

Using clay to make farmland climate proof



Soil management and land planning come together in Upgrading Sandy Soils

Casus in the province of Gelderland NL

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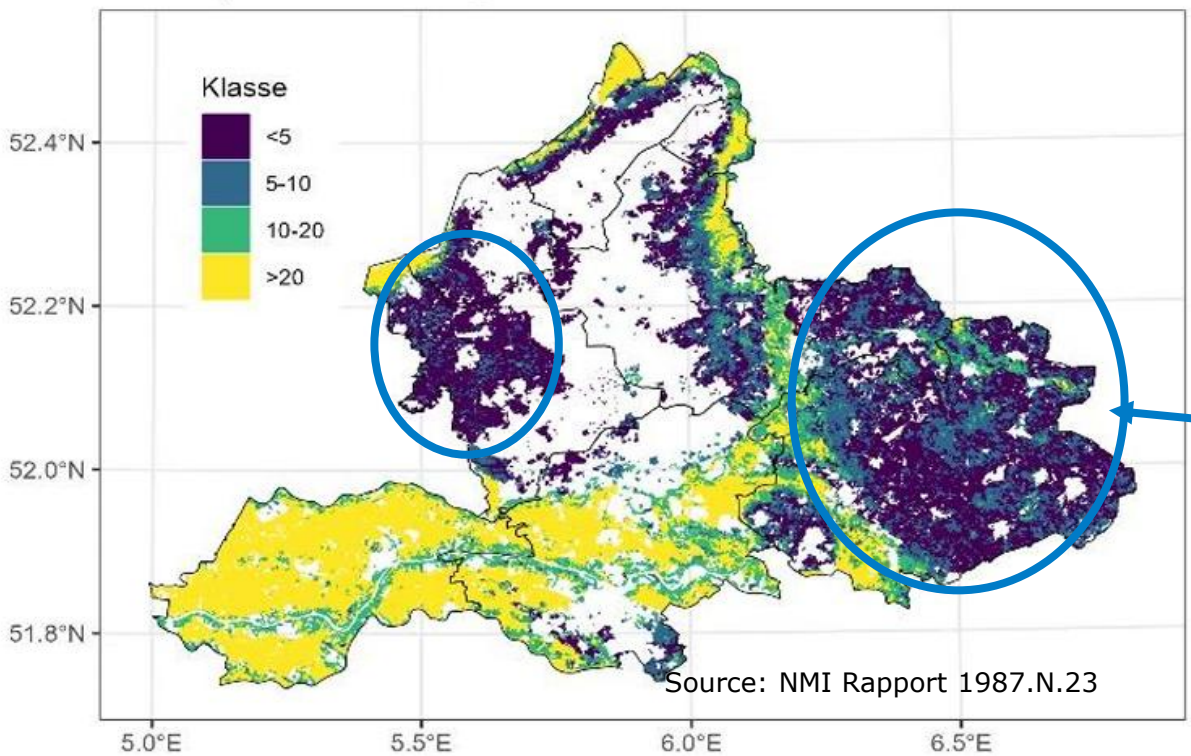
January 24, 2025



Province of Gelderland

- Agriculture 47,1%
 - Agricultural land 230.000 ha, 12 % of NL
 - 70% Grassland
- Nature 26,3%
- Urban 23%
- Water 3,6%

