

The Policy and Planning Landscape for Heat-Health Risk and Resilience in Athens

Key Messages

Heat-related health risks are increasing in Athens. Exposure to high temperatures and heat-related health and mortality risk can occur at home, at work, at school and outside.

There is a need for strategies and action plans focusing on extreme heat at the national, regional and local level, and heat-health risk data available to planners and communities.

More data, planning and action is needed in Athens to address growing health risks associated with extreme heat, urban overheating and compounding and cascading risks related to interconnected hazards such as drought, wildfire smoke and air pollution. This requires coordination between the Regional Authority, local authorities, the health sector, climate scientists, researchers and civil society.

Strategically planned Nature based Solutions (NbS) are not merely aesthetic amenities but critical public health infrastructure. Research demonstrates that well-designed urban greenery provides essential cooling through shading and evapotranspiration, offering a primary means for mitigating urban heat and reducing heat-related health risks.

The CARMINE project is developing digital, climate modeling and decision support tools based on data, scientific knowledge and stakeholder engagement. These tools can serve local, metropolitan and regional level planning for heat health and climate resilience in Athens.

Introduction

Athens is the hottest capital city in Europe¹. The metropolitan area is home to more than 3.7 million people – nearly half of the population of Greece – and hosts over 6 million visitors each year. It is facing escalating challenges and risks related to urban heat and its impact on public health.

Extreme heat in Athens and across Southern Europe is increasing. Metropolitan Athens is experiencing more frequent, intense and persistent heatwaves (high temperatures lasting for at least two or three consecutive days), more very hot days, longer droughts and more tropical nights (where daily minimum temperatures are greater than 20°C)². Its hottest days are projected to become three times more frequent by 2050, from a typical 9-10 days per year currently to 27 days per year³. Athens experienced the longest heatwave in its history in July 2024, lasting for 17 consecutive days.



Heat is a growing health risk. Heatwave-related deaths have increased by 30 percent in Europe over the last 20 years, according to a recent joint report from the UN's World Meteorological Organization and Copernicus C3S. Climate change and warming temperatures also increase the expansion of vector-borne diseases such as malaria and dengue (passed along through carriers like insects or birds) and zoonotic diseases (spread from animals to humans) in the Mediterranean⁴.

The prevalence of heat-related illness and mortality is increasing in Athens, especially for vulnerable groups such as the elderly and low-income households living in old buildings in the dense city centre⁵. Heat-related deaths (excess mortality) are linked not only to heatwaves, but also to very hot days outside heatwave periods⁶.

Described by the World Health Organization as a “silent killer”, hot weather and especially prolonged heat or extreme heat can cause heat illness or death when a person's body is unable to cool itself. Heat stress can lead to fatigue, dehydration, cognitive impacts, and heat-related illnesses like heat exhaustion and heatstroke.

Heat can harm anyone, especially those without mechanical cooling like air conditioning and workers exposed to high temperatures. Some people are at higher risk, including adults aged 60 years or older, people with some pre-existing health conditions, people with mental illness, limited mobility or other disabilities, people experiencing homelessness, infants, children and pregnant women, workers in hot indoor and outdoor environments, people who are socially isolated or live alone, and people in older buildings without adequate cooling.

The Urban Heat Island (UHI) effect increases excessive urban heat and disproportionate heat health risk throughout Athens. The UHI effect or urban overheating is when urbanization, extreme heat and the lack of greenery and natural elements interact to intensify heat and magnify its impacts. As a result, people in urban areas may experience more heat than the temperature in the weather report. In Athens, the UHI effect currently exhibits up to 10°C difference between the center of the city and its suburbs⁷. This challenge is compounded by the city's extremely limited green space, with only 0.96 m² of greenspace per capita—one of the lowest rates among OECD countries and far below the World Health Organization's recommended minimum of 9 meters squared⁸. Furthermore, while over 76% of residents can reach a large park within 2 km, daily exposure to greenery is far lower, with only 15% living in areas with adequate surrounding greenness.

Extreme heat interacts with other hazards to compound health and mortality risks. Extreme heat and high humidity interact with other climate-impacted hazards such as drought, wildfires, wildfire smoke, air pollution and infectious diseases to compound risks and health impacts. Over the last eight years, nearly 40% of the Attica region's forests burned down in wildfires that ignited during heatwaves and came increasingly closer to the wildland-urban interface⁹. Wildfire smoke increases the health risk of heat, and wildfires are projected to increase.

