

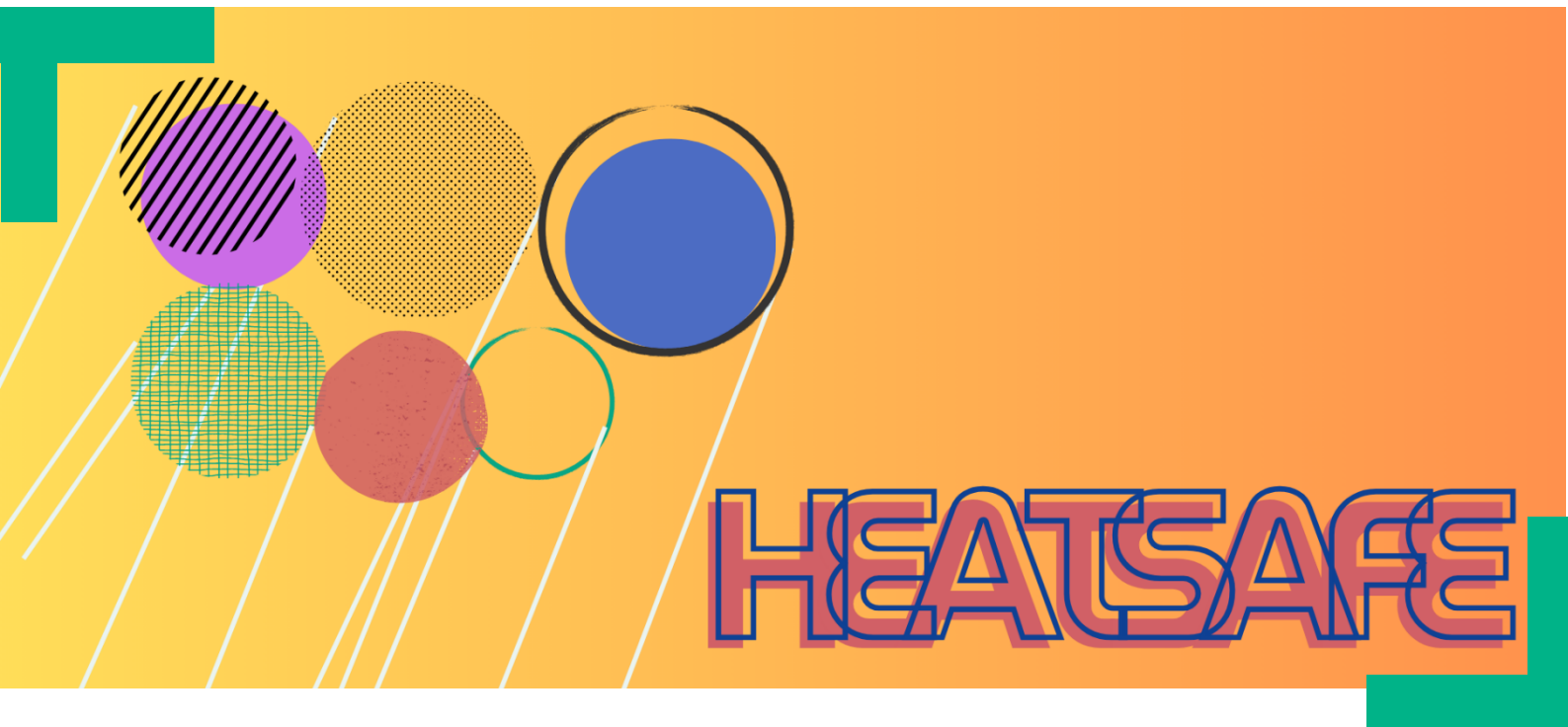


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Diagnosis of heatwaves action planning in the Mediterranean area

HEATSAFE Deliverable 1.1

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Abbreviations

AAK	Municipality of Agii Anargiri – Kamatero
ACM	Catalan Association of Municipalities
AEMET	State Meteorological Agency (Spain)
ASWM	Association of South-Western Municipalities
BMA	Barcelona Metropolitan Area
EEA	European Environment Agency
EMS	Emergency Medical System
HHAP	Heat-Health Action Plan
HHWS	Heat-Health Warning Systems
HHWW	Heat Health Watch Warning
IMSERSO	Institute of Elderly and Social Services
IPH	Institute of Public Health
NACP	National Agency for Civil Protection
NAP	National Adaptation Plan
PGMO	General Plan for Urban Planning
POCS	Operational Plan to Prevent the Effects of Heat on Health
SECAP	Sustainable Energy and Climate Action Plan
SiSMG	Rapid Daily Mortality Surveillance System
SMC	Meteorological Service of Catalonia
SUDS	Sustainable Urban Drainage Systems
USL	Local Sanitary Units
WHO	World Health Organization



1 Summary

This deliverable presents the outcomes of Activity 1.1 of the HEATSAFE project which aims to review the heatwave plans and activities for the six pilot areas within the broader Mediterranean context. It consists of three parts, based on the three sub-activities of Activity 1.1. First, an overview of heat management and plans in the Mediterranean region sets the scene on the current state of actions to prepare for and respond to heatwaves. Next, readiness for heat management in the pilot areas is assessed against the World Health Organization's criteria for heat-health action planning. Finally, potential needs and areas to further develop heat management plans and actions in the pilot areas are discussed. This deliverable establishes the foundational knowledge for heatwave planning and action for the six pilot areas in the HEATSAFE project.



1. Overview on the State of Art of Heat Management Plans and Action in the Mediterranean

Extremely high summer temperatures and heatwaves are becoming increasingly frequent in Europe and the Mediterranean due to climate change. Recent data from 854 European cities shows that 68% of the 24,400 estimated heat deaths in the summer of 2025 were attributable to climate change, which raised local temperatures by up to 3.6°C (Barnes et al., 2025).

Since the prolonged and intense heatwave of 2003, the need for systematic action to address the impacts of heat and heatwaves has been recognised, with several European Mediterranean countries initiating the development of national heat-health plans and strategies. As heatwaves have become more frequent, both the number and scope of heat-health action plans have expanded over the last 20 years. This has been facilitated by guidance documents, particularly those from the World Health Organization's (WHO) European Office (WHO Regional Office for Europe, 2008).

This section of the deliverable presents the state of art for heat-health management in European-Mediterranean countries. It provides an overview of available information on the national and subnational strategies and plans which address impacts of heat on human health, on institutional responsibilities, main actors, and key elements addressed by these plans.

Fourteen Mediterranean countries are included in the assessment: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, France, Greece, Italy, Malta, Montenegro, North Macedonia, Portugal, Slovenia, and Spain. Five of these countries are represented with a pilot area in the HEATSAFE project: Albania, Bulgaria, Greece, Italy, and Spain. Ten of these 14 countries have a national heat-health action plan (HHAP) (Figure 1), while Croatia established a working group in charge of creating a national HHAP in 2023, but the plan is not yet available.

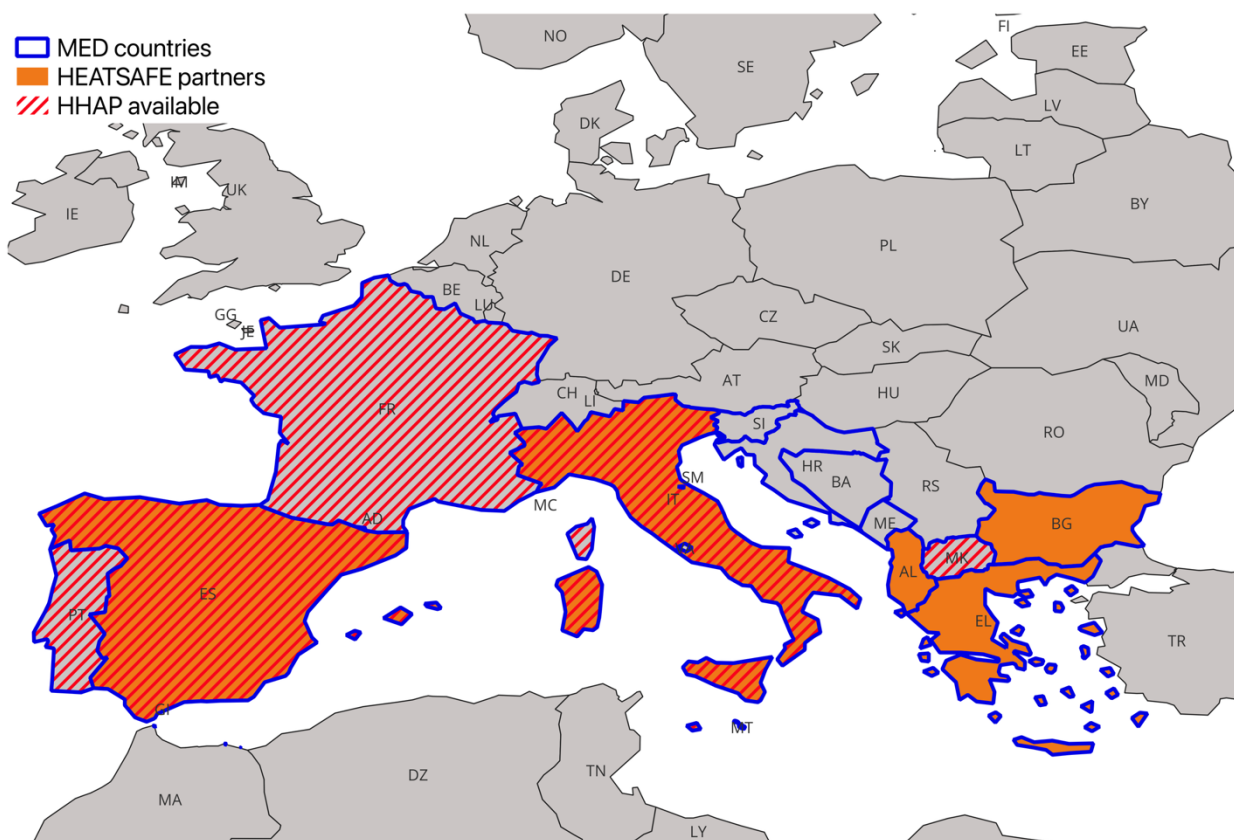


Figure 1: Map of availability of HHA plans in the Mediterranean area

The overview builds on previous surveys conducted by the WHO Regional Office for Europe (2011) and the European Climate and Health Observatory (2022). It includes information on national adaptation actions relevant to heat and heatwaves as reported under the EU Regulation on the Governance of the Energy Union and Climate Action (EEA, 2025). It furthermore draws on an ad hoc investigation across countries in the European Mediterranean region, using information from HEATS SAFE project partners and grey literature. The framework used to structure this overview on the state of art of heat management plans and actions is based on the WHO’s list of core elements of heat-health action plans for the prevention of health effects from heatwaves (WHO Regional Office for Europe, 2008) and is presented in Table 1.