Soil parameter: clay content



- Sandy agricultural soils
- Strategic groundwater resources



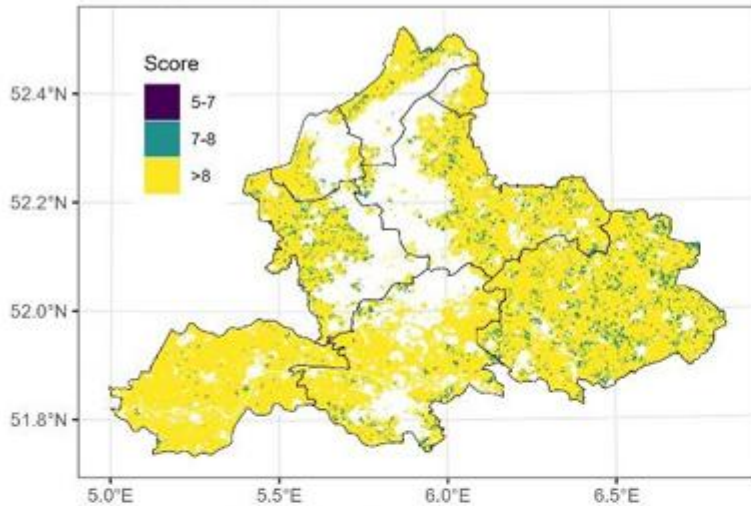
NL Nutrient management institute Soil Quality analysis agricultural Soils

- Soil quality related to ecosystem services (ESS)
 - Primary production
 - Water regulation and purification
 - Climate regulation and carbon sequestration
 - Nutrient cycling
 - Soil biodiversity and Habitat supply
- Soil indicator set for agricultural soils (BLN)
- Insight in functioning ESS

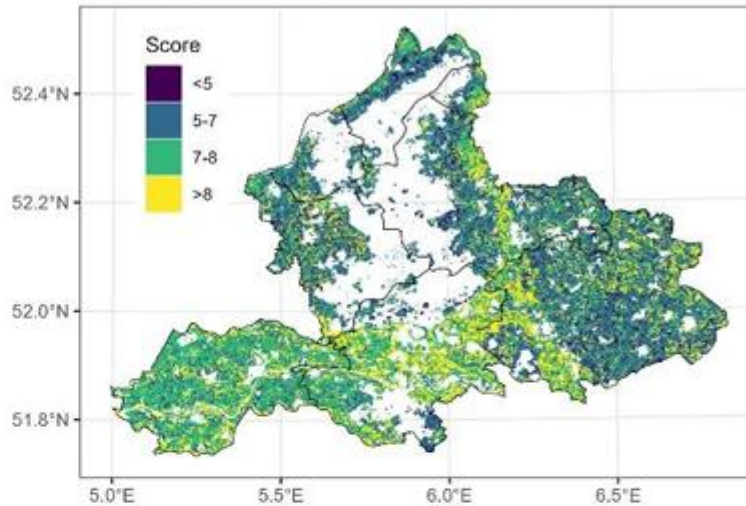




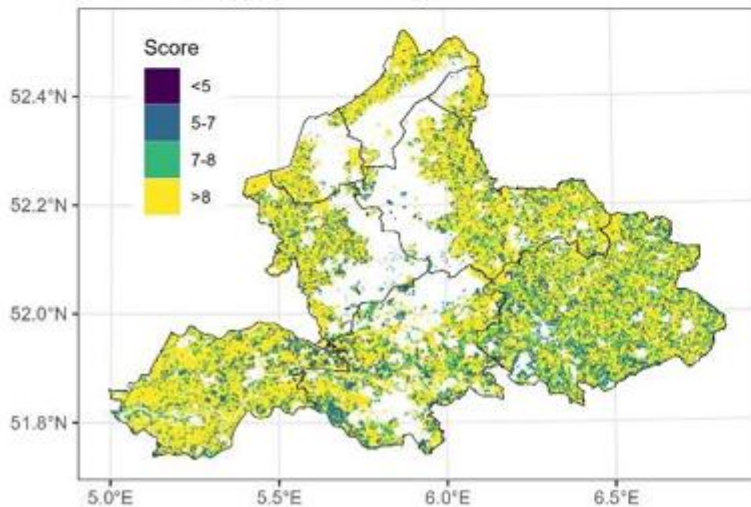
Bodemkwaliteit i.r.t. ESD1
primaire productie



