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Soil health for sustainable land management – France

Cécile Grand, ADEME
5th November 2024

Soil Health related regulatory context

- There is no global soil policy in France, although there are policies for other environments such as water and marine environments.

- Soil is taking into consideration sector-by-sector :
  - polluted site and soil management: human and environmental risk
  - natural risk prevention: flooding risk, erosion risk
  - Land planning management: criteria for construction
  - agricultural and forest policy: local criteria (ZAP)

- Law for housing and renewed urban area (Loi ALUR 2014) : soil information area (SIS) for polluted site (when there is a change of land use (tracability))

- Biodiversity strategy (2018) : soil knowledge in order to preserve and to restore soil quality

- Climate and Resilience Law (Loi Climat et Resilience 2021): No Net Land Take (NNLT) by 2050

What is No Net Land Take (NNLT)?

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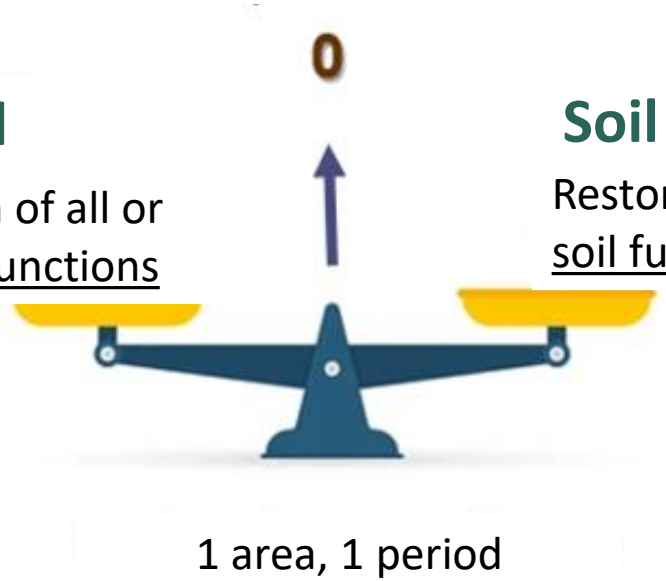
The Climate and Resilience Law (2021)

Net land take is defined as the "**difference between artificialized soil and restored soil** observed in a specific area and period".

Soil artificialized

Long-term degradation of all or part of ecological soil functions



Soil restored

Restoration or improvement of a soil functionality

1 area, 1 period

Objective: NNLT by 2050

NNLT: 2 periods

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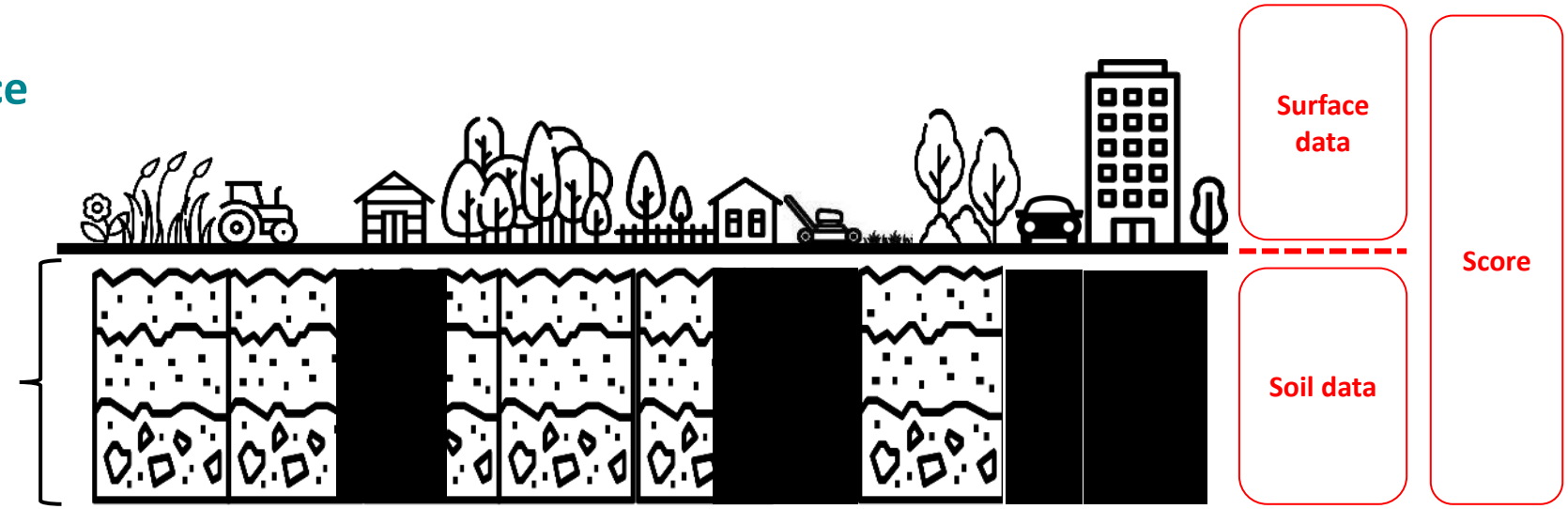
2021 - 2031, halving of land take

Approach based on land take, in 2D

2031-2050, achievement of a balance between soil artificialized and soil restored*

Approach based on the ecological soil functions, in 3D



** Refers to the nomenclature of the decree of 27 November 2023*

Rennes Métropole — République Française — Géosciences pour une Terre durable brgm

Some definitions are existing

Climate and Resilience law definitions

Soil is artificialized:

When the soil loses all or part of **soil ecological functions,** in particular its biological, hydric and climatic functions, as well as its agronomic potential, as a result of its occupation or use.

