

ADAPTATION TO HEAT AND CLIMATE CHANGE AT WORK **ADAPT**HEAT

Comparative report



Collective bargaining and social dialogue in Europe to protect workers' health and safety, welfare and productivity against heat and heat waves

Claudia Narocki. In memoriam

The ADAPT HEAT project was conceived, prepared and led in its first months by our colleague Claudia Narocki, an employee of the 1° de Mayo Foundation, and previously of ISTAS, for more than 25 years.

Claudia Narocki, an expert and activist in occupational health, passionate about the subject and deeply committed to its aims, was one of the first researchers in Europe to draw the attention of the world of prevention and trade unions to the risks of climate change and high temperatures for the health of workers, especially workers in the most precarious situations.

She designed the project, its activities, its products and, above all, the composition of the consortium and the supporting experts.

For health reasons, since the beginning of 2023 she has been unable to continue at the helm, but thanks to the excellent original design of the project and the working party involved, we have been able to move forward without her along the path she marked out for us.

We want to publicly express that Claudia is still the soul of ADAPT HEAT, and that without her work and passion, none of our results would exist.

Postscript: Claudia passed away on 25 April 2024, one month after we wrote these words, and a month and a half before the public presentation of the results of the project in Brussels on 6 June 2024.



Collaborators:



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INTRODUCTION



ADAPT HEAT is a European research project led by the CCOO's 1° de Mayo Foundation and supported by four other international partners (MASZSZ, FDV, ELINYAE, UV). Its main objective is to study the challenges related to the prevention of heat hazards at work and in industrial relations. The main idea of the project is to analyse collective bargaining experiences and tools to improve heat adaptation in work environments in response to high temperatures caused by climate change in five European Union countries.

The ultimate aim of ADAPT HEAT is to promote the health and safety of workers by reducing the risks arising from exposure to excessive heat during their working day. This necessarily involves implementing preventive measures, developing regulations based on scientific evidence and creating heat action plans; said plans must be comprehensive and adapted to the specific reality of the workplace. They must also help mitigate the negative effects of high temperatures on workers' health, and minimise the impact on productivity and occupational well-being.

In order to achieve this goal effectively, consideration needs to be given to the legal, economic and political constraints that characterise collective bargaining in this matter in the various European countries. The project is based on the assumption that the creation and development of public policies, strategic plans and preventive measures against heat in the corporate context have a number of particularities that need to be taken into account. In particular, these include the multi-causality of health and safety, which in turn is a product of its socio-technical essence and the network of power relations used by the agents involved. In this sense, we can speak of a broad and realistic (but not naïve) approach to the problem of occupational heat hazards, which characterised the ADAPT HEAT project from its conception, together with its focus on social dialogue and collective bargaining.

On the one hand, the methodology used includes a collection of exemplary case studies from five countries with diverse climatic and institutional characteristics in the European context. On the other hand, a documentary review was carried out on the technical and legal regulations applicable to heat stress in the work environment at every administrative level: European, national, regional, territorial and organizational. Both the interviews with key informants involved in collective bargaining processes related to heat prevention and the documentary research on existing regulations have sought to reflect all relevant dimensions and realities to explain the current situation of heat stress in companies, a problem that has worsened significantly in recent years and one that will certainly worsen in the coming years as a result of climate change.

In short, ADAPT HEAT focuses on collecting, analysing and comparing materials and information related to occupational heat stress from different sources and national contexts in Europe in order to identify strengths, gaps and opportunities for improvement, etc. The aim is to draw up a set of relevant and informed practical recommendations to ensure safe, healthy and comfortable working conditions for all workers in the European Union, even under extreme climatic conditions.

PART ONE: HEATWAVES, CLIMATE CHANGE AND WORK

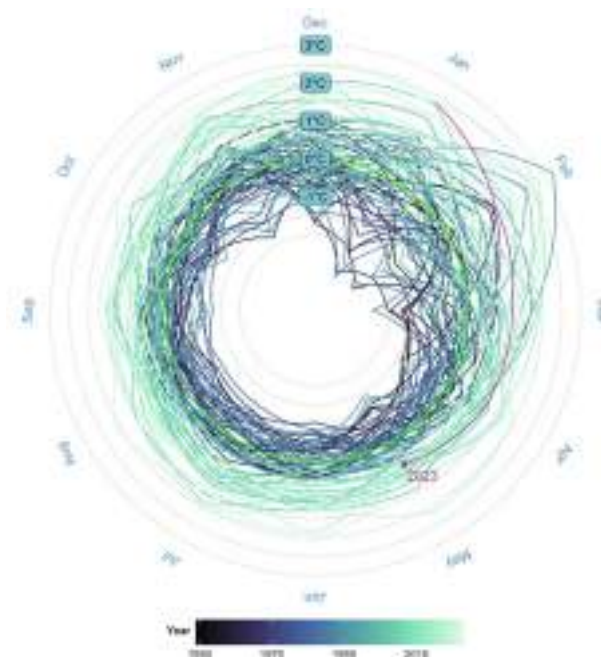


1. HEATWAVES, CLIMATE CHANGE, AND HEALTH

The World Meteorological Organization and the IPCC define a heatwave as “a period of abnormally and uncomfortably hot weather” (United Nations and IPCC 2014), a somewhat unspecific definition. In the context of global warming, it is becoming increasingly common for extreme heatwaves and episodes to occur, across Europe and around the globe. Since the beginning of the 21st century, especially, heatwaves are becoming more frequent, more intense, last more days and are starting earlier and ending later in the summer. These events are a reality not only in areas where summer is usually hot, but also in parts of the globe where summer is known to be mostly mild. Dramatical heat events are registered even in high latitudes.

As the climate crisis develops there is a tendency for extremely hot events to occur more often. Each of the last three decades has been successively warmer than any preceding decade since 1850. In the Northern Hemisphere, 1983-2012 was likely the warmest 30- year period of the last 1400 years. The most recent report from the United Nations Intergovernmental Panel on Climate Change (IPCC) warns that it is increasingly likely that we will exceed the +1.5°C horizon established in international agreements before the end of the decade (World Meteorological Organization 2023).

Figure 1. Monthly mean air temperatures in Europe between 1950 and 2023 (defined relative to a base period of 1979-2000).



Source: (van Daalen et al. 2023).

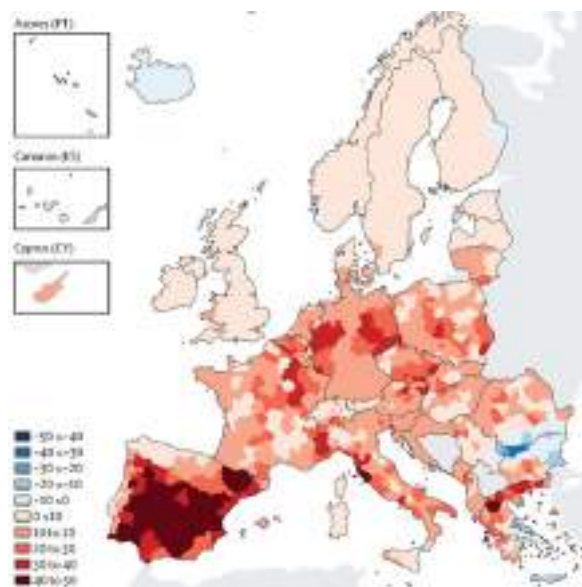
Heatwaves are a manifestation of climate change that generates a wide variety of extreme weather events, which in turn translate into serious health problems for populations, substantially increasing their morbidity and mortality. Above a certain threshold of heat stress, the body's internal regulation mechanisms are no longer capable of maintaining body temperature at a level required for normal functioning. As a result, there is an increased risk of discomfort, of limitations in physical functions and capabilities, and ultimately also of injuries and heat-related illnesses (OIT 2019). If the body core temperature rises above 38°C (i.e. heat exhaustion), physical and cognitive functions are impaired; if

it rises above 40.6°C (i.e. heatstroke), the risk of organ damage, loss of consciousness and, ultimately, death increases sharply (United Nations and IPCC 2014). A physiological adaptation, named acclimatization, which makes the human body more resilient to heat stress develops after a period of typically two weeks and it may offer some protection, but only up to a point. In hot countries, during summer, the acclimatization threshold is exceeded far too often.

The extent and severity of health effects from a heatwave depend not only on its characteristics but also on the vulnerability of the affected populations, e.g. people with pre-existing health problems or the elderly, who are increasingly numerous in Europe¹. Populations in Europe and around the world are also being exposed to increasingly frequent, intense, and extensive heatwaves. Some parts of the world already exceed the international standard for safe work activity during the hottest months of the year. In the following section we will discuss in depth the specific risks workers face regarding extreme heat.

Reliable statistics on heat-related mortality monitoring are limited. According to a recently published study, from June to September 2022 in Europe 61,672 people lost their lives as a result of heat, giving a mortality rate of 237 deaths per million attributable to heat (Ballester et al. 2023). Deaths are also not equally distributed and even within the European continent, significant inequalities in the health effects of heat can be observed between countries (see Figure 2).

Figure 2. Trends in heat-related mortality incidence (annual death per million per decade) in Europe for the general population (2000–2020)



Source: (van Daalen et al. 2023).

In addition, the authorities focus on statistics that are limited to deaths by heatstroke although heat stress is linked to a greater variety of problems of which only a small part is heatstroke, which in turn, is not always lethal. The impacts of extreme heat can include mild skin irritation (heat rash), cramps, swelling, fatigue, heat exhaustion, and heatstroke, occurring when the body temperature surpasses 40°C (see Table 1). Heatstroke, an extreme condition, can result from physical exertion (like exercise or strenuous labour) or the body's failure to regulate temperature, also known as passive heatstroke.

¹ For example, "Research shows an increase in mortality during heat waves in comparison to the communities' usual climates, with heatstroke only representing a small proportion of the causes. Heat increases the risk of suffering a wide variety of cardiovascular, respiratory and other acute illnesses that cause death, via multiple biological pathways (Mora, Counsell, et al. 2017).

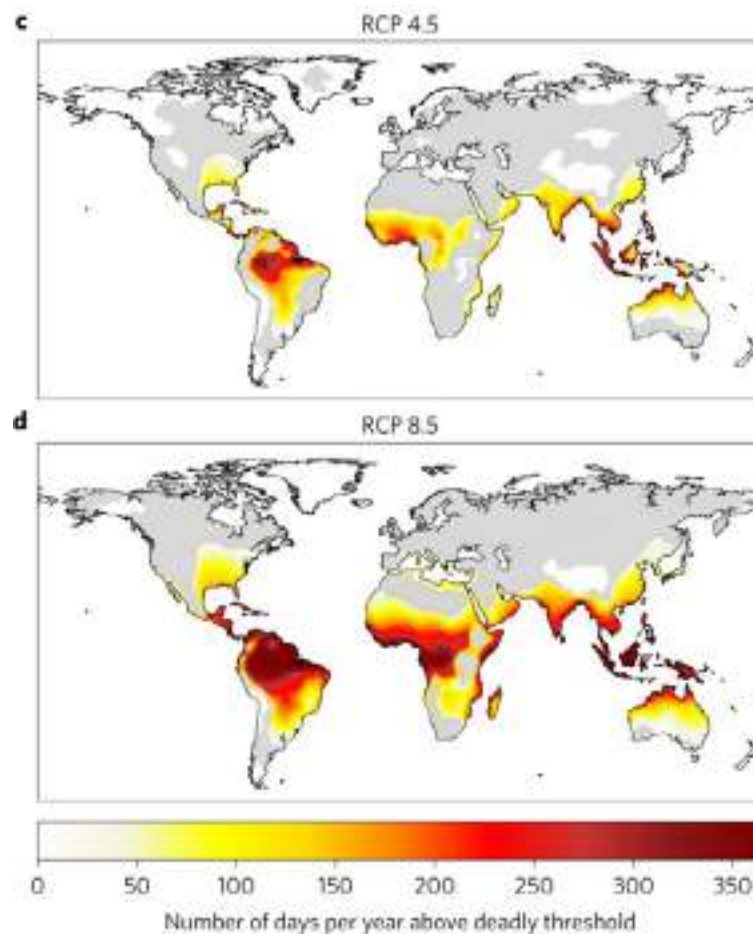
If not promptly identified or treated correctly, either type of heatstroke can lead to enduring physical and/or mental impairment, and in severe cases, fatalities. The health consequences of extreme heat can be more pronounced depending on an individual's physical state and age. Individuals with persistent respiratory or circulatory conditions face a greater risk of heat-related issues compared to the general population. Similarly, older adults over 64 years old bear a disproportionate burden from heat strain.

Table 1. Heat-related illnesses.

Disorders or illnesses	Signs, symptoms and mechanisms
Heat rash	Causes small papules (red spots) and itching, usually on areas such as the face, neck, upper chest, under the chest, groin, etc. It is associated with intense sweating, very common in hot and humid climates.
Heat oedema	Swelling of the lower extremities, generally in the ankles; appears at the start of the hot season.
Heat syncope or fainting	Manifests itself in a short spell of loss of consciousness or dizziness. Usually affects people who have been on their feet for long periods without moving or who have stood up suddenly from sitting or lying down, generally during the first days of exposure to heat.
Heat cramps	Painful muscle spasms which are usually experienced in the legs, arms or abdomen, generally at the end of an extended period of exercise. Can be related to dehydration, loss of electrolytes and muscular fatigue.
Heat exhaustion	Mild to moderate illness characterised by the inability to maintain heart rate, intense thirst, weakness, discomfort, anxiety, dizziness, fainting and headache. Core temperature may be normal, subnormal or slightly elevated (below 39 °C). The pulse is irregular, with postural hypotension and rapid, shallow breathing. There is no alteration of the mental state. Usually appears as a result of exposure to high levels of environmental heat or vigorous physical exercise, sometimes associated with dehydration and/or loss of electrolytes.
Heatstroke	Very serious illness: the body is unable to control its temperature; the temperature increases and can rapidly reach 40°C and continue to rise. The main symptoms are heat, dryness and red skin, rapid pulse, intense headache, confusion and loss of consciousness. There may be nausea, hypotension and increased respiratory rate. The body suffers a generalised inflammatory response, which presents a wide variety of clinical symptoms, resulting in injuries to internal organs (liver, kidney, etc.) and tissues (intestines and muscles). At its most severe, which can occur rapidly, in addition to the above-mentioned injuries there is profound dysfunction of the central nervous system. When the process is not stopped (which requires hospitalisation), fatalities occur.

Source: (Narocki 2021).

Figure 3. Number of deadly days by world region in the 2100 year and in the IPCC “business as usual scenario” (RCP 8.5), where CO₂ emissions keep growing at the same pace during the 21st Century and a more conservative scenario where a mitigation strategy is adopted (4.5 RCP).



Source: (Mora et al., 2017).

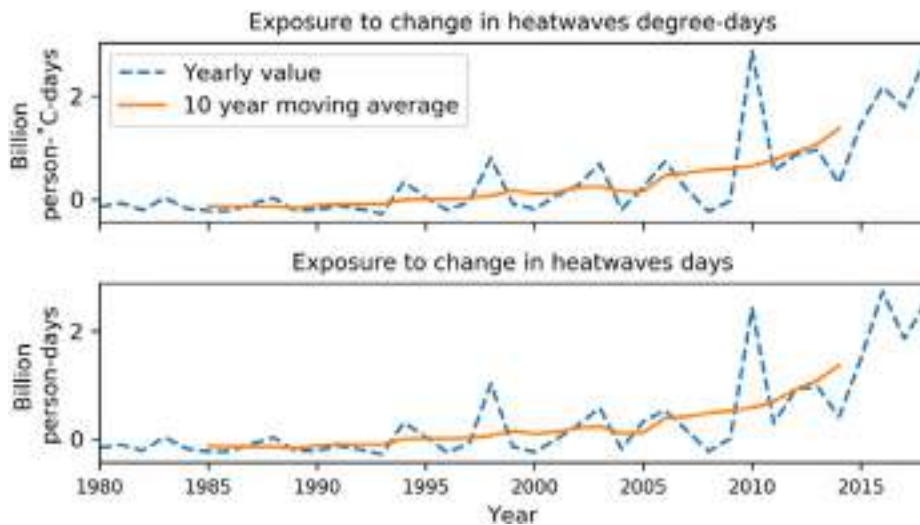
Direct effects on health are not the only sources of threat to human wellbeing. According to a recent report by Lee (Lee, Zermoglio, and Ebi 2019), “the combination of high temperatures and high humidity will compromise normal human activities, including growing food or working outdoors in some areas for parts of the year”. Greater risk of injury, disease and death due to direct exposure to extreme temperatures comes with coupled major threats to health and wellbeing such as:

- Air pollution and increased risk of fires.
- Undernutrition resulting from diminished food production in poor regions.
- Lower physical activity and sedentarism.
- Waterborne illnesses and disease vectors.
- Lost work capacity and reduced labour productivity in vulnerable populations.

Worldwide today, nearly one-third of the global population covering just 13 per cent of the Earth's land area experience at least 20 extreme heat days per year. If emissions continue unchecked and heat interventions are not implemented, this risk expands to 47 per cent of the land area, affecting 74 per cent of the world's population by 2100 (Mora, Dousset, et al. 2017).

The evidence pointing in the same direction adds up. For example, Figure 4 shows the change in the exposure to degree-days and number of days under a heatwave experienced by the world's population (Billion person-°C-days/ Billion person-days) relative to the mean for 1986-2005 and since 1980. The pattern for the last ten years shows a drastic increase in the number of people experiencing heatwave events (Chambers 2020).

Figure 4. Time series (1980-2018) of total world population exposures for degree-days and days of heatwave.



Source: (Chambers 2020).

2. HEATWAVES AS AN OCCUPATIONAL HEALTH AND SAFETY PROBLEM

Heat is a long-known and fully preventable working condition that has important health and productivity outcomes that can be present in many occupations. It can arise from 1) ambient thermal conditions including solar radiation, 2) from strenuous work causing an increase in internal heat production, and 3) from the use of personal protective equipment or clothing hindering the release of body heat.

When temperatures rise, the body activates internal mechanisms such as sweating and vasodilation to regulate internal temperature. However, these mechanisms have limits and are not effective in extremely hot and prolonged conditions. High temperatures, as in heatwaves, can exceed the body's adaptive capacity, increasing the risk of injuries due to direct health effects, such as respiratory and cardiovascular problems, and indirect effects, such as disrupted sleep and reduced concentration that elevate the chances of occupational accidents.

Workers are at high-risk of exposure to heat events and should therefore be considered a risk group for the appropriate purposes. Workers can experience negative effects of environmental heat at lower temperature levels than those eliciting public alerts, especially if tasks require physical exertion or the use of protective clothing or PPE that may hamper natural heat loss. For outdoor settings, sun radiation may add to the environmental heat. In indoor industrial workplaces, heat and humidity can be generated during the production process or by machinery, increasing indoor heat. If appropriate preventive action is not taken, workplace temperature can increase during heatwaves to extremely dangerous levels.

During heat events, there is a clear rise in work-related injuries by all causes, such as burns, wounds, lacerations, amputations, falls, moving objects, contact with chemicals, etc., as well as heat illnesses (Martínez-Solanas et al. 2018; Santurtún et al. 2023). The overall risk of occupational injuries increased by 1% per 1°C increase in temperature above reference values and 17.4% during heatwaves (Fatima et al. 2021). Other estimations show that “there may be 22,000 more occupational heatstroke fatalities in 2030 than in 1975; this should be increased by many thousands of cases of non-fatal heat stroke and other clinical effects” (Kjellstrom et al. 2014).

Indoor industries that utilize heat as a fundamental part of their production processes, like glass or steel industries, and those entailing high humidity levels such as food production and kitchens, have conventionally been identified as particularly vulnerable to heat stress. At the present time, with hotter weather extending beyond the usual vacation period, heat poses a challenge notably in activities and professions unprepared for safeguarding against outdoor heat, though not exclusively limited to them. Exposure issues are arising in sectors previously unaffected, encompassing schools, long-term care facilities, warehouses, or offices situated in buildings lacking adequate cooling systems. In these settings, when the problem arises due to weather conditions, the compromise in well-being is commonly perceived as a minor risk or a “natural” circumstance beyond human control, potentially leading to inaction. Failure to implement suitable preventive measures could lead to a significant rise in workplace temperatures during heatwaves, reaching perilously high levels (Morris et al. 2021).

Outdoor occupations such as agriculture and construction have historically seen a greater incidence of heat-related illnesses, particularly heat stroke. However, exposure to such risks extends to various

other sectors, including fisheries, forestry, military and security, energy, and transportation in vehicles lacking air conditioning, among others. Emerging roles, such as food delivery riders on bicycles or operators working on wind towers, face significant risks of heat stress too. Additionally, certain professions such as tourism, sports, and leisure activity guides or monitors encounter a blend of factors contributing to occupational heat stress. Moreover, work conducted within metropolitan areas suffers heightened impacts of extreme heat due to the “urban heat island effect”, causing urban environments to register higher temperatures compared to their rural surroundings (Rasilla et al. 2019).

Table 2. Examples of occupations facing simultaneous exposure to ambient heat in an expanded range of indoor/outdoor scenarios. Source: own elaboration.

Indoor	Jobs relying on external airflow to mitigate indoor ambient heat: textile mill workers, packaging plant, bakery, machine room personnel on ships, furnace operators in foundries. Physically demanding roles: automobile production lines, cleaners in large complexes, air conditioning installation, gym instructors, maintenance personnel in industrial facilities. Jobs requiring heavy clothing or personal protective equipment (PPE): welders in garages and workshops, laboratories in chemical industries, boiler operators, glass factories, cleaners in medical facilities, indoor farms, etc.
Outdoor	Work exposed to direct solar radiation, physically demanding roles, and/or requiring heavy clothing or personal protective equipment: open-air and greenhouse agriculture, construction, forestry, gardening, fishing, solar and wind power installation, traffic control, airport ground activities, security and military, health emergencies, forest and urban firefighting, loading, delivery services, tourism, leisure activities, lifeguard, street vendor, road and railway maintenance, open-air mining, urban cleaning, waste management, vehicle/machine operation without air conditioning.

In conclusion, acute heat stress is increasingly acknowledged as a significant cause of mortality in developed nations and is gradually gaining attention on national and global health and development agendas. Heat extremes are presently occurring and significantly impacting human health. The risk posed by heat is determined by the intensity of an event, the level of exposure, and the vulnerability of affected populations. The human body’s ability to regulate temperature may routinely be overwhelmed, especially during manual labour, in various regions worldwide throughout this century. In the most severe climate change scenarios predicted, some regions could experience temperature increases ranging from 4°C to 7°C by the year 2100. Should this come to pass, the combination of elevated temperatures and increased humidity may hinder typical human activities, including agricultural cultivation or outdoor work in certain areas for extended periods of the year. Already, some regions exceed the international safety standards for outdoor work during the hottest months (OIT 2019).

2.1. Specific impacts of heat on workers' safety and health

Overall, the risk of occupational injuries increases by 1% per 1°C increase in temperature above reference values and 17.4% during heatwaves (Fatima et al. 2021). Evidence that shows how during heat events there is a clear rise in work-related injuries due to all causes, such as burns, wounds, lacerations, amputations, falls, moving objects, contact with chemicals, etc., as well as heat illnesses, is adding up (Glaser et al. 2022). A fraction of the rise in heat-mortality rates is due to injuries and a part of those can be attributed to the impairment of attention and cognitive function produced by heat strain and therefore contributing to unsafe behaviours. Dehydration, accumulated fatigue—often linked to inadequate housing or energy poverty—, and exposures during commuting also add to injuries caused by cognitive impairment (Habibi et al. 2021).

Heat increases the hazard of other risks, such as chemical toxicity. Exposure to heat can affect how chemicals interact and are incorporated into the body. In general, heat exacerbates chemical absorption and toxicity. “Changes to the body’s core temperature can alter absorption, distribution, metabolism, and excretion of toxicants. Increases in respiration can lead to further toxicant exposure through inhalation, whereas increases in sweat and skin blood flow can lead to more efficient transcutaneous absorption” (NIOSH 2016). Thus, heat-related risks become more severe when combined with exposure to contaminants usually present in occupational contexts, such as urban pollution or pesticides. Similarly, exposure to solar radiation increases the risk of heat strain and by itself also causes alterations in the DNA, increasing the risk of skin cancer, as well as causing premature aging, eye pathologies, burns, etc.

Heat also endangers the psychological well-being of people who work regularly exposed to high temperatures (Tawatsupa et al. 2010). Job insecurity and working conditions have been shown to be determinant for mental health (Moreno Diaz 2023), such that heat can further exacerbate this situation. Heat can also lead to a multitude of long-term health issues, rendering workers particularly vulnerable. For example, chronic kidney disease has been repeatedly hypothesized as an effect of occupational heat stress (Glaser et al. 2022; Kupferman et al. 2018; Mix et al. 2018). Continued heat stress among workers has also been related to lower sperm quality (Figà-Talamanca et al. 1992).

Figure 5. Relationship between climate change and occupational safety and health.

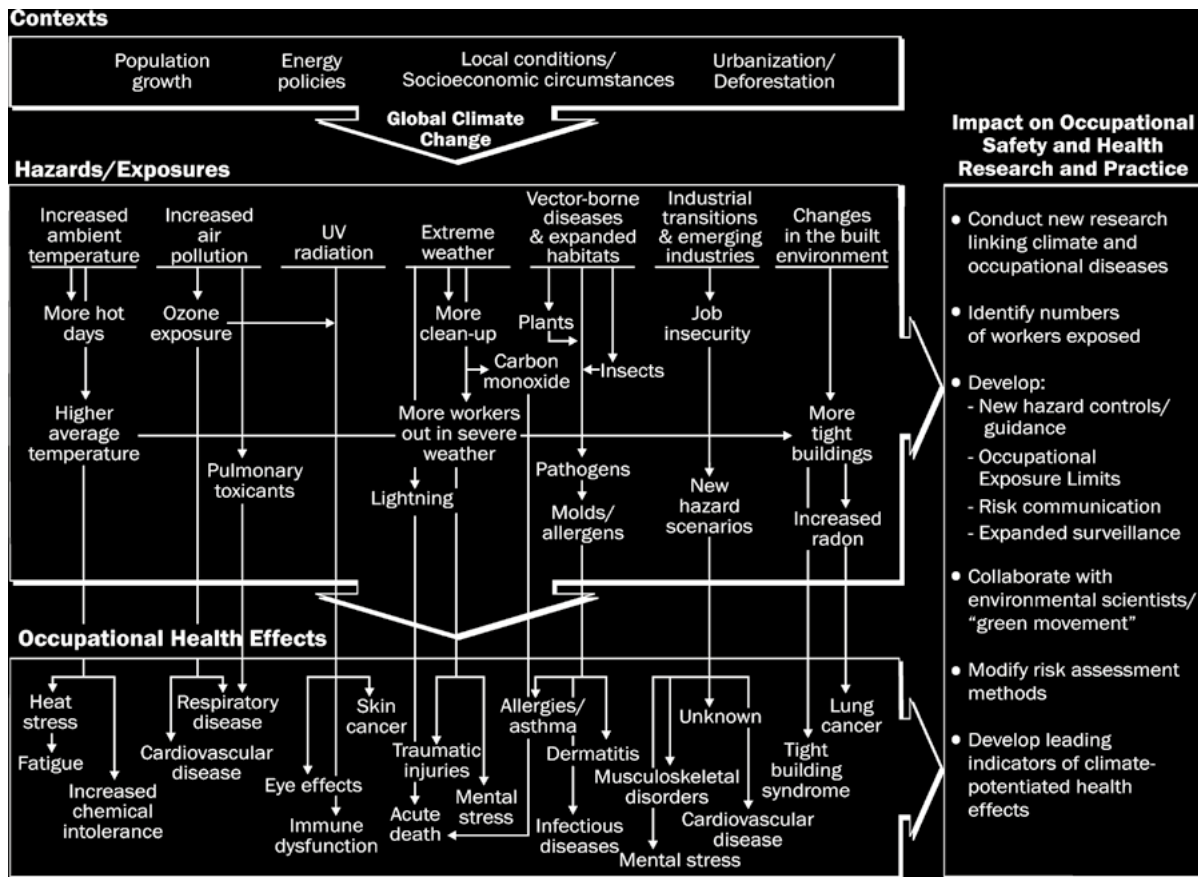


FIGURE 1. Conceptual framework of the relationship between climate change and occupational safety and health

Source: (NIOSH 2016), adapted from Schulte and Chun (2009).

