

Neosol, Technosol, Anthrosoil ...

Concepts, definitions, framework, ecosystem services assesement

What are we talking about today?

- Neosol
- Antroposoil
- Anthrosol
- Technosol
- ...

➔ What is it all about?

Soil's definitions :

Collins: Soil is the substance on the surface of the earth in which plants grow.

Wikipédia : Soil consists of a solid collection of minerals and organic matter (the soil matrix), as well as a porous phase that holds gases (the soil atmosphere) and a liquid phase that holds water and dissolved substances both organic and inorganic, in ionic or in molecular form (the soil solution). Accordingly, soil is a complex three-state system of solids, liquids, and gases. Soil is a product of several factors: the influence of climate, relief (elevation, orientation, and slope of terrain), organisms, and the soil's parent materials (original minerals) interacting over time.

Soil's definitions

Directive (EU) 2025/2360 soil monitoring law: Soil is a vital, limited resource and is considered non-renewable and irreplaceable on a human time-scale. It is crucial for the economy, the environment and society in general.

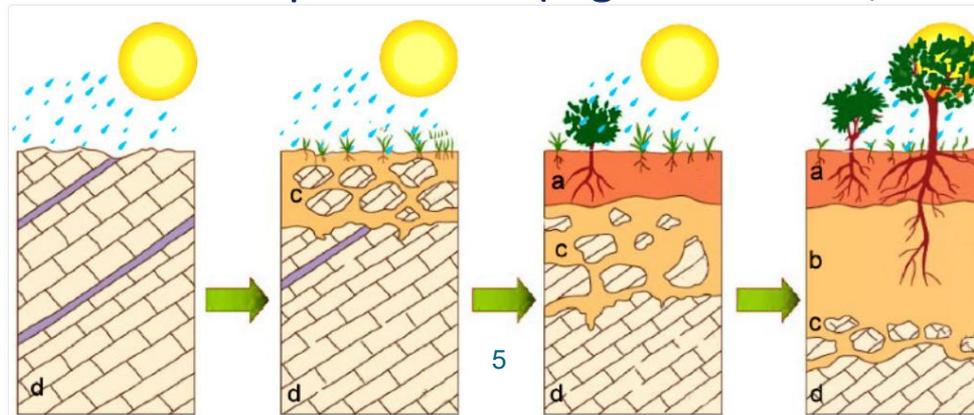
Healthy soils are soils that are in good chemical, biological and physical condition and which can therefore provide ecosystem services vital to humans and the environment, such as safe, nutritious and sufficient food, biomass, clean water, nutrients cycling, carbon storage and a habitat for biodiversity.

Natural soils /Anthropic soils

Natural soil: It results from the transformation of the **bedrock**, degraded and enriched with **organic matter** through the processes of pedogenesis.

It form a complex ecosystem in dynamic equilibrium with mineral inputs via the bedrock and organic inputs from the surface. It is stable at human time scale.

❓ What if there is no equilibrium? (e.g. tilled soils, embankment)



“Soil in the process of formation in the chemical sense of the term. The chemical and organic components of the extracted sediment are not in equilibrium with the atmospheric environment.” (Wikipedia)

There are natural neosol, for example: on volcanic rocks, on glacial retreat slopes, on scree, etc.

And there are anthropogenic neosol, for example: cultivated terraces, hills of mining residues, areas of soil addition (embankments), etc.

≠ Anthrosols & Technosol

ANTHROPOSOILS

The world reference base for soil resources differentiates two types of soils defined by a strong human influence

Anthrosols : soil strongly altered by long and intensive agricultural use.

For example, soil affected by years of traditional tillage.

