

✉ gerrit.versteeg@bsc.es

Gerrit Versteeg (1), Marta Terrado (1)
(1) Barcelona Supercomputing Center

Climate adaptation DT

Destination Earth will develop a digital twin of the earth's climate to create information that fits adaptation efforts. The Climate Adaptation Digital Twin aims to be highly interactive and user-driven. The capabilities of two pre-exascale computers (MareNostrum 5 & LUMI) are tested to support a new generation of Earth System Models. Data about multi-decadal climate projections can be retrieved through a streaming framework that handles global data, unprecedented in spatial and temporal resolution. A continuous flow of highly detailed climate data should benefit consequent risk assessment and adaptation management. The project will define targeted adaptation strategies to support the European Green Deal and green transition efforts by providing a dataspace that is readily available to inform users.



Warming signal of the hottest day during the 2019 heatwave for plausible climates

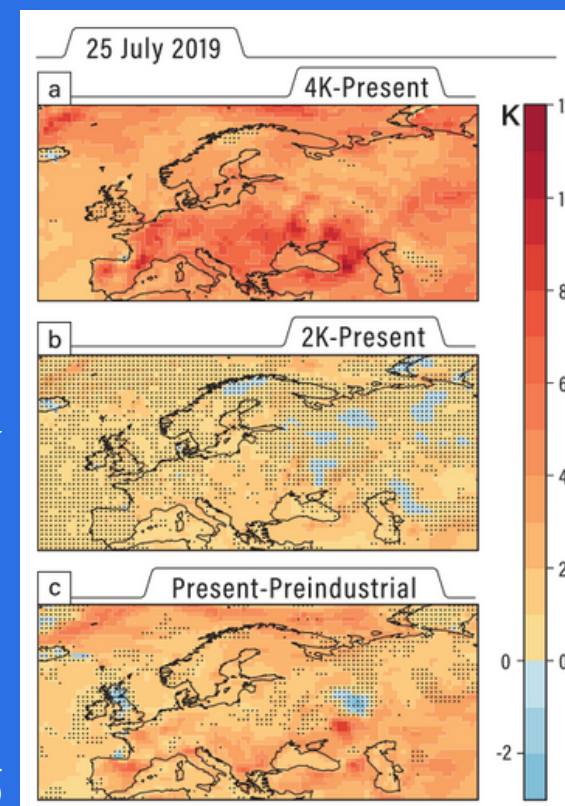


Figure from Sánchez-Benítez et al. (2022)

Climate experiment: storylines

Besides traditional modelling, the Climate DT experiments with a co-designed storyline approach that aims to be highly informative. The constructed storylines are physically self-consistent depictions of historic events in plausible future climates. In more detail, the storylines will be spectrally nudged to constrain the atmospheric circulation and show plausible futures under different degrees of global warming (Sánchez-Benítez et al., 2022).

The potential of storylines to complement traditional risk assessment by investigating the drivers of specific extreme events has been gaining popularity in the climate science field. By exploring the uncertainty and complexity of the future climate, policy-makers become incentivized to reduce societal vulnerabilities.

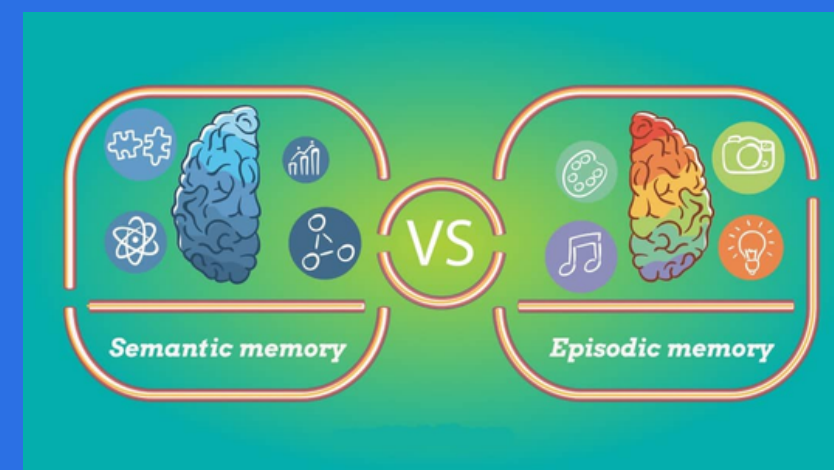
Sectoral applications

The Climate Adaptation DT will focus on providing reliable climate information for the next 30 years to decision-makers in diverging sectors. Included use cases deal with energy supply and demand, urban heat islands, wildfire-prone regions, river floods and drought episodes. With a co-designed approach, the relevant climate hazards for each sector can be translated into impact metrics and indicators.

The BSC will collaborate with climate service providers and users to generate climate information that can be applied to a specific decision-making context that bridges the gap to actionable adaptation efforts.



Pictures by Mike Newbry (top left), Keagan Henman (top right) & Kamyar Fuladlu (bottom)



Picture from The Human Memory (2020)

Storylines (semantic memory) can give meaning to factual and logical statements (episodic memory) as people relate to extreme events and make climate change tangible

Semi-structured interviews

We conduct semi-structured interviews with users from different sectors to capture how the storylines can be applied to each context while navigating subjective and ethical assumptions. Given the narrative component of the storylines, the interviews try to discover how extreme events might impact the sector and how user decisions play a role. Given the different climate forcings, users could combine the data with varying socioeconomic scenarios to inform decisions on relevant adaptation measures. The results are of interest to the climate community as the storylines showcase a complementary way to bring Destination Earth's advancements closer to user needs.