Recent studies show that a large percentage of workers who work in occupational environments dominated by physically demanding manual tasks, especially in workplaces with high ambient temperatures, suffer heat strain and dehydration whether indoors or outdoors. A systematic review and meta-analysis of 111 studies, encompassing more than 447 million workers from over 40 different occupations, estimated that 35 per cent of individuals who frequently work in conditions of heat stress experience the negative effects of occupational heat strain and dehydration. Meanwhile around 15 per cent of those who typically work under heat stress experience acute kidney injury or kidney disease (Flouris et al. 2018).

2.2. Heat-related risk factors and heat inequalities

Traditionally risk factors that lead to occupational heat stress can be classified into three groups as shown in the following table (Narocki 2021). They are not mutually exclusive and quite often workers are exposed to more than one group simultaneously, increasing the level of risk.

Table 3. Classification of heat-related risk factors for occupational safety and health.

The environmental conditions of the working environment	• Air temperature: the specific level of heat in a given place and time. • Relative humidity: high ambient humidity obstructs the evaporation of sweat, our main cooling mechanism and which becomes almost the only mechanism in conditions of intense heat and/or intensive physical activity. • Radiant temperature: there is an exchange of heat between the body and the surrounding, surfaces and, in outdoor environments, the sun. • Air movement: higher air speed helps to dissipate the heat produced by the body, facilitating the elimination of excess heat through sweat by heat convection. However, when air temperature is equal to or greater than skin temperature (starting at 35°C), air speed does not help.
Physical activity performed	• Metabolic heat resulting from physical work can pose an enormous challenge to normal thermoregulation; it can lead to heat illnesses even in 'normal' environmental conditions. • The level of heat produced during physical work or exercise results from its intensity, pace and duration as well as from factors such as the level of acclimatization and fitness, or individual factors such as gender and age.
Personal protective equipment (PPE) / heavy clothing	• Clothing and PPE can be factors in heat stress when they complicate or even prevent the dissipation of body heat to the environment by sweating. • The higher the thermal resistance and the lower the water vapor permeability of the materials making up the PPE, the more they create a micro-environment around the skin. If air cannot circulate around the skin, perspiration is not effective in cooling the body. So, heat loss capacity via the skin surface is reduced.

Source: (Narocki 2021).

Besides, the exposure scenarios to occupational heat stress are increasingly diverse, extending well beyond industries traditionally associated with the generation of heat (e.g. glass industry) or working in heat (farming, construction, gardening, road maintenance, etc.) and encompassing various indoor and outdoor occupations. Overlooked areas prone to heat stress during heatwaves include healthcare, education, commercial establishments, warehousing, logistics centres, and manufacturing. See a few examples below:

- Jobs with heat-generating processes (industries, kitchens) relying on external airflow to mitigate ambient heat are at risk when outdoor temperatures rise.
- An expanding number of activities categorized as “uninterruptible” persist despite extreme heat conditions, spanning from regulated zone monitoring, such as parking areas and airports, to security tasks, technological system supervision, emergency responses (e.g., spills, leaks, fires, health crises), and the assembly and operation of temporary facilities for sports, leisure, tourism, and hospitality.
- Work performed in environments, machinery, and vehicles lacking thermal adaptation poses considerable challenges. Workplaces that lack proper shielding from external heat because traditionally they do not operate during hot weather, such as schools, are increasingly exposed because of today’s longer summers. Workers operating vehicles or machinery without air conditioning also face significant heat-related risks.
- In cities, diverse micro-climates arise due to urban landscapes, with temperature variations of up to 10°C in different areas at the same time. The ‘urban heat island’ effect, driven by factors like cement density, reflective surfaces, or water bodies, amplifies temperatures in cities compared to their surrounding regions (Rasilla et al. 2019) human thermal comfort, and air quality for the city of Madrid, Spain during heat waves. Heat wave periods are defined using the long-term records from the urban station Madrid-Retiro. Two types of UHI were studied: the canopy layer UHI (CLUHI).
- Work pace intensification is a reality across various semi-mechanized or automated activities, including warehouse operations, due to new labour management strategies and payment systems. On the contrary, self-pacing is a proven mechanism to reduce heat strain (Miller et al. 2011).
- Finally, measures to counterbalance heat stress can also create new emergent risks. For example, nighttime harvesting helps to reduce exposure to extreme heat, but night shifts are associated with heart-related diseases, diet-related diseases and some types of cancer. Lighting is also critical for safety in farmwork as it involves interaction with heavy machinery. Gender-based violence and sexual harassment can also be increased by a lack of proper illumination (Mayer 2023).
- In addition, industrialized regions such as Europe are currently challenged by an aging workforce, which will be accompanied by a deterioration of human physiological capacity for heat dissipation, precisely when the planet is expected to increase its temperature higher than ever in human history.

Figure 6. Heat-related illness risk factors.



Source: (NIOSH 2016).

Besides the traditional risk factors and new emerging scenarios, other known “social determinants of health” can play a key role in how exposure to heat is unequally distributed and experienced by different groups of the working population. The likelihood of being exposed to occupational heat stress reflects pre-existing social cleavages, and at the same time accentuates social inequalities since it has a negative effect on earnings and career trajectories (Kim and Lim 2017). Heat is a frequent occupational hazard for workers in low-skilled manual occupations, featuring low income and tasks requiring physical exertion. Furthermore, those experiencing heat-related illnesses and/or traumatic injuries suffer further impoverishment.

More specifically, **low-income workers** exposed to heat stress at work also tend to be more exposed out of work: on the way to work, whether on foot or commuting in vehicles without air conditioning. Likewise, low-income workers are additionally more exposed in their homes, where their buildings are poorly insulated thermally and lack air conditioning, or where they suffer “energy poverty” (an inability to afford gas and electricity bills); while those situated in neglected urban areas are highly affected by the ‘heat island’ effect (Narocki 2021).

Even if the engineered solutions and organizational conditions are key factors in understanding exposures to heat and heat-related hazards, they can only be fully understood by considering wider aspects of **working conditions and work organization** such as:

- Low-paid “piece rate” work, which disincentivizes taking breaks to rest, seek shade, or drink water (Lam et al. 2013).
- Low-paid workers tend to face heat stress at work and out of the work environment, notably in housing and transportation, hindering their rest and favouring dehydration.
- Unstable work relations: a large part of heatstroke cases happen to workers on their first day of employment. This fact has to do with a lack of acclimatization, but also to a lack of information and training that characterizes high-rotation jobs.
- Company size: the exposure of personnel and the effects on their safety and health are often more serious in small companies than in larger ones; this is partly due to weak hazard prevention management and fewer resources for proper adaptation.
- Low bargaining power: workers’ representation is sometimes limited in highly exposed sectors and in small enterprises, which jeopardizes workers’ ability to remain firm about the effective application of heat measures, especially when they have economic costs for the companies, e.g., stopping work due to a heatwave alarm.
- Informal jobs have no legal mechanisms to guarantee heat-related safety and health measures and leave workers beyond the measures of social protection schemes and even health care provision in some countries.

Migrant status is another key social determinant for occupational heat stress. Foreign undocumented workers and those not speaking the local language have some of the most exposed job positions, such as agriculture, construction sites, delivery, etc. They have bigger difficulties in getting the proper training and lower bargaining capacity to make employers effectively apply preventive measures. Heat stress increasingly drives international migration and the displacement of people. Therefore, measures must be put in place in time to avoid unfair heat inequalities.

The challenges of heat stress could widen existing **gender gaps** in the world of work, e.g., by making working conditions worse for the many women employed in subsistence agriculture and adding to the health and productivity hazards faced by pregnant women. The lack of sanitary facilities at workplaces also puts workers at risk for heat-related conditions, especially women. Women have been shown to be at greater risk of dehydration due to voluntary fluid restriction to avoid having to use unhygienic (or non-existent) toilet facilities at their places of work (Venugopal et al. 2016).

The impact of heat stress is higher among certain economic activities and occupations. Jobs with high physical exertion are affected due to the internal heat that is generated. Workers requiring heavy clothing and protective equipment are also at risk. Workers in agriculture and construction, two sectors that are characterized not only by heavy physical exertion but also by a high level of informality, are thus particularly exposed. However, service sector jobs, including refuse collection, repair work, transport, tourism, and sports, are also significantly impacted by heat. Climate change has also been defined as a “threat multiplier” in that it increases the occurrence of extreme weather events as well as fires around the world, which in turn increases the risks for firefighters and other first-responder occupations (Ioannou 2022).

Finally, as previously shown, evidence shows that heat-related mortality varies between countries and world regions. Heat stress is more prevalent in countries with decent-work deficits, working poverty, informal employment, and subsistence agriculture. As stated in the previous paragraph, workers performing strenuous outdoor activities, such as agriculture, farming or fishing, are at greater risk from dehydration and heat stress when heat-related work practices are not in place. These sectors employ a large proportion of the workforce in tropical countries and therefore recent epidemics of chronic kidney disease, linked to chronic dehydration, have been reported in such contexts (Glaser et al. 2022; Kupferman et al. 2018).

2.3. Heat prevention policies, programs, and measures

For years, the World Health Organization has been recommending countries and regions to develop and implement heat-health action plans to prevent, react to, and contain heat-related risks to health. Those plans should include prevention, preparation, and responses, identifying vulnerability factors such as age and health status. In many of these plans, warning systems and graded alerts play an important role to prompt authorities (including civil protection services) and the public to adapt their behaviour. Studies show that these plans reduce heat-related mortality, indicating preventable heatwave health impacts (Díaz et al. 2018).

Figure 7. Summary of protective measures to prevent heat-related illness.



Source: (Cheveldayoff et al. 2023).

The idea to develop a program to capture the growing evidence on climate change and health emerged at a 1998 Intergovernmental Panel on Climate Change meeting, and it was eventually presented as the “**High Occupational** Temperature Health And Productivity Suppression” (HOTHAPS) program. The HOTHAPS program was a multi-centre health research and prevention program used to quantify the extent to which workers are affected, or adapt, while working, and how global heating during climate change may increase such effects (NIOSH 2016).

However, national heat and health plans developed later do not sufficiently stress the occupational dimension of heat prevention. For workers, the ability to apply self-care behaviours at work, to avoid or interrupt exposure, is always conditioned by management practices and a mix of socioeconomic and employment factors. Public heat health adaptation policies are not directly applicable to occupational context and therefore do not automatically correspond to workers’ protection needs unless:

- The plan includes specific measures to reduce occupational exposure or secure workplace protection.
- Considers the constraints on taking self-care measures that originate as part of the employment relationship.
- Acknowledges that most workers who suffer fatal heat illnesses during heat events are occupied in low-skilled and low-paid positions.
- Prioritizes changes in the organizational and collective levels instead of focusing on individual behaviour, following therefore the OSH hierarchy of control of the Framework Directive.

In addition, occupational environments have their own particular characteristics and heat preventive measures must therefore be designed by taking them into account. The participation of workers and their representatives must be formally and sufficiently incorporated in these plans from the design phase. Finally, adaptation policies and prevention measures should be designed in a way that safeguards human rights by effectively protecting the safety and health of workers and not creating or promoting more inequalities (Ioannou et al. 2022).

Studies on the prevalence of heat strain are very important in attracting public attention to the problem of occupational exposure. It is important to bring the voices of experts to the surface and establish collaboration strategies between the scientific community and policy-makers as a means to delivering stronger messages on the adoption of effective occupational heat and health policies.

3. MEASURING HEATWAVES IN A WORKING ENVIRONMENT: A FUNDAMENTAL ELEMENT OPEN TO DEBATE

3.1. Occupational Heat Stress intervening variables

As seen above, there is no standard definition of heatwave and some definitions only consider air temperature. However, in industrial hygiene and occupational safety and health it is well established that air temperature alone is not an adequate indicator of a heatwave, as other conditions affect the body's natural mechanisms for coping with heat: perspiring and breathing.

Heat stress is the thermal environment imposed on a person that can increase body heat storage. The environmental factors of concern in occupational heat stress are (1) air temperature; (2) humidity or, more precisely, water vapor pressure; (3) air velocity; and (4) solar or heat (infrared) radiation. To fulfil its thermoregulatory function, sweat must be able to evaporate when bodies are exposed to heat stress. "With high ambient humidity, with clothing or PPE with properties that obstruct the evaporation of sweat or when the person is dehydrated, this cooling mechanism becomes difficult or is halted" (Narocki 2021).

The energy cost of an activity is the metabolic heat. This value can be directly measured or estimated through metabolic heat tables of energy expenditure for different tasks and activities and their duration. Thus, the total heat load imposed on the human body is the aggregate of environmental factors and the heat generated in the body (metabolic heat), minus the heat lost from the body to the environment. In turn, environmental and/or metabolic heat stress results in physiological responses (heat strain) to promote the transfer of heat from the body back to the environment to maintain core body temperature (Parsons 2002). Heat strain is thus the physiological response to the heat stress that attempts to transfer the stored heat back to the environment. There is a wide range of heat tolerance between humans, but each individual worker has certainly an upper limit for heat stress, beyond which the resulting heat strain can cause the worker to become a heat-related casualty (NIOSH 2016).

Repeated exposure to heat causes a series of physiologic adaptations called acclimatization, whereby the body becomes more efficient in coping with heat stress. Acclimatized workers can therefore tolerate greater heat stress levels before a harmful episode of heat strain takes place. Evidence shows that acclimatization plays a great role in heat-related illnesses and injuries and thus it must be considered when evaluating the occupational hazard posed by heat.

3.2. Occupational Heat Indexes

Heat stress may be assessed by measuring the climatic and physical factors of the environment and then evaluating their effects on the human body via an appropriate heat stress index. There are several scientifically validated evaluation indexes that have been developed throughout the 20th century. According to the American Authority on OSH, the National Institute for Occupational Safety and Health (NIOSH), for it to apply at the workplace, an index must meet the following minimum criteria:

- Feasibility and accuracy must be proven with use.
- All important factors (environmental, metabolic, clothing, physical condition, etc.) must be considered.
- Required measurements and calculations must be simple.
- The measuring instruments and techniques applied must result in data that accurately reflect the worker's exposure but do not interfere with the worker's performance.
- Index exposure limits must be supported by corresponding physiologic and/or psychological responses that reflect an increased risk to safety and health.
- The index must be applicable for setting limits under a wide range of environmental and metabolic conditions.

Even if they comply with all the criteria, each index has its own advantages and disadvantages. An equilibrium between applicability, simplicity and accuracy must be achieved. Again, the NIOSH classifies the most popular index under the following categories: (1) Direct Indices, (2) Rational Indices, (3) Empirical Indices, and (4) Physiological Monitoring (Table 4).

Table 4. NIOSH classification of Heat Index types.

Direct Indices
Dry Bulb Temperature
Wet Bulb Temperature
Rational Indices
Operative Temperature
Belding-Hatch Heat Stress Index
Skin Wetness (%SWA)
Empirical Indices
The Effective Temperature (ET, CET, ET*, and P4SR)
The Wet Bulb Globe Temperature (WBGT)
Wet Globe Temperature (WGT)
Universal Thermal Climate Index (UTCI)
Psychrometric Chart
Physiologic Monitoring
Work and Recovery Heart Rate
Body Temperature
Core Temperature
Oral Temperature
Skin Temperature
Aural Temperature
Dehydration

Source: (NIOSH, 2016).

The most widely used indices at present are Effective Temperature (and its most recent versions: CET, ET)² and Wet Bulb Globe Temperature (WBGT). The Wet Bulb Globe Temperature, or WBGT for short, was developed as a method to control heat casualties in the military as early as 1957. As today, this is the most popular and widely used heat index in occupational settings around the world. The WBGT combines the effect of humidity, air movement, air temperature and radiation (in outdoor situations in the presence of sunshine)³. The ET combines dry bulb and wet bulb temperatures and air velocity. The data on which the original ET was based came from studies on sedentary subjects exposed to several combinations of humidity and temperature, all of which approximated or slightly exceeded comfort conditions. The responses measured were subjective impressions of comfort or equal sensations of heat (NIOSH 2016).

Sometimes, it is not possible to have a technical objective measure of heat stress/heat strain, and not even necessary for certain purposes. In the last years, a few psychometric instruments based on subjective perceptions of heat strain have emerged in the scientific literature. These instruments can never replace a preventive heat strain assessment performed by a doctor or a trained technician, nor enable the establishment of TLV, but they can be used for research purposes. The Heat Strain Score Index is composed of 18 items divided in four factors and it has been proven as a reliable measure of in Iranian workers of a warm context (Dehghan et al. 2015). The Heat Shield validated this instrument for the English-speaking population later. A second method called Observational - Perceptual Heat Strain Risk Assessment, or OPHSRA, has a slightly different approach since it combines subjective perceptions with objective measures to estimate the risk of heat strain in a variety of thermal conditions (Yazdanirad et al. 2021).

Ultimately, heat stress standards seek to limit the risk of heat-related illness, injuries and casualties. The WHO established that working under conditions of heat stress, “it is inadvisable for core body temperature to exceed 38°C (100.4°F) in prolonged daily exposure to heavy work” (NIOSH 2016).

3.3. Recommended exposure limits and threshold limit values

The idea behind recommended exposure limits (RELs) and threshold limit values (TLVs) for heat stress refers to heat stress conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse health effects. Their goal is to help keep core body temperature under safe limits, or in other words, to control thermal conditions (environmental and metabolic) that help maintain the body’s thermal equilibrium. There are several proposals in the scientific literature to determine these RELs/TLVs:

- NIOSH Recommended Exposure Limits or RELs are expressed in WBGT °C units. They were calculated using a physiological approach (NIOSH 2016). However, as there are many factors that can affect how an individual will respond to hot temperatures, RELs may not be protective of everyone, thus professional onsite judgment is extremely important. Also, working for shorter time periods and taking appropriate rest breaks slows down the body’s heat accumulation. Accordingly, RELs are provided for 60, 45, 30 and 15 minutes of work (see the following figure).

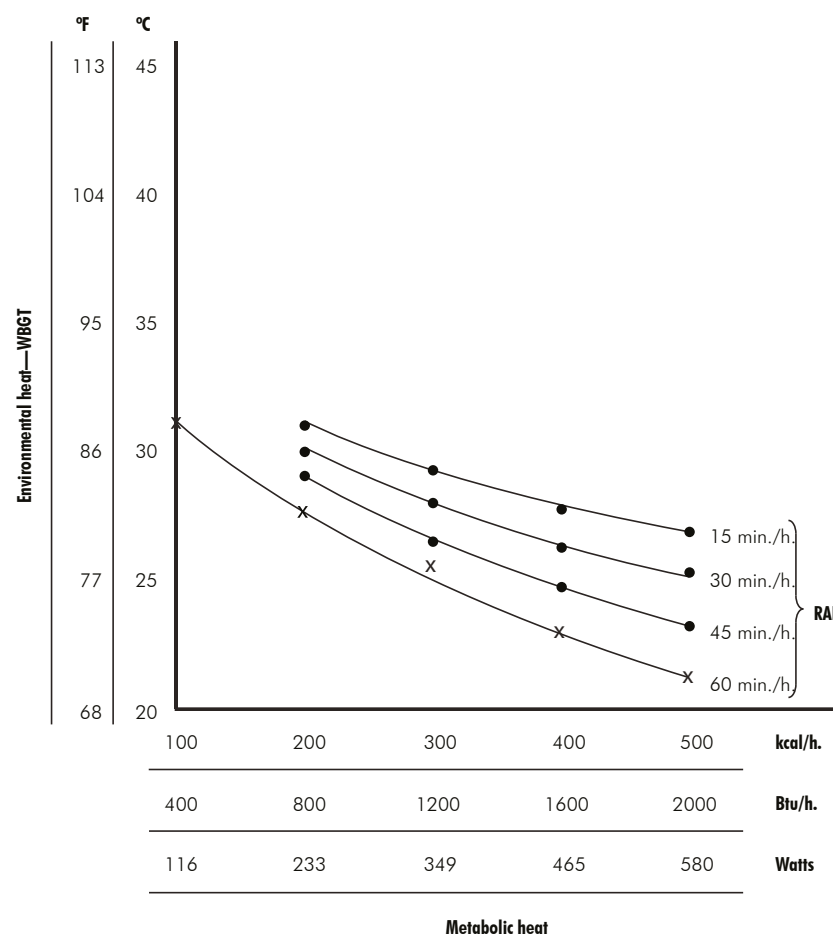
² CET stands for Corrected Effective Temperature and ET* for the newest version of the ET. ET or CET values that exceed 30°C (86°F) for sedentary activities, 28°C (82.4°F) for moderate work, and 25.5°C (79.7°F) for hard work are unacceptable. For fully heat-acclimatized individuals, the recommended limits are increased by around 2°C (3.5°F).

³ Commercially available WBGT measuring instruments give these values separately or integrated in a form for digital readouts. A printer can be attached to provide tape printouts at selected time intervals (NIOSH, 2016).

- The American Conference of Governmental Industrial Hygienists (ACGIH) determines that the goal of its TLVs is to maintain core body temperature within $+1^{\circ}\text{C}$ of normal (37°C), although exceptions can be made under certain circumstances (ACGIH 2014). The environmental factors are again expressed as the WBGT, which contributed to the popularity of this index. ACGIH provides instructions for adjusting the WBGT values on the basis of clothing type and heat production (light work, moderate, heavy and very heavy). Work demands are also considered and the corresponding WBGT values are provided for 100% work, 75% work/25% rest, 50% work/50% rest, and 25% work/75% rest per hour.
- Another TLV proposal is the one by the American Industrial Hygiene Association (AIHA), also expressed in WBGT values: resting, 32°C – 33°C ; light, 30°C ; moderate, 27°C – 28°C ; heavy, 25°C – 26°C ; and very heavy, 23°C – 25°C .

All index proposals should include adaptations for non-acclimatized workers and/or workers with high sensitivity or biological needs. In all cases, it is very important to evaluate each and every one of the company's jobs, taking into account the characteristics of the job (activity performed, clothing used, level of acclimatization of the staff, etc.).

Figure 8. Recommended heat stress exposure limits (RELs) for acclimatized workers according to NIOSH. Values shown are for a man of 70 kg and 1.8 m² of body surface (standard man).



Source: (NIOSH, 2016).

Table 5. Comparison of exposure heat limits for acclimatized workers from various organizations:

Workload	ACGIH	AIHA	OSHA	ISO	NIOSH
Resting		32.2°C (90°F) 100 kcal·h ⁻¹ (117 W)		33°C (91.4°F) ≤100 kcal·h ⁻¹ (117 W)	
Light	30°C (86°F) 100–200 kcal·h ⁻¹ (117–233 W)	30°C (86°F) 200 kcal·h ⁻¹ (233 W)	30.0°C* (86°F) 32.2°C† (90°F) <200 kcal·h ⁻¹ (233 W)	30°C (86°F) 100–201 kcal·h ⁻¹ (117–234 W)	30°C (86°F) <200 kcal·h ⁻¹ (233 W)
Moderate	26.7°C (80°F) 201–350 kcal·h ⁻¹ (234–407 W)	26.7°C (80°F) 300 kcal·h ⁻¹ (349 W)	27.8°C* (82°F) 30.6°C† (87.1°F) 201–300 kcal·h ⁻¹ (234–349 W)	28°C (82.4°F) 201–310 kcal·h ⁻¹ (234–360 W)	28°C (82.4°F) 201–300 kcal·h ⁻¹ (234–349 W)
Heavy			26.1°C* (79°F) 28.9°C† (84°F) >301 kcal·h ⁻¹ (350 W)	25°C* (77°F) 26°C† (78.8°F) 310–403 kcal·h ⁻¹ (360–468 W)	26°C (78.8°F) 301–400 kcal·h ⁻¹ (350–465 W)
Very heavy	25°C (77°F) 350–500 kcal·h ⁻¹ (407–581 W)			23°C* (73.4°F) 25°C† (77°F) >403 kcal·h ⁻¹ (468 W)	25°C (77°F) 401–500 kcal·h ⁻¹ (466–580 W)

*Low velocity; †high velocity; kcal·h⁻¹ = kilocalories per hour.

NOTE: Unacclimatized workers would have greater heat expenditures during the same amount of work and temperature.

Adapted from the American Industrial Hygiene Association (AIHA) [2003].

Source: (NIOSH, 2016)

3.4. Factors limiting efficacy to real existing heat evaluations

The (increasingly) unstable nature of the climate and the fact that it is impossible to predict the weather with absolute accuracy complicates the task of preventing the harmful effects of workers' exposure to heat. Except in isolated interior settings where conditions of heat, humidity and air circulation are constant, heatwaves can significantly alter risk exposure. Heat hazards assessments must take this into account if they are to be effective. If the assessment is conducted at a time that is not representative of normal heat conditions (e.g. first hour in the morning or during a cloudy day), it will be as useless as if the assessment had parameter measurement errors. If the assessment is representative on average, but does not take into account the fact that at extraordinary specific times, such as in heatwaves, the exposure limit values may be exceeded, it may endanger worker safety.

According to NIOSH, "environmental heat measurements should be made at least hourly, during the hottest portion of each work shift, during the hottest months of the year, and when a heatwave occurs or is predicted. If two such sequential measurements exceed the applicable RAL or REL, then work conditions should be modified by use of appropriate engineering controls, work practices, or other measures until two sequential measures are in compliance with the exposure limits of this recommended standard" (NIOSH, 2016).



PART TWO: PROTECTION OF WORKERS FROM HEATWAVES IN 5 EUROPEAN COUNTRIES (SPAIN, ITALY, GREECE, THE NETHERLANDS AND HUNGARY)



4. HEATWAVES ON THE SOCIAL AND POLITICAL AGENDA OF THE COUNTRIES ANALYSED

4.1. The emergence of heatwaves on the social and political agenda of the countries analysed

Awareness of the negative impact of climate change on the health of populations has increased in recent years and is becoming increasingly prominent in the political agendas and actions of EU Member States. More specifically, the health risks of exposure to heat linked to increasingly frequent, early, and prolonged heatwaves are receiving increasing attention in different EU countries. Southern European countries, traditionally more exposed to this type of extreme weather events, have been pioneers in implementing measures to mitigate the adverse effects of heatwaves on the health of their populations. However, concern and action on heatwaves now extends across Europe, albeit at different speeds and levels of intensity.

In the case of the five countries analysed in our study, despite their differences and the varying degrees of development of their policies to address climate change, we can clearly identify in all of them the shaping of “climate change”—and more specifically, heatwaves—as a public health problem. The growing mobilisation of citizens and the scientific community against the effects of climate change, as well as the accumulation of an increasing amount of empirical evidence on the impact of climate change on our lives, has driven the public debate on the need and urgency of adopting measures to curb and reverse the present and future effects of climate change. Health is undoubtedly one of the areas where the impact of climate change can be felt, and this is reflected to a greater or lesser extent in all the European countries we have analysed.

All of them recognise that climate change poses a risk to the health of their populations, not only because of the possible impact of catastrophic meteorological phenomena (river floods, torrential rains, hurricanes, etc.), but also as a persistent public health problem that requires policies, institutions, coordination mechanisms and resources. In this sense, more frequent and prolonged exposure to heat because of increasingly frequent heatwaves constitutes one of the main threats to public health, as has been shown by the excess mortality recorded during heatwaves.

In line with this situation, all five countries analysed have been implementing early warning systems, action plans and information campaigns to try to prevent the adverse effects of heatwaves on the health of the general population (although we cannot assess the design and effectiveness of these measures here). In short, although we cannot affirm that it is present with the same intensity and consistency in all the countries analysed, our research has allowed us to confirm the emergence of heatwaves as a public health problem in all of them. This has been reflected in the implementation of different measures, the mobilisation of resources and, in some cases, even in the transformation of the formal organisation of the State Administration.

