Policy Brief
October 2025

Heat Health Risk Assessment: Strengthening SDG 13 Monitoring to Address Climate-Related Health in Urban Areas

SDGs-EYES service - Monitoring Sustainable Development Goal 13 - Using Earth observation (EO) data to monitor Extreme Temperature

KEY MESSAGES

Heat-related risks are increasing in urban areas.
Extreme temperatures are among the deadliest climate-related hazards. Urban environments, like Turin, intensify heat stress due to the urban heat island effect, exacerbating health risks especially for the most vulnerable.

A spatially resolved risk indicator.
SDGs-EYES Heat Health Risk Assessment in Turin delivers a set of climate indicators, calculated with data from climate reanalyses, which map the risk of heat-related health impacts across the city. By combining climate indicators and models with health, urban environment and socio-demographic data, the service identifies urban heat–health hotspots and informs targeted local interventions.

Supporting SDG 13 adaptation efforts.
The service contributes directly to SDG 13 (Climate Action) by providing cities with evidence to track climate-related health risks, enhance adaptation strategies, and inform public health planning, urban policies, and sustainable design choices.

SDGs EYES

Funded by the European Union

Scene Setting

As climate change progresses, extreme heat is becoming more frequent, intense and prolonged. The urban environment amplifies these risks through the urban heat island effect, heat-retaining materials, scarce vegetation, limited access to cool places, high population density and compact urban forms - including narrow streets and street canyons - that reduce airflow, while absorbing heat, further intensified by impermeable surfaces and waste heat from human activities. For cities like Turin, this means a growing threat to public health, particularly for the most vulnerable subgroups of the population, such as older adults, people with pre-existing chronic conditions or those living in social isolation.

Scientific evidence shows that Europe is warming at twice the global average, with urban heatwave-related mortality on the rise. In July 2022 alone, excess deaths across Europe attributed to heat waves are estimated to have exceeded 61,000, including several thousand in Italy. While precise calculations of heat-related mortality are complex and subject to ongoing scientific debate, this figure provides an important indication of the severe impact of extreme heat in 2022. Yet despite this growing risk, city-level tools for monitoring the health impacts of extreme heat are limited and spatially disaggregated data for targeted action remains scarce.

SDG Target 13.1 "Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries" calls for strengthening resilience and adaptive capacity to climate-related hazards, including heatwaves. Addressing this challenge requires tools that combine climate data, urban characteristics and population vulnerability. SDGs-EYES Heat Health Risk Assessment in Turin demonstrates how such integration can support evidence-based policymaking for urban health adaptation.

Heat Health Risk Assessment in Turin: A New Tool for Monitoring

SDGs-EYES Heat Health Risk Assessment is a co-designed service that maps the spatial distribution of heat-related health risks in the city of Turin. By integrating Copernicus climate reanalysis data, health data, urban context and census-derived sociodemographic indicators, it produces a risk indicator that reflects climate hazard, exposure and vulnerability.

The service identifies urban areas where heat stress coincides with the presence of at-risk populations. These include elderly residents, people with limited mobility or poor housing conditions, and neighborhoods with low adaptive capacity. The result is a map-based tool that highlights where heat-health risk is highest and identifies its main determinants - at the level of individual urban census tracts - and consequently supports policy decisions such as prioritising cooling interventions or issuing heat warnings.

Main Features of the Service

SDGs-EYES Heat Health Risk Assessment provides a comprehensive and scalable solution designed to monitor the relationship between extreme heat events and public health vulnerability. The service integrates multiple data streams to deliver actionable indicators for policymakers and public health authorities.
At its core, the service combines climate data with vulnerability information, such as socio-economic and demographic profiles, contextual risk amplifiers, and local healthcare and social infrastructure. These datasets are processed through an automated cloud-based workflow that ensures accessibility of results. Through stakeholder co-design sessions, local health agencies, academia, urban and environmental experts, and regional institutions contributed to shaping key parameters, such as identifying priority areas and vulnerable groups, including elderly populations and individuals with pre-existing chronic health conditions. The final product consists of: 1) the codes needed to calculate the hazard indicators and 2) the interactive tool to visualise the maps of risk, hazard, exposure and vulnerability together with other geographical features useful to the user.