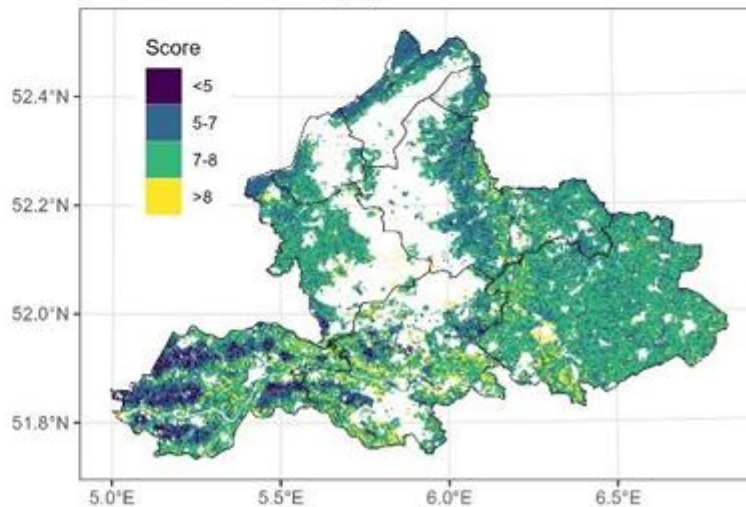
Bodemkwaliteit i.r.t. ESD2
waterregulatie en zelfreinigend vermogen



Bodemkwaliteit i.r.t. ESD3
koolstofvastlegging en klimaatregulatie



Bodemkwaliteit i.r.t. ESD4
faciliteren nutriëntenkringloop



Bottlenecks in agriculture:

- Compaction
- Water availability
- Sulphur and partly pH

Improvement by soil management:

- Soil life and biodiversity
- Waterquality and nutrients
- Climate and carbon sequestration

➡ Measures in land management
➡ Upgrading sandy soils



Upgrading sandy soils

EU project LIFE CO2SAND

Aim:

- improve agricultural soils and stimulate circular use of excavated soil

Drivers:

- Changing climate: drought, water shortages
- Agriculture on sandy soils at risk
- Stop low end use of excavated clayey and silty topsoils

Characteristics:

- Demos with main use grassland and maize for fodder

Improve:

- Water holding capacity of sandy agricultural soils
- Carbon content
- Soil biodiversity

How?

How to improve soils?



