

Bodemgezondheid en ecosysteemdiensten in Europese context

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Gebaseerd op:

- resultaten van het EJP SOIL project 'SIREN',
- Ontwikkelingen EU Soil Mission

Outline

□ Europese ontwikkelingen

- EU Green Deal
- EU Law on Soil Health
- EU Soil Mission

□ Monitoring in EU Lidstaten

□ Bodemkwaliteit incl. ecosysteemdiensten

- Ecologische productiefuncties

Staand beleid EU

- Soil Thematic Strategy 2006
- Gemeenschappelijk Landbouw Beleid (CAP)

Cross-compliance betalingen via 'good agricultural and environmental conditions'

- CAP 2018-22:minimum soil cover, minimum land management to limit erosion, and maintenance of soil organic matter
- CAP 2023-27:protection of wetlands/peatlands, ban of burning arable stubble, buffer strips, tillage management to reduce soil erosion, minimum soil cover, crop rotation
- Monitoring

Beleidsontwikkelingen EU

EU Green Deal strategieën:

- Farm2Fork
- Chemicals
- Leefomgeving
- Klimaat
- Biodiversiteit
- Bodem (vernieuwd Nov. 2021)



New Soil Strategy actions

- Legally binding measures to enhance biodiversity in agricultural land to conserve and increase soil organic carbon
- Join the “4 per mille” Initiative and table a legislative proposal on carbon removal certification
- First assessment of EU soil biodiversity and antimicrobial resistance genes based on LUCAS topsoil survey
- Establishment of the Global Soil Biodiversity Observatory
- Set of “Sustainable Soil Management Practices” and provide assistance to Member States to develop a “test your soil for free” campaign so that sustainable soil management should become the norm in the future
- Legally binding objectives in the context of the Nature Restoration Law (focus: wetlands, peatlands)
- Methodology and indicators assessing the extent of desertification and land degradation

Centraal concept: 'bodemgezondheid'

in sociale context: "*Healthy soils for healthy people!*"

Beleidsontwikkelingen EU

EU Green Deal strategieën:

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-  - Biodiversiteit
- Bodem (vernieuwd Nov. 2021)

Target 2030: "**75% Europese bodems in gezonde staat**"



EU Soil Health Law 2023:

*"Same level of protection
as water and air"*

- Bodemchemische, fysische, en biologische eigenschappen in goede structurele en functionele conditie.
- Continue levering van (max.) aantal (essentiële) ES
- Geen toename in trade-offs

*Levering van diensten
is elementair onderdeel*

*Indicatoren bodemkwaliteit
associëren met ES*

EU Mission on Soil Health and Food

Support European Green Deal

- Climate Adaptation Strategy: Mission Climate
- Long-term Vision for the EU's Rural Areas: Mission Soil



2020:
Mission Board reports; 'Caring for soil is caring for life'



2021:
Foresight reports for Missions in Horizon Europe



Soil health objectives, targets and indicators

1. Soil pollutants, excess nutrients and salts
2. Soil organic matter
3. Soil structure
(incl. bulk density and absence of soil sealing and erosion)
4. Soil biodiversity
5. Soil nutrients and pH
6. Vegetation cover
7. Landscape heterogeneity
8. Area of forest and other wooded lands
9. Global footprint

Specific Targets and Indicators			
Objectives	Land Management Targets	Soil Health Targets	Six Soil Health Indicators
Land degradation and desertification	50% degraded land restored	Strong reduction in degradation and desertification	All 6 soil health indicators
Soil organic carbon	Conservation of high carbon soils and a reverse of carbon loss in croplands.	A switch from a 0.5 % loss per year to a 0.1-0.4% increase in SOC concentration in cropland soils 30-50% reduced area of peatland losing carbon	Soil organic carbon stock Vegetation cover
Soil sealing and net land take	Urban recycling of land from 13 to 50% No net land take by 2050	Switch from 2.4% to no net soil sealing	Soil structure including soil bulk density and absence of soil sealing and erosion Vegetation cover
Soil pollution	25% of land under organic farming Doubling of rate of remediated sites prioritising brown field sites	5-25% additional land (i.e. over and above the 25% in full organic) with reduced risk from a range of pollutants	Presence of soil pollutants, excess nutrients and salts
Erosion	50% degraded land restored	Prevention on 30-50% of land with unsustainable erosion risk	Soil structure including soil bulk density and absence of soil sealing and erosion. Vegetation cover
Soil structure	50% degraded land restored	Reduction by 30-50% of soil with compaction	Soil bulk density and other measures of soil structure
<i>While not being a soil indicator in the strict sense, mission activities will be assessed against their impact on the health of soils outside Europe</i>			
Global footprint	Strengthened international cooperation; trade regulations, including carbon tax	20-40% reduction of current global footprint	Food, feed and fibre imports leading to land degradation and deforestation

