

Destination Earth

Destination Earth (DestinE) aims to develop a high precision digital model of the Earth to monitor and simulate natural and human activity.



DestinE will contribute to the European Commission's Green Deal and digital strategy. It will unlock the potential of the digital modelling of the Earth's physical resources and related phenomena. For example, modelling climate change, water and marine environments, polar areas, and the cryosphere (parts of the Earth's surface where water is found in solid form).

DestinE models are made on a global scale. They can help speed up the green transition and predict major environmental degradation and disasters. By opening up access to public datasets across Europe, DestinE represents a key component of the European strategy for data.

Users will be able to access vast amounts of natural and socio-economic information in order to:

- Continuously monitor the health of the planet. For example, to study the effects of climate change, the state of the oceans, the cryosphere, biodiversity, land use, and natural resources.
- Support EU policy-making and implementation. For example, to assess the impact and efficiency of environmental policy and relevant legislative measures.
- Perform high precision, dynamic simulations of the Earth's natural systems, focusing on thematic domains such as marine, land, coasts, and atmosphere.
- Improve modelling and predictive capacities. For example, to help anticipate and plan measures in case of hurricanes and other extreme weather events and natural disasters. And, to

contribute to analysing events with a major socio-economic impact.

- Reinforce Europe's industrial and technological capabilities in simulation, modelling, predictive data analytics and artificial intelligence (AI), and high performance computing.

At the heart of DestinE will be a federated cloud-based modelling and simulation platform. This platform will provide access to data, advanced computing infrastructure including HPC, software, AI applications and analytics. It will integrate digital twins — digital replicas of various aspects of the Earth's system — such as weather forecasting and climate change, food and water security, global ocean circulation and the biogeochemistry of the oceans, and more.

It will allow users to access to thematic information, services, models, scenarios, simulations, forecasts and visualisations. The platform will enable application development and the integration of users' own data. DestinE will initially serve public authorities and gradually open up to scientific and industrial users to spur innovation and enable the benchmarking of models and data.

Implementation

DestinE will be implemented gradually over the next 7-10 years, starting in 2021. The operational core platform —the digital twins and services — is scheduled to be developed as part of the Commission's Digital Europe programme. Horizon Europe will provide research and innovation opportunities that will support the further development of DestinE. The Commission is also exploring options of pooling resources with other EU programmes, such as the Space Programme, and related national initiatives.

Digital twins

A digital twin is a digital replica of a living or non-living physical entity. The digital twins created in DestinE will give expert and non-expert users tailored access to high-quality information, services, models, scenarios, forecasts and visualisations. This includes models of the climate, weather forecasting, hurricane evolution and more. Digital twins rely on the integration of continuous observation, modelling and high performance simulation, resulting in highly accurate predictions of future developments.

Preparing for DestinE

The first stakeholder workshop on DestinE was organised in November 2019. It brought together a large number of potentially interested parties from public authorities and the industrial and scientific communities.

The Joint Research Centre conducted a study on DestinE use cases analysis and a survey on digital twin initiatives in EU countries. This material provided a state-of-the-art analysis of basic requirements for the development of digital twins at the performance levels needed for DestinE. It did so through the integration of user-driven use cases, and an initial mapping of existing developments in Europe in the area of digital twins.

Institutions such as the European Space Agency (ESA), the European Centre for Medium-Range Weather Forecasts (ECMWF) the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), and as the Commission's services and agencies, contributed to this study.

A further series of stakeholder workshops took place in October and November 2020. They covered the elements of weather-induced and geophysical extremes and climate change adaptation

(Summary Report .pdf) and architecture. Following these, a specific policy user engagement workshop was organised in February 2021.

DestinE will be developed gradually through the following key milestones:

- In 2023: Launch of an operational cloud-based enabling platform and the first two digital twins;
- By 2025: Platform integrates 4-5 operational digital twins and offers services to public sector users for developing, monitoring and assessing the impact of proposed policy and legislative measures concerning the environment and climate;
- By 2025-30: Development towards a full digital twin of the Earth through a convergence of the digital twins already offered through the platform

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