in the Greenhouse Gas (GHG) Protocol.

The African context

- **MRV is limited in Africa, and its cost can discourage investment** by large companies wishing to enter the carbon market. For example, the first African conference on carbon credits was only organised in May 2024. Research and data collection efforts are needed to make progress.

The USA context

- It is crucial that public authorities provide **guidance on the quality of methods** and ensure that they are proper ly implemented.

Key message 5

Enhance research and knowledge sharing through international collaboration

International collaboration is essential to advance soil carbon research and policy. **The Soil Carbon International Research Consortium (IRC)** should continue to facilitate knowledge sharing and cooperation through platforms such as **Impact4Soil and its regional nodes.**

Capacity building is also key to ensure that monitoring tools (e.g. models) and data resources are properly handled. An effective Monitoring, Reporting, Verification (MRV) framework is not just about selecting the best model or modelling approach (see Ceschia et al. 2025), but also agreeing on how it is used to ensure the desired results.

The Soil Carbon IRC should also **promote the alignment of research** and encourage collaboration between stakeholders.

Context in the Pacific region

- **Foundational investments** in knowledge, capacity, and measurement systems are needed before implementing a formal MRV for soil carbon.

The Vietnamese context

- **Vietnam is expected to launch a carbon market in 2027**. However, MRV systems still need further development, and research is needed to determine which organic materials, such as biochar, should be used in soil.

To go further

Batjes, N., Ceschia, E., Heuvelink, G., Demenois, J., Le Maire, G., Cardinael, R., Arias Navarro, C., Van Egmond, F., 2023. **ORCaSa D4.1 - International review of current MRV initiatives for soil carbon stock change assessment and associated methodologies.** *https://irc-orcasa.eu/wp-content/uploads/2024/07/ORCaSa-D4.1.pdf*

Niels H. Batjes, Eric Ceschia, Gerard B.M. Heuvelink, Julien Demenois, Guerric le Maire, Rémi Cardinael, Cristina Arias-Navarro & Fenny van Egmond (2024) **Towards a modular, multi-ecosystem monitoring, reporting and verification (MRV) framework for soil organic carbon stock change assessment, Carbon Management,** 15:1, 2410812, DOI: 10.1080/17583004.2024.2410812

Eric Ceschia, Ainhoa Ihasusta, Ahmad Al Bitar, Niels Batjes, Fenny van Egmond, Gerard Heuvelink, Cloé Paul-Victor, Mathieu Nogues, Lisa Pontes, Suzanne Reynders, Taeken Wijmer, Senani Karunaratne, Ben Macdonald, Edouard Lanckriet, Célia Ruau, Romane Juber, Julius Vira, Liisa Kulmala (2025) **ORCaSa D4.2 - Monitoring, reporting and verification of soil organic carbon stock changes in arable land: Cookbook for assessment in different MRV contexts and proposition of a harmonised approach.** *https://irc-orcasa.eu/resource/*

Wijmer, T., Al Bitar, A., Arnaud, L., Fieuzal, R., Ceschia, E., 2024. **AgriCarbon-EO v1.0.1: large-scale and high-resolution simulation of carbon fluxes by assimilation of Sentinel-2 and Landsat-8 reflectances using a Bayesian approach.** Geoscientific Model Development 17, 997–1021. https://doi.org/10.5194/gmd-17-997-2024

Conclusion and next steps

Harmonisation soil carbon certification and Monitoring, Reporting, Verification (MRV) systems is crucial to **achieving global climate goals.** Policymakers, researchers, and practitioners must work together to develop scalable and adaptable solutions at regional level. By addressing the challenges and opportunities in soil carbon MRV frameworks, they can **advance soil carbon practices and policies, contributing to a healthier planet.**

How to cite

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Soil Carbon
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The **Soil Carbon International Research Consortium** aims to advance carbon solutions and provide better access to research, methods and practices related to soil carbon management

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This policy brief only reflects the authors' views, not all the stakeholders in the policy workshop.