Table 1: Core elements of Heat-Health Action Plans, based on recommendations by the WHO Regional Office for Europe (2008)

Core elements of HHAPs	Contents
1. Agreement on a lead body and clear definition of actors’ responsibilities	Clearly defined lead body and governance structure



Core elements of HHAPs	Contents
2. Accurate and timely alert systems	Threshold definition scientifically sound
3. Health information plan	Clearly defined actors/recipients/contents
4. Reduction in indoor heat exposure	Giving advice
5. Particular care for vulnerable groups	Planning or support for better insulation
6. Preparedness of the health/social care system	Increase of capacity of health services
7. Long-term urban planning	Increased green & blue spaces
8. Real-time surveillance	Daily Analysis of health impacts (morbidity and mortality)

1.1 Heat-health action plans

1.1.1 National plans

The characteristics of heat-health action plans vary widely among Mediterranean countries. Differences exist in the distribution of tasks between actors within and outside the health sector, as well as across governance levels (national, regional and local plans). There are also differences in the content and nature of measures set in place for preparation and action during emergency situations. Generally national plans are guided and/or coordinated by national health authorities, who usually orchestrate and coordinate the principal activities, delegating local activities and eventually the establishment of specific plans to regional or local levels. For example, in Italy, the national plan defines the heat health management measures to be implemented at the local level, while the setting up of regional or local action plans is left to the decision of local agencies (Ministero della Salute, 2019).

1.1.2 Regional and local plans

Depending on the specific national administrative structures, national health plans either prescribe or suggest activities to be implemented by subnational and/or local authorities. For example, in France, the national Ministry of Health prescribes actions to be undertaken at regional and local levels. In Italy, where management of the health system is delegated to the regions, activity at the national level is limited to organising early warning systems for major cities and



communicating with the population. In Portugal, the national health agency provides guidelines for action to be implemented by local healthcare units. Similarly, in Spain, the national plan defines and coordinates actions to be undertaken by regional and local health agencies; yet local plans are not mandatory, but Autonomous regions and cities can adopt their own plans, as in the case of Catalunya, Andalusia and Extremadura, and the Basque Country, while in other cases, regional protocols adhere to the guidelines set out in the national plan. Regional heat action plans have also been created by the respective regional health authorities in Italy, for example in Lazio (Regione Lazio, 2024), Piemonte (Regione Piemonte, 2025), Sicily (Regione Sicilia, 2012), Lombardy (Regione Lombardia, 2024), and Emilia-Romagna (AUSL Emilia Romagna, 2025). Activities in regions which do not have dedicated plans, are limited to the dissemination of information for health personal and vulnerable groups according to the published alarm levels by the Ministry of Health. The Tuscany region for example has published a dedicated [webpage](#) which provides recommendations for behaviour during heatwaves and indicates which health services should be contacted in case of need¹.

The local level, which is generally municipal level, is where most physical and organisational measures are set in place. Measures are either an implementation of prescriptions or suggestions made by national plans (e.g. the dissemination of warnings and recommendations for behaviour during heatwaves, telephone hotlines) or established by local authorities according to their own plans, generally in collaboration with local health agencies, civil protection and social services. Local heat-health action plans exist in Portugal, for example, where the drafting of local action plans is mandatory according to the national strategic plan. These local summer and winter plans (which address the health impacts of energy poverty) are drafted by the local health administrations (Local Sanitary Units, USL) (Ministério da Saúde, 2025).

In Athens, Greece, a Chief Heat Officer was appointed in 2021 as part of the urban resilience strategy, which also addresses heat-related issues (Municipality of Athens, 2017). In Italy, several local authorities have collaborated with municipal social services, local health units and often voluntary organisations to create action plans that provide specific services for monitoring and supporting elderly and vulnerable people (e.g. Turin, Bologna, Milan and Rome). In Spain, local plans also exist on a voluntary basis and should be coordinated by the national plan. One example of this is the Pla Calor 2025-2035 of the Barcelona City Council (Ajuntament Barcelona, 2025). The plan is part of the municipal resilience strategy and is therefore integrated into the city's adaptation plan.

Local activities exist also in countries without a formal national heat-health action plan, either as part of local adaptation and resilience strategies as in Athens, or as dedicated local strategies

¹ <https://www.ars.toscana.it/clima-e-salute/ondate-di-calore-e-altri-eventi-estremi.html>



developed independently of national plans and their specific prescriptions. For example, the International Red Cross set up a plan for the Albanian cities of Tirana, Berat and Elbasan in 2025 (IFRC, 2025). In Slovenia, the city of Maribor developed a Heat Health Action Plan as part of the Interreg project 'Ready4Heat'². In Athens, a Chief Heat Officer was appointed in 2021 as part of the urban resilience strategy, which also addresses heat-related issues (Municipality of Athens, 2017).

1.2 Coordination and implementation

1.2.1 National level

Most national heat plans are coordinated by the Ministry of Health, which generally coordinates the definition of activities to be undertaken, or a framework of activities delegated to sub-national or local plans (e.g. in France, Spain and Portugal). These activities are often supported by the national meteorological agency, which forecasts temperature extremes and heat waves, and an epidemiological institute, which determines and monitors critical thresholds for morbidity and mortality. Another recurring pattern in the definition of national heatwave strategies is the national civil protection agency, which coordinates measures to protect the population. Recently, national agencies responsible for workplace security have also become involved in the definition of national heatwave strategies. The co-ordination group of the Spanish strategy includes, further to the national council for health and social services, the ministry responsible for health and for civil protection, the ministry for the environment, and public and private media. Such strategies, which essentially aim to set up a framework for the early warning and preparedness of heatwaves, are usually updated annually.

1.2.2 Regional and local level

Actors involved at regional or local levels include, first and foremost, local health system agencies, if such a hierarchy exists, civil protection agencies, and local authorities, particularly social services, as well as departments responsible for environmental management and urban planning. This broader array of actors is related to the need of adapting public and private spaces. These spaces are to provide refuge from heat. Cooling spaces consisting of air-conditioned indoor facilities, such as libraries, museums and civic centres, which are only opened in cases of emergency, require mainly organisational measures for the temporary opening of spaces in public buildings. Permanent transformation of urban areas, outdoor spaces and buildings to address the effects of the urban heat island and to better adapt dwellings and public buildings to the need for heat protection requires urban renewal measures. Some examples of this include increased shading

² <https://www.interreg-central.eu/projects/ready4heat/?tab=home>



and greening of outdoor spaces and buildings, better insulation and shading of buildings, and the installation of artificial cooling systems. Outdoor and indoor spaces have been created as cooling refuges in several cities around the world. Examples include Barcelona (Ajuntament de Barcelona, 2025) and Murcia in Spain, Larnaca and Paphos in Cyprus (EEA, 2025 Cyprus), Plovdiv and Sofia in Bulgaria (EEA, 2025 Bulgaria), Bologna, Florence and Rome in Italy, and Athens in Greece. The fact that, in many cases, spaces require long-term physical transformations means that such measures generally find their place in adaptation strategies set up by local authorities rather than in local HHAPs.

1.2.3 Adaptation plans and HHAPs

Nearly all national adaptation plans in the Mediterranean area recognise rising temperatures and more frequent and prolonged heatwaves as one of the main climate hazards, which are expected to have an increasingly negative impact on human health. The French adaptation plan, for example, anticipates that this phenomenon will accelerate in the medium and long term, with an increase in the frequency, duration, intensity and spatial distribution of heatwaves, as well as an extension of hot spells from May to October (EEA, 2025 France). In a similar manner, almost all national adaptation plans mention impacts from high temperatures on health as a relevant climate impact which needs to be addressed.

In some countries without a proper HHAP, national adaptation plans and/or general health management plans provide indications for the definition of local HHAPS, as for instance in Greece, or for the inclusion of heat management measures in local adaptation plans, as in Bulgaria, where the national climate law introduced an obligation for, inter alia, local authorities to mainstream adaptation into their development and plans and housing strategies (Republic of Bulgaria, 2019).