Soil is restored:

When the soil recovers or improve the **soil fonctionality**

Land take **is a process which causes a modification of land use and of the characteristics of the soil**

European Soil Directive definitions

Soil is artificialized:

Durable alteration of soil components and characteristics, resulting in a loss of the capacity of soil to provide **ecosystem services**

Soil is restored :

means the restoration or rehabilitation of destroyed soils with the aim to recover the capacity of soil to provide **ecosystem services**

ISO/ TS 18 718 – concepts and definitions
ISO/TS 18 721 – ecological soil function : indicators and methods

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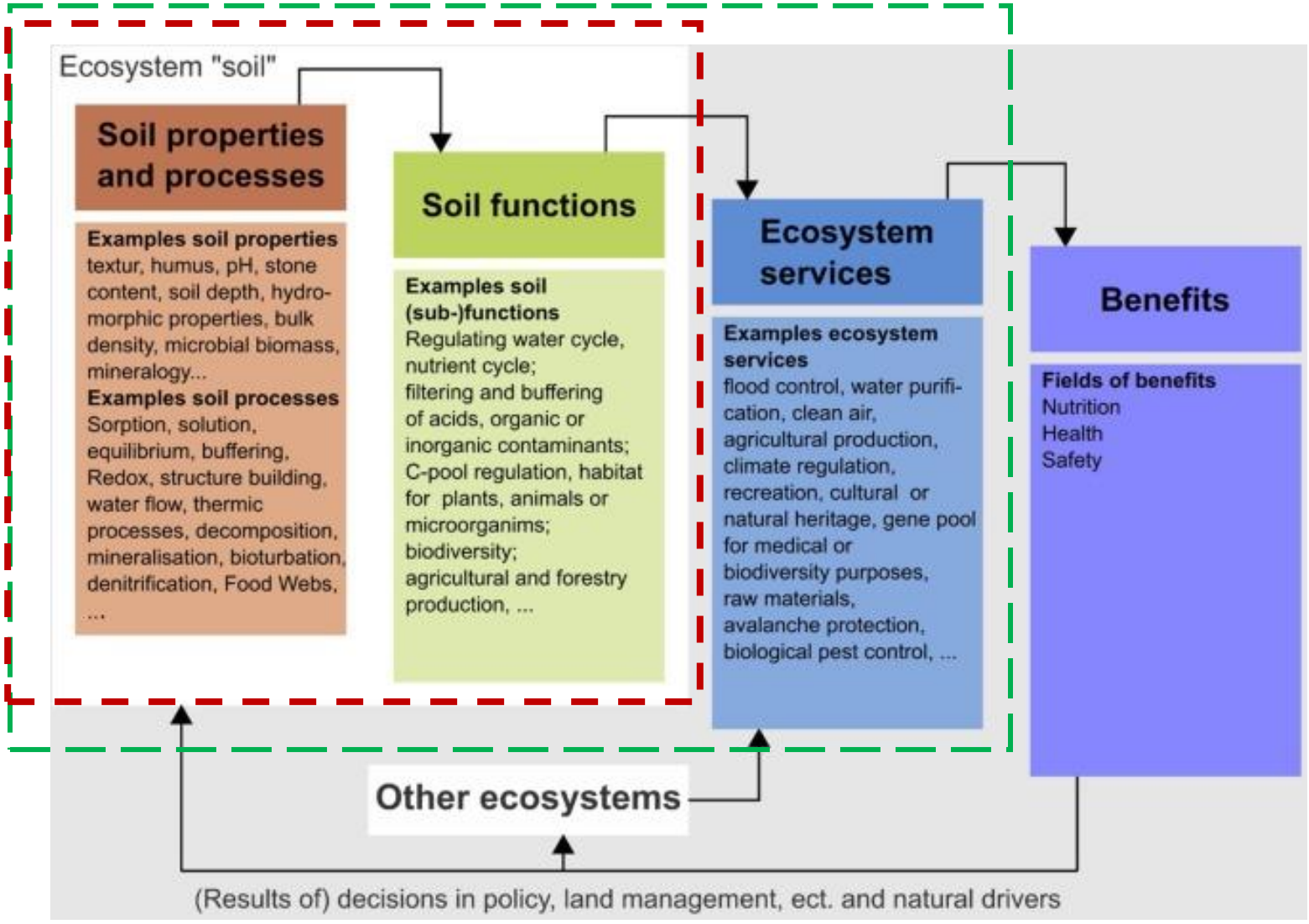


Climate et Resilience law

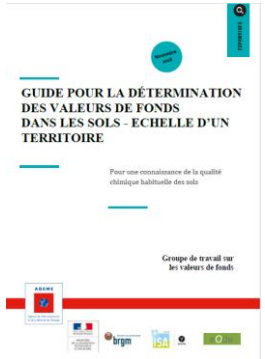
- Indicators of ecological soil function

European Soil Directive

- Indicators of soil degradation

Which tools are available?