Users can explore interactive heat-health risk maps, graphs and download datasets that align with national and international health reporting standards.

Critically, the service's modular architecture ensures high adaptability. It is structured in such a way that regional authorities or other implementing organisations can easily adapt the methodology using local data sources, provided they meet basic technical specifications. This supports the transferability of the service to other geographic regions and regulatory contexts. Replication is immediate for the calculation of the hazard indicators. Regarding exposure and vulnerability indicators, most of them come from open datasets while for others, especially health data, collaboration with the local health authority is needed.

By offering accurate, up-to-date risk indicators in a user-friendly format, SDGs-EYES Heat Health Risk Assessment equips policymakers, urban planners, and public health professionals with a robust tool for monitoring the impacts of extreme heat on population health and planning how to mitigate them.

The Technical Side of the Service

Heat Health Risk Assessment processes Copernicus ERA5-Land, VHR-REA_IT and CERRA reanalysis data to extract daytime maximum temperatures at different resolutions over Turin. It identifies periods of extreme heat based on climatological thresholds and quantifies exposure for each city district.

To assess vulnerability, the service uses sociodemographic data from the Italian census (ISTAT), focusing on age structure, housing conditions and social vulnerability factors. Other indicators come from diverse sources, such as health indicators that were provided by the local health authority and urban characteristics deriving from local research projects. A heat-health vulnerability index is calculated and spatially joined to the exposure data. The final risk indicator is derived by combining exposure and vulnerability layers using an additive index approach.

The process (explained in **Figure 1**) has been implemented with QGIS, spreadsheet and PostgreSQL, generating a number of tables that feed the visualisation tool, developed in NodeJS/Javascript. The methodology adheres to FAIR principles and is fully transparent, making it suitable for operational deployment. The outputs are formatted for use in local policy workflows and can be easily adapted for other cities with comparable data availability.

