

EJP-SOIL as soil data provider to EUSO

20 October 2021 EUSO Stakeholders forum
10:00 Parallel Session 1b: Data integration

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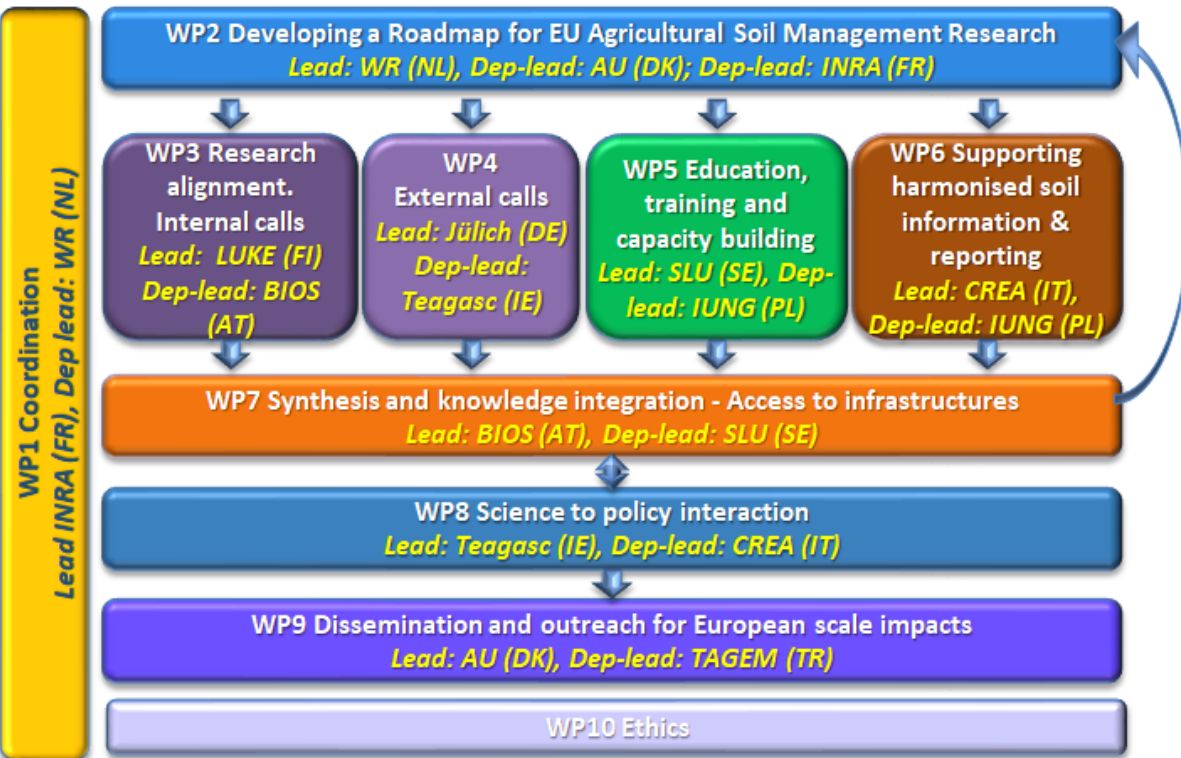


EJP SOIL
European Joint Programme

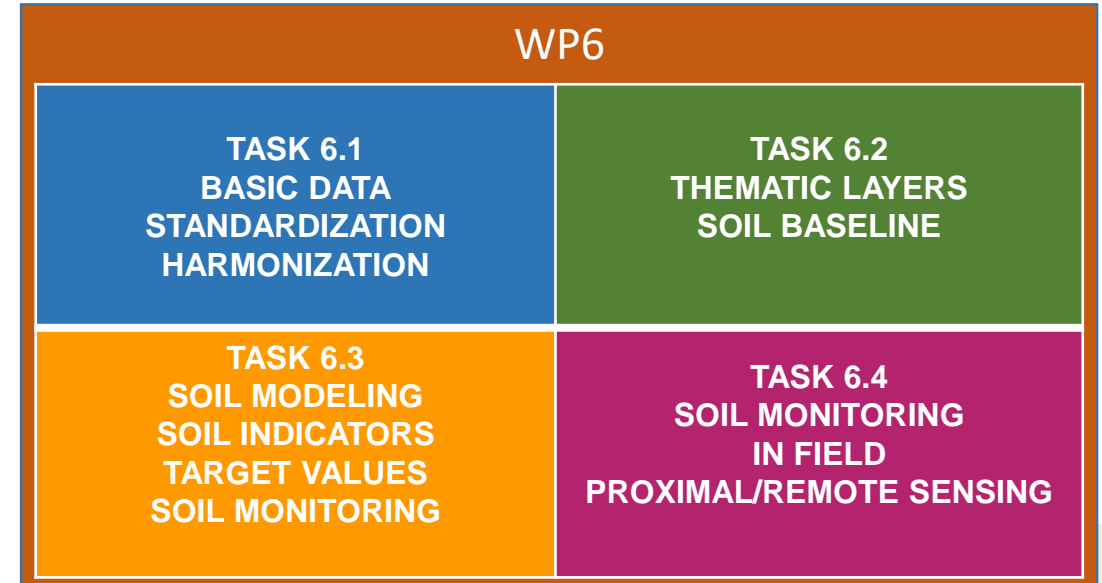


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 652615.

EJP SOIL PROJECT AND THE WP6



WP6 is at the base of soil information infrastructure and will feed the [Knowledge Sharing Platform \(ejpsoil.eu\)](https://ejpsoil.eu) developed by WP9

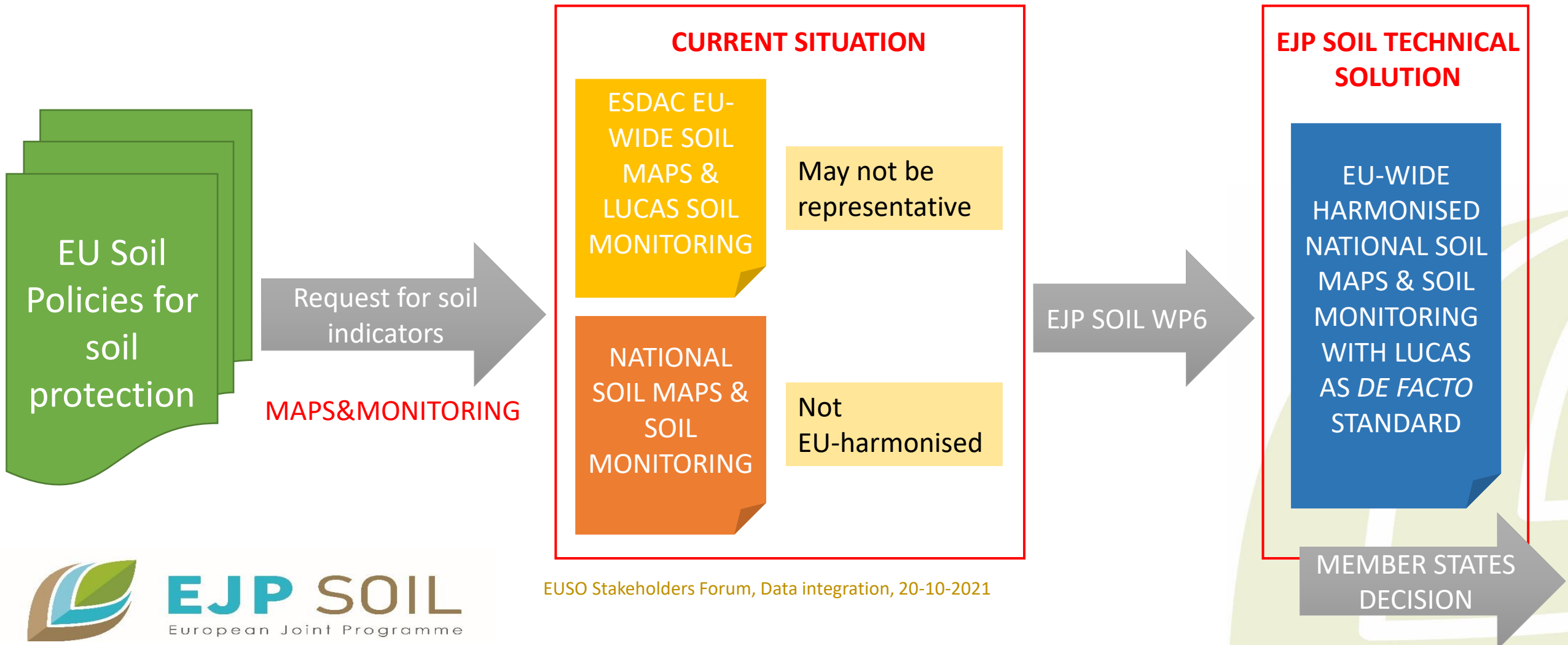


The overall goal of the EJP SOIL is to build a sustainable European integrated research system on agricultural soils and develop and deploy a reference framework on climate-smart sustainable agricultural soil management.

INTRODUCTION

WP6 "Supporting harmonised soil information and reporting"

But what does it mean, and why?