The case of **Spain** may be paradigmatic in this respect. In 2001, the Spanish Office for Climate Change was created within the Ministry of the Environment. The strong impact of the heatwave of the summer of 2003 on public health brought about a change in the way of approaching this type of meteorological phenomena: heatwaves began to be addressed as a public health problem (not only from an environmental perspective) and in preventive terms (instead of only reactive). From that moment on, the

National Plan of Preventive Actions on the Effects of Excess Temperatures on Health (PNAPET) was launched and, since 2004, it has been updated every year. The National Plan for Adaptation to Climate Change (PNACC) was also approved for the periods 2006-2020 and 2021-2030, which placed “climate change” definitively on the government’s political agenda, making it possible to mobilise different types of resources. More recently, in 2020, Spain approved the Declaration on the Climate and Environmental Emergency in Spain (which establishes different lines of action to combat climate change), Law 7/2021 of 20 May on climate change and energy transition, as well as the Strategic Plan for Health and Environment (PESMA) 2022 - 2026. Finally, it should be noted that, during this period, the Ministry for Ecological Transition and the Demographic Challenge, the Institute for Just Transition (ITJ), the Secretary of State for the Environment, and the Health and Climate Change Observatory were also created. A major transformation of the structure of the Central State Administration that reflects the prominence acquired by climate change in government action in recent years.

Not all the countries analysed have registered institutional transformations as extensive as those recently registered in Spain, but in all of them it is possible to trace the implementation of regulatory changes, early warning systems, action protocols, recommendations and awareness campaigns, together with identification of the most vulnerable groups, etc. In **Italy**, for example, also in the wake of the 2003 heatwave, a heatwave warning system was put in place. Initially, heatwaves were dealt with in a reactive manner only, as an “emergency” situation (mobilisation of civil protection services, etc.). The treatment of heatwaves has subsequently evolved towards a more integrated warning system that also includes preventive measures defined from a public health perspective. Shortly afterwards, in 2005, the first prevention plan for the effects of heat on health was also approved, as well as a national portal with data from the Ministry of Health on heatwaves aimed at informing the different regional and local authorities in the country. As we will see, in the Italian case, these authorities have autonomy and are the main decision-makers and implementers of measures to protect the health of the population (including workers).

Greece, another country heavily exposed to the effects of climate change, approved its National Climate Law (Law 4936/2022) in 2022. The law proposes the creation of a National Observatory on Adaptation to Climate Change. The same law also proposes the creation of a climate dialogue forum, where political, academic, business and trade union representatives can be consulted on the various initiatives taken to achieve climate neutrality in the country.

The Mediterranean countries of southern Europe, traditionally more exposed to the effects of heatwaves and heat exposure, are not the only ones to have adopted measures or promoted reforms to deal with the effects of heatwaves. In the **Netherlands**, the protection of the health of the population against heat exposure is mainly the responsibility of the Ministry of Public Health, Welfare and Sport (VWS). Its main instrument for action is the National Heat Plan, developed by the National Institute for Public Health and the Environment (RIVM) and the Royal Netherlands Meteorological Institute (KNMI). This plan, approved in 2007 and reformulated several times since then, establishes the responsibility of municipalities and health institutions in the protection of vulnerable populations, activating the plan when weather forecasts predict a prolonged period of heat. The Plan also establishes an emergency alert system for institutions and individuals. In 2021, the national action plan on skin cancer was also launched, which aimed to raise public awareness of the risks of tourism and recreational activities in the sun. Despite the fact that it is a country traditionally less exposed to the effects of heatwaves, the measures taken over the last few years show that there is greater concern and awareness of the public health impact of heat exposure resulting from heatwaves and the effects of climate change.

Hungary, for its part, has also seen heatwaves become more frequent in the country, with longer hot spells and significantly higher-than-average daily temperatures. Legislators have tried to respond to the heat challenge by promoting research and proposing legislative changes. Of particular note in this regard is Law No. XLIV 2020 on Climate Protection. Furthermore, in 2014 the National Authority for Climate Protection was established as part of the structure of the Ministry of Energy. Among other things, the National Climate Protection Authority is responsible for monitoring and recording emissions of fluorinated greenhouse gases. Finally, it is worth mentioning that, to achieve the 2030 targets, Hungary developed a national plan on energy and climate change in 2019 called the *National Energy and Climate Plan*.

4.2. Heatwaves: from public health issue to occupational health issue?

As we have just noted, all the countries analysed have started to address heatwaves as a public health problem. In many cases, these are recent initiatives that are not yet fully implemented, or that are limited in scope, often based on voluntary measures and recommendations. In addition to these limitations, another major problem is that workers' safety and health is absent or barely present in this type of public health action aimed at the general population.

However, this situation appears to be slowly changing in some countries. The objectives of the climate change strategies and action plans that are being approved in some of the countries analysed are beginning to include the protection of workers' health from the consequences of climate change, with climate change being (implicitly) recognised as an occupational hazard. Likewise, in some of these strategies and proposals for action, certain groups of workers (e.g., those who work outdoors) are identified as a risk group, deserving of specific protection measures against heatwaves.

In **Spain**, for example, the Second National Plan for Adaptation to Climate Change (PNACC), 2021-2030 recognises the existence of vulnerable groups (including certain groups of workers) particularly exposed to the health risks of heatwaves. At the same time, the plan calls for the implementation of preventive actions against the effects of climate change on workers' health, recognising that climate change poses new occupational hazards and aggravates existing ones. The Plan also recognises that many occupations are exposed to the risks of heat exposure and calls for climate change factors to be included in workplace hazard assessments, for preventive measures to be planned, and for specific programmes to protect the most vulnerable groups of workers. Finally, the PNACC establishes the obligation to generate a national plan of preventive actions to address the effects of climate change on workers' health, as well as specific recommendations for companies to identify the possible impacts of climate change on the health of their workers and implement preventive measures.

In Spain, the content and approval of the PNACC is an important step forward in that it explicitly recognises climate change as an occupational hazard. Despite this, the plan is limited by the fact that its measures are voluntary recommendations, with no regulatory or budgetary development to guarantee their application. These limitations are also repeated in the case of the National Plan of Preventive Actions on the Effects of Excess Temperatures on Health (PNAPET), first approved in 2004 and last updated in 2023. The PNAPET is limited to informing the health authorities of the Autonomous Communities and the general population about the protective and preventive measures to be adopted in the event of heat exposure. The plan recognises outdoor work or work that requires a high level of contact with hot environments as hazards, but it does not create an obligatory standard, only recommendations.

References to the protection of workers' health in public actions against heatwaves were also found in other countries analysed, although not always as explicitly as in Spain.

In **Italy**, for example, health measures in relation to heatwaves are the responsibility of regional and local authorities, which oversee the protection of the population, including workers. Since 2003, different Italian regions have developed heatwave action plans, but it was not until 2016, following a process of local worker mobilisation supported by trade unions, that the first territorial ordinance to protect agricultural workers from the effects of heatwaves (e.g., banning work during the hottest hours) was adopted in Puglia. This has been an important change as, for the first time, the actions of the regional authorities will no longer target the general population or vulnerable groups, but rather a specific group of workers.

In **Greece**, the Ministry of Health, the National Public Health Organisation and the National Public Health Action Plan 2021-2025 provide for actions to deal with heat exposure. However, they have no particular action on climate change. Actions include public information, protection against overheating, and preventive measures to address the health effects of heat. However, these are addressed to the general public and do not contain any reference to workers.

The Municipality of Athens, for its part, is taking emergency measures to protect citizens from heatwaves. These measures include: provision of air-conditioned rooms, mobilisation of municipal clinics and a "Helpline" providing advice and instructions on how to deal with health problems, protecting homeless people from heat exposure, Streetwork groups of the Reception and Solidarity Centre of the Municipality of Athens (KYADA), 24-hour Citizen Service Line, updated information on hot days through a specific website of the Municipality of Athens (<https://coolathens.cityofathens.gr/>), etc. Similarly, through the EXTREME Europe4 application, the Municipality of Athens seeks to protect vulnerable groups of the population by informing users about possible personalised health risks as a consequence of heat exposure. This information is provided in real time and for a specific location, based on satellite data.

In the case of the **Netherlands**, the National Heat Plan approved in 2007 does not address the impact of heat exposure on workers. However, some groups of workers are identified as populations that require specific protective measures. Other initiatives related to heat exposure adopted in the Netherlands, such as the KNMI Climate Signal'21, also do not refer to the protection of workers' health. Some organizations, such as the National Institute for Public Health and the Environment (RIVM) and the Royal Netherlands Meteorological Institute (KNMI), are planning to expand their efforts to combat the effects of heat exposure beyond "vulnerable groups", notably the effects on workers. However, the project has not yet been implemented.

In **Hungary**, part of the actions against the effects of climate change have been oriented towards the development of energy-saving measures for households and businesses. However, with the increase in heatwaves, measures for the protection of the population's health have also been put in place. The National Public Health Centre (NNK), for example, has created a three-level heatwave warning system using data from the National Meteorological Centre (OMMSZ). In February 2024, the NNK also published an informative note for social institutions, municipalities and children's homes, informing

⁴ Programmes such as EXTREME Athens are part of the Resilience Strategy and the Climate Plan and one of the integrated solutions to strengthen Athens' resilience to climate change. The application that has been developed is the result of the collaboration of the National Observatory of Athens with the Athens' Resilience Strategy program "Resilient Athens" and the DAEM of the Municipality of Athens, advised by the Faculty of Medicine of the Greek Academy of Sciences.

them about the effects of heatwaves on health, as well as about the corresponding protection measures: maintenance of buildings, staying in shaded areas, checking the functioning of air conditioning, working hours, etc.). In advance of heatwaves, the Health and Safety Authority publishes guidance on protective measures on its website and the NNK also provides information on these measures in the media. In addition, in some cases, police officers distribute water in traffic jams to draw attention to the need to drink water during heatwaves. Despite these initiatives, in the case of Hungary, governmental actions against heatwaves are basically approached from a public health perspective, with little or no reference to workers as a specific risk group.

It is clear from our study that the protection of workers' health is still not very present in the heatwave actions undertaken in the five countries analysed. There are exceptions and positive examples where heatwaves are recognised as an occupational hazard and certain groups of workers are identified as vulnerable, requiring their own prevention and protection measures. However, the general trend continues to be one of public health action addressing the impact of heat exposure on the population (or on certain risk groups), with little or no attention to the specific needs of workers. The working world, however, is increasingly concerned about the impact of heatwaves on workers' safety and health.

In the Mediterranean countries analysed, trade unions and workers have been showing a growing concern about the effects of heat exposure for some years now, but this concern also extends to the Central and Northern European countries investigated⁵. This situation is reflected in the action taken by trade unions in the five countries analysed, where (especially in southern Europe) there is a succession of information and denunciation campaigns. Trade unions are also trying to incorporate content related to heatwaves and heat stress into collective bargaining and occupational hazards prevention, but so far with little success. The increased interest in the impact of heatwaves on workers' health is also reflected in other relevant actors in industrial relations, such as the Labour Inspectorate, the Economic and Social Councils or the bodies responsible for defining and implementing OSH policies. All of them have increased their interest—and some, their actions—regarding the phenomenon of “heatwaves” (e.g., the Labour Inspectorate in several countries, through information campaigns and the verification of companies' prevention plans).

As we have seen throughout this section, the increased interest in heatwaves has not, to date, translated into greater attention to labour-specific problems in strategies and action plans designed to address the effects of climate change. In other words, we could say that labour topics do not seem to have influenced the discussion on heatwaves and climate change to any great extent. But is there perhaps an influence in the opposite direction? And is it perhaps environmental issues linked to climate change that are spreading into the world of work (e.g. in the field of occupational safety and health)?

4.3. Heat exposure in the context of occupational hazards prevention

As we will see below, heatwaves and the effects of climate change do not seem to have a strong presence in the field of occupational safety and health either, even though the temperature in workplaces is regulated in all the countries analysed, with attention being paid to the effects of extreme temperatures on workers' health. Again, the analysis of the five countries selected corroborates the existence of a growing interest in heatwaves in the field of occupational hazards prevention, although this is not

⁵ For example, in 2021, the Dutch trade union FNV surveyed 5500 of its members about their working conditions. In terms of occupational health, “heat stress” emerged as the third of their concerns.

always translated into the implementation of effective heat protection and prevention measures. The situation in the five countries analysed is quite disparate, although they also have a number of common features, as we can see below.

In **Spain**, for example, the regulations on occupational hazards prevention (Law 31/1995 and Royal Decree 486/1997) have been regulating the permissible temperature and humidity in workplaces for several decades. However, these regulations suffered from important limitations in terms of worker protection. First, they stipulated that outdoor work should be protected from inclement weather as far as reasonably possible (Annex III.5), thus giving companies a high degree of discretion in their actions (resulting in less protection for workers). Second, the regulations contained a rather restrictive definition of what a “workplace” was, leaving out many work situations exposed to heat stress (means of transport used outside the company or workplace, temporary or mobile construction sites, extractive industries, fishing vessels, crop fields outside the built-up area of an agricultural workplace).

In 2023, almost 30 years later, these limitations have been corrected with the approval of a new regulation (Royal Decree-Law 4/2023), which modifies fundamental aspects of the occupational hazards prevention regulations in force until then. The new royal decree requires companies to have adequate protection measures in place to protect against adverse weather phenomena, including the possibility of prohibiting certain types of work while such phenomena are active. The new regulation also forces companies to adapt working conditions (including the reduction or modification of working hours) when the State Meteorological Agency issues an orange or red warning and existing preventive measures do not guarantee the protection of workers. As regards hazards assessment, the new Royal Decree makes it compulsory to consider the characteristics of the task and the worker and, at the same time, extends protection to work situations previously excluded (fishing vessels, construction work, etc.). Finally, the regulation establishes that the reduction in working time and activity resulting from the prevention measures adopted cannot lead to a reduction in workers’ wages.

Despite the persistence of some limitations (e.g., the fact that the warning system that activates the protective measures only considers ambient temperature), the approval of this regulation has meant an important step forward in the protection of workers against the effects of heat exposure, at least from a regulatory point of view. However, the degree to which companies comply with the content of the regulations (something that does not always happen in Spain in industrial relations) remains to be seen. In any case, since 2022 the Labour Inspectorate has increased the number of actions it carries out (including financial penalties for infringements) in the framework of the “Exposure to adverse environmental conditions” campaign. Since 2021, it has also been sending information letters to companies in the sectors most affected by heat exposure, reminding them of the importance of adopting preventive measures and providing them with technical information on these measures. Finally, it should be noted that the Spanish Strategy for Occupational Health and Safety 2023-2027 makes explicit reference to the challenges posed by the climate transition for occupational safety and health, underlining the need to improve the protection of workers against more extreme weather conditions. The strategy also mentions the importance of strengthening collective bargaining to reach agreements that promote the prevention of occupational hazards.

In **Italy**, the Law on Occupational Health and Safety (21/2008) also refers to the need to regulate the temperature of the workplace to ensure the protection of workers. Such regulation must consider not only the temperature, but also the physical activity performed by the worker, the tools used, as well as the humidity and draughts to which they are exposed. For the assessment of the risk of heat stress, Italy promotes the use of different standards and indices (such as the Heat Index Chart), defining temperature

thresholds that not only consider air temperature, but also humidity. At the same time, since 2017 (circular number 139/2016) the employer has the possibility of requesting “ordinary redundancy pay” in case of having to suspend work activities totally or partially due to adverse weather conditions (e.g., when temperatures reach 35°C or more). All these measures are intended mainly for outdoor work or activities involving materials or processes that cause heat exposure and may affect the health of the worker.

More recently, in 2023, a regulatory change has been implemented (Royal Decree 98/2023) which extends the sectors eligible to apply for ordinary redundancy pay in case of adverse weather conditions. This new Royal Decree also identifies different levels of risk due to exposure to heat and points out the need to create a prevention system that considers the relationship between climate change, productivity and workers’ health. For its part, the Labour Inspectorate has developed different protocols (4639, 5056) to promote greater control over the actions of companies in the event of a heatwave (verifying, for example, whether they comply with protection measures). All these initiatives show a greater recognition of heatwaves as an occupational health problem, although little action is taken in this respect to date.

Greece, for its part, was a pioneer in protecting workers’ health from the effects of heatwaves and heat exposure. In 1987, following an intense heatwave that caused more than 1300 deaths, the Greek Ministry of Labour and Social Security issued a pioneering circular with preventive measures for workers against the risk of heat stress during heatwaves. As in the other countries surveyed, the general legislation on occupational hazards prevention (Law 3850/2010) regulates the temperature of workplaces, obliging employers to have an occupational hazards prevention plan that includes measures against heat stress (regardless of where the work takes place, indoors or outdoors). The need to protect workers from inclement weather and heat exposure is also covered in other regulations (Presidential Decree 305/1996, 70/1996 and 16/1996; Mining and Quarrying Regulations-KMLE, 2011). As in the countries previously analysed, the problem in the Greek case often lies in the gap between the general principles and obligations contained in the OSH legislation regarding the problem of heat exposure and the implementation of specific (and effective) measures to combat heat in the country’s business fabric.

In Greece, the specific measures to be taken to protect workers against the risk of heat exposure are provided for in the annual circulars issued by the Ministry of Labour and Social Security. These circulars contain a wide range of (technical, organisational) measures aimed at both indoor and outdoor work. The main problem with these circulars is that compliance with their content is not compulsory for companies, but rather they function only as recommendations, thus considerably limiting their effectiveness. In 2023, however, during a heatwave known as “Cleon”, a Ministerial decree (Ministerial Decree 65581/2023) was issued making the measures contained in these circulars mandatory for the duration of the heatwave (which meant, for example, limiting work outdoors or indoor thermal processes during peak heat hours).

Outside the Mediterranean area, in the central and northern European countries analysed, we also find references to the problem of heat in occupational safety and health regulations and institutions, although their development has so far been more limited than in southern European countries, where the problem of heat has been present for longer and with greater intensity. In the case of the **Netherlands**, for example, heat exposure has not tended to attract much interest as a risk factor for workers’ safety and health. Dutch OSH legislation does not contain a threshold value, for example. Also, the Ministry of Social Affairs and Employment, which is primarily responsible for occupational safety and health policies in the Netherlands, has not carried out any initiatives in the field of “heat at work” until recently. Nor has the Neth-

erlands Labour Authority (Netherlands Labour Authority) tended to consider heat to be a high priority occupational health issue (despite receiving an average of 150 complaints per year related to this issue, it ranks low on the National Labour Authority's "integral hazards assessment", which is used to prioritize the Inspectorate's capacity). Nevertheless, in 2023, the labour inspectorate has put heat exposure on the agenda of its emerging risks observatory, also carrying out an action with 27 inspections in 6 sectors to assess the magnitude of the problem and how it is being dealt with by employers.

For its part, as we have already mentioned, the main Dutch trade union (FNV) has recently carried out a study that highlighted the growing concern of workers about heat (incorporating, at the trade union's request, the issue of heat exposure in the country's Working Conditions Survey). Finally, it is worth mentioning that the National Institute for Public Health and the Environment (RIVM) is recently trying to become more active in relation to worker protection, while the Social and Economic Council has addressed the issue of heat stress in 2023 and plans to launch a website with information on the topic in early summer 2024. Although initiatives on the issue of heat exposure have so far been few and far between, it seems clear that the issue has become more prominent in recent years. In fact, as we will see later, other regulatory instruments resulting from the social dialogue (collective labour agreements, OSH catalogues) do address heat-related issues, e.g., by establishing temperature thresholds or maximum times of exposure to extreme temperatures (although not always systematically, nor uniformly).

As far as **Hungary** is concerned, measures to protect against occupational hazards (including those arising from exposure to heat) depend on regulatory developments, measures adopted by the labour authority, as well as the employer's own regulations. As we have seen in the other countries analysed, Hungarian occupational hazards prevention legislation (Act XIII of 1993 on Occupational Health and Safety and the Decree on Minimum Requirements for Occupational Health and Safety) establishes the temperature thresholds within which work should be carried out, as well as the employer's obligation to provide the means to ensure that these thresholds are observed. The regulation establishes a series of measures of a rather general nature for the performance of any type of work, offering somewhat more detailed and specific measures in the case of indoor work. In any case, there is also the problem of the actual implementation of these measures in companies, which cannot be said to occur systematically, thus limiting the effectiveness of the existing regulatory framework.

The Occupational Safety and Health Authority is primarily responsible for verifying compliance with existing legislation, although the National Public Health and Medical Officer Service can also carry out inspections (as, in fact, it did some years ago to verify companies' compliance with heat stress protection plans). The problem is that the National Public Health and Medical Officer Service has not carried out any inspections since then, while the Occupational Safety and Health Authority has only 113 inspectors for a population of some two million companies. With such limited resources, verification of compliance with existing regulations is virtually impossible. The labour authority therefore focuses on carrying out targeted verification campaigns (which have shown poor compliance with heat stress regulations). The Occupational Safety and Health Authority is also responsible for providing information and instructions to companies on how to protect workers from the risks of heat exposure. In any case, these recommendations are not compulsory for companies and are often overly technical, limiting their usefulness as a tool to informing and raising awareness among workers and companies (especially smaller ones). Finally, the regulation itself by individual employers (with the support of occupational hazards prevention experts hired by the company itself) can act as a regulatory framework of reference in the field of occupational safety and health. The Hungarian experience shows that such employer regulation tends to be more advantageous for workers when there is trade union representation at the company or when occupational hazards prevention experts can act independently to defend workers' interests.

In general terms, we can therefore say that the presence of heatwaves in occupational safety and health is still limited despite the progress made in some countries and the increased interest in these issues. It is true that the regulatory frameworks of most of the countries analysed define the maximum and minimum temperatures to which workers may be exposed during their work (sometimes also the maximum exposure time). These regulations also indicate the employer's responsibility to ensure compliance with these temperature thresholds by means of a hazards assessment that considers the effect of heat exposure, and prevention plans if the thresholds are exceeded.

Despite this, in almost every country we have found incomplete regulatory developments: restrictive definitions of "workplace", little specification of protection in the case of outdoor activities, exclusion from the regulatory framework of certain work situations exposed to heat, inadequacy of the regulations in relation to scientific evidence, measurement of the risk of heat stress based solely on air temperature, etc. These shortcomings are not the same in every country and, in some cases, have been or are being partially corrected.

In addition to this problem, however, there is another, perhaps more worrying one: the non-application of the principles of the regulations in force at many companies. This problem is present in every country (especially in small and medium-sized enterprises), with varying degrees of intensity and for different reasons. In many countries, for example, occupational hazards prevention legislation lays down general principles of protection (such as a very general obligation to perform a hazards assessment) which are then not sufficiently developed (either in legislation or in collective bargaining) in terms of the specific measures to be adopted and how they are to be implemented. Very often, the protective measures proposed are voluntary in nature and, moreover, labour inspectorates are not able or willing to verify their implementation. This would be combined with other problems, such as: the lack of information and awareness of the risks of heat exposure in many countries, the reluctance of many employers to adopt preventive measures that often entail a financial cost for the company, and the weakening of trade union presence (particularly visible in some of the countries analysed, such as Greece and Hungary, but also visible as a trend throughout Europe).

Finally, another relevant problem identified in our study is the scarcity of statistics and the lack of consensus on how to measure the risk of exposure to heat stress. In general terms, there are no reliable records of heat stress pathologies and morbidity or data on occupational accidents due to heat exposure. Some agencies responsible for providing labour statistics are beginning to incorporate information on "heatwaves" into their statistical operations; however, there is still a great lack of knowledge about the true impact of heat on workers' health. Without quality information, it would seem obvious that it is difficult to design effective protection policies.

The analyses carried out in the five countries selected also reveal discrepancies in the definition of heat exposure warning systems. These systems are often not harmonised (even within the same country) and may use different methodologies or risk scales, thus undermining the effectiveness of preventive actions. Moreover, while there is a consensus in the scientific community that air temperature is insufficient to measure the risk of heat exposure, heatwave action plans in the workplace are still based primarily on air temperature estimates provided by meteorological agencies. Other fundamental dimensions such as humidity, characteristics of the workplace, the activity performed, or the worker are often ignored in the design and implementation of warning systems. The systems for measuring the risk of heat stress are therefore not in line with the available scientific evidence, even though different types of applications have been developed to facilitate the use of these indicators.

4.4. Climate change, heatwaves and occupational health: visible but not enough progress

Throughout this second section, we have seen the emergence, to a greater or lesser extent, of the issue of climate change and its effects on the political agenda and actions of the five countries analysed. Far from being approached solely from an environmental perspective, climate change policies and actions have also begun to incorporate other dimensions, such as, for example, impact on health. The five countries analysed clearly show the (ambitious, depending on each case) incorporation of a public health perspective in their approach to climate change.

In the study carried out, we were able to observe the implementation of different initiatives and strategies to inform and combat the effects of climate change on the health of populations. Many of these are recent proposals that have yet to be fully implemented, and their impact and effectiveness have yet to be evaluated. In most of them, however, we have observed a weak presence in terms of labour issues. Actions on the impact of climate change on health tend to be directed at the population, with particular attention being paid to certain vulnerable groups. Workers (e.g., those working outdoors) are gradually beginning to be recognised in some of these initiatives as one of the vulnerable groups deserving specific protection. These are positive declarations and acknowledgements, but they do not occur in all countries, nor are they reflected, for the time being, in notable concrete actions.

As far as occupational safety and health policies are concerned, it cannot be said that the presence of heatwaves is very significant either, not even in the countries of southern Europe, which are much more exposed to the effects of heat exposure. We did find that in all the countries analysed, attention is paid to the temperature thresholds within which work should be carried out, and the employer is obliged to take measures to ensure that these thresholds are observed. Our research has also allowed us to observe a greater awareness of the effects of heat exposure on workers' health (including in central and northern European countries), as well as the importance of dealing with heat as an occupational hazard that requires different types of action (information and training, technical and organisational measures, etc.).

Despite the existence of these positive elements, we have also identified a number of shortcomings. First, as we have mentioned, the existence of insufficient, too general or incomplete regulatory frameworks from the point of view of protecting workers from the risks of heat. Second, the lack of reliable and rigorous sources of information measuring the impact of heat on workers' health, as well as the existence of a huge differences in heat risk measurement systems (some poorly adjusted to scientific evidence) used within each country. Finally, the recurrent problem of non-application of existing regulatory frameworks and recommendations on protection against heat exposure. The lack of implementation of existing regulatory frameworks and recommendations on protection against heat exposure may be due to:

- A defective translation of the general principles of protection established by legislation into specific measures applicable in companies.
- The voluntary nature of most of the proposed measures.
- The inability or reluctance of the labour inspectorate (due to lack of resources or interest) to control compliance with current regulations on heat.
- Lack of information and training.
- The resistance of employers to implement measures that may involve economic cost.
- The weakness of trade unions and their loss of their capacity for bargaining and mobilisation, etc.

Collective bargaining and social dialogue can act as useful tools to overcome some of these difficulties, helping to improve workers protection against the risks of heat exposure and climate change. What is the experience of the five countries analysed in this respect? Regarding the protection of workers from heat exposure, has collective bargaining been able to more specifically flesh out the general guidelines contained in the OSH regulations?

Table 6. Presence of heatwaves in the country's social and political agenda [-, +, ++, +++].

	Spain	Italy	Greece	Netherlands	Hungary
Presence of "climate change" in the country's public policies and political agenda	++	++	++	++	++
Approaching the effects of climate change in terms of "public health".	++	++	-	+	+
Presence of "labour and workers" in the policies and actions implemented against the effects of climate change on health	-	-	-	+	-
Presence of the problem of heatwaves and heat exposure in occupational safety and health (OSH) policies	+	+	++	+	+
Relevance attributed by trade unions to heat as an occupational hazard	++	+++	++	++	+
Relevance attributed by companies to heat as an occupational hazard	+	-	+	+	+
Relevance attributed by the labour inspectorate to heat as an occupational hazard	++	NA	+++	+	++

Source: ADAPTHEAT.

