

DESTINATION EARTH

USE CASE ENERGY SYSTEMS

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with



- What is Destination Earth?
- How can it contribute to improved climate-energy modelling?

DESTINATION EARTH

A DIGITAL REPLICAF OF OUR PLANET

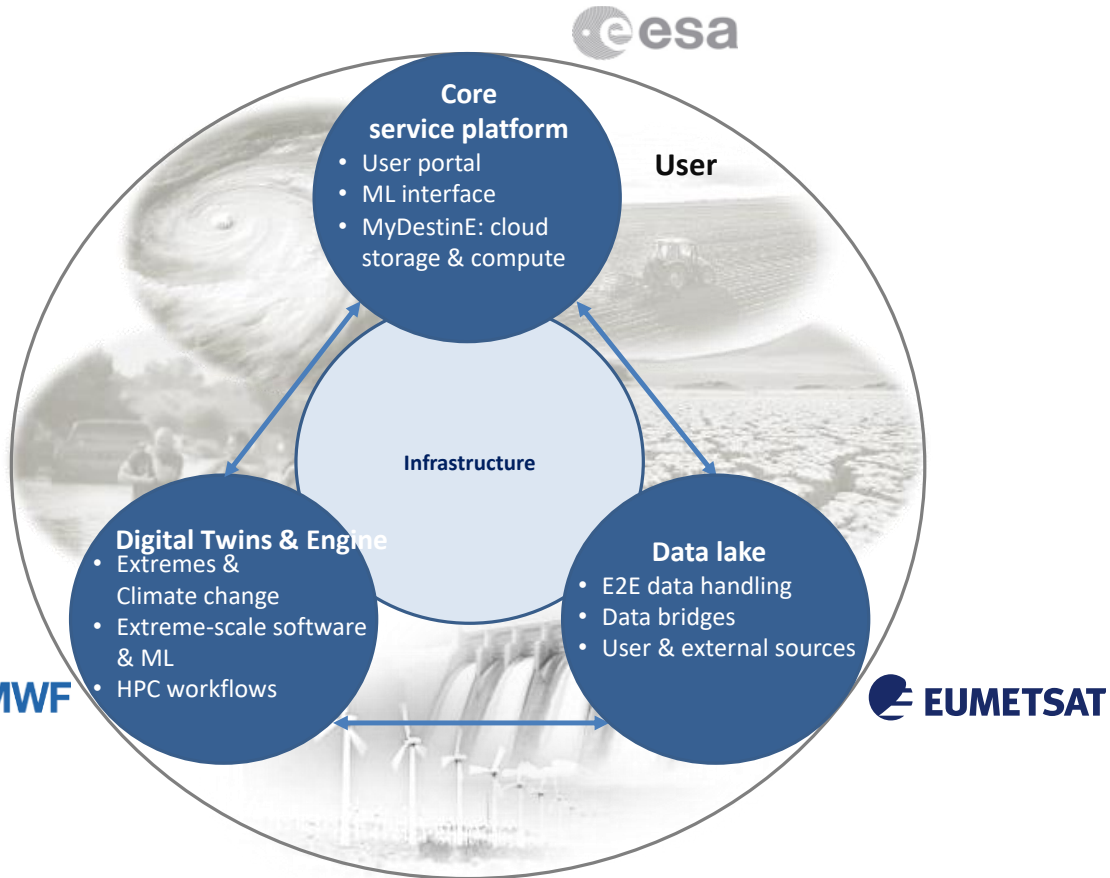
Destination Earth (**DestinE**) aims to develop a highly accurate digital model of Earth to monitor the effects of natural and human activity on our planet, anticipate extreme events and adapt policies to climate-related challenges.



DESTINE IMPLEMENTATION



Governance incl.
external advice



- What is Destination Earth?
- How can it contribute to improved climate-energy modelling?

Integration and Co-Design

From cascaded Earth-system & impact-sector modelling...