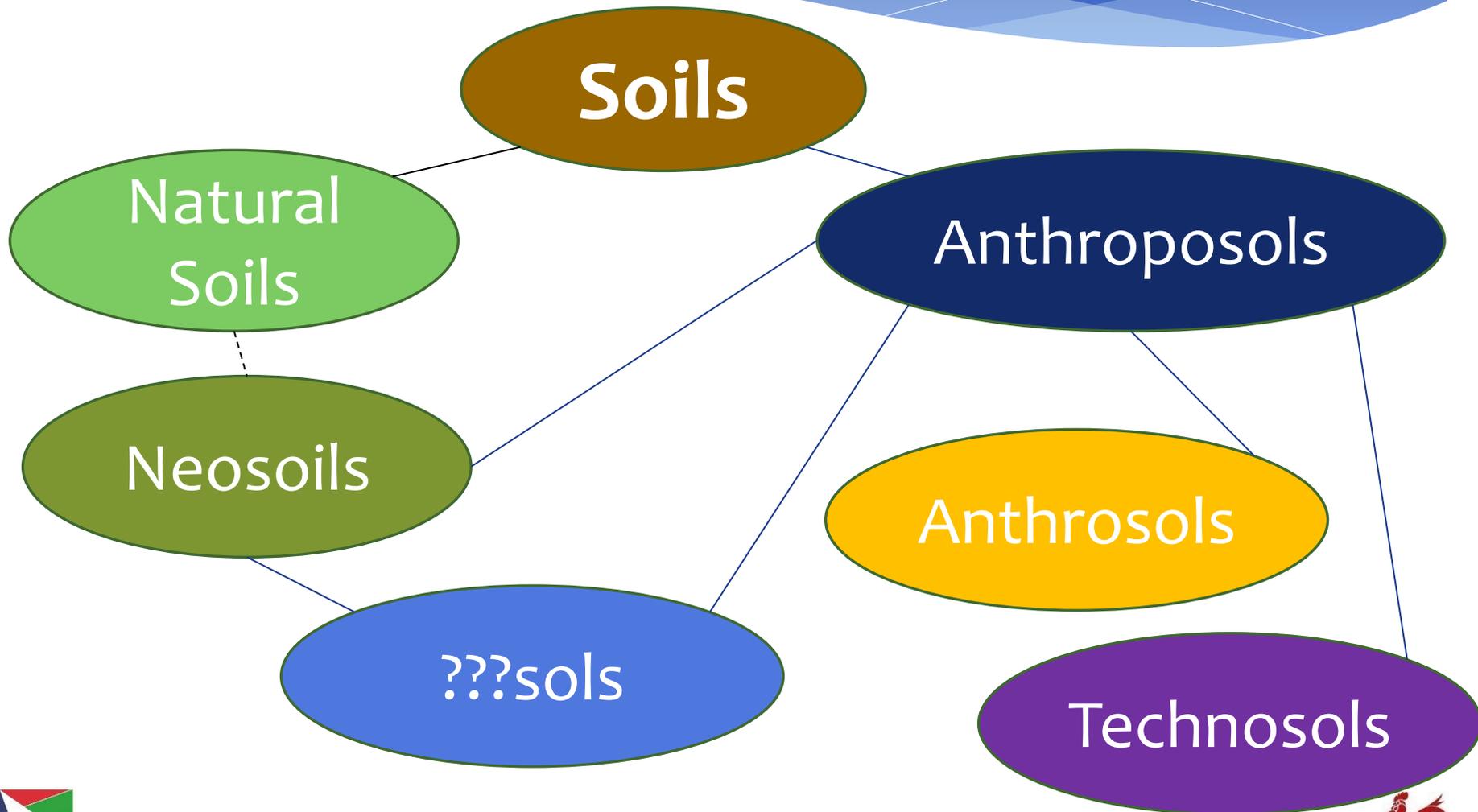
Technosols: soil containing significant amounts of artefacts. Soil strongly influenced or modified by human activities.

For example, soil with demolition wastes embankment.

Anthroposoils have nowadays a negative connotation of 'degraded' soils.



