

# Breaking ground together: solutions for urban and post-industrial soil de-sealing

Thematic event: 14 December 2023

## SOIL AND DE-SEALING

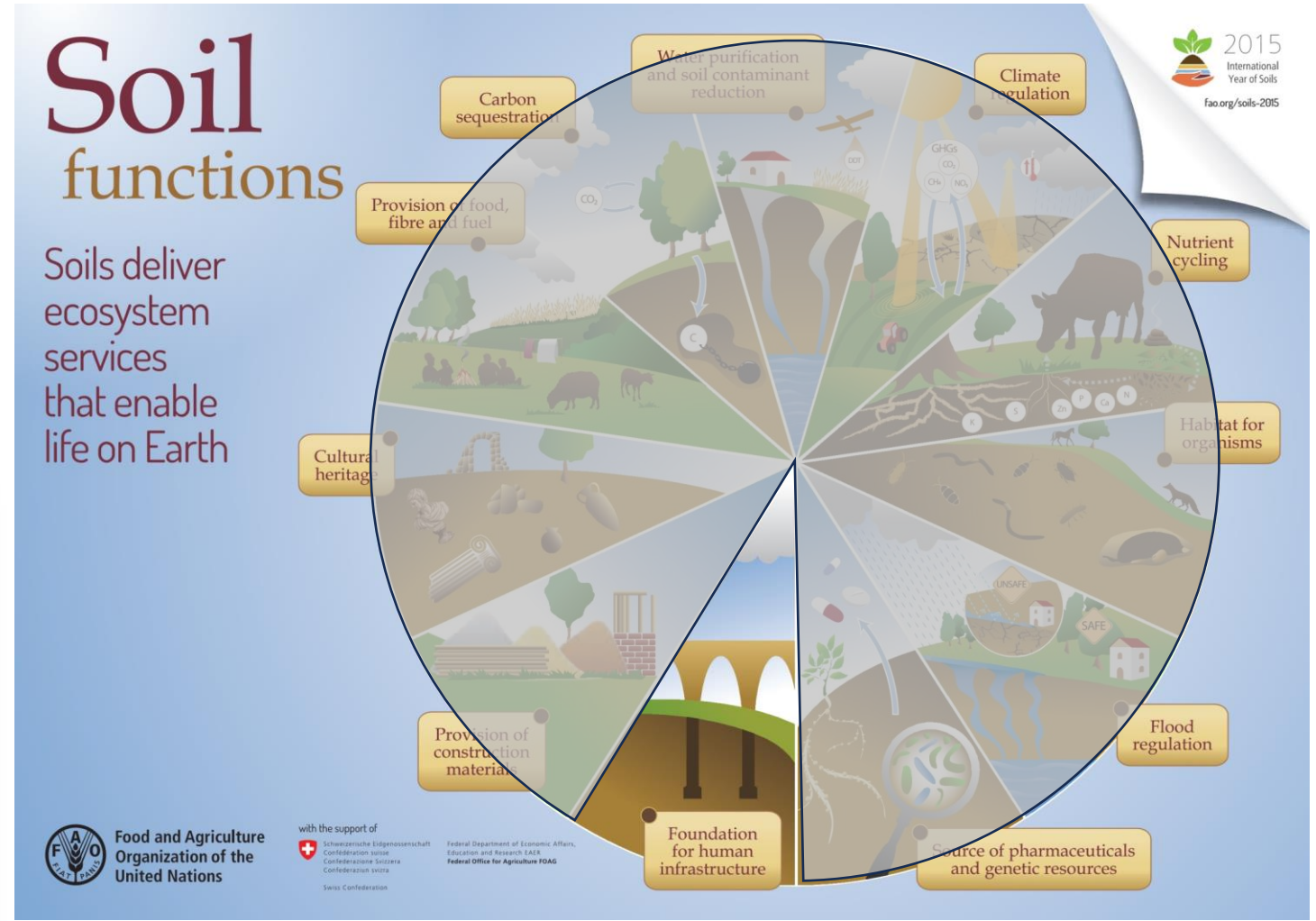
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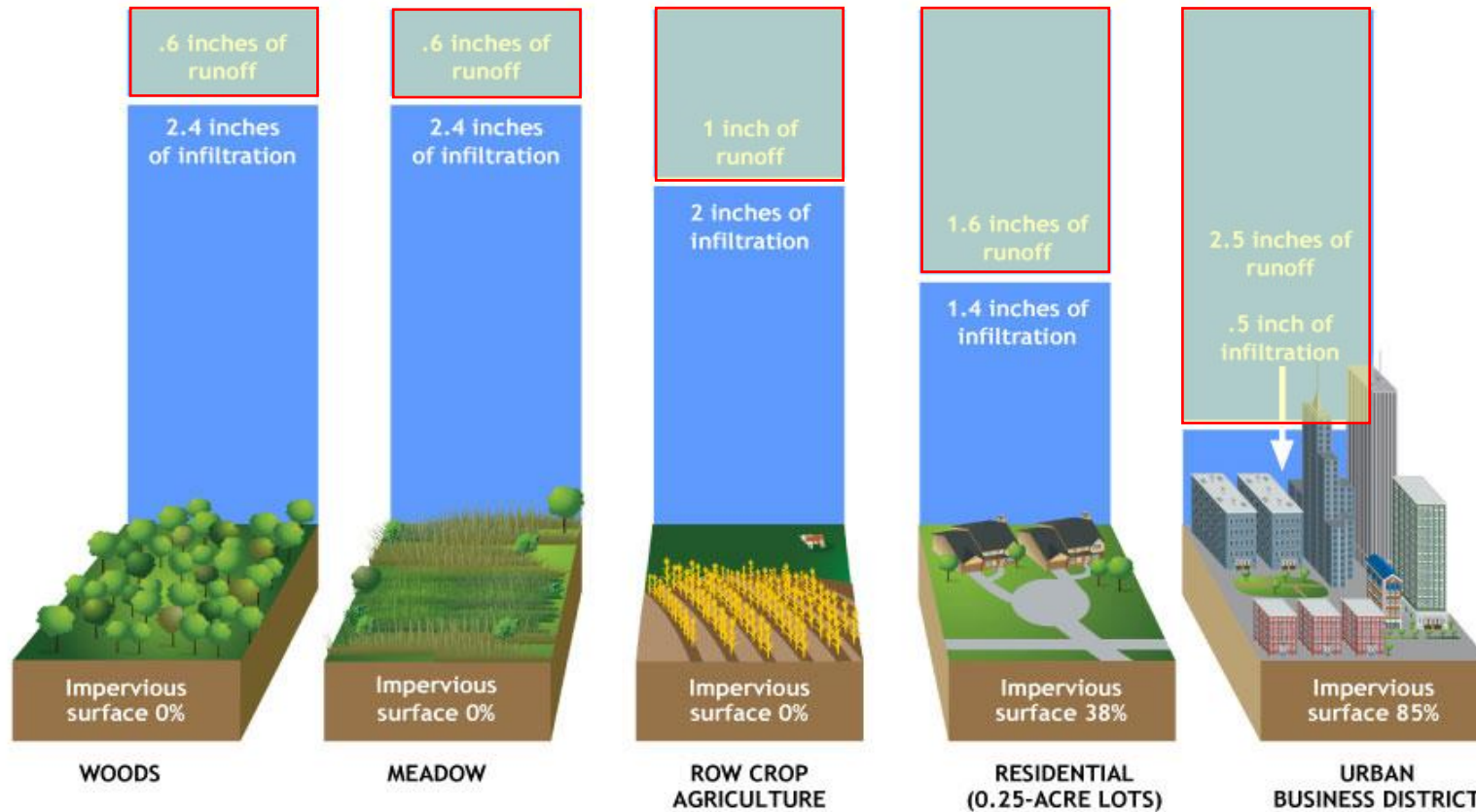


