BIODT
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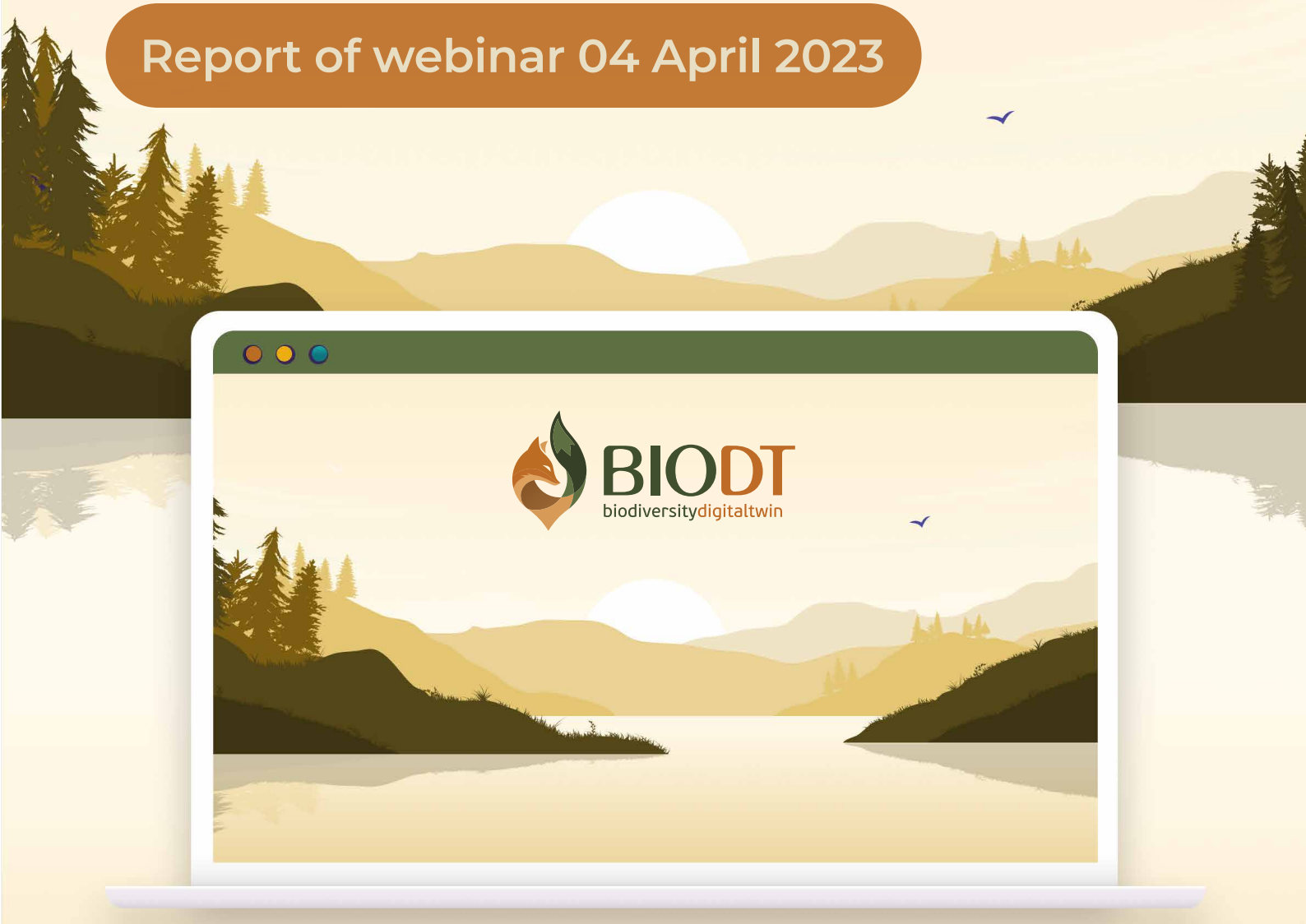
Digital Earth Twins
to build resilience to climate change

Report of webinar 04 April 2023



Investing in our planet with digital twins to tackle climate change and protect biodiversity

In the wider context of Earth Day 2023, BioDT hosted the webinar "Digital Earth Twins to build resilience to climate change" on 4 April 2023. During the event, the project team had the chance to introduce the Destination Earth initiative and take a closer look at the expanding ecosystem of projects working on digital twins, addressing key challenges such as climate change and biodiversity protection.