Table 7. OSH Regulations and Heat exposure [yes, no].

	Spain	Italy	Greece	Netherlands	Hungary
There are maximum/minimum temperature thresholds set in the regulations.	Yes (interior)	Yes	Yes	No	Yes
Regulations establish the employer's responsibility to ensure compliance with temperature thresholds.	Yes	Yes	Yes	Yes	Yes
Hazards assessments include heat stress as an occupational hazard.	Yes	Yes	Yes	Implicit in the general obligation to perform RA	Yes
The risk of exposure to heat stress is measured solely on the basis of air temperature.	No	No	No	N.A.	No
The regulations exclude important sectors or work situations from protection against heat exposure.	No (since 2023)	No	No	No	Yes
The regulation sets out detailed prevention measures for both indoor and outdoor work.	No	No	Yes	No	Yes
The legislation provides for the possibility of work stoppage in the event of heat exposure.	Yes	Yes	Yes	Not explicit	Yes
Work stoppage due to heat exposure results in a loss of wages for workers	No	No ⁶	Yes	Yes ⁷	Yes
There is a single warning system for the activation of heat exposure protection measures.	No	Yes	Yes	Not for workers	Yes

Source: ADAPT HEAT.

⁶ In the Italian case studies, there is a gap between formal policies and real opportunities for workers to act.

⁷ For temporary workers and “independent” (self-employed) workers

Table 8. Implementation of the OSH regulation on heat exposure [-, +, ++, +++]

	Spain	Italy	Greece	Netherlands	Hungary
Degree of implementation by companies of the OSH regulation on heat exposure	+	- ⁸	+	+	+
Degree of protection against heat exposure provided by the application of OSH regulations	++	++	+	+/- (very general)	+

Source: ADAPTHEAT.

⁸ In the Italian case, there is ambiguity related to the presence of different local agreements and protocols.

5. PRESENCE OF HEAT EXPOSURE IN SOCIAL DIALOGUE AND COLLECTIVE BARGAINING

Workers' participation in the definition of occupational safety and health policies is a formally recognised right in all the countries analysed, although the materialisation and exercise of this right varies greatly from one country to another depending on the participatory tradition of their industrial relations system. Thus, for example, the participation of workers in the design and implementation of OSH policies in the Netherlands (both at national, sectoral and company level) differs greatly from the minimal participation recognised in countries with weaker trade union organisations and government dynamics that are not very conducive to worker participation in the design of public policies (as is the case, for example, in Hungary). The institutional framework and the inertia in which industrial relations (in this case, the processes of social dialogue and collective bargaining) take place are very different in the five countries analysed, as we shall see in this section. Despite this, as we will also try to highlight, there are shared or similar elements in relation to the possible use of collective bargaining as a mechanism for improving worker protection against the impact of heat exposure.

In this section of the report, we will analyse the presence of heat and heat exposure in the different social dialogue instruments in each of the countries analysed. This analysis will provide us with a more general view of the incorporation of these issues in collective bargaining. The approach we take in this section also serves as a context for the analysis of the case studies in the next section of the report (Section 4).

5.1. Spain: Minimal presence of heat exposure in traditional collective bargaining and development of “generic action plans” as an alternative

In **Spain**, although the ultimate responsibility for ensuring occupational safety and health is attributed to the employer, workers have a recognised right to participate in occupational safety and health management.

At national level, workers' representatives participate, together with other actors (employers, public administration), in the National Commission for Occupational Health and Safety (CNNSST), which is an advisory body to the Public Administrations on prevention policies. The CNNSST is responsible for drafting the Spanish Strategy for Occupational Health and Safety (EESST) and has played a significant role in the regulatory development of the Law on Occupational Hazards Prevention in Spain (including the transposition of European directives). At national level, workers' representatives are also represented in the Commission for the Control and Monitoring of Mutual Societies, which is a body responsible for verifying that the Mutual Societies for Occupational Accidents and Diseases (organisations formed by employers' associations to provide health care to workers in the event of occupational accidents and diseases) fulfil their functions while respecting the general objectives of Social Security.

At company level, in addition to the individual rights recognised for workers (information, training, proposals, complaints, etc.), workers' participation in occupational health matters is mainly through Prevention Delegates and Health and Safety Committees.

Workers in companies with more than five employees have the right to elect Prevention Delegates, who must be consulted by the employer on matters related to safety and health. These delegates also have the function of monitoring compliance with occupational hazards prevention regulations, being

able to make visits to workplaces, be present at any assessments or inspections carried out, access information on working conditions, make complaints, draw up proposals, stop work in the event of serious risk, transmit complaints and queries from workers on occupational health matters, etc.

The Health and Safety Committees, for their part, are set up in work centres with 50 or more workers and are made up of the Prevention Delegates and representatives of the company. This is a consultative body to which the company must submit (for evaluation and debate) its action plans on occupational hazards prevention. The Health and Safety Committees can issue opinions but cannot take decisions or adopt binding agreements (unless otherwise stipulated in the collective agreement).

In addition to the participation instruments described above, collective bargaining is obviously another fundamental tool for worker participation in the design of occupational safety and health measures to be implemented (at sectoral or company level). In the field of conventional collective bargaining, however, it does not seem that the issue of heat exposure is present in current collective agreements (despite the growing trade union interest in this issue).

The Spanish team of our research project carried out an analysis of the contents of collective agreements registered in the “Registro de convenios y acuerdos colectivos” (Regcon) database of the Ministry of Labour and Social Economy. In Spain, sectoral collective agreements (which affect the largest number of workers) must be published and registered by the Ministry of Labour. Company labour agreements, which are more numerous (although their impact on the coverage rate of workers is lower), are recommended for publication and registration, but this is not obligatory. This means that a good number of them will not appear in the database consulted. Despite these limitations, the Regcon database is the main source of analysis for collective bargaining in Spain and its data can provide, if not an accurate picture of the situation, then an approximate image of the situation of collective bargaining in the country.

During the research, we analysed the presence of the term “heat” in the collective agreements registered from 1 January 2010 to 2 November 2023. The result was that out of a total of 26,887 collective agreements registered, only 69 (0.3%) contained references to the term “heat”, a minimal presence that does not reflect the high level of concern of trade unions, government authorities and public opinion about the health impact of heatwaves. The measures on heat in these 69 agreements mostly revolved around issues such as: the need to incorporate heat in hazards assessments or specific technical actions to comply with current regulations; proposals to monitor thermal conditions in the workplace (without specifying the subsequent use of such monitoring); consideration of heat as an indicator of hardship and the establishment of wage compensation; definition of heat protection measures for pregnant women, etc. Agreements linked to outdoor activities (generally the most advanced in terms of prevention) usually include organisational measures such as adapting working hours, increasing the frequency and/or duration of breaks, and technical measures such as guaranteeing the supply of sun cream.

Thus, even though in recent years Spain has been one of the European countries to develop the most comprehensive social and political agenda against the effects of climate change, its translation into collective bargaining has been minimal. Neither the country’s heavy exposure to increasingly intense and prolonged heatwaves, nor the media attention given to the death of several workers from heat-

stroke in recent summers have managed, for the time being, to bring the issue of heat exposure to the negotiating tables and to extend negotiations beyond traditional content (wages and working hours).

Despite the very limited presence of heat exposure in Spanish collective bargaining, some initiatives based on social dialogue have nevertheless been identified that may be useful in terms of protecting workers from extreme heatwaves. The most innovative of these initiatives is the implementation in some companies of “Generic Action Plans” against the effects of heat exposure. These plans consist of a set of procedures, agreed between the company and the workers, whose objective is to determine whether the environmental conditions in the workplace increase exposure to heat stress, generating a hazard that would make it necessary to adopt additional measures to protect the safety and health of workers.

Ideally, the implementation of these action plans against the effects of heat exposure would involve: the creation of a working party with representation from the company and workers; the definition of a validated method for estimating the existing level of risk and the person responsible for doing so; the identification of measures to be adopted for each level of risk; the planning of the resources necessary to respond to an emergency situation; the training and information of all staff, as well as the evaluation of the effectiveness of the measures adopted.

In 2023, eleven such company plans were known to exist in Spain, in addition to a sectoral master plan (for the agricultural sector). The aim of this sectoral plan is to establish general lines of action to deal with heatwaves for the sector as a whole: incorporating measures for action in the event of heat exposure into the prevention and assessment plans of each company, monitoring and reporting on the risk of extreme temperatures, adapting the timetables of activities that require greater physical effort, reorganising the most intense tasks outside the hours of maximum heat, etc. This sectoral agreement, reached in one of the sectors most affected by heat exposure (agriculture), has been presented as a possible precedent for the signing of a state-wide collective agreement in the agricultural sector. An agreement which, for the first time, could include content relating to protection against heatwaves and heat exposure.

In general terms, the most common contents of the generic action plan analysed can be seen in the following summary table drawn up by the Spanish ADAPTHEAT project team:

Table 9. Contents of Generic Heat Action Plans.

Are there official provisions for the OSH protection of workers against heat, in legal texts, technical texts or conventions? What are the contents?	Number of plans containing the item	Relative weight (%) of the total (12)
OCCUPATIONAL HEAT STRESS		
Heat stress in legal texts	9	75%
Heat stress in official technical texts	4	33%
Defined according to international standards	2	17%
RISK ASSESSMENT		
Recommended technically validated methodologies	5	42%
Explicit recognition that assessments may worsen with warmer weather conditions	3	25%
Inclusion of threshold or limit values	9	75%
Only for temperatures or other thermal conditions (humidity, temperature, radiation, perspiration).	7	58%
Combined or separate reference values	6	50%
Inclusion of heat strain	5	42%
NEGATIVE IMPACTS AND RESULTS TO BE PREVENTED		
Inclusion of other diseases or just stroke	11	92%
Inclusion of comfort	2	17%
Long-term health impairment	0	0
Inclusion of solar radiation	12	100%
Inclusion of productivity?	4	33%
Exclusion of certain sectors or activities	7	58%
Distinctions according to place of work, activity, etc.	11	92%
Provisions for outdoor and indoor work	4	33%
Special provisions for vulnerable groups: pregnant women, young people, the elderly, etc.	9	75%
Provisions on how to manage the coexistence of related risks (chemical, etc.)	0	0
ACTIONS TO BE TAKEN: IS THERE A SET OF TECHNICAL OR ORGANIZATIONAL SPECIFICATIONS?		
Hierarchy of controls, giving primacy to engineering controls	5	42%
Obligation to designate a person in charge of adapting working conditions and able to react to unforeseen circumstances	6	50%
Mandatory or recommended real-time monitoring of information on heat conditions	2	17%
Preferred methodologies for tracking (such as WGTB, indoor and outdoor, or simplified methods)	5	42%
Hydration programs	12	100%
Reference to mandatory acclimatization processes	8	67%
Organizational measures (work/rest cycles; breaks; adaptation of schedules, etc.)	12	100%
Physiological Heat Stress Monitoring and how	2	17%
First aid	8	67%
Emergency plan and transfer to hospitals	5	42%
Workers exposed to heat stress receive periodic, pre-placement medical examinations	6	50%
Early recognition of heat-related signs and symptoms and how to react	9	75%
Specification of who should be trained, together with duration and frequency	5	42%
Heat provisions apply during a fixed part of daylight-saving time	7	58%
Mandatory to have a preventive plan for heat events, with guidelines or indications for the preparation of such a plan, and special provisions for certain sectors or groups	4	67%
Employer action verification	3	25%
Plans for future revisions of the plan	4	33%
Clothing: appropriate protective measures and/or thermal characteristics	11	92%
Inclusion of co-determination and worker participation in the measures taken	9	75%
Binding for the employer	5	42%

Source: ADAPT HEAT.

This table shows that most of the plans analysed incorporate measures against solar radiation (100%), establish differences depending on the type of activity (92%) and consider other health problems in addition to heat stress (92%). Most of them base their definitions of heat stress on legal texts (75%), include threshold or limit values (75%) and consider vulnerable groups such as pregnant women and elderly people (75%). In contrast, none of the plans refer to the management of related risks, nor to long-term deterioration of health. Only 17% incorporate references to worker comfort regarding temperature, and only one in three addresses productivity.

Among the specific measures or actions proposed by each plan, the most common are hydration and organisational measures (adaptation of working hours, breaks, etc.), which are present in all the examples analysed. The reference to the thermal characteristics of clothing is also very frequent (92%), as well as the early recognition of symptoms (75%). Half of the plans have a person responsible for adapting working conditions in the event of a warning or the presence of heat exposure. Three-quarters of the plans have been co-determined with workers, while the rest have been drawn up by an external prevention service. For 42% of the plans, it was possible to verify that the implementation of the plan is binding (compulsory) for the employer, and that there is a specific validated methodology for carrying out the assessment. Finally, only 33% of the plans are explicitly updated and, in general, information on thermal conditions is not monitored in real time (17%), nor is consideration given to thermal overload or heat strain (17%).

Generic action plans against heat are a potentially useful instrument to improve the protection of workers against the effects of heat exposure, especially in a context such as the one in Spain, where traditional collective bargaining is unable to incorporate these issues. In addition to their limited presence in the Spanish business fabric, the main limitation of these plans comes from the fact that they are voluntary: companies are not obliged to negotiate this type of agreement (although once signed, their contents may be mandatory if so agreed in the plan itself), so their implementation will depend largely on the capacity for mobilisation and pressure of trade union organisations. Ideally, these plans could serve as a prelude to or in advance of collective agreements (company or sectoral) that include the contents previously negotiated in the generic action plans (as is expected to happen, for example, in the future with the master plan agreed in agriculture).

5.2. Greece: a country heavily exposed to heat where collective bargaining and small companies provide insufficient protection of workers from heat exposure

In the case of **Greece**, the National Strategy for Health and Safety 2022-2027 recognises the importance of social dialogue to achieve the objectives set out in the strategy. As in the other countries analysed, the national occupational safety and health system includes bodies for worker participation, such as the Hellenic Institute for Occupational Health and Safety (ELINYAE). ELINYAE is a bipartite organisation (employers and workers) in charge of investigating occupational hazards and the impact of working relations on workers' health, supporting the State in the drafting of OSH regulations, facilitating the exchange of information between social partners, and providing specialised knowledge in occupational safety and health, etc.

In addition to the ELINYAE, there are other spaces for worker participation in OSH policies at both national and company level. The Council for Health and Safety of Workers (SYAE), for example, is the national advisory body on OSH, involving members representing workers, employers, scientific experts, and the state administration. At company level, the main body for worker participation would be, in the case of companies with 20 or more employees, the Occupational Health and Safety Committee (EYAE). In smaller companies, one person could be elected to carry out these functions. Occupational Health and Safety Committees play an important role in carrying out hazard assessment studies in companies and can propose measures to minimise the risks to which workers are exposed. They also have the right to information on the company's accident record, as well as the right to request the elimination of work practices considered dangerous.

Beyond these spaces, collective bargaining is, at least in theory, another fundamental area of worker participation in the definition and implementation of occupational safety and health measures. In a country like Greece, which is also heavily exposed to the effects of heat exposure, is collective bargaining capable of developing effective protection measures for workers? When collective agreements including provisions on heat stress are in force, it can certainly promote safety and health of workers. However, most agreements in Greece do not include such provisions.

An analysis of 24 sectoral collective agreements signed in Greece in 2022 showed that only two of them (8% of the total) included some form of measures against heat stress. The first of these collective agreements is that of the ship repair sector, which incorporates different organisational measures (e.g. ending work after 13:00 pm) depending on the existing environmental temperature (it therefore does not consider other relevant variables such as: relative humidity, air speed, individual protective equipment, etc.). This sector agreement has not been signed by every company, so its content does not apply, nor is it mandatory throughout the sector. The second of the collective agreements with references to heat exposure is the agreement for the delivery sector that is in force locally on the island of Santorini, which prohibits outdoor activities during heatwaves. Previous agreements from several years ago, such as the construction sector agreement, included content referring to heat exposure. However, these references have disappeared in the current agreement, demonstrating the fragility of the little progress made in the country.

In the case of Greece, we can see how, despite the existing high exposure to heat, the regulation and protection against the risks of heat stress are hardly present in collective bargaining. The strong social and economic adjustment process in the country following the 2008 crisis, has led to a considerable weakening of collective bargaining and the bargaining power of trade unions. Bargaining processes

have become considerably fragmented, with the process shifting to the company level and, mainly or exclusively, on wage issues (something we also saw to some extent in the case of Spain). In such a situation of atomised industrial relations and companies, the presence and strength of trade unions (and/or mobilisations by workers) is decisive for companies to adopt worker protection measures, especially when the labour inspectorate, as is the case in Greece, was unable award fines to companies on the issue of heat exposure before the new legislation on the “Cleon” heatwave. Furthermore, most companies in the country do not have occupational physicians, since only companies with more than 50 employees are required to have an occupational physician to advise on heat stress measures.

These difficulties occur even where there are collective agreements which, in theory, contain mandatory protective measures. This is the case, for example, with the collective agreement in the ship repair sector, the implementation of which depends largely on the ability of trade unions to enforce compliance. Something similar has happened with regard to the (compulsory) measures put in place on the occasion of the “Cleon” heatwave. There is a low level of commitment and awareness of the problem of heat exposure, especially in the case of employers, who are very reluctant to introduce protective measures because of the costs involved (maintaining productivity levels and containing labour costs are always at the forefront of the debate).

5.3. Italy: Increasing formal protection with a lack of concrete action: the key role of collective mobilizations and scientific community

In the case of **Italy**, the legal basis of arrangements for worker representation in relation to this system is found in Legislative Decree No. 81/08. While industrial relations institutions and procedures in Italy are characterised by voluntary collective bargaining, this decree creates three types of safety and health representatives (*Rappresentante dei Lavoratori per la Sicurezza*, RLS) at company level (RLS), territorial level (RLST), and multi-employer site level (RLSSP). Procedures for their election or appointment are established in the social partners’ collective agreements. Health and Safety Representatives are in charge of advisory and participatory functions. Legislative Decree No. 81/08 (article 51) also establishes the role of regional joint bodies (*organismi paritetici*). These are created by the most representative national employers’ and workers’ associations.

However, in Italy, several critical issues limit the contribution of the Workers’ Representative for Safety, including inadequate training and skills, poor recognition of their role by the institutions, and the limited number of workers. The protection of workers from heatwaves turned out to depend largely on the decisions and measures taken by regional and local authorities rather than on the prevention system described above. Since 2016, there have been a number of examples of action by these authorities specifically targeting workers (e.g., in the agricultural sector in the Apulia region in southern Italy).

Despite trade union mobilisation and the awareness-raising activities carried out by the scientific community, the presence of heat exposure in collective bargaining is also low in Italy. Despite the increasing attention on the issue of heatwaves, various studies on collective bargaining in Italy have shown that collective agreements still lack a formal integration of this issue⁹. In fact, due to the current socio-economic crisis triggered by the Covid-19 pandemic, collective bargaining continues to focus more

⁹ For example: FDV-Cgil (2022) *Terzo osservatorio sulla contrattazione di secondo livello*, a cura dell'Osservatorio nazionale sulla contrattazione di secondo livello, April 2022 or Adapt (2023) *La contrattazione collettiva in Italia* (2022), IX Rapporto ADAPT, ADAPT University Press.

on “traditional” issues (e.g., salary and welfare) rather than providing for a real advancement of content. The result is the leading role played by regional and local authorities in protecting workers from heatwaves, which risks generating highly fragmented and unequal protection, with protocols and regulations that differ greatly according to territory, sector, etc. Faced with this risk, Italian trade unions have promoted the creation of national consultation roundtables, while activating certain experiences of innovative collective bargaining at territorial and company level.

The content of these negotiations has been diverse. At company level, negotiations have dealt with issues such as the inclusion of heatwaves in hazards assessment, the reorganisation of tasks to avoid the hottest hours, the increase in rest time, the adaptation of Personal Protective Equipment (PPE) to weather conditions, indoor climate control, training of occupational health representatives, etc. Negotiations at national level have tended to focus on the production of information guides and awareness-raising campaigns, strengthening the role of trade unions and social dialogue within the OSH system, the extension of the redundancy fund for employers, and the adaptation of PPE, etc. In the Italian case, several successful experiences have been identified at both territorial (Genoa Protocol) and company level (Just Eat Takeaway.com), where the involvement of the social partners in the design, implementation, and monitoring of systems to protect workers against heatwaves has made it possible to improve worker protection, reducing conflict and encouraging compliance with the measures adopted.

However, social dialogue on OSH still underlies negotiating or conflictual logics rather than collaborative ones, hindering the adoption *ex ante* of planned interventions to avoid the emergence of hazardous conditions for workers. The latter implies joint decision-making and management between employers and workers’ representatives, e.g., through the establishment of bilateral organisations or committees (as during the Covid-19 pandemic); these participative models allow constant dialogue between all OSH actors, more informed discussions, and less conflict on decisions, resulting in a better quality of OSH prevention measures for workers.

Despite this progress, the effectiveness of social dialogue in Italy in protecting workers during heatwaves has been generally limited. Government interventions and regulations on heat exposure are often adopted in a purely reactive manner, in summer periods, when there is high media attention and/or worker mobilisation processes. There is therefore little action to promote a more stable system of prevention against the effects of heatwaves. Governments also tend to adopt measures unilaterally, without consulting or negotiating with social partners. The result would be that heatwaves are very rarely considered in Italian collective bargaining, with the consequent risk of fragmentation of workers’ occupational health.

As in the other Mediterranean countries analysed, in Italy, the sectors and territories that currently enjoy greater protection (agriculture and construction) are those that have previously mobilised and taken collective action (due to their greater risk of exposure to heat, greater awareness of the dangers, and a certain trade union presence, etc.). However, the government has tried to extend some of the preventive measures adopted to other sectors (d.l. No. 98/2023).

5.4. Netherlands: a participatory industrial relations model under pressure that is (tentatively) starting to pay attention to the effects of heatwaves

With a model of industrial relations (called *Polmermodel*), which seeks “self-regulation” through co-determination and social dialogue between the social partners, the **Netherlands** is the country of the five analysed where workers have an undisputed voice in the definition and implementation of OSH policies.

In the Dutch model, the company is the main arena for social dialogue on occupational safety and health, and therefore also on heat stress. The Dutch Working Conditions Act establishes the employer’s obligation to ensure the safety and health of their workers, obliging companies to cooperate with workers’ representatives when designing their OSH policies. The Dutch Works Councils Act provides for a strong formal position for workers at company level (see below).

Trade unions also play a well-recognized role on both the national and the sectoral level. Until the mid-nineties, for example, trade unions sat on the board of the sectoral occupational health services, to which all companies of more than 500 employees have to resort for medical counselling and occupational health advice. This cooperation between trade unions and employers has, however, been transformed in recent decades. The 1994 reform of the Working Conditions Act extended the obligation to have occupational safety and health services to all companies. This reform also meant that the management of these services was transferred to the free market, thus limiting the role trade unions used to play when occupational safety and health services were conceived as joint decision-making bodies between the company and the workers.

This change would also have led to a loss of effectiveness of OSH services. As stated in the report by the Dutch ADAPTHEAT project team, prior to the 1994 reform OSH services were jointly financed by the employers in the sector. The reduction in absenteeism or accident-related costs achieved by OSH measures had a positive impact on the sector as a whole and would entail a stimulus for companies to invest in the prevention and improvement of occupational safety and health awareness in the sector. Under the new system introduced since 1994, OSH services are paid for by the individual employer, who is less interested in investing in improving occupational safety awareness in the sector as a whole, at least in the short term. In addition, the OSH services contracted by companies focus on reducing absenteeism and are seldom called in for prevention policies.

In this new context, workers’ participation in the management of OSH services mostly takes the form of works councils. Work councils, which are mandatory in companies of more than 50 employees, have a recognised right to be consulted and to gather information on occupational safety and health issues. More importantly, works councils have what is called a *right of consent* in OSH matters. This means that they can report any company decision or action on OSH policies that does not have the agreement of the works council to the courts.

Other rights granted to works councils that could have an impact on combating the effects of heat exposure include: (i) the possibility of requiring the employer to implement policies to protect workers against heat stress (“right of initiative”, with the possibility of going to court if the employer does not respond to the requirement); (ii) the possibility of refusing to validate the company’s hazards assessment (if, for example, it has not taken heat stress into account), with the possibility of applying to the courts to overturn the company’s decisions if it has acted without the approval of the works council (in practice, this resort to the court is very rare); or (iii) a right of advice in case of “important decisions”, giving works councils the possibility of influencing, for example, investments in the company’s facilities to ensure that the building offers protection against heat.

The formal recognition of these rights means that works councils remain an effective way for workers to participate in the design of OSH policies despite the gradual decrease in the number of existing works councils and representative bodies since the turn of the century.

Workers representatives also play an important role in OSH management on the sectoral level, notably by means of trade unions. Many collective labour agreements contain paragraphs on occupational safety and health, and around the turn of the century employers and trade unions, stimulated by government subsidies, signed 'OSH covenants' on fighting the most relevant risks in their sectors

At national level, dialogue on OSH issues is also a long-standing tradition. Dialogue is mainly conducted through the Dutch Social Economic Council (a tripartite consultative body that advises the Government and Parliament on social and economic policy and on draft legislation) and the Labour Foundation (a bipartite consultative body responsible for discussing relevant issues in the field of industrial relations, including OSH matters). So far, the Social Economic Council has not provided any information or opinions on the issue of heat exposure, although a website with information on the subject is planned for 2024.

However, the well-established tradition of social dialogue on occupational safety and health also was used as a reason for government to deregulate safety and health legislation around the turn of the century under the name of "tailor-made regulation". Since the mid-1990s, the Dutch government has tried to remove most of the specific and technical regulations from OSH legislation, with a view to shifting the responsibility for negotiating them to the social partners and making their content more flexible. Thus, the Dutch OSH regulation now defines in broad terms the OSH hazards that need to be addressed at company level; however, it fails to prescribe concrete measures on how to do so. These measures are to be defined at company level by the employer, with the participation of employees, as described above. The excessive generality of OSH regulations, however, does not offer much guidance. Social dialogue at company level is therefore an open area for negotiation, with the consequent risk of atomisation of protection at company level and weakening of the trade union position in negotiations. The Dutch team found that legal provisions on heat are also very general in nature, lack solid ground under the negotiations, and deliver rather poor results.

At sectoral level, the two main tools of social dialogue are: collective agreements (which have a wide level of coverage and may contain provisions on occupational health) and the so-called OSH catalogues. In the case of collective agreements, of the approximately 1100 agreements in force in the Netherlands, only 35 (approximately 3%) were found to contain references to the problem of heat exposure—a rather weak presence—in line with what we have seen in the rest of the countries analysed. Furthermore, some of these agreements dealt with process-generated heat rather than climate-induced heat. The number of labour agreements that actually have some sort of threshold for heat exposure ("unworkable weather") is limited to two sectors: agriculture and construction.

The OSH catalogues are a kind of "codes of good practice" drawn up by employers and trade unions at sectoral level, detailing measures to achieve the general objectives of occupational health protection set out in OSH regulations. In 2023, there are some 150 OSH catalogues in force in different sectors, covering approximately half of the country's employed population. Although not legally binding on employers, these catalogues may serve as a reference guide in negotiations between employers and works councils. The content of the OSH catalogues must be validated by the Labour Inspectorate and

is used as a reference by the Labour Inspectorate itself in its enforcement, which aims to encourage companies to try to adapt their OSH protection systems to the content of these catalogues (thus having greater certainty of not being fined in case of inspection).

However, despite the expectations placed by government on the positive impact of OSH catalogues on the protection of workers' health, the analysis carried out calls for a certain degree of caution. First of all, according to data collected by the Dutch ADAPTHEAT project team, two out of three employers have never heard of the existence of such catalogues and only one in five has used any of the measures they contain. Second, many of these catalogues are rather old (dating back to the time when the government subsidized the development of the catalogues) and, since 2019, must be renewed every 6 years, so a high number of them are at risk of disappearing in the near future. Most importantly, as far as the impact of heat exposure is concerned, only 52 of these catalogues (35%) address the issue of heat, some of them addressing process-generated heat only. Thus, the contribution of these catalogues to protection against the effects of heat exposure also appears to be limited in a quantitative sense¹⁰.