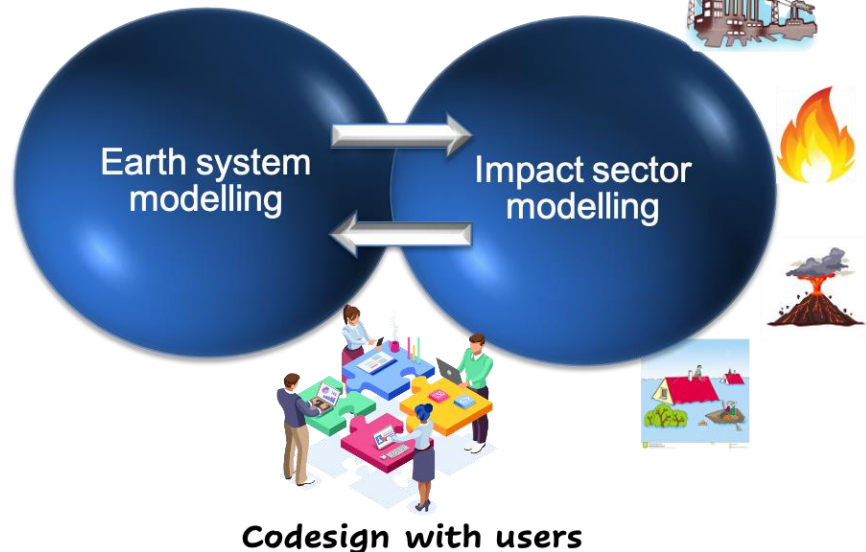


... to integrated Earth-system & impact-sector modelling...