1.3 Heat-Health Warning Systems

Accurate and timely meteorological early warning systems are a vital part of heat-health action systems. Sufficient lead times and spatial detail are important, as meteorological conditions can differ from region to region in most countries, and timely preparation of prevention and emergency management actions requires time. Meteorological forecasts are mainly provided by national meteorological institutions, most of which issue warnings to the public and institutions with different lead times (between two and five days for the public, and up to eight days for institutions involved in heat management) (Casanueva *et al.*, 2019). Generally, more than one meteorologic model with different spatial solution is applied. Early warning systems generally use a combination of temperature and weather forecasts (mean or maximum temperatures, and, in some cases, also expected duration of the heatwave). While in most cases, critical temperature thresholds to be used are identified comparing expected temperatures with historically registered



values, some countries (France, Italy and Spain) base the identification of critical temperature levels for heat-health alarms on a combination of temperature and epidemiological data (past and real time morbidity and mortality, selecting critical thresholds in relation to significant increases in mortality. In France, a city-specific early warning system based has been set up in 2004, based on city-specific epidemiologic data. Thresholds for heat health warnings have been defined, based on temperature indicators (average min. and max temperature over 3 days) which have a high probability to be exceeded both in minimum and maximum values. These temperature thresholds have been defined determining critical temperature levels from an analysis of statistics on mortality data over 30 years and expert judgements. Temperature thresholds are specific for geographic and meteorological situations of 96 cities (Pascal *et al.*, 2013). In Spain, an epidemiologically based system for heat health warnings was introduced in 2025. For this system, critical temperatures thresholds were calculated for 182 different isoclimatic zones (zonas meteorosalud). Critical temperature thresholds have been determined analyzing mortality data for each isoclimatic zone across the period 2009–2018 in relation to mean values of daily maximum temperatures recorded in each isoclimatic zone (López-Bueno *et al.*, 2024). In Italy only non-accidental causes of mortality of elderly are used for the determination of thresholds, (Casanueva *et al.*, 2019) and critical thresholds are determined specifically for each of the 27 major cities included in the warning system, which emits warning according to geographically specific forecasts.

Several national authorities provide spatially differentiated early warnings, to accommodate, regional climate differences. France, for instance, provides such information at the level of departments³. Also Croatia and Northern Macedonia use regional meteorological forecasts and warning thresholds for regions, while in Portugal heat warnings are emitted for districts. The Spanish Heat health plan articulates warning for 182 zones with homogeneous climatic characteristics and health impacts, and the Autonomous Region of Catalonia, where the Metropolitan Area of Barcelona is situated, has its own regional early warning system with a locally detailed articulation of warning levels according to the specific meteorologic conditions. In Italy, the national health provides warnings for the major cities (27 cities with more than 200.000 inhabitants)⁴. In addition, regional meteorologic agencies distribute early warnings for heat waves ensuring a higher spatial detail of the forecast, for instance for Piemonte⁵ and Emilia Romagna⁶.

Early warnings for heat waves are based not only on meteorological data alone, but combine, in most cases, air temperature levels with health outcomes (mortality and morbidity) observed in the

³ <https://vigilance.meteofrance.fr/en>

⁴ <https://www.salute.gov.it/new/it/tema/ondate-di-calore/>

⁵ <https://www.arpa.piemonte.it/bollettino/bollettino-ondate-calore>

⁶ <https://www.arpae.it/it/temi-ambientali/rischio-calore>



past or in real time⁷ and are generally based on the expected duration of the heat waves (mostly at least 48 hrs).

The warning system used in Athens and some other Greek cities is based on meteorological information provided by the Resilience centre set up by the Rockefeller Arsht-Rock foundation⁸ based on observed meteorological and mortality data (Municipality of Athens, 2017). This information adds to the regional early warnings, provided by the Hellenic National Meteorological Service (HNMS), which provides meteorologic forecasts for 16 regions (Casanueva *et al.*, 2019).

Warnings are emitted, in most countries, using critical thresholds identified with the support of epidemiological data (e.g. Portugal, Spain, Athens, Croatia, Italy).

In several countries, meteorological agencies circulate early warning information alongside weather forecasts for the general public about different extreme events, including those related to high temperatures and heatwaves. These countries include Croatia, France, North Macedonia, Portugal, Greece, Slovenia and Spain.

Warning systems generally use three alert levels in addition to a first green level which indicates absence of acute risk, and yellow, orange and red levels indicating increasing levels of health risk severity.

1.3.1 Communication channels

Communication with local health agencies and the general public is typically facilitated through daily (or more frequent) bulletins. These are published on the official web portals of the authority coordinating the HHAP, i.e. the national health agency.

In most countries, warning messages are communicated by social media and TV, and in several cases by specific apps (e.g. Italy). Local level health agencies and social services of local authorities also communicate warnings. A clear plan for regular institutional communication and subsequent information to be disseminated at local level is generally part of the national HHAP, e.g. in Italy, North Macedonia, Slovenia and Spain. The implementation of the Spanish HHAP is coordinated also with representatives of public and private media (Ministerio de Sanidad, 2025), where heat warnings are issued by the Spanish Meteorologic Service (AEMET)⁹ and disseminated with messages sent to all persons in the affected areas further to the publication of maps with geographically detailed forecasts on the internet.

⁷ <https://www.salute.gov.it/new/it/tema/ondate-di-calore/>

⁸ <https://onebillionresilient.org/>

⁹ <https://www.aemet.es/en/eltiempo/prediccion/avisos>



The Climate Resilience Center has launched a pilot initiative to improve awareness and promote effective responses to heat waves. It has developed a five-categories classification of heat waves (from “no risk” to “very high risk”) based on an algorithm which ensures that historical health and meteorological data can inform forecasts of heat wave impacts and started labelling heatwaves of the highest category with names similar to what is done with hurricanes, with the aim of emphasizing the danger that these events present for the population. The initiative has been tested and implemented in Sevilla (Spain) in 2022¹⁰, and has subsequently been implemented also in six Greek municipalities, including Athens’ (where the first heat wave was labelled with a proper name in 2023¹¹).

Apps enable more targeted messages considering the role of who receives the message (e.g. in Italy for health service personnel), the individual-specific physical conditions, age, and geolocation with respect to critical areas, etc. (EXTREMA app)¹². This app which is enabled for geolocation can furthermore indicate the closest free drinking water spot, cooling centre and cool routes for moving in the avoiding particularly hot areas of the city (EXTREMA is used in urban areas of Greece and France and Italy as well as on the Spanish island of Mallorca).

Early warnings for meteorological risks are provided, furthermore, for all Mediterranean countries by the Meteoalarm system¹³ which aggregates, visualises and provides awareness information from more than 40 European National Meteorological and Hydrological systems, yet their spatial detail may depend on the information provided for the respective national meteorological agency.

1.3.2 Target Groups

Target groups identified in HHAPs mostly point to persons identified by personal characteristics (elderly, very young persons) or by physical conditions (persons affected by specific physical or health conditions, such as pregnant women, persons affected by specific diseases or as in the French documents, also by obesity).

Some countries and cities, such as Athens in Greece and the national plan in Spain, go beyond identifying those particularly vulnerable to heat waves as ‘the elderly and persons with pre-existing chronic medical conditions’ (EEA, 2025 Greece; Ministerio de Sanidad, 2025) and include different forms of social disadvantage, including persons with low incomes and poor nutrition, living in low-income areas with difficult access to healthcare services, undocumented immigrants at the fringes

¹⁰ <https://onebillionresilient.org/project/categorizing-and-naming-heat-waves/>

¹¹ <https://onebillionresilient.org/2023/11/21/athens-designing-a-cooler-future/>

¹² <https://extrema.space/>

¹³ <https://www.meteoalarm.org>



of society who are faced with labour market, and social and healthcare exclusion (EEA, 2025 Greece). The list of potentially vulnerable persons identified in the Spanish plan indicates furthermore people living alone, homeless people, people in unfavourable economic circumstances, migrants and/or tourists, persons living in homes that are not well insulated or unable to regulate temperature (Ministerio de Sanidad, 2025).

Further to personal conditions enhancing vulnerability, also specific conditions of exposure to heat are mentioned in some national plans, in particular homeless persons, persons living in poorly insulated dwellings, and school children. The French health ministry lists in its instructions for heat risk management, also imprisoned persons, school children, travelling people living in campgrounds or wandering, and warns that persons accumulating more than one risk are more vulnerable (Gouvernement Francais, 2024). As the season of heatwaves coincides with the peak of arrivals in beach tourism in the Mediterranean, the tourism sector is addressed by some plans in their dissemination strategy. In Rome, the Red Cross in collaboration with the local authority have set up tents with cooling facilities for tourists and pilgrims.

1.4 Measures for risk mitigation

Emergency measures set in place start in all countries with communication campaigns, generally at the beginning of the summer season (during the so-called “green” phases without imminent risk of heatwaves) to create awareness and are intensified with the approaching of heat waves. Generic communications include recommendations for behaviour and nutrition. In most countries, information lines can be contacted by telephone 24/7 for assistance.

National adaptation and regional plans mention more frequently physical measures for increasing shading and albedo to reduce the urban heat island effect and reduce temperatures in public urban spaces. In some cases, interventions also reach out to the design of buildings to reduce indoor overheating in new buildings, changing building codes, as in Tuscany.

Emergency measures are mainly set up at the local level, involving local authorities, civil protection units and local health agencies. The principal measures set up include the organization of emergency services in hospitals (priority access to emergency units, continuity of services for elderly and small children).

Another emergency measure consists of the setting up of telephone lines where vulnerable persons may call for help. In some cases, local social services or medical personnel can actively contact vulnerable persons with regular phone calls. While these systems require vulnerable persons to take action, in Italy family doctors can inscribe their vulnerable patients in a list of persons for special surveillance, which can, e.g. in the Lazio Region, receive regular phone calls and/or home visits. In Bologna, the local authority has set up a surveillance system targeting



elderly living alone, which is active all around the year, and is intensified during heat waves to ensure regular contacts, and in case of needs, home visits and help with daily activities (shopping, etc.). Similar mechanisms are foreseen also in the Spanish HHAP where local social services are identified as channels for the identification and approach to most vulnerable persons (Ministerio de Sanidad, 2025).

