D6.5 IPR, Business Model Report and Policy Brief, v1

M24/AUG 2025

**Funded by
the European Union**

Acronym	SoilWise
Project Full Title	An open access knowledge and data repository to safeguard soils
GA number	101112838
Topic	HORIZON-MISS-2022-SOIL-01-01
Type of Action	HORIZON Innovation Actions
Project Duration	48 months
Project Start Date	1-Sep-23
Project Website	https://soilwise-he.eu/
Deliverable Title	IPR, Business Model Report and Policy Brief, v1
Delivery Time (DOA)	M24
Deliverable Submission Date	31/08/2025
Status	Final
Dissemination Level	PU - Public
Deliverable Lead	BIOS
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Work Package	WP6
Dissemination level	Public
Keywords	SoilWise Repository, IPR, Business Model, Policy Brief
Abstract	The purpose of the SoilWise IPR, Business Model Report, and Policy Brief is to provide key recommendations for the sustainable development of the SoilWise Repository (SWR), focusing on Intellectual Property Rights (IPR), business modelling, and policy alignment. As a metadata hub, SWR improves the findability and reusability of soil data from trusted European sources without storing raw data. By applying FAIR principles and supporting EU soil policy goals, this report guides stakeholders in ensuring responsible data use, long-term sustainability, and institutional integration of the platform.

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In this document, the acronym 'DOMG – VL O' is used to refer to the Department of the Environment and Spatial Development, Flanders, Belgium, as per the partner's request for clarification. It's noted that in the grant agreement, the partner is identified by the acronym VL O (Vlaamse Gewest).

List of Abbreviations

AI	Artificial Intelligence
API	Application Programming Interface
BIOS	BioSense Institute
CAP	Common Agricultural Policy
CEADS	Common European Agricultural Data Space
CORDIS	Community Research and Development Information Service
D	Deliverable
DMP	Data Management Plan
EC	European Commission
EJP Soil	European Joint Programme on Soil
EL ILVO	Eigen Vermogen Van Het Instituut Voor Landbouw- En Visserijonderzoek
ELO	European Landowners' Organization
ESDAC	European Soil Data Centre
EU	European Union
EUSO	EU Soil Observatory
FAIR	Findable, Accessible, Interoperable and Reusable
INRAE	Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement
INSPIRE	Infrastructure for Spatial Information in Europe

IPR	Intellectual Property Rights
JRC	Joint Research Centre
JSON	JavaScript Object Notation
ML	Machine Learning
R&D	Research and Development
SWR	SoilWise Repository
T	Task
UC	User Case
WP	Work Package

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Executive Summary

The SoilWise project, under the Horizon Innovation Actions, aims to develop an open-access soil knowledge and data repository to support users in safeguarding soil across Europe. With 60-70% of European soils currently considered unhealthy. The project addresses the urgent need for reliable and harmonized data to support informed decision-making at various levels, aligning with the EU Mission 'A Soil Deal for Europe' and other related strategies. SoilWise, spanning 48 months and involving 15 partners, is designed to create a scalable, modular repository that leverages Artificial Intelligence (AI) and Machine Learning (ML) technologies to make soil data Findable, Accessible, Interoperable, and Reusable (FAIR).

Purpose

The deliverable *D6.5 IPR, Business Model Report, and Policy Brief* is developed under the task T6.4 SoilWise Business Model, IPR Management, and Policy brief of the SoilWise project. This deliverable is one of the two reports under work package (WP) 6 that outlines the IPR management process, defines business model for the SoilWise Repository (SWR) and its contributors, and presents the project's results and recommendations that will also be communicated to policy makers through a policy brief.

This deliverable represents a comprehensive analysis, and a set of recommendations focused on three components essentially connected to the development and sustainability of the SoilWise Repository: Intellectual Property Rights (IPR), sustainable business modelling, and policy alignment. As a soil data and knowledge hub, the SWR plays a central role in improving accessibility, interoperability, and reuse of soil information across Europe.

This deliverable supports SoilWise project's broader mission to enhance the accessibility, interoperability, and reuse of soil data across Europe, contributing to improved soil management and policy implementation under the EU Mission "A Soil Deal for Europe."

Intended Audience

The document is intended primarily for stakeholders involved in soil data governance and management across Europe. This includes decision-makers and policymakers working in land-use planning, environmental management, and agricultural policy at local, regional, and EU levels. It is also relevant to researchers specializing in soil science and data management, as well as land managers. The document provides stakeholders with key insights into intellectual property rights, sustainable business scenarios, and policy alignment, supporting the effective use and long-term sustainability of the SWR.