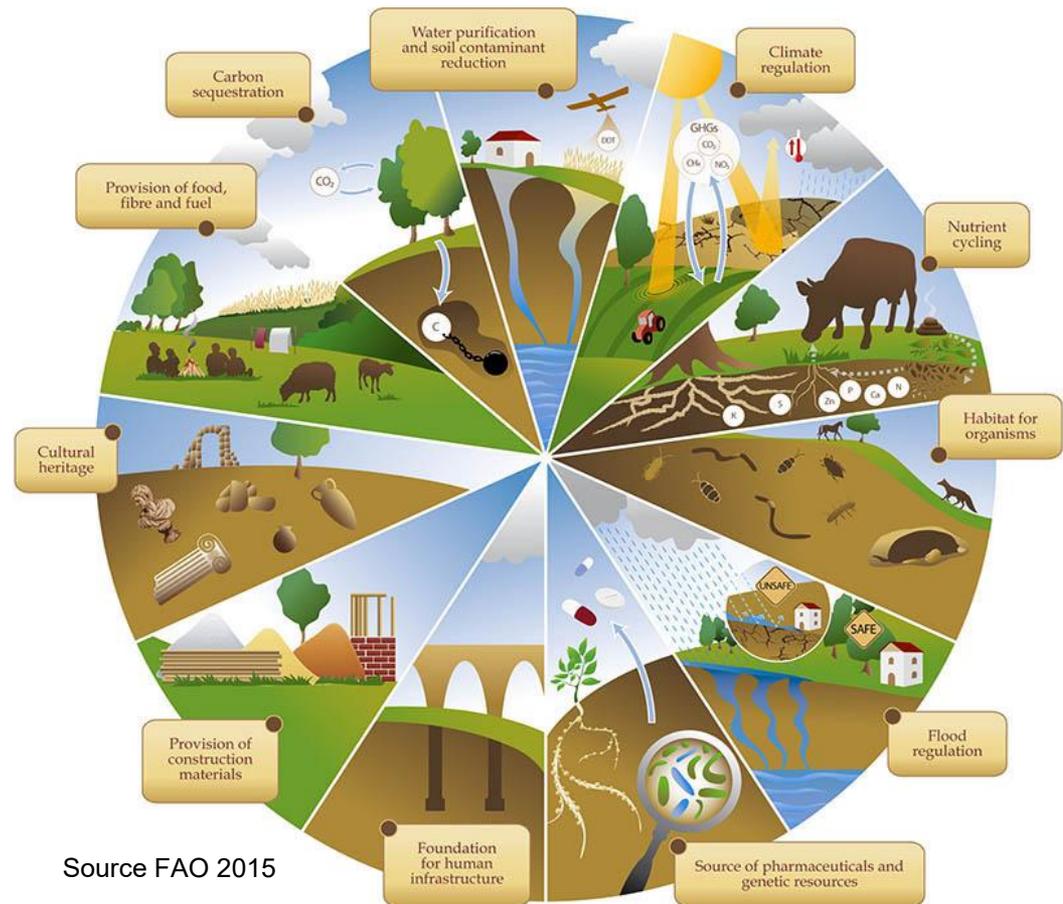
Concepts map



Ecosystem services

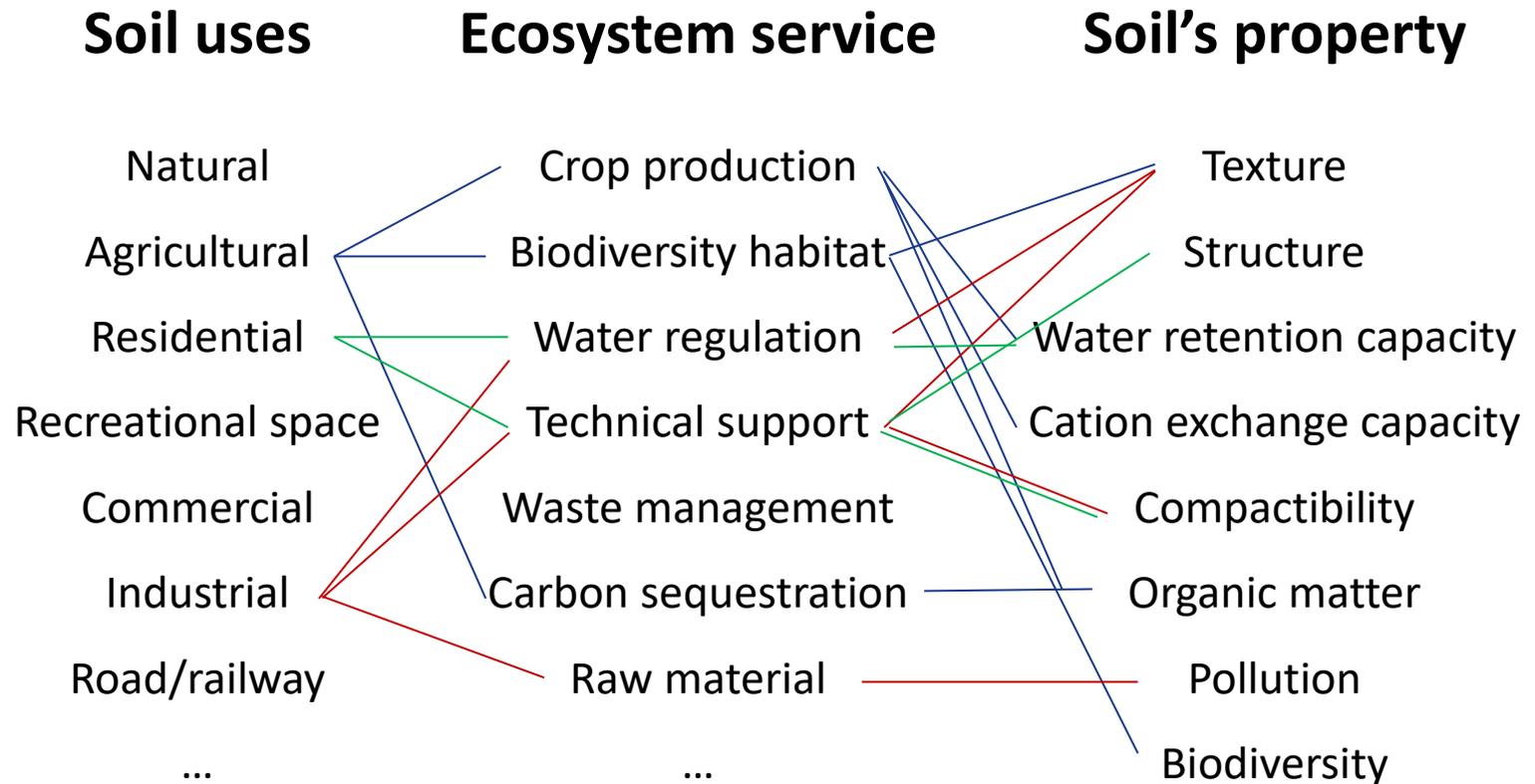
All the 'services' that soil can provide to humans and/or ecosystems. :

- ✓ Crop production
- ✓ Biodiversity habitat
- ✓ Water regulation
- ✓ Technical support
- ✓ Waste management
- ✓ Carbon sequestration
- ✓



Source FAO 2015

The soil quality index



The soil quality index

Concept: Providing a quality index based on soil measurement. The quality is expressed based on the soil ability of a soil to fulfill some ecosystem function.

Uses: Assessment of the quality as it is.

Guidance to restore soil to an optimum quality based on limiting properties.

Adaptation of land use in project to preserve soil's functionalities

Evaluation



Soil Potential

Maximal capacity that a soil can achieve

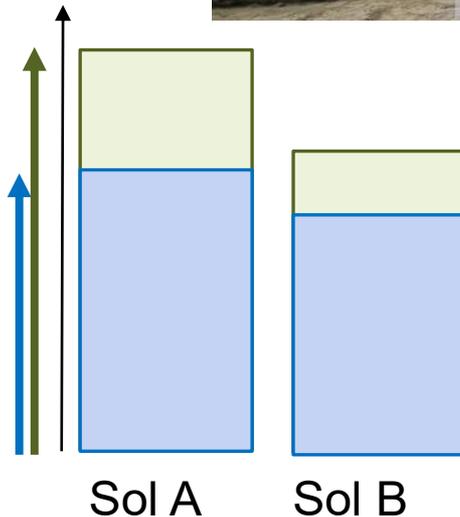
Soil Quality

Measured quality based on an indicator



Sol A > Sol B

Indicator
ex: water retention



$$\text{Soil Health} = \frac{\text{Quality}}{\text{Potential}}$$

quality compared to the potential

Sol A < Sol B

→ Approach

??sols

Soil construction or soil improvement ...

- 1) Identification of the soil's quality and potential by control over physical, chemical and biological **properties**...
- 2) Identification of the services needed from the soil within the framework of a project and the ecosystem services to preserve
- 3) Identification of the material(s) available
- 4) Environmental & technical quality monitoring, initially and over time

→ Requires technical expertise in soil conception and application techniques to ensure soil structuring.

Approach that is still experimental and project based

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