Ground:Breaking Webinars

The importance of soil knowledge
for a proper restoration of functionality after de-sealing

13 May 2024

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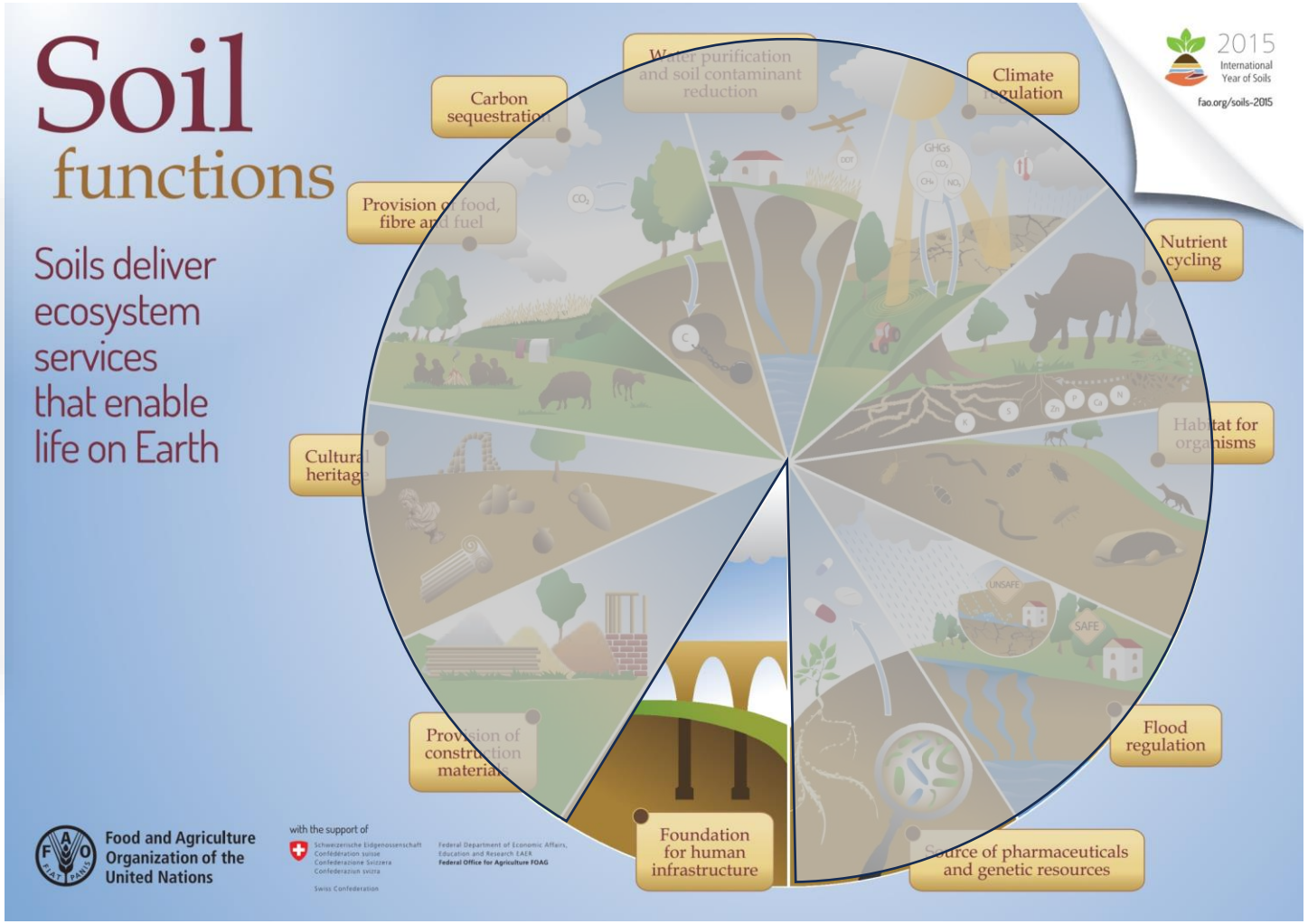
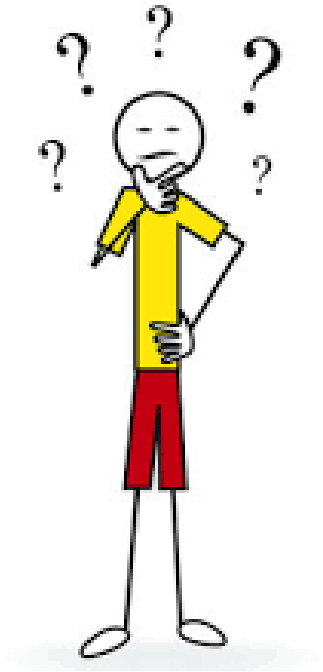
University of Milano Bicocca

WHAT DOES SOIL SEALING INVOLVE IN TERMS OF ECOSYSTEM SERVICES?