Description of Main Activities

Three main activities were carried out:

- **Data Ownership and Metadata:** SoilWise indexes metadata exclusively from existing repositories, where assets already have a persistent presence and their own licensing conditions. The SoilWise Repository functions as a catalogue that organizes and exposes this metadata to enhance asset discoverability. This deliverable clarifies how these components were developed and their nature in terms of IPR in Open Science principles.

- **Exploration of Business Sustainability Options:** Several scenarios for ensuring the long-term sustainability of the SoilWise Repository are described. These scenarios explore potential business

models, funding strategies, and operational approaches that could support the ongoing maintenance, development, and usability of the SWR.

- **Policy Brief Development:** Highlights how the SoilWise Repository supports EU soil governance by harmonizing data, ensuring FAIR compliance, and aligning with key policies.

Research and Practice Implications

The deliverable provides guidance on how metadata is collected, harvested, and indexed within the SWR, highlighting the use of open standards to improve discoverability and interoperability. For practitioners and institutional stakeholders, SWR's alignment with EU governance frameworks facilitates integration with existing soil monitoring and planning activities. By documenting these processes, the deliverable supports the effective use of SWR and informs future developments in open soil data infrastructures.

Policy Implications

The findings highlight the importance of supporting legal and technical frameworks that enable open, interoperable, and discoverable soil data. Alignment with EU policy goals, including the objectives of the Mission Soil, can enhance the integration of soil data into monitoring and sustainable land-use activities. Policymakers may consider SWR as a catalogue infrastructure that facilitates metadata harvesting and indexing from existing sources, supporting broader soil data initiatives such as the implementation of the Soil Monitoring Law and related strategies.

Conclusion

By addressing business sustainability models, intellectual property considerations, and policy integration, this deliverable provides a strategic foundation for the continued development of the SWR. The documented processes and guidance will support future project activities and contribute to the repository's long-term utility as a trusted, policy-relevant infrastructure for soil metadata in Europe.

1 Introduction

1.1 Project Summary

Now more than ever, soil health is an issue that needs to be addressed urgently, as recent assessments state that 60-70% of European soils can be considered unhealthy (Bouman, 2022). The EU Mission 'A Soil Deal for Europe', the EU Soil Strategy and the proposal for a Soil Monitoring and Resilience Directive (5 July 2023) aim to have 75% of EU soils healthy or significantly improved by 2030 and all soils healthy by 2050. Reaching such an ambition requires, among others, access to reliable, harmonised existing and new data and knowledge collected at local, national and EU levels to allow **informed decision-making at all scales to support the proposed Soil Monitoring and Resilience Directive and the EU Soil Strategy**.

☞ SoilWise aims to develop, test, and deliver a prototype for a long-term knowledge and data repository that is expected to become part of European Union Soil Observatory (EUSO). Fifteen project partners must design, develop, validate, and demonstrate the solution. Five practice-oriented "user cases" will support the demonstration of the solution, representing six target groups and their needs.

The SoilWise project will provide an integrated and actionable access point to scattered and heterogeneous soil data and knowledge in Europe, making them FAIR (Findable, Accessible, Interoperable and Reusable) and improving trust, willingness, and the ability to share and re-use soil data and knowledge. In three project development cycles, **co-creation and co-validation by multi-stakeholder groups are at the centre of project activities**.

Figure 1 Development cycles of the SoilWise project

1.2 Document Scope and Structure

This deliverable, titled "IPR, Business Model Report, and Policy Brief v1", provides the first comprehensive framework for managing Intellectual Property Rights (IPR), establishing sustainable business models, and developing policy recommendations within the SoilWise project. It directly supports WP6 objectives by outlining mechanisms that enable the responsible use, sharing, and commercialization of soil data and knowledge.

While the SoilWise Repository (SWR) forms the foundation for data and knowledge exchange, ensuring its long-term viability requires clear IPR frameworks and sustainable business strategies. This deliverable explores approaches to protect and manage intellectual property in a way that balances openness with stakeholder interests, proposes business models that support repository operation and growth, and identifies policy actions to foster interoperability, trust, and cooperation across the European soil data ecosystem.

Recognizing the complexity and diversity of stakeholders involved, this report also emphasizes the need for collaborative development of these frameworks at the European level. SoilWise aims to actively contribute to this process, while acknowledging that further refinement and broader stakeholder engagement will be needed beyond the scope of this initial version.

An updated version of the SoilWise IPR, Business Model Report, and Policy Brief will be developed during the third cycle of the project.

