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Developing a proof-of-concept within Destination Earth for heat-stress adaptation under climate change scenarios, with a special focus on public health management

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According to the World Health Organization, between 2000 and 2016, the number of people exposed to heat waves increased by around 125 million. In Europe in 2003, 70.000 people died as a result of the June-August events and in Spain, that summer produced a total of 6.534 deaths. 2022 summer was even worst and its record-breaking heat caused 61.672 deaths in Europe, 11.324 of them in Spain, according to Ballester et al. (2023) [1].

The most worrying thing is not that all these episodes confirm the global warming, but that what is coming is even worse. If greenhouse gas emissions are not significantly curtailed, extreme temperatures and specifically heatwaves will become more frequent, more intense and longer every year that coupled with urban population growth and the trend towards an ageing population will produce devastating impacts on human health especially on vulnerable populations (see https://www.eea.europa.eu/publications/europes-changing-climate-hazards-1/heat-and-cold/heat-and-cold-extreme-heat). Impacts will depend on local factors related with exposure, vulnerability to climate-related stresses and the capacity to cope with, so well-prepared health systems and well-suited adaptation measures at different levels are essential to protect populations, limit adverse impacts of heat and therefore reduce the magnitude of their risks.

Current information and heat simulation models are limited in time and space due to the high computational costs, so sometimes make it too complex for multiple stakeholders to have a good understanding of heat-stress assessment. This situation leads to ambiguity among stakeholders when implementing adaptation measures. The idea of this ongoing work is to use Destination Earth's Climate Adaptation digital twin to develop an interactive tool that will support decision-makers in the assessment of different adaptation options for heat stress adaptation under climate change scenarios, with a special focus on public health management. The tool will allow to have a better understanding of heat-stress assessment by simulating different type of climate change scenarios and, hence, identifying hotspot areas, and high-risk populations and locating opportunities to incorporate solutions to reduce impacts.

The architecture of DestinE provides a unique opportunity to develop an operational environment in which different but interconnected components give guidance and advice to decision makers in their process of designing adaptation pathways. From the data provided by Destination Earth Data Lake, it will be developed a proof-of-concept over the Basque region based on data-driven statistical models, physically based simulations, cost-impact analysis and algorithms. The demonstrator will also include a web-based graphical interface providing easy and accessible dashboards to support decision-makers in the assessment of adaptation options for heat stress adaptation under different climate change scenarios.

Key words: Destination Earth, Climate Adaptation digital Twin, heat-stress, adaptation, health, Copernicus, Europe.

1. Ballester, J., Quijal-Zamorano, M., Méndez Turrubiates, R.F. et al. Heat-related mortality in Europe during the summer of 2022. Nat Med 29, 1857–1866 (2023). https://doi.org/10.1038/s41591-023-02419-z