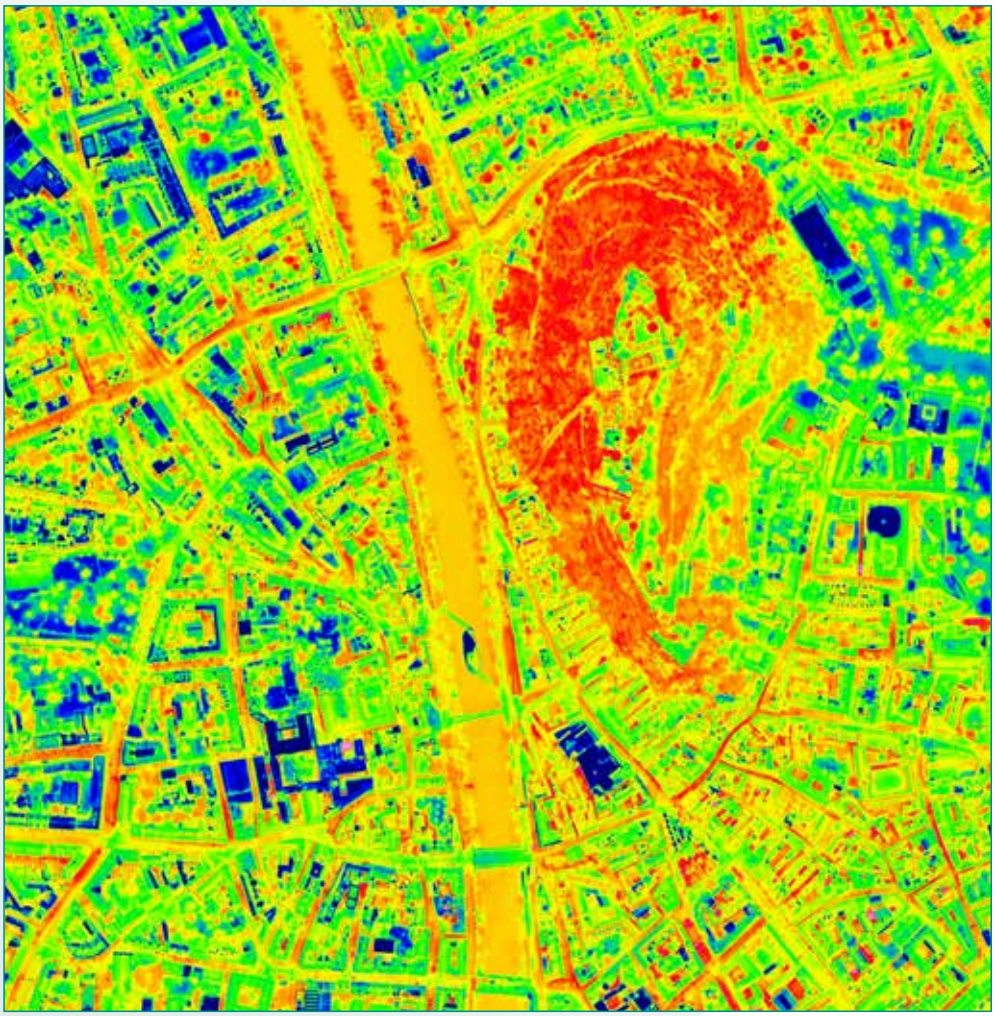
From Heat Islands to Green Spaces:

Graz's Comprehensive Climate Strategy

by Ada Perello



Aerial thermal imagery of Graz city Centre. Thermal imagery, or thermography, visualizes the infrared energy (heat) emitted by objects and surfaces, making temperature differences visible. This powerful tool is used in urban planning to identify a variety of thermal phenomena, from "heat islands" in densely populated areas to heat loss from individual buildings. The data helps decision-makers create more sustainable and energy-efficient cities. Credit City of Graz

The Austrian city of Graz, home to 300,000 residents in Styria, has established itself as a pioneer in urban climate analysis across Central Europe.