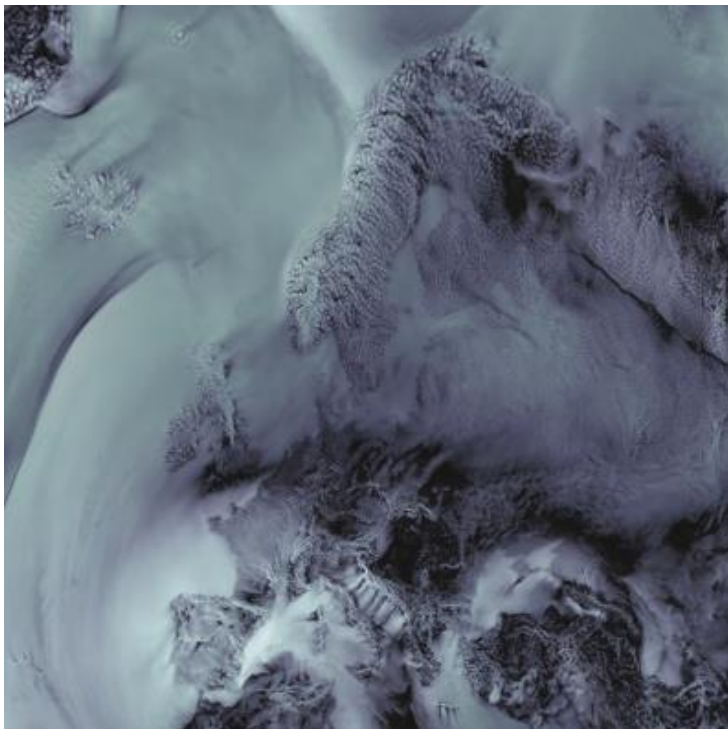
Earth system modelling



Impact sector modelling

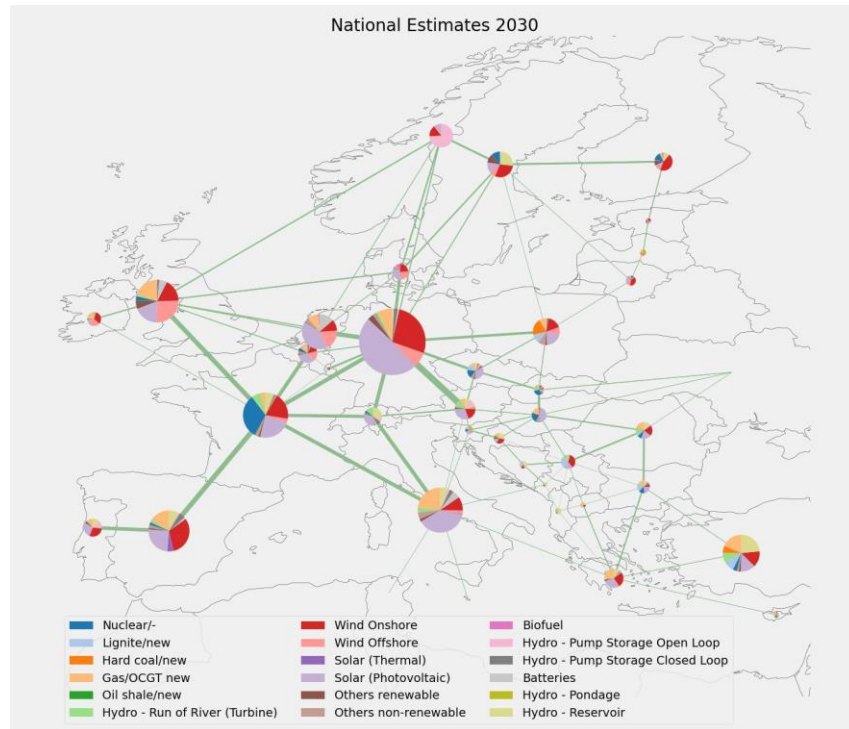


Combining two worlds: Our DestinE Demonstrator



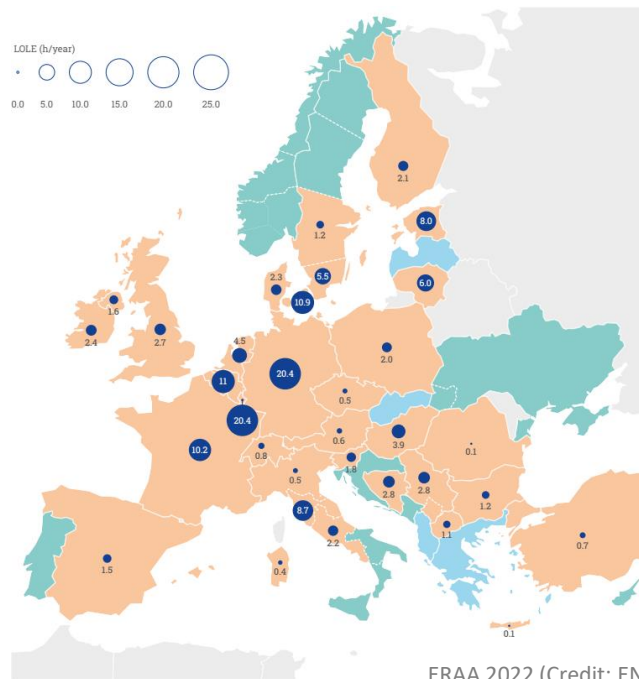
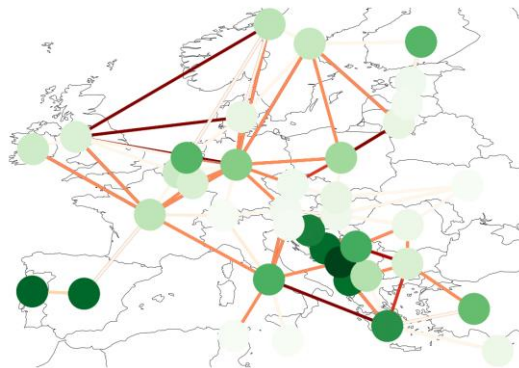
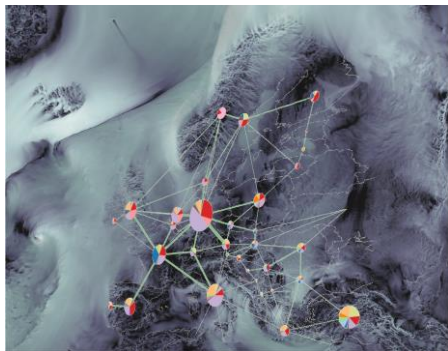
Credit: Nikolay Koldunov (AWI, Visualization), Thomas Rackow (ECMWF, Simulation), NextGEMS project

meteorological information



techno-economical information

Our Demonstrator



From information \longrightarrow through simulation \longrightarrow to impact

User Engagement

survey

user engagement roadmap



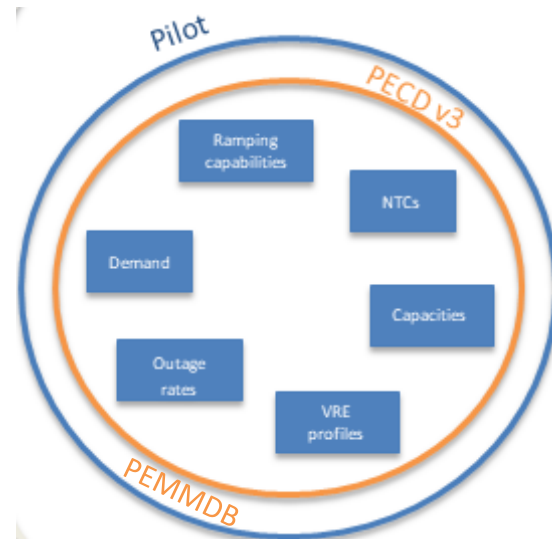
Credit: RGI

user needs workshop

bi-lateral meetings

deep dives

- An open implementation of ENSTO-E's *European Resources Adequacy Assessment*¹
- Based on the recent versions of the *Pan-European Climatic Database* and the *Pan-European Market Modelling Database*
- Available from zenodo² and soon from the official DestinE github repository³
- Maintained in two versions:
 1. Using the open-source version of REMix⁴
 2. Using pypsa⁵