The document is structured as follows:

- **Chapter 1**: Introduction to SoilWise project and the purpose of this deliverable.
- **Chapter 2**: IPR Management – This chapter outlines the open-source nature of the SoilWise Repository, data management aligned with Intellectual Property Rights (IPR), and integration with external data providers and end users.
- **Chapter 3**: Business Model Report – This chapter contains proposed business models for the SoilWise Repository and explores alternative scenarios in reference to EUSO.
- **Chapter 4:** Policy Brief – Covers key policy challenges in the development of the SoilWise Repository …
- **Chapter 5**: Final Summary: IPR, Business Models, and Policy Implications conclusions and next steps

1.3 Relationship to other project deliverables

This deliverable relates to and complements the following deliverables:

- **D1.1** – Usage Scenarios, Requirements, v1 (M6)
- **D1.3** – Repository architecture, v1 (M23)
- **D1.5, D1.6** – Repository GM (M23, M42)
- **D2.1, D2.2** – Developed & Integrated DM components, v1, v2 (M13, M18)
- **D2.5, D2.6** – Report on strategy for FAIRness on soil data, v1, v2 (M27, M42)
- **D3.1, D3.2** – Developed & Integrated KM components, v1, v2(M13, M18)
- **D3.5, D3.6** – Report on strategy for effective soil KM, v1, v2 (M27, M42)
- **D4.1, D4.2** – Repository infrastructure, components and APIs, v1, v2 (M13, M18)
- **D4.5, D4.6, D4.7** – Repository Data and Knowledge Resources, v1, v2, v3 (M21, M34, M46)
- **D5.3** – Deployment and Evaluation Report, v1, v2 (M21, M34)
- **D6.2, D6.3** – DEC and Capacity Building Plan and Report, v1, v2 (M3, M18)
- **D6.6** – IPR, Business Model Report, and Policy Brief, v2 (M47)
- **D7.2, D7.3, D7.4** – Open Science and Data Management Plan (M6, M27, M48)

1.4 Relationship to other project tasks

This deliverable relates to the following tasks:

- T1.1 – Define Repository usage scenarios
- T1.2 – Cooperation with JRC and EUSO
- T1.3 – Requirements, Validation framework and Rolling plan
- T1.5 – Define SoilWise Multi-Stakeholder governance model
- T2.4 – Strategy for FAIRness of soil data
- T3.4 – Strategy for efficient KM
- T4.3 – Solutions & repository validation and population
- **T6.4 – SoilWise Business Model, IPR Management, and Policy Brief**

2   IPR Management

Overview of SoilWise Repository

The SoilWise Repository is an open-access, integrated platform that serves as a centralized access point for soil-related data and knowledge, designed to make these FAIR, Findable, Accessible, Interoperable, and Reusable. Unlike traditional repositories, the SWR neither claims ownership of nor directly stores the original assets.

The core value of the SoilWise Repository lies in enhancement: by adding standardized metadata, applying semantic alignment, and integrating advanced visualization and querying tools, it makes soil data usable across disciplines, geographies, and systems, especially for researchers, policymakers, and business community, and farming professionals.

2.1 Intellectual Property Management

2.1.1   Intellectual Property and Data Ownership

All source data and knowledge used by the SoilWise Repository remain the intellectual property of their original publishers. The SWR makes no claim of ownership over any harvested data and fully respects all existing rights. Its role is limited to harvesting and storing metadata while providing references and direct links to the original sources, ensuring strict compliance with the IPR terms established by the data providers. Currently, the quality of the metadata in the SWR is determined primarily by the quality of the metadata supplied by the original data providers at the source.

2.1.2   SoilWise Metadata, Semantic Transformation, and Interoperability

The SoilWise Repository functions not merely as a metadata catalogue but as a **knowledge-oriented system**. While it does not harvest or store the actual data or knowledge assets, it indexes metadata from existing repositories and leverages semantic techniques to **organize, enrich, and interlink** this metadata. As outlined in Task 3.4 on knowledge management, these capabilities aim to transform scattered data references into **actionable knowledge**, enabling policymakers, researchers, and businesses to derive insights more easily. By integrating these knowledge-management functions into its operational model, SoilWise Repository delivers added value: it supports decision-making and evidence-based policies rather than serving solely as a data download portal. This strategic linkage with Task 3.4 enhances the repository's sustainability, usability, and user appeal without duplicating the technical details described in T3.4.

Metadata describing **data and knowledge assets** in the SoilWise Repository vary in origin, format, and how they can be used. SoilWise harvests metadata exclusively from existing repositories. Each asset may have its own license; many are open-access (allowing free use and sharing), though some carry restrictions requiring permission or attribution. The formats also differ: one asset might be a structured table or geospatial map, whereas another could be an image or document. Importantly, not all assets are at the same stage of processing. Some have been "semantically enriched," meaning SoilWise has tagged them with standard terms and linked them to related knowledge (making them easier to find and combine), while others appear in a more basic form with basic descriptions. This clarification helps users understand that each asset in SoilWise might have different origins, usage rights, formats, and levels of integration into the knowledge system, which is key for planning how to access or reuse the information. in origin, format, and how they can be used.

