

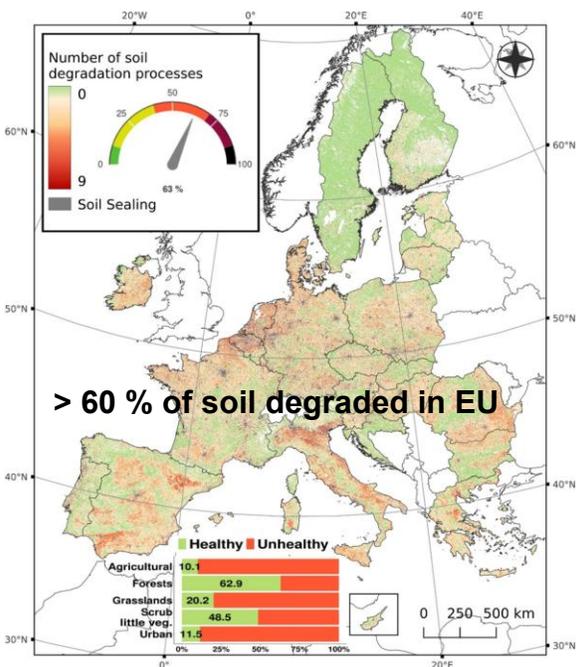
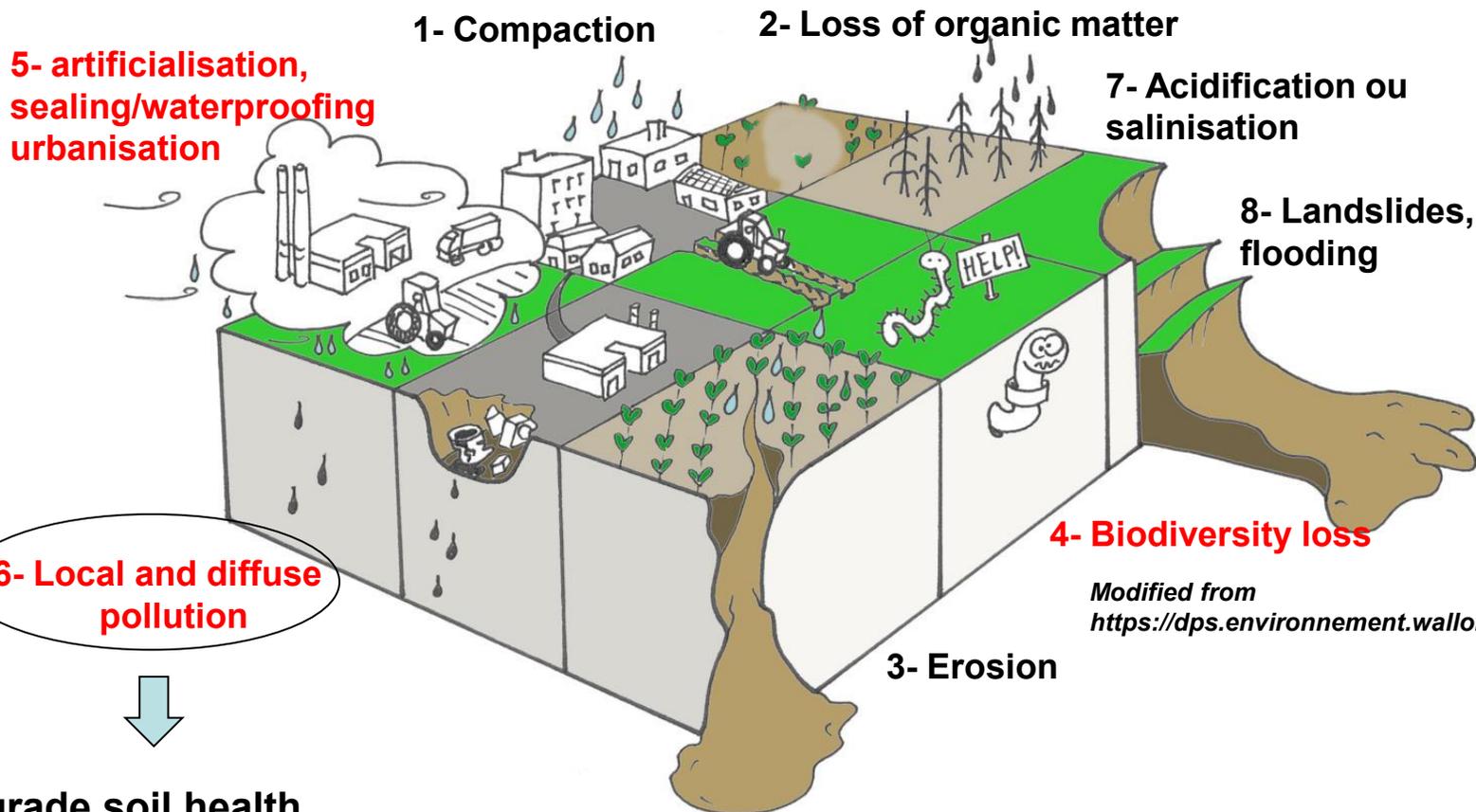
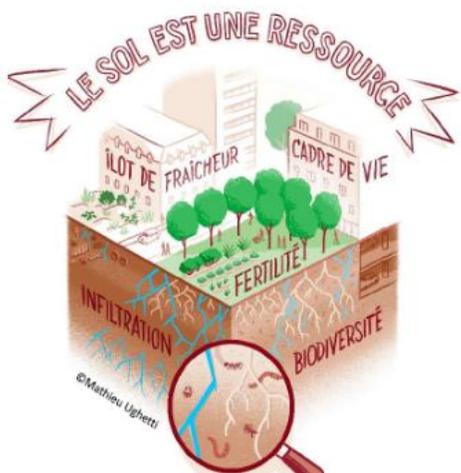