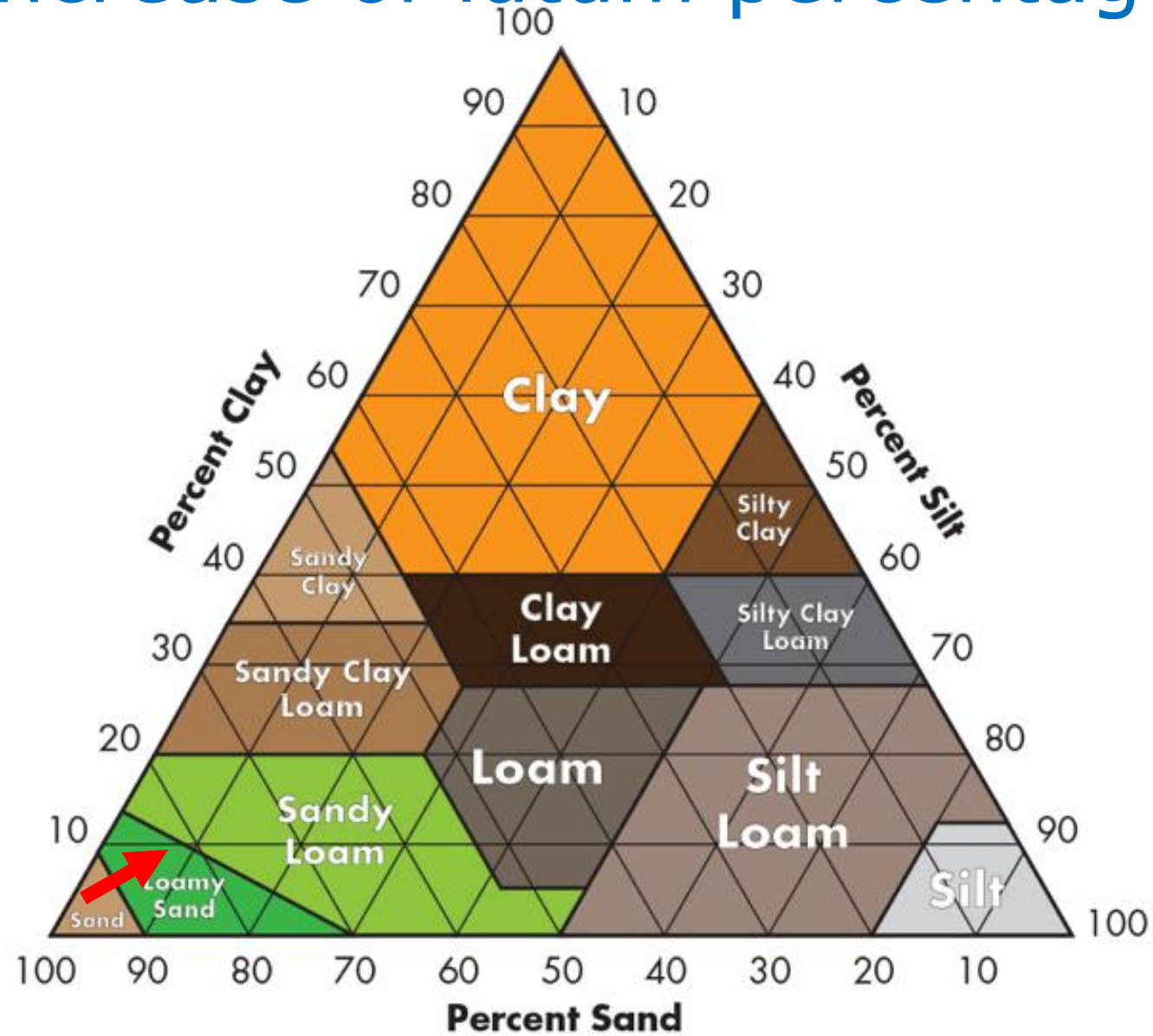
- Back to the past..
- For a long time flooding was a method to improve agricultural soils (the Nile)
- The clay sediment left after flooding was key in this Nature Based Method
- This method was lost due to:
 - Abundance of fertilizers
 - Safety measures: stronger and higher dikes
 - Poor water and sediment quality