Table 1 Objectives of the mission board and the targets and indicators used to assess progress and achievement. (Source MB 2020)

Soil Mission Building Blocks

1) Research and innovation

Horizon Europe:
'BENCHMARKS', 'SOILVALUES'

2) Co-creation and Demonstration of good practices

Living Labs
Lighthouses

3) Soil Monitoring

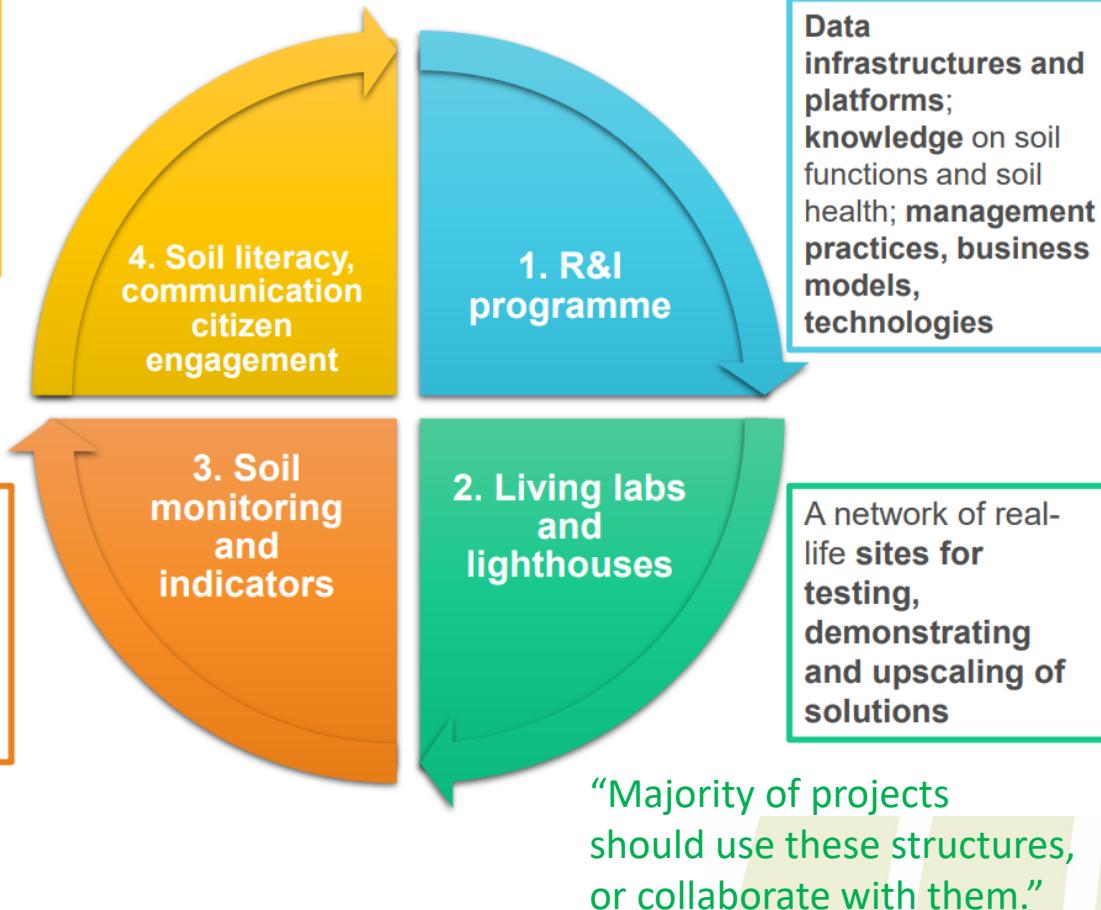
cf. water, lucht, biodiversiteit;
agreed methodologies, **indicators**