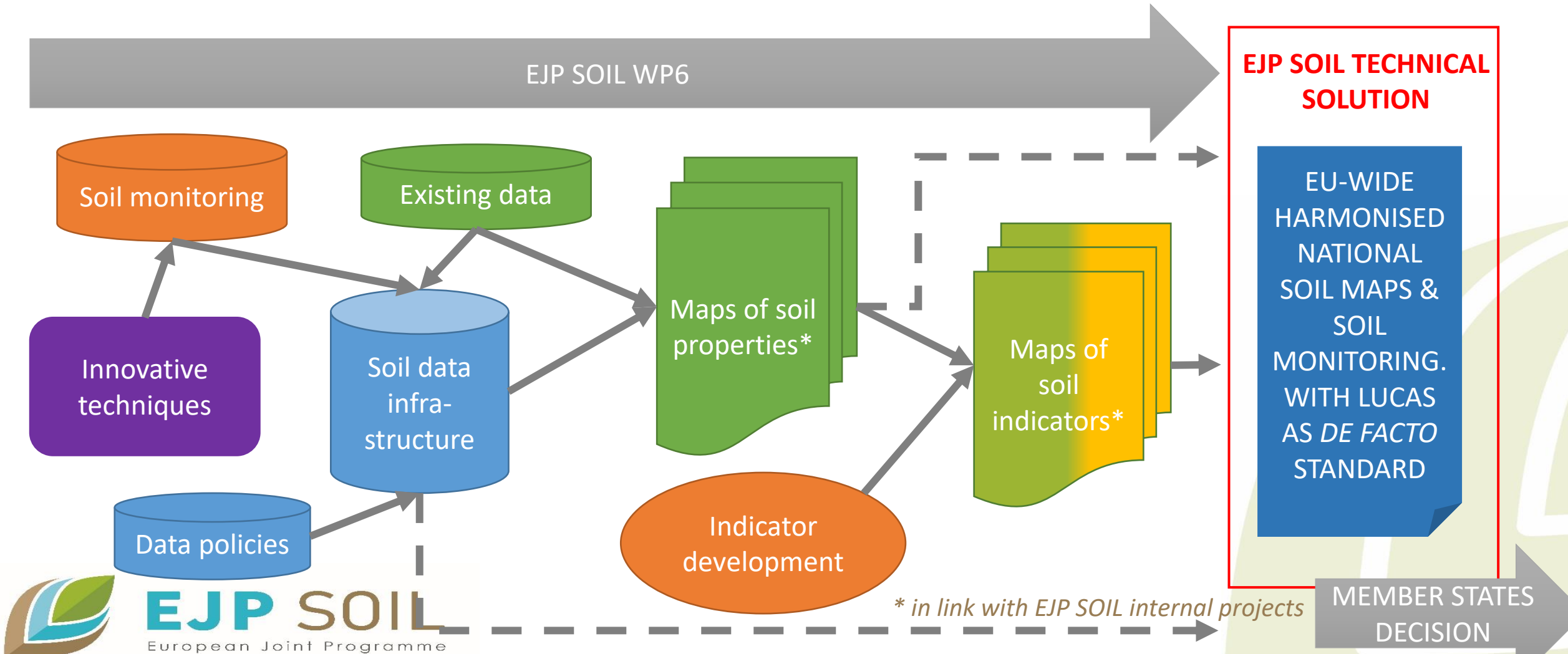
Benefits and drawbacks

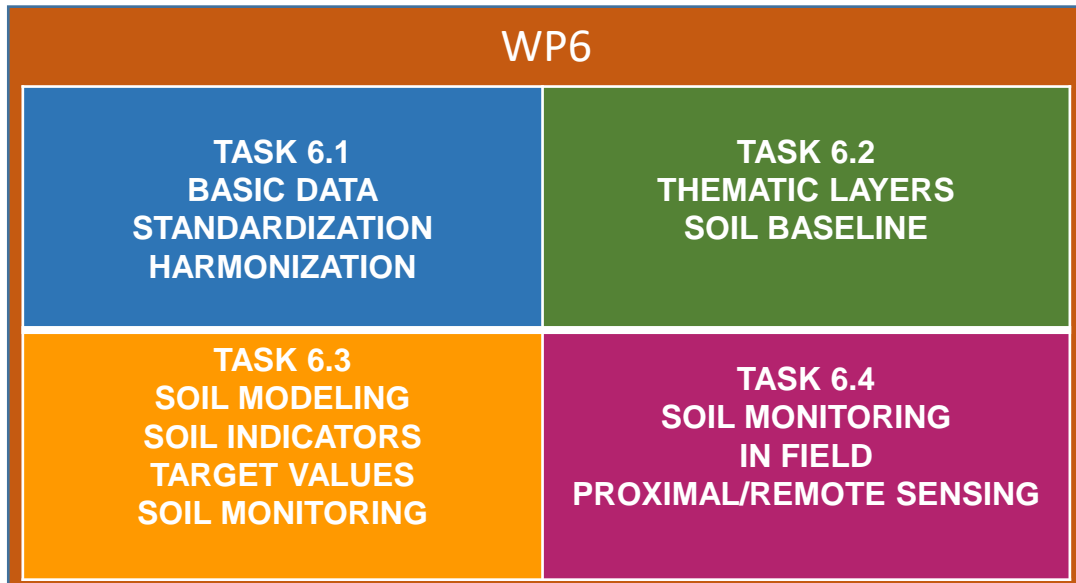
- National information (maps and monitoring) is based on local knowledge on soils, therefore is usually more representative and more detailed
- National monitoring systems and soil mapping services strengthen the national engagement in soil protection
- Diversity of national systems makes information exchange across borders and assessment of implications and evaluation of EU soil policy difficult
- EU LUCAS Soil monitoring started because data sharing was difficult 20 years ago, while there was a need for (harmonised) soil data in Europe
- We have entered the information age and exchange (*as is* and standardised) becomes technically possible
- This allows better information at EU level and better-informed policies, transboundary research: efficient, coordinated action
- EJP SOIL is a technical project, decision to cooperate is for Member States at policy level

INTRODUCTION

WP6 "Supporting harmonised soil information and reporting"

But what does it mean, and why?





Improved final objective: not just a STATIC final product, a geodatabase, instead a **Soil Data Exchange Infrastructure**

SUBMITTED DELIVERABLES	M
D6.1 Report on harmonized procedures for creation of databases and maps	14
D6.2 Report on the national and EU regulations on agricultural soil data sharing and national monitoring activities	18
D6.3 Proposal of methodological development for the LUCAS programme in accordance with national monitoring programmes	18
THE NEXT ONES TO BE DELIVERED	M
D6.4 Software framework for a shared agricultural soil information system (confidential for EJP SOIL partners and commission services)	24
D6.5 Guidelines for accounting and mapping agricultural soil carbon, fertility and degradation changes at different scales	24
... TOWARDS AT THE END... THE FINAL GOAL	M
D6.6 Geodatabase on agricultural soil properties including SOC and agricultural soil functional properties related to water and nutrients	48
D6.7 Procedure for mapping of agricultural potential in different present and future climate conditions	58
D6.8 Final version of the agricultural soil information system for EU populated with the final version of project datasets	59

DIRECTIVE 2003/4/EC, on public access to environmental information from the D6.2 regulatory framework at supranational level

OWNERSHIP

Article 3 Access to environmental information upon request

Article 3(5) For the purposes of this Article, **Member States shall ensure that:**

- (a) officials are required to support the public in seeking access to information;
- (b) lists of public authorities are publicly accessible; and
- (c) the practical arrangements are defined for ensuring that the right of access to environmental information can be effectively exercised, such as:
 - the **designation of information officers;**
 - the establishment and maintenance of **facilities for the examination of the information required,**
 - **registers or lists of the environmental information held by public authorities or information points,** with clear indications of where such information can be found.