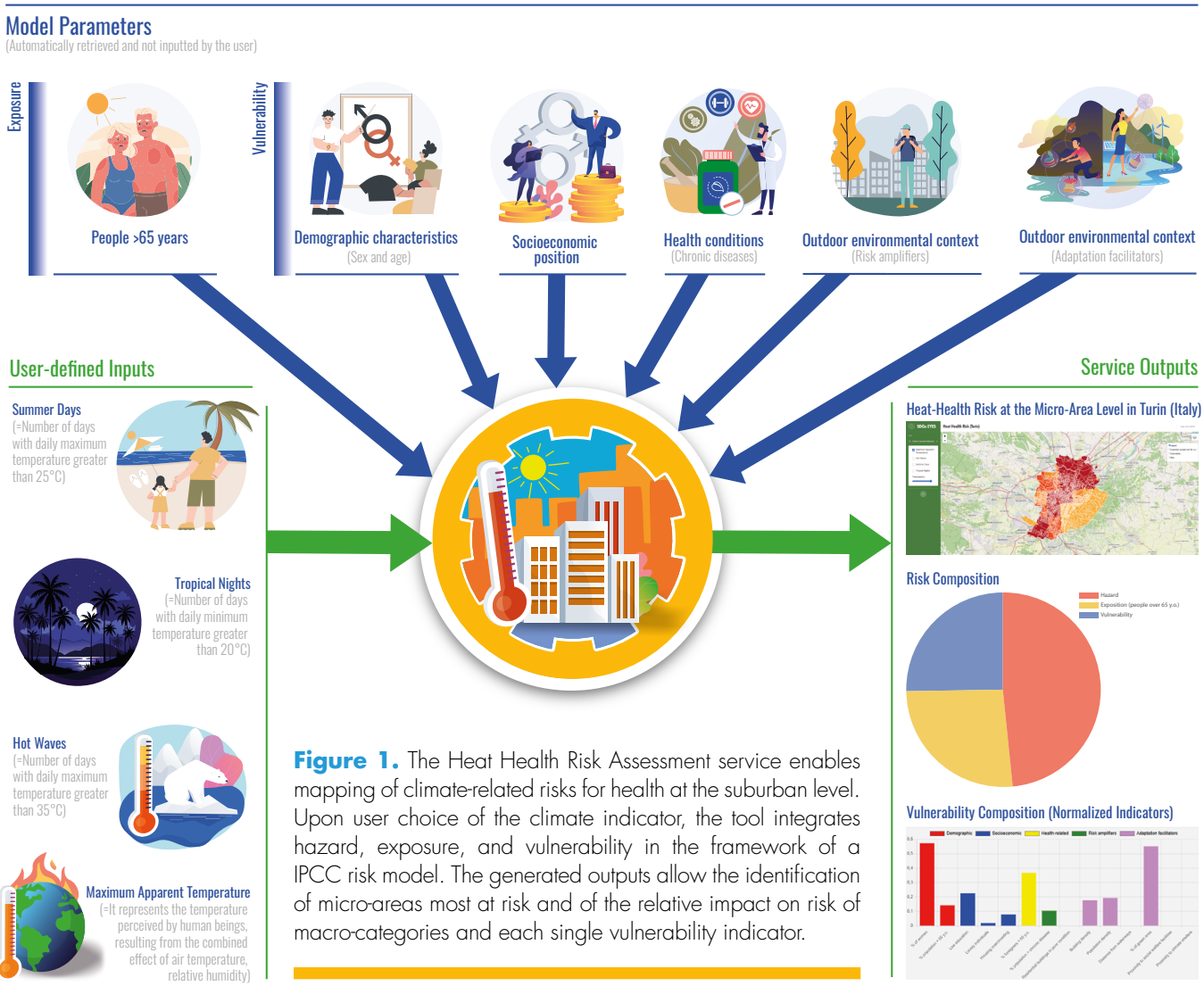


Figure 1. The Heat Health Risk Assessment service enables mapping of climate-related risks for health at the suburban level. Upon user choice of the climate indicator, the tool integrates hazard, exposure, and vulnerability in the framework of a IPCC risk model. The generated outputs allow the identification of micro-areas most at risk and of the relative impact on risk of macro-categories and each single vulnerability indicator.

What Does This Mean for Policy?

The SDGs-EYES Heat Health Risk Assessment represents a step forward for public health governance in the face of escalating climate challenges. For policy makers at local, national, and European levels, the service delivers not only innovative technological solutions but also practical, actionable insights to support evidence-based decision-making and long-term planning.

By providing continuous, spatially explicit monitoring of heat-health risks across the urban context, the service allows authorities to identify vulnerable populations and high-risk areas with unprecedented precision. For example, local governments can use the platform to map neighborhoods where extreme heat events intersect with high concentrations of elderly residents, chronic patients or socio-economically disadvantaged groups, all of whom are more susceptible to heat-related illnesses and mortality. This enables targeted policy responses, such as opening cooling centres, issuing heat-health alerts, adjusting urban planning policies and enhancing healthcare resource allocation during heatwaves.

At a national level, the service supports compliance with European and international policy frameworks.

The service aligns with the European Climate Law and the European Green Deal by providing concrete data that can inform national climate adaptation strategies and public health preparedness plans. Its outputs can be directly integrated into National Energy and Climate Plans (NECPs) and national health monitoring systems, providing both real-time operational value and long-term policy support.

For the European Union, SDGs-EYES Heat Health Risk Assessment offers added value in harmonising heat-health monitoring across member states. Given the increasing frequency and severity of heatwaves linked to climate change, a unified approach to tracking health risks supports cross-border policy coherence. This is particularly relevant for transnational urban regions and border areas, where coordinated responses can save lives. The service's compatibility with Eurostat SDG reporting channels ensures that it can be adopted as a standardised tool within the EU's official statistical and policy assessment frameworks.