# SOIL SEALING AND ECOSYSTEM SERVICES

**Urban soil** is often perceived as a supporting platform or as waste to be disposed of once it has been removed from its original location. But it also provides important **ecosystem services**.

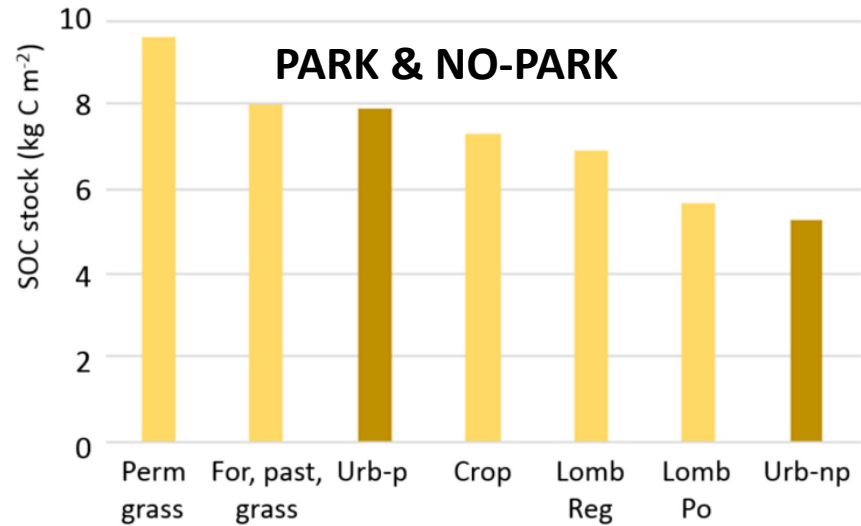


# WATER REGULATION SERVICES



Infiltration correlates with the degree of soil sealing

# URBAN SOILS OF MILAN: ORGANIC CARBON SEQUESTRATION AND FERTILITY

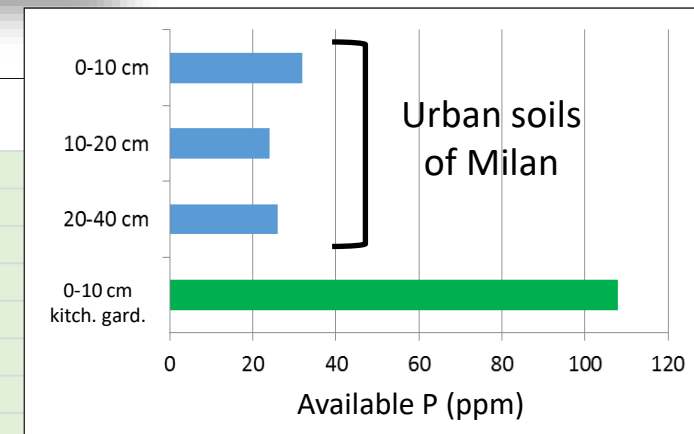
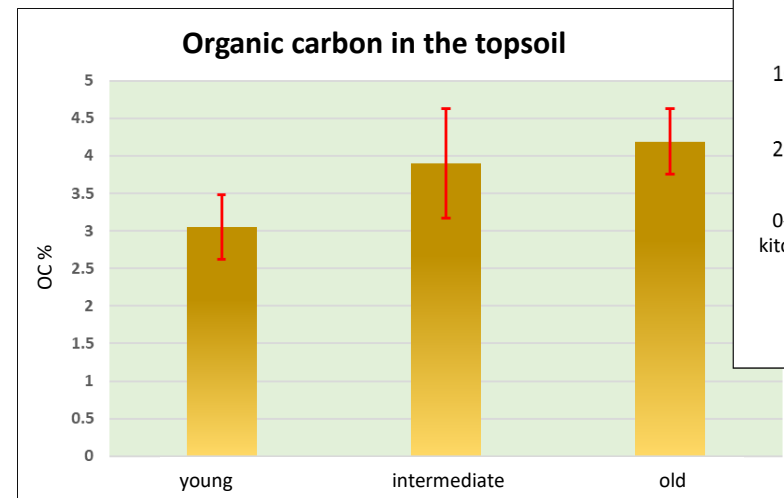


Land use		OC stock (kg C m <sup>-2</sup> )	Min	Max	s.d
Perm grass	Permanent grasslands (Milan surroundings)	9,6			
For, past, grass	Lombardy region (forest, pasture and grasslands)	8			
Urb-p	Urban parks (Milan) *	7,9	2,7	12,9	2,4
Crop	Croplands (Milan surroundings)	7,3			
Lomb Reg	Lombardy region	6,9			
Lomb Po	Lombardy region (Po alluvional plain)	5,7			
Urb-np	Urban non-parks (Milan) *	5,3	1,3	9,9	2,5

(Canedoli et al., 2020)



**KITCHEN GARDEN**

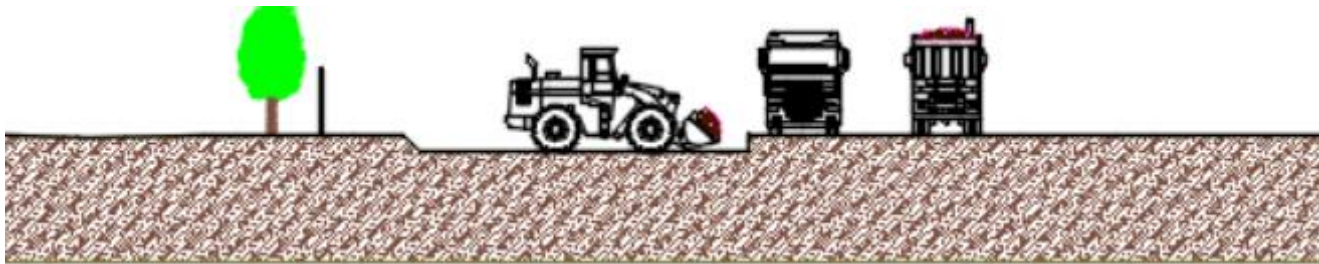


Urban soils of Milan

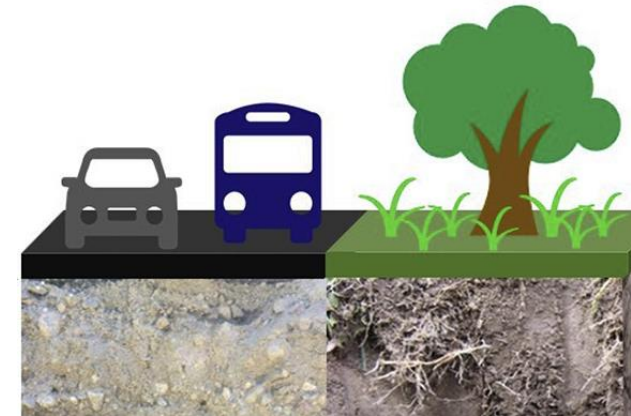
# ORGANIC CARBON OF DE-SEALED SOIL

The organic matter is preserved in the absence of losses and input of organic matter, but...

**Topsoil removal**

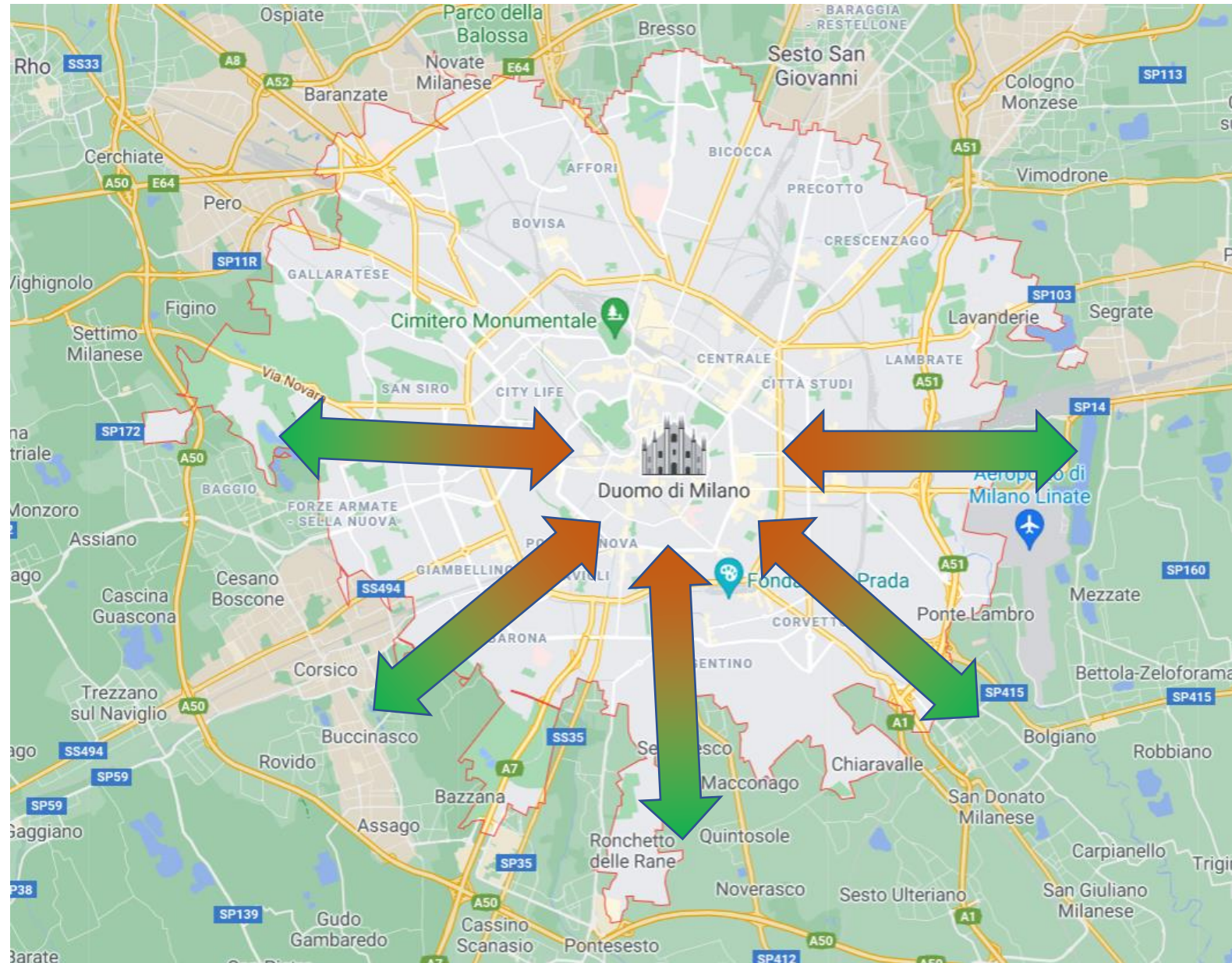


**OM free construction fill**



Changyi Lu et al. 2020

# NATURALITY-DISTURBANCE GRADIENT



# URBAN SOILS



**Umbrisol**



**Cambisol**



**Anthrosol**



**Technosol**

Semi-natural

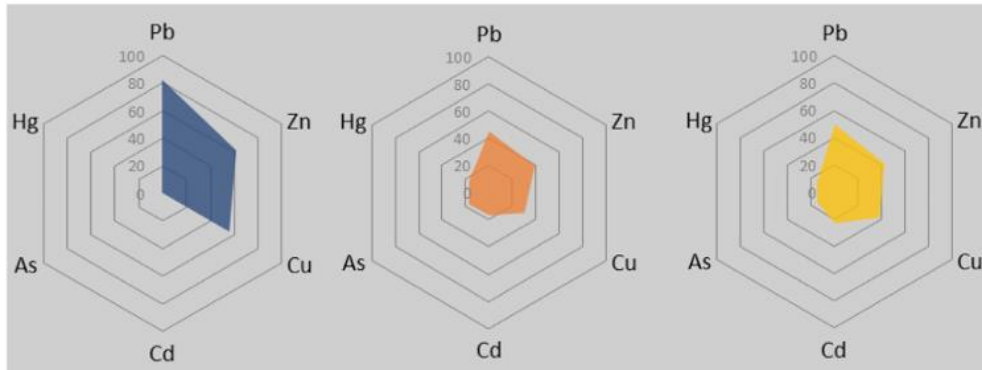
Highly modified



Degree of disturbance

# HEAVY METALS IN EUROPEAN URBAN SOILS

## ANOXIC CONDITIONS



traffic

industry

historic  
urbanisation

Binner et al., 2023 (review)

## COMPACTION





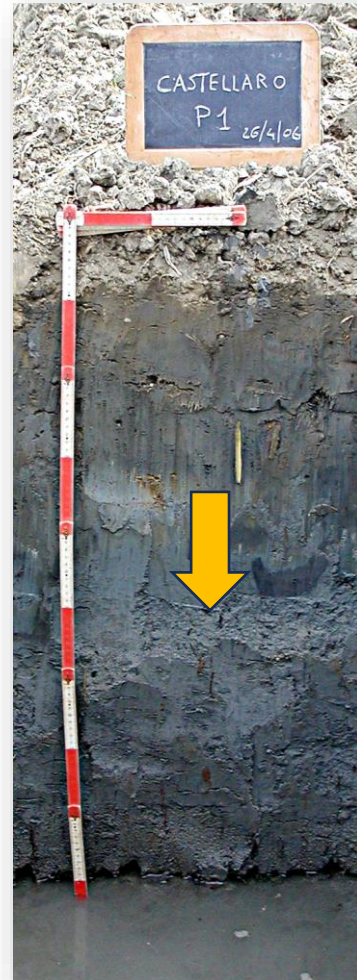
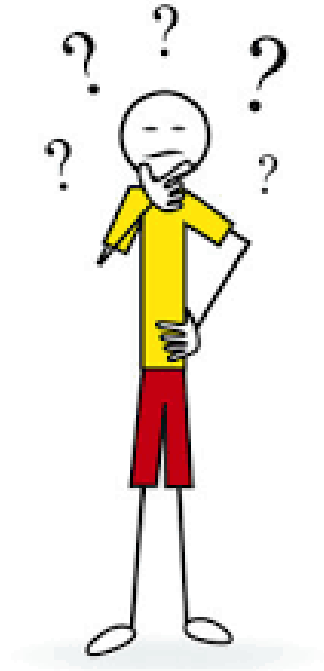
# DE-SEALING PRACTICES



The objective of de-sealing is to recover the soil and its functions first of all promoting the establishment of vegetation:

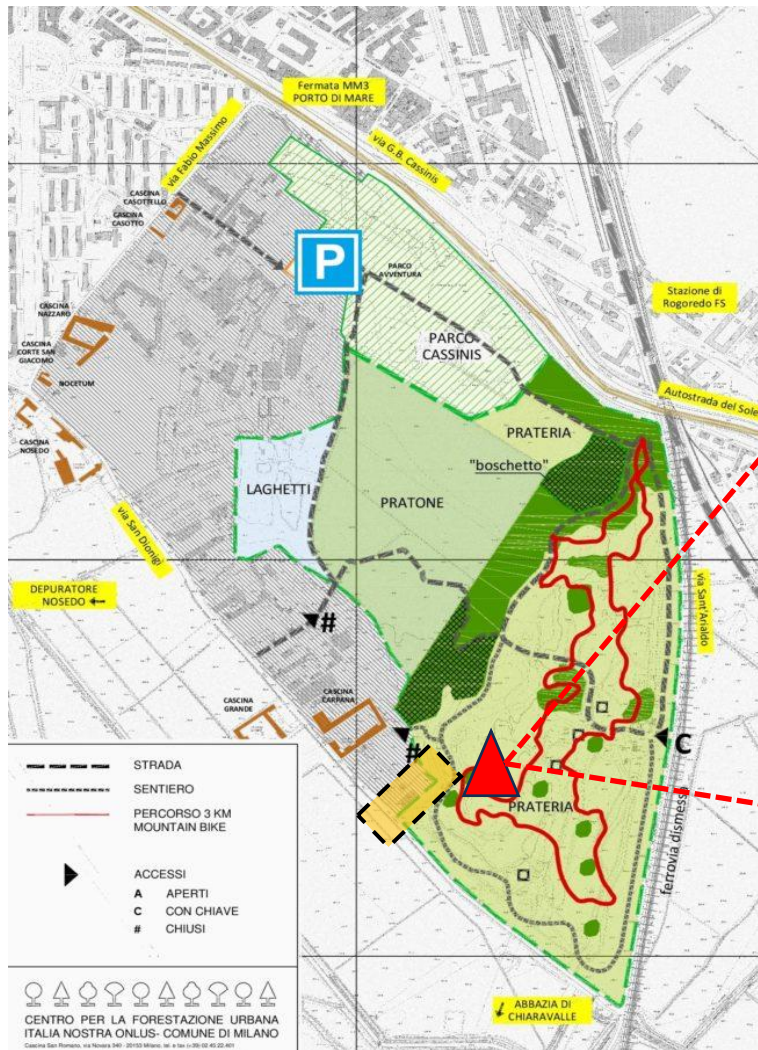
- by decompacting
- by adding organic matter (e.g. compost)
- by adding exogeneous soil
- by conservation and reuse of on-site materials for soil reconstruction