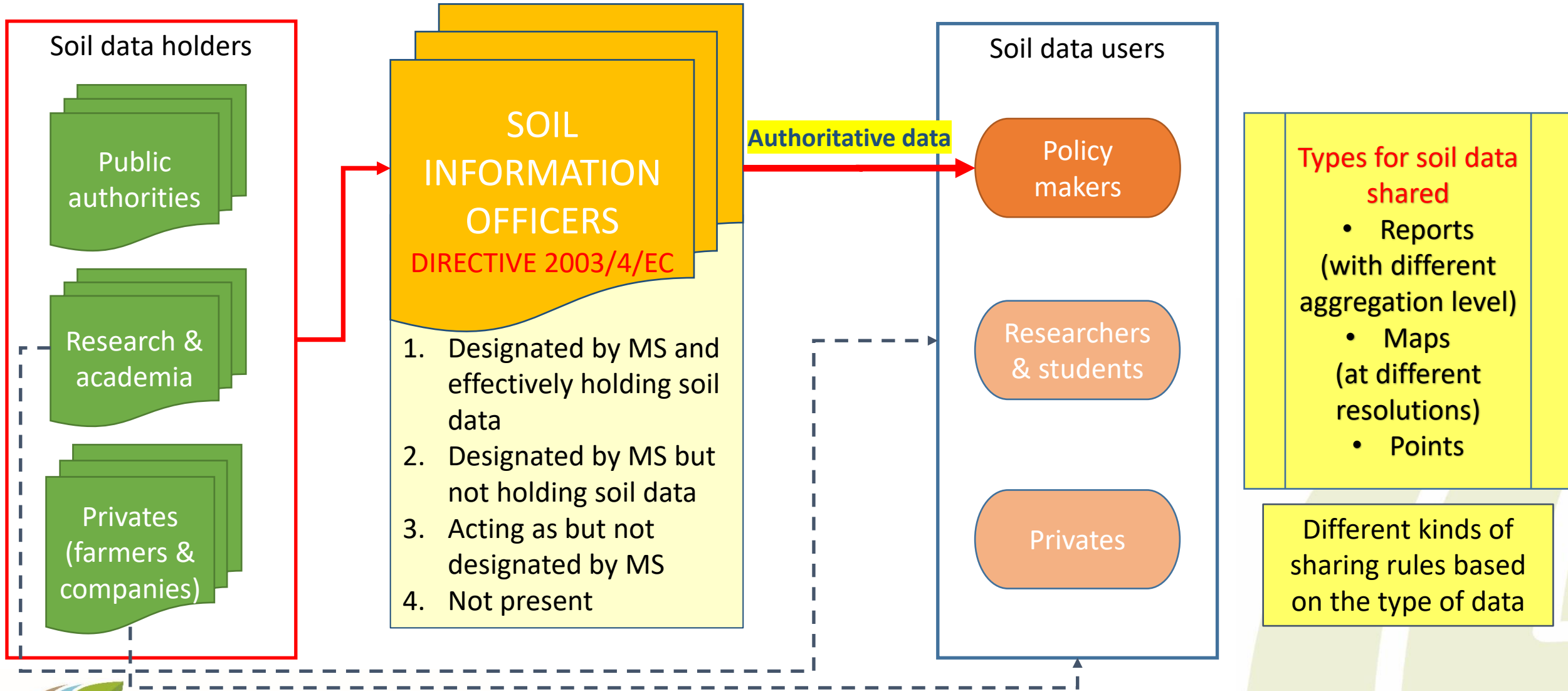
SHARING

Article 4 Exceptions (to sharing)

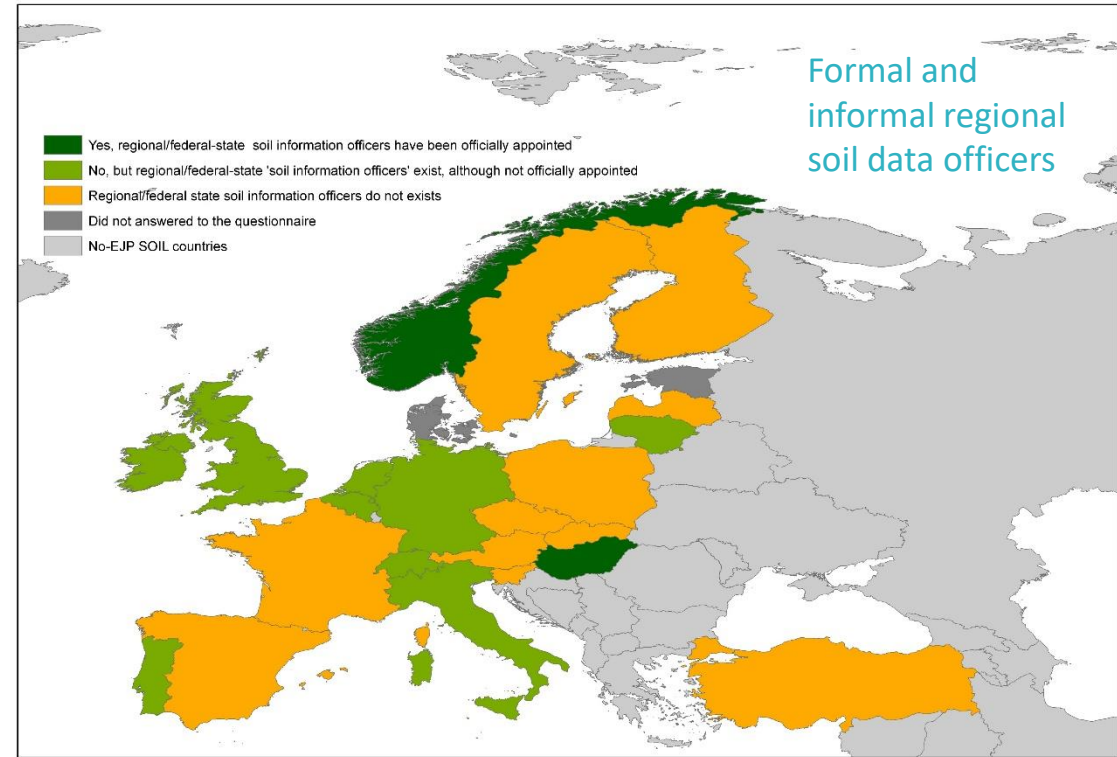
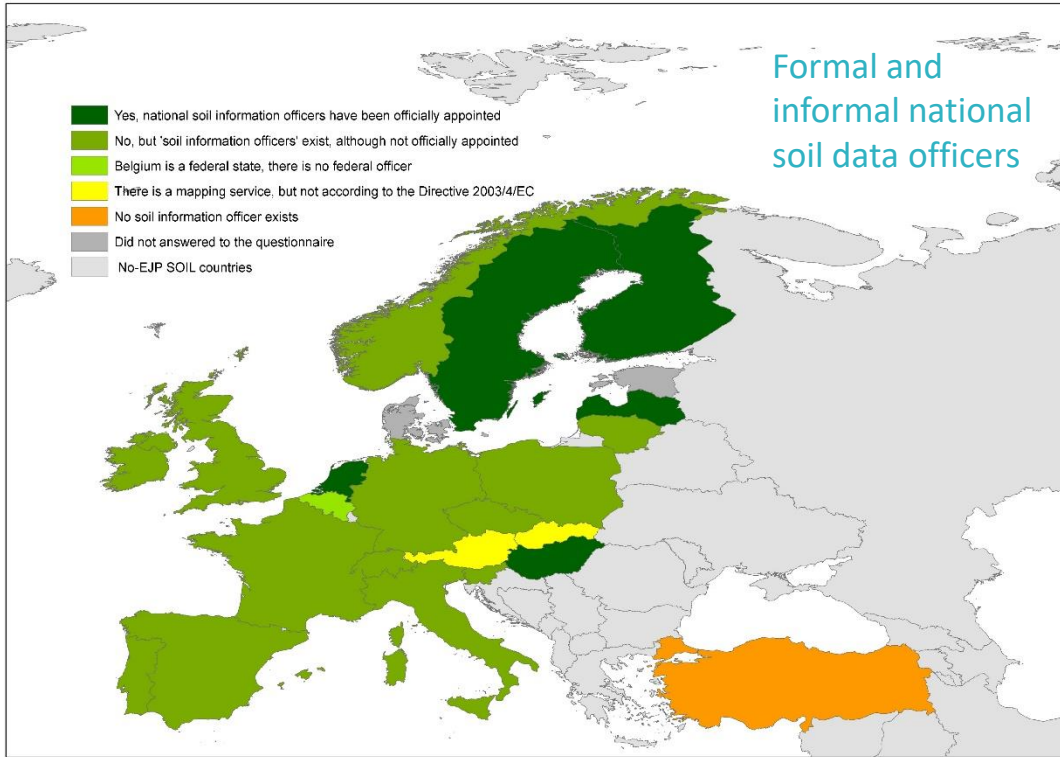
Article 4(2) **Member States may provide for a request for environmental information to be refused if disclosure** of the information would **adversely affect:** (a) **the confidentiality** of the proceedings of public authorities, where such confidentiality is provided for by law; (b) **international relations, public security or national defense;** (c) **the course of justice,** the ability of any person to receive a fair trial or the ability of a public authority to conduct an enquiry of a criminal or disciplinary nature; (d) **the confidentiality of commercial or industrial information** where such confidentiality is provided for by national or Community law to protect a legitimate economic interest, including the public interest in maintaining statistical confidentiality and tax secrecy; (e) **intellectual property rights;** (f) the confidentiality of **personal data** and/or files relating to a natural person **where that person has not consented to the disclosure of the information to the public,** where such confidentiality is provided for by national or Community law; (g) **the interests or protection of any person who supplied the information requested** on a voluntary basis without being under, or capable of being put under, a legal obligation to do so, unless that person has consented to the release of the information concerned; (h) **the protection of the environment** to which such information relates, such as the location of rare species. [...] **Member States may not,** by virtue of paragraph 2(a), (d), (f), (g) and (h), provide for a request to be **refused** where the request relates to information on **emissions into the environment.**

SOIL INFORMATION OFFICERS

from the D6.2 analysis on soil data ownership



D6.2 - SOIL DATA information officers in EJP SOIL countries



Each country has its own peculiarities, and will be considered separately.

The EJP SOIL partner is the «officially» appointed soil information officer (national or regional): WR, NIBIO

The EJP SOIL partner is the «not officially» appointed soil information officer (national or regional): INRAE, CREA, THUNEN, LAMMC, Teagasc.