1.4.1 Legislation protecting workers' health

Several national and regional HHAPs mention outdoor workers as particularly exposed, and agencies responsible for workers' health are involved in some cases in the planning of HHAPs. In Tuscany, as in other Italian regions, some specific outdoor work activities (agriculture, building sector) or in scarcely ventilated indoor environments are prohibited by decree during the hottest hours of the day. Spain, Greece and Bulgaria mention the need for protecting workers' health among the vulnerable groups to be targeted. Greece in particular has established a collaboration between the Ministry of Labour and Social Affairs, workers' and employers' organizations, OSH inspectors, occupational physicians, the Meteorological Service and scientists for creating a framework to protect workers from heat stress. It has been adopted to address a specific fourteen-day long heatwave (EEA, 2025 Greece).

1.4.2 Cooling centres

Cooling centres (also commonly called climate shelters) play a key role in many local strategies. They have been realized in different forms in many municipalities, such as Barcelona, Madrid, Murcia and Bilbao in Spain, as well as in Athens and in Agioi Anargyroi-Kamatero in Greece. They are also foreseen also in national plans as for example in Portugal (Ministério da Saúde, 2025). They consist of indoor rooms in public buildings (e.g. libraries, civic centres, market halls and shopping malls) which offer shade, space where to rest and water fountains and are designed or selected to be comfortable and safe for vulnerable groups in the event of heatwaves. These spaces must be easily accessible and free of charge. The Municipality of Barcelona has created a network of around 400 "climate refuges" distributed across all districts, to ensure that every resident can reach such a refuge within walking distance (Ajuntament de Barcelona, 2025). While in Barcelona this coverage has been achieved in almost all urban districts with approx. 75% of the vulnerable population can reach a climate shelter within a 10-minute walk. Obstacles to the usability of these shelters are related to temporal (not all public buildings are open in August, when heat risks are most acute) and spatial (not all districts reach the vicinity goal for 75% of the population) (Mombelli *et al.*, 2026).



1.4.3 Health and social care sector

The health and social care sector are under particular stress during heat waves in terms of heat related health emergencies arriving on top of normal emergencies, but also because patients and hosts in hospitals and care homes are particularly vulnerable to heat, while the physical structures are, in many cases, not adapted to the need of providing cooling. The health and social care sector is explicitly requested to plan for adapting organizational procedures during heat waves, creating, for instance, redacting proper emergency plans (e.g. France) and establishing, for instance, priorities in emergency services during heat waves. The health outcomes of heat waves are generally used as a term for monitoring the performance of the measures put in place in this sector.

The physical adaptation of premises used for health care and other care facilities is generally not contemplated in the HHAPs, although the need for such activities is mentioned in several national adaptation plans or reports, as in Cyprus where “not all health facilities are climate-resilient or thermally efficient, particularly in rural areas”, in Portugal, where the fear is that heat waves will affect negatively “the response capacity of health services”, or in Slovenia, where the need is seen for “healthcare systems [to] adapt to increased patient demand, particularly during extreme heat events and infectious disease outbreaks” (EEA, 2025 Cyprus, Portugal, Slovenia).

2 Heat Management in the Pilot Areas

2.1 Diagnosis of the project areas regarding their readiness for heat management

National, regional and local plans and actions for the six pilot areas are assessed against the World Health Organization (WHO) guidance on heat-health action planning to verify progress and gaps in terms of heat-health plans, activities, data, and governance.



Figure 2: Core elements of the WHO guidance on heat-health action planning (Source: based on WHO Regional Office for Europe, 2021)

A three-step methodology is applied to collect and assess data:

Step 1: Develop a set of criteria to assess readiness for heat management.

The 8 core elements of the WHO guidance on heat-health action planning were expanded on to develop a set of 20 questions to collect detailed information on national heat-health action plans (HHAP) and heat-health warning systems (HHWS), heat management plans and actions in pilot areas, current governance structures for managing heat in the pilot areas, and vulnerabilities to heat and how they are represented in existing plans and activities.

The 20 questions were structured in the form of a questionnaire to be completed by project partners to gather general information and local knowledge on national and regional/local heat preparedness and response in the 6 pilot areas.



The full set of 20 questions in the questionnaire are included in Appendix I.

Step 2: Collect project-level and national-level data from the 6 pilot areas (and 5 associated countries) on preparedness to manage and respond to heatwaves.

Using Google Forms, the questionnaire was distributed to the project partners representing the 6 pilot areas. The project partners who completed the questionnaire are:

1. Regional Council Durrës, Albania
2. Association of South Western Municipalities, Bulgaria
3. Municipality of Agioi Anargyroi-Kamatero, Greece
4. Municipality of Arezzo, Italy
5. Barcelona Metropolitan Area, Spain
6. EuroVértice (Municipality of Cartagena), Spain

Step 3: Compile reported data and fill in any remaining data gaps.

The primary data collected through the questionnaire was compiled and complemented by desktop research to clarify or expand on relevant points. The 6 completed questionnaires are included as Appendix II of this report.

A diagnosis of each pilot area provides an overview of their readiness for heat management based on policies addressing heat, governance of heat-health plans and actions, warning systems and measures in place, and monitoring and surveillance of heat impacts on health.

The source of information included in the diagnosis of each pilot area is the respective pilot area questionnaire. A note is made when additional resources are referenced to provide a more comprehensive description of ongoing plans and actions.

2.2 Regional Council Durrës, Albania

2.2.1 National and local policy

Albania lacks a dedicated national heat-health action plan or a specific health strategy to address heat. Similarly, the city of Durrës does not have a standalone heat-health plan. Despite this, there are existing frameworks and measures in place to mitigate heat risks.

Albania's national adaptation plan (NAP) led by the Ministry of Tourism and Environment as well as local adaptation plans include measures to reduce heat risks. The NAP's municipal initiative calls for developing heat-wave plans and promotes urban-planning measures to reduce heat risk like expanding green spaces, installing green roofs and using reflective materials. As part of the NAP, municipal adaptation plans must comply with Law 155/2020, which obliges municipalities to



draft and implement adaptation policies and integrate them into decision-making. This ensures vertical coordination between local and national levels. Durrës is drafting a local adaptation plan under the national initiative.

2.2.2 Governance and coordination

There is no permanent governance structure for heat-related issues in Albania. Instead, a temporary arrangement is activated during heatwaves. The Ministry of Health and Social Protection is the lead agency responsible for health policies and coordinating with other key organizations. The Institute of Public Health and National Agency for Civil Protection provide scientific advice and coordination.

During a heatwave, the Ministry of Health coordinates with the Institute of Public Health (IPH), the National Medical Emergency Center, the National Agency for Civil Protection (NACP), the military medical unit, and local health services. This system provides horizontal coordination among health, meteorological, and civil-protection services, though it lacks a formal, integrated structure.

Locally, the municipality of Durrës and its health directorate handle implementation.

2.2.3 HHWS and measures in place

Albania does not have an institutionalized heat-health warning system and lacks an official definition or hazard status for heat. Currently, operational heat warnings and emergency alerts issued by the National Agency of Civil Protection (AKMC), are based on meteorological forecasts provided by the national Institute for Geoscience IGJEO through its national forecasting center. Health-specific alerts are also issued by the Ministry of Health and Social Protection.

Currently, Albania does not have a formal, epidemiology-based heat-health warning system. Alert decisions are based primarily on meteorological forecasts and expected extreme temperature conditions. Work is ongoing at the national level to further develop this into a structured heat-health warning system in the coming years.

Following heat warnings, the Ministry of Health and the civil protection circulate public advisories and deploy mobile medical teams. For example, in summer of 2025, the government opened 36 fully-equipped summer health centers (30 in 2023) along coastal and mountainous areas operating 24 hours a day, 7 days a week. These centers serve both locals and tourists by providing medical care and disseminating information on how to stay safe in extreme heat. While these centers act as “cooling points,” there is no formal network of climate shelters. During heatwaves, hospitals and emergency departments operate on high alert and paediatric emergency services remain open around the clock.



The Ministry of Health's heatwave measures emphasize special care for vulnerable populations, such as the elderly and those with chronic conditions. Public health experts advise these groups to avoid direct sun exposure and stay hydrated. Mobile medical units are deployed in city centers to assist these groups.

There are no dedicated programs of interventions to reduce indoor heat exposure.

2.2.4 Surveillance and monitoring

Albania monitors both mortality and morbidity health impacts during heatwaves.¹⁴ Mortality data used to monitor impacts during heatwaves is collected weekly at the municipal level and is broken down by sex and age. This includes descriptive analysis of mortality data during heatwaves (i.e. no computation of excess mortality or modelling of heat attributable mortality through epidemiological or similar models). Morbidity data used to monitor impacts during heatwaves is also descriptive and includes ambulance calls per day at the municipal level and GP consultations per week at the municipal level. Ambulance call data is broken down by sex and age, while GP consultation is only broken down by age.

The ALBAdapt project also aims to develop a modern hydrometeorological network and early-warning system for natural hazards that will include heat.

An IFRC report references a case study showing that mortality in Albania increased by 9-16 % during two heatwaves in 2017, but such analyses are not done routinely (IFRC, 2025).

2.3 Association of South Western Municipalities, Bulgaria

2.3.1 National and local policy

Bulgaria lacks a formal national heat-health action plan, but its approach to heat-related risk assessments and emergency preparedness are integrated into broader public health and environmental policies. Bulgaria's national adaptation plan (NAP) includes measures to mitigate the health impacts of climate change, such as heatwaves. These plans focus on protecting vulnerable populations, improving emergency response, and enhancing public health infrastructure. At the local level, urban planning in municipalities like Blagoevgrad aims to reduce

¹⁴ Information on monitoring impacts during heatwaves is from the 2024 EEA Heat mortality and morbidity surveillance in European countries technical report (<https://climate-adapt.eea.europa.eu/en/observatory/evidence/health-effects/heat-and-health/2024-heat-mortality-technical-background-document.pdf/@@download/file>)



heat risk by expanding green spaces. However, there is no specific heat plan at the level of the pilot area.