To support data harmonization and interoperability, the SoilWise Project utilizes hale»studio by WeTransform GmbH, a specialized open-source software, whereby the main hale studio components/libraries are released under the GNU Lesser General Public License (LGPL) v3.0. Through this software diverse soil data can be mapped and converted into standardized formats such as INSPIRE-compliant GML, GeoJSON, and RDF, enabling seamless integration and reuse across systems.

2.1.3   Developed Components, Liscencing and Ownership

The SoilWise Harvester is a core ingestion component that collects and manages metadata from distributed sources. It runs on a schedule to keep local catalogue copies synchronized with remote sources, publishing results only after processing and metadata augmentation. The harvester uses existing standards where available and includes duplication checks to ensure data quality.

The SoilWise Catalogue User Interface is the primary access point to the repository, enabling users to discover and explore metadata. It supports full-text and faceted search, displays results with previews of key information, and offers a map view for spatial data. Users can download data in its original format and view metadata augmentation, with options to provide feedback to publishers or authors.

The **pycsw component** in the SoilWise repository provides a standards-based metadata catalogue that enables users to search, discover, and access resources. It supports multiple APIs, including CSW, OGC API-Records, STAC, OAI-PMH, and OpenSearch, making it highly compatible with different data discovery tools. pycsw is open source under the MIT license and serves as an OGC reference implementation, ensuring compliance with international standards. In SoilWise, it powers the catalogue functionality, allowing seamless integration of metadata harvesting, storage, and search capabilities.

The component checks the status of web links in metadata records and consists of 2 parts: (1) an API which can be queried to retrieve link-test results by status or the status of an individual link. The component includes a generic python link checking library. An exception is made for links of type OGC: WMS, WFS, WCS, CSW, WPS, SOS, which return an error 500 if requested without parameters. The OwsLib is used to test these links. Link types are identified by analysing the type of property of the link (in the OGC API – Records).

Metadata Validation component of the SoilWise Repository component ensures harvested metadata is structured, complete, and reliable. It performs profile validation, completeness checks, and link liveliness assessments to verify conformity, presence of required fields, and active references. Implemented as open-source software, these tools improve metadata discoverability and trustworthiness and are documented via GitHub, Zenodo, video tutorials, and online technical guides.

Transformation and Harmonization component, implemented by **HALE Studio 5.3**, supports the preparation of metadata for interoperability and consistent use across data and knowledge assets. It enables manual metadata upload, metadata and data transformation, coordinates reference system (CRS) conversion, data restructuring, format transformation, codelist mapping, and unit of measurement conversion. Users can also download interoperable metadata ready for integration into the SoilWise Repository.

Metadata Augmentation: SoilWise Repository enhances metadata through three key components: a Translation Module to standardize multilingual metadata, a Keyword Matcher to harmonize terminology across assets, and a Metadata Interlinker to create semantic connections between related assets. These tools improve discoverability, interoperability, and usability of metadata

SoilWise Knowledge Graph enables enrichment and linking of soil-related assets, creating semantic connections that support advanced querying, reasoning, and knowledge discovery.

Repository Storage: SoilWise Repository manages different types of content using specialized storage systems: user-enhanced content is stored in Git, raw harvested metadata and augmented metadata are stored in PostgreSQL, and augmented, linked metadata along with the Knowledge Graph are stored in a triple store.

Table 1 SoilWise modules with their licenses and ownership

Component	Function / API	Source code (GitHub)	Source code (Zenodo)	Tutorials/ Documentation	Developer	License
Harvester	Harvest metadata resources	https://github.com/soilwise-he/harvesters/releases/tag/v0.2.0	https://doi.org/10.5281/zenodo.14923563	https://prototype-2-0.soilwise-documentation.pages.dev/technical_components/ingestion/	WU/WR /ISRIC	MIT
	Harvest knowledge resources					
	Metadata harmonization					
	Metadata RDF Turtle serialization					
	RDF to Triple store					
	Duplication identification					
Catalogue User Interface	Query Catalogue (full text)	https://github.com/soilwise-he/catalogue-ui/releases/tag/v0.2.0		https://prototype-2-0.soilwise-documentation.pages.dev/technical_components/catalogue/	WU/WR /ISRIC	MIT
	Query Catalogue (facet filters)					
	Data download (AS IS)					
	Display metadata augmentation results					
	Map preview					
	User Engagement					
pycsw	CSW API	https://github.com/geopython/pycsw/releases/tag/3.0.0-beta1		https://prototype-2-0.soilwise-documentation.pages.dev/technical_components/catalogue/	pycsw community	MIT
	OGC API-Records					
	STAC API					
	OAI-PMH API					
	OpenSearch					
Metadata validation	Metadata profile validation		https://doi.org/10.5281/zenodo.14924543	https://www.youtube.com/watch?v=PxI5hI3FxJg&list=PLoyBfgUelhNOwA_GGkd4hSwDnwNhxGC87&index=1&t=1461s	MU/WE	MIT
	Metadata completeness check	https://github.com/soilwise-he/metadata-validator/rel		https://prototype-2-0.soilwise-documentation.pages.dev/technical_components/metadata_v	WU/WR /ISRIC	MIT