Information officers (official or not) exist which are not the EJP SOIL partners, but a connection exists through Program Owners.

AWP3

National Hubs meeting to promote the organisation of NATIONAL SOIL MAPPING & SOIL MONITORING SERVICES

WP1

WP8

WP6

WP9

In order to produce «authoritative» maps and monitoring reports

D6.2 and the Data Management Plan of EJP SOIL

SOIL DATA PRODUCED BEFORE AND OUTSIDE EJP SOIL

The **sharing rules** are **already defined by the data owners**. In the D6.2 we have found the following **most frequent sharing rules for soil data**:

- 1) the **georeferenced point soil data** are recognised as 'personal data under European Directive' and need an authorization to be published online, which must be given by the respective landowners;
- 2) The **elaborated soil maps**, in whichever format (vector or raster), can be subject to Intellectual Property Rights, owned by the authors of those soil maps, or are published under specific licences, or are shared under the recognition of an economic payment.

All these **sharing rules are (or should be) explicitly declared in the metadata repository**.

SOIL DATA PRODUCED INSIDE EJP SOIL

The EJP SOIL partners have agreed to follow the **FAIR principles** in the management of the **data resulting from** the research activities undertaken under the **EJP SOIL programme**, included the research activities undertaken under the internal projects of the EJP SOIL programme. Therefore, **for the WP6 final deliverables (D6.6 & D6.8)** the following is the technical/legal proposal:

- 1) They will consist of **elaborated soil maps** (grid format, resolution to be decided: 1km to 100m...)
- 2) **Country-driven approach** will be followed but with common procedures (WP6 cookbooks)
- 3) The **soil maps elaborated** will be **shared following FAIR principles**
- 4) **WP6 proposes CC-BY license**, that is open but with the recognition of intellectual property rights to those who have participated in the elaboration (explicitly declared in the metadata)

D6.2 Proposal of general agreement for soil data sharing among EJP SOIL partners, between EJP SOIL partners and other institutions at national level owning/holding soil data, and in relation to external EU public institutions.

1. The **point georeferenced soil data** eventually shared among EJP SOIL partners, and towards public institutions external to the EJP SOIL consortium, will **not be shared online, if there is not the declared consent from the data owner**, which may imply obligatorily for some countries/regions/owners of the EJP SOIL consortium, to get the consent from landowners;
2. The consent for the disclosure of point georeferenced soil data may not be needed only in case of **data on emissions into the environment**, which disclosure can be denied only if the disclosure adversely affects the international relations, the public security or national defence, the course of justice, the ability of any person to receive a fair trial or the ability of a public authority to conduct an enquiry of a criminal or disciplinary nature, and the intellectual property rights;
3. The **soil map data**, in whichever format (vector or raster), eventually shared among EJP SOIL partners, and towards public institutions external to the EJP SOIL consortium, **can be published online given** that in the metadata the sharing rules are declared, such as **intellectual property rights or specific licenses, as defined by the respective data owners**;
4. The **soil map data**, in whichever format (vector or raster), eventually shared among EJP SOIL partners, and towards public institutions external to the EJP SOIL consortium, **which are shared by their owners under the recognition of an economic payment**, could be published in metadata repositories explicitly declaring in the sharing rules the respective fees defined by the owners;
5. **A 'bottom-up' approach will be adopted** in the soil mapping activities promoted by the EJP SOIL involving the national/regional/federal-state soil data officers/services (official or not), **similarly as it is adopted by the pillar 4 of the Global Soil Partnership**;
6. The signing of **specific mutual agreements** for soil data sharing **between the EJP SOIL partners and external institutional owners of soil data** will be promoted inside each EJP SOIL country. **WP6 proposes CC-BY license**, that is open but with the recognition of intellectual property rights to those who have participated in the elaboration (explicitly declared in the metadata)

D6.1 Report on harmonized procedures for creation of databases and maps

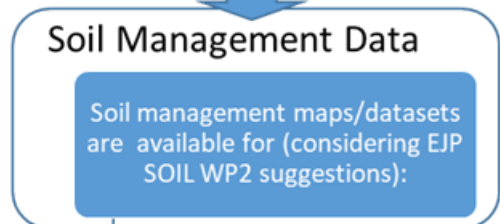
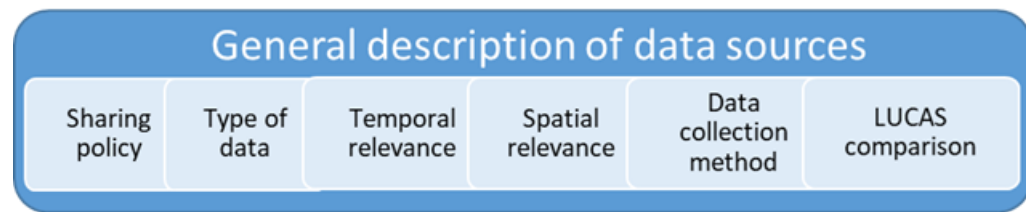
- EJP SOIL D6.1 by over 50 people (43 writers, 24 reviewers) and 20 institutes
- Synthesis report of current knowledge: resource
- With chapters on:
 1. Context and Rationale: an overview of relevant initiatives and (EU) projects
 2. Current situation of soil data in EJP SOIL: Evaluation of the stocktake results and other surveys on data sources
 3. Harmonised procedures for creation of databases and sharing soil data
 4. Sampling theory for mapping and monitoring purposes
 5. Harmonised procedures for creation of soil maps
- Aim: Level knowledge field
- Published soon: [Reports & Publications \(ejpsoil.eu\)](http://ejpsoil.eu)

Theory base for D6.4 and soil data infrastructure

Sampling design, complementary to D6.3 LUCAS + national soil monitoring

At the basis for future task 6.2 mapping activities

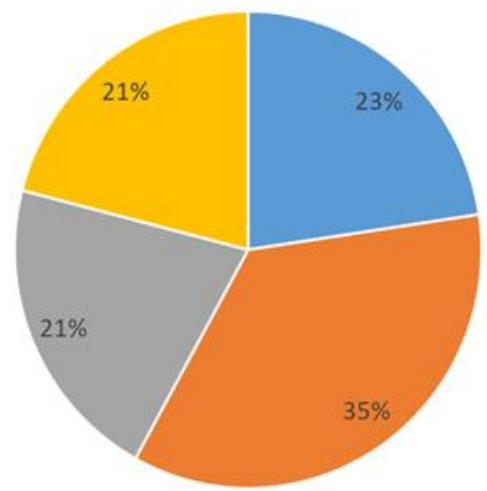
D6.1- chapter 2 Current situation of data in EJP: Evaluation of the stocktake results and other surveys on data sources



- SP1. For main soil properties, according to Global Soil Map specifications, 2015
- SP2. For other soil properties
- SP3. Threats (e.g.vulnerability), based on RECARE Project review report 2015, and EJP SOIL WP2 suggestions 2020
- SP4. Soil classification and fertility
- SP5. Soil functions/services

- MG1. Soil tillage, farming system
- MG2. Crop and cropping system
- MG3. Soil nutrient management and plant protection
- MG4. Water management and related protection
- MG5. Measures to controll soil erosion
- MG6. Permanent crops
- MG7. Other management practices