Furthermore, the service plays a pivotal role in supporting the EU Mission on Adaptation to Climate Change. By providing high-resolution, near-real-time monitoring of one of the most direct and dangerous climate-health impacts - extreme heat - it helps local and regional authorities design and implement effective adaptation measures. This includes informing the development of heat action plans, guiding urban greening initiatives, supporting healthcare system resilience and assessing the effectiveness of adaptation interventions over time.

From a broader governance perspective, the service fosters stronger intersectoral collaboration. Heat-health risks touch multiple policy domains: healthcare, urban planning, social services, environmental protection and emergency management. By offering a unified data platform, SDGs-EYES Heat Health Risk Assessment enables these diverse sectors to coordinate more effectively. For instance, city planners can integrate heat-health risk maps into zoning decisions, while health agencies can align intervention strategies with meteorological forecasts.

The co-design process embedded in the service's development ensures that its outputs are tailored to policy needs and formats. Policy makers can rely on indicators that are scientifically robust and practically relevant, having been shaped through direct input from public authorities, statistical offices, and healthcare organisations. This ensures both usability and alignment with institutional needs.

Importantly, the service helps bridge a persistent gap in policymaking: the availability of timely, high-quality, localised environmental health data. Traditional public health monitoring systems often lag behind fast-evolving climate conditions. SDGs-EYES Heat Health Risk Assessment fills this gap by offering a dynamic, cloud-based monitoring solution that complements existing systems, rather than replacing them. By providing granular spatial analysis, the service enables more informed policy responses to protect public health in the context of climate change.

From Barriers to Action: Enabling Earth observation-based SDG Reporting

Data Fragmentation

The Challenge: Health, climate, urban context and socio-demographic data are often held in separate systems.

Strategic Response: Heat Health Risk Assessment harmonises different datasets into a unified spatial risk indicator, ready for direct policy use.

Local Capacity Gaps

The Challenge: Urban administrations may lack the tools or expertise to process climate data and assess the climate-health nexus.

Strategic Response: The platform provides ready-made outputs and visualisations, with minimal technical requirements and support for non-expert users.

Institutional Inertia

The Challenge: New tools may be underused if they do not align with existing planning cycles.

Strategic Response: The service was co-designed with local institutions and fits within existing urban resilience frameworks.

Data Timeliness and Updating

The Challenge: Traditional vulnerability assessments may become outdated quickly.

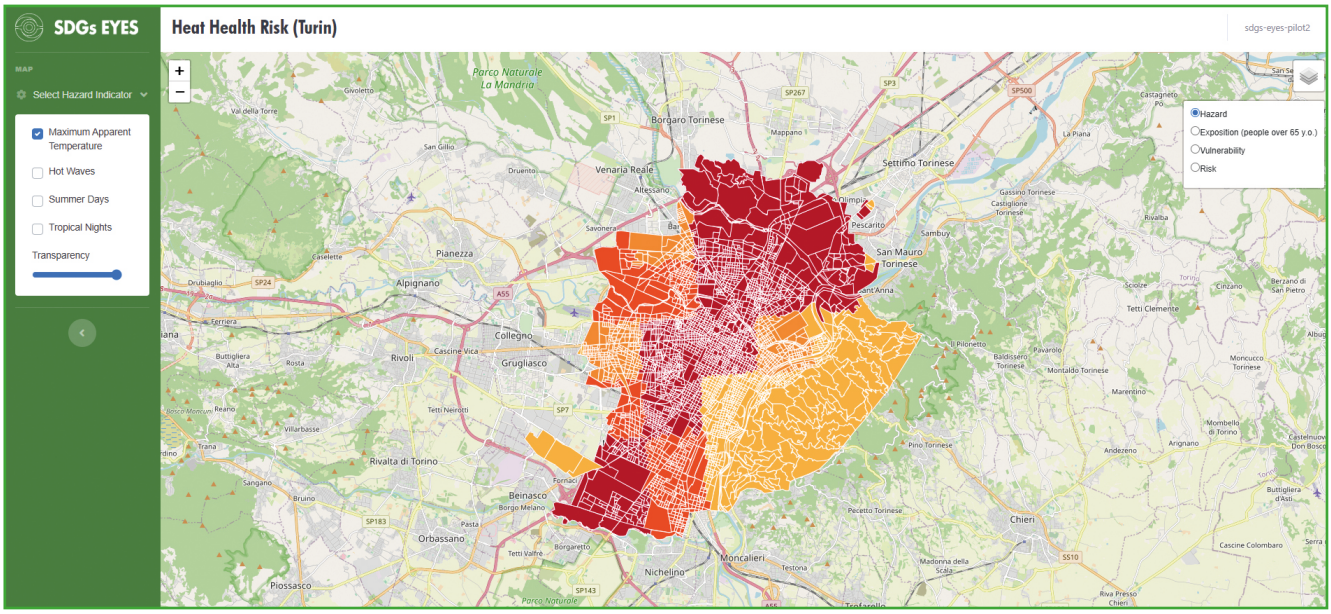
Strategic Response: At the technical level, the tool is designed to be easily updated.