Regarding the content and protective measures against heat exposure, the analysis of the content of the OSH catalogues (52), collective agreements (35) and hazards assessment tools (17) with references to the problem of heat has identified certain weaknesses. First, almost none of the collective labour agreements analysed make reference to the need to incorporate heat in hazards assessments. Only a limited number of the labour agreements mention the measurement of temperature, also using the air temperature from a nearby weather station (which does not provide an accurate assessment of the temperature in the workplace). As regards the OSH catalogues, only 28 (implicitly or explicitly) mention the need to assess heat risks. The hazards assessment models reviewed do not usually refer to "heat" as a hazard either, although they do refer to "climate" in somewhat general terms. Overall, the contribution of all social dialogue instruments to the development of clear and easy-to-implement measures in the field of occupational hazards prevention (in this case, hazards assessments including work-related issues) is rather limited.

Furthermore, the collective labour agreements, OSH catalogues and hazards assessment tools analysed rarely set clear, well-founded limits for exposure to heat, and these limits can even differ widely from one case to another. There are collective agreements that include, for example, values above which protective measures would be triggered. However, as 'unworkable heat' (unlike unworkable cold weather conditions) does not provide for wage maintenance thanks to social security support, employers are very hesitant to give workers time off even in the harshest of heatwaves, according to one of the interviewees in the Dutch case.

Agriculture is an exception in this respect as it does, under certain circumstances, consider heat as a possible "unworkable weather condition". In the construction sector, some collective agreements also incorporate references to heat and propose different types of measures depending on the temperatures reached. The problem is that the activation of these measures is only linked to the measurement of air temperature. Furthermore, all eight agreements containing actual stipulations on 'unworkable weather' had different threshold values, based on air temperature only (instead of science-based meth-

¹⁰ A similar analysis could be made of another sectoral instrument that served as a prelude to the OSH catalogues: the OSH covenants. The OSH covenants (in force between 1999 and 2007) also sought to involve the social partners in the development of sector specific OSH measures. The negotiation of the OSH covenants did not result in major agreements, and the agreements reached had a limited impact on the protection of workers' health, partly due to employers' refusal to negotiate clear measures for their implementation.

odologies). Only three agreements contained a provision on ‘tropical schedules’, one of them leaving it totally to the discretion of the employer to consider such a schedule, and two referring to some sort of worker involvement. None of them say anything about the financial compensation for unworkable weather, which implies that there is no resort to wage compensation via the unemployment act.

As for the OSH catalogues, some of them do include provisions on heat, but only three of them actually refer to “threshold values” (requiring work stoppage). It is more common for OSH catalogues to refer to “action values” (leading to measures such as performing less physically demanding tasks or distributing water to workers), with considerable variation between catalogues. With some exceptions, most OSH catalogues use air temperature as the only indicator for measuring heat. Only a small minority (n=7) referred to an established ISO standard such as ISO 7243 (WBGT). Most catalogues fail to give clear guidance on how to interpret the general legal provision in the Dutch Decree on Working Conditions whereby “temperature at the workplace shall not be detrimental to the health of workers”. This lack of precision is at odds with the well-known concept of legal certainty.

Moreover, the great variability of criteria and values which, as we can see, are being applied in social dialogue (OSH catalogues, collective agreements, etc.) are not managing to counteract the risk of fragmentation of the OSH system. The “tailor-made” regulation that has been promoted in the Netherlands for decades could be endangering the principle of equal protection of all workers. The protection measures and criteria resulting from social dialogue processes vary according to the power relations between the social partners, leading to unequal levels of protection among workers, which could be avoided by unambiguous and detailed general legislation applying to all workers.

Finally, regarding the adoption of measures to protect against heat exposure, it was found that collective agreements do not usually include such measures. In the few agreements that do refer to such measures, they are usually limited to the employer providing protective equipment (sunglasses, sun-screen, etc.). Only the agreements in the construction and hairdressing sectors included specific protective measures (although in the case of construction they were repealed in 2023). In turn, the OSH catalogues focus mainly on personal protective measures, giving less importance to other possible preventive actions higher up the hierarchy of control (substitution, technical measures, and organisational measures). Moreover, many of them merely list the issues to be addressed, and rarely specify how to deal with the general provisions of the legislation. Moreover, some of the proposed measures are not supported by scientific evidence. The OSH catalogues appear to be a useful tool to raise awareness among companies and workers about the risks of heat, as well as to provide a list of issues that would need to be addressed. What they do not seem to be achieving is to provide concrete unified action measures to counteract the existing risk of fragmentation.

Table 10. Most common content in OSH Catalogues.

Type of measure	Number of catalogues	%
“Substitution”		
Stop/don't start work	2	4%
Minimise work	1	2%
Technical measures		
Workplace design/climate system	15	29%
Air conditioning	12	23%
Ventilation	16	31%
Organisational measures		
Take weather forecast into account	13	25%
Tropical work schedule	15	29%
Job rotation	12	23%
Extra (drinking) breaks	16	31%
Provide information on heat hazards	12	23%
Medical surveillance	6	12%
First-aid measure	3	6%
Personal protection		
Sun cream	19	37%
Protective clothing	23	44%
Use of hats, caps (with or without neck flaps)	12	23%
Supply drinks or ice cream	26	50%

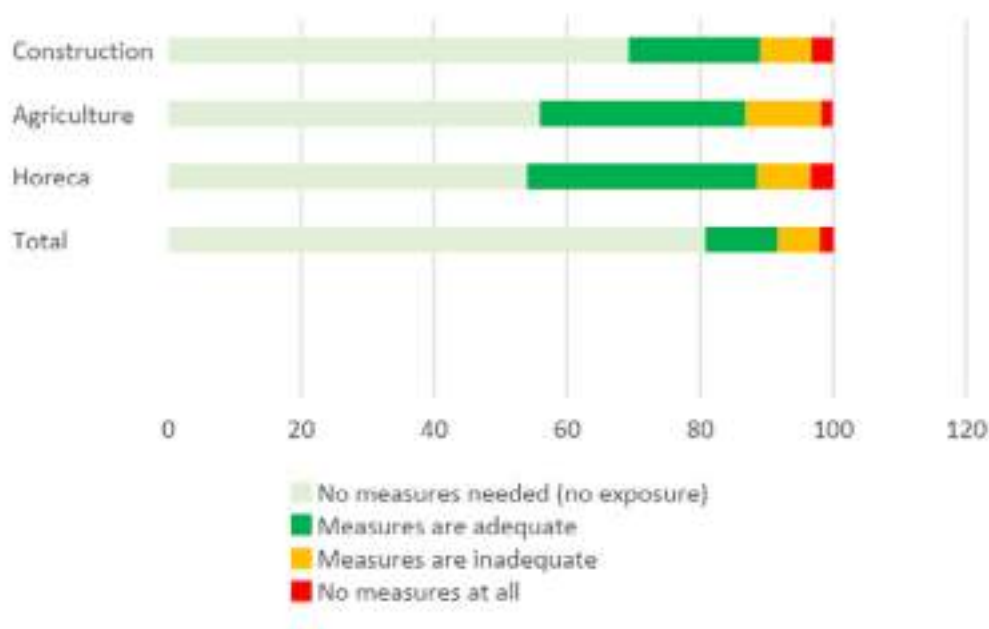
Source: ADAPT HEAT.

In a more general assessment, we can point out that the OSH catalogues are not being used to establish detailed and specific protection measures applicable to the sector. Their use among companies is, moreover, very limited and their impact on protection against heat exposure is doubtful. What the OSH catalogues do establish is an agenda with elements of heat policy that employers and workers will have to negotiate in the workplace. Similarly, despite their limitations, sectoral hazards assessment tools allow for a negotiation agenda to be set around heat impact issues. However, the way in which these hazards assessments are being carried out in practice, many on the basis of online tools comparable to the OiRA-methodology, suggests in many cases a low level of worker participation.

In short, the current government policy in occupational safety and health is incomplete and invites workers' representatives to engage in social dialogue, but regarding extent and quality of social dialogue, it does not *per se* lead to the desired results. Many sectors are not covered by OSH catalogues at all, and the same goes for hazards assessment tools. In sectors where a catalogue has been drawn up, they are used only in a minority of cases. Many of the catalogues and tools are not of high-quality, and are skewed towards PPE rather than a preventive strategy or measures to minimise other heat stress factors that may add to climatological heat (such as physical effort, work pressure, workplace lay-out or use of heat-generating equipment). Collective labour agreements seldom address the issue of heat, and if they do, it is mostly from the perspective of "unworkable weather" and financial compensation ("inconvenience supplements").

Whether the Dutch system leads to adequate protection against climate-related heat at work is a matter that would require more in-depth research. However, a crude proxy would be the question if workers think that their employers take adequate measures against heat. This was one of the specific questions asked in the 2019 edition of the National Working Conditions Survey (NEA). It was found that some 8 per cent of all Dutch workers think that they are inadequately protected against heat at work¹¹.

Figure 9. Adequate measures against heat.



Source: Netherlands Working Conditions Survey 2019.

¹¹ Note that exposure in the Horeca sector (Hotels, Restaurants and Cafés) may be attributed in part to process-generated heat, such as furnaces and ovens in the restaurants.

5.5. Hungary: a poorly participatory industrial relations system with minimal protection against the effects of heat exposure

In the case of **Hungary**, very few references to heat exposure have been identified in collective bargaining. As we have seen previously, existing occupational safety and health legislation does address the issue of temperature in the workplace. The problem identified by the Hungarian ADAPT HEAT project team is that this legislation hardly establishes any mandatory preventive measures, so that companies have hardly any restrictions on their actions. This is compounded by the problem of chronic understaffing of the labour inspectorate, which is unable to effectively monitor the implementation of preventive measures to protect against heat exposure.

This lack of institutional support (in terms of the content of regulations and their implementation) weakens the bargaining power of trade unions, limiting the possibility of incorporating content related to protection against heat exposure in collective bargaining. Sufficiently developed and enforceable regulations and effective monitoring by the labour authority would improve the “willingness” of companies to sit down and negotiate (not only on high-temperature issues) with trade union representatives, which is not always the case today.

The analysis of the Hungarian case has shown that the development of social dialogue, the establishment of agreements and the implementation of preventive measures against the impact of heat depend mostly on the trade union presence in workplaces and the trade union organisations’ capacity for applying pressure. In a country with a highly fragmented company structure and a large presence of self-employed workers (i.e., many companies with little or no union presence), this means that a significant proportion of workers lack adequate protection measures against the risk of heat exposure.

Except in a few specific cases (e.g., in the railway sector or in commerce), most companies only comply with the minimum standards laid down by law in terms of occupational hazards prevention, and it is sometimes even difficult to ensure that these minimum standards are met¹². Workers and employers show little awareness of the risks associated with heat exposure and, in addition, employers are reluctant to implement preventive measures that involve higher economic costs for companies (e.g., air-conditioning of premises, use of air-conditioning, availability of machines for distributing cooled water, compliance with rest periods, etc.). The analysis carried out in Hungary has shown a situation of poor protection of workers’ health against the risk of exposure to heat.

Beyond company level, worker participation in the design and management of OSH policies does not seem to be improving at national level either. The National Committee for Occupational Safety, for example, is a tripartite body with representation from trade unions, employers’ associations, and government. Its main role is to promote social dialogue on occupational safety and health, and it can comment on current draft legislation, prepare reports, and participate in the development of national OSH policy and strategy. The National Committee for Occupational Safety also takes positions and makes recommendations on OSH issues presented by the negotiating teams. It is therefore the main mechanism for social dialogue in OSH at national level, at least formally. The problem lies in the way this body operates, which in practice prevents real participation of the social partners. For example, trade union organisations and experts represented in this body complain about the limited time available (6 days) to make suggestions on proposals for legislative changes. Sometimes, legislative reforms are carried out without even seeking the opinion of this body.

¹² In the case of the railway sector, workers do have more extensive protection measures against heat exposure: workers doing physical work outside have hourly rest periods when temperatures are above 29°C, there are also organisational measures to reorganise the working day to avoid the hottest hours of the day, the railways are usually acclimatised, etc.

5.6. A long journey ahead: low presence of heat exposure in the social dialogue of the countries analysed

The previous sections of this report highlighted the scarce presence of working environment and occupational health in the public policies implemented in the five countries to combat the impact of climate change on the health of populations. As we have seen, climate change has started to be addressed as a public health problem in all countries, but not as an occupational health problem. Some public health agencies are beginning to recognise work as an area requiring specific protection from the effects of climate change, but this recognition has not always been translated into meaningful (proposals for) action.

For their part, occupational safety and health policies have been unable to offer a sufficient response to the challenges that climate change represents for workers' health, even though all the countries analysed have paid attention to temperature regulation in the workplace. As we have seen previously, the actions undertaken in the field of occupational safety and safety and health are running into difficulties that significantly limit their capacity to protect workers from heat exposure. First, the existing regulatory development is often insufficient or excessively generic, which makes it difficult to implement specific (and effective) protection measures. Second, many of the proposed measures for action are not mandatory, but merely recommendations for companies. Finally, the application of OSH regulations on protection against heat exposure is not always guaranteed due to:

- a lack of awareness (of workers, employers, occupational hazards prevention experts) of the risks of heat;
- companies' resistance to applying preventive measures that entail an economic cost for them;
- a lack of resources (or interest) on the part of the labour inspectorate to monitor compliance with current regulations;
- the weakening of the presence and negotiating capacity of trade unions;
- the atomisation of the business fabric and the preponderance of small companies (or, directly, of self-employed workers), etc.

As we have already mentioned, all these circumstances increase the risk of fragmentation and dispersion of OSH systems, endangering the right to health protection for all workers. The size of the company and the sector in which it operates, the existence of previous mobilisation processes on the part of the workers, the strength of the trade union organisations present, the media coverage of occupational accidents linked to heat exposure, the existence of public aid to cover the cost of certain preventive measures, etc. strongly condition the adoption of protective measures by the company. Workers thus face a scenario of great uncertainty regarding the implementation of heat protection measures, as well as the content of these measures, an uncertainty that collective bargaining and social dialogue could potentially help to correct.

As we have seen, all the countries analysed recognise, at least formally, the right of workers to participate in the design, management and implementation of occupational safety and health policies, as well as the positive effects of such participation. Many countries (the Netherlands being a clear example) have made social dialogue and collective bargaining a key instrument for the development and implementation of the basic protective principles of OSH legislation. The transfer to social dialogue of the responsibility for defining, in concrete and operational terms, the content and principles of OSH regulations would, in theory, make the system more flexible, adapting its content to the specific and changing needs of the different sectors and companies. In other countries, such as Italy, where local

authorities are responsible for defining measures to protect the population from heatwaves (including workers), the risk of atomisation of workers' protection has also been addressed through the promotion of (national and sectoral) collective bargaining. Social dialogue and collective bargaining should therefore have served, in the five countries analysed, to develop clear mechanisms for protection against heat exposure to compensate for the lack of definition in both public health actions and OSH regulations. These objectives, however, are far from being achieved.

First, in most of the countries analysed, we have noted complaints from trade union actors about the increasing unilateral intervention in OSH matters by companies and governments. Many important policies and regulatory reforms are implemented without consulting the social partners or without promoting real negotiation processes (processes that are not limited to informing workers' representatives about the measures that are going to be implemented). In this respect, the Dutch case would be somewhat different from the other countries analysed because of the greater degree of participation—and greater bargaining power—of workers' representatives. However, some of the reforms implemented in the Netherlands since the 1990s (elimination of specific content of the OSH regulations, “commoditisation” of the management of companies' OSH services, etc.) have also led to a slight decline in worker participation, as well as to a loss of effectiveness of the OSH system. Nevertheless, the Dutch model still maintains a high degree of worker participation, especially if we compare it with the other countries analysed, where such participation does exist but without clear mechanisms (such as the right of consent of the Dutch works councils) that serve to strengthen the negotiating position of trade union organisations (and in some cases, such as Hungary, with a clear disregard for formally recognised workers' participation rights). It should also be noted that a strong formal position for workers representatives, such as in the Netherlands, might not always be deployed due to lack of time, expertise and other resources on the side of the workers.

Second, the presence of “heat” in the content of collective bargaining is very low in the five countries analysed, including those most exposed to heatwaves and the effects of heat exposure. In Spain, for example, we found that only 0.3% of collective agreements (sectoral and company) registered between 2010 and 2023 contained references to heat (quite superficial most of the time). In Greece, only 8% of sectoral agreements signed in 2022 included measures against heat stress (indeed, sectoral agreements, such as the construction sector, which previously included measures to protect against heat exposure, have seen such content disappear), while in the Netherlands only 3% of collective agreements in force referred to heat exposure. In Italy and Hungary, with a few isolated exceptions, there is also very little mention of heat exposure in traditional collective bargaining, although no precise figures are available for a quantitative estimate.

The contents and measures against heat promoted by traditional collective bargaining, apart from being quite exceptional, have been modest in their scope. In Spain, they have focused on the implementation of technical measures to facilitate the adaptation of facilities to current regulations, on protective measures for pregnant women, on stressing the need to include heat stress in the hazards assessment of workplaces or on recognising additional pay (for “hardship”) for workplaces that are more exposed to heat. Only in sectors where work is mostly performed outdoors have organisational measures been introduced, such as adapting working shifts, suspending work during the hottest hours and extending rest periods. In Greece, the two sectoral agreements with references to the heat problem also provide for the possibility of interrupting work at the hottest times. These measures have also been found in some cases reported in Hungary (the railway sector), as well as in some Italian company agreements (together with other issues, such as the consideration of heat in hazards assessments, the adaptation

of PPE or the extension of rest periods). In the Netherlands, a country with a well-established tradition of collective bargaining, the content on heat exposure is also underdeveloped, partly due to lack of expertise, but also because of the employers' refusal to accept the inclusion of specific measures in agreements that would increase the cost of their production activities. Most of the references to the problem of temperatures in collective labour agreements focus on the issue of "workable weather", with some agreements (agriculture, construction) recognising the possibility of stopping work when there are episodes of high heat. In all the above-mentioned cases in the five countries, heat stress hazard measurements are usually taken solely on the basis of air temperature.

The difficulty of incorporating in collective labour agreements content that goes beyond the usual collective bargaining topics (wages and working time) has led the social partners to explore other instruments in the social dialogue. We have seen this, for example, in Spain through the generic action plans against heat implemented in some companies. In the Netherlands, the government chose not to make "tailor made legislation" something to be included in collective labour agreements, but in the form of OSH catalogues, which are a hybrid form of *public* labour law implementing EU legislation on safety and health.

In both cases, as we have seen in this part of the report, these are initiatives with positive elements, but also with important limitations.

The generic action plans drawn up in Spain have made it possible to establish a series of procedures and actions against heat in companies (most of the time, but not always, in negotiation with workers' representatives). These procedures make it possible to implement precise action measures, defining maximum temperature thresholds (usually measured by air temperature) that would give rise to different types of action. These actions have included both individual measures (hydration, sun protection, clothing) and organisational measures (reorganisation of timetables, suspension of activities, extension of breaks). An action plan has even been identified whose application extends to an entire sector (agriculture), which could serve as a basis for a future sectoral collective agreement that includes, for the first time, specific measures to prevent heat exposure. Despite its positive aspects, the proposal for generic action plans contains limitations. The main limitation lies in their still very limited implementation in Spain, as well as their voluntary nature (companies are not obliged to adopt these plans, nor to negotiate them with trade unions, although until now most of them have been the result of social dialogue) and their being non-binding for the employer (although the plan can propose that compliance with its content is compulsory, which is the case in 42% of the plans analysed).

As we have seen, the Dutch OSH catalogues are a kind of code of good practice negotiated by the social partners at sectoral level and validated by the Labour Inspectorate. These codes of good practice seek to define specific, clear, and coherent protection measures to compensate for the excessive generality of OSH regulations, as well as the risk of atomisation of the system (a consequence of shifting responsibility for determining and negotiating specific OSH measures to the company level). The extension of the OSH catalogues (which would cover approximately half of employed workers) and the fact that the Labour Inspectorate takes them as a reference in its actions might presumably lead many companies to use them even though they are not compulsory.

As we have seen in this third section, the OSH catalogues nevertheless face important limitations as a protection mechanism against the risks of heat exposure. First, the impact of OSH catalogues on companies is lower than expected (a large proportion of Dutch companies are not even aware of their existence) and, moreover, only one-third of these catalogues contain references to the prob-

lem of heat. Second, the content of the OSH catalogues is incomplete, highly variable, and often not specific (which should in theory be exactly what the catalogues would deliver). For example, hardly any of these catalogues give guidance on how to include heat in the hazards assessment of the workplace (and many fail to address hazards assessments at all), the temperature thresholds covered vary from one catalogue to another (if mentioned at all), and the methods for measuring the risk are not always in line with available scientific evidence. Finally, as far as the proposed measures are concerned, there is a greater emphasis on individual protection measures (hydration, sun protection), while organisational measures are much less present (e.g., few recognise the possibility of stopping work in case of heat exposure). Overall, the OSH catalogues may have raised awareness of the health risks of heat and established a negotiation agenda around this issue, but they have failed to define clear, detailed, and coherent protection measures.

Thus, although we were able to find examples of collective bargaining and social dialogue addressing the problem of heat exposure in all the countries analysed, we can conclude that their presence is still very limited and their content rather meagre. Collective bargaining and social dialogue have not concretised or developed the generic principles of protection provided for in the OSH regulations of these countries. In all of them, we have observed a strong refusal on the part of companies to incorporate preventive measures against heat because of the economic cost they entail. Given the minimal interest or resources, as yet, for the issue of heat at work by governments and labour inspectorates, it could be surmised that mobilisation of workers and pressure from trade unions remain key to ensure that companies adopt preventive measures. For example, the Dutch trade unions have taken action to address the issues of heat and specifically, skin cancer, to raise awareness among both employers and government. These risks are now higher on the agenda. There are also good examples in which social dialogue has played a role in fighting heat at work, which will be described in the next chapter.

The tendency to decentralise collective bargaining processes and establish non-binding social dialogue agreements is also present, to a greater or lesser extent, in all the countries analysed, generating strong inequalities in the protection of workers depending on the strength of trade union organisations (which is particularly detrimental to the most vulnerable groups). Countries (such as the Netherlands) with a longstanding tradition of worker participation in industrial relations, which still maintain a strong trade union presence and a right of consent right for works councils on OSH issues, have been able to somewhat reduce (but not prevent) the damaging effects of these atomising dynamics in Europe. Resilience has been much weaker where the trade union fabric has been hit hardest and collective bargaining more decentralised and weakened (as in Greece and Hungary, for example).

Finally, the analysis carried out in this section underlines the importance of having clear and detailed rules and standards of protection that are mandatory for companies. Norms and standards are required whose validity or application does not depend on the correlation of forces between the social partners and their willingness to reach agreements in the social dialogue. However, the experience of the five countries analysed also suggests that the existence of adequate regulations is not a sufficient guarantee of protection if it is not accompanied by the capacity to enforce them effectively. The monitoring and control role of trade union organisations, as well as the action of the labour inspectorate and other bodies are, in this respect, essential to ensure that workers are adequately protected against heatwaves.

6. PROTECTION OF WORKERS FROM THE RISKS OF HEATWAVES: CASE STUDIES

In this section of the report we summarise the different case studies analysed in each of the five countries participating in the ADAPT HEAT project. The explanatory usefulness of the case studies does not lie in their statistical representativeness, but in their ability to illustrate, in greater depth, certain (positive or negative) dynamics identified in our study regarding the protection of workers against the effects of heatwaves.

Each of the national teams selected two case studies (except in the case of Hungary, where there were three) in order to ensure that there were significant cases for the study of worker protection against heat hazards. In general terms, the aim was to select sectors with high exposure to heatwave hazards, mostly –but not exclusively– sectors where work is carried out almost entirely outdoors: construction, agriculture, water management, certain types of logistics activities or ship repair. The impact of heatwaves on workers' health is not, however, limited to outdoor work, and sectors whose activities are mainly carried out indoors have also been analysed: the food industry, logistics, administrative services and educational establishments.

The selection of cases has tried to combine analyses of a more sectoral nature and analyses focused on specific companies. In all cases, beyond the significance of the sector itself (economic weight, number of employees, impact of heatwaves, etc.), the aim was to prioritise cases in which there is some kind of initiative to protect workers from the effects of heatwaves. The aim was not only to analyse the extent of such initiatives or possible obstacles to their implementation, but also the role played by social dialogue and worker participation in the process. Although not all, many of these case studies constitute good practice cases, i.e., examples where problems linked to the protection of workers' health from heat have been effectively solved. On other occasions, the selected cases have also served to highlight the difficulties faced in protecting workers from heat exposure.

In all the analyses, the national teams collected different types of information on each case analysed (size of the sector and/or company analysed, type of impact of heat exposure, OSH regulations in force in the sector, social dialogue and collective bargaining mechanisms in place, etc.). At the same time, in-depth interviews were conducted with different strategic actors in the sector (trade union and company representatives, experts in occupational hazards prevention, OSH policy-makers, etc.). The following table summarises the case studies carried out.

Table 11. Case studies carried out in the course of the ADAPT HEAT project.

	Spain	Italy	Greece	Netherlands	Hungary
Case study 1	Water management company	Agriculture sector	Food sector company	Agriculture sector and company	Agriculture sector and company
Case study 2	Construction sector	Logistics sector	Ship repair sector	Construction sector company	Administrative services company
Case study 3	-	-	-	-	Education sector

Finally, before presenting the summary of the case studies analysed, we would like to underline the uniqueness of each one, as well as their belonging to a particular regulatory, socio-economic or institutional framework (still largely defined at national level). In this sense, although an attempt has been made in every country to follow a common pattern when selecting the cases and carrying out their analysis, the possibility of comparing all these cases together is limited, given the heterogeneity of the corresponding contexts. Nonetheless, at the end of this section we will try to gather common elements that we believe emerge from the different case studies carried out.

6.1. Spain: protection against heat exposure in the water management sector and in the construction sector

In the case of Spain, two case studies have been carried out. The first focused on the analysis of a leading company in integrated water management that has implemented a protocol for the protection of its workers against heat exposure. The second is an analysis of the construction sector in southern Spain (one of the hottest areas of the country), where preventive measures against heatwaves have been in place for years.

6.1.1. Case 1. The water management sector

The first case study selected is that of an integrated water management company, which includes activities in different workplaces, from water quality analysis laboratories to repairing breakdowns in water pipes. Some of these activities (e.g., those related to water treatment plants) have to take place outdoors and are exposed to high humidity, thus increasing the risk of heat stress. Moreover, as they are exposed to other health risks (bacteria, mosquito bites, chemicals, etc.), the activities require the use of personal protective equipment which, if not adapted, can increase the risks of heat exposure. In Spain, there are at least two companies in the sector that have recently (summer 2023) implemented heat exposure action plans. This case study focuses on one of them: Aqualia.

Aqualia is one of the most important companies in the water management and treatment sector in Spain, with different work centres in the country, as well as a presence in other countries in Latin America and the Middle East. Of the different activities carried out by the company, drinking water treatment and wastewater treatment are the most important and they are carried out mainly by a very young or elderly male population, often coming from the construction sector (and often with physical injuries). This type of activity also entails the greatest occupational hazards (contamination by gases, bacteria, animals, etc., all of which are accentuated by heat exposure), forcing the use of PPEs that significantly increase the metabolic heat load. This is joined by the increase in temperature in some parts of the work process.

As far as social dialogue is concerned, there is a sectoral round table at the company where OSH issues are discussed and where representatives of the two main trade union organisations (CCOO and UGT) meet every 3-6 months, together with representatives of the company's human resources and hazard prevention departments (including the medical team). In the specific case of prevention against episodes of extreme heat, it was the company itself that took the initiative to begin the process of drawing up an action protocol, which the trade union representatives asked to be adapted to the tasks of each work centre. The workers' representatives were involved in drawing up the protocol and their proposals were included. The overall agreement reached during the process was subsequently passed on to the employees and the territorial human resources managers so that its general content could be adapted to the needs of the respective work centres.