Athens also ranks low among European cities for air quality, and the combination of air pollution and heat increases health risk. The UHI effect in turn adds to air pollution by elevating the concentration of ground-level ozone. A study of the municipalities in the Region of Attica for the years 2000-2016 found evidence that air pollution elevated the effect of heat on mortality at higher levels of PM10 and 8-hour-max ozone (O3), with more pronounced increase for respiratory mortality at all levels of PM10¹⁰.

Compound heat health risks are projected to increase in Athens. Europe is heating up faster than any other continent. Southern Europe is a hotspot for several interconnected climate risks that require urgent action and are increasing in frequency and intensity, including wildfires, drought, extreme heat, reduced rainfall and water scarcity, according to the first climate risk assessment of the European Environment Agency (EEA)¹¹. Climate change is projected to increase temperatures, ground level ozone and air pollutants through more frequent, extreme and destructive wildfires in Europe¹².

Methods

To address the growing challenge of heat stress in urban Athens, the Ministry of Digital Governance, the National Observatory of Athens (NOA), the Development Organization of the Region of Attica “New Metropolitan Attica S.A.” (NMA) and the National Infrastructures for Research and Technology (GRNET) are coordinating a Living Lab to identify transformative solutions for urban heat and health resilience and build on climate adaptation and resilience work taking place in Metropolitan Athens and the Region of Attica. The Athens Living Lab is one of eight Living Labs in the CARMINE project (Climate Resilient Development Pathways in Metropolitan Regions of Europe).

As part of the Living Lab, coordinating partners convened two workshops, conducted an analysis of heat and climate related policies and plans at local, regional and national levels, and distributed a survey to the municipalities of metropolitan Athens.

The Academy of Athens and the Athena Research Center (ATHENA RC) are also key partners in the CARMINE Living Labs.

Participatory workshops

The workshops brought together over 40 participants from local, regional and national government authorities or development agencies, research institutes, a government fund for climate adaptation, participatory urban planning groups, civil society organisations and the media.

In the first workshop, participants mapped out key risks, underlying risk drivers, existing and potential solutions for heat health risk adaptation and mitigation, and factors that create barriers or enable solutions. They also identified Nature-based Solutions (NbS) that are needed or have been implemented in the Athens metropolitan area to create cooler spaces in neighborhoods and help address the UHI effect.

Participants in the second workshop discussed ambitious yet realistic goals for addressing the growing challenge of urban heat health risk and how crucial sectors (health, urban planning, housing and schools, and civil protection) can mitigate this risk by 2050 if they take action for climate adaptation, mitigation and resilience.

Municipalities survey

The Athens Living Lab partners developed and disseminated a questionnaire to more than 40 municipalities in the metropolitan area to gain a better understanding of planning, actions and needs related to extreme heat and health risk and the use of NbS for urban heat mitigation across the area. The survey was sent to mayors' offices July 2025 and followed up with reminders through December 2025. Twenty-two completed surveys were collected from 17 municipalities. Survey participants included elected officials and city staff: one Mayor, one General Secretary, 5 Deputy Mayors (Civil Protection and Urban Environment portfolios), one appointed municipal councilor for civil protection, one advisor to the mayor on environmental issues, 4 heads and one deputy head of civil protection directorates, 4 directorate heads (climate change; planning and development; sanitation and environment; social assistance and welfare services), one chief heat officer, and 3 city staff.

Policy analysis

Athens Living Lab partners conducted an analysis of policies, strategies and plans at local, regional and national levels related to climate adaptation, mitigation and resilience. The analysis included identifying how the documents addressed extreme heat and health risk, urban heat adaptation and resilience, and interconnected hazards. Analysis of each policy document also considered how the risks, risk drivers, socio-economic vulnerability conditions, and solution barriers and enabling factors identified in the Living Lab workshops are addressed.

Growing Heat Risks

Risk components: The health consequences of extreme heat are not simply a matter of high temperatures or a person's characteristics or health condition. Heat health risk involves several elements:

Hazard likelihood: What we know about increasing extreme heat.

Consequences: Heat-related illness, physical and mental health impacts and mortality.

Exposure: UHI effect, built environment, housing quality, living or working in high-heat neighbourhoods, etc.

Vulnerability: Socio-economic characteristics, conditions and marginalization, existing health conditions.

Adaptive capacity: Ability of individuals and groups to respond and anticipate, or barriers to these abilities.

Individuals may experience increased risk based on individual health characteristics or varying levels of risk according to changing circumstances or activities. People can be exposed to high temperatures and heat-related health and mortality risk throughout their daily life and routine activities at home, at work, at school and outside:

At Home

Risk statement from Athens Living Lab: Risk of increasing physical and mental health impacts and mortality risk in residences (old buildings are not energy efficient) and risk of increasing energy poverty and economic insecurity.