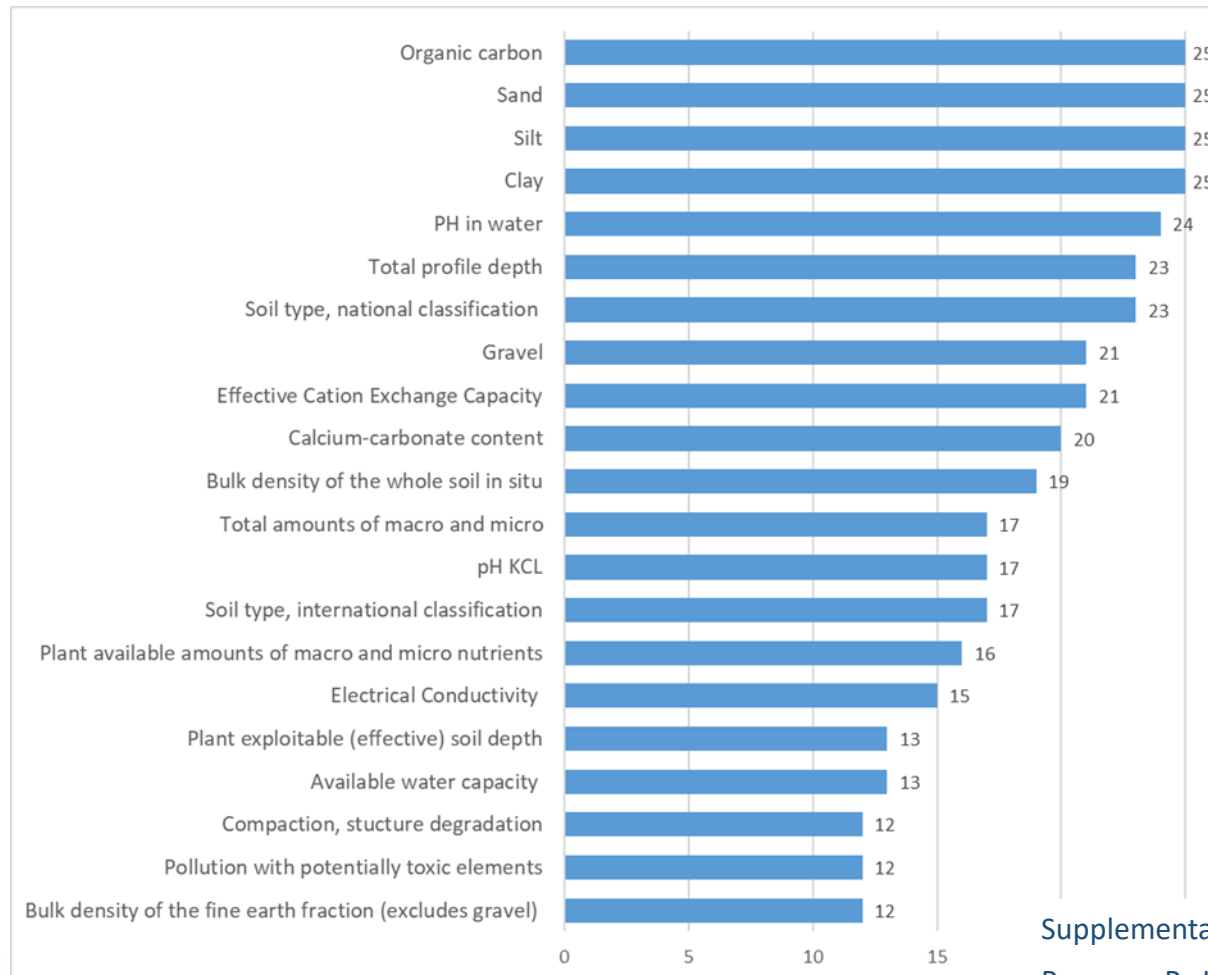
Country	databases				sum
	SP+MG	only SP	only MG	other	
Austria	4	1	2	0	7
Belgium Flanders	0	4	4	8	16
Belgium Wallonia	3	1	0	0	4
Czech Republic	4	1	0	0	5
Denmark	2	4	1	0	7
Estonia	2	2	1	1	6
Finland	2	0	0	0	2
France	2	11	0	0	13
Germany	1	0	1	3	5
Hungary	1	2	2	0	5
Ireland	0	4	0	0	4
Italy	0	5	1	6	12
Latvia	9	6	0	0	15
Lithuania	3	0	0	0	3
Netherlands	4	8	0	0	12
Norway	0	5	2	8	15
Poland	1	5	0	0	6
Portugal	1	2	2	0	5
Slovakia	3	2	0	0	5
Slovenia	0	1	2	18	21
Spain	10	0	0	0	10
Sweden	3	6	1	5	15
Switzerland	0	1	0	0	1
Turkey	0	1	13	0	14
United Kingdom	0	14	19	2	35
sum	55	86	51	51	243
%	23	35	21	21	100



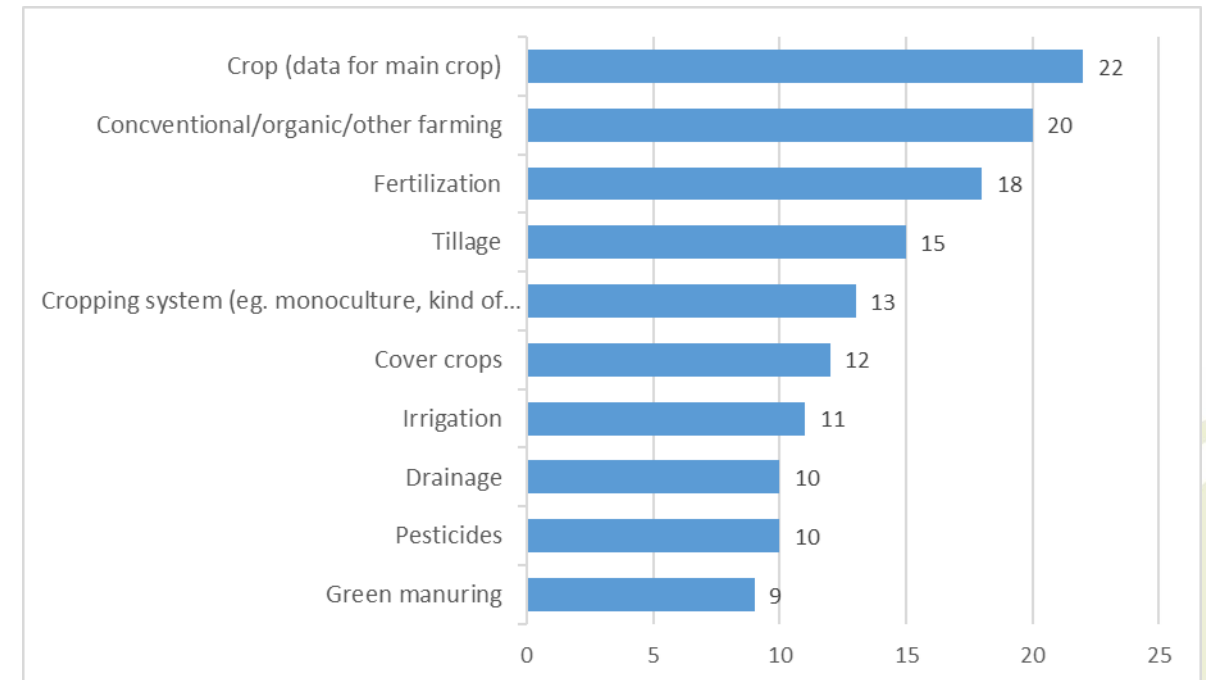
■ SP+MG ■ only SP ■ only MG ■ other

D6.1- chapter 2 Current situation of data in EJP: Evaluation of the stocktake results and other surveys on data sources

Soil Property (SP) Data



Soil Management (SM) Data



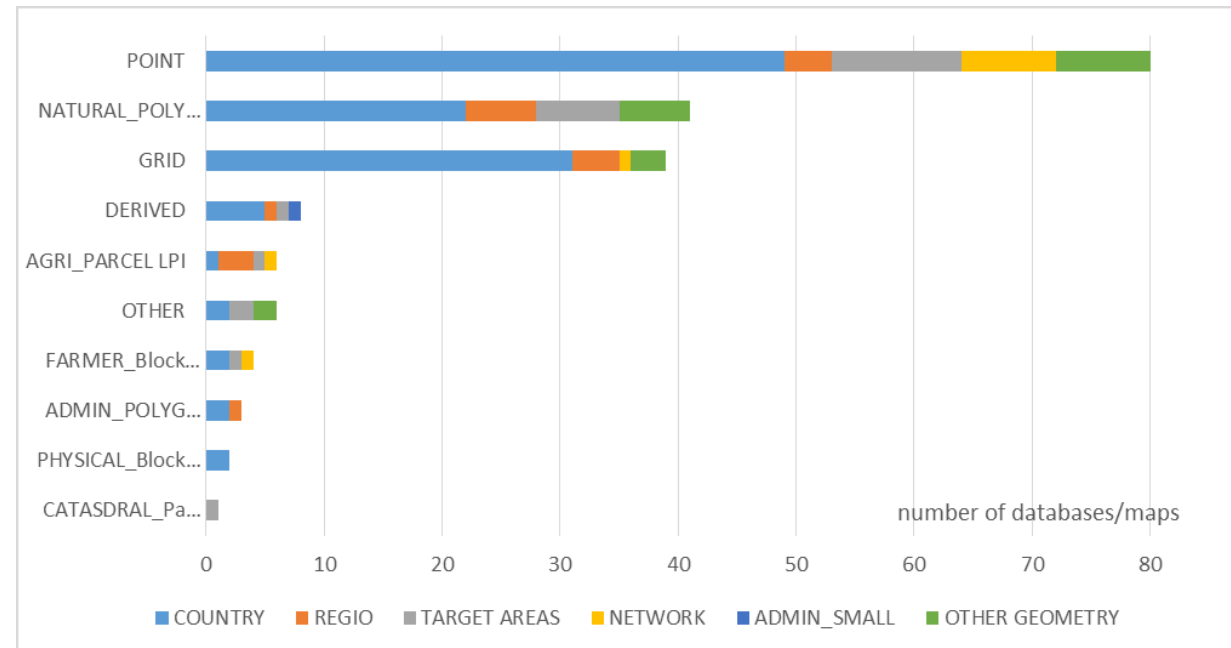
-based on questionnaires

Supplementary information about ESDAC/LUCAS data: JRC Technical report

Panagos, P., Jones, A., Van Liedekerke, M., Orgiazzi, A., Lugato, E. and Montanarella, L., JRC support to the European Joint Programme for soil (EJP SOIL), EUR 30450 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-25322-8, doi:10.2760/74273, JRC122248