Experimental Results and Operational Validation

In its pilot implementation, the service analysed heat patterns from 1991to 2020 (using climate indicators) and mapped the spatial distribution of heat-health risk across Turin. Results show consistent hotspots in the city's densely built and socio-economically vulnerable districts.

Feedback from city stakeholders confirmed the utility of the maps and indicators.

The service was presented in two co-design workshops (May 2024 and March 2025) involving more than 30 participants from the municipality, local health agencies, regional institutions and academia. Feedback led to refinement of the vulnerability weighting scheme and improved visualisation of results at the small-area level. The service is now considered ready for integration into Turin's climate adaptation dashboard.



Forward Looking

SDGs-EYES Heat Health Risk Assessment provides a solid foundation for scalable monitoring of climate-related health risks with clear institutional relevance. Building on this base, several development directions are envisaged to increase impact and usability.

Geographic scalability remains a priority. Thanks to its modular design, the service can be adapted to additional urban and regional contexts. Consultations with local health authorities will help tailor parameters such as temperature thresholds and vulnerability indicators to specific regional profiles, with a longer-term ambition to contribute to a harmonised Europe-wide network of services supporting SDG 13 indicators.

Closer collaboration with meteorological and public-health agencies will be pursued to integrate predictive models that enable short-term heat-health risk forecasts, supporting early-warning systems and targeted interventions. These capabilities will be aligned with established civil-protection and public-health protocols.

Cross-sectoral integration opportunities will also be explored. By linking heat-health risk monitoring with complementary urban resilience and public-health services - such as energy management, urban planning tools and health-infrastructure support - the service can offer more comprehensive insights for integrated policymaking.

Ensuring operational sustainability is essential. The service will remain online for two years after the end of the SDGs-EYES project in December 2025. Arrangements beyond that horizon will be defined in due course. Partnerships with relevant EU agencies, national health bodies and local institutions will support durable embedding of the service in health and climate-adaptation workflows.

By following these pathways, SDGs-EYES Heat Health Risk Assessment is positioned as a practical tool for climate-resilient health governance, enabling evidence-based action to protect public health as heat stress intensifies.

SDGs-EYES in short

SDGs-EYES aims to boost Europe's capacity to monitor the Sustainable Development Goals by harnessing the power of Copernicus Earth observation data. The project focuses on building a portfolio of decision-support tools to enhance the production and use of SDG indicators, with an emphasis on accessibility, reliability, and impact.