Indoor temperatures can be higher than outdoor temperatures and are often the greatest predictor in heat-related deaths. Most heat-related deaths occur indoors, especially in low-quality housing without mechanical cooling like air conditioning (AC) or heat pumps¹³. High temperatures at night also increase the health and mortality risk for people vulnerable to heat. The risk for people susceptible to heat increases at indoor temperatures higher than 26°C, and temperatures higher than 31°C can be dangerous for everyone.

Electric fans do not meaningfully lower the body core temperature of older adults in temperatures >33-35°C, and other low-cost alternatives to AC are also largely ineffective, according to research in Canada¹⁴. Using an electric fan when indoor temperature is 35°C or above is not effective in reducing morbidity and mortality and can lead to dehydration and increased heat load for people susceptible to heat¹⁵.

In the dense city center of Athens, many multi-unit residential buildings (polykatoikias) are older and do not have the insulation and energy efficiency required to stay cool indoors. Excessive heat increases the need for mechanical cooling, thus increasing energy use. Individuals and households with low income often have to forego mechanical cooling because they cannot afford it, thus experiencing more health risk or health consequences. If they use more energy for cooling, these individuals and households may experience increased energy poverty. This adds to disproportionately higher vulnerability for many seniors, lower income households and immigrants that reside in these buildings¹⁶.

The added urban heat in Athens increases buildings' energy consumption by 4.1 per cent for each degree increase in air temperature¹⁷, and the energy demands for cooling in urban residential buildings in Greece are projected to rise¹⁸. Greece's National Energy and Climate Plan sets a summer target of 27°C for indoor environments. However, Greece is not upgrading or renovating enough housing stock to be energy efficient, and upgrades that do happen result in low percentage of energy savings¹⁹.

At Work

Risk statement from Athens Living Lab: Workers in outdoor and indoor locations are exposed to high temperatures and increased risk of heat illness.

Workers around the globe are among the people most exposed to dangerously high temperatures and heat stress, and increasingly are developing serious and debilitating chronic diseases that impact cardiovascular and respiratory systems and the kidneys²⁰. In some areas, heat-related deaths may occur more among young people than older persons because they are more likely to be working in outdoor and indoor environments exposed to high temperatures, inflexible work arrangements, and exploitative employers²¹.

Heat stress and heat-related illness can reduce workers' efficiency, increase the likelihood of accidents, and even lead to death. Europe is one of the regions with the most rapidly increasing proportion of heat-related occupational injuries since the year 2000. In Greece, deaths, illnesses and work-related injuries caused by heat are widely under-recorded, creating a challenge for understanding vulnerability and risk, and developing effective policies to protect workers.

At School

Risk statement from Athens Living Lab: Children and teachers are increasingly exposed to heat as the heat season begins earlier and ends later each year and school buildings and schoolyards in Athens are not heat resilient.

Children are vulnerable to heat, and they along with teachers and school staff are increasingly exposed to heat as the heat season grows longer in Athens. Many school facilities and schoolyards in Athens are not prepared for high temperatures and have inadequate cooling. This results in physical discomfort and stress for students and teachers. Closing schools more often with more frequent heat waves disrupts children's education and leaves some children exposed to heat if their homes also overheat.

Outside

Risk statement from Athens Living Lab: Risk of increased isolation, marginalization and mental and physical health impacts, as walking outside during high temperatures is difficult for people vulnerable to heat and public transit is not sufficiently cooled, and from frequent or extended disruption to outdoor recreational and social activities.

Being outside for a prolonged period or while doing strenuous activity during very hot weather can be dangerous. People who have to be outside for work, athletics or to commute for appointments, basic needs, or to care for others are at risk of heat illness, especially if there is no shade or greenery and they are near traffic and industrial areas. When people cannot go outside to socialize with others or to access the services they need, they can be isolated and lonely and suffer health consequences.

Additionally, large regional parks in Attica are closed during days with the highest wildfire risk (level 5, based on heat and wind conditions) by order of the Ministry of Climate Crisis and Civil Protection and the Fire Service. This includes the largest urban park in Athens Pedion tou Areos, situated in the dense city centre and offering potential relief for many residents in surrounding older buildings. This policy restricts the availability of large urban parks to provide outdoor respite from the heat on the days when people may need it most.

Risk statement from Athens Living Lab: Loss of urban greenery and biodiversity from extreme heat and drought, contributing to further increase in urban overheating.

