agriCULTURAL landscapes

30 years of landscape architecture education in Nitra

BOOK OF ABSTRACTS

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DIGITAL LANDSCAPE TWINS AND BIM: TOOLS FOR ECOLOGICAL SIMULATION AND INNOVATION IN LANDSCAPE PRACTICE

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As landscape architects respond to the challenges of biodiversity loss, climate change, and urban transformation, new digital tools are redefining the way we design, simulate, and manage landscapes. This abstract presents an emerging body of innovative practice that integrates Digital Landscape Twins and Building Information Modelling (BIM) into the core of landscape architecture.

Digital Landscape Twins offer real-time, data-rich models that simulate ecological processes, plant growth, seasonal dynamics, and environmental performance. When paired with BIM—used to organise spatial, botanical, and material data into a coherent system—they enable a form of landscape practice that is predictive, iterative, and grounded in ecological intelligence.

This approach supports a new generation of multifunctional and responsive landscapes. Practitioners can simulate a planting strategy's evolution over time, test species combinations for biodiversity gains, or evaluate microclimatic effects through seasonal leaf cover. By modelling plant behaviour (e.g., shading, evapotranspiration, root depth, flowering cycles) within digital twins, designers can anticipate how landscapes perform in time—not just how they look at the moment of completion.

Moreover, this method allows for design at eye level. Using real-time visualisation tools (e.g., Unreal Engine, Rhino, or Twinmotion), designers can inhabit their proposals, testing spatial experience, perception, and accessibility. This immersive dimension enhances human-centred design, reinforcing the social and cultural relevance of ecological interventions.

Digital Landscape Twins are not just representational—they are operational. They enable dynamic collaboration between disciplines (e.g., ecology, engineering, architecture), allowing design teams to coordinate complex landscape systems with precision and foresight. BIM-based workflows structure the project from concept to construction and maintenance, linking spatial form to performance data, materials, and life-cycle costs.

Across Europe, these tools are now being used in public space redesigns, agroecological projects, climate parks, and biodiversity corridors. They are particularly powerful in scenarios where multiple futures must be imagined and tested—such as urban flooding, habitat fragmentation, or soil regeneration. In each case, the combination of digital twin simulation and BIM-driven design opens space for experimentation, iteration, and dialogue.

In sum, the integration of Digital Landscape Twins and BIM in landscape architecture marks a shift from drawing-based to system-based practice. It enhances our capacity to intervene in complex, living systems with clarity, rigour, and imagination—pushing the boundaries of what landscape architecture can do in an era of planetary urgency.