

# OPPORTUNITIES FOR RECREATIONAL AND EDUCATIONAL USE OF THE WATER UTILITY TECHNICAL SITE

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## Abstract

Technical sites represent a specific category of urbanized environments traditionally perceived primarily through their production or infrastructural functions. At the same time, these areas may offer considerable potential for the development of public spaces. This paper examines the opportunities for recreational and educational use of the technical facilities of a water utility company located in Nitra, Slovakia. The proposed design applies three key spatial components: an exhibition of technical elements related to water management, a water body with a wetland biotope, and a recreational zone intended to support active forms of leisure. Water serves as the central design motif, functioning as both a landscape-forming and interpretative element. Installations created from authentic water utility components, together with educational features and ecological interventions, communicate the importance of water resources, the functioning of water supply infrastructure, and the need to protect aquatic environments.

**Key words:** museum, park, sport activities, vegetation, wetland

## Introduction

The transformation of industrial sites into public spaces has become a central topic in contemporary landscape architecture and urban regeneration discourse. A dominant strategy is adaptive reuse (Song et al., 2024), aimed at preserving significant physical structures while enabling their functional reinterpretation. Another widely applied approach is the development of multifunctional public landscapes (Lu & Nasir, 2024), where former industrial sites are reprogrammed to support recreation, environmental education, and community activities. In this context, ecological restoration and landscape regeneration also play a crucial role, particularly through the implementation of green infrastructure, ecosystem restoration, and the improvement of environmental quality. Overall, current research indicates that successful transformations rely on integrated, multidisciplinary approaches combining heritage preservation, ecological design, and recreational programming.

The aim of this study is to explore the possibilities of transforming the technical infrastructure of a water utility site in Nitra into an open recreational and educational landscape, while preserving its historical and functional identity.

## Material and methods

The study area of the water utility site is located in the city of Nitra (Figure 1), within the cadastral area of Staré Mesto, in proximity to the Sihot' urban park and a football stadium. The site is directly connected to the Nitra–Dražovce cycling route and the R1A expressway, ensuring good accessibility within the city as well as the wider region.

From an urban planning perspective, the area represents a development zone designated for the construction of a new urban district (City of Nitra, 2018).

Future development is expected to involve the gradual expansion of the urban area and its transformation into a fully urbanized zone with new functions and infrastructure.

The site contains three water supply wells. Soil conditions are influenced by fluctuations in the groundwater table, which increases the ecological value of the area and its importance for water resource protection. Clay-rich soils prone to waterlogging are present due to the high groundwater level. The natural vegetation is represented by ash–elm–oak floodplain forests (*Ulmion*), typical of alluvial habitats affected by flooding and groundwater dynamics.

In 1950, the area was predominantly used as arable land (Figure 2, right). Over subsequent decades, changes in land use led to natural succession, resulting in the restoration of meadows and the gradual development of floodplain communities (Figure 2, center and left), as well as the recovery of habitats for wildlife.

Climatically, the area belongs to a warm lowland region characterized by long, warm, and dry summers and short, moderately warm to dry winters. The mean annual temperature is 10.05 °C, the annual precipitation ranges from 500 to 600 mm (Lapin et al., 2002).

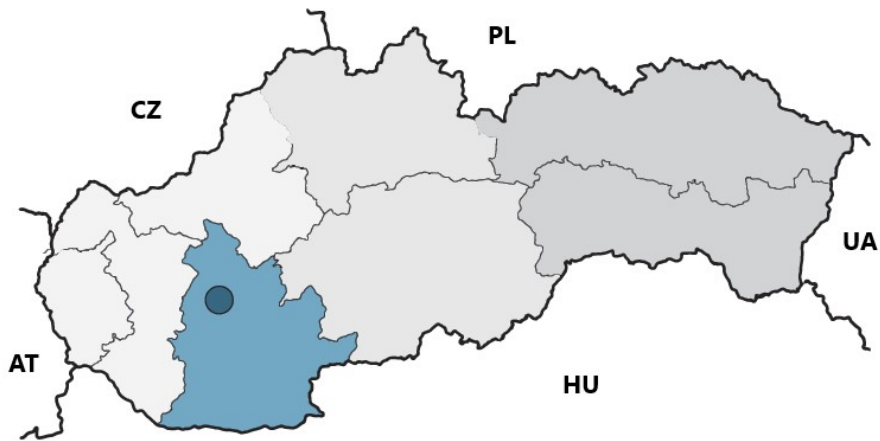


Fig. 1: Location of town Nitra (dark circle) in the Nitra Self-Governing Region (blue) in Slovak Republic