		eases/tag/v0.2.0/		alidation/completeness-indication		
	Link liveliness assessment	https://github.com/soilwise-he/link-liveliness-assessment/releases/tag/v0.1.0	https://doi.org/10.5281/zenodo.14923790	https://prototype-2-0.soilwise-documentation.pages.dev/technical_components/metadata_validation/#link-liveliness-assessment	NP	MIT
Transformation and Harmonization (hale>>studio 5.3)	Manual metadata upload	https://github.com/halestudio/hale/releases/tag/v5.3.0		https://www.youtube.com/playlist?list=PLoyBfgUelhNOwA_GGkd4hSwDnwNhxGC87	WE	GNU Lesser General Public License LGPL v3.0
	Metadata transformation					
	CRS transformation					
	Data restructuring					
	Format transformation					
	Codelist mapping					
	Units of measurements conversion					
	Download interoperable metadata					
Metadata Augmentation	Translation module	https://github.com/soilwise-he/harvesters/releases/tag/v0.2.0		https://prototype-2-0.soilwise-documentation.pages.dev/technical_components/metadata_augmentation/	WU/WR/ISRIC	MIT
	Keyword matcher	https://github.com/soilwise-he/metadata-augmentation/releases/tag/v0.2.0	https://doi.org/10.5281/zenodo.14924181			
	Metadata interlinker					
Knowledge Graph	Knowledge Graph enrichment and linking	https://github.com/soilwise-he/soil-health-knowledge-graph/releases/tag/v0.2.0		https://prototype-2-0.soilwise-documentation.pages.dev/technical_components/knowledge_graph/	WR	MIT
	Knowledge Graph querying (SPARQL endpoint)					
Repository Storage	Storage of user-enhanced content - Git	Not applicable	Not applicable	https://prototy		

	Storage of raw harvested metadata – PostgreSQL		pe-2-0.soilwise-documentation.pages.dev/technical_components/storage/	Not applicable	Not applicable
	Storage of augmented metadata – PostgreSQL				
	Storage of augmented, linked metadata, knowledge graph - Triple Store				

2.2 Integration with External Data Providers and Users

The SWR enables collaboration among diverse stakeholders, including public authorities, researchers, and farming or business professionals. The stakeholders can contribute data, access information, or do both, while the system itself ensures metadata quality, interoperability, and responsible (meta)data handling.

Integration with data providers is primarily handled through the Harvester component, which collects and synchronizes metadata from external catalogues. When needed, the Transformation and Harmonization module (using Hale»studio 5.3) can be used to transform specific metadata to selected metadata schemas, ensuring consistency and interoperability.

The Metadata Validation module checks the level of metadata completeness and the link liveliness, i.e. whether the links are working. The Metadata Augmentation module adds additional information to make data easier to find and understand.

The Knowledge Graph semantically links data, enhancing discoverability and interoperability across the repository. All data and metadata are persistently stored in the Repository Storage, ensuring reliable access and traceability.

To foster collaboration, the SWR uses standardized APIs, making it easier for data users to search, discover, and access information. SWR's technical documentation, APIs, and source code are publicly available via the project's GitHub repository, under an open license (e.g., MIT License), except for transforming tools (Hale»studio). SoilWise organizes and links data to facilitate responsible data access and reuse, ensuring compliance with IPR at the component level. Access control, validation, and provenance tracking are embedded in the system to support responsible, FAIR-compliant use of data.

2.3 Conclusion and Recommendations

The SoilWise Repository contains only metadata, including their persistent identification, and links to the original data sources. It respects and preserves the IPR and licensing conditions defined by those sources while remaining neutral regarding data ownership and licensing. The repository's catalogue does not store data or enforce IPR restrictions; instead, it focuses on making metadata and linked resources FAIR by using standardized, interoperable formats and open specifications. All developed components, including the catalogue and metadata validation tools, are open source and available via the project's GitHub repository. When openly licensed data are transformed into enriched products, SWR ensures that these outputs are clearly distinguished from the original data and that source licensing conditions are fully respected. To promote open science and innovation, it is recommended that data contributors adopt open licensing models and that collaborations follow transparent, well-defined data-sharing agreements.