¹<https://www.entsoe.eu/outlooks/eraa/2022/>

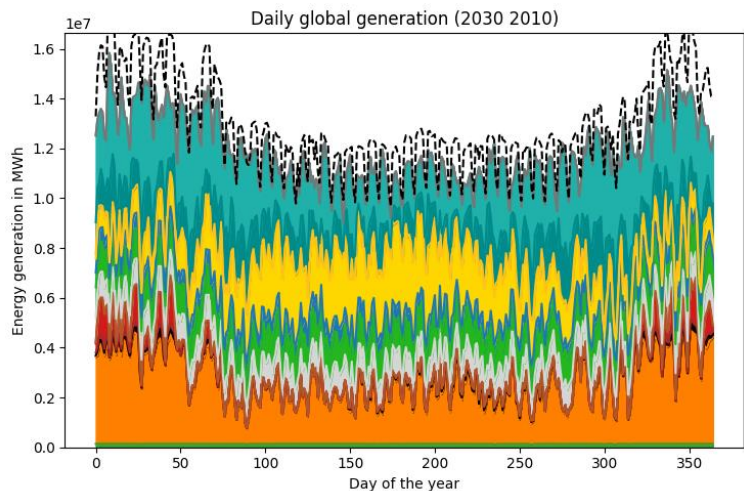
³<https://github.com/destination-earth>

⁵<https://github.com/PyPSA/PyPSA>

²<https://zenodo.org/record/8305799>

⁴<https://gitlab.com/dlr-ve/esy/remix>

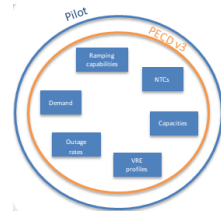
The Pilot



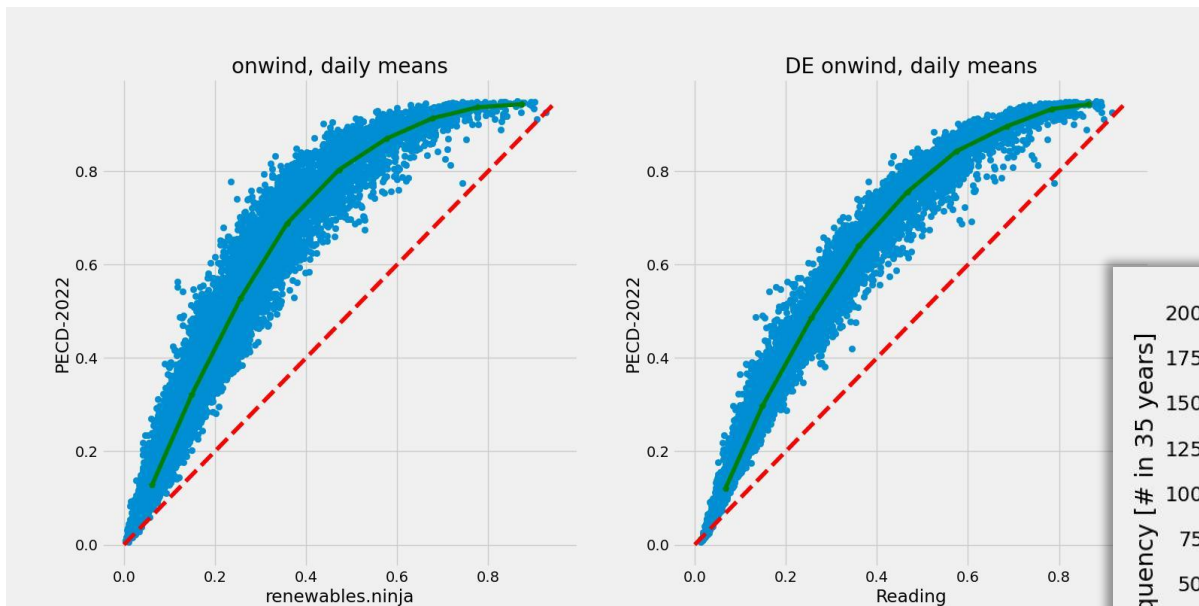
Power dispatch for

- Different climatic years
- Different capacity scenarios (*target years*)
- Different meteorological datasets

