



Forest Digital Twin Component

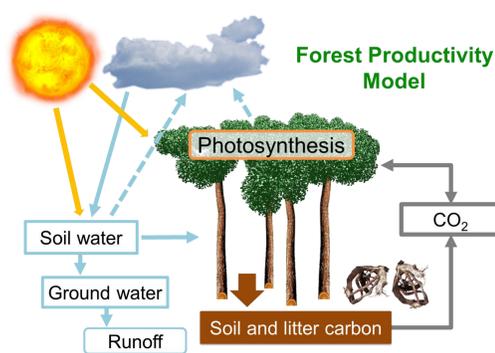
Authors Renne Tergujeff (VTT) and the Forest DTC team

Forest Digital Twin Component

Within the **Digital Twin Earth** programme of the European Space Agency ESA, a team led by VTT is building the **Forest Digital Twin Component (DTC)**. Forest DTC targets to enable an advanced reconstruction of the present and potential future evolution of the world's forests, at a resolution relevant to forest users and decision-makers.

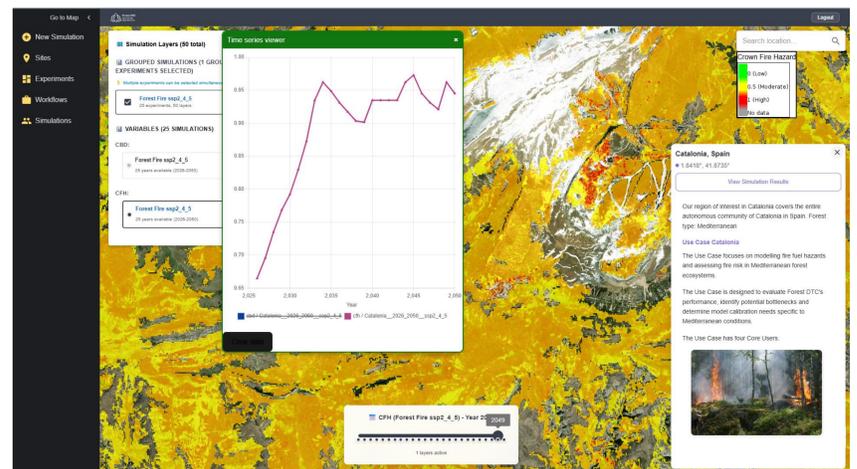
Forest DTC includes **physical models, AI-based emulators and processing subsystems** and interfaces that connect it with EO data, forest information and visualisation tools. The system enables to analyse **what-if scenarios**, helping users to understand how climate variations and forest management policy decisions affect the well-being and carbon stock of forests.

Forest growth and disturbance modelling in Forest DTC is based on forest parameter maps updated with Sentinel-2 earth observation data and daily weather projections from the climate scenarios of the Climate Change Adaptation Digital Twin of the European **Destination Earth (DestinE)** initiative. Forest growth estimation currently uses the process-based Prebasso model. The system will support integration of new models.



Use Cases

The project develops and validates its approaches with the help of four thematic Use Cases: **bark beetle infestation risk** in Czechia, **fire risk** in Catalonia, **forest management** in Finland, and adoption of **new data sources** in the ICOS network forest sites. Core users associated with the Use Cases support the development.



Forest DTC Prototype user interface, showing a map output of crown fire hazard simulation and a 25-year timeline graph of estimated risk development in a point location.

Timeline and synergies

As a mid-term achievement, the project has successfully completed and demonstrated the **prototype Forest DTC** system and initial simulation results to target users and interested stakeholders. The aim is to deliver an independent thematic pre-operational end-to-end system in November 2026. Further, the target is to integrate Forest DTC with the **DestinE Platform**.

Project team

- VTT: coordination, design and specification, impact assessment, outreach, roadmapping and DTC synergies
- Terramonitor: implementation and integration
- Yucatrote: modelling, validation, uncertainty estimation
- GFZ Helmholtz Centre for Geosciences: new data sources
- Global Change Research Institute CAS – CzechGlobe: biotic damages
- Forest Science and Technology Centre of Catalonia (CTFC): fire risk modelling



More information

- Forest DTC: foresttwin.org
- ESA Digital Twin Earth: eof.esa.int/dte/
- Destination Earth: destination-earth.eu