4) Education and training

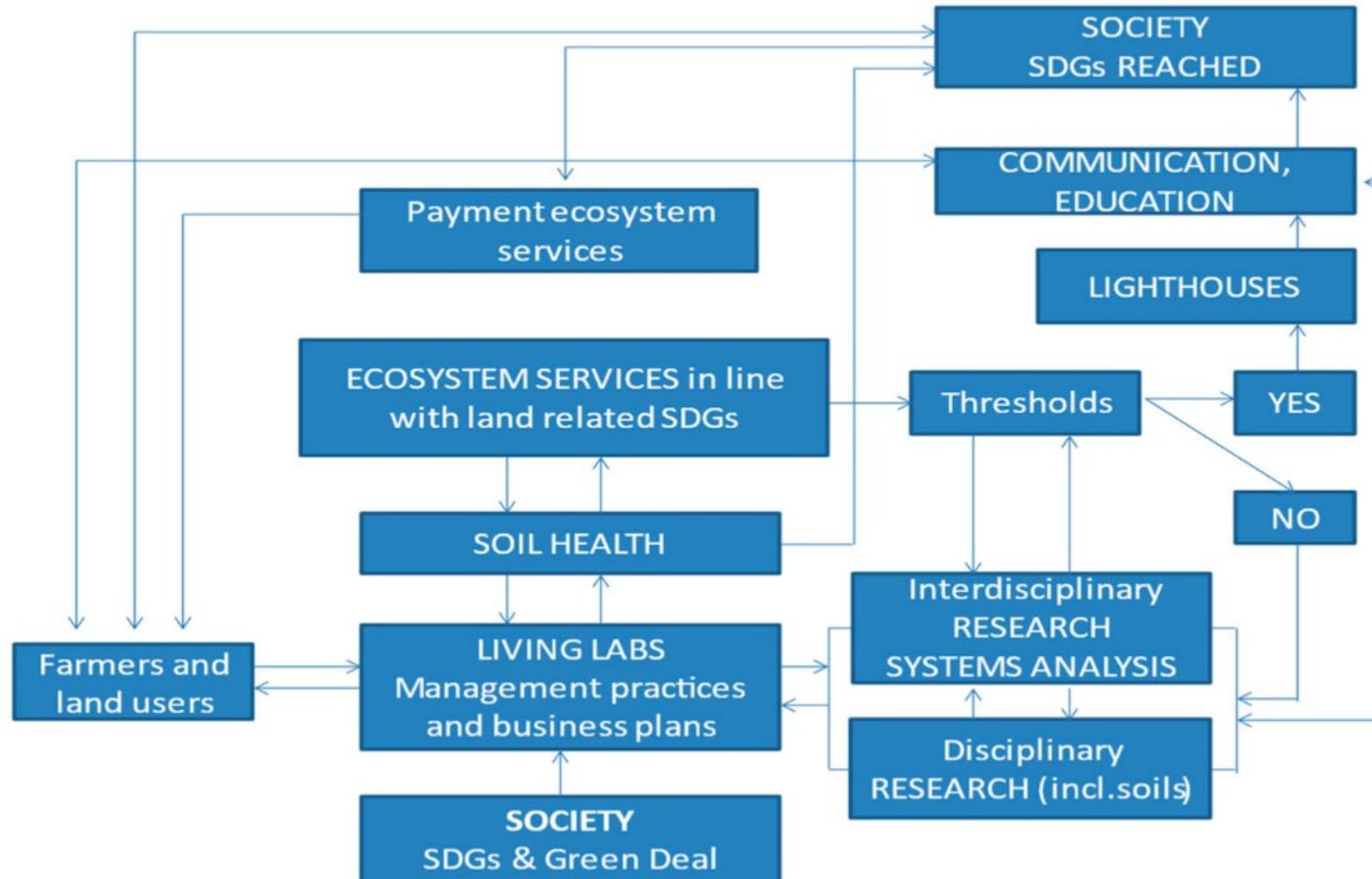
Communication material, training curricula for different target groups and specialised "soil advisors"

Indicators for soil health; approaches for measuring, assessing and dynamic monitoring of soil health across Europe