2.3.2 Governance and coordination

While there is no specific structure for managing heat, horizontal coordination occurs during heatwaves among meteorological services, public health authorities, and municipalities. The Ministry of Health is the primary body responsible for public health responses to heat at the national level, with regional health authorities responsible for regional implementation. Municipalities also play a role, as some cities set up local heat-health action plans to activate during heat alerts.

2.3.3 HHWS and measures in place

In Bulgaria, heat-related health information is communicated through the warning system of the National Institute of Meteorology and Hydrology (NIMH) and the Ministry of Health.

The NIMH issues heat alerts based on temperature thresholds that vary by region and time of year. While a precise, standardized national definition of a heatwave does not exist, heatwaves are generally recognized when maximum daily temperatures exceed a high threshold (e.g., above 35°C) for several consecutive days. The Ministry of Health then issues public advisories based on these alerts.

When high temperatures are observed, local authorities may issue specific guidance for the elderly and outdoor workers and provide public water points.

There is no climate shelter network in the pilot area.

There is no specific planning or preparedness for heat-health risks in health and social care settings, and the heat-health risks and the heat related health conditions are treated in the regular medical units like emergency care units and local hospitals.

Air conditioning is the main intervention to reduce indoor heat exposure.

2.3.4 Surveillance and monitoring

In Bulgaria, real-time information used for heat-health surveillance and monitoring primarily involves a combination of meteorological data, health monitoring systems, and early warning alerts.

The NIMH provides daily weather forecasts, temperature thresholds, and heat alerts. They carry out real-time monitoring of maximum and minimum temperatures, humidity levels, and heat



index values. The Ministry of Health monitors emergency calls, hospital admissions, and mortality data, especially during heatwaves. Sentinel surveillance systems may track increased incidences of heat-related illnesses like heatstroke, dehydration, or cardiovascular events. The Bulgarian Ministry of Health, often in collaboration with regional health authorities, monitors these indicators to evaluate the burden of heat-related health outcomes.

2.4 Municipality of Agioi Anargyroi-Kamatero, Greece

2.4.1 National and local policies

Greece's national climate change adaptation strategy (NAS) integrates climate considerations into all sectors, with a focus on adapting the health sector to extreme weather events. There is not a national heat-health action plan for Greece or a local heat-health action plan for the Municipality of Agii Anargiri – Kamatero (AAK).

The municipality follows guidance from the Ministry of Civil Protection by republishing heat warnings and opening cooling centers. A key strategy for the municipality is the provision of cooling centers, which are designated air-conditioned public spaces where people can find relief from the heat. The Municipality's action plan, which aims at to effectively and efficiently structure and manage its administrative, budgeting and planning processes, prioritises sustainability and resilience by implementing measures such as creating green areas acting as cooling spots, adjusting city infrastructure, and ensuring the well-being of at-risk residents.

The Municipality of AAK established a Sustainable Energy and Climate Action Plan in 2020, which includes measures to address energy consumption and promote sustainability, taking into consideration extreme heating. It involves strategies like improving energy efficiency in buildings, transitioning to renewable energy sources for heating, and raising public awareness about energy conservation.

Long-term urban planning aims to significantly reduce heat risks in the Municipality of AAK through the implementation of various measures, such as:

- **Green Infrastructure:** Planting trees, creating green spaces, and implementing green roofs and walls, providing shade, and reducing air temperatures.
- **Sustainable Building Design:** Promoting building designs, constructions, pavements and roads that minimize heat gain through material choices.
- **Integrating Water:** Incorporating water bodies (e.g., ponds, fountains) and using water-sensitive urban design can help cool the air through evaporation.



- Behavioral Changes: Encouraging the use of soft mobility options like cycling and walking, which reduce the propagation of heat from vehicles.
- Community Engagement: Educating the community about heat risks and promoting participation in heat mitigation efforts can foster a more resilient community.

Specific care is often given to vulnerable groups when designing heat plans and systems. Vulnerable groups, including the elderly, homeless, outdoor workers, children and those with pre-existing health conditions, are prioritized in heat response strategies due to their heightened risk of heat-related illness and mortality.

2.4.2 Governance and coordination

National plans guide regional and local implementation, helping to tailor responses to specific local needs. The Ministry of Health is the lead body for public health responses to heat at the national level. At the sub-national level, regional health authorities supervise hospitals and public health, while local medical centers and municipal authorities are responsible for providing protective measures and informing the public about health issues related to extreme heat. Within the City of AAK, the Civil Protection Committee and the Directorate of Environment are the primary governance structures for heat management.

2.4.3 HHWS and measures in place

In Greece, warnings are generated by the Hellenic National Meteorological Service. The Ministry of Civil Protection publishes announcements to alert residents about dangerous heat levels and inform about the protection measures, especially for the vulnerable populations, using, inter alia, an alert service to all cell phones in an area affected by the specific warning. No epidemiologic data is used for the thermal thresholds triggering warning levels. A heatwave is typically defined as a period of at least three consecutive days with maximum temperatures reaching or exceeding 39°C and minimum temperatures of 26°C or higher, with weak or no wind.

Although there is no established heat-health warning system in the Municipality of AAK, the Mayor's office uses its website and social media to repost announcements made by the Ministry of Civil Protection to alert residents about dangerous heat levels and protection measures. The Mayor's Office and the Social Services Directorate post announcements about municipal buildings, such as the Town Hall and open care centers for the elderly, which are designated as cooling centers or heat refuges. The municipality's website and social media are the primary channels for communicating heat-related health information, with no additional methods used to reach vulnerable populations.



The climate shelter network in AAK consists of municipal buildings such as the Town Hall and the open care centers for elderly. These shelters provide thermal comfort, access to water, and rest areas. This network is not really connected to other public spaces and facilities.

To reduce indoor heat exposure, interventions focus on reducing heat gain and providing cool spaces. These include using air conditioning and ventilation, implementing work practices such as scheduling work during cooler hours and providing rest breaks, and utilizing personal cooling measures like cooling vests.

2.4.4 Surveillance and monitoring

Greece monitors both mortality and morbidity health impacts during heatwaves.¹⁵ Mortality data used to monitor impacts during heatwaves is collected weekly at the country level and is broken down by age. This includes computation of excess mortality during heatwaves. Morbidity data used to monitor impacts during heatwaves includes emergency room visits, ambulance calls, and hospital admission.

2.5 Municipality of Arezzo, Italy

2.5.1 National and local Policy

The Plan for the Prevention of Heat Effects on Health - Guidelines for Prevention - Heatwaves and Air Pollution (Piano Nazionale di Prevenzione degli effetti del caldo sulla salute)¹⁶ is Italy's latest national heat-health action plan (HHAP) developed in 2019.¹⁷ It includes a chapter on the National Operational Plan, which details the national heat watch warning system (HHWS), indications on prevention measures to be activated at different alert levels, identification of at-risk (vulnerable) subgroups, recommendations for specific subgroups, and systems for monitoring the health impact of heat waves. Specifically, it includes the following components:

- activation of city-specific forecasting and warning systems - HHWS

¹⁵ Information on monitoring impacts during heatwaves is from the 2024 EEA Heat mortality and morbidity surveillance in European countries technical report (<https://climate-adapt.eea.europa.eu/en/observatory/evidence/health-effects/heat-and-health/2024-heat-mortality-technical-background-document.pdf/@@download/file>)

¹⁶ <https://www.quotidianosanita.it/allegati/allegato7519094.pdf>

¹⁷ Details of the HHAP in this section were obtained from the 2019 Plan for the Prevention of Heat Effects on Health - Guidelines for Prevention - Heatwaves and Air Pollution (<https://www.quotidianosanita.it/allegati/allegato7519094.pdf>)



- coordination and definition of the information flow for the dissemination of information on the level of health risk predicted by the HHWW systems and identification of a reference center for the prevention plan at the local level
- health surveillance system for health effects (daily mortality and morbidity)
- identification of population subgroups susceptible to the effects of heat
- information initiatives for the general population and for subgroups at risk
- initiatives for the training and updating of social and health workers
- monitoring and evaluation of the impact on health and of the interventions activated during the summer.

According to the national plan, operational plans developed at the local level must include differentiated interventions based on the level of climate risk and the population's susceptibility profile. Activities developed at the local level can be part of a structured local prevention plan, at the regional level, at the level of the local health authority, or the municipal level.

2.5.2 Governance and coordination

The Ministry of Health, in collaboration with the Department of Civil Protection, is responsible for developing and overseeing the national framework for preventing heat-related health effects. Implementation of the plan and specific actions are decentralized, giving responsibility to the regional and local health authorities to carry out the plan on the ground. The Ministry provides the tools and overarching strategy, but local entities adapt and execute the response. The Tuscany Regional Health Agency is the lead body responsible for the public health response to heat at the regional level of the pilot area.

2.5.3 HHWS and measures in place

The Italian HHWS defines city-specific threshold temperatures for warning levels (0-3) through analysis of temperature-mortality association¹⁸. It covers all regional capitals and cities with more than 200,000 inhabitants and has a particular focus on people aged 65 and over. The HHWS models are based on empirical data and use weather forecasts to predict at-risk conditions for the

¹⁸ Information on surveillance of heat related health impacts during heatwaves is from the 2024 EEA Heat mortality and morbidity surveillance in European countries technical report (<https://climate-adapt.eea.europa.eu/en/observatory/evidence/health-effects/heat-and-health/2024-heat-mortality-technical-background-document.pdf/@@download/file>)



following 72 hours. Heatwaves (level 3 warnings) are defined as 3 or more consecutive days of level 2 warnings. Threshold varies by month to account for acclimatization.