# HOW CAN THE KNOWLEDGE OF SOIL HELP IN THE RECOVERY OF THE DE-SEALED SOIL?

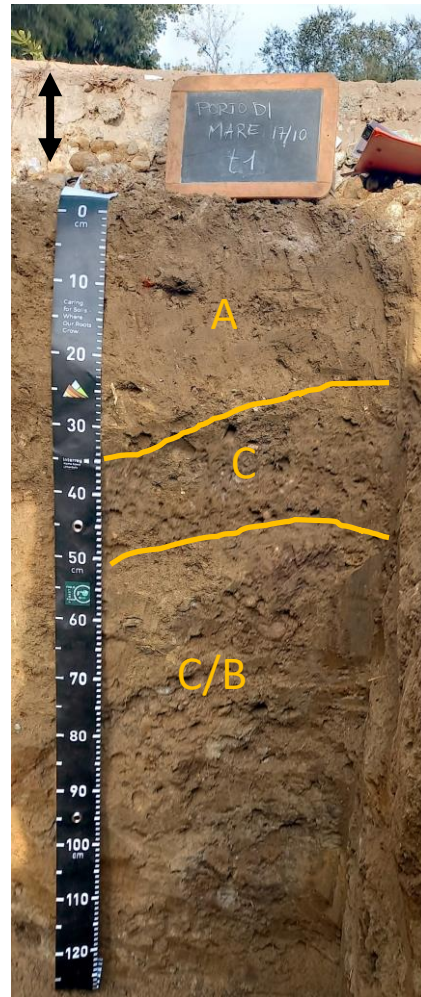


# FUNCTIONAL RECOVERY OF URBAN SOILS THROUGH DE-SEALING TECHNIQUES

## CASE STUDY AT PORTO DI MARE (MILAN)



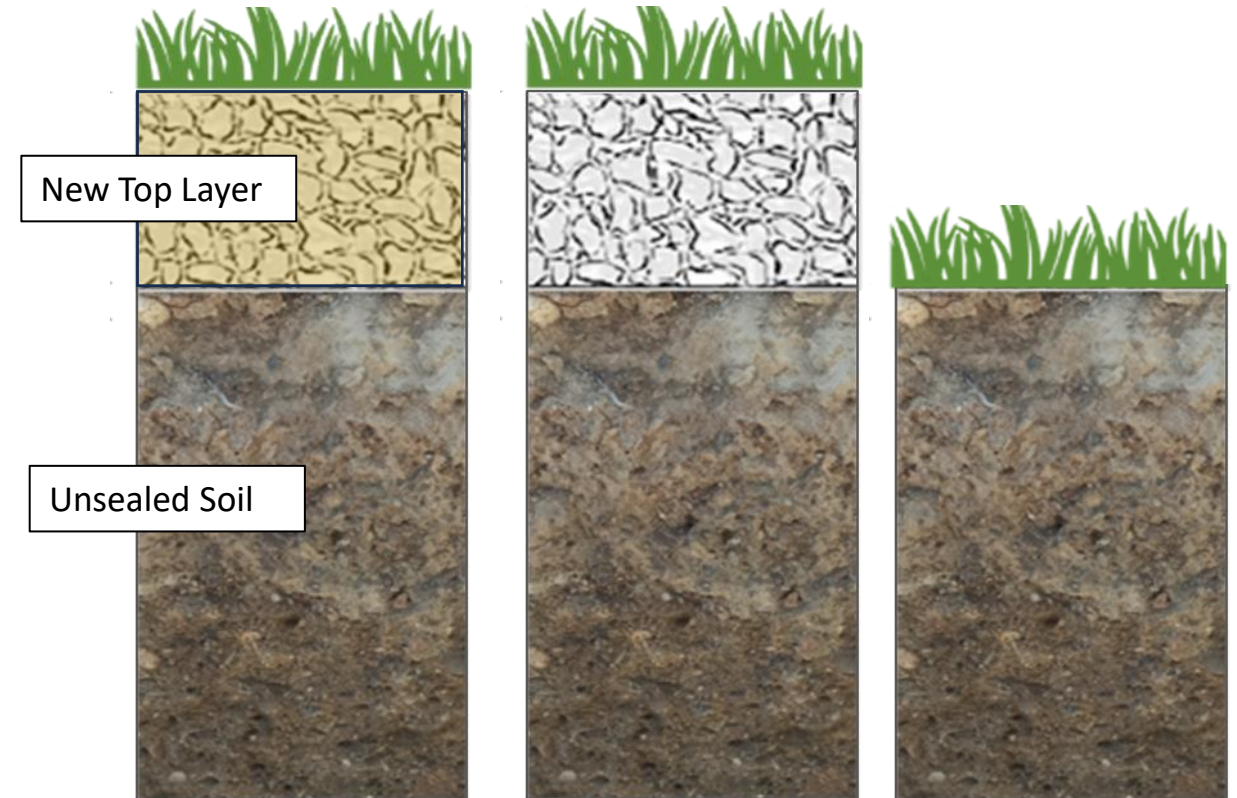
# DE-SEALED SOIL



# DE-SEALED SOIL

## Project Aims

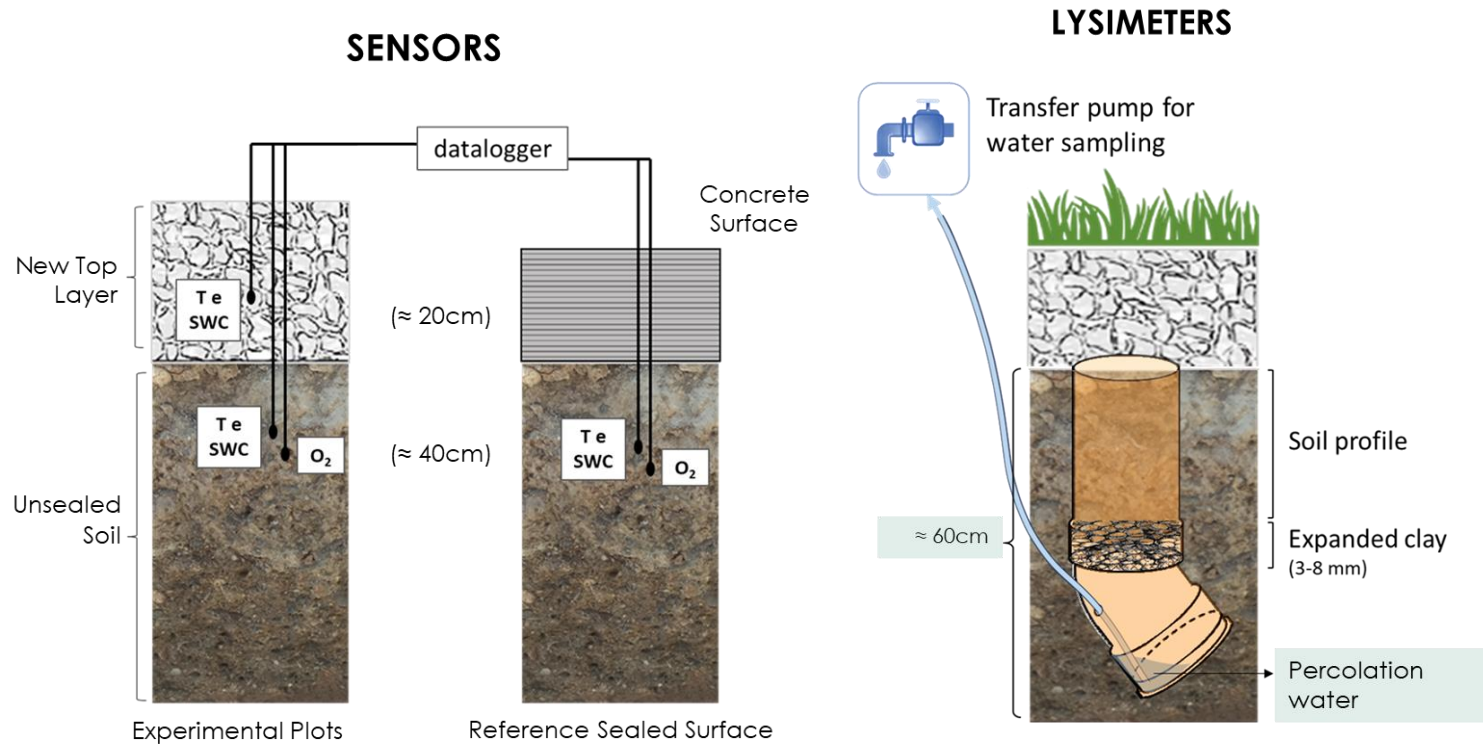
- Assess the effects of different treatments useful to get a soil newly able to provide the main ecosystem services needed in an urban environment.
- **Evaluate the reuse in situ of pavement demolition waste (DW) as soil parent material**, by redepositing and spreading the fragments on the unsealed soil surface.
- Provide a better understanding of the processes and dynamics that occur during the development of the soil after de-sealing interventions.
- Monitor the recovery of soil functionality.



## Experimental Treatments

- v1 Herbaceous Mix (A)
- v2 Herbaceous Mix (B)
- t1 Demolition Waste + Herbaceous Mix (A)
- t2 Demolition Waste + Herbaceous Mix (B)
- t3 Demolition Waste + Compost + Herbaceous Mix (A)
- t4 Demolition Waste + Compost + Herbaceous Mix (B)

# SOIL, VEGETATION AND WATER MONITORING



- Total biomass, relative abundance of individual species, and roots development.
- Monitoring of soil temperature and water content, soil respiration, oxygen level and percolation water quality.
- Chemical, physical and microbiological analyses of soil samples.



**NATURAL  
DE-SEALING**

A photograph of a concrete path with a pile of broken concrete blocks in the foreground. The text "THANKS FOR YOUR ATTENTION" is overlaid in the center. The path is made of light-colored concrete slabs with visible expansion joints. To the left, there is dense green foliage, including ferns and other leafy plants. To the right, there is some sparse vegetation and a blue structure in the background. The pile of broken concrete blocks is in the lower foreground, consisting of many irregular, greyish-brown fragments of varying sizes. The text is white, bold, and sans-serif, centered horizontally and vertically over the path.

THANKS FOR  
YOUR  
ATTENTION