

How EJP SOIL activities will support the future EU soil monitoring scheme?

SoilveR conference - Soil monitoring schemes in several European countries

Claire Chenu, Antonio Bispo, Maria Fantappiè, Fenny van Egmond, Bozena Smreczak, Zsófi Bakacsi, Rudi Hessel, Johanna Wetterlind, Grzegorz Siebelec



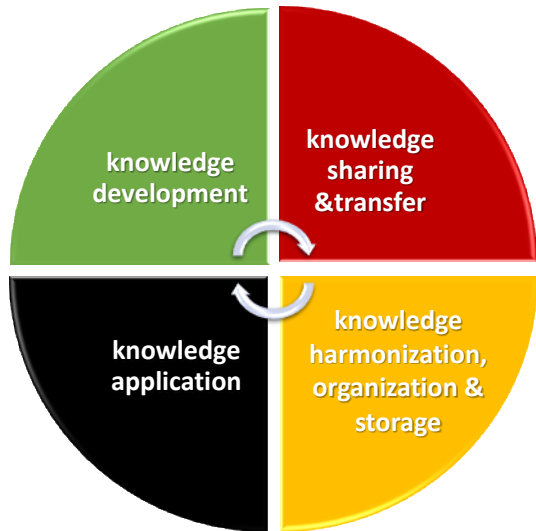
EJP SOIL
European Joint Programme



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

European Joint Programme SOIL

Overall goal : build a sustainable European integrated research system on agricultural soils and develop and deploy a reference framework on climate-smart sustainable management of agricultural soils.

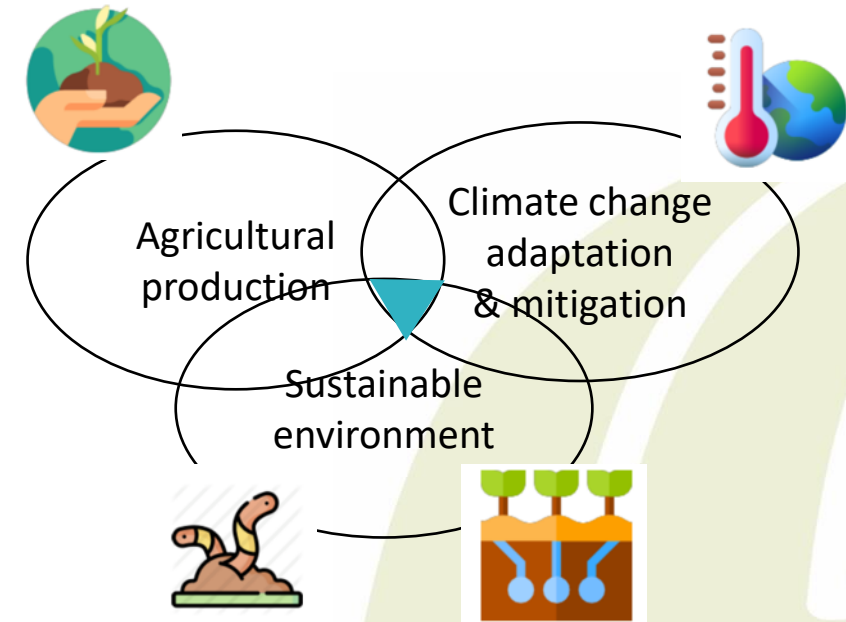


understanding of soil management and its influence on soil health

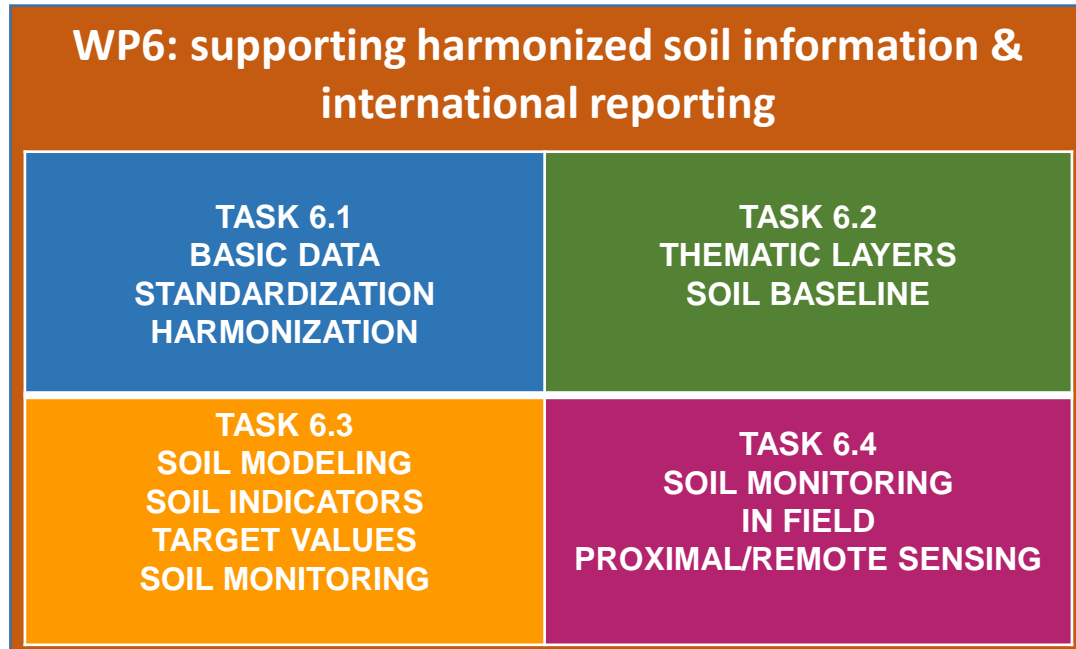
strengthening scientific capacities and cooperation

supporting harmonised European soil information

fostering the uptake of climate-smart sustainable soil management practices



European Joint Programme SOIL: WP6



D6.1 Harmonized procedures for creation of databases and maps



D6.2 National and EU regulations on agricultural soil data sharing and national monitoring activities



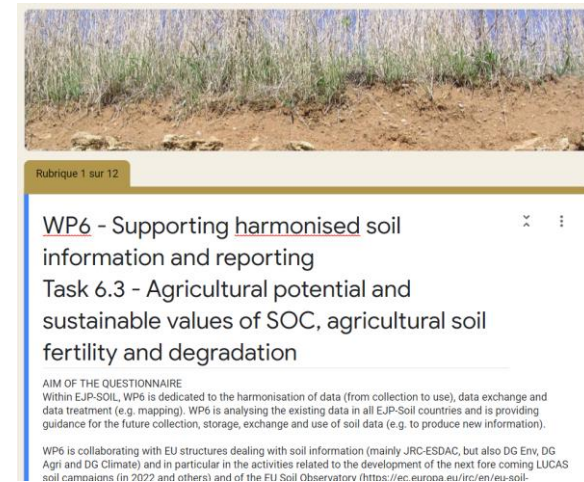
D6.3 Proposal of methodological development for the LUCAS programme in accordance with national monitoring programmes