Strategic investment in green infrastructure can directly mitigate these risks. Vegetation cools the environment through two primary mechanisms: shading, which blocks solar radiation from reaching heat-absorbing surfaces like asphalt and buildings, and evapotranspiration, where water evaporating from leaves consumes energy, thereby lowering air temperature²². This cooling is most effective when urban greenery is designed as NbS, meaning “functional” system, with sufficient permeable surfaces and healthy trees to support sustained evapotranspiration, particularly during prolonged heatwaves²³.

The Current Extreme Heat Policy and Planning Landscape

The scale of climate change, the rate of increasing extreme heat, the geographical scope of natural ecosystems and built infrastructure, and the size of urban metropolitan Athens call for coordination between central government bodies, the Regional Authority, local authorities, the health sector, climate scientists, researchers, civil society, and other stakeholders.

Greece has national and regional strategies for climate adaptation, mitigation, and related environmental management strategies in line with EU legislation and policy frameworks, but there is no national strategy dedicated to extreme heat adaptation and heat health risk management. The national Ministry of Health and several other ministries have responsibilities related to heat health preparedness, emergency response, and risk data. The Ministry of Environment and Energy is the national government body responsible for long-range climate change adaptation and mitigation policy and planning. The Regional Authority and local authorities have responsibilities for climate adaptation and mitigation planning and action.

National Authorities and Emergency Heat-Health Action, Guidelines & Data

While there is no single national government body leading the coordination of government agencies, local authorities, research and other stakeholders on heat-health action and urban heat resilience, several ministries hold responsibilities related to heatwaves and health safety.

Table 1. Governance of Emergency Heat-Health Action in Greece

Government Agency / Risk Data	Responsibilities or Data Availability
The Ministry of Health (MoH)	Responsible for management of heat waves in Greece. MoH issues a circular a few days before a heat wave, following an alert from the Hellenic National Meteorological Service, with instructions for specific government entities and health sector entities (hospitals) to take emergency response actions.
The Ministry of Labour and Social Security (MoLSS)	Implements an integrated protection framework to protect workers from heat stress. While not yet adopted as legislation, the framework uses Wet bulb globe temperature (WBGT) as a heat stress indicator: complete work interruption occurs when the WBGT rises above 32.5°C for low-intensity work, 31.5°C for moderate-intensity work, 30.5°C for high-intensity work, and 30°C for very high-intensity work.
The Ministry of Interior (MoI)	Issues a circular during extreme heat with safety guidelines for public sector employees, in communication with Hellenic National Meteorological Service and Ministry of Climate Crisis and Civil Protection (MoCCCCP).
Ministry of Climate Crisis and Civil Protection (MoCCCCP) and Fire Service	Responsible for wildfire management. They also order the closure of large regional parks in Attica during days with high wildfire risk, determined by extreme heat and wind conditions. This includes the largest urban park in Athens, situated in the dense city centre and offering potential relief for many residents that live in surrounding older buildings and are vulnerable to heat. In 2023, this park was closed 23 days.
Heat Health Data - MoH	MoH is responsible for collecting mortality and morbidity data related to heat. Mortality data (all causes) is tracked weekly at the national level and computation of excess deaths is used to estimate heat-related mortality. Greece reports that it collects morbidity data associated with heat through emergency room visits, ambulance calls and hospital admissions during heat waves, but it does not forecast impacts based on weather reports or evaluate the impacts of heat on health after heat events. (European Climate and Health Observatory, 2024) Morbidity data is not made public, and any results analysed after heatwaves are in scientific papers, making information minimally accessible to policymakers, planners and the public. Greece also lacks a systematic medicolegal process for investigating heat-related deaths.
Heat and Worker Safety Data	Greece does not systematically collect labor and occupational safety data such as deaths, illnesses and work-related injuries caused by heat. This creates a challenge for understanding the risk, raising public awareness and developing data-based policies.

International spotlight: In Canada and US, the Coroner’s office of local or regional government conducts medicolegal investigations of deaths linked to heatwaves. For example, in British Columbia (BC), Canada, the BC Coroners Service issued a Report on heat-related deaths during and following the 2021 heat dome and made recommendations to improve public safety and prevent death in similar circumstances²⁴. The Report defines a heat-related death as one where: the localized environment or body temperature is keeping with hyperthermia; or there is no direct temperature at the time of death but there is evidence (circumstantial, scene environment, medical history) to support that heat played a significant causal effect on the death. The Report tracks heat-related deaths by injury location: Inside Residence (the deceased’s own or another’s residence, hotel, seniors’ homes, etc.), Outside (in vehicles, streets, sidewalks, public parks, etc.), or public buildings (restaurants, community centres, businesses, etc.)