Daily heatwave bulletins (3 day warnings for 27 major cities) are published on the Ministry of Health website from May to September. These bulletins are based on city-specific models that analyze the relationship between local temperature, humidity, and mortality data from previous years. The bulletins are also available on the "Caldo e Salute" app and are sent to a local reference center in each city (Municipality, Local Health Authority, local Civil Protection center) responsible for distributing the bulletin throughout the area to the services included in the prevention plan so that they can activate plans for vulnerable populations if necessary.

In the event of extreme heat, the Ministry of Health activates a call center during the summer. The service is free and provides the public with information on the health risks caused by heatwaves, advice and recommendations on how to prevent them, and information on the social and health services to contact, as well as updated information on weather bulletins produced daily by the HHWW warning systems.

The Ministry of Health publishes a list of services offered at local level by local health agencies, public and civil society social services which offer assistance during heat waves.

At the regional level, Tuscany's regional health department website publishes information on heatwaves with advice and tips on how to protect oneself.

Yet, the heat warnings are not specifically tailored for Arezzo, which is neither a regional capital nor a city with more than 200,000 inhabitants. Among the local services indicated by the national ministry for health for every region for contacts for support to vulnerable persons, no services are included regarding the city of Arezzo.

2.5.4 Surveillance and monitoring

Italy's surveillance of heat related health impacts includes forecasting the impacts before they occur to mobilize resources and prepare for action (HHWS), monitoring the impacts during the heatwaves to support rapid decision making, and the evaluation of the health impact of heatwaves after they have happened to support longer-term decision making.¹⁹

¹⁹ Information on defining heatwaves is from the 2024 EEA Heat mortality and morbidity surveillance in European countries technical report (<https://climate-adapt.eea.europa.eu/en/observatory/evidence/health-effects/heat-and-health/2024-heat-mortality-technical-background-document.pdf/@@download/file>)



Italy monitors both mortality and morbidity health impacts during heatwaves.²⁰ Mortality data used to monitor impacts during heatwaves is collected daily at the municipal level and is broken down by sex and age. This includes computation of excess mortality during heatwaves and modelling of heat attributable mortality through epidemiological or similar models. Morbidity data used to monitor impacts during heatwaves includes computation of excess activity for emergency room visits and GP consultations per day at the municipal level broken down by age and sex. After heatwaves, Italy also monitors mortality data, emergency room visits, and GP consultations.

Real-time information is used for heat-health surveillance according to the Ministry of Health Circular, May 23, 2025, no. 2556 - Communication regarding the Rapid Daily Mortality Surveillance System (SiSMG) - Summer 2025.

Health impacts of heat are monitored according to the Ministry of Health Circular, May 23, 2025, no. 2555 - Communication on the Emergency Room Access Surveillance System - Summer 2025.

2.6 Barcelona Metropolitan Area and Cartagena Municipality, Spain

2.6.1 National overview

In this section, the national framework for Heat-Health planning is summarised, the specific settings in the two pilots of the Metropolitan area of Barcelona and Cartagena are elaborated in the following sections (3.6.2 and 3.6.3, respectively).

2.6.1.1 National policies

Spain's National Plan of Preventive Actions against the Effects of Excessive Temperatures on Health (Plan Nacional de Actuaciones Preventivas de los Efectos del Exceso de Temperaturas Sobre la Salud)²¹, active since 2004 and most recently updated in 2025, is managed by the National Ministry of Health. It details responsibilities and procedures for heat-health action planning, defines modalities and thresholds for early heat-health warnings and for the coordination of the national government with agencies responsible for health and social policies in those Regions and

²⁰ Information on monitoring impacts during heatwaves is from the 2024 EEA Heat mortality and morbidity surveillance in European countries technical report (<https://climate-adapt.eea.europa.eu/en/observatory/evidence/health-effects/heat-and-health/2024-heat-mortality-technical-background-document.pdf/@download/file>)

²¹

https://www.sanidad.gob.es/areas/sanidadAmbiental/riesgosAmbientales/calorExtremo/publicaciones/docs/planNacionalExcesoTemperaturas_2025.pdf



Cities which have their own health authorities due to their status as Autonomous entities (Comunidades Autónomas).

2.6.1.2 Governance and coordination

The Spanish Ministry of Health is the lead body responsible for public health responses to heat. Specifically, its General Directorate of Public Health and Health Equity serves as the primary entity for coordinating heat-health actions, including overseeing the implementation of the national HHAP. The Ministry works closely with other government agencies, such as the State Meteorological Agency (AEMET) and Civil Protection Authorities, to manage heat-related public health risks.

The implementation of the national HHAP plan requires strong coordination between various stakeholders. The Interministerial Commission, established by Orden PRE/1518/2004, is the body responsible for coordinating with both public and private entities and for executing the plan.

The Commission is led by the Director General of Public Health and Health Equity from the Ministry of Health. It includes representatives (at the Deputy Director General level) from the Ministry of the Interior - Directorate General of Civil Protection and Emergencies; the Ministry for Ecological Transition and Demographic Challenge - State Meteorological Agency (AEMET); Ministry of Social Rights, Consumption, and the 2030 Agenda: Institute of Elderly and Social Services (IMSERSO); and the Ministry of Territorial Policy and Democratic Memory - Directorate General of General Administration of the State in the Territory. The Secretary of the Commission is the head of the Subdirector General of Environmental Health and Occupational Health from the Ministry of Health.

The functions of this Commission are as follows:

- To draw up the guidelines for the implementation of the National Plan at the State level.
- To establish the preventive and control strategies that are considered appropriate in the light of new evidence.
- Activate the levels of information in coordination with the Autonomous Communities and Autonomous Cities and taking into account the competency frameworks.
- Propose the organizational, structural and preventive measures necessary to avoid or reduce the impact of thermal extremes on health.
- To draw up risk assessment, management and communication plans.

At the sub-national level, the responsibility for implementing public health responses to heat falls to the Regional and Autonomous Health Authorities. Each of Spain's Autonomous Communities such as the Autonomous regions of Catalonia and Murcia have their own health department or



ministry, which adapts national guidelines to local needs. These bodies work with local governments, social services, and meteorological agencies to ensure the implementation of preventive measures at the regional and local levels. In the Region of Murcia, which did not establish a regional heat-health plan, this is the Health Ministry and within it, the General Directorate of Public Health and Additions.

2.6.1.3 HHWS and measures in place

The main role of the Spanish national Heat-Health plan consists of the coordination of actors for the implementation of the plan, the setting up, coordination and surveillance of activities and the monitoring of health impacts from heat, the organization and implementation of the early warning system, the design and implementation of effective flows of information and communication, monitoring and the definition of a set of measures to be implemented for each level of risk.

The National Plan establishes furthermore measures to reduce the effects associated with excessive temperatures and to coordinate the relevant State Administration institutions. It also proposes actions that can be carried out by the Autonomous Communities and Cities and Local Administrations.

The plan has set up a heat-health warning system, which focuses on mortality rates and identifies temperatures associated with health risks. The definition of health risks is not connected to a specific minimum number of days as in the case of heat wave warnings, but on observed health impacts. It is thus more suitable for heat health alerts, as it reflects actual vulnerability to extreme heat. The methodology for preventing health effects due to excessive temperatures is based on daily temperature forecasts for the maximum and minimum temperatures provided by AEMET, which are given for each day and the following four days. These forecasts are broken down by Autonomous Communities, provincial capitals, and isothermal zones.

The definition of heat risks is based on the identification of critical temperature thresholds which trigger alarm levels, with risk severity levels ranging from 0 (no risk) to 3 (high risk). The differentiation between alarm levels is based on statistical analyses of the mortality series in relation to temperature in the different climatically homogeneous (iso-climatic) zones called "*zonas meteosalud*" defined by AEMET. Heat health warning are emitted for specifically for the interested zones according to the meteorological forecasts provided by AEMET.

Further to Heat-Health warnings, AEMET issues generic heat wave warnings. Using a definition of heatwave as a period of at least three consecutive days when 10% of stations record temperatures exceeding the 95th percentile of their daily maximum temperatures for July and August during the period 1971-2000.



2.6.1.4 Surveillance and monitoring

AEMET provides real-time data on temperatures, weather forecasts, and heatwave warnings. The HHAP relies on AEMET's daily forecasts of maximum and minimum temperatures, as well as predictions for the upcoming days, to assess heat risks and eventually emit heat-health warnings. Additionally, the Ministry of Health uses real-time data from AEMET to adjust and activate health-related preventive measures based on the evolving risk levels.

Autonomous Communities and regional health authorities use AEMET data to issue heat alerts specific to their regions, depending on the local climate and the vulnerability of populations.

Information on health impacts during heatwaves is monitored through the national plan and is coordinated with the Regions and Autonomous Communities.

2.6.2 Barcelona Metropolitan Area

2.6.2.1 Regional and local policy

The national framework of the two Spanish pilot areas is summarized in section 3.6.1.

The Metropolitan area of Barcelona (AMB) is part of the Autonomous Region of Catalonia. As an autonomous region, Catalonia has its own health agency, the Public Health Agency of Catalonia (Agència de Salut Pública de Catalunya, ASPCAT), and has developed a heat-health action plan. The first initiatives for such heat-health action plan began in 2004 in response to the 2003 heatwave. The most recent plan has been defined in 2022 (Pla d'actuació per prevenir els efectes de les onades de calor sobre la salut (POCS))²² and coordinates actions with regional and local entities and health services. The POCS foresees the use of meteorological data and health information to create more specific, localized alerts for different areas within Catalonia. The regional plan coordinates with social services, emergency medical systems, and municipalities to ensure that vulnerable individuals receive direct support, such as home visits or telephone checks. It furthermore establishes a monitoring service regarding health impacts (emergency admissions and mortality and heat strokes) during the summer period²³.

²² https://salutpublica.gencat.cat/web/.content/minisite/aspcat/vigilancia_salut_publica/POCS/2022/Pla-dactuacio-POCS-2022.pdf

²³ https://sivic.salut.gencat.cat/pocs_mortalitat



The operational plan of the POC represents the framework for seasonal operational plans for its implementation²⁴. The operational plans are activated usually from June 1 to September 30, with a preparatory phase in May.