Main topics covered by WP6

- Identifying existing soil data at EU scale and develop ways to expose / share /exchange data
- Defining, calculating and mapping indicators for soil health, threats and soil-related ecosystem services in close collaboration with JRC and EEA
- Identifying soil monitoring issues across EJP SOIL partners and JRC (to update national and EU monitoring campaigns as LUCAS)
- Contributing to a common ground for the future EU soil monitoring system (EU and national collaborations) in link with EUSO

Activities linked to soil monitoring

- Collaboration with LUCAS 2022 campaign to define/identify additional sampling points in EU countries
- Stocktake the description of monitoring networks across EJP SOIL partners through the use of a questionnaire (27 answers, 18 countries, 42 contributors)
- Synthesis of the questionnaire and publication of a deliverable
- Comparison of datasets protocols, lab methods and sampling designs: national - LUCAS



Towards climate-smart sustainable management of agricultural soils

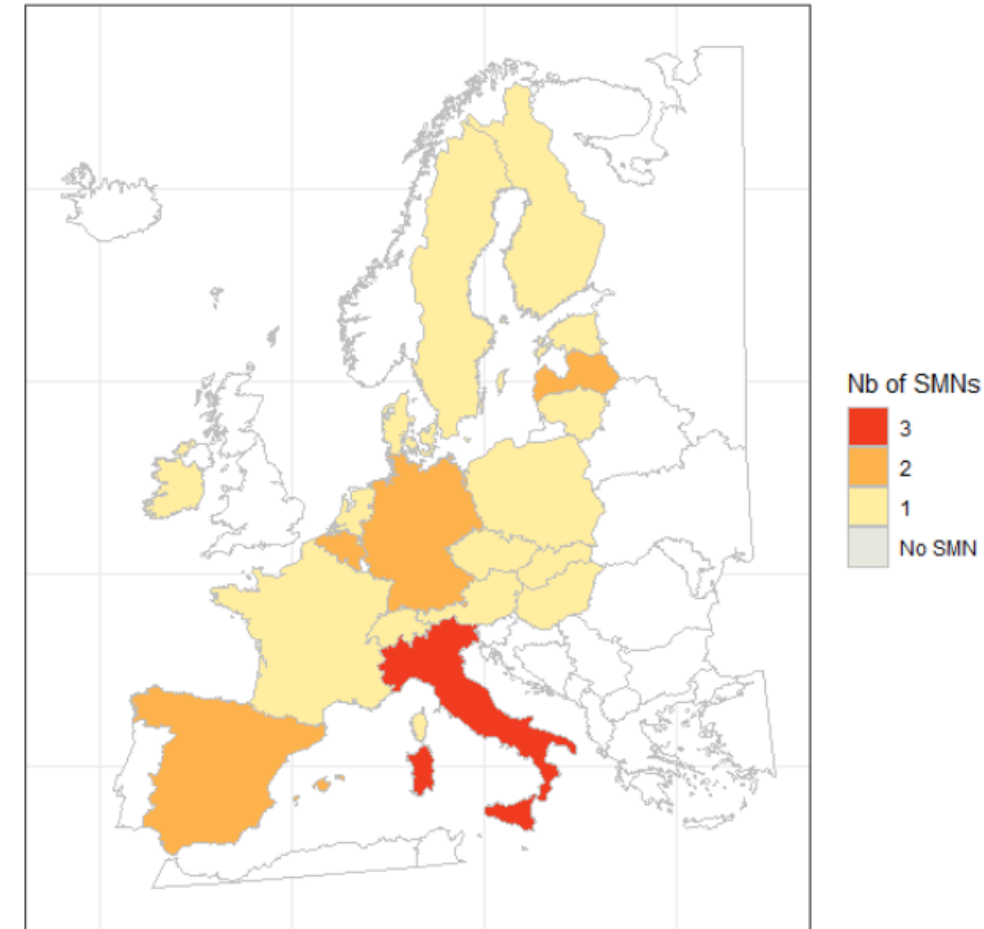
Deliverable 6.3

Proposal of methodological development for the LUCAS programme in accordance with national monitoring programmes

Due date of deliverable: M18
Actual submission date: 31.07.2021

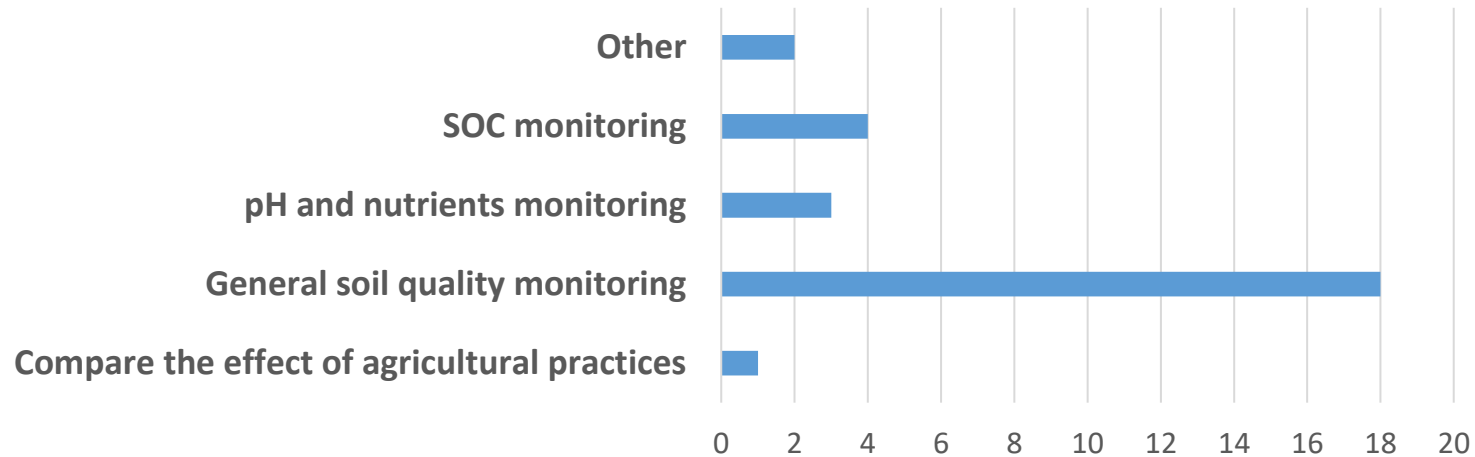
Soil Monitoring Systems (SMS) in EJP SOIL countries