This year's Earth Day theme ("Invest in our planet") urges decision-makers to concretely steer the transition towards a sustainable future for our planet by tackling pressing environmental issues, including climate change, biodiversity loss, and waste reduction. The Destination Earth (DestinE) initiative promoted by the European Commission fits this global effort, funding the development of thematic digital twins that enable scenario simulations, predictions, and bio-monitoring methods, which will enable researchers and other users to better address these challenges and improve predictive performance in biodiversity management.

Why does the European Commission support the development of a Digital Twin of the Earth?

Christian Kirchsteiger, European Commission DG Connect, opened the webinar with an insightful explanation of why it is crucial for the European Commission to support the development of Earth Digital Twins. In particular, he explained that the EC is sponsoring the development of a digital twin of the Earth through Destination Earth, in a bid to **monitor**, **simulate**, and **predict natural phenomena** and the **impact of human activity on the planet**. The initiative aims to create a highly accurate digital model of the Earth to enable evidence-based decision-making in the face of climate change and other environmental challenges.

BioDT and DestinE: collaboration to strengthen the development of Digital Earth Twins

The second part of the webinar aimed at presenting BioDT and DestinE and how the two initiatives can benefit from mutual cooperation. ***Jesse Harrison***, *Senior Data Scientist at CSC and BioDT Project Manager*, opened this session by presenting the BioDT project: a Research and Innovation initiative that aims to extend the digital twin concept to biodiversity research, observing changes in biodiversity and understanding why they occur. The project aims to improve predictive biodiversity modelling and provide infrastructure for long-term biodiversity research, meeting EU biodiversity strategies, global frameworks, and United Nations Sustainable Development Goals. The team is building and deploying a prototype platform compatible with multiple supercomputing systems, with a range of prototype digital twins, such as species response to environmental change, genetically detected biodiversity, invasive and endangered species, and disease outbreaks. The project seeks to improve the predictive performance of models and integrate with biodiversity research infrastructures to reach new user communities.

Harrison's presentation was followed by the one by ***Thomas Geenen***, *Technology Partnership Lead for Destination Earth*, provided a general overview of this initiative. Geenen, in particular, strengthen its main objectives: Destination Earth aims to develop a digital twin of the Earth, consisting of a high-resolution, highly interconnected model of the planet, with real-time data and observations feeding in. The project will develop multiple digital twins, including ones focused on extreme events and climate change adaptation scenarios. The digital twins will interact with each other and with humans, and will be highly configurable and interactive. The initiative is being led by multiple consortia and trusted entities, being responsible for the actual implementation of three digital twins. While the initiative is highly technical and involves complex systems and data, it also has implications for the wider digital ecosystem, including biology. The project will involve collaboration between different research infrastructures and data lakes, including Bio-indicators and the Euro HPC systems.

This session was closed by ***Jeroen Broekhuijsen***, *Team Lead Digital Factories at TNO*, who stressed the distinction between science and use cases, explaining that while digital twins are usually used in engineering work, researchers and scientists want to capture and understand real-world phenomena. Broekhuijsen highlighted the big questions that digital twins could help answer, such as how climate change will affect biodiversity and what can be done to mitigate biodiversity loss. He also discussed the challenges of transitioning from loosely coupled digital twins to embedded or tightly coupled twins, and identified four groups of users for digital twins: scientists, policymakers, industry, and civil society and citizen scientists. The EU has several projects in progress, such as the Biodiversity Digital Twin, the Digital Twin of the Ocean, and InterTwin, which are creating prototype twins that will be linked to the Destination Earth program. Jeroen concluded his presentation by emphasising the need to discover how to make digital twins practical for end users and translate the science into real-world applications. In order to achieve this objective, it is vital for the digital twin projects to collaborate effectively.

Panel discussion on the role played by digital twins on green deal & EU digital strategy