Interlinked Mission Building Blocks



Living Labs: soil health and ecosystem services

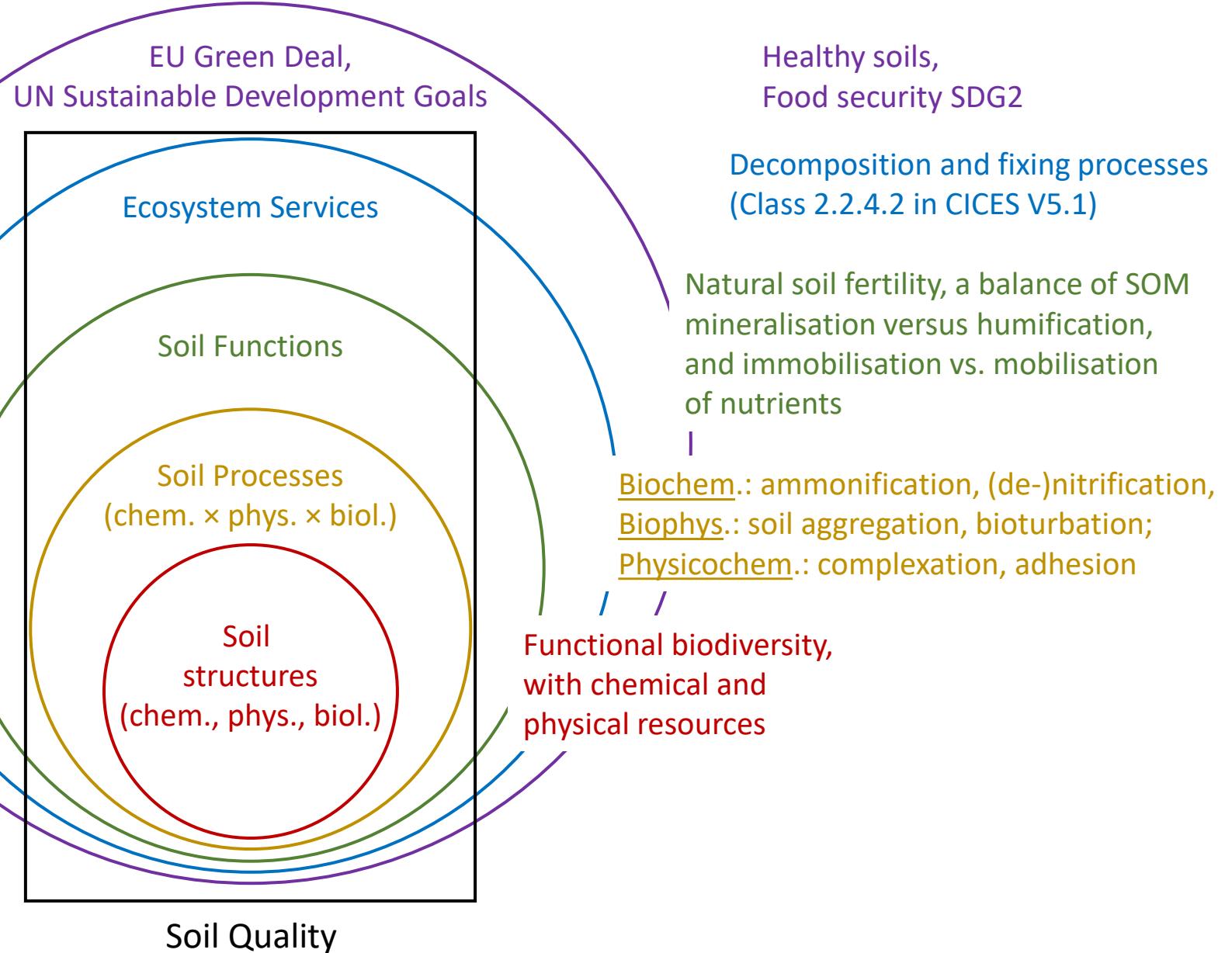


Bouma et al. 2021
<https://doi.org/10.3390/soilsystems5030056>

Bouma & Veerman 2022
<https://doi.org/10.3390/land11122178>

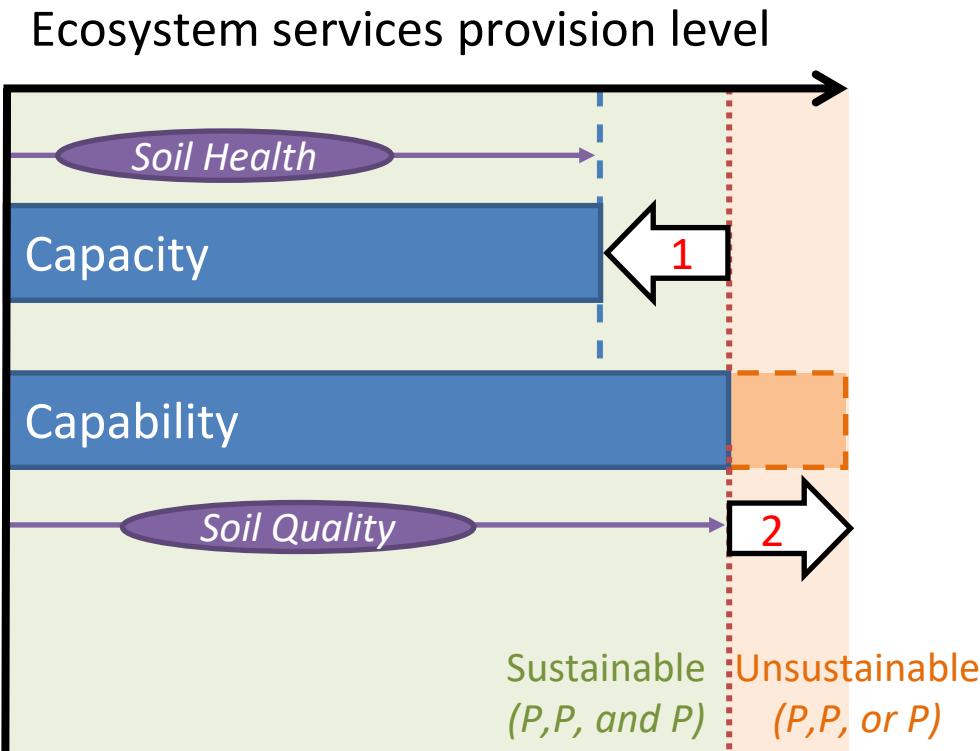
Soil Health assessment by integrating and upscaling soil data