- 18 countries answered out of 24
- 27 declared soil monitoring systems
- Turkey and Portugal do not have soil monitoring systems
- Five countries have 2 or 3 soil monitoring systems
 - managed at regional scale
 - with different purposes (e.g. agricultural vs forest, monitoring trace element vs agricultural parameters, monitoring a network of highly instrumented sites vs network agricultural soils)
- Caution: Not all countries declared their forest soil monitoring systems

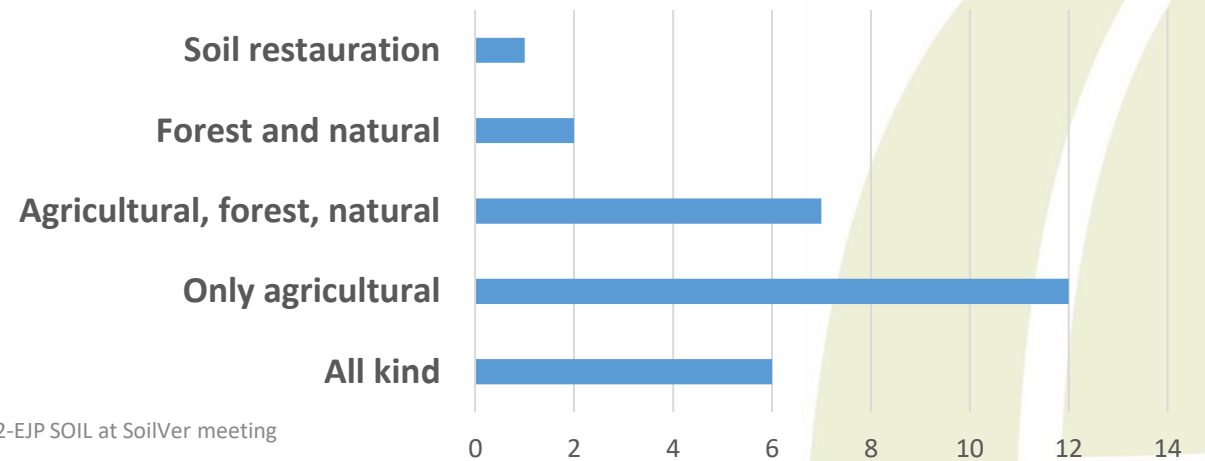


Results at a glance

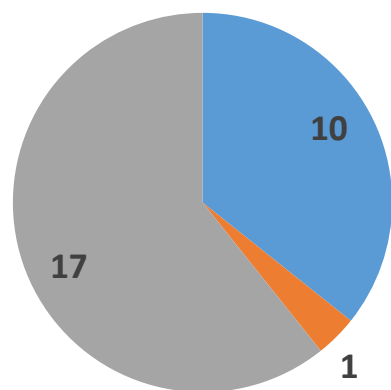
Main objective of the SMS



Investigated land uses

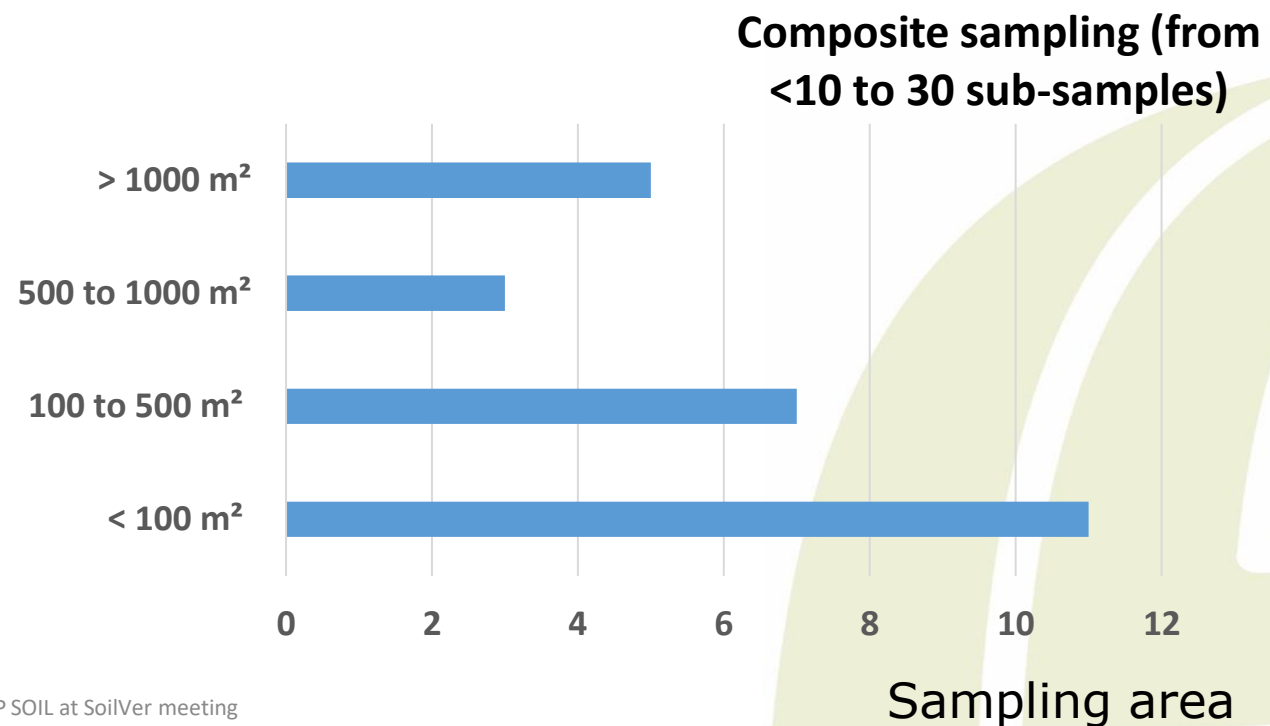


Results at a glance



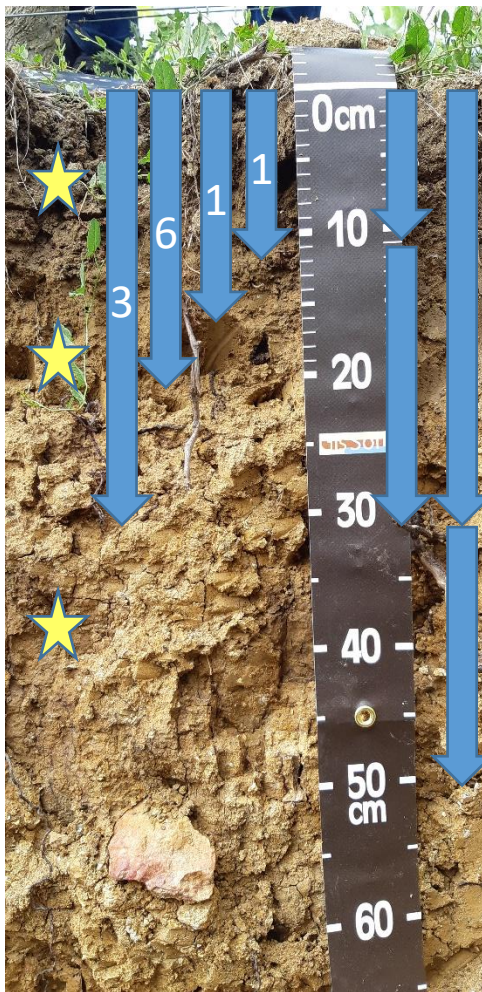
- Grid
- Mixed (grid + representative sites)
- Stratified representative sites

Sampling design



Results at a glance

Sampling depths



11 one fixed depth

16 MS sample for bulk density

14 different fixed depths

13 MS are sampling deeper than 30 cm

to 1 m

2022-04-12-EJP SOIL at SoilVer meeting

Analytical methods (to be completed)

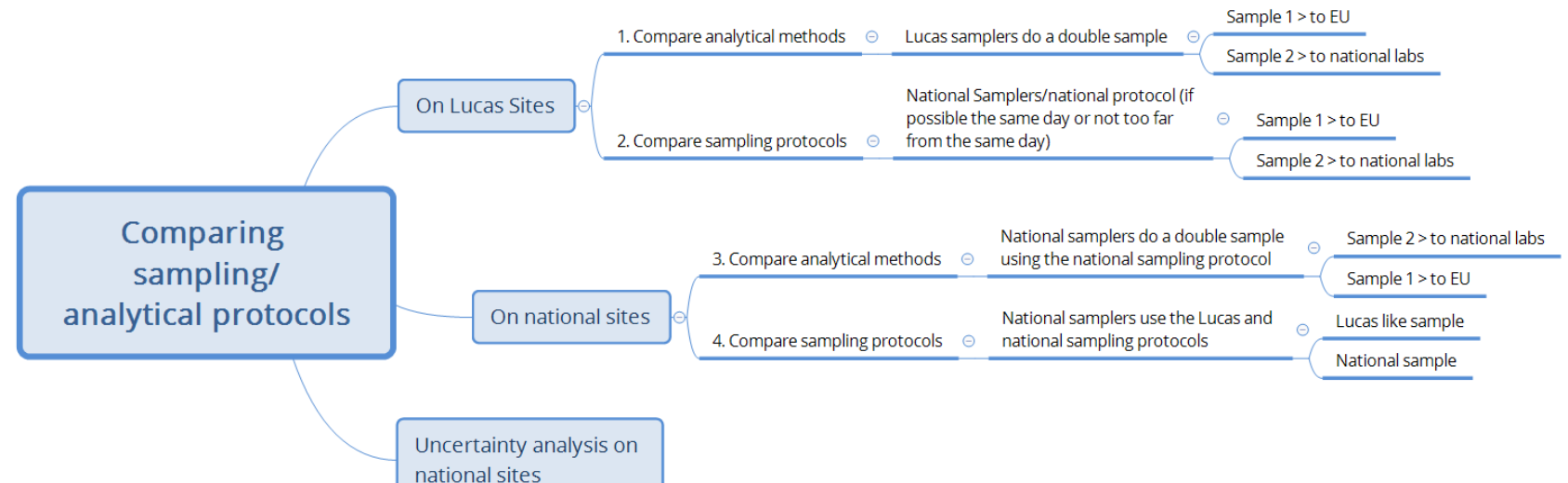
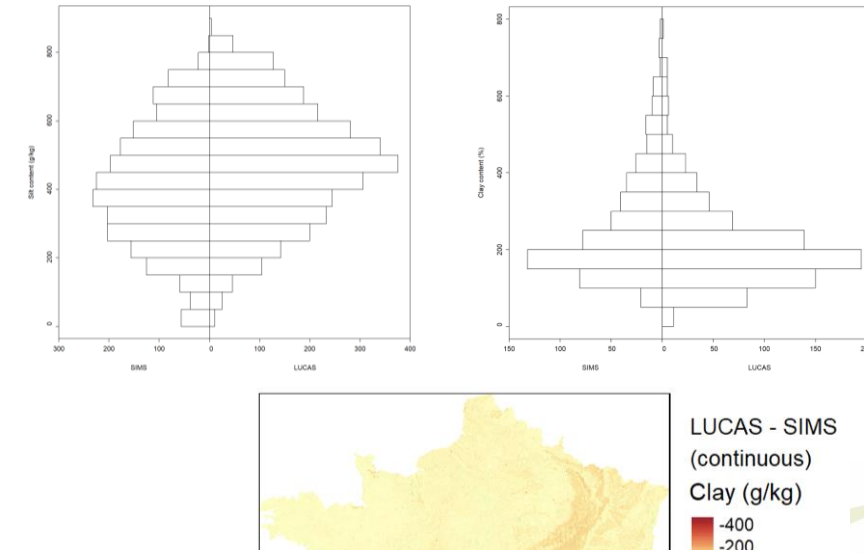
	Countries	Sweden	France	EU-JRC	Czech Republic	Latvia		Lithuania	Belgium - Wallonia	Belgium - Flanders	Netherlands	Slovakia	Denmark	Germany	TOTAL