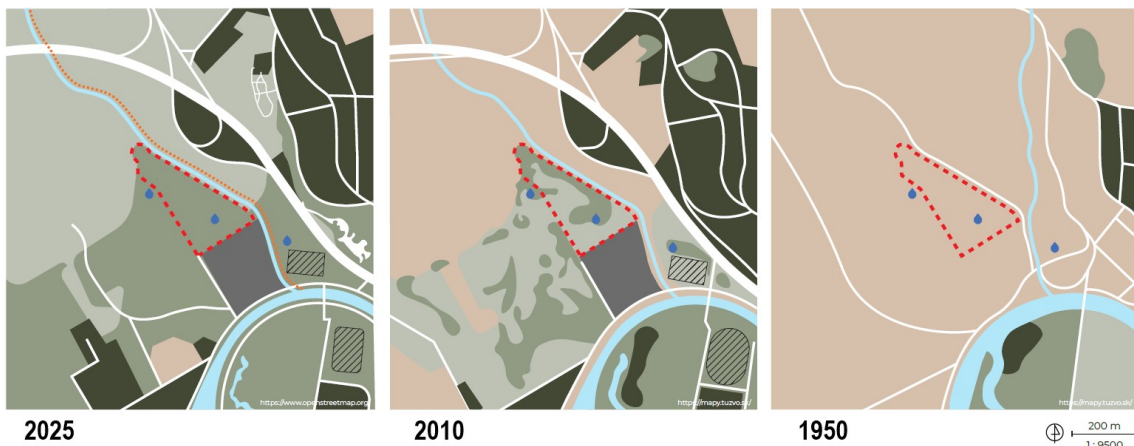


Fig. 2: Changes in the landscape structure of the study area: arable land (brown), meadows (light green), non-forest woody vegetation (green), built-up areas (dark green), water management company premises (grey), sports facilities (hatched), boundary of the study area (red line), cycling route (orange line), three wells (blue droplets), and the Nitra River channel (light blue).

The study area, covering 1.92 ha, is adjacent to administrative and technical facilities of the water utility company. In 2025, most of the vegetation cover was removed, and the site was enclosed with a single entrance. Several elements of technical infrastructure that no longer serve their original function have been preserved, including pipelines, valves, a hydrant structure, and disused electrical lines. The original woody vegetation consists of *Fraxinus excelsior*, *Populus* sp., *Salix × fragilis*, *Juglans regia*, *Cerasus avium*, *Rhamnus catharticus*, and *Robinia pseudoacacia*.

The conceptual design was developed as part of a studio-based project by students of the Institute of Landscape Architecture at the Slovak University of Agriculture in Nitra. Students worked in groups to develop various design concepts, exploring the transformation of the technical site into an open recreational and educational landscape integrating cultural, ecological, and sports functions.

The methodology is based on pre-design research, which, through the analysis of spatial relationships, historical context, and functional conditions, aims to identify site constraints and potentials. Subsequently, a research-by-design approach was applied to address the research question: “How can closed technical infrastructure be transformed into a public space without losing its historical identity?”

## Results

The design is based on the transformation of a technical water utility site into an open recreational and educational landscape. Water functions as a key structuring and interpretative element, organizing the spatial composition while conveying the site’s content and meaning. The integration of artistic, ecological, and recreational components creates a multifunctional environment supporting diverse uses.

The landscape architectural concept is structured around three interconnected components: an outdoor museum exhibition, a water body with a wetland habitat, and a sports and recreational zone designed for active use (Figure 3).



Fig. 3: Functional activity zones in the design area. Entrance zone – water museum exposition (Exhibition), large running loop and outdoor workout area (grey). Wetland – presentation of aquatic and wetland vegetation, Ropeway – a play element for children. Cycling routes and infrastructure (dark grey). Pumptrack – a closed-loop terrain circuit (Authors: Králik, Molnárová, Flórová; Supervisors: Kuczman & Paganová, 2025)

The water museum exhibition is conceived as the main प्रवेश area to the site and represents its technical and industrial identity. Water infrastructure components—pipes, valves, fittings, and pumps are presented as technical artefacts, some of which are artistically reinterpreted. The exhibition enables visitors to perceive the functionality, design, and development of water infrastructure systems. In its immediate vicinity, a training polygon is designed to support the practical skill development of water utility employees.