Data and investigation of previous heatwaves and heat-related deaths is important for determining who is most vulnerable during extreme heat events in a particular city or region. The BC Coroners Service found that 98% of all heat-related deaths (619 in total) across the province occurred indoors, and over half the victims lived alone. However, a recent study of mortality in Mexico shows that 75% of heat-related deaths are occurring among people under 35 because they are more likely to work in outdoor and indoor labour where they are exposed to heat (farming, construction, manufacturing).

National Policy and Urban Heat Adaptation & Mitigation

The Ministry of Environment and Energy (MoEE) is responsible for designing and implementing energy and climate policy, and is therefore the lead government entity for most of the legislation, strategies and plans that address various aspects of urban heat adaptation and mitigation related to heat health risk. The table highlights how these national policy documents address urban heat health specifically.

Table 2. National Policy Framework for Addressing Urban Heat and Heat-Health Risk in Greece

National Policy	Responsible Government Entity	Relevance to the Urban Heat A&M and Heat Health Risk
National Climate Law (2022)	MoEE	Focuses on mitigation. It does not address extreme heat, high temperatures, urban overheating. Some types of measures related to urban heat mitigation are mentioned but not mandated or encouraged.
National Climate Change Adaptation Strategy (2016)	MoEE. 10-year plan.	Recognizes that heat waves are likely to become more frequent, longer and more intense, but does not present data, projections or scenarios, or how heat health risk is compounded by other hazards. Some NbS are briefly discussed, though the strategy will be strengthened with the addition of specific guidance, measures and steps for planning and implementing a comprehensive list of NbS relevant for the local context, and designed for heat and multi-hazard mitigation.

National Policy	Responsible Government Entity	Relevance to the Urban Heat A&M and Heat Health Risk
National Energy and Climate Plan (2025 update)	MoEE. 10-year plan.	This plan, mandated by the EU for member states, includes targets and supporting measures to put the country on a path to net zero emissions. It does not focus on heat health risk, but the plan's extensive focus on renewable and sustainable energy for climate mitigation and energy efficiency for buildings targets risk drivers of people's vulnerability and exposure to high temperatures, and heat health and mortality risk. Existing data for Greece is not presented, nor is the collection and utilization of data mandated. It does not urge or prioritize deep renovations or passive house renovations for buildings where vulnerable households live and that are located in urban heat hotspots. National or metropolitan heat health action plans to inform energy and energy poverty planning are not mandated, though the plan states that 'local heating and cooling plans will be drawn up in municipalities with a total population of more than 45,000 inhabitants' focusing on energy efficient and renewable methods, in line with the EU Energy Efficiency Directive. There is no scientific evidence used to discuss current/trending conditions of energy poverty in the country and the projected impacts of extreme heat. It indicates that an 'Inter-ministerial Committee for the Environment and Climate' is responsible for applying a methodology, analysing and updating scenarios to be investigated, and proposing energy policies, actions, and guidance for institutional actors, in cooperation with a Scientific Committee on Climate Change that was set up at the MoEE.
National Biodiversity Strategy and Action Plan (2014)	MoEE (at that time Ministry of Environment, Energy & Climate Change). 15-yr plan (2014-2029)	Focus is on protecting biodiversity. While it does not address extreme heat directly, its strategic targets related to biodiversity and natural systems cover a holistic approach by addressing support for scientific knowledge; conservation of species, landscapes, protected areas; biodiversity and climate change; inclusive participation; public administration and biodiversity protection; and societal value system. The strategy's vision recognizes "the substantial contribution of biodiversity to the society's welfare and economic prosperity" and there are some mentions that biodiversity contributes to human wellbeing, but there is no direct discussion of how human health and communities benefit from biodiversity and natural ecosystems.