	Name of the Soil Monitoring System	Soil & Crop Inventory	RMQS	LUCAS _a	Basal soil monitoring	SPPS	SPPS N	Dirv_DR10LT	CARBIOSOL	Koolst of monitoring netwerk	Netherlands Soil Sampling Program (NSSP)	CMS-P	DSMDB	Boden-Dauerbeobachtung _b	
Main soil properties, according to Global Soil Map specifications, 2015	total profile depth		x					x		x	x			x	6
	plant exploitable (effective) soil depth		x					x			x			x	4
	organic carbon	x	x	x	x	x	x	x	x	x	x	x	x	x	13
	pH in water	x	x	x		x	x	x		x	x	x		x	10
	sand	x	x	x	x	x		x		x	x	x		x	10
	silt	x	x	x	x	x		x		x	x	x		x	10
	clay	x	x	x	x	x		x		x	x	x		x	10
	gravel		x	x				x		x	x	%		x	6
	ECEC	x	x	x	x	x	x	x				x		x	9
	bulk density of the fine earth (< 2 mm) fraction (excludes gravel)		x						x	x	x			x	5
	bulk density of the whole soil in situ (includes gravel)		x	x	x			x			x	x		x	7
	available water capacity							x						x	2
Other soil properties	Electrical Conductivity		x			x		x		x	x	x		x	6
	calcium-carbonate content	x	x	x	x	x	x	x		x		x		x	10
	Field capacity (mm)							x						x	2
	Plant available amounts of macro and micro nutrients	x	x	x	x	x	x	x		x	x	x	x	x	12
	Total amounts of macro and micro nutrients/trace elements	x	x	x	x	x		x					x	x	8
	quality of clay minerals (e.g. type or ratio of illite, smectite, montmorillonite in clay fraction...etc)			x				x							2
	distribution of soil organisms		x	x							x		x	x	5
	properties for NIR and MIR (near and mid infrared)	x	x	x						x	x				5