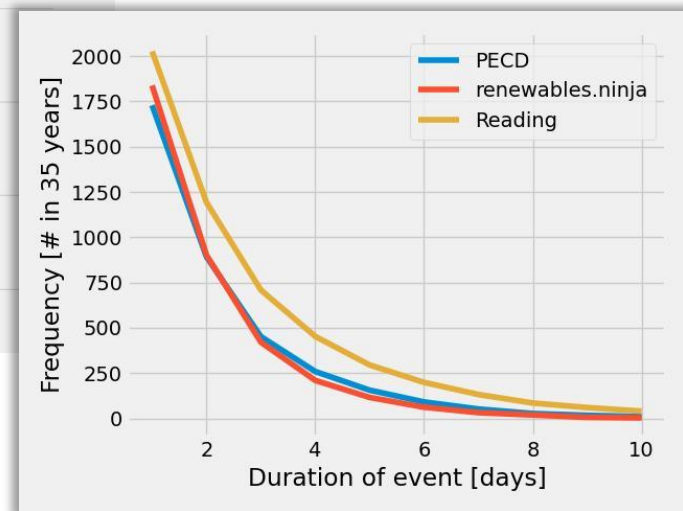




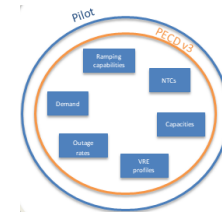
Comparing different meteorological datasets



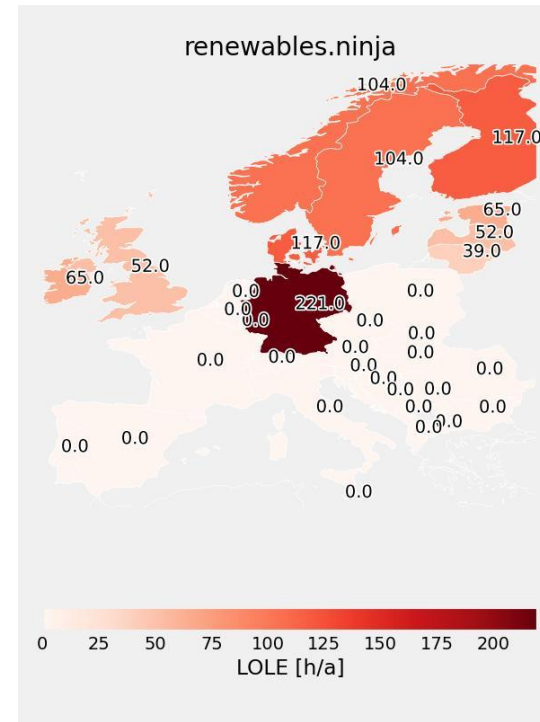
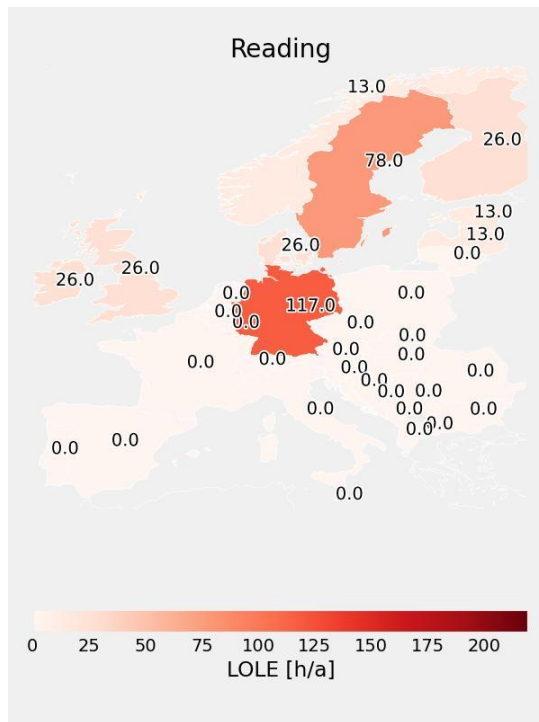
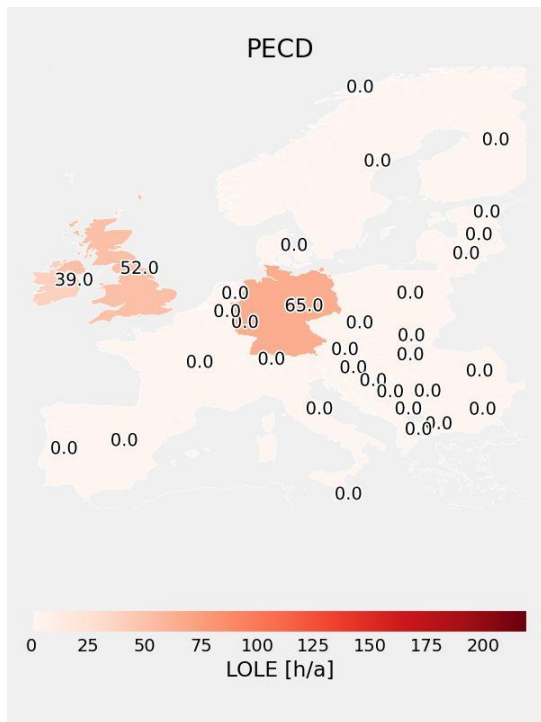
Onshore wind capacity factors, Germany