WHAT KIND OF SOIL DO WE FIND
WHEN THE SEALING LAYER IS REMOVED?



URBAN SOILS

Umbrisol **Cambisol** **Technosols**

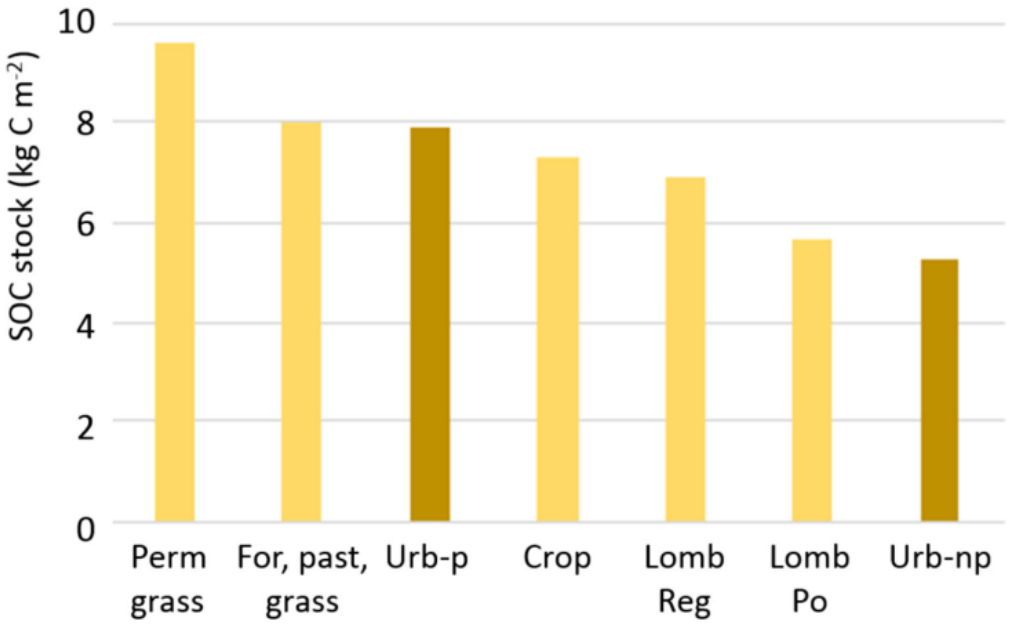
Semi-natural

Highly modified

Degree of disturbance

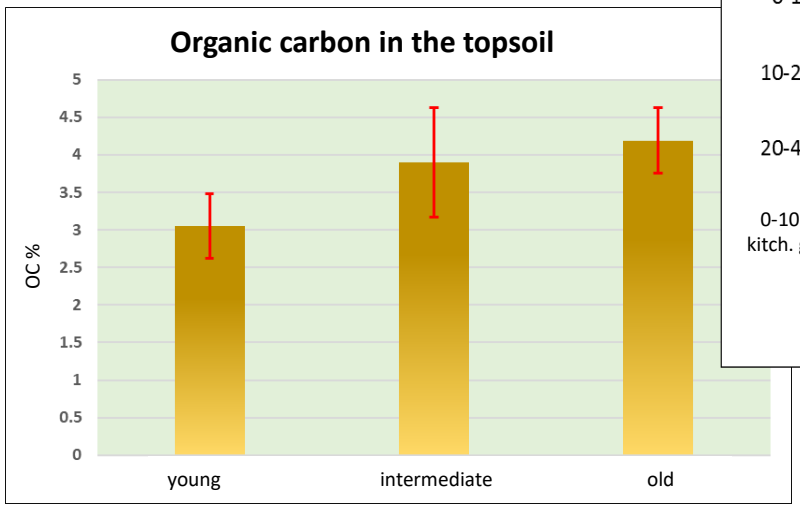
URBAN SOILS OF MILAN: ORGANIC CARBON SEQUESTRATION AND FERTILITY

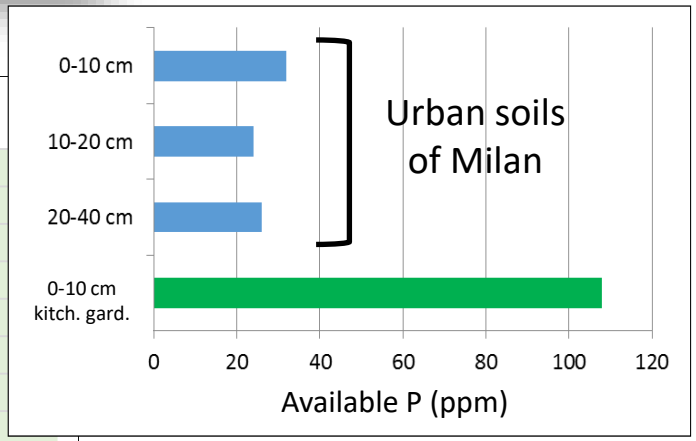
PARK & NO-PARK



(Canedoli et al., 2020)

KITCHEN GARDEN

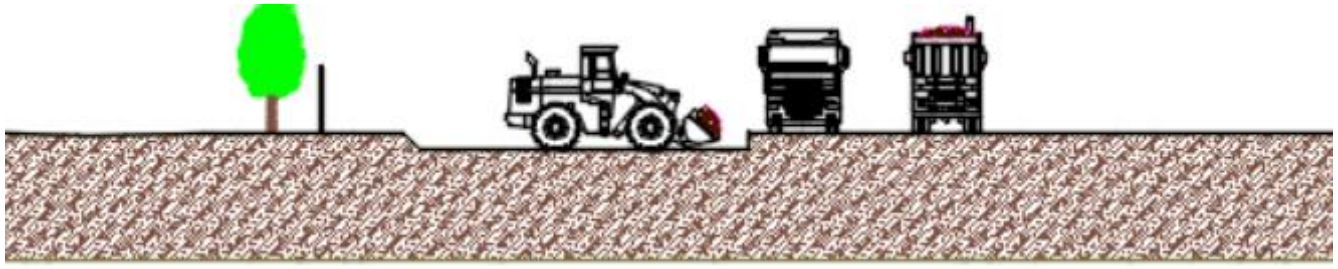




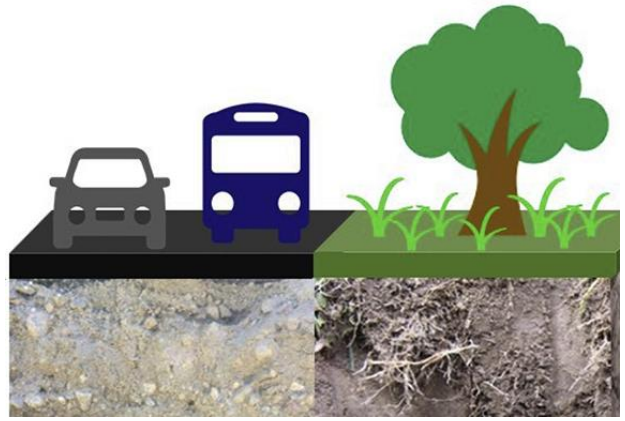
ORGANIC CARBON OF DE-SEALED SOIL

The organic matter should be preserved in the absence of losses and input of organic matter, but…

Topsoil removal

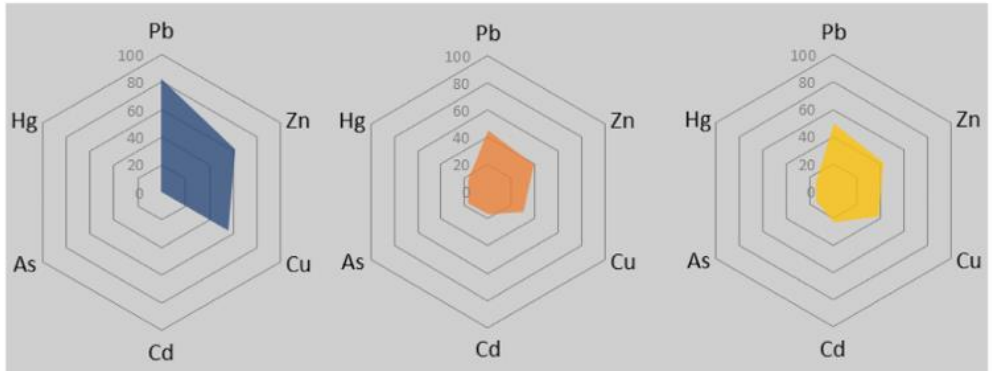


OM free construction fill



Changyi Lu et al. 2020

HEAVY METALS IN EUROPEAN URBAN SOILS



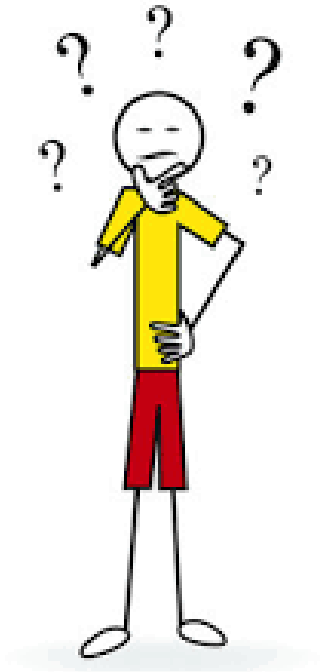
traffic **industry** **historic urbanisation**

Binner et al., 2023 (review)

ANOXIC CONDITIONS

COMPACTION

WHAT ARE THE COMMON PRACTICES FOR THE DE-SEALING PROCESS?

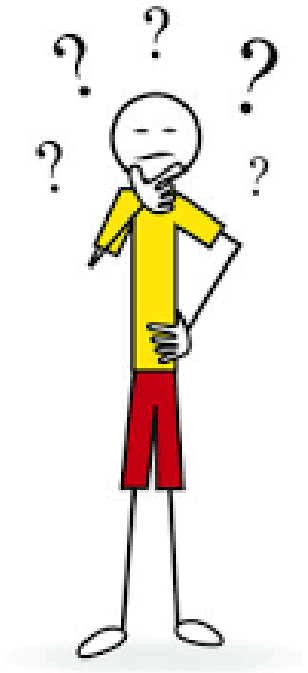


DE-SEALING PRACTICES

The objective of de-sealing is to recover the soil and its functions first of all promoting the estabilishment 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?

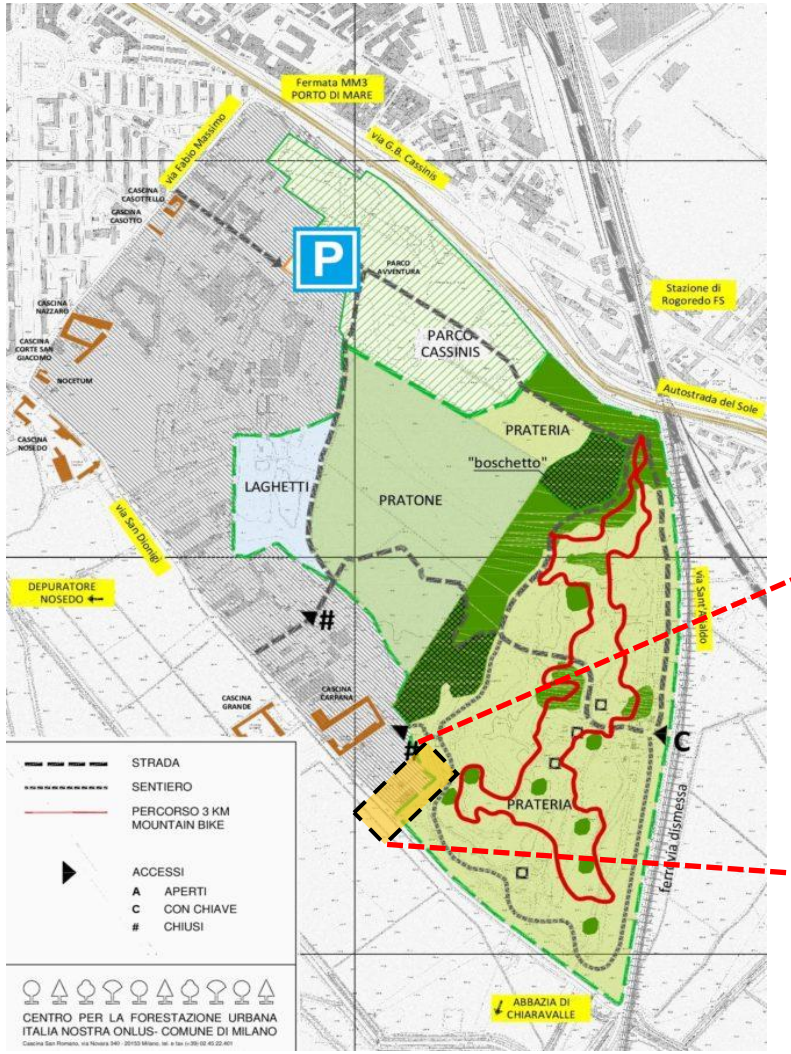


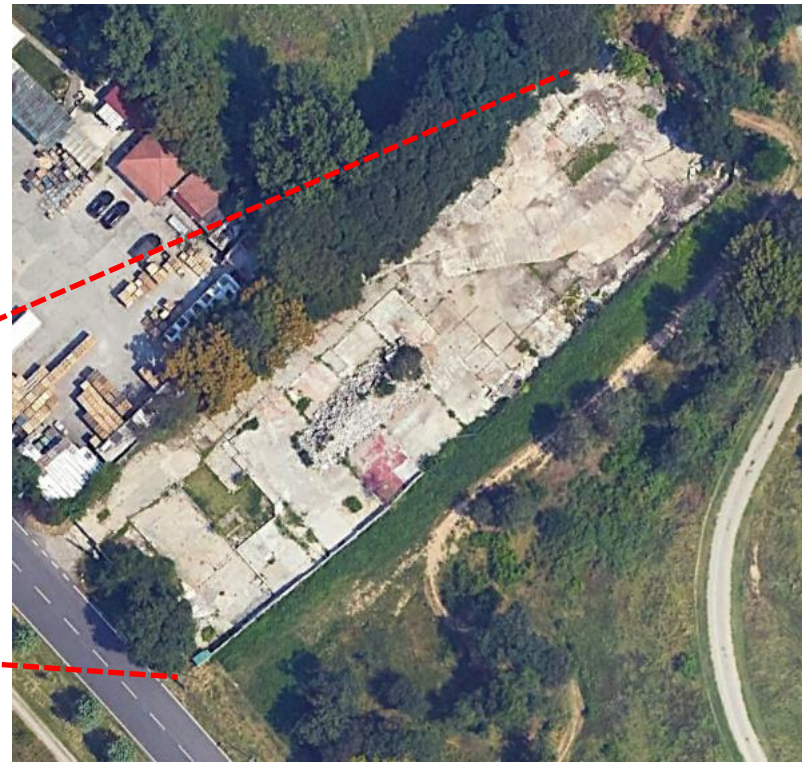
TOPSOIL

- Chemical characteristics (e.g. pH, available phosphorus, contaminants)
- Physical characteristics (e.g. soil texture, compaction)
- Biological characteristics (e.g. organic matter content)

FUNCTIONAL RECOVERY OF URBAN SOILS THROUGH DE-SEALING TECHNIQUES

CASE STUDY AT PORTO DI MARE (MILAN)





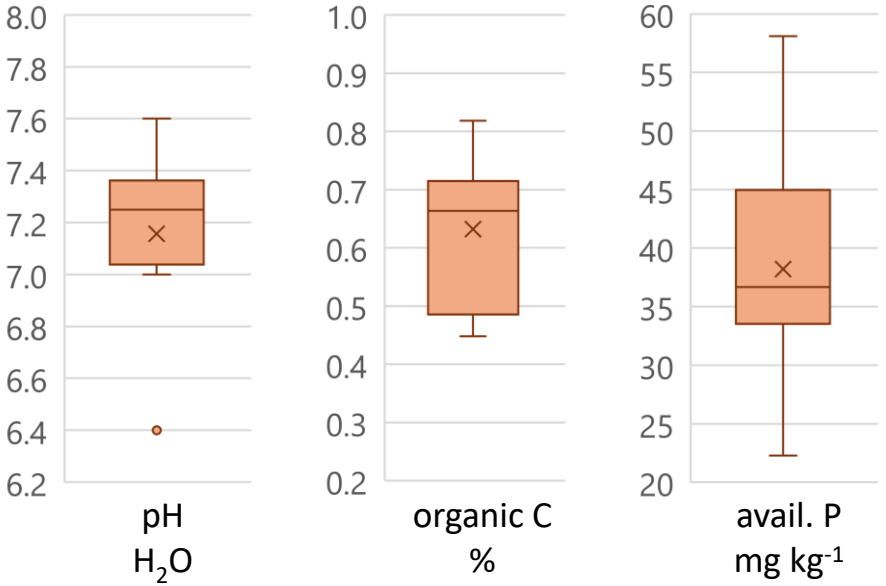
DE-SEALED SOIL – THE STARTING POINT

Ekranic Technosol → **Eutric Transportic Regosol**

PROFILE

Soil horizon	pH H_2O	organic C %	C:N	avail. P mg kg^{-1}	CSC cmol(+) kg^{-1}	Sand %	Silt %	Clay %	Textural class
A1	7.3	0.81	7.1	57	7.4	58	32	10	SL
A2	7.4	0.28	6.4	33.1	7.9	51	38	11	L
CB1	7.1	0.42	7.2			66	28	6	SL
CB2	7.1	0.26	6.6			62	30	8	SL
CB/C	7.1	0.19	5.9			52	37	11	L
CB/Cg	7.2	0.18	5.8			57	33	10	SL

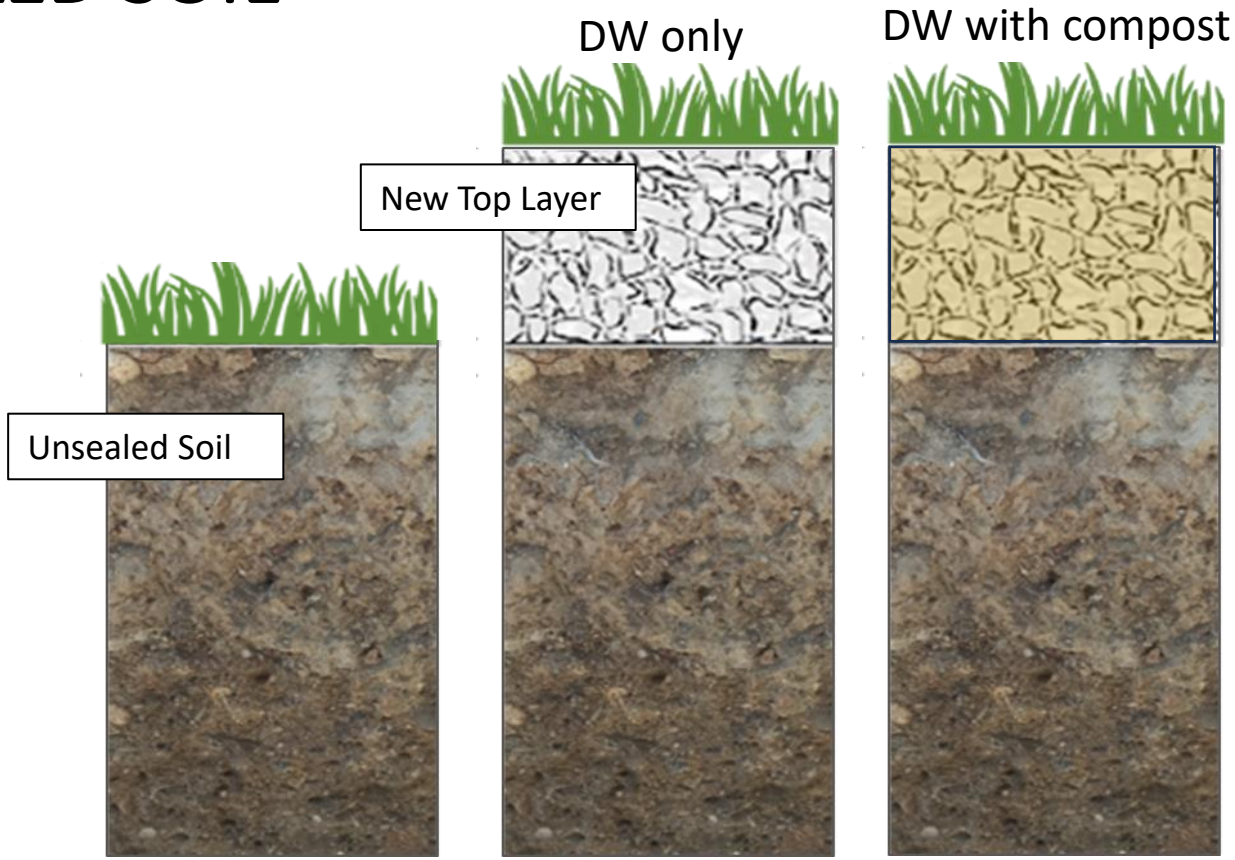
TOPSOIL



DE-SEALED SOIL

PROJECT AIMS - G. Mascetti PhD project

- 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.
- Assess the effects of different treatments useful to get a soil newly able to provide the main ecosystem services needed in an urban environment.
- 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

Herbaceous Mix (A)
Herbaceous Mix (B)
Demolition Waste + Herbaceous Mix (A)
Demolition Waste + Herbaceous Mix (B)
Demolition Waste + Compost + Herbaceous Mix (A)
Demolition Waste + Compost + Herbaceous Mix (B)

PLOT SCHEME

April 2024

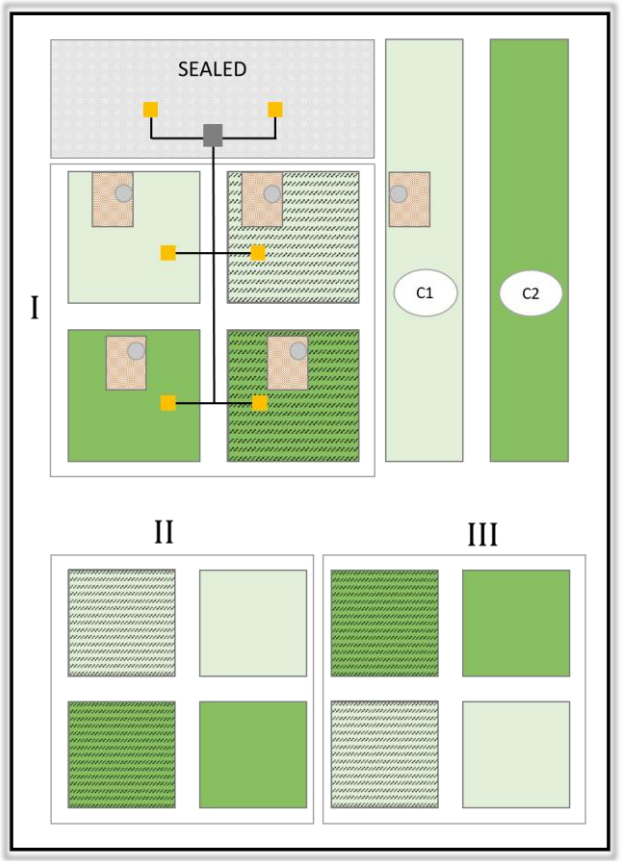
Experimental Treatments

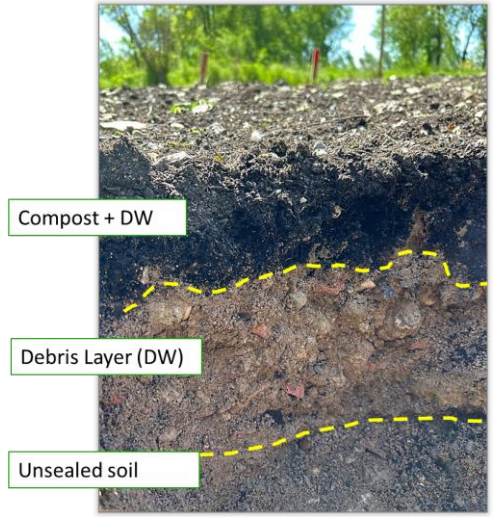
- Compost
- Sorghum
- Herbaceaus mixture

Monitoring System

- Datalogger
- Sensors
- Cables

- Soil profiles
- Lysimeters

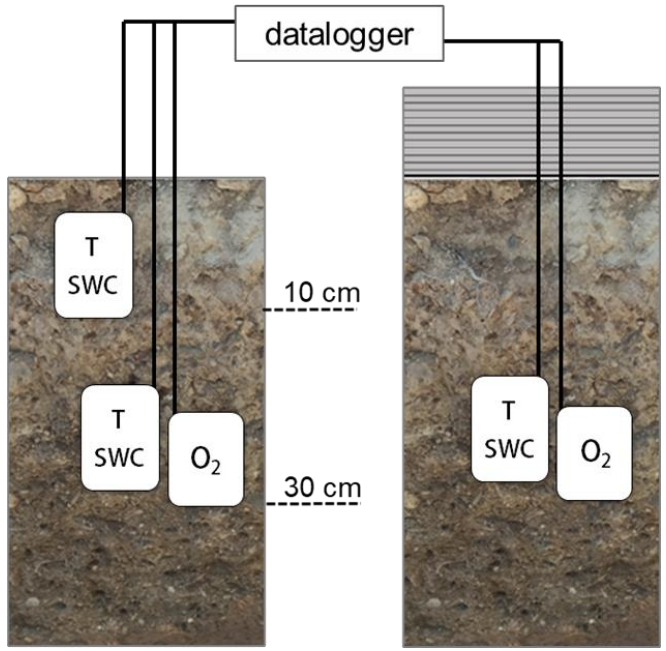


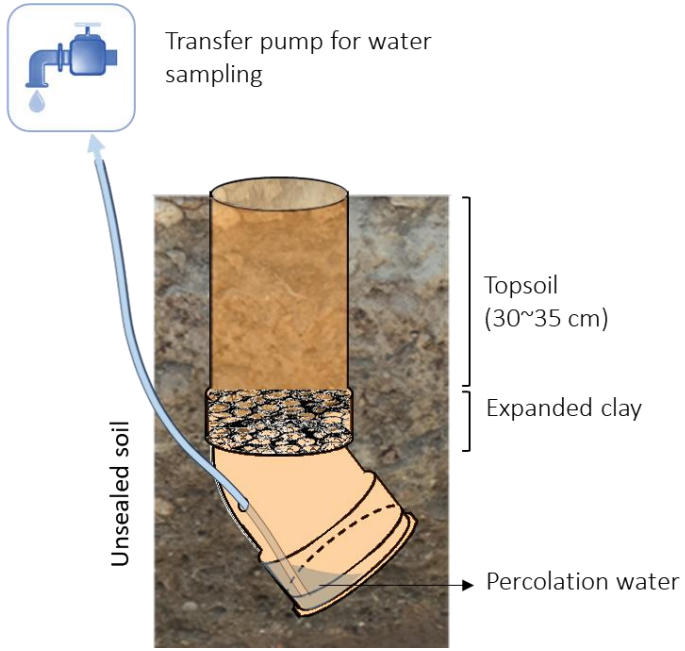


New top layer of DW and compost (~20 cm) on the unsealed soil.