Harmonization options

Questions	Yes		No	
	#	Representative comments	#	Representative comments
May the sampling design of your SMS be adapted or changed?	15	<ul style="list-style-type: none"> - New sites are possible (#12) - We are planning a new SMS, changes can occur (#3) 	13	<ul style="list-style-type: none"> - Changing design would make it impossible to compare the data with the old samples - Changes in the design would affect the time series in the core sampling area.
Can you consider collecting new information on the monitoring sites?	23	<ul style="list-style-type: none"> - Depends on means - Soil management information will improve the use of data 	4	<ul style="list-style-type: none"> - It takes too much time - Financial support needed
Can the soil description be improved?	16	<ul style="list-style-type: none"> - Translation of national classification into WRB can be made - If there is new funds soil description/classification can be made 	11	<ul style="list-style-type: none"> - Not planned - Needs skilled people - Too much time/work on the site
Can you modify the sampling area?	7	<ul style="list-style-type: none"> - We are planning a new SMS, changes can occur (#3) 	19	<ul style="list-style-type: none"> - Rather no, all the previous data rely on this protocol. - Changing the area would make it impossible to compare the data with the old samples
Can you change the sampling depths?	8	<ul style="list-style-type: none"> - We may sample deeper (#4) - We are planning a new SMS, changes can occur (#3) 	17	<ul style="list-style-type: none"> - All previous data rely on this protocol
Can you change the soil sample preparation, before analysis?	5	<ul style="list-style-type: none"> - We are planning a new SMS, changes can occur (#3) 	20	<ul style="list-style-type: none"> - All previous data rely on this protocol
Can you change measurement methods?	9	(without comment)	15	<ul style="list-style-type: none"> - Since the purpose is to monitor changes, changes in the measurement methods is problematic - Would probably need some double analysis, which means increased costs.
Can you add extra parameters to be analysed?	20	<ul style="list-style-type: none"> - Depending on funds (struggling to maintain basic analysis) 	4	<ul style="list-style-type: none"> - Costs

On going work – collaboration with LUCAS

- Compare, with the same approach national data with LUCAS data, country/country
- Develop transfer functions (from sampling to analytical methods), taking the opportunity of LUCAS 2022



Next steps

- Publish our first results
- Compare the results of the datasets comparisons, country/country and at EU scale
- Organise the collaboration between LUCAS 2022 and national sampling campaigns to compare sampling/analytical methods and develop pedotransfer functions
- Collaborate with JRC
 - Within EJP SOIL
 - Within JRC EU SO working groups

Benefits and drawbacks for a country driven approach

- National information (maps and monitoring) is authoritative and therefore used in the application of national soil protection policies
- National information (maps and monitoring) better suits the national needs and specifics on soil, land uses and climate, and is often more detailed
- 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

