Applying the Digital Twin Concept to Ecological Reality: Challenges and Lessons Learned

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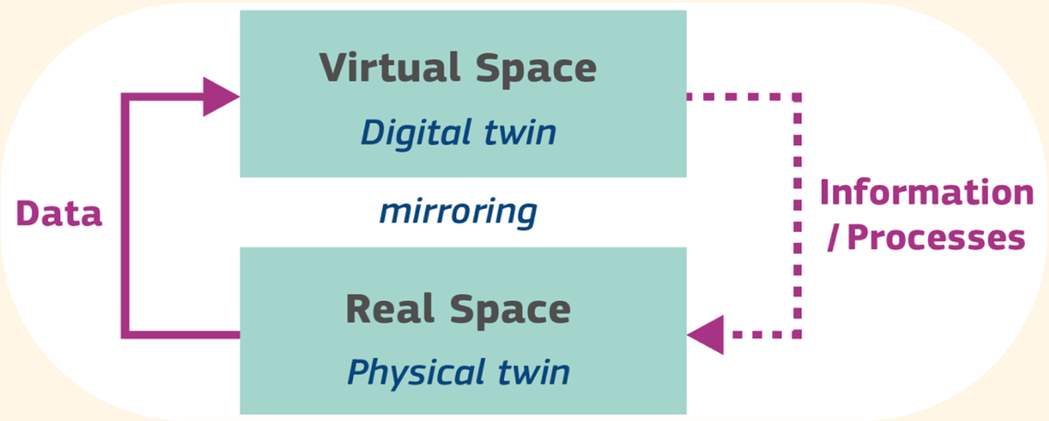
Why build a digital twin?

Digital twins are dynamic, synchronised digital representations of real-world entities and processes.



As the pressures of environmental degradation mount, there is an urgent need for innovative tools that can accurately and reliably monitor, forecast, and inform management of ecosystems and their associated cultural ecosystem services.

Digital twins (DTs) have emerged as a promising technology to address this gap.

Challenges

The definition of a digital twin depends on who you ask. DTs originated in engineering and have been translated to other domains such as ecology. Their meaning can vary widely, reflecting the diverse ways they are applied.

Digital twins require complex infrastructure. DTs are live services comprising of dataflows, models, workflows, data, user interfaces, and external connections.

Most ecological models are not digital twin ready. To build digital twins we need models that are containerised, scalable, reproducible, FAIR, and workflow-ready.