All local climate adaptation plans within the BMA include specific measures to address heat-related health risks. Longer-term urban planning strategies being implemented to reduce heat in the pilot area include green infrastructure, shadow structures (ephemeral or fixed), cool roofs, bio-solar roofs, integrating water in pavements (SUDS). The Barcelona City Council Heat Plan 2025-2035 is part of the city's broader Climate Plan.

Another key component of the regional response is Catalonia's network of climate shelters. Information on the climate shelter network is available by municipality on the Public Health Agency of Catalonia (ASPCAT) website. In Summer 2025 there were 243 climate shelters in the Barcelona Metropolitan Area (BMA). The BMA network is managed by Climate Action Area and connected with the Catalan one.

2.6.2.2 Governance and coordination

At the regional level, Catalonia's POCS is coordinated by the Public Health Agency of Catalonia (ASPCAT) and the Catalan Health Service, and has the participation of more than fifteen entities: ASPCAT, the Epidemiological Surveillance Network of Catalonia (XVEC), the Catalan Health Service (CatSalut), the Department of Social Rights, the Department of Business and Labor, the Department of the Interior, the Meteorological Service of Catalonia (SMC), the Emergency Medical System (EMS), Catalan Health Institute (ICS), Barcelona Public Health Agency (ASPB), Catalan Association of Municipalities (ACM), Federation of Municipalities of Catalonia (FMC), Council of Pharmaceutical Colleges of Catalonia (CCFC), Institute of Legal Medicine and Forensic Sciences of Catalonia (IMLCFC), Health and Social Consortium of Catalonia (CSC), Catalan Union of Hospitals, Health Services of the Barcelona Provincial Council, Barcelona Social Services Consortium (CSSBcn), Red Cross, Public Health Services of the Barcelona Provincial Council, Department of Education.

2.6.2.3 HHWS measures in place

The Heat Health management Plan for the Region of Catalonia defines six alarm levels related to the probability of reaching statistically determined threshold values for extreme temperatures. Threshold values are expected temperatures that exceed by 2 degrees or more the 98th percentile

²⁴ <https://scientiasalut.gencat.cat/bitstream/handle/11351/13313/pla-operatiu-prevenir-efectes-calor-salut-pocs-estiu-2025.pdf?sequence=1&isAllowed=y>



of maximum and minimum historic summer temperatures for the local area by 2°C. Warnings are issued according to the expected temperature levels and the (low, medium or high) probability of reaching these levels. Forecasts of expected maximum temperatures are provided by the regional Meteorological Service of Catalonia (SMC) at a sub-provincial scale so to take better into account local climatological specificities, but do not take into account the health impacts of temperatures.

Information and advisories are communicated to the public primarily through the ASPCAT website. The SMC also has an app in which alerts are issued when the temperature is higher than a certain threshold at the weather station closest to the user.

The local Teleassistance service, managed by the Provincial Deputation of Barcelona, provides services and advice to vulnerable groups, particularly the elderly, during periods of high temperatures.

The main intervention used to reduce indoor heat exposure in the pilot area is air conditioning.

2.6.2.4 Surveillance and monitoring

Under the POCS, daily monitoring of heat-related morbidity and mortality is carried out in Catalonia. This includes overall mortality according to age and gender throughout Catalonia, the number of cases of heat stroke attended in health centers, the number of consultations in emergency services and unscheduled hospital admissions in Catalonia, and deaths due to heatstroke throughout Catalonia.

2.6.3 Municipality of Cartagena

2.6.3.1 Regional and local policy

The national framework of the two Spanish pilot areas is summarized in section 3.6.1

In the case of the pilot area of Cartagena, the regional authority, the Autonomous Community of the Region of Murcia, coordinates heat health actions with the national government, but no regional specific action plan has been defined. Depending on the risk level communicated by the national alert system, the regional civil protection plan (PLATEMUR) is activated.

In the Autonomous Region of Murcia, Heat-health management is addressed in several sectoral plans, including the Protocol for Action to Prevent the Effects of Excessive Temperatures on Health in Nursing Homes and Day Centers for the Elderly and People with Disabilities, the Civil Protection Territorial Plan of the Region of Murcia, and the Climate Change Mitigation and Adaptation Strategy.

2.6.3.2 Governance and coordination

In the pilot area, the municipality of Cartagena is the responsible entity. This typically involves coordination with municipal departments like urban planning, environmental services, and social welfare. However, there is not yet a governance structure for heat management in the pilot area.

2.6.3.3 HHWS and measures in place

In the Region of Murcia, warnings are based on the temperature thresholds set by AEMET, with risk levels ranging from 0 (no risk) to 3 (high risk). When the risk levels are high, preventive actions are triggered. This is in line with the National Plan for the Prediction and Monitoring of Adverse Meteorological Phenomena, which includes warnings for high temperatures and heatwaves, based on AEMET's data. The "Thresholds and Warning Levels" table details the maximum temperatures for each province and the corresponding alarm levels.

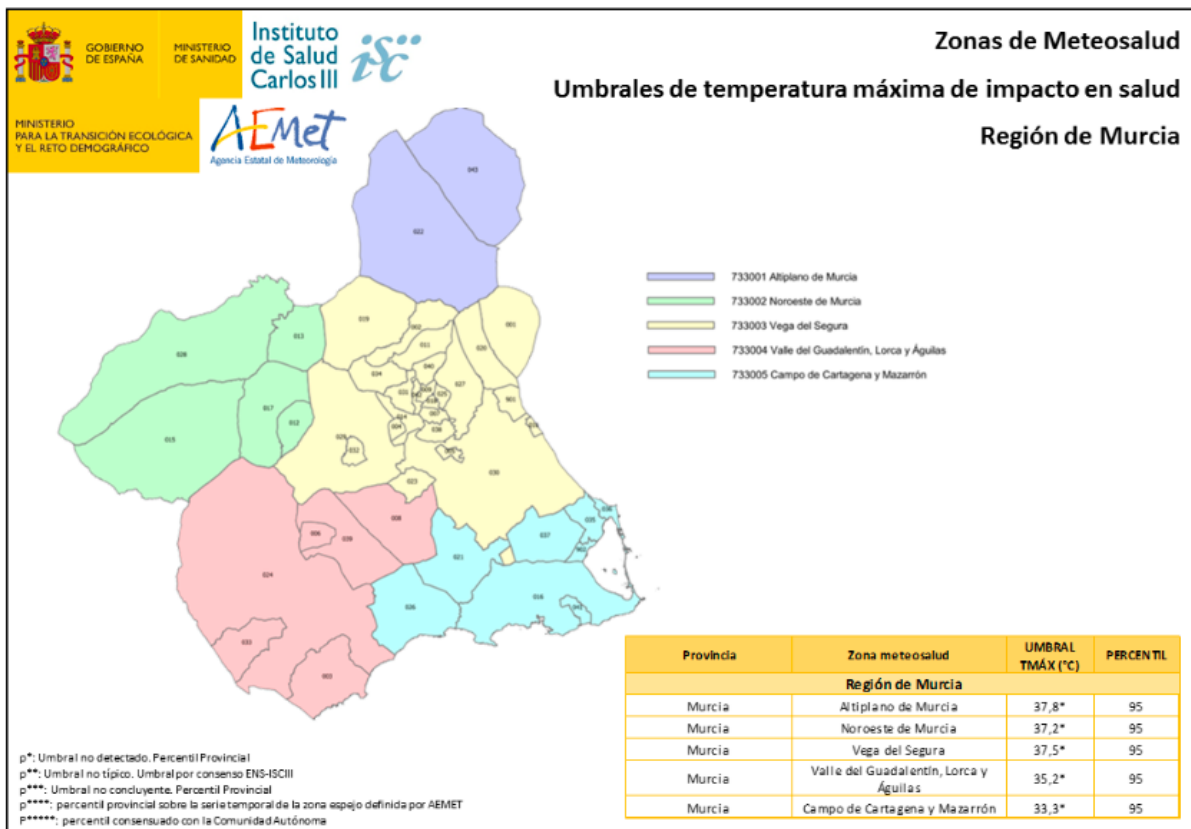


Figure 3: Thresholds and Warning Levels source Ministerio de Sanidad, (2025)

Currently, in the pilot area, traditional media such as press releases, as well as communication through the municipality's official website and social media channels, are used to share health-related information about heat.



There is no municipal heat-health action plan in the pilot area. Cartagena does however have a climate change adaptation plan that includes 11 measures targeting heatwaves. They include actions related to energy efficiency, revegetation, and the promotion of green roofs and facades to mitigate the urban heat island effect. One of the measures focuses on increasing resilience to heatwaves by creating a network of climate shelters in social and cultural centers, which will extend their operating hours during extreme heat events to protect vulnerable populations from heatstroke. A climate shelter network is also a planned measure of the Sustainable Energy and Climate Action Plan (SECAP), but it is not yet developed. Additionally, a cooling zone assessment will identify areas in need of shading improvements, such as "cool routes" along main pedestrian paths, parks, and schools, utilizing solutions like trees and roofs. This is part of the "Shadow Plan" focused on increasing tree planting and installing awnings in public areas, with the initial work starting in the pedestrian zone of Cartagena. Furthermore, photovoltaic canopies and pergolas will be implemented to turn shading into an energy asset. The municipality also plans to employ high-albedo materials for pavements and facades to help reduce the heat island effect, drawing inspiration from projects like the Life HEATLAND project in Murcia.

Other longer-term urban planning measures to mitigate the impact of high temperatures and increase resilience to heatwaves in Cartagena's adaptation plan include integrating and developing green infrastructure; implementing SUDS to manage rainfall while reducing urban heat, also promoting water retention, which helps cool down the environment, and support the creation of vegetated areas; and adopting and promoting building codes and standards that encourage energy-efficient design and passive cooling techniques.