Available soil property data per country over time

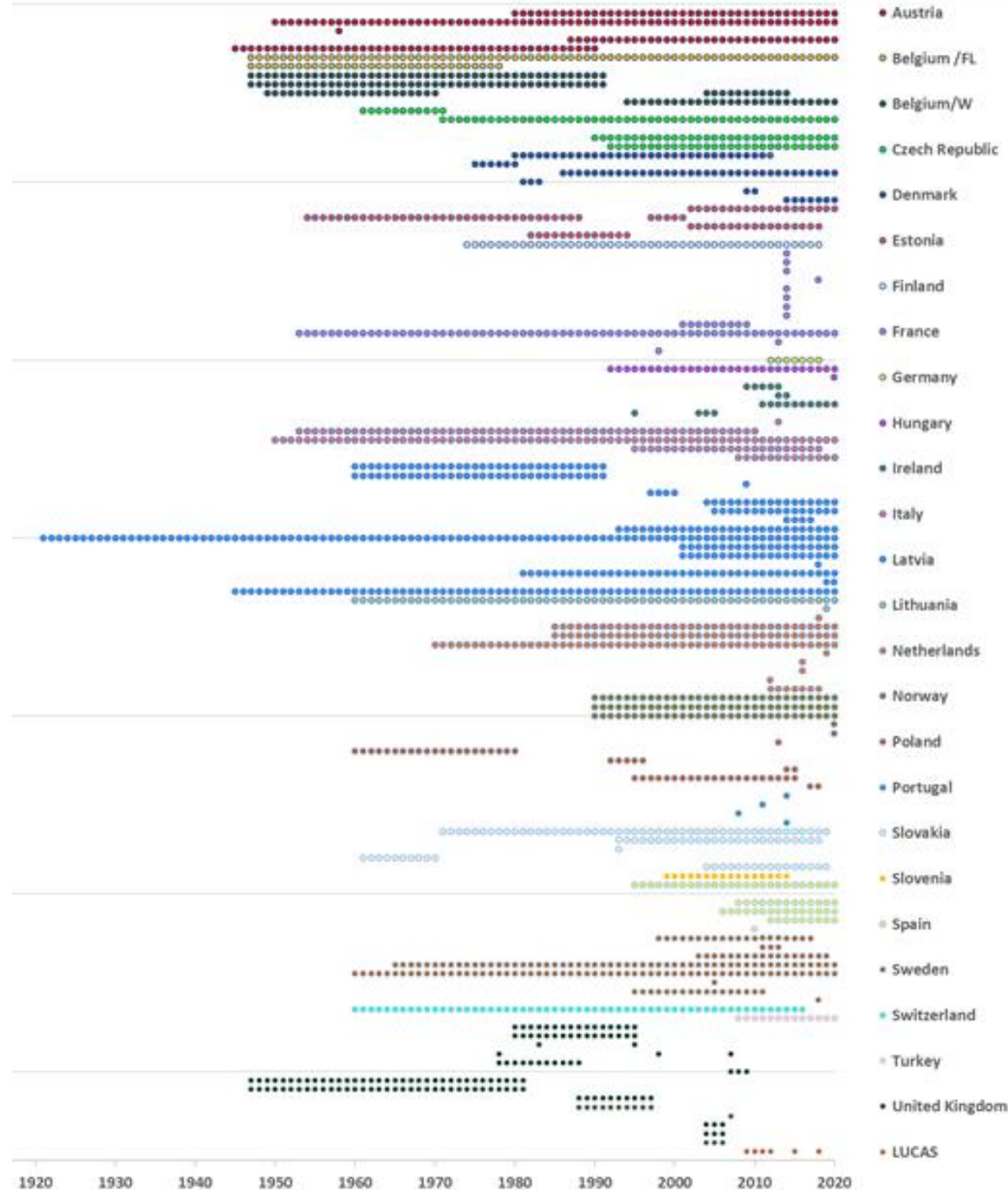


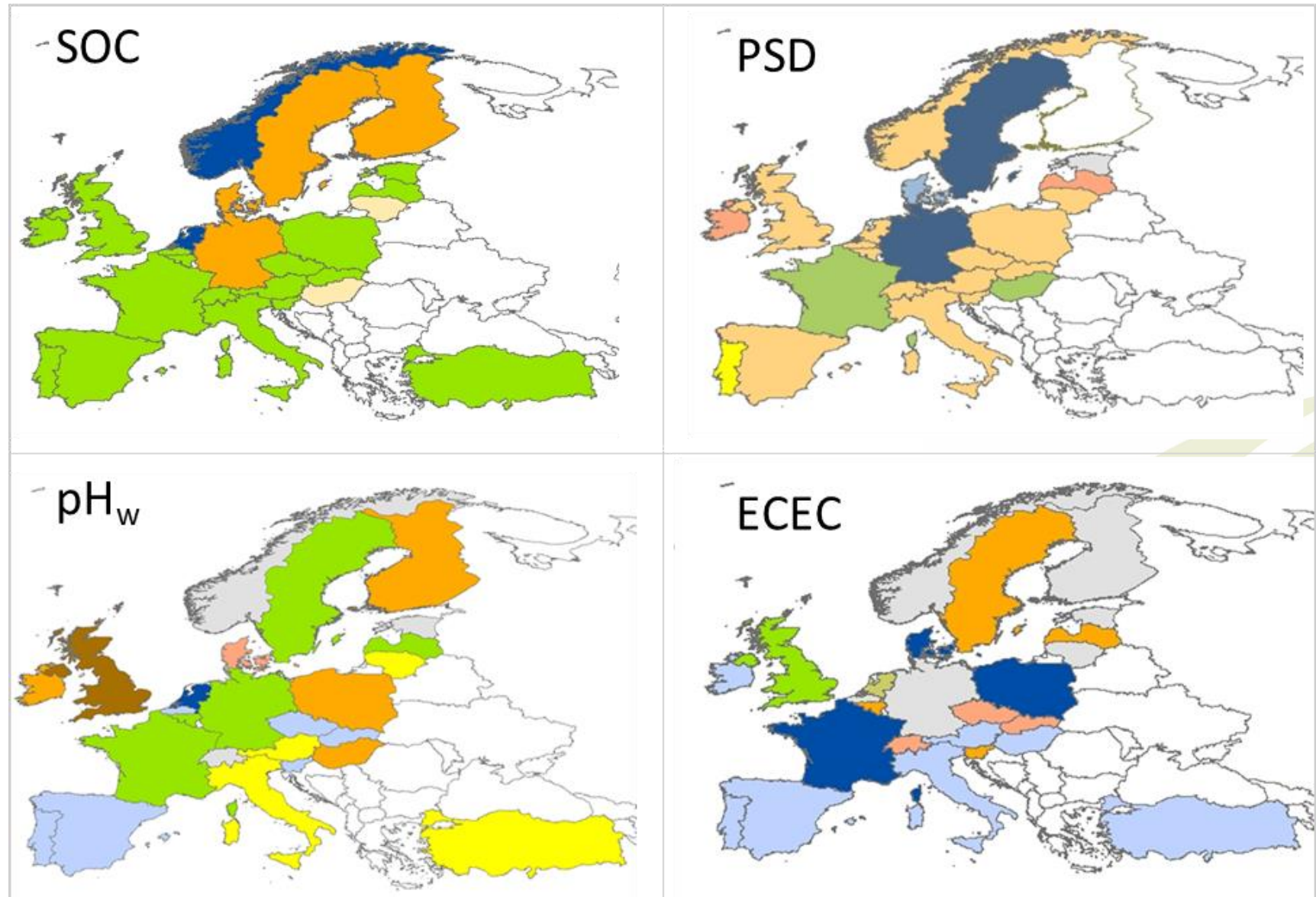
Figure 2.3, report D6.1



The diversity of methods or sets of methods used to measure a given soil property in each country.

The same color within a map indicates the same applied methodology.