The attitude of the human resources department throughout the process has been one of dialogue and collaboration. Instructions have been given to the different territorial managers for the implementation of the approved heat prevention measures at each centre. However, the specific negotiation of how to do this takes place at each workplace, which may entail a risk of inconsistent implementation or loss of effectiveness, as not all workplaces are of the same size, nor do they have the same trade union presence. Moreover, the awareness of territorial managers of the problem may vary from one site to another. To avoid the risk of insufficient implementation or, directly, non-implementation of the agreement at some sites, the unions often turn to the Labour Inspectorate if the negotiation mechanisms are not sufficient. The financial cost to the company of a fine awarded by the labour inspectorate is an incentive for human resources management to get involved in the negotiation and effective implementation of these prevention plans.

In the negotiation of the action protocol, it was agreed to update the hazards assessment for each job to explicitly include the assessment of heat stress due to adverse weather conditions. The existing alert level is posted on the notice board in each work centre every day, with each level having a series of associated measures and PPEs that must be available (checklist) so that workers can carry out their work. Workers have to sign a report attesting to compliance with all the safety measures corresponding to that level of alert. If this is not the case, they have the right not to start their working day or to stop the task they are carrying out. In the case of urgent or emergency services, the protocol also contemplates different protection measures against the effects of heat exposure. In any case, the approved protocol is not a closed document, but the aim (at least for the unions) is that it can continue to be updated and adapted to new problems as they arise. One of the shortcomings of the protocol is the absence of a gender perspective, despite the fact that workers' representatives did request the inclusion of specific measures.

Furthermore, as mentioned in section 2 of this report, the approval in Spain of RDL 4/2023 has led to changes in occupational hazards prevention regulations, forcing companies to have adequate protection measures against adverse weather phenomena and to adapt working conditions (including the reduction or modification of the working day) when the State Meteorological Agency issues orange or red alerts and the existing preventive measures do not guarantee the protection of workers. As a result of this new regulation, Aqualia issued an internal technical note (NI 2023_2) establishing general lines of action to be subsequently negotiated at the work centres and translated into specific Preventive Action Plans against the effects of heat.

In said technical note, the company establishes that, in the months with a risk of heat exposure (from May onwards), the temperature and relative humidity forecast should be assessed at the start of the working day. For this purpose, the use of two possible methods of measurement (to be defined by the work centre) is envisaged: the alert systems of the Spanish Meteorological Agency (AEMET) and the Thermal Sensation Index, which is produced by the same organisation, i.e., measurement at the workplace itself is not envisaged. Each method establishes alert levels by colour and associated technical measures (use of hats and social protection, continuous hydration, air conditioning, creation of shaded areas, etc.) and organisational measures (adaptation of working hours and of the most physically demanding tasks, rotation of personnel and limits to exposure time, increased breaks, etc.). The technical note also includes the need to carry out health surveillance that takes into account not only meteorological phenomena, but also the characteristics of the task to be carried out and of the person performing it (recommending, in groups of greater vulnerability, the reorganisation of tasks, increased breaks, emphasis on hydration, etc.). Finally, the technical note establishes the need for all staff to be aware of

the heat hazard, as well as the preventive measures and emergency actions to be applied in the event of heat exposure.

The technical note would thus include most of the points that should be included in the action plans against heat exposure, as could be seen in the plan approved in 2023 at one of the company's work centres in Jaén (one of the hottest provinces in Spain), which included most of the measures and proposals put forward in the technical note.

6.1.2. Case 2. Construction sector

The second case analysed one of the sectors most affected by the risk of heat exposure: the construction sector. Most construction work takes place outdoors or, at the very least, in spaces that are not enclosed and are difficult to acclimatise. It is also physically demanding work, which increases the risk of physiological overload due to overheating. A significant proportion of workers in the sector are men of immigrant origin, a factor that can make occupational health protection more complex due to the greater social vulnerability to which they are exposed.

As a sector traditionally open to heat exposure, in the hottest areas of Spain (such as Andalusia) there have been agreements negotiated with trade unions since the 1990s. These agreements prohibit physical work in the hottest hours during the summer months and establish an intensive or continuous working day (7-8 hours). This organisational solution makes it possible to concentrate working hours in the cooler hours of the day, without prejudice to additional preventive measures such as: increasing the frequency of breaks, providing refreshment and hydration areas or even stopping activity in the presence of weather warnings. However, these measures are only applied in the summer months (generally June, July and August, sometimes only July and August), which is clearly insufficient in a context such as today, in which episodes of heat exposure are occurring earlier and earlier and are not limited to the summer months only.

Trade unions in the sector are generally very active and aware of the risks heat poses for workers' health. Unions such as CCOO, for example, carry out actions every summer consisting of visiting the operational worksites in Andalusia to verify compliance with the intensive workday against heat agreed in the provincial agreements. On sites in breach of regulated working hours, a complaint is filed with the labour inspectorate. In the 2022 summer campaign, 200 complaints were lodged. In 2023, the union also lobbied for the different companies in the sector to negotiate protocols for dealing with heat stress at work, and managed to formalise agreements, albeit limited in number.

In 2023, an action plan against heat stress was signed between the sector's business association (CNC) and the two main trade union organisations (CCOO and UGT). This is a protocol for action against heat exposure with a national scope, indefinite duration and non-binding. The action protocol first establishes a series of generic recommendations: scheduling breaks in shaded areas, adapting working hours to cooler hours whenever possible, sun protection, working in pairs in case of an orange or red alert, reorganisation of physically demanding tasks, provision of fresh water, air-conditioned spaces, adaptation of PPEs, training, etc. The protocol also contains a specific section on outdoor activities and work, which reaffirms the need to plan work according to the shaded areas of the site and the physical effort required. To avoid ambiguity, a detailed definition of what is considered heavy or very heavy work is provided.

With regard to the monitoring of meteorological phenomena, the protocol establishes that heat alerts are based on the AEMET's Meteoalerta system, which establishes three risk levels (yellow, orange and red). Based on these levels, a series of preventive measures are established, which at orange/red level include prohibition of solitary work, prioritisation of work indoors or in the shade, more frequent water supply, adaptation of working conditions (including the reduction or modification of working hours) of tasks carried out outdoors and which involve a risk that cannot be reduced by existing preventive measures, etc.

Likewise, regardless of the level of risk, the plan establishes general measures, such as: the designation of a responsible person on site who must consult daily weather forecasts to plan the daily work and adopt (and report) the appropriate preventive measures to avoid or minimise the risk. The colour of the day's risk level according to information provided by AEMET will be indicated on the site notice board. Workers must be informed of the forecast before the start of the working day. In work requiring the presence of a person outdoors (excessive exposure to solar radiation), rotation with other workers will be considered. Preventive measures will also be taken to try to provide these areas with shade by means of artificial systems, whenever possible. The protocol also contains measures relating to the training of workers in hazard prevention and the detection of symptoms due to excessive heat.

Finally, the protocol details how to adapt working conditions on days when orange or red alert warnings are issued, which is one of the main points of the agreement. Among the measures included, it is proposed, for example, to replace the most exposed tasks with others that do not involve risks due to heat exposure. When replacing tasks is not an option, it is proposed that the working day be reduced or modified by using a continuous working day, bringing forward or delaying the start or end time, interrupting the working day and then resuming it (with a maximum interval of two hours). The worker must be notified at least 72 hours in advance of the adaptation of the working day (the worker may not be penalised if they are unable to attend for conciliation reasons). It is also established that 70% of working hours must be made up on days affected by orange or red alerts issued by the AEMET.

Some of the clauses of this protocol have been included in the new general collective agreement for the construction industry. Unlike the protocol, this agreement is binding. Among the most important preventive measures that have been included in this agreement are the provision of an air-conditioned environment at lunchtime, the provision of fresh water and shaded areas for cooling off, and the prohibition of isolated work in the event of a yellow alert.

The measures contained in the agreement, as well as those included in the above-mentioned protocol for action against heat exposure, have been the result of a lengthy negotiation process. The construction sector has a permanent forum for negotiation and dialogue (known as the Joint Body for Prevention in Construction, OPPC), where representatives of employers and workers meet periodically to discuss various preventive issues, including protection against heat exposure. This body is supported by contributions from employers and workers (part of the collective wage bargaining process) and allows for constant dialogue that facilitates the approval of action protocols such as the one analysed, which, although they could be improved, are also among the most advanced of which we are aware.

6.1.3. Partial conclusions of the Spanish case studies

The Spanish case studies have corroborated the usefulness of protocols (and action plans) as a tool for combating the effects of heatwaves on workers. In the two cases analysed, the employer's willingness to engage in dialogue, the presence of active trade union organisations and the existence of bipartite spaces for social dialogue in OSH (sectoral round table, in the case of the water management company; Joint Body for Prevention in Construction, in the construction sector), have made it possible to approve and implement these protocols (company protocols in the former; sectoral protocols in the latter).

The two cases analysed highlight the advantages of social dialogue in the protection of workers' health. Both protocols, in the formulation of which workers' representatives have also participated, contain, as we have seen, very positive preventive measures against heat. These include the establishment of different alert systems (with associated action measures and PPEs), which are informed daily to workers during the hot months, or the incorporation of heat in the hazards assessment. In the case of construction, among many other positive measures, one could also mention, for example, the introduction in the protocol of instructions on how to carry out the reorganisation and/or substitution of tasks, changes in working hours or the identification of which outdoor tasks need to be reorganised or substituted in case of heat exposure.

The two cases analysed also show how these protocols can serve as a basis for the development or extension of other social dialogue tools, such as, for example, the generic heat action plans analysed earlier in this report, as well as the incorporation of their contents into the collective agreements themselves. The two cases analysed contain examples of both: translation of the principles of the protocol into a heat action plan in the workplace of the water management company in the province of Jaén; and incorporation of some elements of the protocol into the national sectoral agreement in the construction sector.

However, these positive elements cannot hide limitations previously identified in other sections of this report. First, that the protocols and their contents are voluntary in nature (their approval and compliance), which limits their effectiveness. This voluntary nature tends to persist even when their content is incorporated into generic action plans. This is not the case when the contents of these protocols are transferred to collective agreements, which are mandatory in Spain. The problem we have observed in this case is that the contents incorporated into the collective agreement (creation of an air-conditioned area in the canteen, etc.) are positive aspects, but possibly not the most relevant aspects of the protocols. In other words, the incorporation of the contents of the protocols in traditional collective bargaining is currently limited, with most of the contents of the protocols remaining voluntary.

Second, despite the positive elements they contain, the two protocols analysed contain shortcomings, or aspects that could be improved. For example, the alert systems taken as a reference for activation come, in both cases, from the Spanish meteorological agency (AEMET), incorporating references not only to temperature, but also to humidity. However, these alert systems exclude on-site risk measurement. Another possible area for improvement is the obligation to make up 70% of the hours lost due to suspension of work, as established in the protocol for the construction sector. Finally, in the case of the water management company, mention could be made of the risk of inconsistent application of the content of the protocol at the company's different work centres as a consequence of the unequal trade union presence at each one, and the different levels of awareness of those in charge of each centre, etc.

The case studies analysed in Spain have also highlighted other important elements. First, the need to update the period considered as “hot months” or those exposed to heatwaves. In the construction sector, collective agreements restrict “exceptional” measures (intensive working hours, etc.) to the summer months (sometimes only to July and August), although the impact of heatwaves and their effects are increasingly extending beyond these summer months. Finally, the two cases analysed have highlighted the important work carried out by trade union organisations and the labour inspectorate in the prevention of heat hazards.

6.2. Italy: protection against heat exposure in agriculture and logistics

In the Italian case, two sectoral case studies have been analysed that have a significant weight in the country’s economy and are highly exposed to the effects of heatwaves: agriculture and logistics. These are two sectors in which there is a significant presence of SMEs and self-employment, as well as informal work in the case of agriculture. As we shall see, despite the difficulties and constraints identified, both sectors have had positive experiences in protecting workers from the risks of heatwaves.

6.2.1. Case 1. The agricultural sector

The analysis of the agricultural sector in Italy is relevant for at least three reasons. On the one hand, because most of its activities take place outdoors, which increases the risk of exposure to high temperatures. On the other hand, because a significant part of the workers suffers from precarious and temporary employment situations (with a high presence of workers of immigrant origin), which makes the implementation and enforcement of protection measures more complex. Finally, because the sector has seen mobilisations by workers demanding improvements in working conditions and, in fact, has been a pioneer in the approval of local ordinances for protection against heatwaves. In 2016, for example, a local ordinance was passed in Nardò which, on days when weather agencies announced extreme heat situations, prohibited outdoor agricultural activities between 12:30 and 16:00.

The problem with a prevention system based on ordinances issued by local authorities is that it did not guarantee the same protection system for all workers: not all municipalities adopt the same preventive measures and, moreover, most of the agricultural enterprises in the Apulia region are small companies that have no formalised prevention plans in place and are widely dispersed throughout the territory (making it difficult to verify the application of existing regulations). Regional ordinances have been passed to address this problem. For example, in 2022, Ordinance 258/2022 was passed, extending the ban on working in the fields between 12:30 and 16:00 hours to the entire Apulia region. Gradually, a system of regional ordinances has been structured in such a way as to involve various actors in a prevention system based on a diversified network of prevention agents (labour inspectors, local health companies and traffic police, etc.). Among these prevention agents, the creation of the territorial occupational safety and health representatives (Territorial OSH Representatives) stands out. Their mission is to try to extend and ensure the consistency of OSH protection for agricultural workers in a context where many workers have no union representation.

However, this prevention system faces difficulties due to the characteristics of the Italian agricultural sector, which limit its effectiveness, such as the diversity of climatic conditions and crops in each region, the dispersion throughout the territory and the small size of the companies. These problems are compounded by the variety of bargaining levels (national and provincial) and the high variability of bargaining content and results at provincial level. The activation of bargaining at this level was aimed precisely at providing the agricultural sector with more flexible regulatory frameworks adapted to the different circumstances of the country: wages and living costs, the characteristics of each job depending on type of crop, etc.

Negotiations and social dialogue in Apulia (e.g. in the bilateral body set up between the main employers' and trade union associations in the sector) have also considered the specific circumstances of the region. As far as heatwaves are concerned, trade union organisations and political authorities have shown greater awareness of this issue given the presence of higher temperatures than in other regions of the country. However, this greater awareness has not translated into a greater presence of this type of content in provincial and regional employment contracts¹³, with employers being reluctant to accept the contents of the ordinances against high temperatures. Being able to include these ordinances in provincial and regional employment contracts is one of the biggest challenges.

The impact of high temperatures and heatwaves in the Apulia region has often resulted in a restructuring of working hours, with the main part of activities concentrated in the early morning hours (with fewer and fewer cases of resumption of activities in the late afternoon). This measure has been recognised by employers' organisations as a measure that improves workers' productivity and has a positive economic effect on companies. However, the sector still faces critical challenges, such as the use of migrant labour in an irregular situation (a workforce employed 12-14 hours/day for wages of only 2.5 euros/hour) and the lack of awareness of many workers of the health risks of heat stress.

In general terms, the main business organisation in the sector, Confagricoltura, has expressed its satisfaction with the results of the regional ordinances (suspension, during heatwaves, of outdoor work during the hottest hours). These ordinances are perceived as a useful tool to limit the effects of heatwaves on occupational safety and health (as evidenced by the recorded decrease in the number of accidents related to high temperatures). These ordinances also encourage the introduction of other "good practices" related to the prevention of hazards associated with heatwaves by raising awareness among all the social actors involved. These positive elements do not, however, prevent trade union organisations from calling for the formal integration of these contents into provincial and national collective agreements. In order to improve the protection of agricultural workers against the effects of heatwaves, the trade unions also stress the importance of companies' substantive—and not merely formal—application of the indications provided for in the regulations. For the trade union organisations, many of the problems of lack of protection in the sector stem from employers' reluctance to apply the regulations, particularly with regard to the organisation of work, the rescheduling of working time and the presence of irregular work.

¹³ The provincial and regional collective agreements are signed by trade unions and employers' associations to integrate the national collective agreement considering the specific circumstances of the local economies.

6.2.2. Case 2. The logistics sector

This second case study analyses the experience of high-temperature protection in different areas of the Italian logistics sector, a very varied sector combining indoor and outdoor activities. It is also a sector whose activity is very difficult to stop during heatwaves due to the strategic position of logistics in the Italian economy. The analysis of the sector aims to show some of the measures taken to combat the effects of heat on workers' health.

On the one hand, in airports, reference is made to the experience of airports such as Milan Malpensa, where the measures to combat heatwaves have basically consisted of the installation of several water supply points that workers can hardly use due to the intense rhythm of the loading and unloading work they have to do. The company carried out an awareness-raising campaign in 2023 to incorporate heat in the hazards assessment documents, but other central issues (adequate hydration, breaks, air-conditioning of workspaces, clothing adapted to heat, etc.) remain unresolved.

In ports, attention has been focused on the port of Monfalcone, where trade unions and companies have sat down to negotiate a shared protocol for the protection of workers during heatwaves. The main difficulty of the negotiation seems to lie in the definition of a "collapse point", which, to assess when working activities are to stop, takes into account the perceived temperature, the duration of the physical activity and the intensity of the effort made by the worker. The trade unions of the port of Monfalcone have also signed a bilateral protocol with the port companies which includes breaks of 10-15 minutes during heatwaves, as well as the provision of cool water and ice lollies to rebalance body temperature. These are emergency solutions for extreme temperature situations which do not guarantee the same protection as scheduled shutdowns or the reorganisation of activities. Nevertheless, the approval of the protocol has succeeded in reducing the number of accidents related to heat stress, thus meeting with some satisfaction among the social partners. This protocol has, in fact, been taken as an example by the logistics sector trade union for application in other areas (airports, public transport).

In the port of Genoa, another important agreement on the protection of workers from heat hazards ("Guidelines for the prevention and protection from hazards related to microclimate conditions at workplaces in Genoa") was signed in July 2023. The agreement emphasises the employer's obligation to assess all hazards related to the microclimate of the workplace, including heat stress. According to the agreement reached, the hazards assessment must be specific to each company (according to the work carried out), must have a system in which different prevention agents are involved, and must also be accompanied by specific organisational practices to protect safety and health.

In the case of digital platform riders, two rulings from 2022 establish that delivery platforms are obliged to protect riders from heat stress due to high temperatures. The rulings state that platforms must also provide workers with personal protective equipment against high temperatures (e.g. cool water with mineral salts, sun protection, etc.) and carry out a specific hazards assessment on the risks of exposure to heatwaves. As a result of these assessments, platform companies must adopt worker protection and hazards prevention measures, and inform delivery drivers of the specific health risks to which they are exposed during delivery activities.

In the case of the food delivery platform Just Eat Takeaway.com, the existence of a climate of good industrial relations enabled the signing of an agreement between the trade unions of Bologna, Modena, Parma and Rimini and the company during the summer of 2023. The aim of the agreement was to protect the safety and health of motorbike delivery drivers during heatwaves. In addition to the

obligations set out in the two legal rulings of 2022, the agreement provides for two paid breaks of up to 10 minutes during the work shift, the monitoring of workers' health status by the company and the establishment of maximum two-hour shifts during the hottest hours of the day (with the possibility of suspending activities in case of a national red alert for high temperatures).

In the logistics warehouse sector, the main problem is that most buildings are not adequately insulated and need to be refurbished by installing heating and cooling systems that allow for an adequate indoor microclimate. This problem is often exacerbated for companies with fewer financial resources. Collective bargaining related to OSH issues and heatwaves in logistics warehouses emerged as part of a wider action of the trade unions in the logistic sector, where they had identified the presence of occupational accidents related to high temperatures. In 2023, trade unions participated in a political discussion with employers' associations and the Ministry of Labour to formulate and implement a system for the protection of workers' health during extreme weather events. As a result of this dialogue process, a national protocol was adopted, inspired by the best practices taken on board during the Covid-19 emergency.

In Tuscany, for example, the Regional Department of Health and Safety issued a circular providing precise guidelines on how to manage work activities during heatwaves (including the logistics sector). The Italian government has also approved the "Ordinary Redundancy Fund for heatwaves" with Legislative Decree No. 98/ 2023, which allows companies to stop working activities in case of a national alert. The first interventions against the effects of heatwaves in the sector date back to about ten years ago and led to good practices, such as reviewing the number of existing breaks, reorganising tasks according to the intensity of physical effort, distributing water and replacing work clothes with more breathable fabrics.

Meanwhile, in the Novara logistics warehouses, workers suffered health problems in July 2023 due to high temperatures and heat stress. In this case, the company suspended some of its work. The Italian regulation (l. 81/2008) establishes the obligation for the employer to verify that there are adequate microclimatic conditions for the work activity without endangering the health of workers, with the possibility of suspending the activity if these conditions are not met. The problem is that, unlike in construction, the logistics sector has no possibility of accessing the redundancy fund in the event of adverse weather conditions. At present, the social partners have succeeded in getting working hours in some logistics companies to be modified, suspending outdoor activities during the hottest hours and increasing paid breaks for lorry drivers and other drivers.

6.2.3. Partial findings from the Italian case studies

The case studies selected in the case of Italy have made it possible, on the one hand, to show the difficulties encountered in protecting workers' health in certain contexts, such as agriculture, marked by the presence of precarious workers in an irregular situation and by the fragmentation of the productive fabric (made up of small enterprises) and of the regulations themselves (largely based on local authority ordinances). To face these difficulties, the analysis carried out has shown the implementation of valuable initiatives such as, for example, the development of regional ordinances (to avoid excessive fragmentation of local ordinances) and the creation of figures such as workers' representatives for territorial security (to provide representation in OSH matters also to migrant workers in an irregular situation). The analysis of agriculture in the Apulia region has also shown the usefulness of other measures taken to protect workers from heatwaves, such as the reorganisation of working hours (avoiding work in the fields during the hottest hours of the day). These measures have been well appreciated by companies as they increase work productivity, which has facilitated their implementation.

However, despite these positive elements detected in the analysis, it has also been possible to identify the persistence of certain important problems that pose a challenge for protecting workers against heatwaves. On the one hand, the intensive use of migrant workers in an irregular situation persists, a workforce exposed to a situation of high vulnerability and job insecurity that is often excluded from the protection measures provided. On the other hand, the excessive variety of the agricultural sector in the region, as well as the high number of results obtained in the provincial negotiation processes, still maintains a certain risk of fragmentation of the protection mechanisms and their application. Finally, in the agricultural sector, defective application of the regulations by companies has been observed, as well as strong resistance by employers to incorporate in collective agreements the contents and preventive measures contained in local/regional ordinances. To conclude, the agricultural sector in the Apulia region is at a more advanced stage of reflection than other Italian regions in terms of interventions to cope with the impact of heatwaves at work. However, this is still an embryonic experience that needs to find a way of formally transferring the content of the various initiatives launched into collective bargaining.

In the case of logistics, a certain degree of awareness on the part of workers and employers to the risks associated with high temperatures has been noted. Despite this, the analysis carried out seems to corroborate that the sector is still defining how to include preventive measures against heat in its organisational models and collective agreements. There is a high degree of unionisation of workers in the sector, which allows for rapid intervention (stopping work) in the event of heatwave-related problems. However, there are logistics segments (self-employed workers, workers in smaller warehouses without union representation, etc.) that are less protected, resulting in a risk of fragmentation of worker protection in the sector.

Some of the actions carried out in the sector (such as the protocol adopted at the port of Monfalcone or the organisational agreement of Just Eat Take Away.com) have made it possible to reduce the risks of heat stress. However, the problem of high temperatures needs to be addressed in a more structured and comprehensive way in the context of collective bargaining. The sector also needs protocols and procedures that are easy to apply in companies, as well as more precise and detailed information on the risks linked to high temperatures. Finally, it is essential for collective bargaining to encourage shared procedures for monitoring the risk of heat stress using heat indices that go beyond the measurement of air temperature.

6.3. Greece: protection against heat exposure in the food industry and in ship repairs

In the case of Greece, firstly, the case of a century-old company in the food industry has been selected, where there is a strong trade union presence and an explicit policy of protection against heat exposure risks. Secondly, the ship repair sector has been analysed, where a sectoral collective agreement is in force which includes a number of measures related to heat exposure.

6.3.1. Case 1. Food industry

The first case study selected is a company in the food industry with a track record of more than 120 years and approximately 175 employees with open-ended contracts. The sector has a well-established trade union and the company has had a works council elected by the workers for two decades. In 2021, during the Covid-19 pandemic, the works council and workers mobilised to demand measures to protect their health, as well as financial support in said emergency situation. Since then, the mobilisation of the work-

force has continued, with numerous workers' assemblies and strikes, putting pressure on management and reaching a bilateral agreement in 2022 that included occupational safety and health issues.

Following this process of collective mobilisation, the need (and the possibility) to sign a company collective agreement became apparent. This agreement was signed by the sector's trade union and the company's management in 2023 and covers 55 workers in the company, with a special focus on five workers in the open-air wastewater treatment unit. The main measure in the agreement regarding the problem of heat exposure is the establishment of financial compensation for workers in the wastewater treatment unit, who are exposed to the heat for the longest period of time. However, the company was already implementing measures (technical and organisational) to deal with heat exposure that were not included in the agreement. These measures were implemented after bilateral discussions. In general terms, it can be said that the company agreement is being implemented, together with the corresponding occupational safety and health measures. When problems or unforeseen events arise, the works council and union management intervene.

The company meetings are held once or twice a month, where representatives of the company and the workers, involving the occupational safety expert and the occupational physician. At the meetings, employees present their demands regarding occupational safety and health. Through pressure from workers, various preventive measures have been taken, including protection against heat stress and exposure to adverse weather conditions. If any of the agreed measures are not implemented, or if new problems arise, the workers exert pressure through the works council, usually succeeding in getting the company to take action.

As far as the company's heat stress prevention measures are concerned, it is worth mentioning that the hazards assessment was carried out by a prevention service external to the company, including measures related to heat stress (although it is not known whether the heat stress measurements were based only on air temperature or whether other variables were taken into account). The company's main plant is designed to prevent heat stress for workers and organisational measures are also implemented. For example, pipes through which hot material circulates are insulated (limiting their impact on workers), operators in the steam boiler room are inside an air-conditioned cabin and other production areas have been air-conditioned, all of which were implemented thanks to union pressure. During particularly hot weeks, cool water and tea are offered to workers, and in some areas of the plant there are panels indicating temperature and relative humidity. In areas of the factory where there is a high risk of heat exposure (such as the boiler room), the temperature and available oxygen are measured before entering (although the threshold above which work cannot be carried out is not defined) and workers wait for the boiler to cool down before entering.

Outdoor work exposed to heat is basically of two types: loading and unloading of material, and wastewater treatment. When the National Meteorological Service (EMY) announces a heatwave, breaks are taken (according to the company, 15 minutes every 45 minutes of work, although the union maintains some complaints about their correct application) and tasks are rescheduled (for example, trucks with material are received very early in the morning or the process is postponed). There is a shaded area for workers to rest and water fountains are easily accessible. In one case a canopy has been erected for a workstation that was regularly exposed to the sun.

The company employs an occupational physician, who is responsible for providing a fitness for work certificate for every worker. The company also has a one-hour initial training programme on OSH issues, which is provided by an external prevention service and also addresses heat stress issues. There

is also a first-aid group of ten company employees who can intervene in the event of symptoms of heat stress or heatstroke affecting workers. The prevention measures adopted (according to the trade unions, always after a process of mobilisation, including strikes) are generally maintained, and when this does not happen, the works council and the trade union quickly intervene.

The company's managers value positively the experience and the functioning of the preventive measures taken, considering that this is a positive example that could be transferred to the sector as a whole and also to other sectors. The trade unions also value the experience, although they criticise the fact that the only measure on heat exposure included in the bilateral agreement signed by the company is limited to financial compensation for five workers particularly exposed to the effects of heat. They also consider that the preventive measures to be adopted should not be based on productivity criteria, but rather that the aim should be to protect the safety and health of workers. They also denounce the poor implementation of preventive measures whose effectiveness has been scientifically proven. Simple measures, such as taking breaks, are only applied when there are active trade unions present and a constant mobilisation of workers. The shortage of resources for labour inspection in Greece makes it very difficult to verify the correct application of regulations by companies.