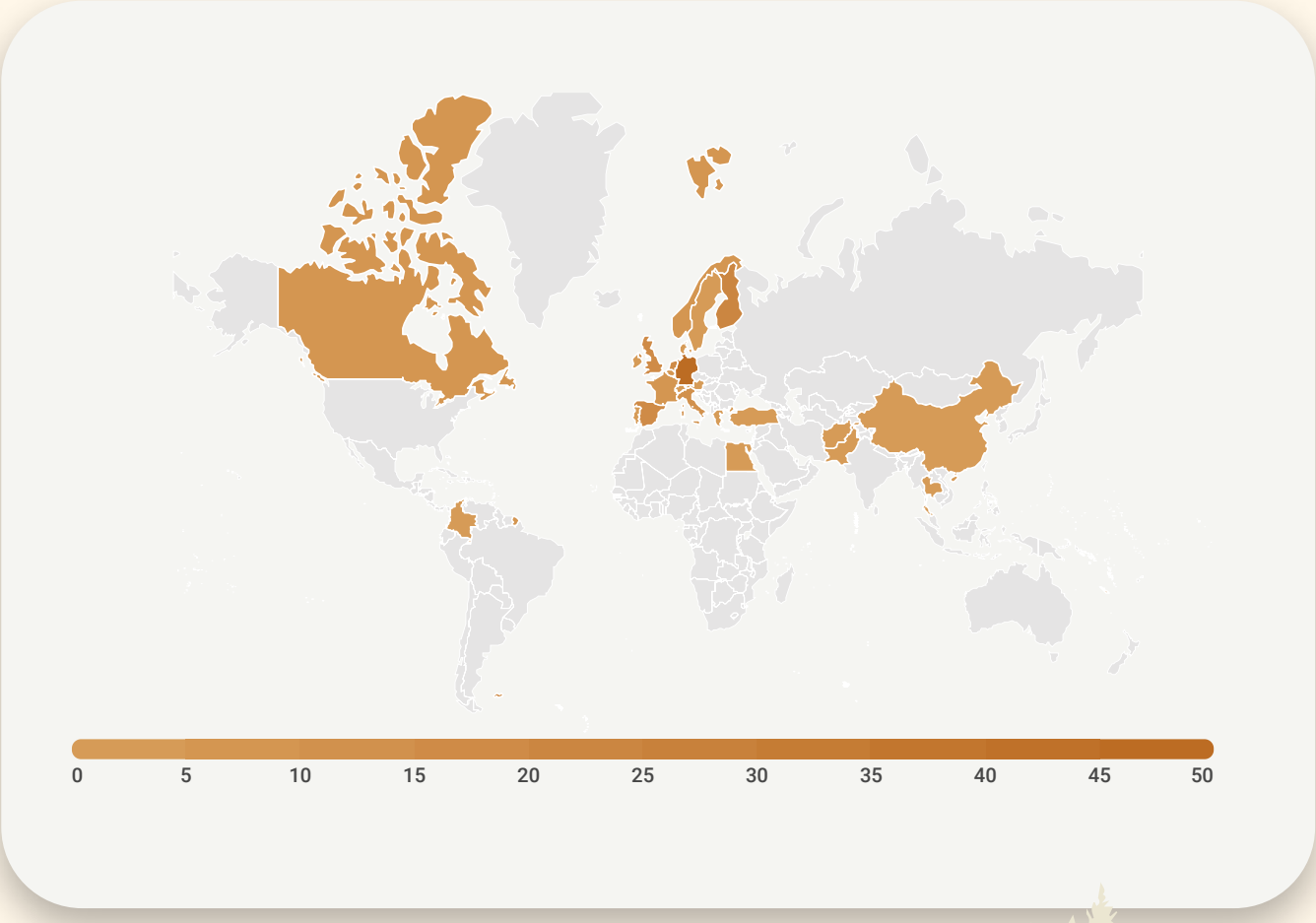
The panel discussion was moderated by ***Jeroen Broekhuijsen*** and featured ***Jesse Harrison, Thomas Geenen, Jenni Kontkanen***, *Development Manager at CSC and Climate DT project manager*, and ***Marina Tonani***, *Ocean Forecast Expert at Mercator Ocean and EDITO project partner*.

The discussion focused on challenges of bridging the gap between scientific modelling and non-scientific end-users and the importance of organising the information produced in a way that is accessible and understandable for these users. All the experts agreed that it is a delicate aspect that requires collaboration and identification of the correct level of information, vocabulary, and constraints that should be linked with all the knowledge that will be made available.

The panellists also discussed the challenges of creating and maintaining digital twins, especially in relation to sustainability and climate change. One challenge is the need for high computing power to run high-resolution simulations, as well as the challenge of handling the huge amounts of data generated. Another challenge is the need to adapt different models and datasets to work together and to be integrated into high-performance computing infrastructure. They also highlighted the need for standardisation of data, the importance of time constraints due to climate change, and the difficulty of collaboration and integration of different twins due to their use of different datasets, scales, and programming languages. The panelists concluded the session by mentioning the importance of making these models publicly available and accessible through platforms like EOSC.