# The memory of soils - Pollution as a component of soil health

## Summary

- Mapping soil pollution hazard for spatial planning
- Indicators linked to contamination to assess soil health

# Context : Soil, a threaten resource



> 60 % of soil degraded in EU

6- Local and diffuse pollution



Degrade soil health  
But partial knowledge  
How to better anticipate?

Modified from <https://dps.environnement.wallonie.be>

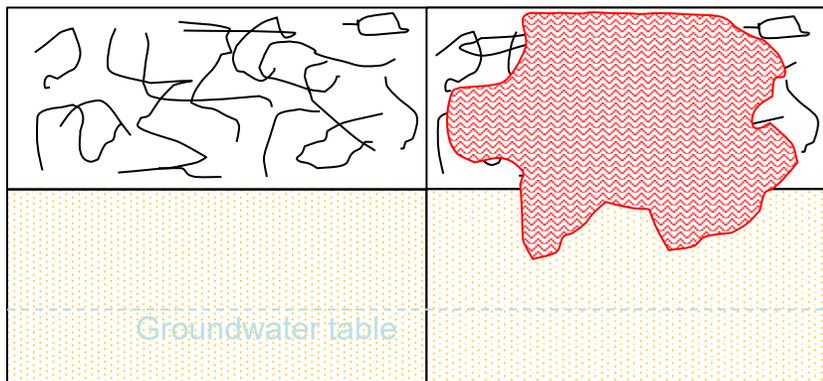
# Soil contaminants

Focus on urban areas

## Origin

**Anthropogenic deposits**

Natural soils/rocks



Crédit Cécile Le Guern, BRGM

**Human activities**

## Issues

**Sanitary  
Environmental  
Economic  
Legal**

Playgrounds	Ingestion/inhalation
Gardening	Vegetable ingestion
<b>Planning</b>	<b>Desealing, renaturing</b>
(Re)development	Excavated soils, project adaptation
Groundwater	Drinking, other uses

Scale: From site to territory through catchment/district

# How about if no geochemical data?



## > Hypothesis

- Memory of soil
- Soil accumulates all the current and historical contaminant pressures

## > Mapping soil contamination pressure

- Alert GIS layer
- Historical land use analysis

## > Methodology

- Approach by origin

Industrial and service activities
Agriculture
Domestic activities
Transports
Anthropogenic deposits