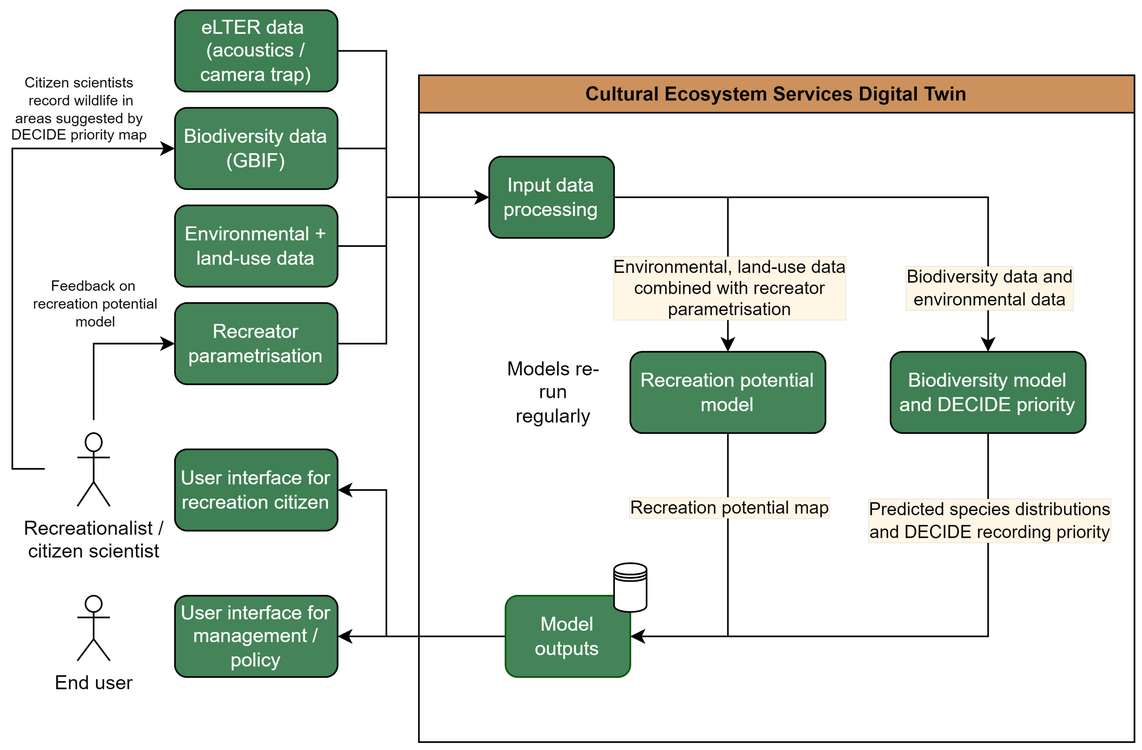
Lessons learned

Digital twins are as much a platform for innovation, not the technical end goal. Use them as catalysts for research and practical problem-solving, not a box ticking exercise.

Building digital twins is interdisciplinary, and interdisciplinarity is hard. By bringing together diverse expertise we can foster collaboration across fields and bridge differences in methodologies, languages, and perspectives.

Our prototype digital twin

A digital representation of the cultural ecosystem services. The pDT provides personalised insights for recreationalists and supports the management of cultural ecosystem services.



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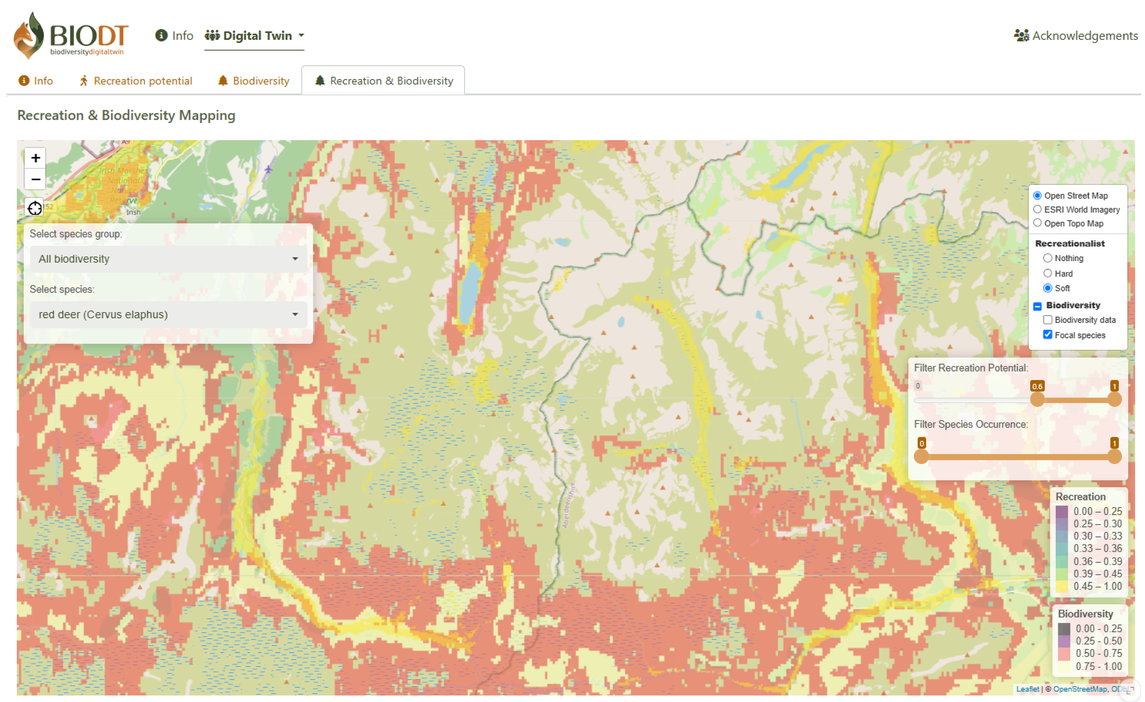

Try out the BioDT graphical user interface. The interface combines interactive layers, filters, and data visualisations to explore recreation potential and species distributions in the Cairngorms National Park.

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