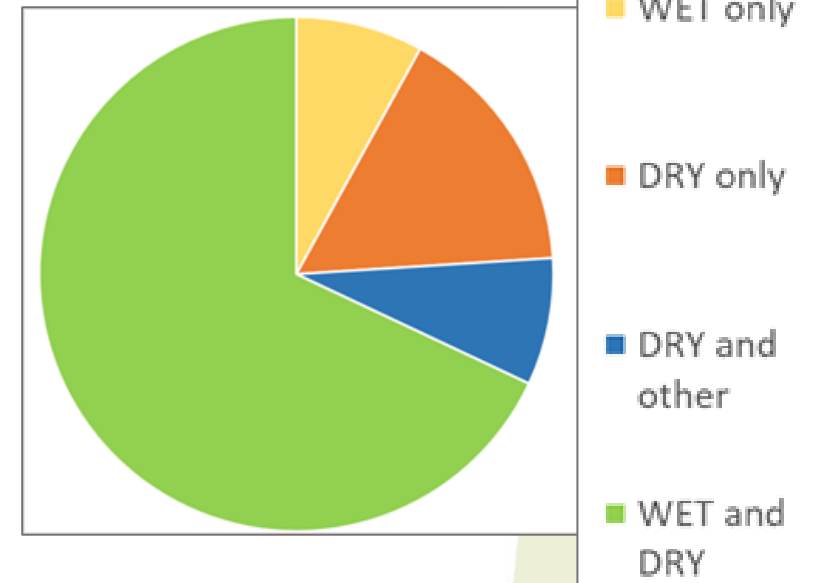
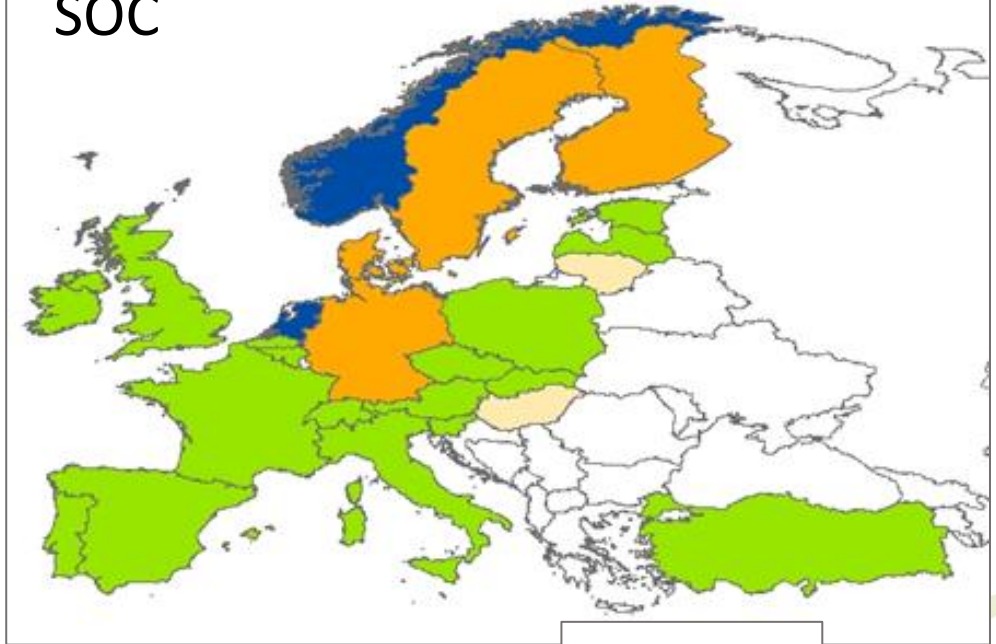
*SOC- soil organic carbon content;
PSD- particle size distribution;
pHw- pH value, in water;
ECEC- effective cation exchange
capacity.*



Diversity of methods - example

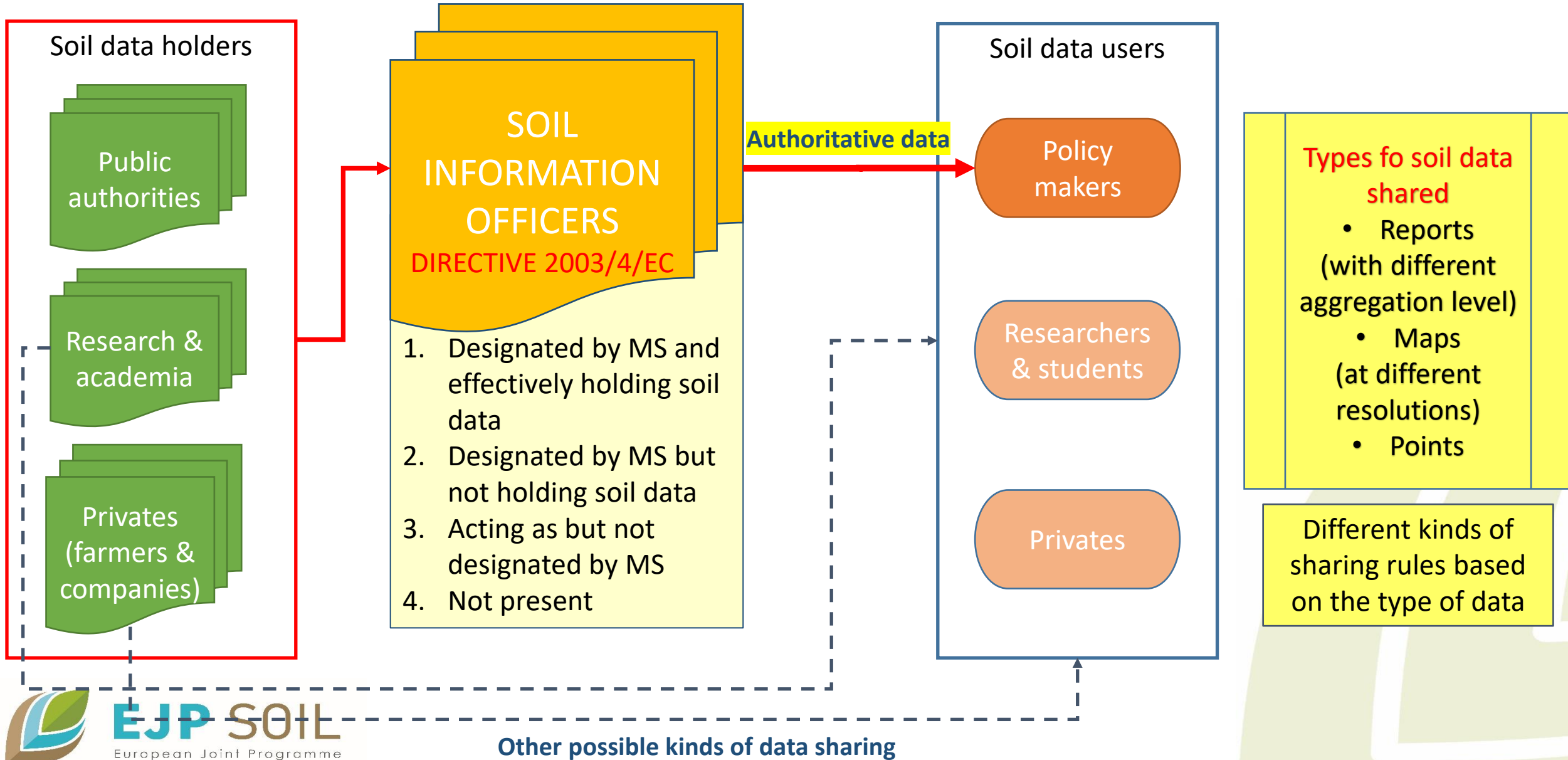
SP 1.3 Organic C	databases			applied method					
Country	Relevant for topic	data policy	(at least a part of it) open access or freely available for EJP SOIL						
				WET_WB	WET_TYURIN	WET_OTHER	DRY_W_LOSS	DRY_ADC	other
Austria	4	FPO	eBOD	yes	no	yes	no	yes	no
Belgium Flanders	2	F	DOV, SOCMB	yes	no	no	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