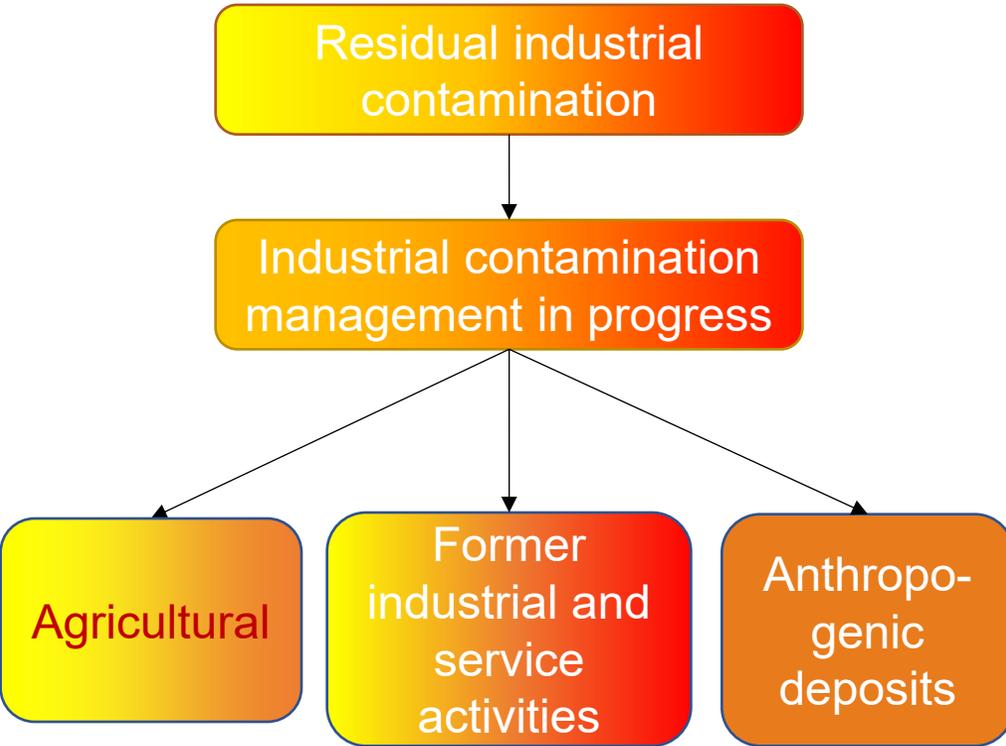
- Thematic GIS layers

- Combination in one index

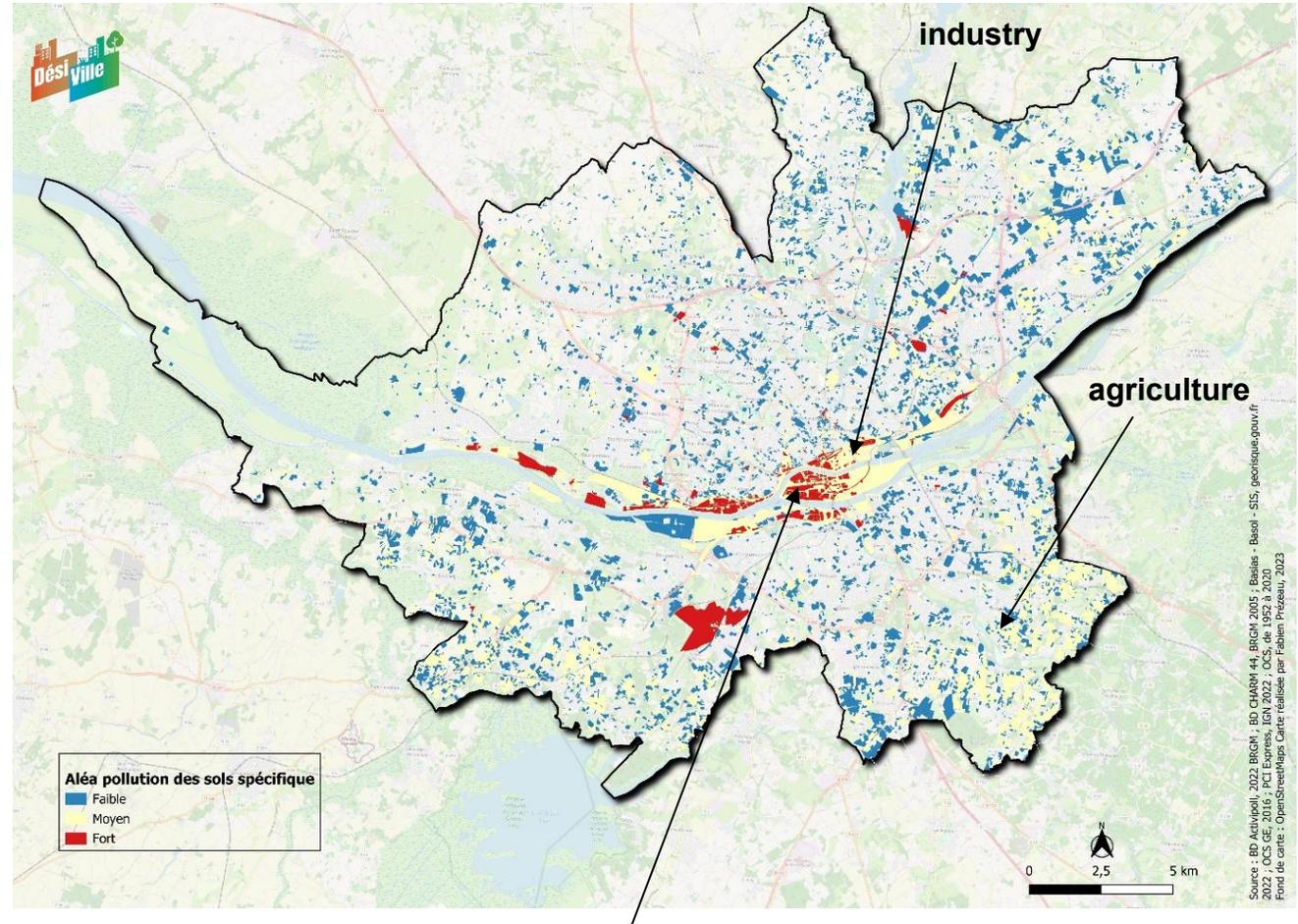
Colour	Level of pressure
	A priori none
Yellow	Low
Orange	Medium
Red	High