6.3.2. Case 2. Ship repair sector

The second of the selected cases looks at the ship repair sector. Companies in this sector do not usually have company agreements, but they do have a sectoral agreement. The collective agreement for the sector was signed in 2022 as a result of worker mobilisations. The sectoral agreement does not cover all companies in the sector (e.g., large shipyards) and the unions complain that many of its contents are not respected even by the companies that have signed it. The trade unions in the sector are pushing for the Ministry of Labour and Social Security to declare this collective agreement compulsory for all companies in the sector and for it to be applied at all workplaces, something that has not happened so far.

The sectoral agreement includes the possibility of stopping work when the temperature exceeds 36, 37 or 38 degrees Celsius; however, the unions denounce that this measure is not usually applied. As noted above, the resources of the labour inspectorate in Greece are very limited. Inspections are carried out on a random basis and many companies, especially small and medium-sized enterprises, may never have been inspected. Indeed, the president of the employers' organisation, SENAVI, believes that control through labour inspection is not the most effective means of preventing heat stress and underlines the difficulties faced by smaller companies. The implementation of the collective agreement, as well as the other measures for the prevention of the risks of heat exposure, therefore, seems to depend largely on the lobbying capacity of the trade union organisations.

The employers' association acknowledges that the implementation of the approved sectoral agreement, especially with regard to wages, was initially difficult due to the country's economic situation. However, it considers that, in the end, it is being applied by most companies, including the OSH content and the obligation to stop work between 1:00 pm and 7:00 pm during heatwaves. The trade unions in the sector consider that the main problem with the implementation of these preventive measures is that companies have to pay workers even if they are not working, a situation they are resisting. The sector's business association believes, however, that most companies, including small ones, comply with these requirements.

For the sector's employers' organisation, occupational health surveillance should be central, including preventive measures against the effects of heat. However, it recognises that workers' training in these hazards is very low in the sector.

6.3.3. Partial conclusions from the Greek case studies

The analysis carried out in Greece has provided more in-depth knowledge of cases of good practice, such as those of the food company in the first case study selected, where a whole series of preventive measures against the risks of heat exposure have been put in place. As we have seen, these measures include the very design of the factory facilities and work spaces (insulation of pipes, air conditioning of work spaces, creation of shaded areas in outdoor workplaces, etc.), as well as other technical and organisational measures. Most of these measures were the result of discussions in the monthly meetings, where the workers, who have a strong presence in the company, are represented. The general assessment is that the agreements reached are being complied with by the company.

Within the generally positive assessment that can be made of this first case study, there are, however, several elements that have nevertheless attracted our attention. First, the prevention measures taken have almost always required a prior mobilisation process on the part of workers (with assemblies, petitions by the works council and even strikes). The mobilisation and constant vigilance of the works council and the sector's trade union have been key to ensuring that the company sits down to negotiate and that these measures (which are more easily implemented when they improve work productivity) are put in place. The works council and the trade union are also key in monitoring compliance with the agreements. Second, we were also struck by the fact that, despite being a case of "good practice" in the Greek context, the collective agreement signed in 2022 did not include any of these preventive measures applied at the company, with the only proposal for action in the face of heat exposure being an economic supplement for 5 workers particularly exposed to heat due to working outdoors. As in the cases analysed above, here too we find significant resistance by companies to incorporate into collective agreements the preventive measures that are being implemented *de facto* in their day-to-day operations.

The limitations and difficulties of traditional collective bargaining in protecting workers from the risks of heatwaves were also corroborated in the second case study. In the ship repair sector, there is a collective agreement which includes positive measures against the impact of heat (such as the possibility of suspending work when temperatures exceed 36°C). In addition to the fact that this collective agreement does not apply to all companies in the sector, the main problem reported by the unions is that even companies that should have applied the agreement did not do so in practice at the beginning. However, almost all companies now apply the organisational measures of the agreement and trade unions continue to force companies to comply with the measures set out in the agreement. The adoption of preventive measures by companies seems to be approached solely from the point of view of improving work productivity and not as an intrinsic right of workers to preserve their safety and health at work.

6.4. The Netherlands: protection from heat exposure in agriculture and construction

In the case of the Netherlands, we first analysed the agricultural sector, one of the sectors most exposed to the harmful effects of heatwaves. This sector has spaces for social dialogue that have managed to promote protocols for protection against heat hazards that are consensual, practical and effective. In the agricultural sector, the case of a greenhouse horticulture company that has put in place an effective, albeit not very formalised, heatwave protection strategy was also analysed. Secondly, one of the largest Dutch companies in the construction sector was analysed. A company with a clear commitment to occupational health and where a protocol for action against the effects of heat exposure has been developed in collaboration with workers' representatives.

6.4.1. Case 1. The agricultural sector

The first case selected is that of agriculture, a strategic sector for the Dutch economy, albeit with a relatively small number of people working in it (around 200,000). The sector has approximately 78,000 companies, most of which are very small (90% have fewer than 5 workers). Agriculture is also one of the sectors most open to the risks of heat exposure and, at the same time, one of the sectors where workers say they are most satisfied with the protection measures taken. In this sector, the analysis focuses particularly on horticultural activities carried out in greenhouses (3,000 companies, 82,000 employees), where the risks of heat exposure are accentuated because of the characteristics of the work to be carried out.

One first relevant aspect to underline is that the sector has a sectoral institute (called Stigas) which is well appreciated and very active in the field of occupational safety and health. The institute supports employers and employees in the agricultural sector in the design and implementation of OSH measures at the companies; it can carry out hazards assessments and medical check-ups on workers. Stigas is managed by a joint board of trustees in which employers and employees are represented (3+3), together with two independent experts. The institute is financed by the sector, and by services that are not free of charge and hence generate fees.

Stigas carries out several activities on the impact of heat in the workplace and is very aware of heat exposure at work and the risks of working in the sun. Both issues are present in most of the OSH catalogues in force in the different sub-sectors of agriculture and, in fact, the labour inspectorate often considers the sector's catalogues as an example of good practice. In contrast to the OSH catalogues of other sectors (usually rather general in nature and lacking in concreteness), the OSH catalogues of the agricultural sector have a pragmatic approach, with precise proposals that can be applied to solve clearly identified problems.

The good functioning of the Stigas institute, and its valuable contribution to the improvement of OSH policies in the sector, may be attributed to the fact that both employers and workers are well represented and play an active role in the institute. This leading role of the social partners means that the institute's work agenda only addresses issues considered fundamental by all parties, which facilitates the search for and implementation of solutions. The recommendations made by experts help to define solutions and are generally well valued and respected by all parties.

Stigas has also been responsible for the drafting of OSH catalogues for thirteen sub-sectors related to agriculture. Most of these catalogues have a section on "working in extreme climatic conditions", where the issue of heat is addressed. The hazards mentioned include exposure to ultraviolet radiation

and reduced alertness in hot weather. In the case of the greenhouse horticulture sector, the OSH catalogue does not refer to the problem of heat, although a website linked to the sector (Glastuinbouw.nl) does provide a protocol (“working in hot weather”) developed with the help of Stigas. However, the protocol focuses on individual and emergency measures in case of heatstroke, but provides little information on preventive measures such as adapting the workplace (e.g., chalk up the greenhouse, allow less sunlight in) or adapting working hours.

Most OSH catalogues for the other agricultural sub-sectors contain simple checklists for working in heat: planning of working hours (not working between 12:00 pm and 3:00 pm)¹⁴, use of appropriate clothing, head protection and proper hydration. These catalogues do not have a clear exposure limit, nor is it clearly explained how to measure actual heat exposure. For guidance purposes, Stigas often refers to the use of the FNV union’s heat stress calculator, which is based on the WBGT index methodology and standards.

In the agricultural sector there are also several collective agreements in force with provisions on heat at work. These agreements define situations above a certain temperature as “unworkable weather”. These collective agreements all maintain different thresholds for temperature or number of days of exposure, which is questionable from the point of view of equal protection of workers. In addition, they all use air temperature as a reference point, which is not state-of-the-art. Finally, four collective agreements also used night temperature as an additional parameter, but it was not clear which areas were to be used to establish the air temperature. Conceivably, this may differ between employees in the same company, depending on where they live.

The definition of the threshold above which it is considered “too hot to work” is, in fact, often one of the most difficult dimensions to agree on. From the analytical work carried out in the sector, it appears that employers fear that if there were a legally defined temperature threshold, employee absenteeism on hot days would increase. Therefore, employers are more in favour of measures such as the reorganisation of tasks or working hours (notably, early start and finish). However, it is worth remembering that the agricultural sector is one of the few sectors where heat is considered as a factor of “unworkable weather” (the reference to cold being more common in the Netherlands, as we saw in section 3 of the report). Still, even if ‘extraordinary climatological circumstances’, as mentioned in the Unworkable Weather Regulation, does not exclude heat (which could therefore, in principle, qualify for financial compensation), funding from the compensation set forth in the Regulation can only be applied for if heat is explicitly mentioned in the collective labour agreement as one of the ‘extraordinary weather conditions’ eligible for the compensation scheme. As this is not included in any of the labour agreements studied for this research, it is safe to say that ‘unworkable heat’, unlike cold, is not eligible for the compensation scheme. For this reason, employers are very reluctant to consider “stop working” as a possible measure to protect workers.

In the analysis carried out on greenhouse horticulture, attention has also been paid to the experience of one important company: Red Star. Founded in 1953 and doing business in several countries, the company specialises in tomato production and is committed to “good working conditions” as one of its hallmarks. The company has a nine-member works council and a prevention team in which two works council members are also involved. Despite being singled out by Stigas as a case of “good practice” in heat protection, the company has not formalised its heat prevention policy, nor has it sought the works council’s approval, nor does it include heat in its hazards assessment. Despite these shortcomings, the works council was

¹⁴ Note that this is good advice for working in the sun, but inadequate for protection against heat, which is not highest between 12.00-15.00 but between 16.00-18.00 (at least in the Netherlands).

satisfied with the situation because, in practice, the company has taken and continues to take preventive measures against the effects of heat, something that has also been validated by Stigas itself.

The analysis carried out at company level showed that it was aware of heat hazards and had thought about how to prevent them by implementing effective specific measures. For example, the screens used to keep light out of the greenhouse at night are also used to keep the sun out during sunny days. Similarly, the top of the greenhouses can be covered with chalk, which reduces direct sunlight. Workers sometimes work shifts at very early hours, and, in cases of extreme heat, work can be stopped (although there is no single standard for determining when it is too hot). The problem, in this case, is that many of the workers are temporary workers of migrant origin seeking to maximise their income: if work is interrupted, the workers do not get paid, so many of them are willing to continue working even if it puts their health at risk¹⁵.

Heat risk protection measures are not formally discussed with the works council, but the interviewees all insisted that there is constant dialogue, and that the employer is open to the concerns of the workers at the company. Protection is also based on “common sense”, without the need for a formalised protocol. Members of the prevention team are responsible for regularly asking employees about their status and needs, which allows for a rapid response to problems. The company is aware that, under circumstances of heat exposure, workers’ productivity may not be the same. In general, the company’s managers claim that informal management and prevention mechanisms are put in place based on common sense and dialogue with workers. However, the company director and the works council pointed out that, in the future, some of the measures implemented should be put down in black and white, if only for the probable event of the Labour Inspectorate knocking on the door.

In short, the agricultural sector is a sector that frequently adopts relative heat protection measures and where most workers are relatively satisfied with these measures.

And even if the emphasis is on personal protective equipment and individual measures, adjustments to working shifts are also frequent, as well as adaptations of buildings/greenhouses. There is hardly any mention in the sector of the need for clear legal regulations; conversely, emphasis is placed on the need for measures that respond to the companies’ requirements. The case of the Red Star company served to highlight that the absence of a formalised heat prevention policy does not necessarily mean that effective measures are not being taken with the informal approval and participation of workers. At this company, co-regulation practices are carried out as more than a formal procedure.

A number of characteristics in the sector at the present time (such as recurrent labour shortages) encourage companies to seek to “be a good employer” and to offer good working conditions (as a way of stabilising and retaining a scarce and therefore highly valued workforce). As this case study has shown, labour shortages and maintaining labour productivity are both factors that can provide incentives for companies to act on heat protection at work.

¹⁵ More generally, occupational health is a matter that may be interfering with labour relations or pay schedules. For example, labour agreements containing ‘inconvenience surcharge’ for working in unhealthy conditions may also entice workers to work longer than would be advisable for their health, and may even be a reason for workers to oppose protective measures.

6.4.2. Case 2. Construction sector

Construction was the second area of analysis selected by the Dutch ADAPT HEAT project team. As in agriculture, construction is a sector where workers suffer from above-average heat exposure. In fact, a good number of workers in this sector identify heat at work as an important risk to their health. In this sector, the case of Heijmans, one of the most important companies in the sector, has been selected because it has a protocol for action against heat.

The construction industry is an important sector with 257,000 companies (mostly SMEs) and 6% of the country's total employment (around 570,000 people, 40% of them self-employed). Of the approximately 1000 companies employing more than 50 workers, only 66% have works councils (below the national average). Despite this, there are permanent spaces in the sector for the cooperation of the different works councils (such as the PCOBB, a network of works councils in the construction and dredging industry), which has a positive impact on the organisation of OSH policies in the sector. In general, the sector has a well-organised system of labour relations.

Construction has historically had a high rate of occupational hazards and also has vast experience in OSH action. In 1985, for example, employers and workers set up the Arbouw Institute to improve working conditions in the sector (Arbouw being a contraction of the Dutch words for OSH and Construction). The Arbouw Institute was dissolved in 2016 and replaced by a new institute, Vlandis. Among other things, this institute manages an atlas of the sector, based on data from occupational health surveys of employees. The institute also supports the creation of OSH catalogues and has prevention advisors who can advise companies on how to improve working conditions. The social partners appreciate the contribution of Vlandis to the effectiveness of the social dialogue.

The issue of heat was addressed by the Arbouw Institute as early as in 2013 with the publication of a handbook on the impact of heat stress on sick leave. The manual paid attention to the nature of physical stress and contained maximum reference values for heat exposure, considering different types of variables that could be involved (temperature, humidity, clothing, metabolic load of the activity, individual factors, etc.). The Dutch team identified the handbook as one of a few examples in which reliable knowledge was put together at state-of-the-art level. The manual also gave recommendations on how to organise work: for example, doing heavy work during the hottest hours of the summer months ($T = 25$ to 30°C) subject to generous breaks (50% of working time). This manual continues to guide the actions of Vlandis' risk prevention specialists today. The Vlandis website has several (rather general) recommendations for working in heat exposure: adjust working hours, avoid intensive heavy work, wet flat roofs to cool down, work in the shade, wear adequate clothing, hydrate sufficiently, take plenty of breaks in cool rooms, avoid the sun between 12 noon and 3 p.m., apply sunscreen, etc.

The construction sector has also developed numerous OSH catalogues. The OSH catalogue Constructions and Infrastructure applies to all employers and workers covered by the collective agreement in the construction sector. This catalogue identifies 74 occupations, of which 20 are considered as subject to heat hazards. The analysis of the 20 OSH catalogues in force in the construction sector shows that the hierarchy-of-control approach is not really followed. In addition, the content is often rather vague: for example, it is not made clear how many additional breaks are necessary, how much drinking is "sufficient", or what is "adequate" clothing. In fact, all 20 OSH catalogues talk about work clothing in the cold and rain, while only one of them clearly refers to clothing in relation to heat. The new sector catalogues evaluated by the Labour Inspectorate have also been pointed out as being too generic in their content (sometimes just repeating elements that are already contained in the law). This clashes

with the assessment of Vollandis and the social partners in the sector, who consider that the Labour Inspectorate demands too much detail and exhaustiveness, something they believe would not be useful in a sector as varied as construction.

As far as collective labour agreements are concerned, as we have already seen, Dutch law does not set temperature thresholds for working in heat, although the social partners can set such thresholds (in the OSH catalogues or in collective agreements). This is actually the case with references to “unworkable weather” in some collective agreements in the sector. The declaration of “unworkable weather” means that the cost of wages for workers who have been unable to work are borne by the UWV (Employee Insurance Agency). The problem, however, is that the labour agreements that provide for this possibility refer only to working in cold conditions and not working in hot conditions. This is why employers resist setting a clear threshold for ‘unworkable *hot* weather’ rather than action levels, as they would then have to pay the wages themselves if work is suspended due to heat.

Another strategy pursued by the unions has been to try to incorporate the heat issue directly into collective agreements, which is in fact the case in some collective agreements in the construction sector. However, the declaration of “unworkable heat” in these agreements requires quite high temperatures (usually above 35°C or even 40°C, albeit true that the figures do not refer to general air temperature, but rather to actual exposure while laying down bitumen roofings). The analysis of the collective agreements has also shown that the way in which these agreements determine the reference temperature is not sufficiently clear, nor is it in line with current scientific evidence. The rules of the collective agreements do not consider factors such as high humidity, heavy physical work or the need to wear protective clothing, even though this approach was already present in the 2013 *Arbouw* manual. Furthermore, the collective agreements in the sector contain hardly any agreements on actual preventive measures. The few measures that are included tend to refer only to the provision of personal protective equipment (sunglasses, cap, work clothes, sun cream, etc.). The ‘construction and infrastructure’ collective agreement of 2021-2022 did include more substantive agreements: protecting the workplace from heat, incorporating additional breaks and/or adjustment of working hours, providing adequate clothing and supply of cooling waistcoats, ensuring the availability of sufficient fresh drinking water, etc. However, this was put on hold pending new research in the sector.

Beyond this analysis of the social dialogue instruments used in the sector, the case of the company Heijmans, one of the largest companies in the sector with around 5000 employees, has also been analysed. The company has a far-reaching commitment to occupational safety and an extensive infrastructure to encourage safe work (which it brings together under the name GO!, meaning *Geen Ongevallen/No Accidents*). In its annual reports, Heijmans provides figures on recorded accidents (including subcontractors). All divisions of the company have certificates showing their active promotion of safe work (certificates that are also required for subcontractors and freelancers working for the company). The company also has a heat protocol (presented to the works council and approved in 2023) that incorporates, to some extent, the content of five previous protocols that were in place in the different divisions of the company some 10-15 years ago. The unions have increased pressure with regard to heat problems and, for example, the use of the FNV union’s heat stress calculator has served to bring more attention to the issue.

The creation of the protocol was the result of a long process that lasted several years. The demand initially came from asphalt workers, who are highly exposed to heat. Radboud University carried out research

on how the workers reacted to heat, and advised the company to improve protection. Initially, a protocol was drawn up for this specific group of workers, and others were subsequently developed for other groups. In 2023, at the request of the works council, the different existing protocols were merged into a single protocol (with the consent of the works council) so that the same standards would apply to all workers, and they would have the same protection regardless of whether they worked for one division of the company or another. The need to unify the various protocols was also shared by the company's safety experts. The current protocol does not only apply during the summer season, but has been extended to any circumstance in which work is carried out in hot conditions regardless of the time of year.

The protocol includes specific measures for jobs where it is always hot (such as asphalt work), but also gives an overview of heat hazards, as well as possible measures to be implemented (in accordance with the occupational health strategy) and a colour chart indicating which measures apply depending on the (air) temperature. The protocol has served to expand on the content of general legislation and the OSH catalogue, both of which were lacking in specific measures. The guiding principle of the protocol is that from 25-30 degrees, additional resources need to be mobilised and these resources and measures should be mandatory from 30-35 degrees. Above this temperature, work is suspended (unless it can be carried out in a cooler environment), which means that excessive heat is recognised as "unworkable weather".

The possibility of suspending work, however, is not common or easy to apply. Firstly, because these are unusual temperatures in the Netherlands. Secondly, because there are sectors (such as infrastructure) with very tight deadlines and financial penalties if the company does not meet these deadlines. Thirdly, because in case of suspension, the UWV only covers the costs of wages for cold, but not for heat. Many subcontractors are paid on piece-rate and are against work being suspended. It is therefore to be expected that there will be situations of heat exposure in which, "by mutual agreement", work will continue, albeit organised differently. The strong presence of subcontracting chains in the sector also complicates the application of this type of measure (even though subcontractors are also obliged to certify that they protect the safety and health of their workers).

The protocol also establishes that the measures to be applied must be adjusted to the particularities of the different work situations. To this end, it establishes that a hazards assessment must be carried out to determine whether the work situation is safe and what measures need to be implemented (including subcontractors). In short, a certain degree of personalisation of actions is suggested. The temperatures in the protocol are not fixed: if the weather forecast is over 35°C, it is possible that certain activities may be exposed to even higher temperatures, while others may be exposed to lower temperatures. It is up to the managers of each workplace to take measures according to the specific circumstances of the site. Accordingly, each working day begins with a meeting with all the workers on the site to assess the weather forecast and what measures to take.

Under these circumstances, it therefore seems inevitable that the agreements contained in the protocol are of a general nature, and detailed measures cannot be drawn up for each situation. The protocol serves to give guidelines, but it is necessary to personalise the actions according to the risk identified. This, however, means that there may be differences depending on the diligence or criteria of the people responsible for each workplace, although workers can also express their complaints and points of view, something that seems to happen with some normality (in case of discrepancy, experts can advise the parties). The GO! approach that is to be applied to the company (including subcontractors) promotes this possibility of dialogue between the parties involved.

The protocol is evaluated each year, and the works council can participate in the discussions and make proposals if it deems it necessary. In general, the works council participates regularly in safety consultations. All works council members regularly (2 or 3 times a year) carry out an on-site safety walk-around. They also draw up a report on said on-site inspection, which is forwarded to the safety department. In case of serious deficiencies, works council members can immediately contact the safety officer. The company seems to have a culture of open and professional participation and the safety department is open to input from the works council. The fact that the works council itself has set up an independent health, safety and environment committee is also an indication of professional involvement. In addition, the works council has a say in the appointment of prevention officers. There is therefore good employee participation in the management of the OSH policies drawn up and applied by the company.

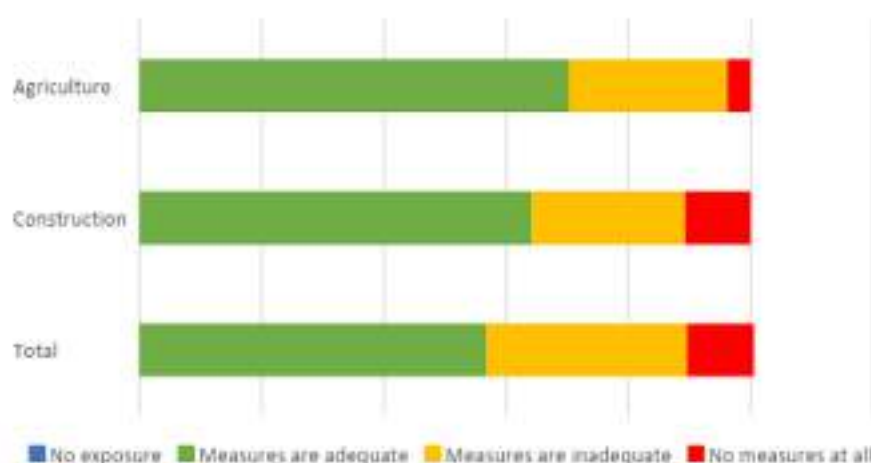
6.4.3. Partial conclusions from the Dutch case studies

As these two case studies have shown, agriculture and construction are two sectors with a relatively high level of exposure to heatwaves. Therefore, workers and companies in the sector show a higher degree of awareness and commitment to the problem of heat exposure on workers' health.

As we have seen in this brief presentation of the two selected case studies, in Dutch agriculture and construction, there have been different social dialogue initiatives on the protection of workers against heat risks. Measures such as, for example, the recognition of heat as a possible cause of "unworkable weather" in the sectoral agreement for agriculture and in some of the construction agreements; the development of protocols for action against heat where different responses (including the possibility of suspending work) are envisaged depending on the temperatures reached, as in the case of the company Heijmans; adaptations of buildings and work facilities to heatwaves; increased breaks and/or reorganisation of tasks during the summer period; provision of PPEs and protection recommendations, etc.

These measures are not always formulated in a coherent manner. They are often non-specific or are not always in line with the available scientific evidence. The proposed measures tend to focus on individual approaches, ignoring other types of action. Sometimes, their application meets with strong resistance (as is the case with the suspension of work for "unworkable weather" due to heat). Despite this, workers in both sectors are reasonably satisfied with the existing heatwave protection mechanisms, a positive assessment that is also generally shared by companies and evidenced in the Netherlands Working Conditions Survey 2019 (see below).

Figure 10. Adequate measures according to workers.



Source: Netherlands Working Conditions Survey 2019.

One of the elements that seems to have contributed significantly to this success is the existence—in both sectors—of consolidated institutions and mechanisms (formal and informal) for social dialogue in which worker participation is guaranteed (bipartite sectoral institutes, formal and informal consultation processes, sectoral roundtables, etc.). These spaces make it possible to establish a consensual agenda among the social partners on the most important OSH problems in the sector, while at the same time offering technical assistance in the search for effective solutions. We have seen this, for example, in the case of agriculture, where the sectoral OSH catalogues are pointed out by the Labour Inspectorate as an example of good practice in the preparation of concrete and applicable measures to solve specific problems identified by the social partners in the sector.

There are other elements that have also attracted our attention from the results obtained in these case studies. First, the difficulties, and complexities of translating the general provisions of the OSH regulations to concrete work situations (with specific heat exposure risks). As we saw in previous sections of this report, the Netherlands opted to remove any reference to specific preventive measures from its OSH legislation. The aim was to make the system more flexible by leaving the definition of general legal provisions (e.g. maximum temperature thresholds in workplaces) and “tailor-made” measures to social dialogue, whether sectoral (collective agreements, OSH catalogues) or at company level.

The two case studies carried out, particularly those of the selected companies, have also shown the complexity and variety of responses when it comes to specifying the contents and measures for protection against heat exposure. In the case of the construction company, we have seen the need to strike a balance between the need for unified protection measures to ensure that all the company’s workers are entitled to the same level of protection and adapting the action protocols to the different activities and professions at the company. At the same time, the need to adapt actions to the circumstances of the workplace and its group of workers leads companies and prevention experts to demand a certain flexibility in the application of these measures (which promotes the inclusion of measures that are not excessively rigid in the protocols implemented). In the case of the company in the agricultural sector, we were also able to observe how the application of effective protection measures is not always carried out through their

formalisation (the action protocol of this company had not even been validated by the works council), but can also function adequately when the company allows, in daily practice, the involvement of workers and their representatives in the design and implementation of these measures (although the company and the works council also recognise the usefulness of formalising this type of protocol for the future).

Another aspect that has attracted our attention in the case studies is the reluctance of companies to establish fixed temperature thresholds above which work is automatically suspended (fear of increased absenteeism on the part of companies), as well as the need to develop (mutualised) mechanisms to facilitate the payment of wages in the event of work stoppage. The problem is that this recognition does not involve the mobilisation of financial resources (sectoral, state, etc.) to help companies meet the costs of these measures. When the worker has a recognised right to continue to receive wages when work is suspended due to heat, it is the individual employer who must bear the cost, while the worker “pays” the consequences (by not receiving any wages) when the suspension of work is not recognised as a right to receive wages. In both cases, this type of measure generates resistance among employers and workers, for various reasons, , making such basic preventive measures less effective (or non-existent).

6.5. Hungary: protection against heat exposure in agriculture, administrative services, and schools

In the case of Hungary, the first sector to be analysed is agriculture, which is one of the sectors most exposed to the negative effects of heatwaves. In this sector, we analysed the prevention policy of a small farm, as well as the difficulties faced by the sector. Secondly, a company providing administrative services was selected. In this case, the aim was to analyse the risks of heatwaves in indoor work, especially in a context, such as the Hungarian one, in which the increase in energy prices has led to significant restrictions in the use of cooling systems. Finally, the analysis of a third case study has been carried out, also focusing on a sector where work is carried out indoors and without air-conditioning mechanisms: education.

