

SOIL PROFILE DISPLAY

Summary

The Soil Profile Display at Tündérsziget Ökopark in Dunasziget, Hungary, is a living outdoor classroom developed within the trans4num project. Through three full-depth soil profiles, visitors can directly observe authentic soil layers, root systems, and biological activity beneath the surface. Together with the trans4num NBS Tools, the installation creates a complete learning journey that connects hands-on experimentation with real-world landscape processes, making soil health and nature-based solutions tangible for diverse audiences.

The need

Healthy soils are fundamental for food production, water management, biodiversity, and climate resilience. However, most soil processes occur underground and remain largely invisible, making them difficult to understand and appreciate.

In the Szigetköz region, centuries of river regulation and water management have significantly altered the natural floodplain landscape and influenced soil development. Understanding how soils function, how roots shape soil structure, and how agricultural practices affect long-term soil health is essential for promoting sustainable land management.

There is therefore a need for educational tools that can transform complex soil processes into visible, understandable, and engaging learning experiences.



The benefits

The Soil Profile Display helps visitors see what is normally hidden beneath their feet.

Key benefits include:

- Visualising soil horizons and natural soil formation processes.
- Demonstrating the role of roots in soil regeneration and structure development.
- Showing the impacts of crop rotation, cover crops, legumes, and deep-rooting species.
- Increasing awareness of soil biodiversity and biological soil functions.
- Supporting practical learning about nature-based solutions.
- Encouraging sustainable agricultural practices and soil stewardship.
- Providing an engaging educational environment for schools, farmers, advisors, and policymakers.

The installation transforms soil science from an abstract concept into a direct and memorable experience.



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trans4num solution

The outdoor classroom consists of three excavated soil profiles located beside the Szigetköz Experience Centre. The profiles were excavated to a depth of 230 cm and carefully preserved behind reinforced glass panels, allowing visitors to observe authentic soil layers and living root systems throughout the year.

Each profile is planted annually according to crop rotation principles and showcases different crop groups:

- Deep-rooting crops such as maize and sorghum.
- Nitrogen-fixing legumes such as lucerne and berseem clover.
- Cereals such as winter wheat and sand oats.
- Companion plants and cover crops that enhance soil biological activity.

The site is maintained using nature-based management practices including no-till cultivation, cover cropping, mulching, and compost application.

The Soil Profile Display forms an integral part of the wider trans4num NBS Tools ecosystem. The mobile toolkit acts as a portable laboratory, allowing participants to explore processes such as water infiltration, erosion, compaction, and soil structure through simple experiments. The outdoor classroom then reveals these same processes in a living landscape context. The relationship works in both directions:

1. From mobile to field

- The NBS Mobile Tools introduce key concepts through hands-on experimentation.
- Visitors arrive at the soil profiles already understanding ideas such as root functions, compaction, biological activity, and water movement.

2. From field to mobile

- Observations made at the soil profiles generate questions that can be explored through experiments using the mobile toolkit.
- Demonstrations such as rainfall simulation and soil compaction testing help explain the processes visible within the profiles.

Together, the two systems create a complete learning arc that connects controlled experiments with real-world ecosystems.

What were the challenges / limitations in the implementation process?

- Excavation and profile stabilisation require specialised expertise
- Long-term maintenance is needed to preserve soil structure and visibility
- Seasonal crop management is necessary to maintain educational value
- Interpretation and facilitation are essential to maximise learning outcomes

What kind of resources do you need to implement the proposed solution?

- Excavation and construction materials
- Reinforced glass viewing panels and protective covers
- Annual crop establishment and maintenance
- Educational interpretation materials
- Trained facilitators and educators
- Access to complementary NBS Mobile Tools for integrated demonstrations

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Educational Experience

The Soil Profile Display outdoor classroom has successfully engaged:

- Kindergarten and primary school children
- Secondary school students
- Teachers and educators
- Farmers and agricultural advisors
- Gardeners and allotment holders
- Policymakers and decision-makers
- Visitors to the Ökopark

The soil profiles demonstrate that soil is a living system with a continuous capacity for renewal when biological processes are supported. They highlight the importance of considering soil biology alongside physical and chemical soil properties.

One of the most innovative aspects of the trans4num NBS Tools approach is the integration of the mobile toolkit with permanent demonstration sites such as the Soil Profile Display. Rather than offering isolated educational tools, the project provides a connected and scalable knowledge system that helps people understand the relationships between soil, water, farming practices, and ecosystem health.

Rooted in the soils of the Szigetköz region, this model can be adapted and replicated across Europe to support learning and adoption of nature-based solutions.

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