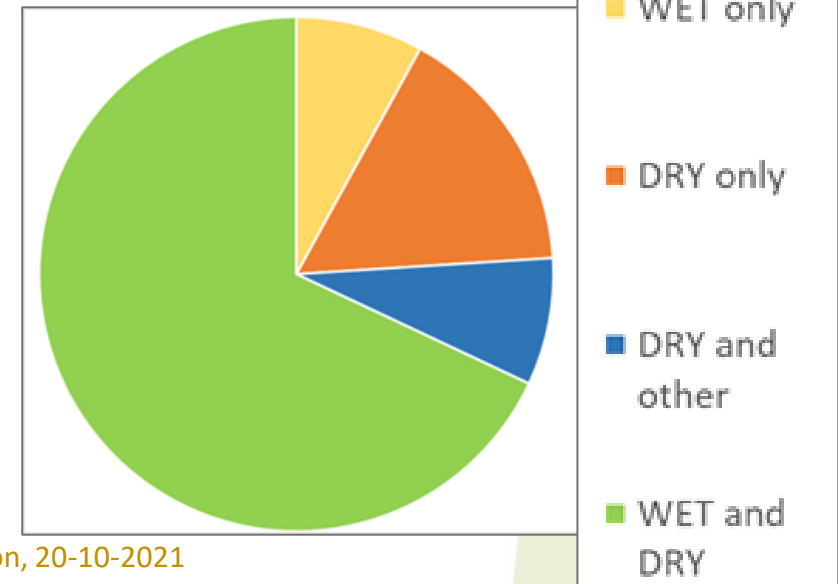
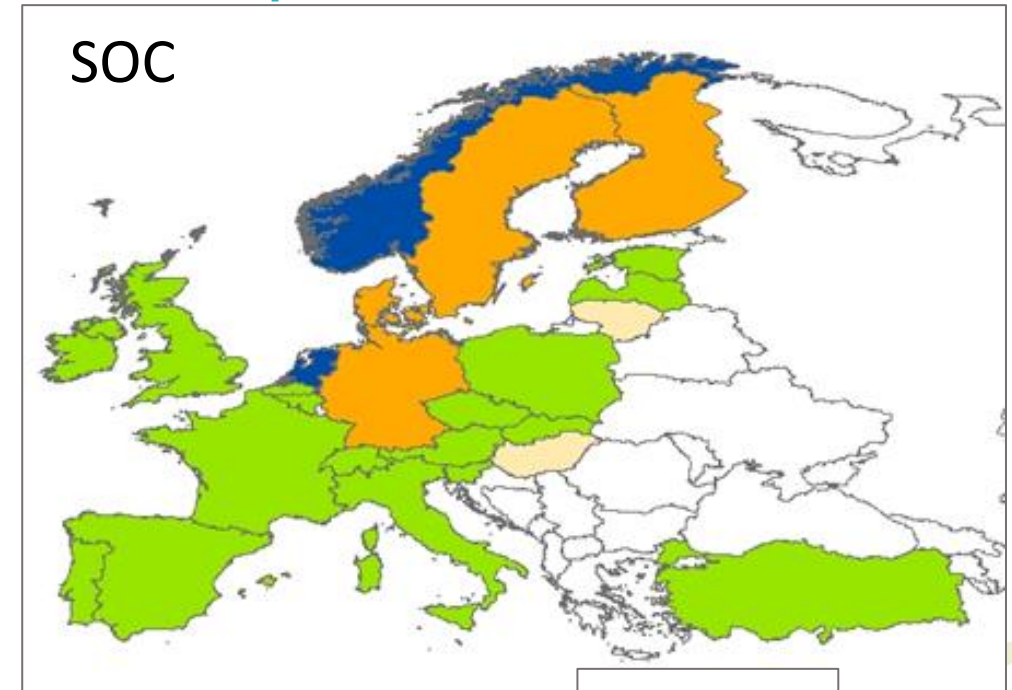
D6.1 – chapter 2 available data (formats)

- Wide variety of formats and standards used
- Not always soil database or SIS due to lack of skilled staff, resources, time
- Lack of communication/coordination between organisations
- Lack of standards
- Mainly point, then polygon, then grid datasets
- Soil properties often available, threats/management less
- Often variation in methods and spatio-temporal resolution



D6.1- chapter 2 Diversity of methods - example

SP 1.3 Organic C	databases			applied method					
Country	Relevant for topic	data policy	(at least a part of it) open access or freely available for EJP SOIL	WET_WB	WET_TYURIN	WET_OTHER	DRY_W_LOSS	DRY_ADC	other
Austria	4	FPO	eBOD	yes	no	yes	no	yes	no
Belgium Flanders	2	F	DOV, SOCMB	yes	no	no	no	yes	no
Belgium Wallonia	3	P	-	yes	no	no	yes	yes	no
Czech Republic	3	PO	-	yes	no	yes	no	yes	no
Denmark	5	RP	DDSM	no	no	no	yes	yes	no
Estonia	3	FRO	KESE, SMI	no	yes	no	no	yes	no
Finland	2	P	-	no	no	no	no	yes	no
France	4	FP	RMQS, BDAT	no	no	yes	no	yes	no
Germany	1	F	BZE_LW	no	no	no	no	yes	no
Hungary	1	P	-	no	yes	no	no	no	no
Ireland	3	PO	-	yes	no	no	no	yes	no
Italy	5	FP	SISI, PPD, NS	yes	no	yes	no	yes	no
Latvia	7	RP	LLU	no	yes	no	no	yes	no
Lithuania	1	F	DR10LT	no	yes	no	no	no	no
Netherlands	3	O	-	no	no	no	no	yes	yes
Norway	3	FP	NSS	no	no	no	no	yes	yes
Poland	4	FRP	MChGO, MonFrm	no	yes	no	no	yes	no
Portugal	4	FP	INFSOL, PROSOL	yes	no	yes	no	yes	no
Slovakia	2	P	-	yes	yes	no	no	yes	no
Slovenia	1	F	SPSLO	yes	no	no	no	no	no
Spain	5	P	-	yes	no	no	no	yes	no
Sweden	5	FP	SOILCOM	no	no	no	yes	yes	no
Switzerland	1	F	SWISOIL	yes	no	no	no	yes	no
Turkey	1	P	-	yes	no	yes	no	yes	no
United Kingdom	7	FRP	NSI_Top, NSISC88, NSISC09, AFBI 5K, TEL_XRF	yes	no	no	yes	yes	no
%*				52	24	24	16	88	8



D6.1- chapter 2 Available, previously compiled maps (main sources, subject, resolution)

ESDAC databases and maps:

- LUCAS Topsoil point database,
- maps for physical and chemical soil properties,
- threats and functions

Global Soil Partnership maps: country driven initiative, 30 arc-seconds ~1000 m resolution,

- GSOCmap
- GSOCseq and
- GSS (ongoing)
- GSE (erosion, planned)

Global Soil Map Products, twelve basic soil properties are delivered as predictions with uncertainty at six standard depths, 3 arc - second grid ~100 m

SoilGrids, global soil property maps at six standard depth intervals, 250 m



MAIN TOPIC	TOPIC	SUBTOPIC	POINT	POLYG	>1000	1000	500	250	100	Publ.	coverage
Soil Point Data		LUCAS_2015									2015 EU-27 +2
		LUCAS_2009									2009 EU-27
		SPADE-2									2009 EU-20
		SPADE/M									2004 EU-20
		SPADE_14									2014 EU-28
Soil Properties	TOP_PHYS	TOP_PHYS									2016 EU-25
	TOP_CHEM	TOP_CHEM									2016 EU-26
Soil threats	EROSION	EROSION_LOSS									2010 EU-28
	EROSION	EROSION_NET									2010 EU-28
	EROSION	EROSION_C									2015 EU-28
	EROSION	EROSION_LS									2015 EU-28
	EROSION	EROSION_RUSLE2015									2016 EU-28/36
	EROSION	EROSION_K									2014 EU-all
	EROSION	EROSION_RAIN_EU									2015 EU-28 +13
	EROSION	EROSION_P									2015 EU-28
	EROSION	EROSION_RAIN_GLOBAL									2017 World
	EROSION	EROSION_RISK									2004 EU-23
	EROSION	EROSION_WIND									2016 EU-28
	EROSION	EROSION_GLOBAL									2012 World
	EROSION	EROSION_WATER_GLOBAL									2015 World
	EROSION	EROSION_P_LOSS									2012 World
	EROSION	EROSION_HARVEST									2019 EU-28
Soil Carbon	SOIL CARBON	SOC_STOCK									2014 EU + 8
	SOIL CARBON	SOC_TOPSOIL									2015 EU-25
	SOIL CARBON	CARBON_BUDGET									2016 EU-28
	SOIL CARBON	SOC_OCTOP									2004 EU
	SOIL CARBON	GSOCmap_GSP									2017 World
	SOIL CARBON	GSOCseq_GSP									2017 World
	SOIL CARBON	SOC_GLOBAL									2012 World
Biodiversity	BIODIVERSITY	BIODIV_THREATS									2015 EU-27
	BIODIVERSITY	BIODIV_EROSION									2009 Pan-EU-11
	BIODIVERSITY	BIODIV_ATLAS									2016 World
LANDSLIDES	LANDSLIDES_ELSUS2									2018 EU-28 +13	
Soil Salinity	SOIL SALINITY	SALINITY_ESDAC									2008 EU-27
	SOIL SALINITY	GSSmap_GSP									2021 EU-27
SOIL COMPACTION	COMP_SUSCEPT									2008 EU-27	
Pollution	POLLUTION	POLLUTION_Co									2009 EU-25
	POLLUTION	POLLUTION_Cs137									2020 EU-6
	POLLUTION	POLLUTION_HEAVYM									2016 EU-28
Soil functions	SOIL CARBON	SOC_SATURATION									2016 EU + 2
	SOIL HYDRAULIC	HYDRROGRID									2014 EU + 3
	SOILSTORE_FILTER	STORE_FILTER									2017 EU-28
	BIOMASS	BIOMASS_PRODUCTIVITY									2016 EU-27
	GAS	GHG_FLUX									2018 EU-28
GAS	N2O_EMISSION									2017 EU-28	