3   Business Model Report

3.1 Background and Context

SoilWise Repository is envisioned as a comprehensive digital platform focused on soil data collection, management, analysis, and sharing. It aims to serve diverse user groups involved in agriculture, environmental management, research, and policymaking. The business model is currently in its conceptual stage, and this report explores potential user needs and proposes foundational elements for the business strategy. A second, more mature version of the business model will be developed towards the end of the project, taking into account lessons learned, stakeholder feedback, and the final governance model as defined in Deliverable D1.5, D1.6 respectively. The choice of governance model will directly influence how the SWR is integrated within the European Soil Observatory (EUSO) framework and, consequently, the sustainability strategy for the platform.

In this context, the business model can be discussed from two perspectives. The first considers full integration into EUSO, where the SWR becomes a backend hub supporting the EUSO platform and its users through coordinated infrastructure, services, and governance. The second considers an alternative scenario in which the platform, or selected components of it, are not fully adopted by EUSO, requiring a partially independent or standalone sustainability strategy. Both perspectives are explored below to provide flexibility for future decision-making and alignment with the evolving role of EUSO in the European soil data infrastructure.

3.2 Business Models Options for the SoilWise Repository

3.2.1 Integration of the SoilWise Repository into EUSO

Following the conclusion of the SoilWise project, the **European Soil Observatory (EUSO)** is well-positioned to take over or integrate the SoilWise repository, ensuring its long-term sustainability within the European soil data infrastructure. Designed according to **FAIR** principles, the repository provides a centralized, open-access platform for soil data, harmonizing information from diverse national and research sources.

The SWR is foreseen as a key data and knowledge hub to support further growth of the EUSO in terms of extended functionality and a rising number of users. The SWR is considered a backend hub of the EUSO. As such, the EUSO users will use the SWR functionality and search through the SWR metadata holdings and enhanced knowledge and data sources. The SWR will benefit from the EUSO frontend, including its authentication layer, enabling a single sign-on approach.

Sources of Costs

Upon takeover by EUSO, the repository would continue to operate as a metadata catalogue. The SWR will be integrated into EUSO under the management of Joint Research Centre (JRC) which are following closely the project development and giving input in the process. The costs and resources needed to sustain and further develop the platform past the SoilWise project cycle will be taken in consideration during the four years of iterative development. Platform development will use GitHub for issue tracking and project management, which incurs no additional cost, and this approach will facilitate the transition to EUSO, as JRC is utilizing the same software.

Maintaining the repository will require infrastructure (servers, storage, and IT systems), staff for management, metadata curation, and platform development, as well as ongoing maintenance and updates to ensure FAIR compliance.

Potential Revenue Streams

Value-added services may include enhanced analytics, access to specialized datasets, data quality certification, and partnerships with national and international research networks or environmental organizations. Integration into EUSO may also increase the visibility and usability of the SWR, potentially creating opportunities for collaborative projects and service agreements.

3.2.2 Business Model for a Soil Data Space (follow- up project/ initiative)

SoilWise Repository can evolve into a Soil Data Space, adopting a business model that enables trusted, interoperable, and value-driven soil data exchange among diverse actors. As a Soil Data Space, SoilWise would act not only as a data repository but as a shared digital infrastructure governed by transparent rules and enabling cross-sectoral data collaboration.

Benefits and Business Opportunities of a Soil Data Space

A Soil Data Space would significantly improve the accessibility and handling of sensitive soil data (e.g., data sets containing identifiable personal data or determinable economic insights, etc.). Its robust identity management and clear governance and data usage policies directly address data providers' concerns about trust and data protection. This, in turn, would foster a more open and accessible data ecosystem e.g. in the soil domain. In a

best-case scenario, (sensitive) datasets would never leave the data space itself but would be used for a variety of services.

Within SoilWise several sustainable business models can be considered and validated:

- **Infrastructure Provision:** Offering and maintaining Soil Data Space's infrastructure and governance through data intermediaries and federators.

- **Data product and Services:** Providing access to closed/restricted datasets, alongside services for (meta)data transformation and harmonization, data quality enhancement (e.g., for AI model training), and anonymization/pseudonymization of sensitive attributes.

- **Specialized Analytics and AI Development:** Developing and offering advanced analytical tools, predictive models, and AI applications leveraging soil data, e.g., for yield prediction, soil health diagnostics, and optimized fertilization.