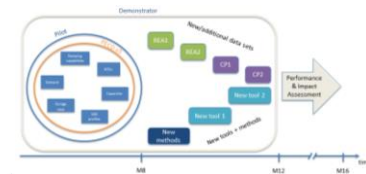
Low-wind events, France



Investigate model sensitivities



Outlook: Setting the scene



2021-2024

- Operational cloud-based platform and data lake
- First two digital twins

2024-2027

Platform integrates the next operational digital twins and offers more services to its users

2027-2030

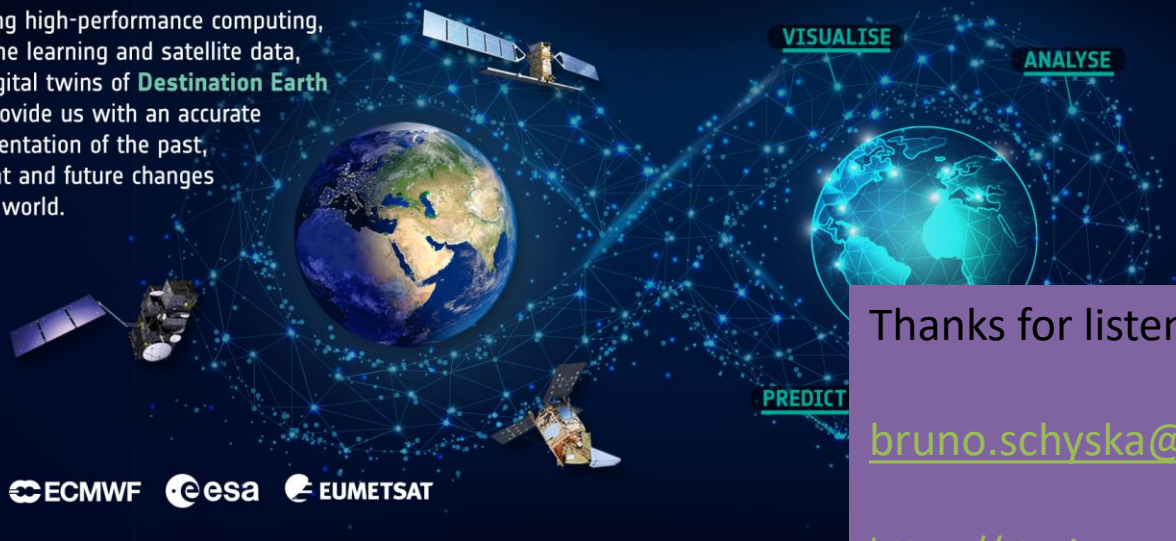
Towards a full “digital twin of the Earth” through a convergence of multiple digital twins on the platform

DESTINATION EARTH



UNLOCKING THE POTENTIAL OF DIGITAL MODELLING

Utilising high-performance computing, machine learning and satellite data, the digital twins of **Destination Earth** will provide us with an accurate representation of the past, present and future changes of our world.



Thanks for listening!

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<https://stories.ecmwf.int/energy-systems/>