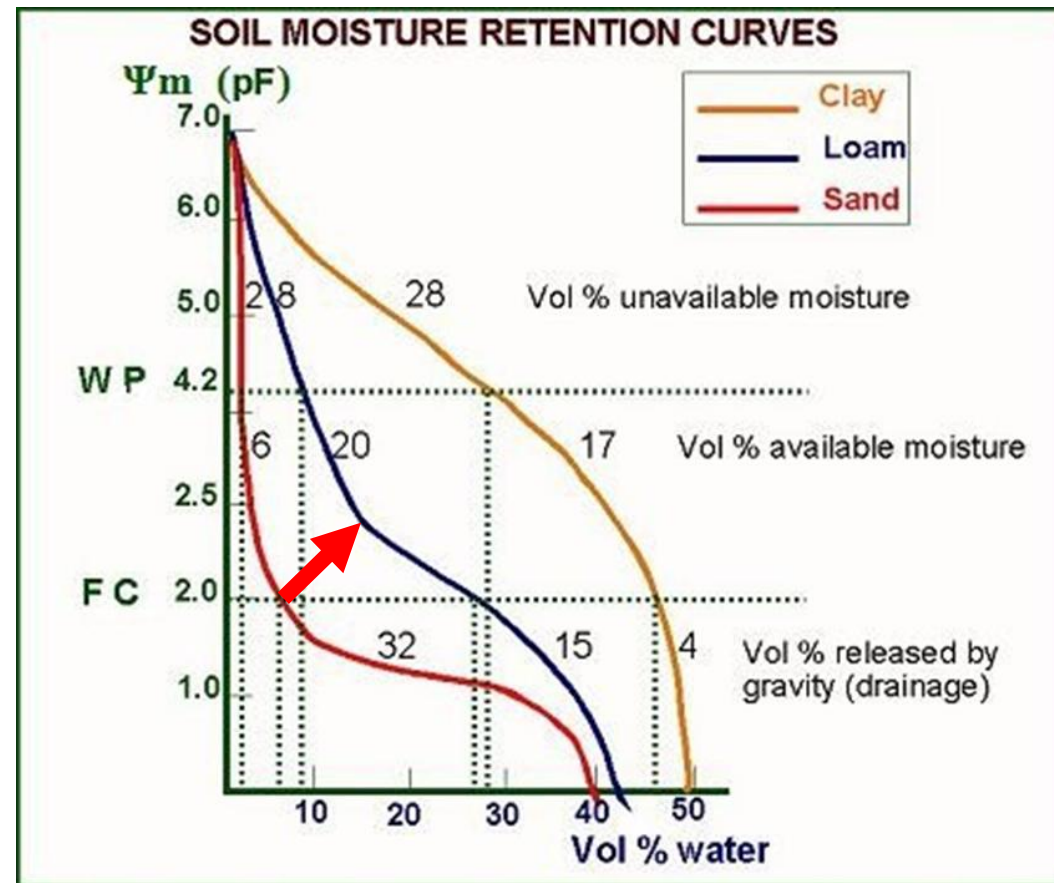
Application of a thin layer of clay for several years