Guidance is missing
cf. NEN5737:2010
ISO 19204:2017
site-specific ERA
contaminated soils



Bodemkwaliteit en bodemgezondheid i.r.t. ecosysteemdiensten

■ Resultaten EJP SOIL project 'SIREN'



1. Current soil degradation, management practices, climate change, etc. limit ES provision

2. Context properties (e.g., soil type and land use) define potential.

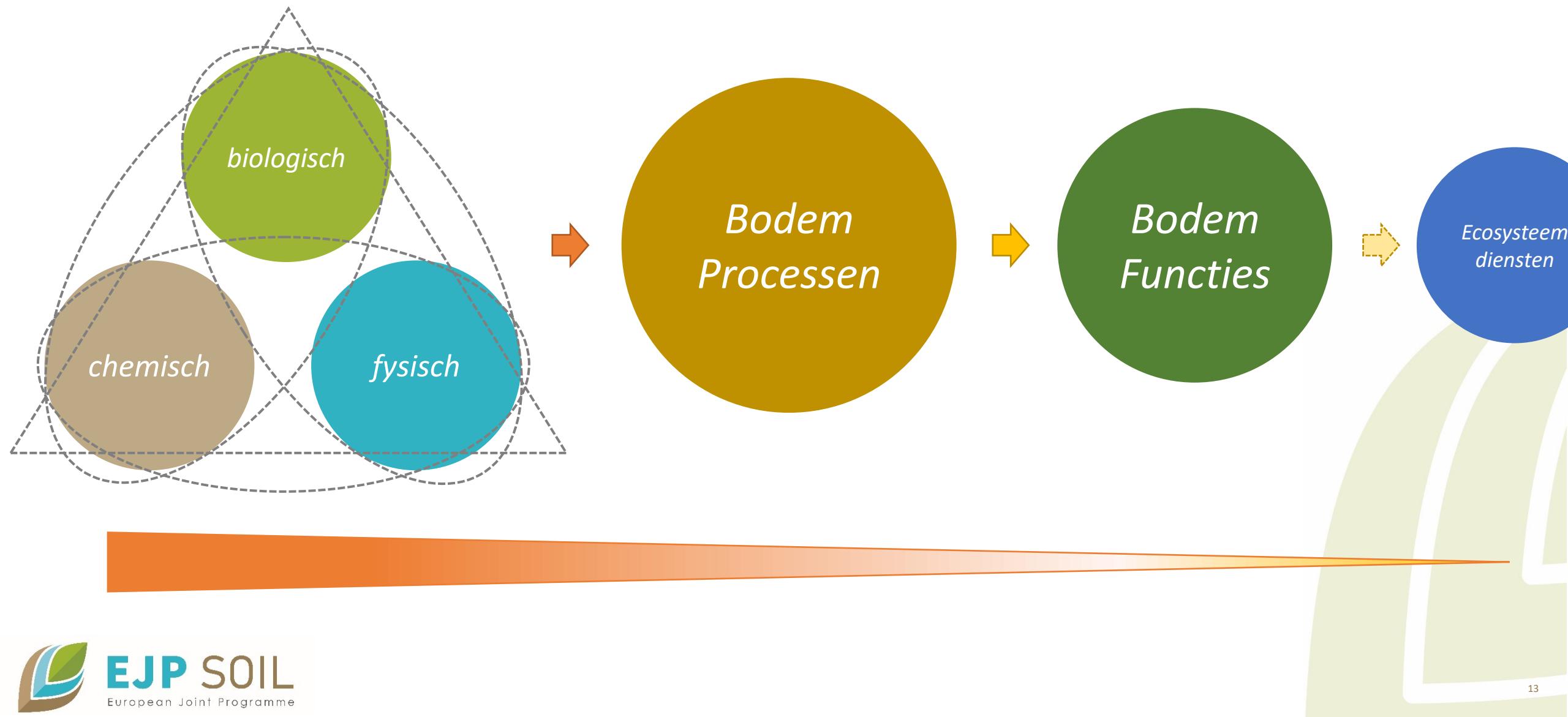
Increase of ecosystem services provision is possible by using fertilizers, pesticides, intensive tillage and other management practices, but lead to increased trade-offs to other services, to other people, elsewhere or later.