D6.1 - chapter 3 Harmonised procedures for creation of databases and sharing soil data

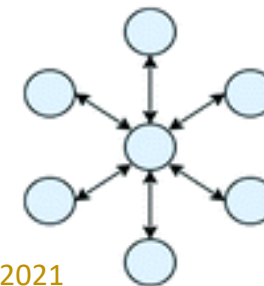
Guiding principles in EJP SOIL EU soil data infrastructure development

- Follow INSPIRE metadata and soil
- Accommodate existing soil information systems (SISs)
- Respect data policy: request only derived products, original point data voluntary
- Up to date data: maintain and update data at data owner
- Open source if possible
- Minimum is metadata catalogue
- Standardisation and harmonisation to the extent feasible
- Provision of tools (software) and guidance to partners/countries
- Easy linkage to other scales ((sub)national, global) and domains: reduce needed extra efforts for countries to a minimum

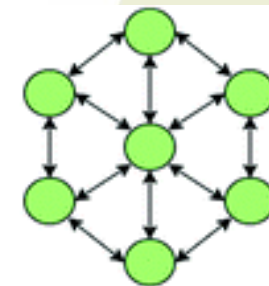
D6.1 - chapter 3 Harmonised procedures for creation of databases and sharing soil data

Centralised, distributed, federated system?

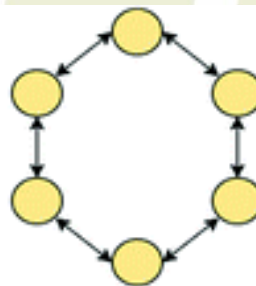
- In a central setup all data will be exchanged to and stored at a central location (or server).
- In a distributed system the data is kept, maintained, updated and processed at different locations that are connected through a communication network.
- A federated system is a set of autonomous, distributed and heterogeneous information systems, which are operated together by means of a shared global data schema to generate a useful answer to users



a) Centralized



b) Federated



c) Decentralized

D6.1 - chapter 3 Harmonised procedures for creation of databases and sharing soil data

Steps for serving soil data according to INSPIRE

- Steps needed:
 - Metadata creation and publication
 - Transform from a local data model to INSPIRE encoding
 - Publish data in a download service
- For all steps tools are available, either more manual or automated, more advanced or more basic
- EJP SOIL aims to provide an overview of options for partners

	D6.4 SOFTWARE FRAMEWORK functions	(WP5) CAPACITY BUILDING on SOIL DATABASES and INSPIRE compliance
STEPS FORWARD	a) upload and download data, and integrate external databases (in the software), manage data quality assurance and data models b) manage and publish metadata c) configure and manage data harmonization (standardization to reference CodeLists and INSPIRE soil data model) d) configure, publish and manage INSPIRE network services (view, download, transform ... e.g. WMS, WFS, WCS ...)	a) Conceptual and data model, ontologies, general principles b) Data standardisation - vocabulary and codelists c) Controlled vocabularies and ontologies on Soil d) The INSPIRE Soil Data specification e) The INSPIRE Registry ... with practical application such as the use of HaleStudio or SensorThings

D6.1 - chapter 3 Harmonised procedures for creation of databases and sharing soil data

Serving soil data

- Options:
 - Serving data *as is* and metadata catalogue (eg. GeoNetwork)
 - Serving standardised data in a catalogue
 - Serving standardised data and put up webservice for machine approachable data endpoint
 - Serving harmonised data
- Influences amount of work at the data provider versus data user on standardisation, querying, usability
- Different levels of FAIR
- An overview of concepts and examples for the entire workflow is described in chapter 3

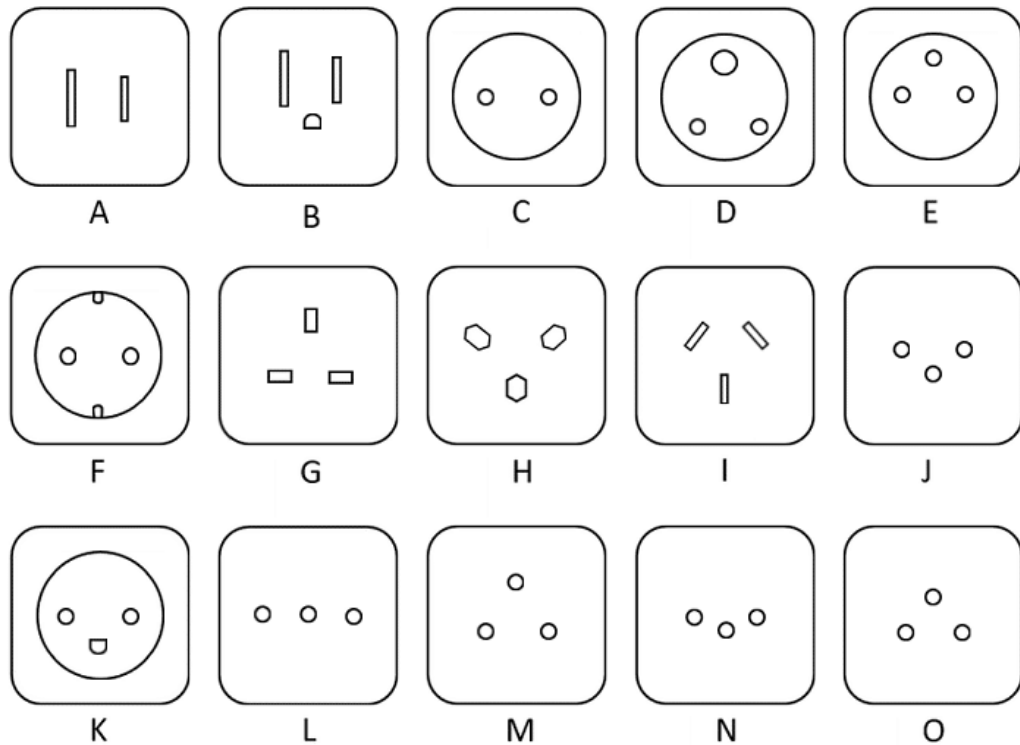
The screenshot displays a web interface for a soil data resource. It includes a 'Categories' section with tabs for 'Datasets', 'WoSIS Latest', and 'Geoscientific information'. Below this, there are sections for 'Stratum' (Soil science), 'Region' (Global), 'Other keywords' (coarse fragments, soil profiles), 'Language' (English), 'Resource identifier' (625d233b-9060-4145-8372-70e560b1d707), 'Legal constraints' (Licenced per profile), and 'Contact for the resource' (ISRIC - World Soil Information, PO Box 353, Wageningen, 6700AJ, Netherlands, Author: Ad van Costrum, Niels Batjes, Ulan Turdukulov). The 'Status' is 'On going'. The 'Technical information' section shows 'Representation type' as 'Vector' and 'Scale' as '100000'. A 'Keywords' section lists terms like 'soil profiles', 'bulk density', 'texture', 'carbon', 'digital soil mapping', 'pH', 'electrical conductivity', 'calcium', 'nutrients', 'cation exchange capacity', 'nitrogen', and 'salinity' with associated counts. At the bottom, there are three map thumbnails: 'Global Soil Salinity Map', 'IPCC default soil classes derived from the Harm...', and 'SoilGrids250m 2.0 - Cation exchange capacity'.



BUT STANDARDISED DATA IS STILL NOT HARMONISED DATA

STANDARDISED DATA

explicit data = FAIR



HARMONISED DATA

transformed data to a common standard



Standardisation is describing data in the same way (agreed definitions, structure, format)

Harmonisation is translating data to the same units, lab methods, definitions, etc.