With decades of experience integrating climatic data into urban planning—following Stuttgart's early example—Graz continues to push boundaries through dedicated research centers like the Wegener Center at the University of Graz. This commitment to climate science has recently manifested in two groundbreaking projects that demonstrate the city's innovative approach to environmental monitoring, both involving collaboration with EAASI member AVT Airborne Sensing.

Comprehensive Climate Data Integration Through USAGE

The first initiative sees Graz participating as an external partner in the USAGE (Urban Data Space for Green Deal) project, an EU Horizon-funded program designed to help cities implement the European Green Deal through advanced data analytics.
While Graz already possessed extensive climatic datasets from decades of research, interdependencies and interactions between these resources were only partly exploited.
USAGE has transformed this landscape by implementing two specific use cases that showcase the power of integrated geospatial analysis. The first addresses urban heat island monitoring, where the city traditionally relied on satellite thermal imagery without quality assessment.
Through USAGE, a comprehensive validation methodology now compares satellite data with thermal aerial imagery, analyzing error distribution across different surface materials.
This approach revealed that estimation errors varied significantly between surfaces—asphalt showing different patterns compared to grass or other materials.
The second use case tackles accessibility to green infrastructure through the innovative "3-30-300 rule"—a framework ensuring residents can see at least three trees from their homes, live in neighborhoods with 30% tree canopy cover, and access open green spaces within 300 meters. Buildings meeting all three criteria appear in green on resulting maps, while those failing all criteria show in red, creating powerful visualization tools for decision-makers and urban planners.
This methodology directly supports Graz's Klimainformationssystem (KIS), launched in 2020 to provide dynamic climate visualization. The system integrates diverse data sources, including climate observation stations and thermal aerial images, enabling large-scale analysis and vulnerability assessments while supporting predictive modeling based on IPCC climate scenarios.
Graz is one of four pilot cities in the USAGE consortium, alongside Ferrara, Leuven, and Zaragoza. Each location addresses specific local challenges while contributing to scalable methodologies designed for replication across European cities.

Precision Thermal Mapping for Energy Efficiency

The second major project represents a direct application of crewed aerial surveying technology. In late November 2024, Graz conducted a comprehensive aerial thermal survey to identify heat loss across urban rooftops, supporting city-wide energy efficiency initiatives.
AVT Airborne Sensing operated the mission using a crewed aircraft equipped

Cockpit. Unlike satellite imagery, a crewed aircraft offers superior precision and control, allowing operators to fly under optimal conditions—such as at night with a clear sky—to capture high-resolution data. This method provides the detailed, actionable intelligence that turns broad climate goals into practical planning solutions. Credit AVT

Graz 3-30-300 RULE. The 3-30-300 rule is a simple but powerful framework for urban greening. It means residents should be able to see at least 3 trees from their homes, live in a neighborhood with 30% tree canopy cover, and have a park or green space within 300 meters. Credit: Image created with Canva Pro/ Ada Perello EAASI

with dual longwave infrared (LWIR) thermal cameras during optimal nighttime conditions—clear skies, minimal wind, and temperatures below 5°C. Over four hours, the aircraft captured more than 13,000 thermal images along a 600-kilometer flight path, processed into a seamless thermal mosaic achieving approximately 35-centimeter ground resolution.

The surveying department's fusion of thermal imagery with geospatial roof data enabled precise rooftop-by-rooftop analysis, creating a publicly accessible web tool allowing residents to assess their buildings for potential heat loss. This practical application supports both the city's climate action goals and provides actionable guidance for homeowners considering thermal renovations.

Setting Standards for European Cities

The integration of crewed aerial surveying with advanced data analytics showcases how traditional geospatial techniques remain essential for modern climate monitoring. While satellite data provides broad coverage, the precision and validation capabilities offered by crewed aircraft operations prove invaluable for detailed urban analysis. These initiatives position Graz at the forefront of climate-responsive

urban planning, demonstrating how decades of research excellence, combined with innovative partnerships and cutting-edge aerial surveying capabilities, can create practical solutions for contemporary environmental challenges. The city's approach offers a blueprint for municipalities seeking to leverage geospatial technology in support of sustainable urban development and climate resilience.