# Soil pollution hazard for urban planning: Nantes Métropole (France)

## Hierarchy of contamination sources



*In Prezeau et al. (2024), in French*

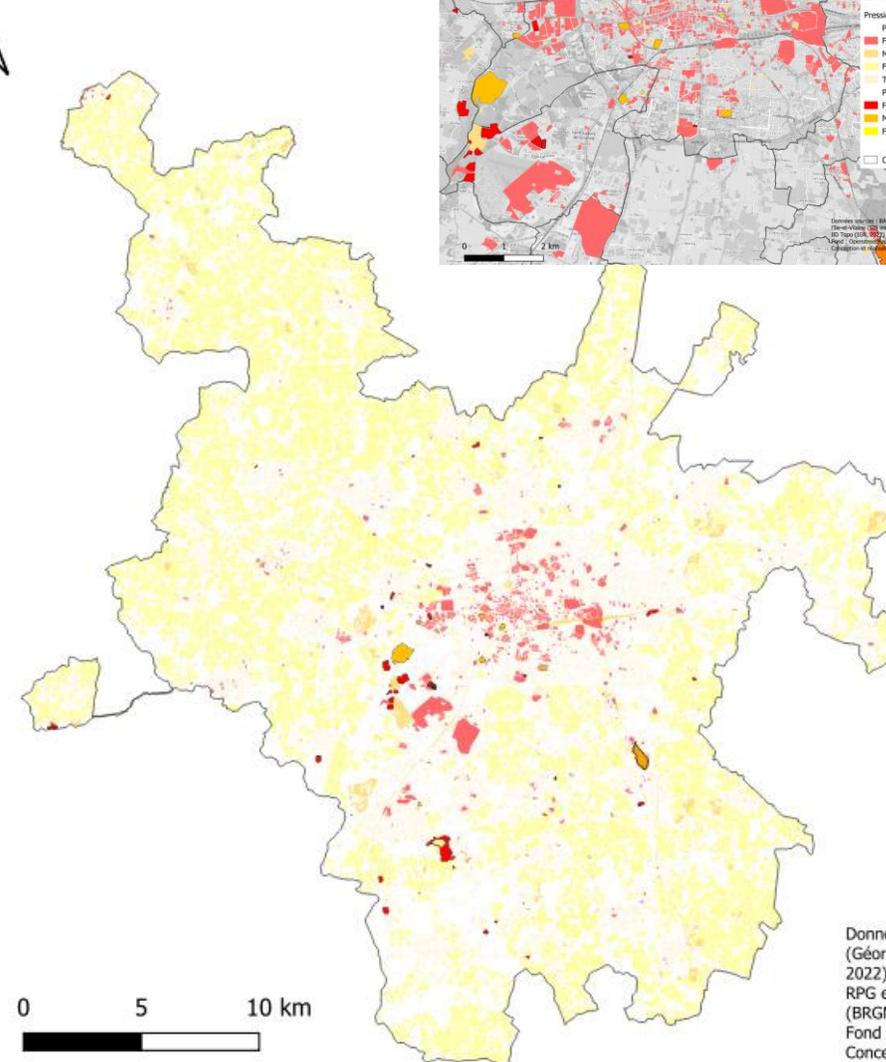
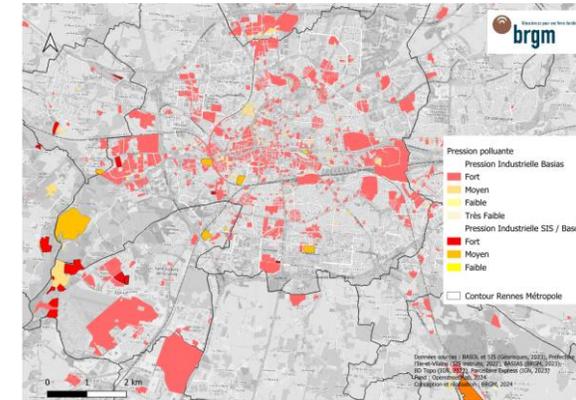