- **SOILVAL**: recognising Soil values in land use planning systems
  - https://soilver.eu/news/project-soilval-recognising-soil-values-in-land-use-planning-systems/
- **MUSE** project: To introduce the multifunctionality of soils in land planning documents
  - https://librairie.ademe.fr/
- **SUPRA** project: Urban Soil and Development Projects
  - From urban soil sampling to land use decision-making tools
  - https://librairie.ademe.fr/
  - Geoffroy Séré ,Cécile LeGuern ,Antonio Bispo ,Clément Layet ,Christophe Ducommun, Margaux Clesse, Christophe Schwartz ,Laure Vidal-Beaudet - ***Selection of soil health indicators for modelling soil functions to promote smart urban planning, ScienceDirect, 2024***
- **DESTISOL** project: Soil, an opportunity for sustainable urban development
  - https://librairie.ademe.fr/
- **Identification of background values** : territorial and local scales
  - https://ssp-infoterre.brgm.fr/sites/default/files/documents/2022-05/jt2018-f2-valeurs_de_fonds_hr_ademe-sb_brgm.pdf



Process for mapping soil fonctionnality

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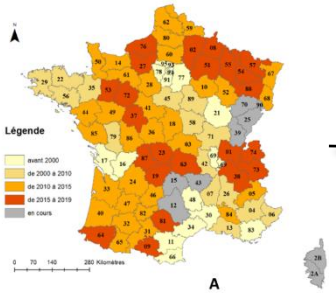
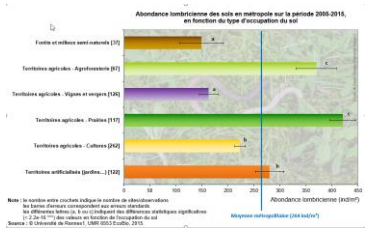
Cerema INRAE IRSTV brgm Aix-Marseille université cerege

Regional pedological references 1:250 000



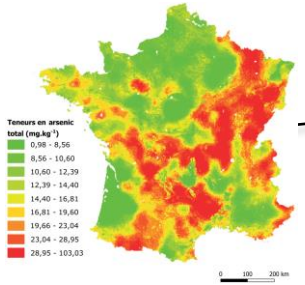
Messant et al. 2021

ECOBIO Rennes



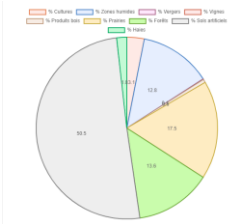
Graduated from 0 to 5

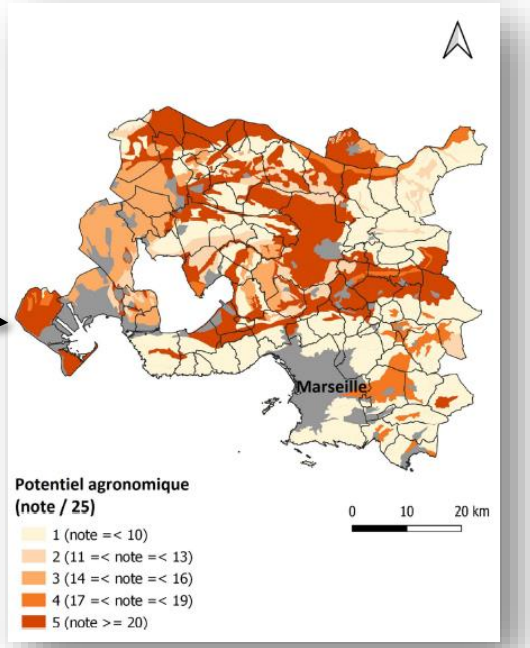
Soil data bases
DONESOL
BD-Sol-U
BDAT
BDETM



Estimated agronomic value
Estimated infiltrability
Estimated carbone storage
Estimated soil biodiversity

ALDO
Evaluez vos stocks et puits de carbone





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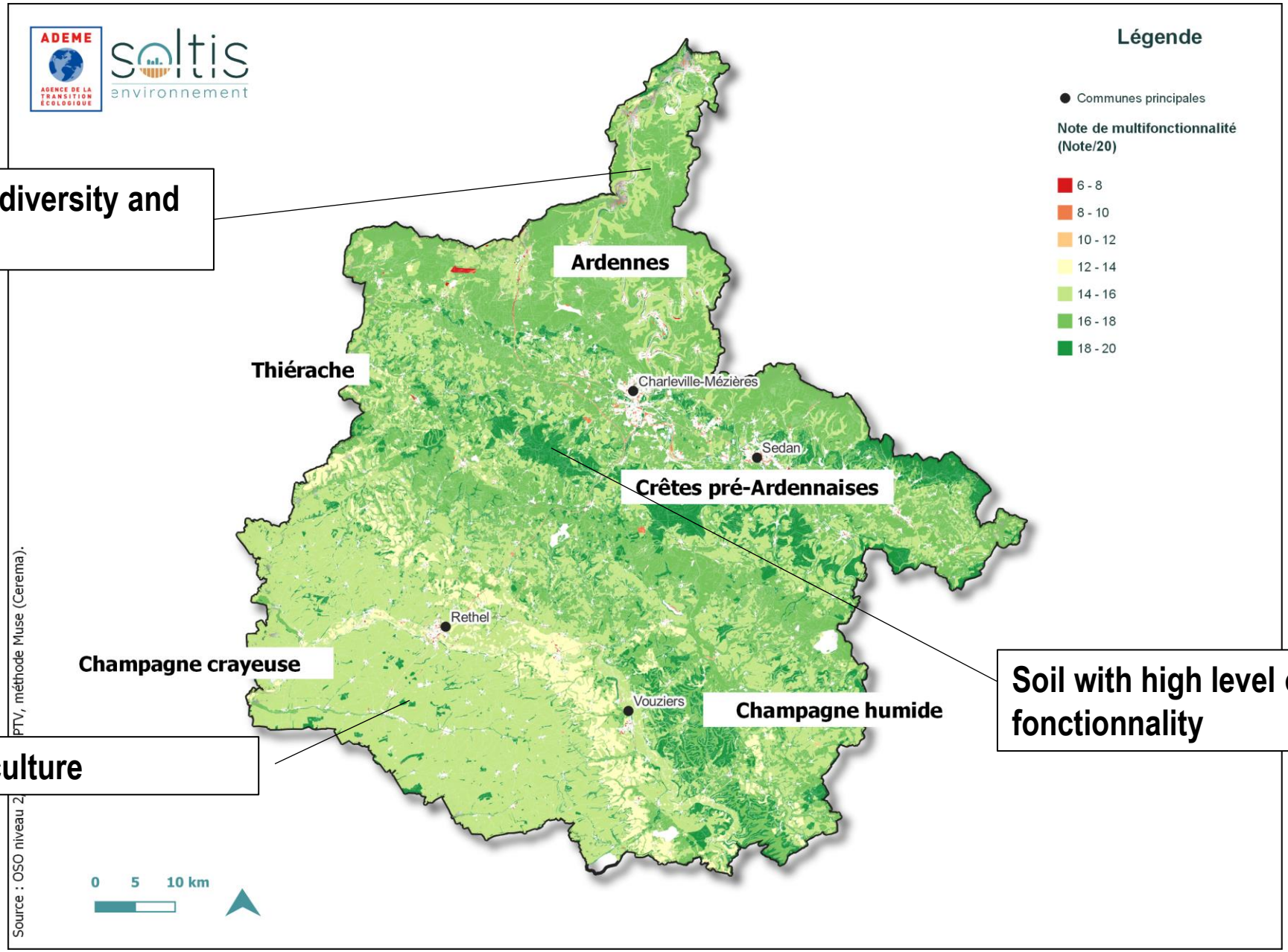
saltis environnement

Assessing soil functionality at regional scale (1: 250 000)



Soil suitable for biodiversity and carbone storage

Soil with high level of fonctionnality

Soil suitable for agriculture

Contacts :

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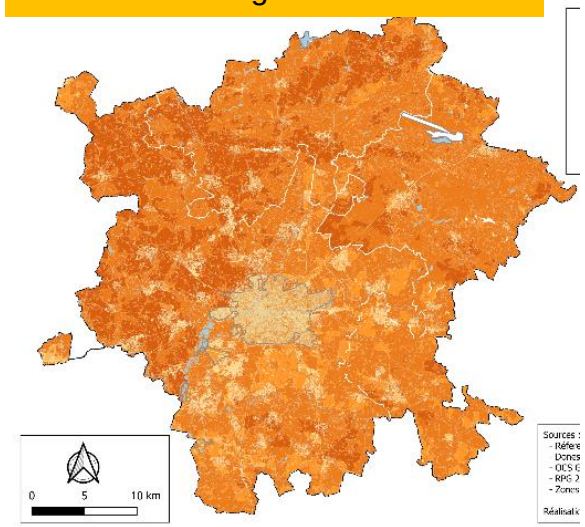
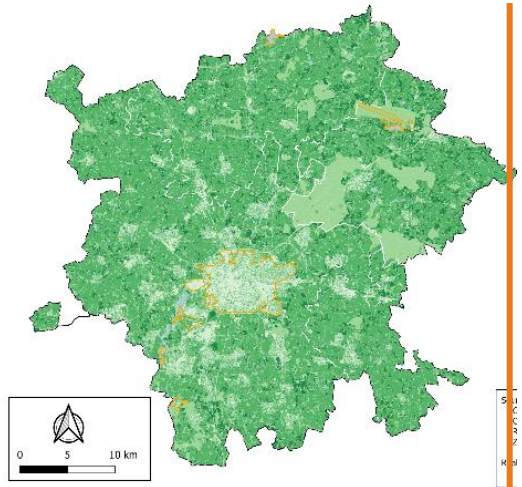
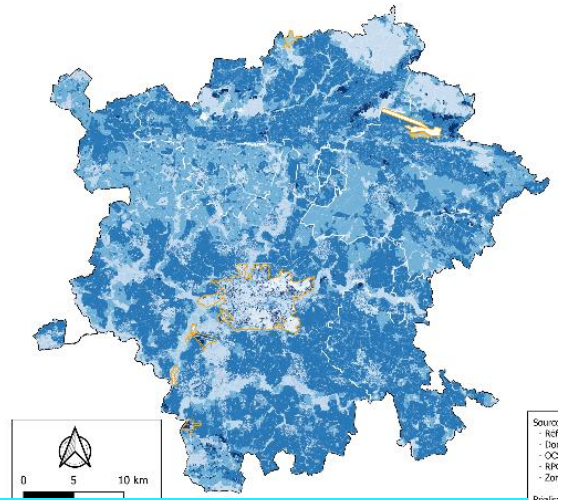
Assessing soil functionality at land planning scale (data bases)

Estimated agronomic value

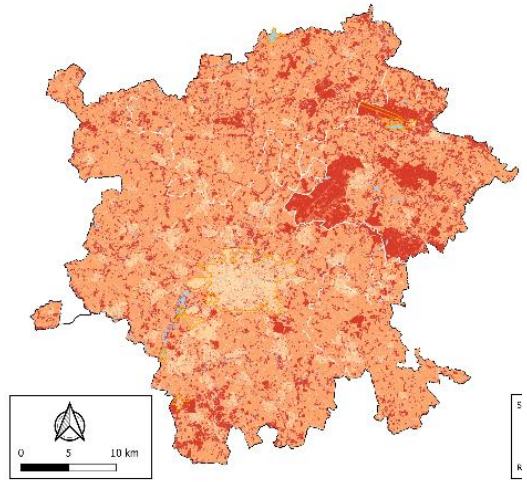


Estimated soil biodiversity





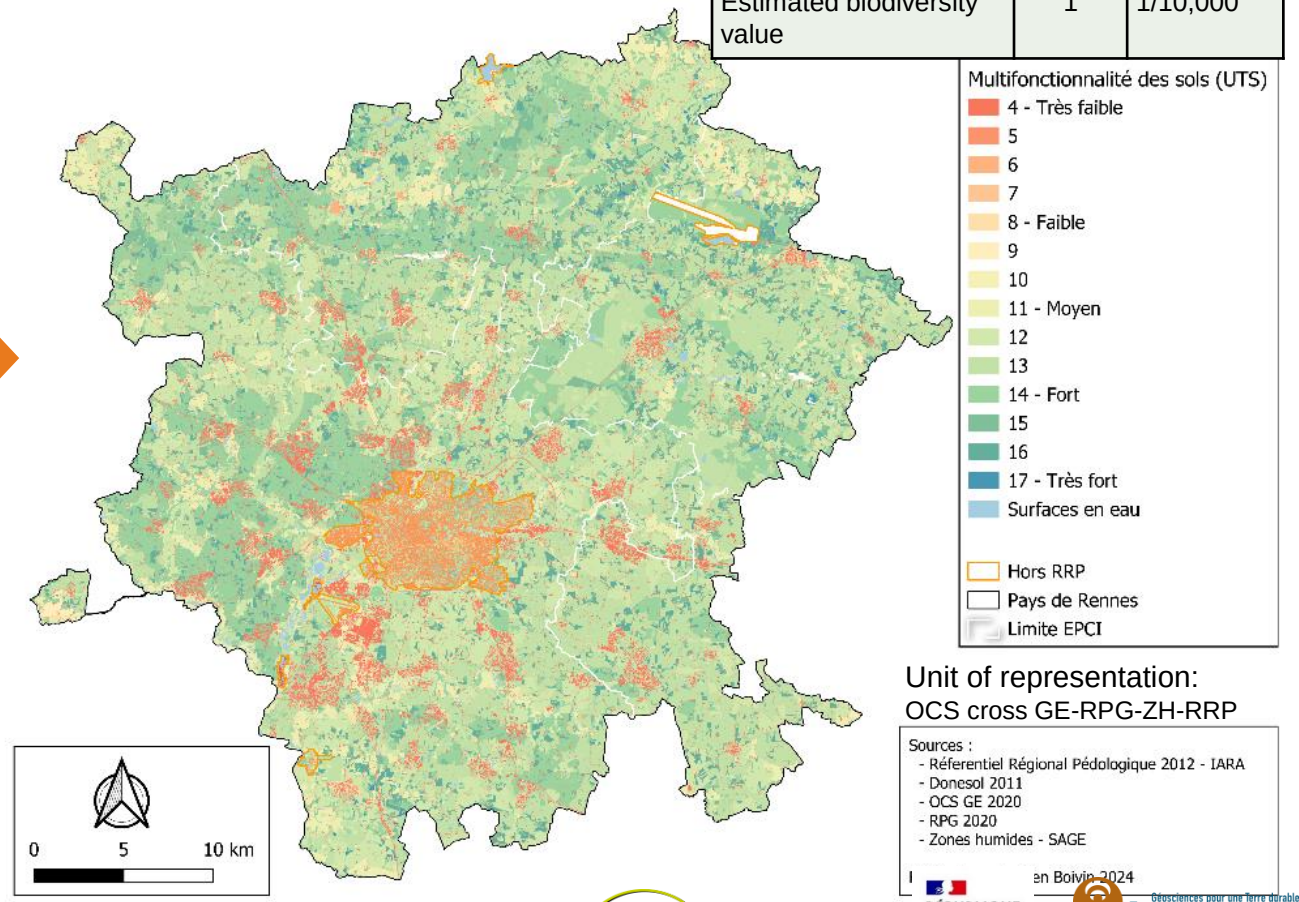
Estimated soil infiltrability



Estimated carbon storage

QuaSoZAN QualiSoil SCoT

Function	Weight	Scale
Estimated agronomic value	1	1/5 000
Estimated MUSE infiltrability	1	1/5 000
Estimated carbon storage	1	1/10,000
Estimated biodiversity value	1	1/10,000