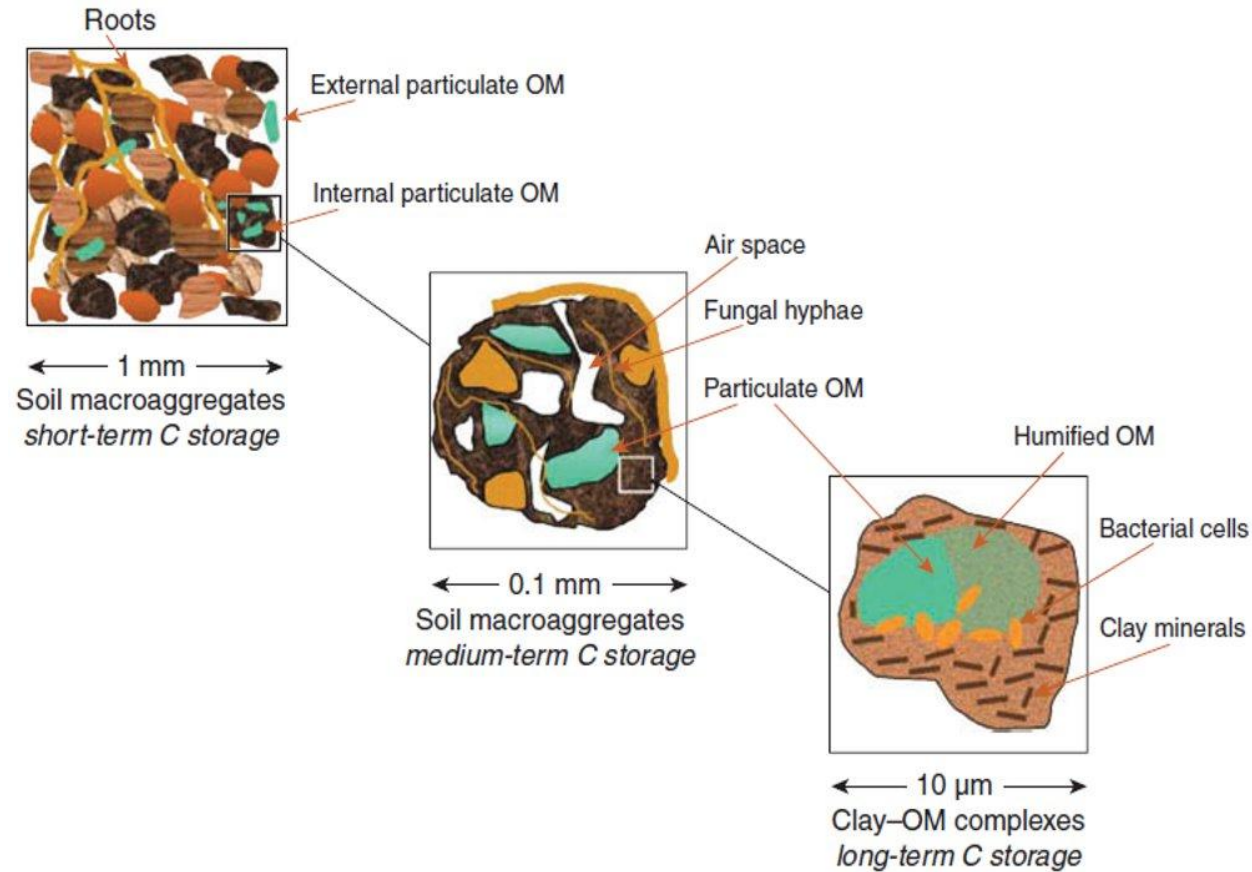
Increase of lutum percentage



Availability of water for plant uptake



Stabilisation of organic matter





Transition & upscaling

- Towards high quality re-use of clay (soil) instead dumping or low quality re-use
- In 2027 700 ha in treated with clay
- Knowledge sharing within the European sand belt (Netherlands, Belgium, Germany and Poland)
- Community of practice
- Agenda setting for environmental policy
 - Extra CO₂ emission due to transport of soil versus beneficial effects on soils
 - Legal restrictions by soil quality regulation



Questions?



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For the discussion

- Soils should be used based on their natural characteristics, no amelioration but management measures....
- Using excavated soils is a good way to keep soil ecosystem services into the loop...
- There is not enough knowledge to safely use excavated soil on agricultural land...
- There are other functions that give value to sandy soils....