National Policy	Responsible Government Entity	Relevance to the Urban Heat A&M and Heat Health Risk
Modernization of Spatial and Urban Planning Legislation (2020)	MoEE General Secretariat of Spatial Planning and Urban Environment 4-year plan (2022-2026).	The law reforms urban policy in Greece in the context of a green transition. All municipalities must prepare a Local Urban Plan (LUP) by 2026 and Special Urban Plans (SUPs) will be prepared for strategic developments that span multiple municipalities. The plans must include a chapter on climate adaptation measures and a chapter that includes a local plan for civil protection or emergency management. Extreme heat and heatwaves are not mentioned, and there is no focus on UHI effect or urban overheating, or that these are projected to increase, though some examples of NbS interventions to address UHI are specified. The law does not mandate cooling, or the prioritization of bioclimatic building design. There is no explanation of what a safe thermal comfort threshold might be, or any attempt to set a target. It does not address spatial inequity in planning, renovations, prioritization of investment or interventions. The law's strength lies in its action-oriented and multi-scaled approach, providing specific technical requirements for buildings while simultaneously outlining large-scale metropolitan interventions, but it does not explicitly state the climate objectives behind these interventions.
Social Climate Plan (2025)	MoEE, along with Ministry of Infrastructure and Transport; Ministry of Education, Religious Affairs and Sports; Ministry of Development; Ministry of Social Cohesion and the Family; Ministry of Maritime Affairs and Insular Policy.	The EU indicates that "Member States may use the Social Climate Fund to support structural measures and investments in energy efficiency and renovation of buildings, clean heating and cooling and integration of renewable energy, as well as in zero- and low-emission mobility solutions." Greece announced its draft plan in June 2025 and published it for public consultation for a short period in July. The draft plan includes energy efficiency building upgrades for energy-vulnerable households, student housing and very small businesses, new and/or more accessible buses and taxis, and soft mobility infrastructure. It also includes a heating allowance for vulnerable households using fossil fuels. An Interministerial Working Group for the National SCP sent a survey to the 7 Greek cities in the EU Mission for Climate Neutral and Smart Cities asking about their projects and priorities.
National Worker Heat Stress Protection Framework (2022)	Ministry of Labour and Social Security (at that time Ministry of Labour and Social Affairs)	This framework describes and references heat health impacts science extensively and utilizes the Wet-Bulb Globe Temperature (WBGT) Index to raise awareness and guide employer action to prevent heat stress and address heat health risk of workers. It does not refer to climate science or future projections. It does not directly address the lack of occupational safety and heat-related health data in Greece, for understanding risk and evaluating the effectiveness of adaptation and risk reduction measures. If this framework is adopted as legislation and enforced, and occupational safety data and heat-related health data is collected by the Greek government to monitor effectiveness, it can contribute significantly to occupational safety and heat health risk reduction for workers.

Regional Planning

Athens is located in the Region of Attica. The Region of Attica launched its regional climate change adaptation plan (RCCAP) in 2020. This is largely an assessment of data, climate vulnerability, expected climate change, and projected impacts on different sectors. There is no regional plan focusing on extreme heat.

In the 93 proposed Measures in the RCCAP, two refer directly to heat or heat waves as examples, though there are several measures related to: climate change, extreme weather and health; urban planning and green and blue infrastructure; water management; and air pollution (without reference to the compound risk of air pollution and heat).

The sectors addressed in the RCCAP include Forest Ecosystems, Water Resources and Floods, Energy, Health, Built Environment and others as mandated by national legislation. Housing and the social sector are not addressed, and there are subsequently no measures addressing support for local authorities or social sector organizations and their role in climate adaptation, mitigation, risk reduction and community resilience. There is an assessment of socio-economic vulnerability and poverty across municipalities, though energy poverty is not assessed.

While the plan acknowledges green and blue infrastructure, it does not set specific, evidence-based targets for urban tree canopy cover or other NbS. This is a missed opportunity, as research shows that achieving a target of 30% tree canopy cover in European cities can significantly reduce heat-attributable mortality²⁵. Furthermore, the plan does not explicitly adopt a multi-hazard approach for NbS, which is essential given the interconnected risks of drought, heat, and wildfire in the region²⁶.

The Regional Authority launched a Climate Change Observatory data platform to accompany the regional plan, and it remains in development²⁷.

Local planning

Based on the survey of municipalities in the Athens metropolitan area, few local authorities have a heat action plan, but there is extensive interest in developing such plans and accessing health, vulnerability and heat risk data. There is also significant need for data, financing, partnerships and multi-stakeholder collaboration to implement and evaluate NbS in public spaces, heat health resilience actions, and renovations or upgrades for safe thermal comfort in buildings.

Four municipalities in metropolitan Athens have developed Sustainable Energy and Climate Action Plans (SECAP, Greek acronym SDAEK) under the Covenant of Mayors framework. These plans focus primarily on climate mitigation through carbon footprint calculations, emissions reduction and energy transition. They are a pre-condition for accessing EU funds focused on energy efficiency. While they do not focus on heat health risk, they address key risk drivers of heat health and mortality risk, including: energy poverty, energy efficiency building upgrades and building design techniques, indoor temperatures and thermal comfort, and urban heat islands. They do not present data or analysis of the distribution of urban heat islands and heat health risk indicators within the municipality, or heat emergency planning and response actions.