Unit of representation:
OCS cross GE-RPG-ZH-RRP

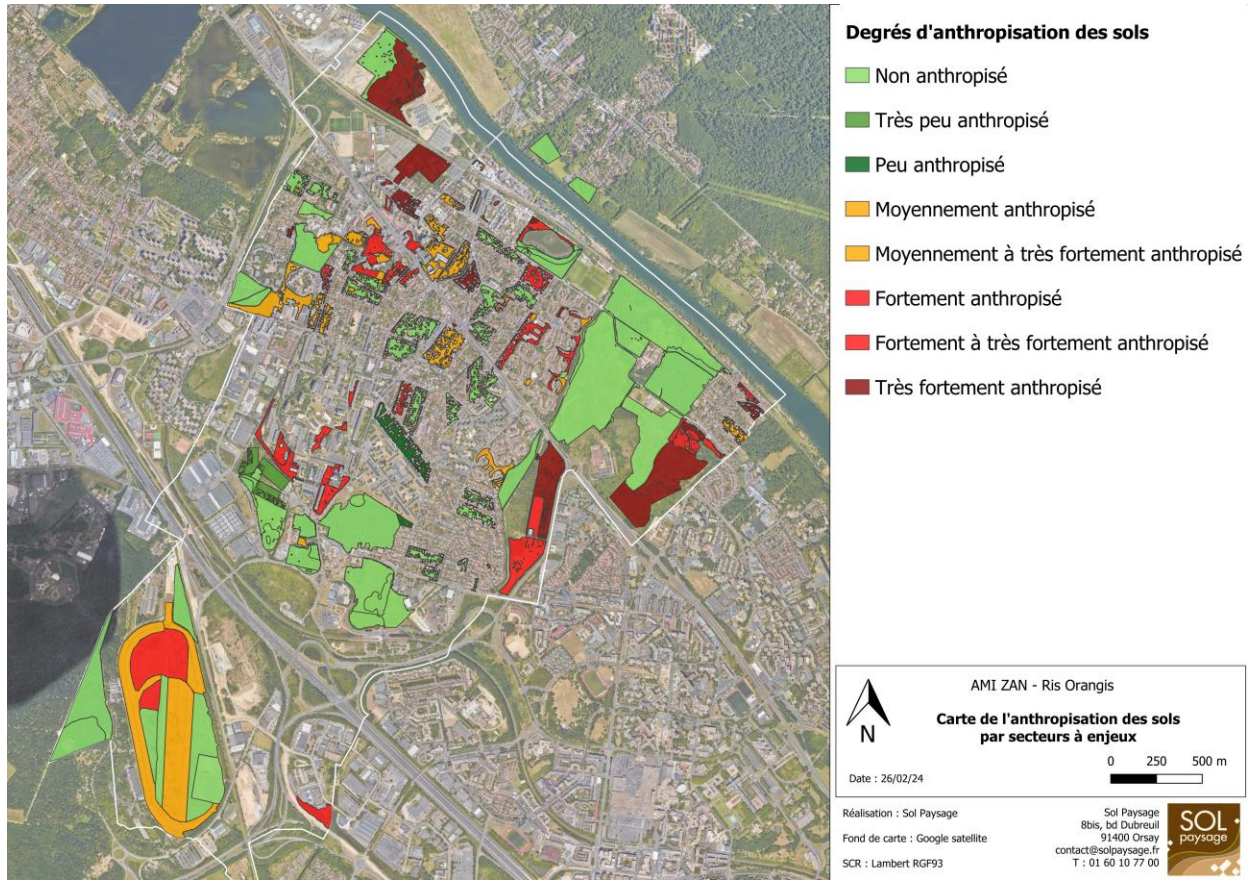
Sources :
- Référentiel Régional Pédologique 2012 - IARA
- Donesol 2011
- OCS GE 2020
- RPG 2020
- Zones humides - SAGE

Contacts :

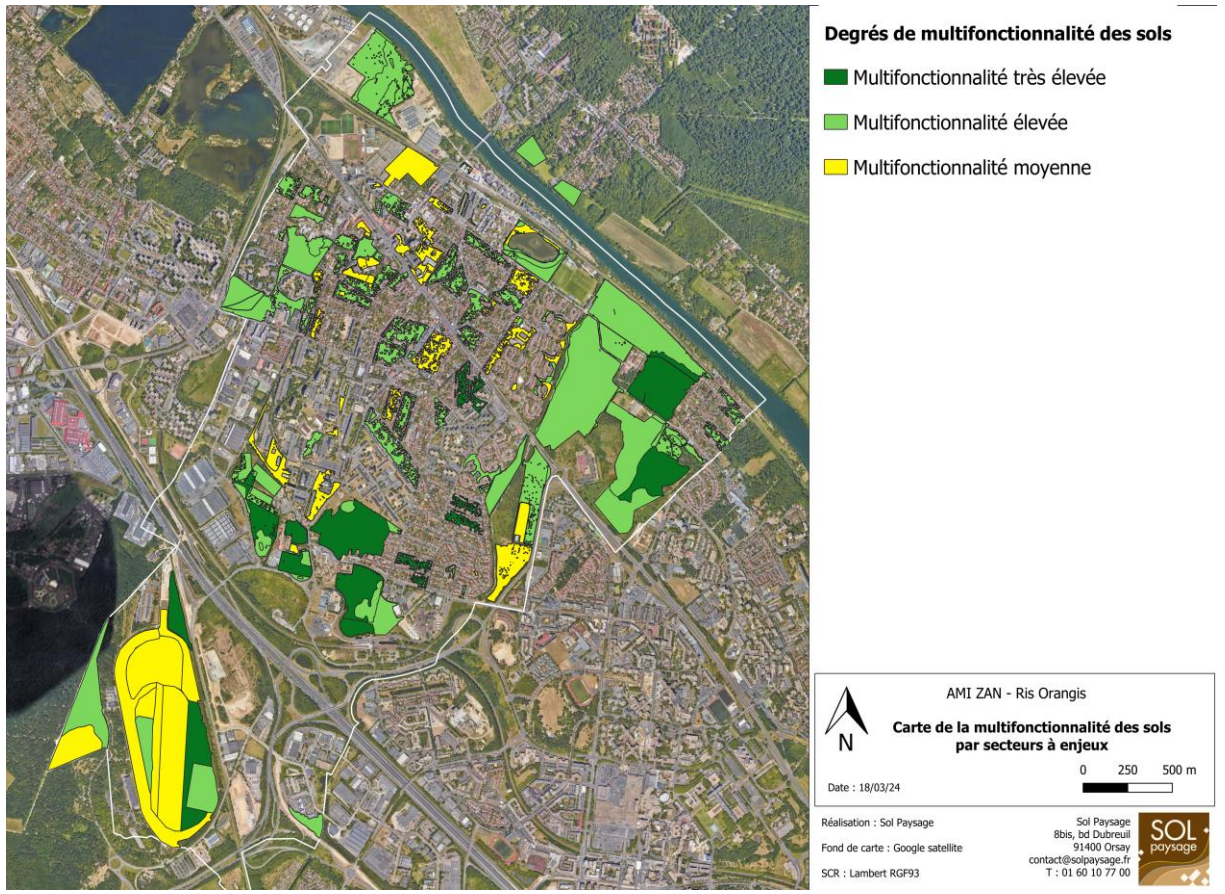
- Le Guern Cecile : c.leguern@brgm.fr - TRESSE Francois : f.tresse@rennesmetropole.fr

Assessing soil functionnality at land planning scale (field investigations)

Step 1 – indices of soil artificialized by land uses



Step 2 – indices of ecological soil functions



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Cerema
CLIMAT & TERRITOIRES DE DEMAIN

SOL paysage

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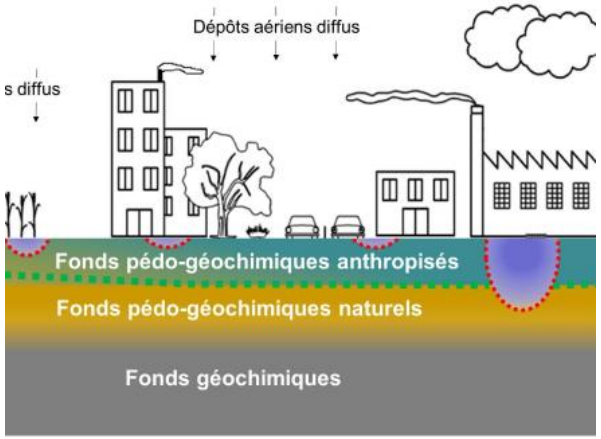
Chemical soil quality

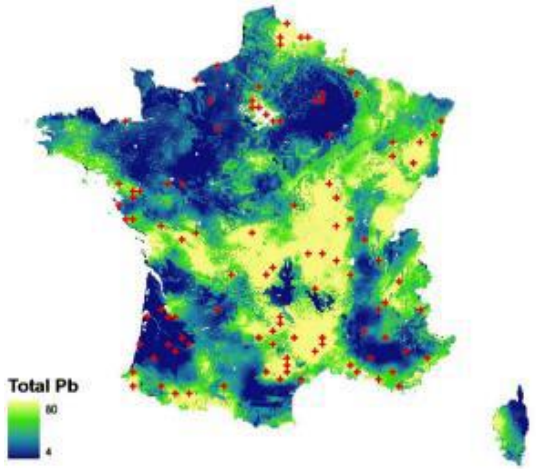
Identification of brackground values

Natural background values
Artificialized background values
(Backfill material)



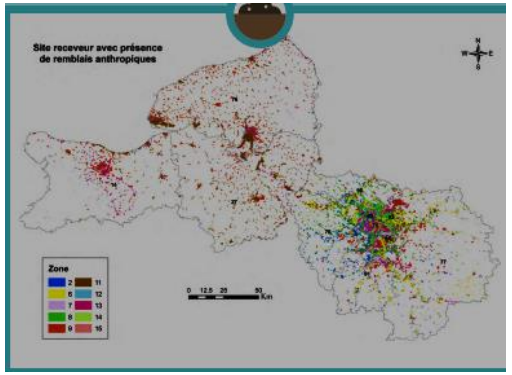
GUIDE POUR LA DÉTERMINATION DES VALEURS DE FONDS DANS LES SOLS - ECHELLE D'UN TERRITOIRE

>10 km



GUIDE POUR LA DÉTERMINATION DES VALEURS DE FONDS DANS LES SOLS – ECHELLE D'UN SITE

< 1 km



What research has been done ?

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- Different methodologies have been developed by researchers in order to introduce soil functions into land planning
- These methodologies have been developed to meet different needs at different scales

What research has been planned?

- Methodologies have to be improved and should be operational for land planners (feed back is needed)
- Many questions remain about the soil references that should be used by urban planners
- Awareness among local authorities is required to convince them that soil has to be characterised in planning process (urban soil is less well-known compare to agricultural soil)

What are the main challenges ?