Land use sustainability in terms of people, planet, profit (P,P,P)

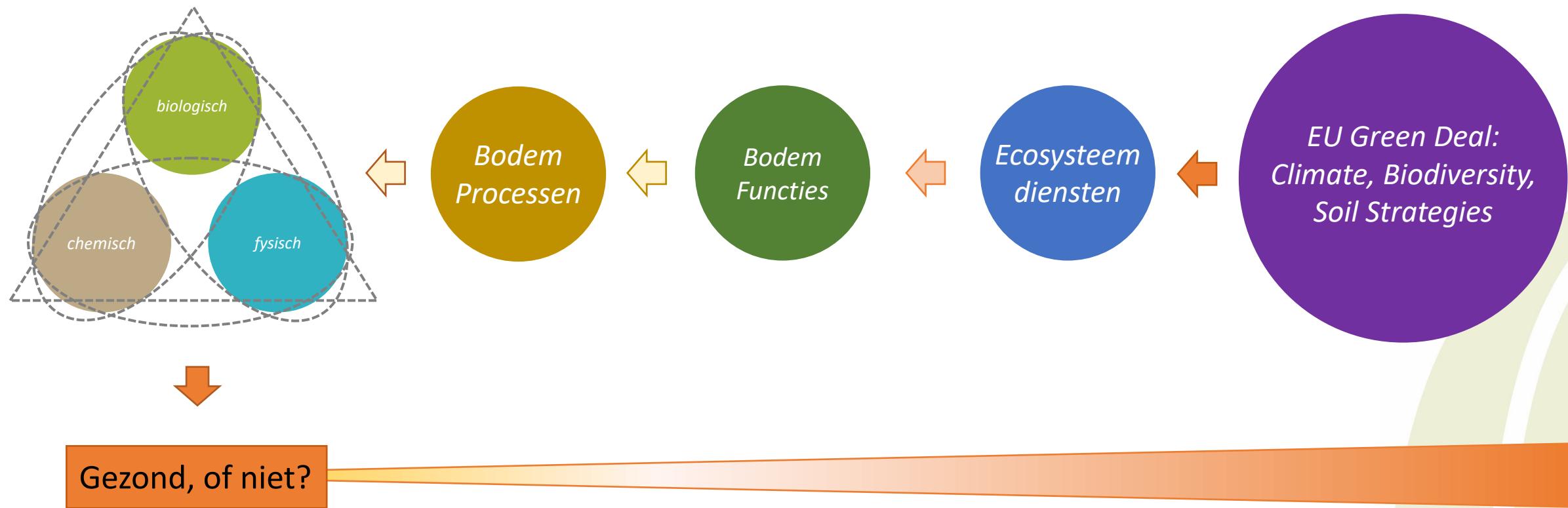
"No negative impact on future supply of ecosystem services, and no increased trade-offs"

- <https://ejpsoil.eu/soil-research/siren>
- Eindrapport
 - Videopresentatie
 - Policy brief

Bodemgezondheid in bodemkundig perspectief



Bodemgezondheid in beleidsmatig perspectief



Bodem essentieel voor tal van ES

- Common International Classification of Ecosystem Services (CICES):
83 klassen
29 (in)direct bodem-gereguleerd

- Verkorte lijst 25 ES
o.i.v. agrarisch bodembeheer
(Paul et al. 2021)