Under the National Climate Law, all municipalities are required to have an Action Plan to reduce emissions and report how they are reducing energy and fuel use. They are also required, under a 2020 law reforming urban policy in Greece, to prepare a Local Urban Plan (LUP) by 2026, that includes climate adaptation measures and a local civil protection plan. Municipalities with a population of more than 45,000 inhabitants will have to develop a local heating and cooling plan focusing on energy efficient and renewable methods, in line with the EU Energy Efficiency Directive and as mandated under the National Energy and Climate Plan.

In terms of heat health emergency action, municipalities are responsible for declaring if schools will remain closed, and for opening cooling centers. Additional actions by some municipalities as reported in the CARMINE survey: informing the public about self-protection measures; telephone help hotlines; visits to vulnerable people; reduced outdoor work hours; cool spots and fountains in parks; distribution of cooling kits to people experiencing homelessness.

Many local authorities are actively pursuing NbS and hybrid or grey interventions as part of broader urban regeneration and climate adaptation efforts. Measures commonly cited in the CARMINE survey include tree planting, green space enhancement, pocket parks, green islands, use of cool materials with high reflectivity in public spaces and building retrofits, and integration of water features such as fountains and misting parks. Several municipalities also reported more ambitious initiatives including green roofs, green walls, and the creation of urban forests. A significant gap remains in monitoring and evaluation. These survey results suggest growing awareness and ambition, yet underscore the critical need for enhanced data collection, technical capacity, and structured evaluation frameworks to support evidence-based NbS planning and implementation across the metropolitan area.

A New Digital Twin for Heat Health Risk

The CARMINE project is developing digital, climate modeling and decision support tools based on data, scientific knowledge and stakeholder engagement. These tools can serve metropolitan level planning for heat health and climate resilience in Athens.

A new Digital Twin (DT-HEAT+) developed by the National Observatory of Athens (NOA) within the CARMINE project is advancing understanding of urban heat and mortality risk across metropolitan Athens. Using deep learning, environmental data, and a wide range of indicators, DT-HEAT+ provides next-day forecasts of heat-related mortality risk. DT-HEAT+ incorporates a Heat Vulnerability Index developed through CARMINE as a composite index based on demographic, social and economic indicators at the municipality level. This data-driven digital solution can contribute to long-term planning for extreme heat health risk, enhance emergency response and strengthen risk awareness.

DT-HEAT+ is now on board the European Space Agency's (ESA) Destination Earth (DestinE) Platform and its pilot operation took place during the summer of 2025. It is expanding progressively to exemplify how Earth Observation, AI, and predictive modelling can be leveraged within ESA's DestinE to address urban heat in cities.

Policy and Planning Recommendations

Expand Heat Health Resilience Policy

- Create local, metropolitan and regional extreme heat action plans and a national strategy, building on existing work to identify and map heat vulnerabilities and impacts across scales and sectors. The plans must identify funding and finance options, build on existing solutions, address risk in outdoor and indoor spaces, and advance nature-based solutions and green technology.
- Prioritize strategic placement of NbS to deliver maximum thermal benefit and to serve the most exposed and vulnerable neighbourhoods.
- Address all the phases of disaster risk management: risk data and understanding, prevention/mitigation, preparedness, response, recovery and risk reduction and adaptation.

Adopt a cross-sector and all-of-society approach

- For heat health resilience, this involves decision makers and practitioners in the health sector, emergency management, housing policy, regulation and financing, school facilities management, occupational safety, urban planning, water management, social sector organizations, and media, along with scientists and researchers in the fields of climate and disaster studies, public health, environment, urban geography, urban sociology and urban design.

Address knowledge gaps and awareness

- More local and regional data and mapping of heat risks, vulnerabilities and impacts are needed, including at the level of small-scale neighbourhoods within municipalities, to address increasing heat risk in Athens and Greece.
- Risk data that is open and usable, or shared with relevant stakeholders, including data on heat and interconnected hazards, health data and investigation of previous heat-related mortality and health impacts.
- Improved public communication, education and engagement on extreme heat risk and how people can prepare and respond. Journalists and media have a responsibility to deliver effective heat risk communication and raise public awareness of heat as a public health issue.
- Collaboration with and investment in social sector organizations and networks that have relationships with people who are most at risk, to strengthen their role in communicating heat risk, listening to peoples' concerns, and enabling community resilience.

A multi-hazard approach to address compounding risk

- Understanding heat health risk and addressing urban heat, especially by restoring natural ecosystems or integrating natural elements, requires a multi-hazard approach to risk assessment. This should include drought, heat, wildfire, air pollution, disease and even flood hazard data to assess interconnected and compounding risks. Implementing NbS throughout a metropolitan area requires significant resources, therefore interventions should be planned for multi-benefits, including cooling, water and flood management, quality of life and biodiversity conservation. Therefore, all risks should be considered when planning where to locate and how to maintain nature-based solutions for urban greening and cooling. This multi-hazard approach is particularly critical in Athens, as it requires careful species selection and irrigation planning to ensure that new/restored green spaces do not become a fire risk during droughts and are resilient to the very heat extremes they are meant to mitigate.