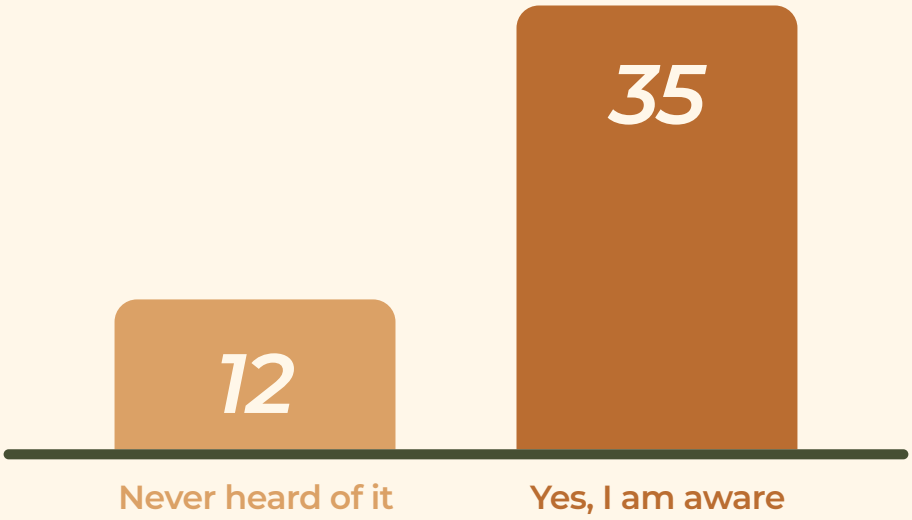
Interactive session with the audience

The “Digital Earth Twins to build resilience to climate change” webinar saw 96 attendees from 29 countries.



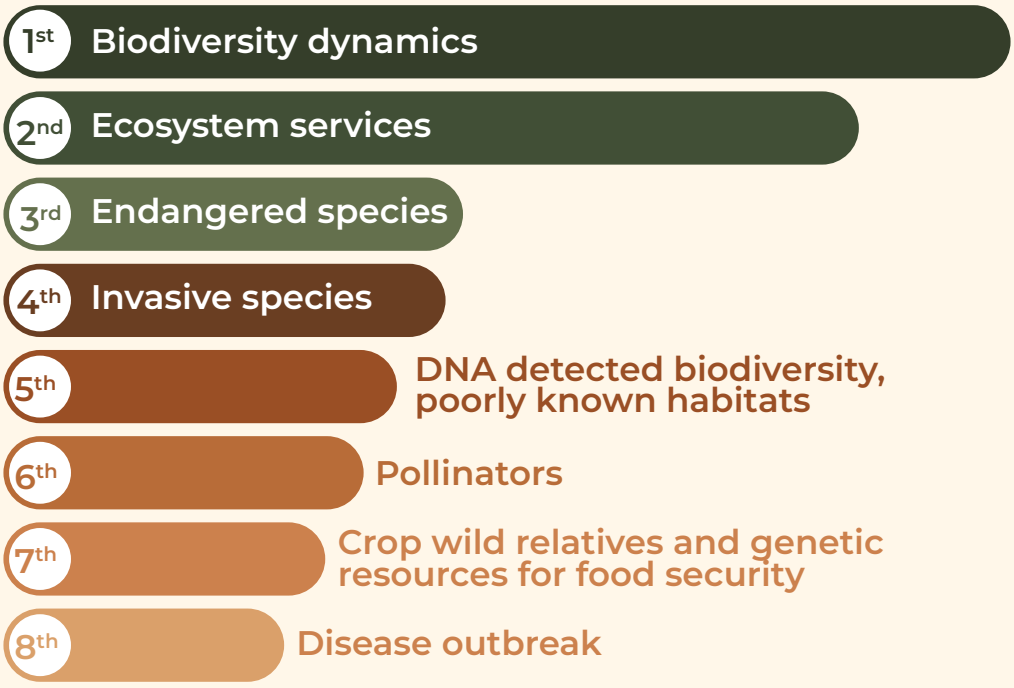
During the event, participants were asked a series of questions to understand their familiarity with the topics connected to the concept of digital twins. The following graphs show the main findings and takeaways from the surveys. The session has been moderated by ***Rita Giuffrida***, *Researcher at Trust-IT Services*.

Have you ever heard of the Destination Earth initiative?



Which topics are more relevant for your research?

(rank them from the most to the less relevant)



Which UN SDG benefit the most from Digital Twins of the Earth?

Conclusions and next steps

The main technical advancements of the BioDT use cases are going to be presented in a series of dedicated workshops and webinars in 2023 - 2024.

Follow BioDT on the main project's social media channels and visit the website to follow the development steps of the use cases.

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In the meantime, we invite you to watch the webinar recording on the BioDT YouTube channel.

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