ABOUT EAASI

The European Association of Aerial Surveying Industries (EAASI) is a non-profit organization founded in 2019 that represents Europe's crewed aerial surveying sector. Its primary mission is to unify and advocate for an industry that is the leading provider of high-resolution geospatial data for critical applications like infrastructure planning and flood protection. EAASI champions the importance of crewed aerial surveying and fosters collaboration among its members to promote best practices and ensure the industry's continued growth and influence in a rapidly evolving digital world.

ABOUT THE AUTHOR

Ada Perello is a journalist specializing in geospatial content and a regular contributor to industry magazines. She serves as the Communications Manager for the European Association of Aerial Surveying Industries (EAASI), where she brings a passion for technology and expertise in strategic communications. She holds a Master's degree in both Communication and International Business Administration.

KEYWORDS

Graz, thermal imagery, green deal, climate change

ABSTRACT

Graz has emerged as a pioneer in climate-responsive urban planning, combining decades of research with innovative geospatial applications. Within the EU-funded USAGE project, the city validated satellite thermal imagery against aerial surveys and applied the “3-30-300 rule” to map access to green infrastructure, feeding results into its Klimainformationssystem. A complementary aerial thermal campaign captured high-resolution rooftop data to identify energy loss, supporting both municipal strategies and citizen-led renovations. These initiatives illustrate how integrating satellite, aerial, and ground-based data can transform climate monitoring into practical planning tools. Graz’s approach offers a scalable model for European cities seeking sustainable development and greater climate resilience.

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Lake District, UK
(13th july 2025)

The varied landscape of England's Lake District is featured in this image captured by the Copernicus Sentinel-2 mission. Located in northwest England in the county of Cumbria, the Lake District is shaped by a harmonious mix of several natural landforms, and extends to the coast of the Irish Sea, facing the Isle of Man, partly visible in the far left of the image. Lakes, hills, valleys, woodland, settlements and farmland combine to give life to England's largest national park, which was designated a UNESCO World Heritage Site in 2017. As we see in the image, the Lake District features a roughly circular core of mountains, deeply carved by valleys of glacial origin, hosting long, narrow lakes in their hollows. The region is home to England's highest peak, Scafell Pike, which reaches an elevation of 978 m. On a clear day, the view can span from the Galloway Hills of Scotland to the Mourne Mountains in Northern Ireland, as well as the Isle of Man, and Eryri (Snowdonia) in Wales. As the name suggests, the area is home to the principal lakes of England, including the largest, Windermere, whose elongated shape can be seen south of the central massif. Next to Windermere is Coniston Water and further west are Wasdale valley and Wastwater, the deepest lake in England.Northwest of Wastwater lies Derwentwater, studded with wooded islands, and further east is Ullswater, the second largest lake in the region, known for the daffodils that inspired Wordsworth's famous poem of the same name. While the higher hills – also known as fells – are mainly rocky, deciduous native woodland occurs on many of the lower, steeper slopes. Extensive agriculture and farmland can be seen lower down around the mountains, interspersed with villages and settlements, which appear as grey areas. The Lake District is also home to varied freshwater habitats, such as mires, lakeshore wetlands, coastal heath, dunes and a number of estuaries, including Morecambe Bay, visible in the bottom right corner of the image. Covering an area of 310 sq km, Morecambe Bay is the UK's largest expanse of intertidal mudflats and sand and supports a wealth of wildlife, with abundant bird and marine species. Zooming in off the coast of Morecambe Bay, the turbines of several offshore wind farms stand out as white dots in the Irish Sea water.

[Credits: contains modified Copernicus Sentinel data (2025), processed by ESA]