6.5.1. Case 1. Agriculture sector

The first case study selected focuses on agriculture. This is a sector of great economic importance in Hungary (where 55% of the country’s land is used for agricultural purposes) and where the risks of heat stress are high since a large part of its activities are carried out outdoors. In 2017, the Ministry of Labour produced a summary with the main OSH recommendations for the agricultural sector, pointing to heatwaves as a factor that must be considered in the hazards assessment.

Protection against the risks of heat exposure in the sector involves, however, certain structural problems. First, it is common in Hungary for one person to be responsible for the farm and, at times when labour is needed, other members of the family join the farm as self-employed workers. This means that every year more than one million people work without being obliged to comply with OSH regulations. Second, the sector concentrates a significant number of workers in an irregular administrative situation, a group that is not adequately protected by existing OSH regulations.

In the agricultural sector, one farm has been selected which employs around 30 people and has demonstrated a good commitment to the safety and health of its workers. An analysis of the hazards assessment carried out in 2020 on this farm showed that the risks faced by three different types of occupations had been analysed: the farm manager, vehicle management (tractor, combine harvester, etc.) and

skilled farmers. In all three cases, temperature was listed as a risk factor, with the difference that the farm worker was exposed to its effects for eight hours a day, while in the other cases the exposure was much lower (one hour a day).

Irrespective of the duration of exposure to heat, all agricultural employers in Hungary are obliged to provide drinks for protection purposes and to observe the rest periods provided by law. The hazards assessment verified that the owner of this farm complied with these obligations and did not require any additional measures. However, when considering the issue of temperature risks to workers' health, the hazards assessment report emphasised protection from the cold, pointing out the need for workers to be provided with appropriate warm clothing. The hazards assessment report did not, however, make any mention of the problem of heatwaves and their impact on workers' health. The hazards assessment report did not make any specific recommendations for the summer period either, such that the employer would simply be subject to the measures set out in the general regulations (use of a hat or helmet against direct sunlight, sun protection cream).

In addition to this farm, the Hungarian ADAPTHEAT team has observed during its fieldwork some of the difficulties experienced by farmers during hot periods. It is a challenge for them that some activities (such as spraying) cannot be carried out at temperatures above 25°C. To avoid these constraints, working times are often rearranged, taking advantage of early mornings or evenings. Sometimes the length of the working day is reduced, and the consumption of cold drinks is increased to combat the risks of heat exposure. These measures are not always easy to implement, since, for example, it is not always possible to organise work in a split schedule (4 hours in the morning and 4 hours in the afternoon). Fresh drinking water is not always easy to obtain on remote farms that are not connected to the drinking water network. Furthermore, much of the machinery and vehicles used are very old-fashioned and lack integrated air-conditioning.

Finally, the fieldwork corroborated the existence of groups of workers who are particularly vulnerable to the effects of heat exposure in the agricultural sector. For example, an analysis was made of the case of an elderly agricultural worker with a chronic illness (high blood pressure) who died because of the effects of heat exposure. The worker was doing physically intensive work (moving 15 kg sacks of onions) from 7:00 am to 5:00 pm, with a temperature of 34°C during a high temperature alert. Despite 10-15 minutes breaks in the shade every 40-60 minutes and the workers having water to hydrate themselves, with little time left before the end of the working day the worker began to feel unwell and died of heatstroke after being taken to hospital. This was an uncontracted worker whose case came to light because of his death. Had he not died, his unprotected situation against the risks of heat would not have come to light. The worker's personal characteristics made it inadvisable for him to perform such tasks on such a hot day. Insufficient awareness and information about the risks of heat, the lack of prevention measures and a hazards assessment by the employer, the limited capacity to verify compliance with regulations, etc. are evident in a case with such tragic consequences.

6.5.2. Case 2. Administrative services

In the second case study, we have chosen to analyse a sector whose activities are mainly carried out indoors, but which has also been exposed to the effects of heat exposure because of the increase in the price of energy over the last year. In a context of rising inflation and energy prices, with the aim of reducing energy consumption, the Hungarian government established that, during the winter season, the maximum temperature of heating systems could not exceed 18°C (thus contradicting the country's OSH regulation, which obliges the employer to maintain a temperature of 20-22°C in workplaces).

With this decree, non-governmental employers were not exempted from complying with existing OSH regulations, but as confirmed by the experts and trade unions consulted, the sharp increase in energy prices would have led many employers to turn off or minimise heating in workplaces (with temperatures in many places not exceeding 15 degrees Celsius). Unsurprisingly, after the winter season, the same type of problem has been reported regarding the use of air conditioning systems, leading to a noticeable increase in workplace temperatures.

Within the scope of the analysis, the case of a company that is dedicated to administrative tasks and has trade union representation has been selected. At the beginning of the summer, before the heatwaves, the company informed employees that they could not use the air conditioning (neither in the workplace nor in their own homes). This measure was not accompanied by others that could have helped to alleviate the effects of the heat, such as those relating to compulsory clothing etiquette. Faced with this situation, the workers' representatives requested the opinion of the company's occupational safety and health expert and drew up a proposal, in accordance with OSH regulations, containing a series of preventive measures for the summer months. Those that were finally implemented are outlined below.

The adoption of effective preventive measures had several difficulties arising from the existence of a wide array of hazard situations: due to the high number of workers present (with different tasks, different medical histories, etc.) and the uneven impact of heat in the building (e.g. with higher temperatures concentrated on the upper floors). First, measures were proposed that tried to reduce the temperature of the building without the help of air conditioning (e.g. airing the premises at dawn and keeping the building closed during the hottest hours). This solution achieved an indoor temperature of 22-23 degrees Celsius but was insufficient during heatwaves (when the upper floors of the building reached temperatures of 31 degrees Celsius or more). In these cases, employees working in rooms with air-conditioning systems could activate the air-conditioning between 10:00 am and 1:00 pm. Employees whose workspace was not air-conditioned could go to a cooled room for customers to cool down for 5-10 minutes.

Another measure taken was the modification of working hours for employees working in the hottest parts of the building. In this case, they could, for example, start their working day at 6:00 am instead of 8:00 am. A 4+4 timetable was also considered, where employees worked 4 hours in the morning in the office and 4 hours in the afternoon at home. People with health problems could also work entirely at home during heatwaves. During the hottest time of the summer, when 75% of the employees are on holiday, it was approved to stop the company's activity for two weeks to reduce the risk of heat stress. Finally, the supply of fresh water was ensured, and a leaflet was prepared to inform workers of the measures taken, as well as the risks and symptoms of heat stress.

6.5.3. Case 3. Educational establishments

In the Hungarian case, a third case study has been selected that focuses on educational facilities. The bulk of the work in this sector is also indoor and, as in the previous case, is also exposed to the aforementioned energy constraints. In most schools there is usually no air-conditioning except, on occasion, in the administrative offices. This means that neither teachers nor students have a cooled space while classes are in progress. There is also no cooled space in which to rest. Workers in the sector do have refrigerators for cooling water, which is easily accessible, but it is more difficult for them to apply preventive flexitime measures because of face-to-face teaching obligations with students. At present, on-line courses are only possible in adult education and higher education, where it is up to the institution to decide whether to provide face-to-face courses.

In the education sector, one secondary school was selected for analysis. The hazards assessment available in this school was carried out based on the job description. This made it possible to analyse the assessments for the posts of head teacher, administrator, teacher, chemistry teacher, maintenance, and cleaning. In all of them, temperature is mentioned as a risk and reference is made to the dangers of temperature fluctuations, but in no case are special measures taken to ensure an adequate temperature. It is true that students are not usually present during the hottest part of the summer, but teachers are often exposed to the heat of these months, even if only for a relatively short period of time, usually in August, before the start of the school year, when they carry out administrative tasks. However, if the number of heatwaves continues to increase because of climate change, they may have to endure heatwaves several times during the school year without air conditioning or other means of cooling themselves. In the case of primary schools, it should also be considered that they often also have a kitchen on the premises, which implies the presence of a work process that itself generates heat.

6.5.4. Partial conclusions from the Hungarian case studies

The analysed case studies would confirm many of the weaknesses of the Hungarian heatwave protection system identified in the previous sections of this report. As we have seen, OSH in Hungary lacks sufficiently developed regulations and mechanisms for real worker participation in their definition and implementation. The capacity of the labour inspectorate to verify the application of the regulations is very limited, and this is compounded by a lack of awareness on the part of companies, administrations, and workers about the risks of heatwaves and exposure to heat.

In the case of agriculture, this background context has been aggravated by the presence of a large group of people on the margins of existing protection mechanisms. First, because many farms are made up of self-employed workers (the owner of the farm and, at peak times, other members of the family unit) who in Hungary are not subject to the (few) obligations established by OSH regulations. Second, as in many other countries, Hungarian agriculture has a high percentage of undocumented workers who, because of their administrative circumstances and the highly precarious employment to which they are exposed, are often excluded from the protection mechanisms provided for. As we have pointed out, these protection mechanisms are not very demanding and their compliance (not always effective) does not guarantee the correct protection of workers' health, as shown by the case of the worker who died from heatstroke on a farm. In this case, the company had complied with many of the measures required of companies during hot hours (rest periods in the shade, hydration of workers, etc.), but this did not prevent the tragic outcome. The lack of a specific hazards assessment taking into account the personal circumstances of the worker and the activity to be carried out, the absence of more ambitious measures in the context of a heatwave alert (suspension of work, reorganisation of working hours, etc.) or more effective control by the labour inspectorate are evident in the case of this irregular worker who died, showing the failures of the Hungarian system for protection against the risks of heat exposure.

The case studies analysed in Hungary also highlight the importance of the presence of trade union representation in workplaces to improve workers' health protection. This has been seen particularly in the case of the administrative services company, where the measures put in place to cope with rising temperatures were the result of proposals made by workers' representatives. This case has also shown the importance of having hazards assessments and prevention measures adapted to the specificities of the different work situations (which are very varied in most contemporary work environments). Finally, it should be stressed that the Hungarian case studies also serve to underline that the risks of heat exposure are not only limited to outdoor or manual work, but constitute a problem that climate change extends, with varying degrees of intensity and risk, to virtually all occupations.

6.6. General comments from the selected case studies in the 5 countries

As mentioned at the beginning of this section, it is not easy to extrapolate the results and findings obtained in the selected case studies. The usefulness of the case studies lies in their ability to make visible, with a greater degree of detail, fundamental characteristics or dynamics of the general context in which they are inserted. Despite the development of political and economic integration processes within and outside Europe over the last half century, the regulation of the working world remains largely national in its logic. The “context” of the case studies is largely defined in a national context (in some cases even with a strong regional component), limiting the possibility of extrapolating the results obtained to other contexts. Despite these methodological limitations, we believe that there are common elements in the selected case studies which, with due caution, can be highlighted. Without prioritising their relevance, the following summarises a number of aspects that have caught our attention in particular.

Firstly, the reluctance of companies to incorporate preventive measures against heat exposure that entail an economic cost. The business side often tends to prioritise only measures that have a positive impact on the company’s economic results (measures that increase work productivity, reduce absenteeism, etc.). From a strictly business perspective, this approach may be understandable, but it clashes with the right of workers to preserve their safety and health at work.

Secondly, the preference of companies for voluntary agreements (protocols, action plans) with social partners, rejecting the incorporation of these contents in collective agreements (which are obligatory). Companies opt for protocols with a certain degree of flexibility in their application (e.g. avoiding the definition of clearly defined temperature thresholds that could lead to an automatic suspension of activities). In this respect, the case studies analysed have corroborated what had already been anticipated in previous sections of this report: the scarce presence of heat exposure in traditional collective bargaining and the incompleteness of the contents incorporated.

Thirdly, the tendency for action plans to prioritise individual preventive measures (hydration, sun cream, adapted PPEs, etc.) over other types of response (e.g. organisational) that are available and often necessary. However, this is a trend that we have observed and not something that occurs in all cases: we have seen, for example, experiences where companies accepted the reorganisation of working hours in hot weather, precisely because this type of measure made it possible to increase or maintain work productivity without having to stop work.

In addition, the enormous difficulty of incorporating (and applying) the suspension of work activity as a protective measure in the event of heat exposure. As we have already pointed out, the definition of precise temperature thresholds above which work would be suspended is one of the measures on which it is most difficult to reach agreements in collective bargaining. In the fieldwork, we did find examples of agreements (collective agreements, protocols, action plans, etc.) that include this type of measure in their proposals for protection against heatwaves, but we cannot say that they are always present. Moreover, we have found that, even when work stoppages are formally recognised, they are rarely implemented.

For different reasons, companies and workers (especially those in more precarious and vulnerable positions) show resistance to the application of this type of measure. Work stoppage entails an economic cost for the company if the legislation obliges workers to continue to receive their wages (in addition to other possible complications such as non-compliance with completion deadlines stipulated in contracts that may lead to financial penalties). When legislation does not guarantee that workers continue

to be paid (or when workers are in an irregular situation), the suspension of activity due to heat exposure means no income or a systematic reduction in income. If there are no mutualised “solidarity” mechanisms that prevent the individual employer or worker from having to bear the financial cost of its implementation, the application of this measure runs the risk of failure (as we have seen in some of the case studies analysed).

We were also able to corroborate another element that we had previously identified: the absence of clear criteria and an agreed methodology for measuring the risk of exposure to heat in each country (and even in each sector). On-site measurements are quite exceptional and most commonly use data from meteorological services based only on air temperature or, at best, also include relative humidity. Many of the approved measures are not up to date or are not in line with existing scientific evidence and their application is, moreover, only planned for the central summer months (when climate change is already clearly anticipating and prolonging the effects of heatwaves to other times of the year).

Furthermore, we have noted a certain tension between the need for a clear, precise and well-developed regulatory framework on heat protection (to guarantee the right to protection of all workers and the commitment of companies) and the need for the measures contained in the protocols and action plans to have a certain margin of flexibility in their application (to adapt them correctly to the different situations and circumstances present in a company or sector). Responding to both needs does not seem simple and, nevertheless, it has proved to be relevant to guarantee the correct application of the preventive measures designed. The risk of ready-made regulation and the “atomisation” of the regulatory and institutional frameworks of reference has already been pointed out in previous sections of this report and also corroborated in the analysis of the case studies.

Another point is the existence of consolidated spaces for social dialogue in which the effective participation of workers is guaranteed has proven to be very effective in implementing consensual protection measures against the risks of heat exposure. The development, through social dialogue, of instruments such as action plans or heat protocols has contributed to improving the protection of workers against heatwaves, despite the aforementioned limitations of such instruments (the main one probably being their voluntary nature). The willingness of employers to engage in social dialogue depends on many constantly changing variables (regulatory and institutional pressure, trade union pressure, labour shortages in the sector, company culture, economic developments, competition in the sector, etc.). Making the protection of workers’ health dependent on how these variables evolve is risky. In this sense, as we have already mentioned, the translation of these contents into collective agreements is an urgent task that does not seem to be easy, given the resistance of employers in this respect.

Finally, trade union presence and mobilisation has been fundamental for the implementation of heat protection measures, including in those countries with a stronger tradition of social dialogue. Although it is not possible to generalise, the fieldwork revealed a high level of non-compliance with regulations by companies. Vigilance and pressure from workers’ representative bodies, as well as from the Labour Inspectorate itself, are essential to ensure that workers are properly protected against the challenges of heat exposure.

FINAL CONCLUSIONS



7. GENERAL CONCLUSIONS AND RECOMMENDATIONS OF THE STUDY

7.1. General conclusions

1. To a greater or lesser extent, the issue of climate change and its effects is present in the political agenda and actions of the five countries analysed. Far from being addressed solely from an environmental perspective, climate change policies and actions have begun to incorporate other dimensions, such as its impact on health. The analysis of the five countries involved in the project shows the incorporation (more or less ambitious depending on the case) of a public health perspective in their approach to climate change.
2. Climate change has started to be addressed as a public health issue in all countries, but much less so as an occupational health issue. Some agencies responsible for public health are beginning to recognise work as an area requiring specific protection from the effects of climate change, but this recognition has not yet materialised into significant proposals for action.
3. For their part, occupational safety and health (OSH) policies have not offered a sufficient response to the challenges that climate change represents for workers' health so far, even though all the countries analysed pay attention to heat regulation in the workplace. Yet, the research showed that there is an increased awareness of the effects of heat exposure on workers' health.
4. Despite the existence of these turns for the better, this study also identified a number of difficulties:
 - a. The existence of insufficient or incomplete regulatory frameworks in terms of protecting workers from the risks of heat.
 - b. The lack of reliable and rigorous sources of information that map the impact of heat on workers' health.
 - c. The existence of a wide disparity of heat risk measurement systems in use (some poorly aligned with scientific evidence). Many of these measurement systems are still based mainly on air temperature, and on-site measurements are rare.
 - d. Many of the prevention measures adopted are only intended for the summer months, even though heatwaves are spreading more and more to other periods of the year. In addition, heat exposure can occur in some industries and jobs even during the colder months of the year.
 - e. The application of OSH regulations on protection against heat exposure is not always guaranteed due to:
 - a lack of awareness (of workers, employers, occupational hazards prevention experts) of the risks of heat;
 - companies' resistance to applying preventive measures that entail an economic cost for them;
 - lack of resources (or interest or priority) on the part of the labour inspectorate to monitor compliance with current regulations;
 - the weakening of the presence and negotiating capacity of trade unions;
 - the atomisation of the business fabric and the preponderance of small companies (or, directly, of self-employed work), etc.

5. There is a risk of fragmentation and dispersion of OSH systems, endangering the right to health protection for all workers. The size of the company and the sector in which it operates, the existence of previous mobilisation processes on the part of workers, the strength of the trade union organisations involved, the media coverage of occupational accidents linked to heat exposure, the existence of public aid to cover the cost of certain preventive measures, etc. strongly condition the adoption of protective measures by the company. Workers are thus faced with a scenario of great uncertainty as to whether or not employers may or may not implement heat protection measures, as well as the content of these measures, an uncertainty that collective bargaining and social dialogue could potentially help to correct.
6. The right of workers to participate in the design, management and implementation of OSH policies, and the positive effects of such participation, is at least formally recognised in all the countries surveyed. Transferring the responsibility for defining, in concrete and operational terms, the content and principles of OSH regulations to social dialogue would, in theory, make the system more flexible, adapting its content to the specific and changing needs of different sectors and companies ("tailor-made regulation"). Social dialogue and collective bargaining should therefore serve to develop clear mechanisms for protection against heat exposure to compensate for the lack of definition in both public health actions and OSH regulations. These objectives, however, are far from being achieved.



7. In all the countries analysed, we have noted complaints from trade union players and other workers' representatives regarding unilateral intervention in OSH matters by companies and governments. Many important policies and regulatory reforms are implemented without consulting the social partners or without promoting genuine negotiation processes. Companies have also shown a clear preference for voluntary agreements with the social partners, rejecting the incorporation of such content in collective agreements.
8. The application of basic measures such as the suspension of work during high heat exposure is rare. For different reasons, companies and workers (especially those in more precarious and vulnerable positions) are often opposed to their application. On many occasions, companies are reluctant to adopt preventive measures against heat exposure that entail an economic cost, prioritising those that have a positive impact on the company's economic results (measures that make it possible to continue work in times of heat, increase work productivity, reduce absenteeism, etc.). Stoppage of work entails an economic cost for the company if the legislation obliges it to maintain wages (in addition to the risk of financial penalties for failure to meet deadlines). From the workers' perspective, when legislation does not guarantee that they will continue to receive their wages (or when we are dealing with workers in an irregular situation), suspending work means that their income is stopped (notably the case with workers hired via a temping agency or (bogus) self-employed workers). In the absence of mutualised "solidarity" mechanisms that prevent the individual employer or worker from bearing the financial cost of their implementation, such as compensation by social security mechanisms or other means to compensate employers, the implementation of this type of measure may be hampered.
9. The contents and measures against heat promoted by traditional collective bargaining, apart from being quite exceptional, have been modest in their scope. In this sense, companies opt for protocols with a certain degree of flexibility in their application (avoiding, for example, the definition of clearly defined heat thresholds that could lead to an automatic suspension of activities).

10. The difficulty of collective agreements including content that goes beyond the usual collective bargaining topics (wages and working time) has led the social partners to explore other instruments within social dialogue, such as: generic heat action plans, heat protocols, etc. These initiatives have had positive effects, but also have important limitations.
- a. The generic heat action plans in Spain have made it possible to establish a series of procedures and actions against heat in companies (mostly) on the basis of negotiations with workers' representatives. These procedures have made it possible to put in place more precise action measures, defining maximum temperature thresholds that give rise to different types of action. These actions have included both individual and organisational measures. Some of these plans have a sectoral application and could serve as a basis for the development of collective agreements with content related to heatwaves. However, the main limitation of these plans lies in their weak implementation, as well as their voluntary nature.
 - b. The Dutch OSH catalogues are a kind of code of good practice negotiated by the social partners at sectoral level and validated by the Labour Inspectorate. These codes of good practice seek to define specific, clear and coherent protection measures to compensate for the excessive generality of OSH regulations and the risk of fragmentation of workers' safety and health protection systems. But like the generic action plans, the OSH catalogues also face significant limitations. First, their impact on companies is lower than expected or hoped for. Second, their content is of varying quality and often incomplete or not very concrete. Finally, as far as the measures proposed are concerned, emphasis is placed mostly on individual protection measures, with much less focus on organisational or technical preventive measures. The OSH catalogues may serve to raise awareness of heat risks and to establish a negotiation agenda around this issue, but they seldom serve to define clear, coherent and detailed preventive or protection measures in practice.
11. The tendency to decentralise collective bargaining processes and establish non-binding social dialogue agreements is also present, to a greater or lesser extent, in all the countries analysed. This leads to significant inequalities in the protection of workers depending on the strength of trade union organisations (which is particularly detrimental to the most vulnerable groups). Countries with a long tradition of worker participation in industrial relations, which still have a strong trade union presence, appear to have been able to reduce (but not prevent) the detrimental effects of these atomising dynamics in Europe. Resilience has been much lower where the trade union fabric has been hardest hit and collective bargaining more decentralised and weakened.

12. In all the countries analysed, we were able to find examples of collective bargaining and social dialogue addressing the problem of heat exposure. However, we can conclude that their presence is still very limited and their content rather incomplete. Overall, collective bargaining and social dialogue have not been able to concretise and develop the generic principles of protection provided for in OSH regulations, although we have identified positive experiences where social dialogue has proven to be a useful instrument for the implementation of consensual mechanisms for protection against heat exposure.
13. Finally, the analysis carried out has confirmed the importance of having clear and detailed protection norms and legal standards that are mandatory for companies. Norms and standards whose validity or application does not depend on the correlation of forces between the social partners and their willingness to reach agreements in the social dialogue. Also, centralizing legal protection standards would likely lead to less transaction costs and add to the notion of equal legal protection. Clear-cut legal standards, particularly a science-based occupational exposure limit, would also be useful from the perspective of legal certainty. However, the experience of the five countries analysed also suggests that the existence of adequate regulations is not a sufficient guarantee of protection if there is no possibility of ensuring that said regulations are effectively applied by companies (which is not always the case). The monitoring and control role of trade union organisations, as well as the action of the labour inspectorate and other bodies are, in this respect, essential to ensure that workers are properly protected against heatwaves.



7.2. Recommendations

1. Recognise workers as a specific risk group within national strategies and action plans against the health effects of climate change, designing measures specifically adapted to their particular needs and circumstances (e.g. that prevention at source usually involves changes in work organization and that this does not depend on them).
2. Strengthen the production of evidence-based scientific knowledge on the impact of high temperatures on workers' safety and health. Establish robust monitoring systems that provide reliable and up-to-date statistics to assess the effectiveness of the measures adopted, as well as to adequately monitor the groups and situations at greatest risk.
3. Establish unified national or regional heat risk warning systems that are specific (as localised as possible), reliable and developed in accordance with existing scientific evidence on heat physiology and thus not limited, for example, to measuring air temperature but rather also including humidity and activity (as a proxy for level of physical effort).
4. Develop a specific European Directive on work and heat, that complements the 89/391/EEC and the 89/654/EEC Directives, in which rules and standards are precisely established and enforceable for all Member States, starting with the definition of an Occupational Exposure Limit that is clear and consistent with the available scientific evidence and methodologies for measuring the risk of occupational heat exposure, such as the WBGT (ISO 7243) (Ioannou et al., 2022).
5. Include the mandatory establishment of heat action plans and protocols negotiated with workers' representatives in the new "Occupational Heat Directive". These plans should provide for the automatic application of various protective and preventive measures (of an individual, technical and organisational nature, including the possibility of work stoppage) (see Annex I of the report) depending on the severity of the situation and the alert level reached. These measures should be defined at least at sectoral level and then adapted to the specific nature of the workstations, the nature of the activity to be carried out and the personal and health characteristics of the worker.
6. Work stoppage due to the risk of exposure to heat should not, under any circumstances, entail any financial loss for the worker (regardless of their employment status: temporary, permanent, self-employed, etc.), nor any other type of penalty (such as the obligation to make up the hours not worked for this reason). In order to facilitate the application of this type of measure, it would be advisable to establish mutualised systems that prevent the individual employer from having to bear the full economic cost of the work stoppage, especially in small companies.

7. Enforce the measures taken against the risk of exposure to heat throughout the year and not only in the summer months.
8. Strengthen the resources (human, financial, sanctioning, etc.) available to the labour inspectorate, and incorporate protection against the risk of exposure to high temperatures and heat among their priorities.
9. Strengthen the participation of workers (at European, national, sectoral and company level) in the definition and implementation of policies on prevention and protection against heat and high temperatures. It is imperative to strengthen spaces and mechanisms for social dialogue in OSH. The participation of workers and their representatives in the definition of prevention plans and measures, including those against heat, is not only a legal imperative (Framework Directive 89/391), but has also proven to be the most effective way of guaranteeing the health and well-being of workers (Popma, 2009) (Walters & Wadsworth, 2020), and thus advocated by ILO (2022) and EU-OSHA (2018).
10. Put in place institutional mechanisms to ensure that smaller companies/workplaces and those with more difficulties to negotiate and implement effective heat preventive measures comply with regulations: detailed collective agreements, letters, inspections, collaborative innovative actions such as workplace bipartite visits, etc. Continuous collaboration between social agents remains useful to enforce the application of the agreed negotiated measures.
11. Develop campaigns to raise awareness on the risks of excessive heat among workers, companies and other relevant actors in the working world (trade unions, employers' associations, labour inspectorates, occupational medicine, experts in occupational hazards prevention, etc.). These campaigns must be designed (and evaluated afterwards) according to scientific evidence to make them as effective as possible. Similarly, provide up-to-date training on heat-related risks prevention among workers and employers, including identification of heat-related symptoms and emergencies results imperative.
12. Strengthen collaboration with the scientific community involved in research on heat and OSH in all its domains (social, organizational, industrial, engineering, physiological, biomedical, etc.) and prevention stages.

ANNEXES



ANNEX I

PREVENTIVE AND PROTECTIVE MEASURES AGAINST HEAT STRESS THAT COULD BE INCORPORATED IN THE NEW “OCCUPATIONAL HEAT DIRECTIVE”.

1. GENERAL MEASURES

- Each company should draft a heat action plan, not only for periods of extreme heat but also for periods other than heatwaves. The action plan should be updated on the basis of practical experience or in case of new scientific knowledge.
- Draft an occupational exposure limit (OEL) on the basis of a technically validated methodology, if not already in national legislation.
- Establish the level of heat exposure on the basis of a technically validated methodology.
- Make workers aware of the risks of working in heat, and notably train them to recognize early warnings of health problems.

2. PREVENTIVE MEASURES FOLLOWING THE HIERARCHY OF CONTROL (STOP-approach)

Substitution

- Stop/don't start work when, after having implemented the corresponding protection measures, heat exposure is still above the OEL.
- