cityclim.eu | Factsheet

EO-based City Services

Heat

Administration Services

EO-based Heat Island Simulation and Mitigation Strategies Service

cityCLIM

What is CityClim?

CityCLIM is a European Union-funded project designed to develop an open platform for climate information and mitigation services. It integrates data from Earth observation sources, ground measurements, and urban weather prediction models to provide detailed weather forecasts for various European cities. The project acknowledges the significant impact of climate change on urban life, particularly the Urban Heat Island (UHI) effect, and addresses these challenges through mitigation and adaptation strategies.

Generic City Climate Platform (GCCP)

The Generic City Climate Platform (GCCP) is a Software-as-a-Service (SaaS) solution developed as part of the CityCLIM project to provide climate adaptation and mitigation services for cities. **It integrates diverse climate data sources, including ground measurements, airborne and satellite data, to offer an advanced urban weather model.** The platform serves as a one-stop shop for City Climate Services, helping both city administrations and citizens understand, predict, and respond to climate-related challenges.

Services

- **Citizen Climate Knowledge Services (CCKS):** A public service that informs, warns, and engages citizens on climate change and extreme weather events, encouraging awareness and adaptation.
- **City Administration Services:** A decision-support tool for city planners and policymakers to analyze, simulate, and implement sustainable urban climate strategies.

- INFORM CITIZENS ON CLIMATE CHANGE
- WARN CITIZENS ON ARISING HAZARDS
- ONE-STOP SHOP FOR CITY CLIMATE SERVICES
- SUPPORT MITIGATION & ADAPTATION STRATEGIES
- ADVANCED URBAN WEATHER MODEL
- ADVANCED URBAN WEATHER MODEL

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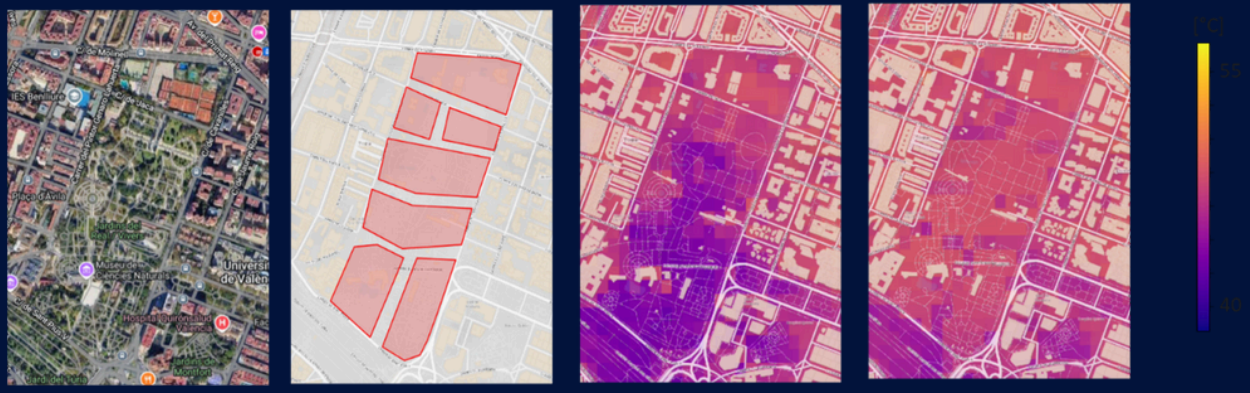
EO-based Heat Island Simulation and Mitigation Strategies Service

The “EO-based Heat Island Simulation and Mitigation Strategies Service” offers a simulation tool to estimate and visualize the impact of changes in the urban landscape on urban heat patterns as indicated by the land surface temperature (LST). The tool is able to provide a fast and initial overview of the direct effects of future construction projects before they are realized. Multiple options can easily be evaluated as it is needed by city administrations or the interested public. Since the tool is based on EO data only, its advantages are a short runtime and a low effort of implementation for any city worldwide.



Example for performance of the EO-based Heat Island Simulation and Mitigation Strategies Service Engine. Sealing the municipal park Jardins del Real in Valencia, Spain, leads to an increase of about 4.4 °C over the modified areas.

The input data sources for this tool are Landsat 8/9 LST products, Sentinel-2 optical data, ESA Worldcover, and high-resolution Digital Elevation models. The EO-HISMSS engine is only run for specific points in time: (1) a typical summer day representing average summer conditions (selected based on the median LST value among the available summer month LST data), and (2) an extreme summer day to represent extreme hot weather conditions within a city (selected based on the maximum scene mean LST value among the available data). These two options are considered for each year of 2021-2024. For each dataset, a machine learning model is set up linking the satellite LST measurements to a number of layers characterizing the urban land surface which are derived from optical satellite data (vegetation and built-up indices, distances to vegetation and water) and the 3D structure of the city when available. For the LST prediction we use a fully connected neural network.

The engine and service were developed to support practitioners, i.e. city administrations, in assessing and implementing urban heat mitigation options (e.g. planting trees, building constructions). The tool can also be valuable for the interested public as information and to enhance the understanding of urban heat patterns and the immediate effects of changes in the urban landscape on the urban heat distribution. The engine is an easy-to-use tool answering requests within seconds to minutes. Its requirements for data storage and processing are low. The usage of standard EO data allows for an easy transfer to new cities.

Key features:

- **Urban Heat Impact Simulation:** Estimates the effect of landscape changes on land surface temperature (LST).
- **Fast & Low-Cost Analysis:** Uses EO data for quick, efficient heat assessments.
- **Supports Multiple Scenarios:** Evaluates different urban planning options before implementation.
- **Machine Learning-Based Predictions:** Uses neural networks to model LST changes.
- **Easy-to-Use & Scalable:** Requires minimal data processing and can be applied to any city worldwide.

Benefits:

Helps city planning by assessing urban heat impacts before construction.

- Supports heat mitigation strategies like tree planting and green spaces.
- Uses EO data for fast, low-cost simulations applicable to any city worldwide.
- Provides insights for both administrators and the public on urban heat patterns.
- Easy-to-use tool with quick results and minimal data processing needs.

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