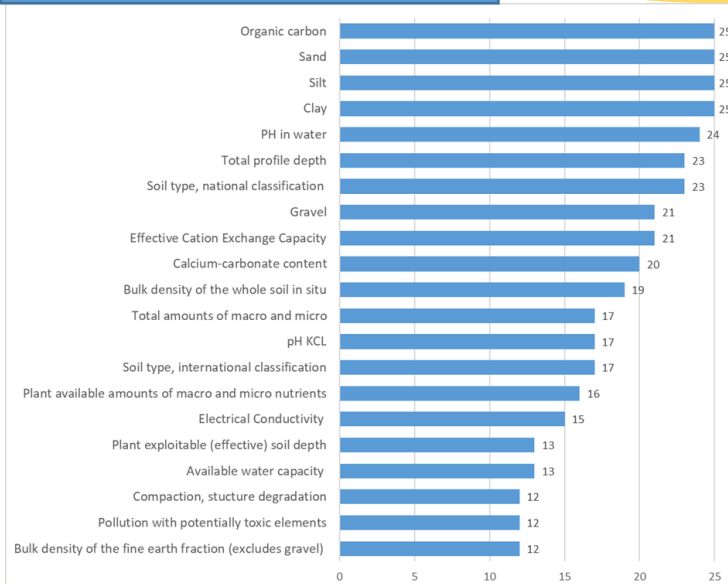
Basic soil properties to start with:

If multiple lab methods are used: harmonise to LUCAS

- soil organic carbon (25 Partners)
- silt/sand/clay (25)
- pH in water (24)
- coarse fragments (21)
- cation exchange capacity (21)
- carbonate content (20)

bulk density (19)

EJP Data Availability



MODULE	Type of analysis	Year of survey		
		2009–2012	2015	2018
MODULE 1 Physico-chemical properties	Coarse fragments (>2 mm)/% PSD ¹ : clay, silt, sand/% pH (CaCl ₂ , H ₂ O) Organic carbon/g kg ⁻¹ Carbonate content/g kg ⁻¹ Total nitrogen content/g kg ⁻¹ Extractable potassium content/mg kg ⁻¹ Phosphorous content/mg kg ⁻¹ Cation exchange capacity/cmol(+) kg ⁻¹ Electrical conductivity/mS m ⁻¹ Metals Multispectral properties Mineralogy	Available	Available	Available
MODULE 2 Soil biodiversity	Bacteria and Archaea (16S rDNA) Fungi (ITS) Eukaryotes (18S rDNA) Microfauna (nematodes) Mesofauna (arthropods) Macrofauna (earthworms) Metagenomics	Available	Available	Available
MODULE 3 Bulk density	Bulk density	Available	Available	Available
MODULE 4 Field measurements	Soil moisture Soil erosion by water and wind Thickness of organic layer in Histosols Soil structure	Available	Available	Available
MODULE 5 Pollution	Organic pollutants Pesticides residues	Available	Available	Available

Source: JRC support to the EJP SOIL (Technical report)

<https://publications.jrc.ec.europa.eu/repository/handle/JRC122248>

First internal call: https://ejpsoil.eu/soil-research/first-internal-call-closed/					
	start	duration	aim	target map/or map-related product	potential WP6 linkage(s)
CarboSeq	1/2/2021	48 months	To estimate the feasible SOCsequestration potential taking into account technical and socio-economic constraints.	SOC-sequestration potential maps for different management options.	all Tasks
STEROPES	1/2/2021	36 months	To overcome the limitations of static soil maps by putting the use of satellite time series forward, test their potential to predict cropland soil organic carbon content over various pedoclimatic conditions and cropping systems across Europe.	To predict cropland soil organic carbon content over various pedoclimatic conditions and cropping systems across Europe	Task 6.3.
SensRes	1/2/2021	36 months	Proposing and testing a new method to downscaling large-extent soil maps to higher resolutions using proximal sensors, drones and satellite images.	For agricultural fields in 7 European countries , using proximal sensors, drone images and satellite images; strongly linked to task 6.4. The mapped soil properties will include soil organic carbon, soil texture and locally important soil properties .	Task 6.4.
SCALE	1/2/2021	36 months	To improve the management of sediment connectivity in diverse agricultural landscapes.	To improve the harmonisation of data sets, observation and modelling techniques in connectivity research and bridge the gap between different spatial and administrative scales .	Task 6.2./6.4.
i-SOMPE	1/2/2021	40 PM	By using a surveying approach , i-SoMPE will aim to document innovative farming practice.	Context specific thematic maps will be provided to guide policy makers to the most efficient innovative SMPs as climate-smart sustainable tools.	Task 6.2.
SIREN	1/2/2021	12 months	To make an inventory of indicator systems for assessing soil quality and ecosystem services , as currently used by Member States associated in the EJP SOIL and beyond.	Stocktaking of soil indicators, therefore strongly linked to task 6.3. Reference values for SOC, soil quality, soil biodiversity and degradation risk , the associated target values of indicators.	Task 6.3.
Second internal call: https://ejpsoil.eu/soil-research/second-internal-call-closed/					
	start	duration	aim	target map/or map-related product	potential WP6 linkage(s)
SERENA	1/11/2022	36 months	To use, test and improve the robustness and sensitivity of existing indicators and their interpretation values (e.g. reference and/or threshold values) to model and map soil functions and related ecosystem services, focusing especially on climate change adaptation and mitigation.	EU-wide soil indicators mapping.	all Tasks
MINOTAUR	1/11/2022	36 months	To provide models, maps and policy-relevant indicators with validated reference values for monitoring soil biodiversity and associated functions. To harmonize and integrate soil biodiversity data and contribute to support long-term harmonized EU soil information and international reporting.	EU-wide soil biodiversity mapping.	all Tasks
PROBEFIELD	1/11/2022	36 months	Quick and simple soil analyses directly in the field through proximal sensing has the potential to substantially gear up the number of samples analysed. With focus on visible and near infrared spectroscopy (Vis-NIRS) ProbeField will work to make this happen. The Vis-NIR technique, in contrast to spectroscopy in the lab on prepared samples, variable moisture and structure in the field will hamper	Soil field-scale mapping and monitoring through proximal (+ remote) sensing. A wide range of soil properties will be analysed and 3D mapping will be performed to estimate for example carbon stocks. A best practice protocol will be produced.	Task 6.4.

Questions/decisions

- What is the long term legal status of EUSO: now voluntary, but legal binding soil health monitoring foreseen. What are possible implications for countries?
- What is the essential data for policy indicators? Recognised national authoritative datasets?
- Point data sharing: are soil data and coordinates private data or in the public domain? Solutions proposed in EJP SOIL (EU-harmonised, interpretation values/scoring approaches, statistics calculated by country with EUSO audit, e.g. of less favoured areas)
- This requires trust (both ways): how to build, ensure and operationalise? (e.g. audits, independent institutions (policy and land owners) address policy-research pressure, conflict of interest in data collection and policy incentives)
- Consider providing more added value to countries, e.g. re-use and re-publish LUCAS data as part of national monitoring dataset, easy tools to facilitate the work, etc.
- Data collection can support awareness of soil status for people in the field who execute the resulting policies
- Update frequency? Harmonisation? Accuracy? Resolution? At what level to include research and EU project data?

CONCRETE EJP SOIL CONTRIBUTION TO EUSO

PRODUCT	SPECIFICATIONS
<p>Soil Data Exchange Infrastructure Metadata creation and publication Transform from a local data model to INSPIRE encoding Publish data in a download service</p>	<p><u>Technical actions:</u> Mapping national schemas to the INSPIRE schema, with D6.4 software to facilitate Solving INSPIRE model current issues Develop national Codelists and deposit at INSPIRE codelist registry Develop/Integrate reference international CodeLists in the INSPIRE codelist registry Capacity building on soil database, INSPIRE compliance <u>Data policy:</u> defined by data owners</p>
<p>EU-harmonised soil maps in grid format (baseline properties, indicators, and scenario for climate and management change).</p>	<p>Harmonised from national to EU-LUCAS (lab) standards. Country-driven approach Common elaboration methods (standard cookbooks) Agreed soil indicators, target values and thresholds (specific to pedoclimatic conditions) IN COLLABORATION WITH EJP SOIL INTERNAL PROJECTS <u>Data policy:</u> CC-BY license with IPR recognized</p>
<p>Exploration for an integrated EUSO soil monitoring system (national + LUCAS)</p>	<p>Compare national and LUCAS sampling strategies/schemes Compare national and LUCAS datasets Develop transfer functions (Harmonised from national to EU-LUCAS (lab) standards. Identify and test statistical methods to merge national and LUCAS datasets and/or existing maps Develop interpretation values/scoring approaches</p>
<p>Improved methods for soil monitoring through proximal/remote sensing</p>	<p>Under definition inside task 6.4 and EJP SOIL internal projects Results in cookbooks/best practices Analysis of accuracies, costs and applicability of PS/RS techniques to soil monitoring & their applicability for different types of users (researchers/extensionists/farmers).</p>

WHERE COULD EUSO HELP?

1. Present, align and summarise the EU requests/needs for harmonised data and indicators (Soil Mission/ Green Deal, CAP, and so on) Where? At National Hubs and other meetings
2. Active contribution to alignment of indicator and threshold development internationally in the interface with national developments
3. Clearly indicate and develop added value for and with countries.
4. Vehiculate the national requests for financial support, which is necessary to maintain and extend the national soil (monitoring) services
5. Facilitate the linkage with the INSPIRE technical group to solve technical issues which are currently a barrier for INSPIRE implementation
6. Consolidate and enhance the capacity and functionality of the European Soil Data Centre (ESDAC) to allow serving of provided national (EU-harmonised) soil data