In the central part of the site, the wetland zone is established (Figure 4), where water acts as a key landscape-forming element shaping local ecosystems and habitats. The water body and adjacent wetland communities perform ecological and microclimatic functions while enabling direct environmental learning.

Elevated walkways, footbridges, and seating, complemented by interpretative panels, are arranged along the water features. The central zone (Figure 3) also includes a rope playground (Ropeway) supporting the development of motor skills and balance in children. Together with a small running loop (500 m), it promotes active use of the area, connects natural settings with physical activity, and balances recreational and educational functions.

The “Pumptrack” represents an intensively used sports and recreational zone for cycling. It is located in the peripheral part of the site and is accessible via a dedicated cycling route. Vegetation elements, including lawns and meadow areas, soften the visual character of the sports infrastructure, while planted trees provide shade and improve microclimatic conditions.

The entire site is equipped with cycling infrastructure ensuring continuous and functional use. In addition to paved cycling routes and unpaved running paths, open areas are designed as meadow vegetation. Larger areas consist of commercially established flowering meadow mixes managed

through regular mowing. These areas support pollinators and small fauna and contribute to increased ecological diversity.

The design creates a multifunctional landscape that supports recreational, educational, and ecological functions, integrates technical heritage, and enhances environmental awareness among visitors.



Fig. 4: Visualization of the wetland habitat zone for recreation, nature observation, and environmental education, featuring elevated timber walkways, seating, and meadow areas with sun loungers. (Authors: Králik, Molnárová, Flórová; Supervisors: Kuczman & Paganová, 2025)

### Discussion and Conclusion

The successful transformation of industrial sites is dependent on the integration of technical infrastructure with natural systems, resulting in multifunctional recreational landscapes with a strong sense of place (Čibík et al., 2019, 2022). This shift expands the discourse from purely architectural adaptation toward landscape-based and systems-oriented thinking (Bellérová & Hus, 2025; Žolobaničová et al., 2025). Transformations commonly combine cultural interpretation, recreational infrastructure, and green spaces, thereby enhancing both spatial usability and social interaction (Lu & Nasir, 2025).

Within this context, interpretation and creative placemaking are key strategies for maintaining the identity of industrial heritage. The reuse of authentic water infrastructure components, together with artistic and interpretative interventions, enabled the communication of historical narratives while supporting contemporary public use.

The findings of this study demonstrate that the transformation of technical water utility infrastructure into a public space can be achieved without the loss of its historical identity. This is enabled through the integration of three complementary approaches: the preservation and reinterpretation of technical elements, the incorporation of ecological structures, and the introduction of recreational functions. Together, these strategies allow the site to retain its technical character while being redefined as a multifunctional landscape for contemporary urban use.

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### Souhrn

Tato studie se zabývá přeměnou areálu vodárenského podniku v Nitře na Slovensku na otevřený rekreační a vzdělávací prostor při zachování jeho historické identity. Výzkum vychází ze současných přístupů k regeneraci průmyslových areálů, včetně adaptivního opětovného využití, multifunkčního krajinářského návrhu a ekologické obnovy. Byla použita metodika „research-by-design“, kombinující analýzu lokality s koncepčním návrhem krajiny. Navrhované řešení je strukturováno kolem tří propojených komponent: venkovní expozice představující dědictví vodního hospodářství, ekologická zóna založená na mokřadech a sportovní a rekreační oblast. Voda slouží jako ústřední prvek utvářející krajinu a sloužící k interpretaci, který propojuje technické, ekologické a sociální funkce. Návrh integruje zachované prvky infrastruktury, biotopy podporující biologickou rozmanitost a rekreační zařízení, čímž vytváří multifunkční veřejný prostor. Výsledky ukazují, že transformace technické infrastruktury na přístupné veřejné krajiny lze dosáhnout integrací zachování dědictví, ekologického designu a rekreačních programů. Tento přístup umožňuje zachovat technický charakter lokality a zároveň reagovat na současné městské potřeby a podporovat environmentální povědomí.

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