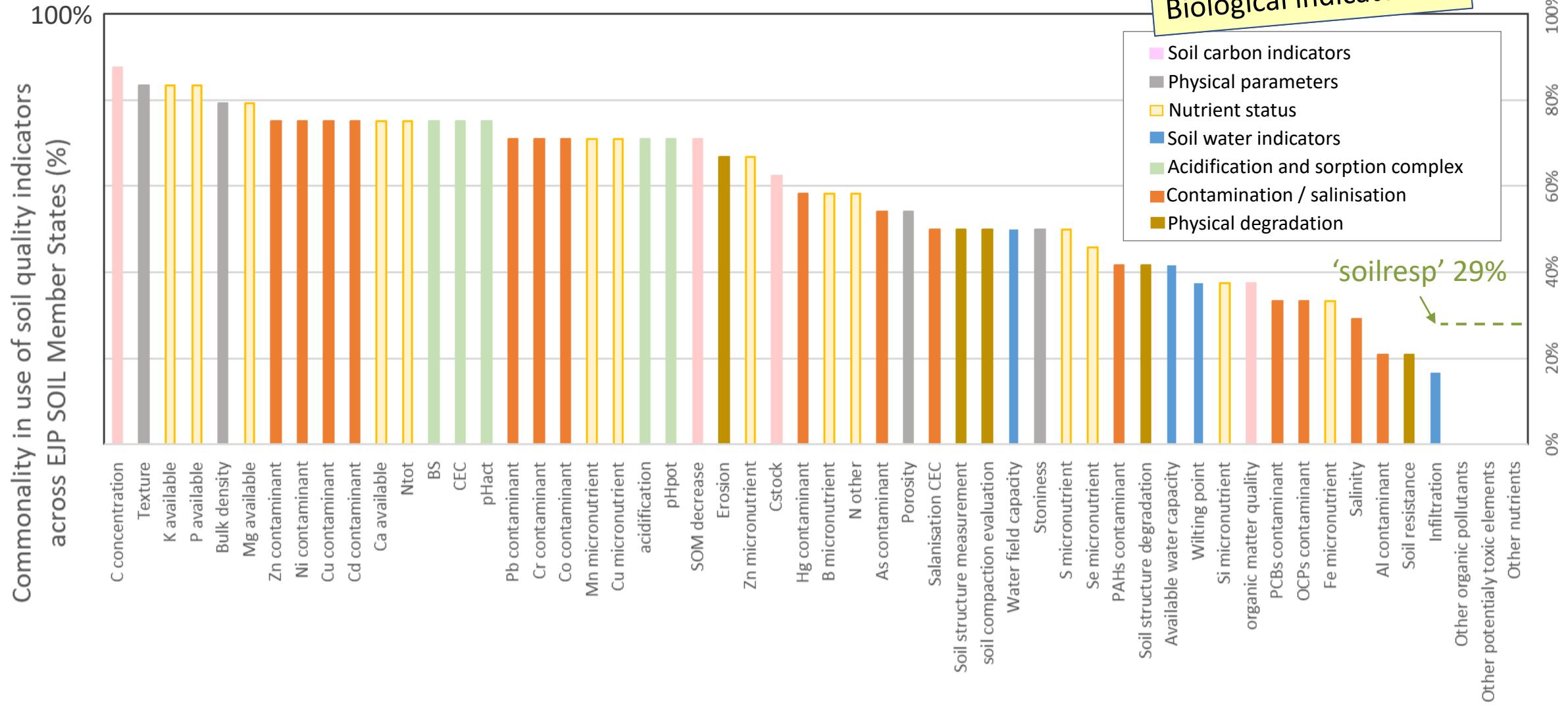
Huiskamervraag

“Geen toename in trade-offs” (afwenteling)
vereist beoordeling van *alle* (83) ES,
óók de niet-bodemgelieerde diensten.



Uw antwoord “Ja” of “Nee” graag in de chat.

Indicators used in soil monitoring by MS



Source: T2.4.2 stocktake

Shortlist “minimum dataset” for harmonised SQ monitoring across Europe

Criteria:
• EU Policy-relevant
• >50% MS
• >30% sci. literature
• Appl. in EU projects

Biodiversity data
• Structural
• Functional

Policy Indicator	Soil Quality Indicator
Soil physical condition	Texture, Porosity, Bulk density
Soil fertility	C concentration Total N P K pH
Erosion evaluation	Based on calculation
Salinity	Electric conductivity
Contamination	Heavy metal trace elements
Other contaminants	<i>Recommended to be included *</i>
Soil biodiversity	
Water regulation	

* Based on our selection strategy, we observed significant omissions regarding indicators for soil biodiversity, organic contamination and water regulation/filtration. As soil condition data in these areas are called for by policies and stakeholders and (standardised as well as novel) methods are scientifically available, we recommend to also include relevant indicators in this 1st tier minimum dataset. Based on our stocktake and reviews it is yet impossible to select any without making subjective choices, which we wanted to avoid.