Additional Resources

Heat mortality and morbidity surveillance in European countries – Technical report

2024 European Climate and Health Observatory report

<https://climate-adapt.eea.europa.eu/en/observatory/evidence/health-effects/heat-and-health/2024-heat-mortality-technical-background-document.pdf>

Heat Action Day Tools and Resources – Global Disaster Preparedness Center

<https://preparecenter.org/initiative/heat-action-day/#Resources>

Extreme Heat Risk Management Scorecard

Making Cities Resilient (MCR2030), UNDRR

<https://mcr2030.undrr.org/extreme-heat-scorecard>

Urban Heat Risk Management Resource Package

Making Cities Resilient (MCR2030), UNDRR

<https://www.undrr.org/publication/urban-heat-risk-management-resource-package>

Public registry of heat-health action plans from around the world

Plans from local to national level. The registry:

https://sparklabnyc.github.io/heat_health_action_plan_registry/

Building Resilience to Heat in the City of Athens

October 2025, Resilient Cities Network

<https://doi.org/10.5281/zenodo.17243305>

Οικοδόμηση Ανθεκτικότητας στη Ζέστη της Πόλης της Αθήνας

Οκτώβριος 2025, Δίκτυο Ανθεκτικών Πόλεων

<https://doi.org/10.5281/zenodo.17398304>

Hadrian Aqueduct Cooling District: Heat Risk Reduction Guidelines (2023) / Κατευθυντήριες οδηγίες μετριασμού θερμότητας: γαλάζια και πράσινη ζώνη Αδριάνειου υδραγωγείου

<https://www.preventionweb.net/publication/hadrian-aqueduct-cooling-district-heat-risk-reduction-guidelines>

Οδηγός για την προσαρμογή των Δήμων στην Κλιματική Αλλαγή

ΚΕΔΕ, LIFE-IP AdaptInGR

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Climate Landscape Analysis for Children in Greece (October 2024)

October 2024 study, UNICEF Greece & ELIAMEP

<https://www.unicef.org/greece/en/reports/climate-landscape-analysis-children-greece>

A Practical Guide to Creating OASIS Schoolyards

From the Resilient Cities Network, April 2025

<https://resilientcitiesnetwork.org/oasis-schoolyards-guide/>

Framing summer energy poverty: Insights and recommendations for a resilient future

2025 European Commission report

<https://op.europa.eu/en/publication-detail/-/publication/af533cb3-f7df-11ef-b7db-01aa75ed71a1/language-en>

Partners

The National Observatory of Athens (NOA) is a leading Greek Research Centre focused on advancing Space Sciences and their practical applications, with a proven track record of impactful contributions. NOA is participating in CARMINE work with two Institutes: the Institute for Astronomy, Astrophysics, Space Applications & Remote Sensing (IAASARS) and the Institute for Environmental Research and Sustainable Development (IERSD).

The Hellenic Ministry of Digital Governance (MoDG) operates as a public administration unit and brings together all critical IT and telecommunications structures involved in the provision of electronic services to citizens and the broader digital transformation of the country. MoDG supports CARMINE as an Associate Partner.

The National Infrastructures for Research and Technology (GRNET – EDYTE S.A.) is one of Greece’s largest public tech agencies under the Hellenic Ministry of Digital Governance. Since 1998, it has been driving digital transformation through data centers, high-performance computing, secure networks and cutting-edge innovation in AI and digital skills.

“New Metropolitan Attica S.A.” (NMA) as a Regional Development Organization of Attica operates with the purpose of contributing to the planning and actualisation of development initiatives and projects which support the wider developmental targets and priorities of the Region of Attica. Major reference points for the Organization are the enhancement of social cohesion and the improvement of the quality of life both in and beyond Attica.

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ACKNOWLEDGEMENTS

We thank Spyridoula Ntemiri for her review and feedback.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them. Every effort has been made to ensure that all statements and information contained herein are accurate, however the CARMINE Project Partners accept no liability for any error or omission in the same.

UK participants in this project are co-funded by UK Research and Innovation (UKRI).

The work of Meteomatics partner (Switzerland) has received funding from the Swiss State Secretariat for Education, Research and Innovation (SERI).

Horizon Europe Grant Agreement ID: 101137851

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