- **Certification and Validation Services:** Providing independent certification or validation of data quality, processing methodologies, or derived insights within the data space ensuring data integrity and compliance.

In addition, interoperability between different data spaces, also known as cross-data-space interoperability or data space federation, can contribute to significant business opportunities by enabling seamless data flows and cross-domain collaborative innovation. Anticipated services could include, for instance, cross-sectoral data products and services, federated innovation and R&D, improved compliance and reporting, cross-domain data marketplaces, and data-as-a-service (DaaS) for integrated insights.

3.2.3   SoilWise Repository Operating Independently of EUSO

While the primary exploitation pathway for the SoilWise Repository assumes that the SoilWise Repository will in its entirety be adopted by or maintained under the European Union Soil Observatory (EUSO) hosted by JRC, it is important to acknowledge that this is not yet confirmed. An alternative scenario can be that the core modules of the SWR are adopted by EUSO, but other additional modules are not. The whole SWR can be adopted by commercial or institutional partners such as EV ILVO, WeTransform, ISRIC or other partners, or they will be archived and no longer be used. Depending solely on the decision by EUSO/JRC on their adoption of SWR, a third scenario can be that SWR continues independently, outside formal EUSO or JRC governance, if EUSO/ JRC decides to not adopt SWR. This scenario will be further elaborated in the next version of this deliverable if needed. In this case, SWR would operate as a federated, service-based soil data space, aligned with EU standards and FAIR principles, but not institutionally absorbed, ensuring continuity, flexibility, and broader applicability. It would need to be adopted by one or more partners and a business model, and governance will need to be elaborated. Note that the SoilWise components are developed as an open source, with source code stored at the GitHub repository, so they can be reused by the third parties as well.

An initial rough estimate of the costs for operation and maintenance at WeTransform, for example, is as follows:

- Cost of operating and maintaining the SWR (as a catalogue):
    - Hosting: 10 to 25k€/a
    - Application management: 10 to 15k€/a
    - Maintenance: 20 to 30k€/a
    - IT Security: 20 to 30k€/a

      o   Support: 10 to 30k€/a

In addition, the efforts and costs associated with productizing the currently loosely connected SWR components into a seamlessly functioning system must be taken into account. WeTransform has many years of experience in providing, operating, and maintaining such systems at scale and is capable and willing to take on responsibility if med- to long-term financing can be secured.

Revenue streams

As described in section 3.3.1, additional sources of revenue can be created if SWR can be extended to a Soil Data Space operated by a for-profit company. This includes providing and maintaining the necessary technical infrastructure (Data Space as a Service), harmonizing and ensuring the interoperability of soil data, data-derived products, particularly for training and using AI applications (e.g. sensitive data), and providing analyses and insights for decision-making.

Therefore, it is crucial for an economically sound operation to identify and validate potential stakeholders within and outside the SoilWise community who are willing to pay for the development of the Soil Data Space and such services outlined.

3.2.4   ChatBot – Potential Integration with EUSO

The ChatBot component may be incorporated into the European Soil Observatory (EUSO), though a final decision has not yet been made. While the ChatBot is not open source, it has been referenced multiple times in the project requirements by JRC, highlighting its potential relevance for supporting metadata discovery, user assistance, and knowledge access. As proprietary software, any potential integration into EUSO would need to comply with the licensing terms defined by its owner, ensuring proper use, access control, and alignment with project requirements.

From a business case perspective, the use of a chatbot built on an existing model such as ChatGPT also implies considerations regarding costs (e.g. licensing fees, subscription models, or usage-based charges), user access management (e.g. defining access rights for internal vs. external stakeholders), data storage and handling (including the need to clarify where and how data is stored and processed), and data security/privacy safeguards (to ensure compliance with GDPR and protect sensitive information). These factors will directly affect the long-term sustainability, scalability, and independence of a SoilWise Catalogue solution, both if adopted by JRC/EUSO or if pursued as a standalone service beyond the project.

4   Policy Brief

Introduction

The Soil Deal for Europe aims to have 75% of soils healthy or significantly improved by 2030, requiring access to reliable, harmonized data and knowledge collected at local, national, and EU levels to support informed decision-making in line with the **EU Soil Strategy** and **Soil Monitoring Law**. The SoilWise Repository provides an integrated and actionable access point to scattered and heterogeneous soil data and knowledge, making them **FAIR** and fostering trust, willingness, and ability to share and re-use soil data. The repository is designed to be open, modular, scalable, and extensible, employing AI and ML techniques to interlink scattered data, automate processes, infer new knowledge, and improve FAIRness, while respecting data ownership, access policies, and privacy. SoilWise applies infrastructure thinking rather than project thinking, creating a repository intended to support the evolution of the **European Soil Observatory** over at least a decade.