Growth of herbaceous mixture two weeks after sowing.

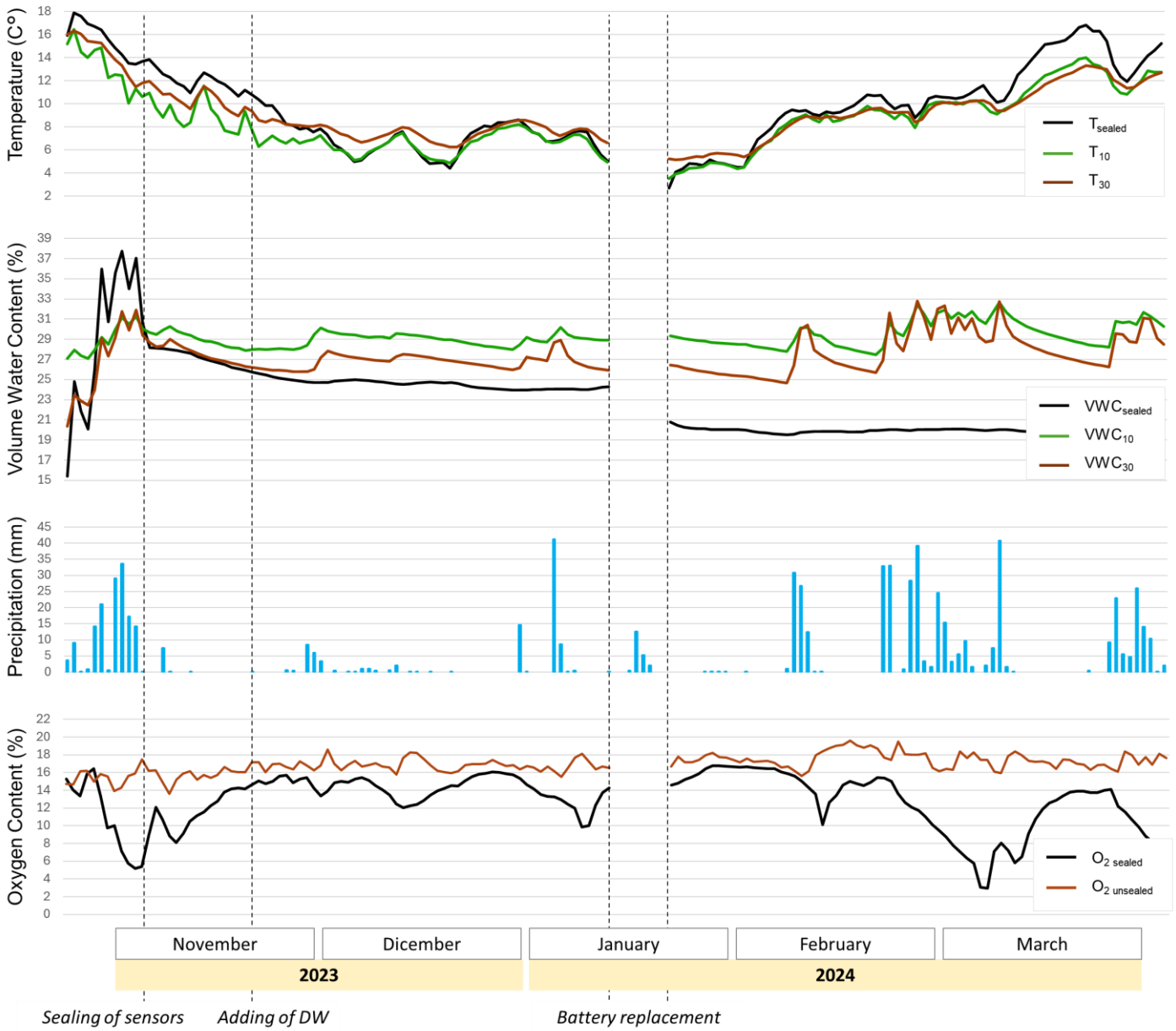
SOIL, VEGETATION AND WATER MONITORING





- Chemical, physical and microbiological characteristics of soil.
- 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.

PRELIMINARY DATA



- The desealing operations promoted an increase in oxygen and water content, providing the basis for the recovery of soil functionality.

- The next steps will be to evaluate the most appropriate solutions for rapid and successful vegetation development, as well as the effectiveness and safety of using DW as a growth medium.

NATURAL DE-SEALING


THANKS FOR
YOUR
ATTENTION