SOC

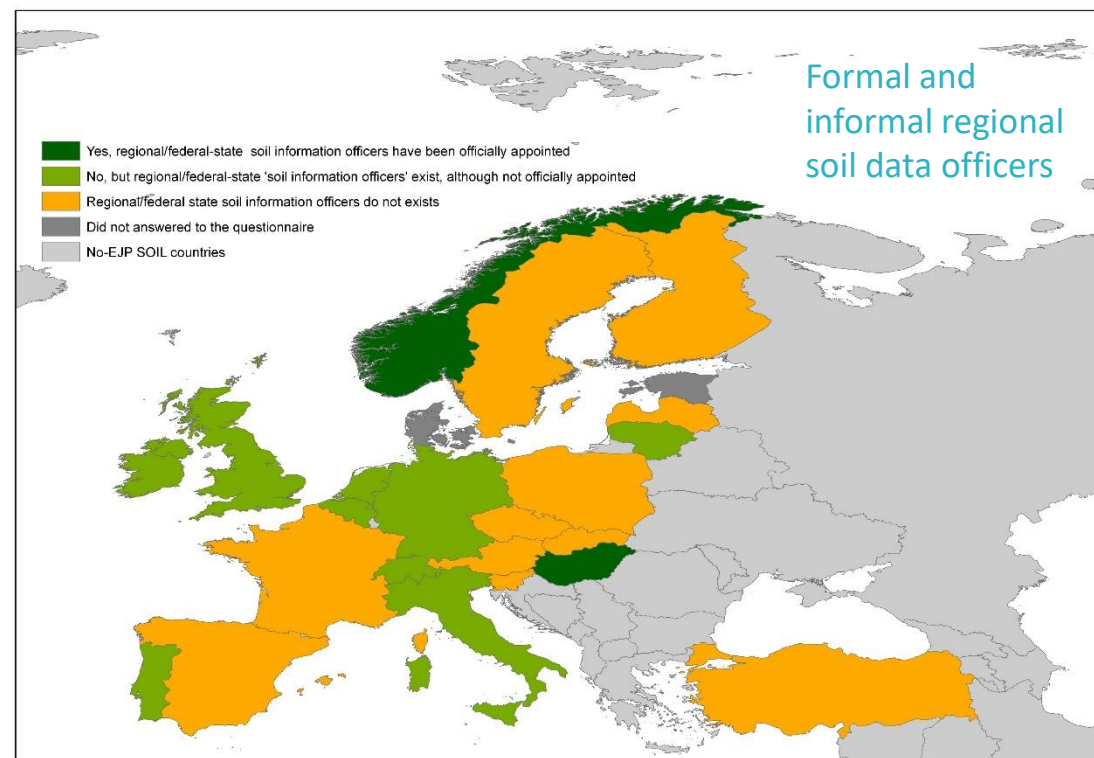
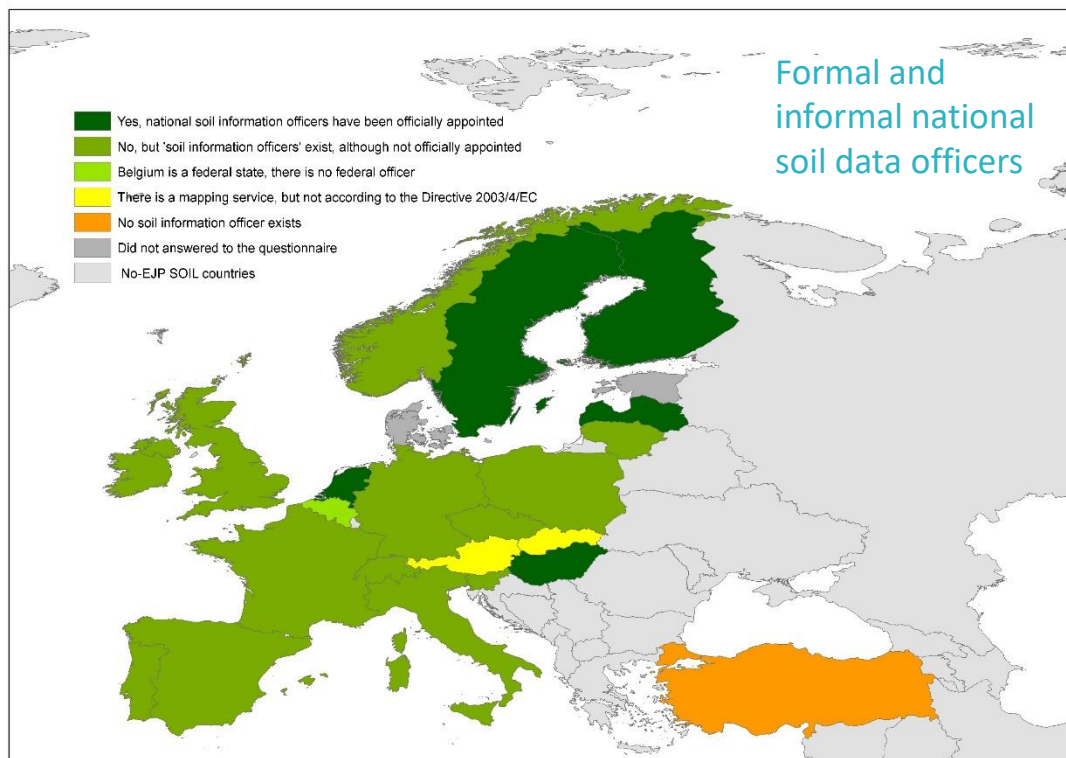


SOIL INFORMATION OFFICERS

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 ←

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)

National monitoring systems – LUCAS Soil intercomparison *ongoing*

	Sites	Sampling methods	Analysis methods	Countries involved
LUCAS Soil	●	●	●	All EU countries) JRC operated
National soil monitoring systems	●	●	●	19 countries
Double analysis <i>Compare methods of soil analysis</i>	●	●	●	France, Austria, Belgium-Flanders, Czech republic, Denmark, Estonia, Germany, Hungary, Ireland, Italy, Poland, Portugal, Slovakia, Spain and Sweden
Double sampling <i>Compare sampling methods & analytical results</i>	●	●	●	Denmark, Poland and Sweden Belgium-Flanders, Belgium/Wallonia and Italy
	●	●	●	France, Slovakia, Spain, Denmark and Sweden
Nested sampling <i>Analyse and compare uncertainty sources</i>	●	●	●	Resampling & re-analysis : LUCAS
	●	●	●	Resampling & re-analysis : France and Flanders



LUCAS methods

National methods