SQL criteria in Member States

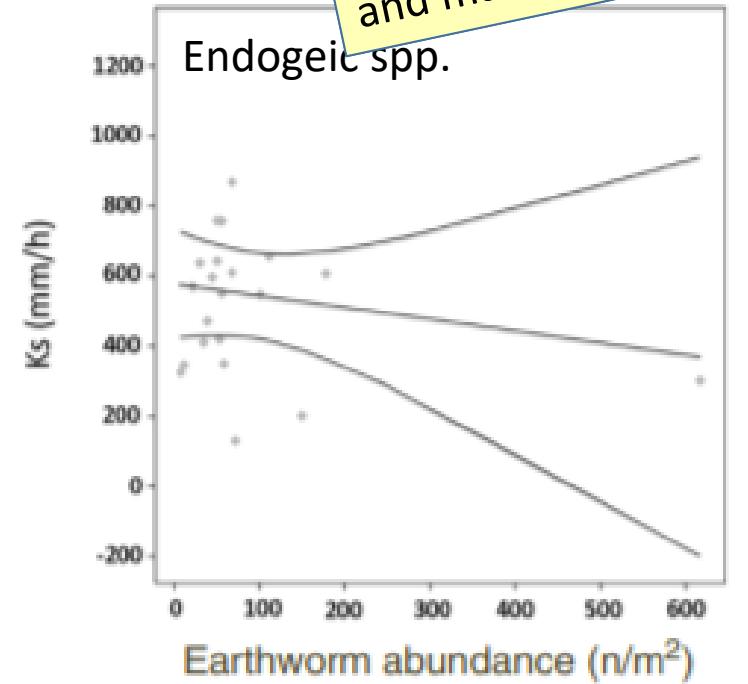
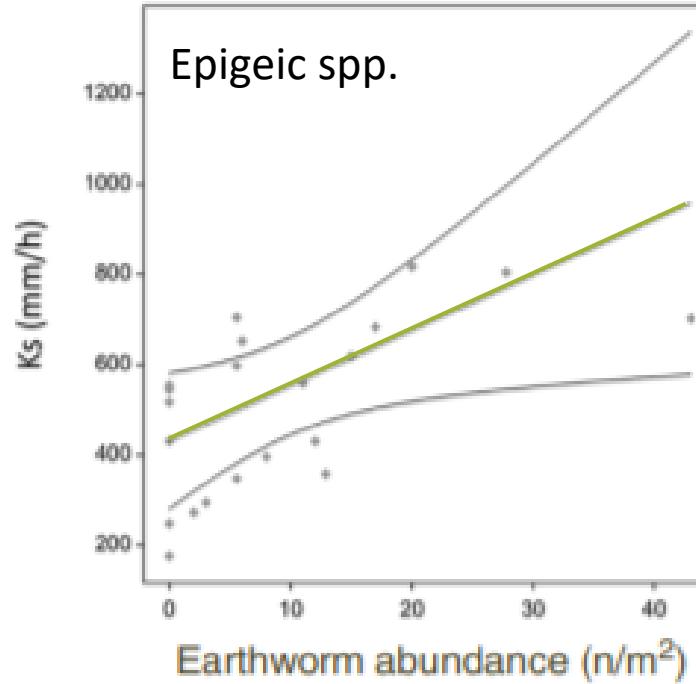
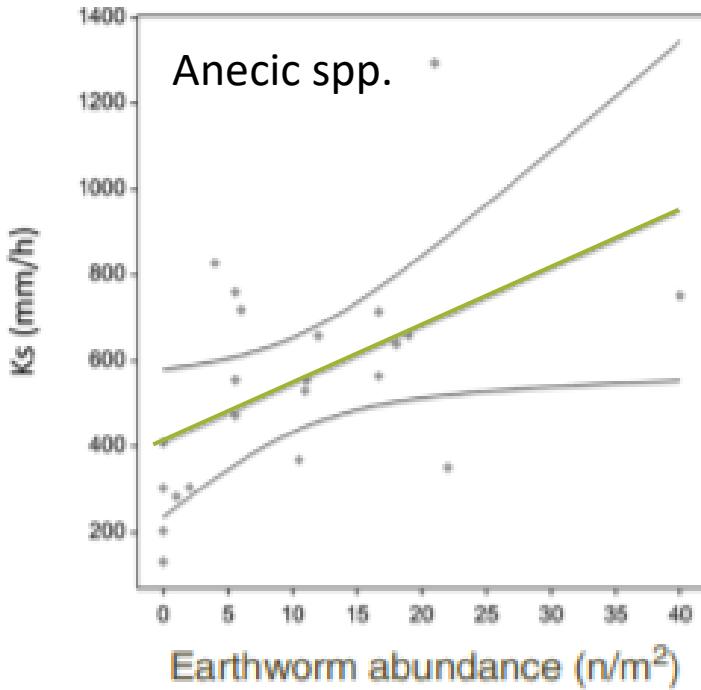
REFERENCE values
THRESHOLD values
TARGET values

	Soil organic matter (SOM)	Soil reaction and sorption	Nutrient status			Physical parameters	Soil water content	Physical degradation	Chemical degradation			Sal.	Biological parameters			Indices composed	Additional		
			C-stock (topsoil)	C-stock (subsoil)	Inorganic nutrient quality				SOM decrease	Object	Habitat		Ntot	Other	available	available	available	available	
Belgium-FL																			
Belgium-WL																			
Czech Republic																			
Estonia																			
France																			
Ireland																			
Italy																			
Latvia																			
Lithuania																			
Netherlands																			
Norway																			
Poland																			
Portugal																			
Slovakia																			
Slovenia																			
Sweden																			

multiple contexts not shown

Example EPF: regulation of water infiltration by earthworm groups

contextualisation:
benchmarking for
soil type, land use
and management



Observed effect of earthworms on infiltration rate for abundance of (a) anecic earthworms, (b) abundance of epigeic earthworms, (c) abundance of endogeic earthworm. Line shows a linear regression fit, with dotted lines as 95% confidence intervals.

Spurgeon et al. 2013

Gezonde status en duurzaam gebruik: te evalueren per 2030 / 2050

Bodembeoordeling cf. Water Framework Directive ???

“Good ecological status”, “One out - All out”

Verder ter attentie:

- Integraal, sector-overstijgend beleid
- Participatie stakeholders alle sectoren
- Integratie water, lucht en landschap
- Synchronisatie met EU *Ecosystem* en *Biodiversity assessments*
- Afwenteling naar elders en later
- Levenscyclus producten, global footprint
- Sociaal-economische aspecten van ecosysteemdiensten
- Culturele diensten

Valt duurzaam gebruik te meten met indicatoren voor bodemgezondheid?