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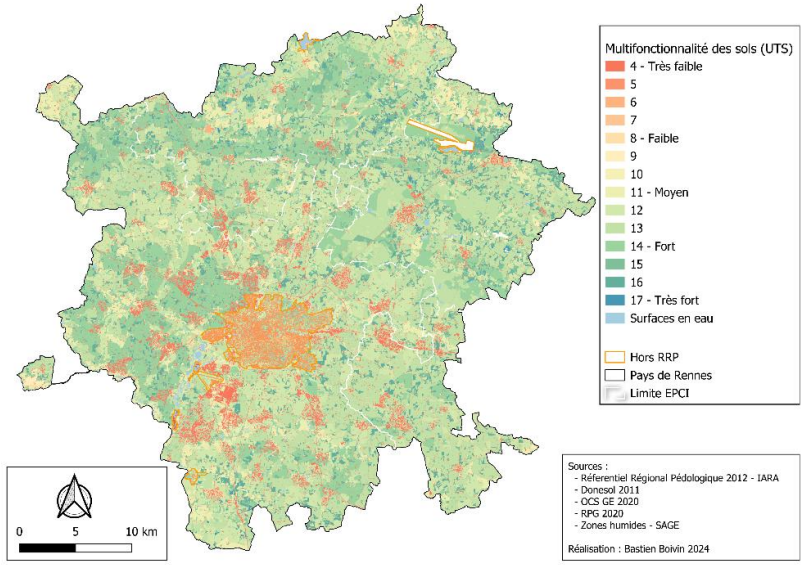
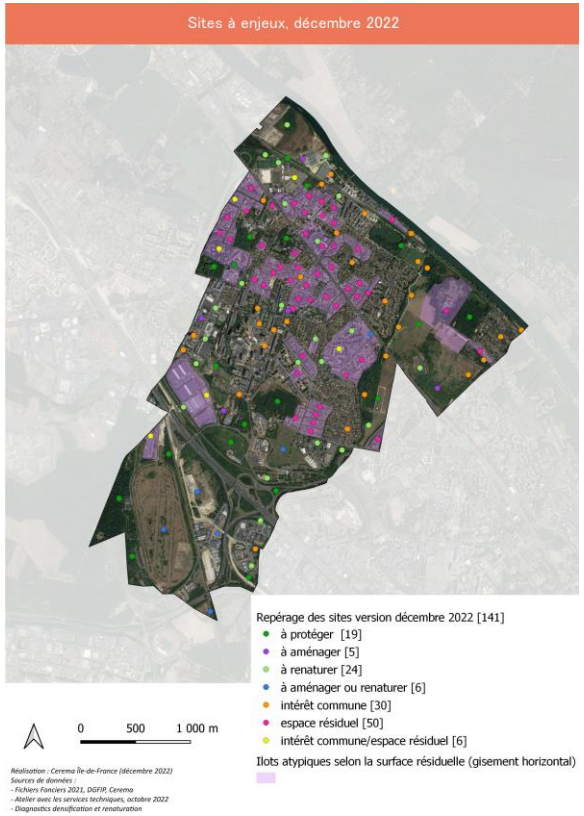
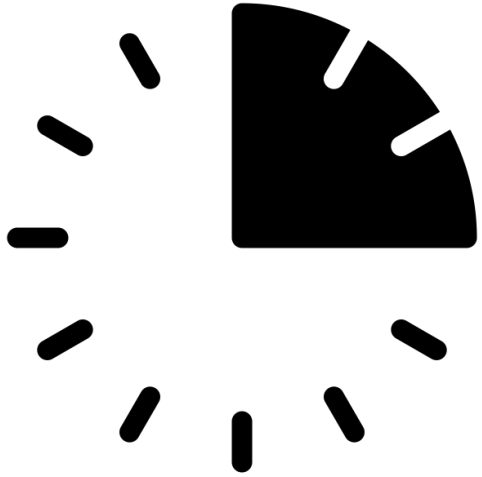




Considering soil in land use planning : a matter of scale above all

Temporal scale



Soil formation
Pedogenesis

From centuries to thousand years

Soil artificialization
Loss of ecological soil functions

From hours to days

- **Temporal asymmetry between soil formation and its destruction**
- **It takes a long time to restore soil functions**
- **Soil health is changing all the time**

Spatial scale
Different issues

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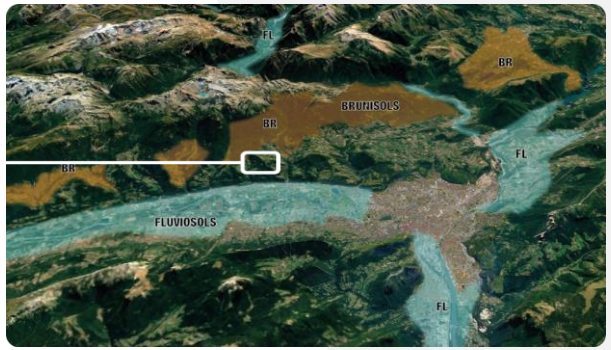

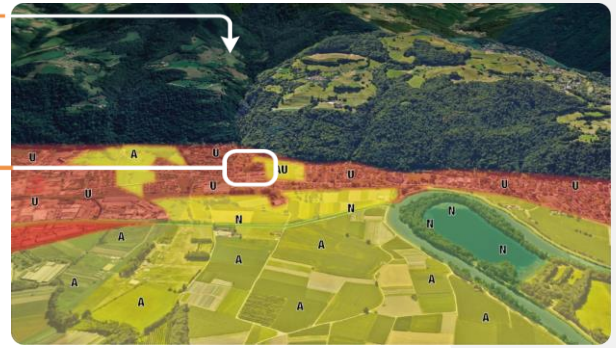

National / Regional scale

To quantify artificialized soils

- To Select areas with soil degradation

Soil erosion mapping
Soil compaction mapping
Soil sealing mapping
Soil artificialized by land uses

Land planning scale

To introduce soil data into land planning

- To select areas to be preserved (planning)
- To select areas to be managed (projects)
- To select areas to be restored (projects)

Specific area mapping
- Green corridors
- Flooding risk
- Areas for soil restoration
- Areas for urban densification

Project scale

To introduce soil data in project development

Soil health mapping
- To design a urban project
- To re-use soil material (technosol)
- To design the lanscape (trees, lawn, park etc.)

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Questions / Comments?

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