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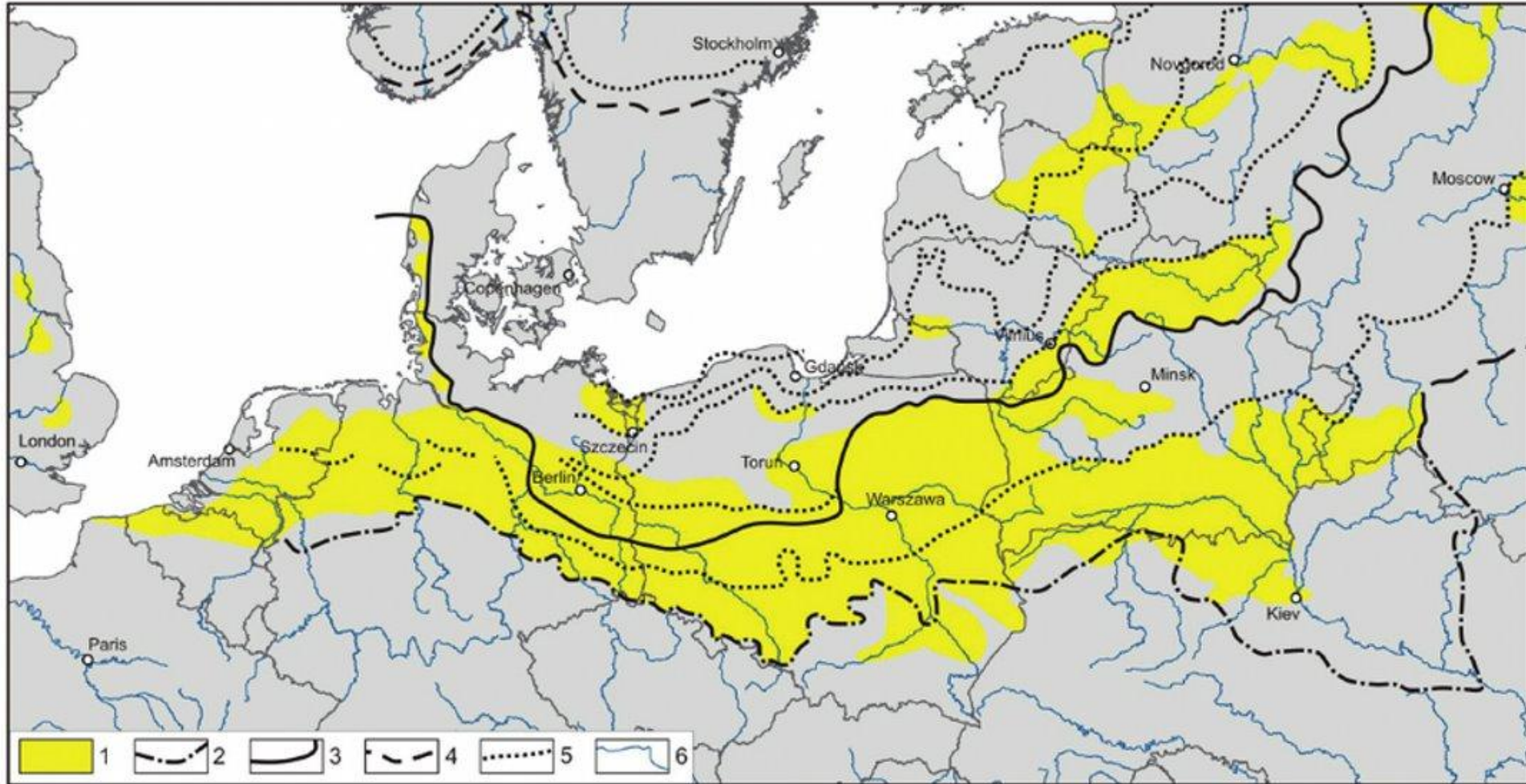
Soil indicators for 4 ecosystem services

Tabel 2-1. Overzicht van beoordeelde bodemfuncties voor vier ecosysteemdiensten (ESD1: primaire productie, ESD2: waterregulatie en zelfreinigend vermogen, ESD3: koolstofvastlegging en klimaatregulatie, en ESD4: het faciliteren van de nutriëntenkringloop) conform de systematiek van BLN 2.0.

ESD1	ESD2	ESD3	ESD4
Primary production	Water regulation and attenuation	Carbon sequestration and climate regulation	Nutrient cycling
pH-buffering ^C	N buffering GW	C vastlegging potentie	NUE
N-leverend vermogen ^C	N buffering OW	C verzadigingsgraad	N kringloop
P-buffering ^C	P buffering OW	EOS balans	P kringloop
K-buffering ^C	Waterbuffering		K kringloop
Mg-buffering ^C	Grondwateraanvulling		
S-leverend vermogen ^C	N uitspoelingsrisico		
Verslemping ^F	N afspoelingsrisico		
Verstuivingsrisico ^F	Pesticide water		
Aggregaat stabiliteit ^F	N retentie GW		
Verkruimelbaarheid ^F	N retentie OW		
Ondergrondverdichting ^F			
Watervasthoudend vermogen ^F			
Droogteschade ^F			
Natschade ^F			
Bewerkbaarheid ^F			
Microbiële activiteit ^B			
Ziektewerendheid ^B			