Moreover, the new General Plan for Urban Planning (PGMO), which is in its final approval phase, includes climate-related standards, such as shade provisions. It also incorporates measures like water reuse, sustainable mobility, and other conditions aimed at reducing heat and improving environmental sustainability.

The City of Cartagena, through its Social Affairs Department, has specific programs for homeless people, informal settlements, and a dedicated program for elderly people. These initiatives will incorporate the effects of heat on these vulnerable groups, ensuring that their needs are addressed in response strategies.

2.6.3.4 Surveillance and monitoring

AEMET provides real-time data on temperatures, weather forecasts, and heatwave warnings. The HHAP relies on AEMET's daily forecasts of maximum and minimum temperatures, as well as predictions for the upcoming days, to assess heat risks. Additionally, the Ministry of Health uses



real-time data from AEMET to adjust and activate health-related preventive measures based on the evolving risk levels.

Autonomous Communities and regional health authorities use AEMET data to issue heat alerts specific to their regions, depending on the local climate and the vulnerability of populations.

Information on health impacts during heatwaves is monitored through the national plan and its coordination with the Regions and Autonomous Communities.



3 Needs for further development of heat management in the pilot areas

Each of the six pilot areas is at a different stage of readiness in terms of heat risk management, largely shaped by the availability of national policy frameworks for heat-health management and heat-health warning systems at the national level. Local initiatives have been developed in some cases despite the absence of comprehensive policy frameworks while others are in early stages despite the availability of national guidance frameworks.

Needs to further develop heat management vary accordingly across pilot areas. Figure 2 represents these needs referring to the 8 core elements required for HHAPs according to the WHO guidance on heat-health action planning (WHO Regional Office for Europe, 2008), identifying elements that are not yet developed for the pilot area and elements that are available at a higher governance level and should be transposed into local policy instruments. The Municipality of Agioi Anargyroi-Kamatero, Arezzo, Barcelona Metropolitan Area, and Cartagena are engaged in at least one of the 8 elements of WHO guidance on heat-health action planning at the level of the pilot area, while clear gaps are evident (with multiple elements lacking) at the level of the pilot area in Durrës, and in the Association of South-Western Municipalities.

	RCD, Albania	ASWM, Bulgaria	AAK, Greece	Arezzo, Italy	BMA, Spain	Cartagena, Spain
Lead Body Agreed	Yellow	Yellow	Yellow	Red	Yellow	Yellow
Effective Alert Systems	Red	Yellow	Yellow	Yellow	Yellow	Yellow
Health Info Plan	Red	Red	Red	Yellow	Yellow	Yellow
Indoor Heat Reduction	Red	Red	Blue	Red	Blue	Red
Vulnerable Care	Yellow	Red	Blue	Yellow	Blue	Blue
Healthcare Prepared	Yellow	Red	Red	Yellow	Yellow	Yellow
Urban Planning	Yellow	Yellow	Blue	Red	Blue	Blue
Real-Time Surveillance	Red	Yellow	Yellow	Yellow	Yellow	Yellow
Needed in the pilot area			Red	Yellow	Yellow	Yellow
Existing at higher governance level, but not in the pilot area			Yellow	Yellow	Yellow	Yellow
No need, already existing in the pilot area			Blue	Yellow	Yellow	Yellow

Figure 2: Needs for Heat Management Actions



Based on the review of the pilot area questionnaire, responses and several national level heat-health policy documents, we find that warning systems are more prevalent than action plans, and that both tend to originate from a higher governance level than that of the pilot area. Local planning and action for heat-health plans depend in most areas on national level frameworks which support readiness for heat response, while the pilot areas in Spain are also relying largely on regional level initiatives.

Effective local heat-health plans benefit from higher-level (regional and national) policy frameworks and dedicated support. This support often includes (1) establishing heat-health warnings based on critical temperature or meteorological thresholds informed by epidemiological data (e.g., heat warnings in Albania and Greece currently rely only on meteorological data), and (2) creating a local heat-health warning system that actively involves local health institutions to significantly improve early warning and preparedness efficiency within the health sector. Durrës, the Association of South-Western Municipalities, and the Municipality of Agioi Anargyroi-Kamatero do not currently have plans for the dissemination of heat-health warnings. Such plans could help ensure that the most vulnerable groups are effectively reached during a heatwave.

The identification of vulnerable groups is an important element in effective heat-health policy. Some overarching frameworks are now recognizing diverse socio-economic drivers of heat vulnerability that extend beyond traditional factors like age and physical conditions. The Spanish national plan, for example, broadens the definition of potential vulnerability to include groups facing energy (cooling) poverty and marginalized groups such as migrants. Defining heat vulnerability in national policy instruments in this more comprehensive way can directly lead to local actions that recognize and address these specific forms of heat vulnerability at the local level. The Regional Health Agency of the Tuscany region has published, on their [web-pages](#) dedicated to heat, recommendations for focusing attention to social inequalities as determinants of health vulnerability to heat.

One common element and reason for having joined the HEATSAFE project is that all pilot areas are lacking a local heat-health action plan, or transposition of national or regional plan at the local-level. Such a plan should clearly identify emergency measures to be implemented locally and the responsibilities and procedures for the management of these measures. HeatSafe will support all pilot areas with the definition of heat vulnerability maps, so to contribute to making concrete steps ahead in the matrix highlighted in Figure 4.

To begin developing these plans, the Barcelona Metropolitan Area, and Cartagena first need to define their lead coordinating body, though they can use existing higher-level policy frameworks for guidance.



While all pilots currently engage in some level of monitoring or surveillance of heat impacts on health during heatwaves, we found no evidence of monitoring the effectiveness of existing heat-health activities or performing evaluations of interventions to inform updates. Integrating these essential monitoring and assessment activities would need to be a strong element in any local action plan.

Some activities already in place go beyond the management of emergency situations during heatwaves, as for example the organization of cooling refuges for the vulnerable population reducing heat impacts using public parks and buildings. The Barcelona Metropolitan pilot area has a well-developed network of cooling shelters, and in AKK some shelters have been organized in public buildings and care homes. The Municipalities of Agioi Anargyroi-Kamatero, Cartagena and the Barcelona Metropolitan Area have identified clearly defined measures to reduce indoor heat exposure and provide specific care for vulnerable groups by reducing heat loads in buildings and urban spaces.

The Tuscany region, which includes the Arezzo pilot area, offers substantial support for long-term heat mitigation. The region has published heatwave recommendations on their web pages, and has adopted regional [guidelines](#) that incorporate the [WHO guidelines for housing and health](#). Since these guidelines have already informed several local building regulations, Arezzo is well-positioned to use this existing framework to develop its long-term strategies for the planning of urban spaces.

Such long-term investments are normally part of adaptation plans rather than of heat-health action plans. Some of the pilot areas have such adaptation plans, which should be synergistic to the emergency management in heat health plans. Other pilots, in particular the Municipality of Agioi Anargyroi-Kamatero and Arezzo have indicated that such urban planning measures for long-term heat reduction have not yet been set in place.



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4.2 Tables and figures

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4.3 Annex 3: Questionnaire

Questions for project partners managing pilot areas

1. What is the current national health policy/strategy/plan? Is heat included? Please provide title, date and link.
2. Is there a separate national level heat-health action plan (HHAP)? If yes, please provide title, date and link. Which stakeholders were involved in the development of the plan? Which stakeholders are responsible for the implementation of the plan?
3. Is there a heat plan for the pilot area (region or municipality)?
4. Are there any other sub-national level plans for heat and/or health relevant for the pilot area?
5. Is there any connection between the heat-health plans at different governance levels, if applicable?
6. Is there a climate adaptation plan that includes measures to address heat-related risks to human health? At what governance level(s)?
7. Who is the lead body responsible for the public health responses to heat at the national level, at the sub-national level, and in the pilot area?
8. Is there an existing governance structure for heat management in the pilot area? Which stakeholders are involved? Is there horizontal coordination and collaboration between meteorological services, public health authorities, and other stakeholders? Is there vertical coordination with other governance levels?
9. Is there an established heat-health warning system (HHWS) in the pilot area? Is it connected to any national or sub-national level HHWS? Who is responsible for managing the system(s)? How do they work? When is an alert or warning issued? What happens when an alert/warning is issued?
10. How are heatwaves defined (e.g. # consecutive days with T_{max} above X°C)? Is this a national definition or specific to the pilot area?
11. How is heat-related health information communicated to the public in the pilot area? Are any additional means used to reach vulnerable groups? Which groups and how?
12. Is there a climate shelter network in the pilot area? Who is managing the network? How does it work? Is it connected to any other larger networks?
13. What types of interventions are used to reduce indoor heat exposure in the pilot area?
14. Is specific care given to vulnerable groups in the pilot area - considering risk factors when designing heat plans and systems or providing target response strategies? Which vulnerable groups (e.g. elderly, homeless, outdoor workers, etc.)?
15. Is there planning and preparedness for heat-health risks in health and social care settings in the pilot area?



16. Does (longer-term) urban planning aim to reduce heat risks in the pilot area? What types of measures have been incorporated to reduce heat (e.g. green infrastructure, cool roofs/pavements, integrating water)?
17. Is real-time information used for heat-health surveillance and/or monitoring at the national level, sub-national level, and/or in the pilot area?
18. Are health impacts (mortality or morbidity, e.g. emergency room visits, ambulance calls, hospital admissions, GP consultations) monitored during or after a heatwave in the pilot area?
19. Are there processes for monitoring the effectiveness of the heat-health plan or system, evaluating interventions, and updating the plan or system in the pilot area?
20. Is there any additional information on national or local heat preparedness or response that should be included in the A1.1 assessment?



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