## Anthropogenic deposits + former industrial/service activities

Typology vs intrinsic pollution potential (Le Guern et al., 2018)

Urban Historic Inventory (Le Guern et al., 2016)

# Soil pollution hazard for urban planning: Rennes Métropole (France)



Residual industrial contamination

Industrial contamination management in progress

Anthropogenic deposits

Former industrial and service activities

Agricultural

In Le Guern et al. (2025), in French

# Lack of knowledge on anthropogenic deposits

- > Poorly mapped, but potential source of pollution
- > In situ observation important

**Artefacts (Human-made materials)**  
=> Nature and abundance

+ Color  
+ Odor

<i>High (T4)</i>		<i>Medium (T3)</i>	
<i>pyrite</i>	<i>soot</i>	<i>brick</i>	<i>concrete</i>
<i>bottom ash</i>	<i>smelter</i>	<i>slab</i>	<i>engrave</i>
<i>slag</i>		<i>pavement</i>	<i>masonry</i>
<i>asphalt</i>		<i>glass</i>	<i>block</i>
<i>bitumen</i>	<i>black (not peat or other natural organic layer)</i>	<i>made grounds</i>	<i>gravel</i>
<i>tar</i>	<i>violet/purple</i>	<i>infilling</i>	
<i>coal</i>	<i>bordeaux/burgundi</i>	<i>backfill</i>	

*Le Guern et al, 2018*



*Crédit photo Ademe*



*Crédit Photo V. Baudouin, BRGM*



*Crédit photo Ademe*

Other impacts on soil characteristics  
Infiltration of water  
Corg  
Biodiversity

# Pollution pressure

## > **Necessary to anticipate pollution hazard in urban planning**

- No global knowledge
- Challenging task

## > **Memory of soil**

- Historical land use as crucial knowledge

## > **Various lacks/difficulties**

- Eg. anthropogenic deposits footprint

## > **Verification of contamination / pollution risks**

- Soil diagnosis



# Indicators of soil pollution

		 SUPRA	INDIQUASOL	SML	
<b>Trace elements /heavy metals</b>	As, Cd, Co, Cr(total), Cu, Hg, Ni, Pb, Sb, Zn, Tl (Total)	X	X (+extractable)	X* (+V)	<b>*Reference to geochemical background level</b>
	Ba, Mo, Se	X			
<b>Organic</b>	Pesticides et métabolites	X	X	X**	<b>**List established by Member States</b>
	PFAS			X**	
	Other emerging contaminants			X**	
Other organic	HAP (>=16), PCBi (>=7), PCDD-PCDF	X	X		
	C10-C40, TPH	X			
	BTEX, COHV (if relevant)	X	X		

## Specificities of urban areas

**In situ observation important: artefacts, color, odor**

**Heterogeneity: representativity of soil samples**



**Indicators to be adapted according to pollution pressure and local context**

**=>**

**Thanks for your attention !  
Any question ?**

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