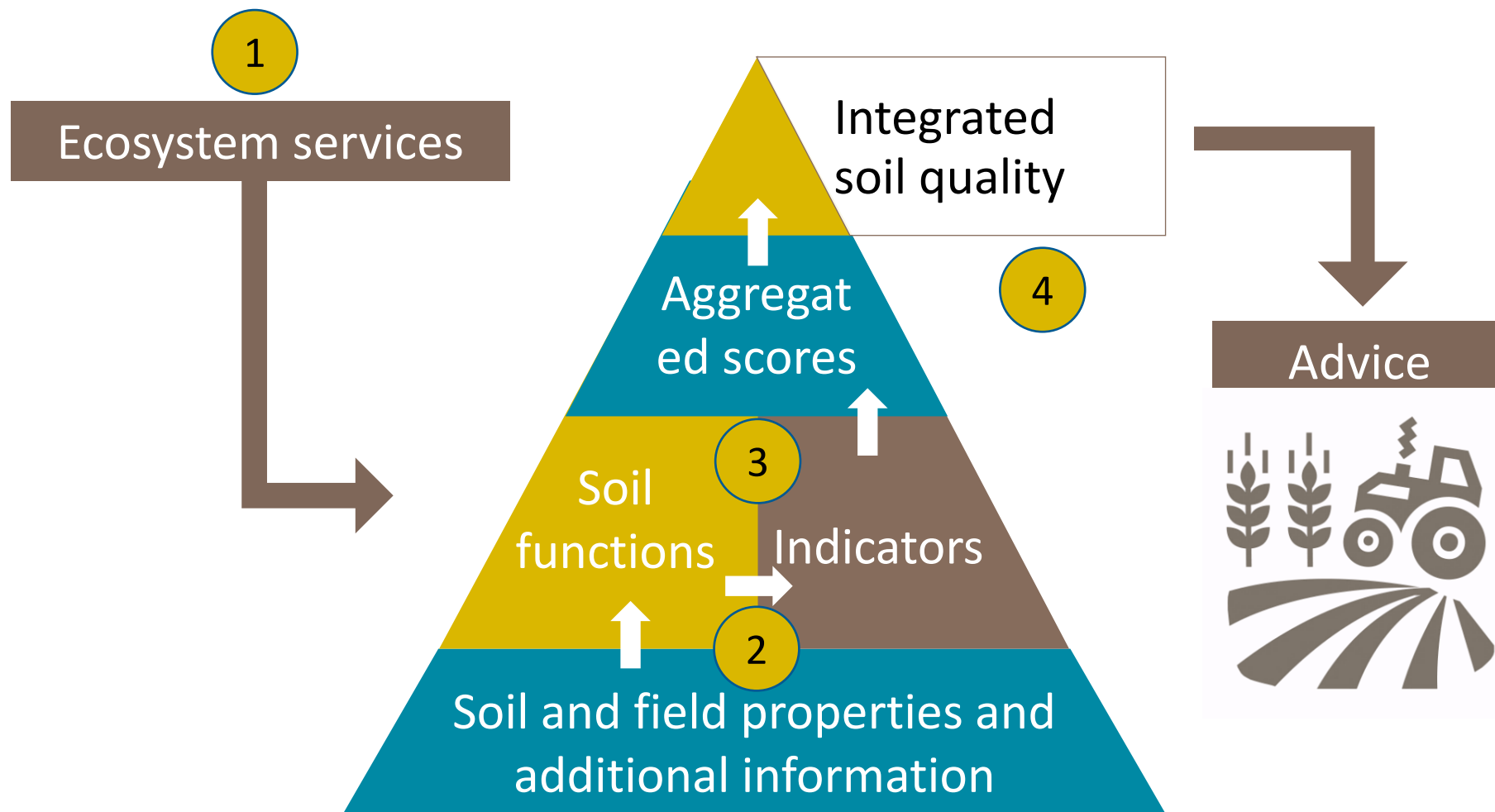
C: chemische bodemfunctie; F: fysische bodemfunctie; B: biologische bodemfunctie

European Sand Belt





How to assess quality?



Ros et al. (2021) Open Soil Index

High value agricultural soils for primary production



- Green area (soil quality >7) high value soils.
 - Chemical, fysical, biological good quality
 - Valuable soils: brook valleys, levees, (low) windborn sand deposits, (humus rich) earth soil

AQUATOR
GROEN+RUIMTE

