



## Economic Impact of Thermal Inversions

Key Words: Thermal Inversions | Climate Data Analysis | Geospatial data processing | Climate Data Store (CDS)

*Can climate data be used to gain insights and understanding of the economic impact of meteorological changes? Within this field, PhD researchers, Vinh Phan and Fiorella Parra Mujica, aimed to investigate the economic impact of thermal inversions by using a range of economic factors. Thermal inversions are layers of air where the temperature increases instead of decreases with altitude. These can lead to pollution, such as smog, being trapped close to the ground, and health hazards. The researchers utilised the Climate Data Store (CDS) to gather geospatial data from the past five years from different countries. However, they faced significant barriers: limited infrastructure, slow code, and a lack of technical resources.*

### Erasmus Data Collaboratory | House of AI Support

The researchers approached EDC to assist in extracting, processing, and cleaning the needed data. EDC was able to provide both the computing power and technical expertise. One of the EDC's data scientists rewrote the initial R-based workflow using optimised Python libraries and introduced a multiprocessing approach that significantly reduced runtime. He also improved the statistical accuracy of the spatial analysis by correcting their distance-weighting method by replacing a flat-earth model with a matrix-based Haversine formula to account for the Earth's curvature. The computations were executed on one of EDC's powerful high-RAM workstations, avoiding the need for external supercomputers and saving substantial research costs for the team.

## Impact

The collaboration with EDC had a transformative impact on the project: data processing times were reduced by over 80%, leading to lower energy consumption and improved data quality. With the support of the EDC data lab team, researchers completed their analysis at a fraction of the anticipated cost and time. This project exemplifies how EDC can empower researchers to address data-intensive challenges through tailored technical support, blending sustainable computing, smart optimization, and domain-specific consulting to deliver high-impact outcomes.

**Stakeholders:** Vinh Phan | Fiorella Parra Mujica | Erasmus School of Economics (ESE) | Erasmus School of Health Policy Management (ESHPM) | Erasmus University Rotterdam | Climate Data Store (CDS)

**Tech/Tools used:** R | Python | Haversine formula | Storage and Processing Tools | Multiprocessing | Polars

**Specific EDC expertise used:** Data Extraction | Data Cleaning | Data Processing | Data Quality Improvement | Sustainable Computing | EDC's compute facilities

**Testimonial of researcher Vinh Phan:** *“The collaboration with the EDC was very helpful for us in optimizing our process. EDC scientists quickly understood our problem and what we were trying to achieve, thereby creating a seamless experience in helping us transition our codes to a faster pipeline. We were able to save much computing resources due to faster processing time, and equally important, we are also able to learn from and build upon the new code with detailed documentation provided by the EDC”*