Enhancing Access and Usability of Earth observation Data

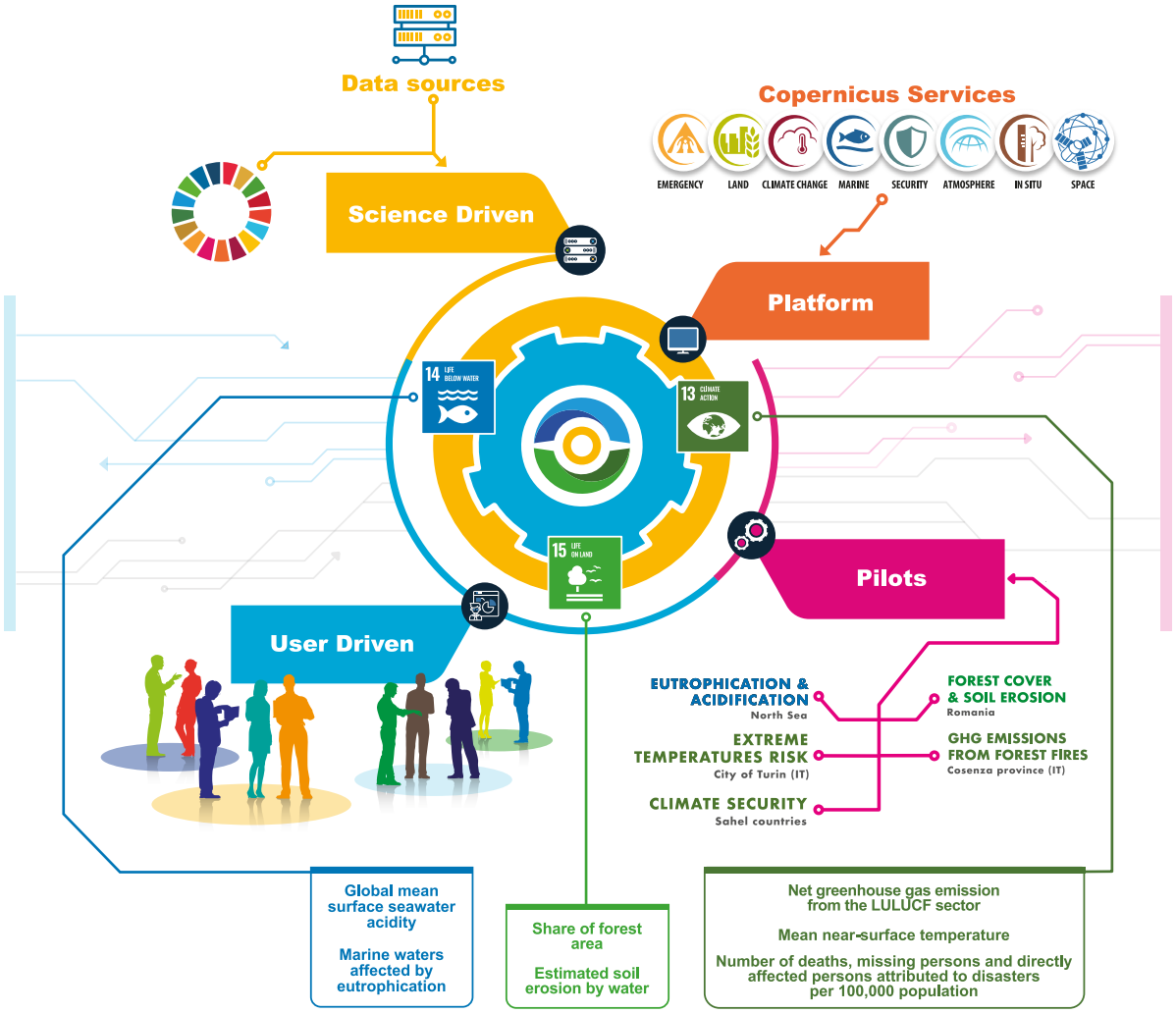
SDGs-EYES develops a scientific and technological framework to build robust and accurate indicators. It aggregates and processes data from Copernicus's six core services - along with space-based and in situ sources - to make Earth observation information more accessible and actionable.

Improving the Quality of SDG Indicators

The project demonstrates Copernicus-enhanced measurement for seven indicators across three SDGs goals (SDG 13 - Climate Action, SDG 14 - Life Below Water, SDG 15 - Life on Land). A cross-cutting indicator has been developed to assess the exposure of vulnerable communities to multiple and overlapping climate extremes.

Building Stakeholder Capacity for Societal Impact

SDGs-EYES delivers service-oriented data products that simplify the tracking and reporting of SDG indicators. These tools have been co-designed with users - including public authorities, researchers, and environmental agencies - to ensure usability and relevance in decision-making contexts.



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SDGs EYES

Find Out More

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