Challenge and Context

Soil data in Europe are currently scattered across national and research sources. The SoilWise governance model, defined in **Deliverable D1.5**, provides a structured framework to manage these data responsibly, ethically, and in compliance with European legal requirements, including the **Soil Monitoring Law (SML), INSPIRE Directive, GDPR, Data Act, Data Governance Act, and AI Act**. Adherence to the **SoilWise Data Management Plan (DMP)** and **Open Science principles** ensures that soil data and knowledge are curated, reliable, and usable for both research and policy purposes. By compiling and harmonizing the results of **Mission Soil projects**, the SWR provides structured, FAIR-compliant metadata that supports consistent organization, discoverability, and interoperability.

Role of the SoilWise Repository

The SWR organizes metadata from heterogeneous soil data sourced from national and research repositories, with the aim of supporting openness, interoperability, data sovereignty, trust, and value creation. It **aligns with OpenDEI design principles** for European data spaces to provide clarity for data providers and users and **follows ISO 30401 knowledge management guidelines** to encourage co-creation, learning, and continuous improvement. Lessons from the **Common European Agricultural Data Space (CEADS)** and the **AgriDataSpace** project have informed the governance, technical, and operational design, illustrating potential approaches for multi-stakeholder collaboration and clear rules for data sharing and licensing. The SWR is positioned to operate independently while supporting the **planned integration into EUSO 2.0**, enhancing coordination and preventing duplication across European soil initiatives.

Policy Support and Recommendations

Policy support should focus on ensuring ongoing metadata curation, updates, and hosting, maintaining compliance with **FAIR principles**, and adhering to the governance framework defined in **Deliverable D1.5**. Alignment with **Open Science** practices ensures transparency, usability, and reliability, enabling both research and policy applications. Coordinated engagement with national agencies, research institutions, and European Commission bodies will strengthen harmonized data standards and responsible use of soil data and knowledge. This project is particularly important for the **European Commission** (EC), as it compiles and integrates results from **Mission Soil** projects. By providing these results in a structured, accessible, and reliable manner, the project facilitates evidence-based policymaking and supports the development of effective soil management strategies.

Such support will help establish the SWR as a central, sustainable, and trusted repository for soil data, enabling informed decision-making and policy development across Europe.

5 Final Summary: IPR, Business Models, and Policy Implications

5.1 Summary of IPR, BM and Policy

This deliverable presents an **initial overview** of the considerations for IPR, business sustainability, and policy alignment for the SWR. It will be used in further internal discussions and get input from the developments and stakeholder interaction and will be further developed in parallel with the governance model (T1.5) towards the end of the project.

Intellectual Property Rights (IPR)

The current assessment provides an overview of ownership and licensing for the SWR components, noting that most developed modules (e.g., Harvester, Catalogue UI) are released under open-source licenses (MIT). Detailed General IPR arrangements for third-party tools and metadata referenced or linked via SWR are documented in Deliverable D5.1.

Business Model

The SoilWise Repository (SWR) provides a FAIR-compliant metadata platform for responsible soil data access and reuse. It can operate independently or integrate with the European Soil Observatory (EUSO) to enhance coordination and support soil policy development. A proposed ChatBot interface could further enable natural-language queries and decision support for users. By the end of the project, we will also know how much of the SWR data can be integrated into EUSO, providing a clear picture of its contribution to the European soil data infrastructure.

Policy Alignment

The SWR supports EU soil data policy objectives, including FAIR principles, Open Science practices, and compliance with the **Soil Monitoring Law (SML), INSPIRE Directive**, and other relevant **EU regulations**. It facilitates harmonized metadata organization, discoverability, and interoperability, supporting evidence-based decision-making and long-term policy implementation.

5.2 Future Development

This summary will guide internal discussions and be refined over time based on stakeholder input, project progress, and the final governance model, ensuring the SoilWise Repository remains sustainable, policy-compliant, and effective as a hub for soil data and knowledge.

These considerations provide a clear pathway for IPR management, sustainable business operation, and policy compliance, ensuring that SWR remains a reliable, transparent, and impactful resource for European soil data and decision-making beyond the lifetime of the project. The deliverable will be updated in Month 47 (D6.6 update) to reflect the final governance, integration, and stakeholder outcomes.

Deliverable D6.6 PR, Business Model Report and Policy Brief, v2, updated in Month 47, will include a final overview of the defined IPR arrangements, the developed business models, and clear policy guidelines, reflecting the project's validated outputs and governance decisions.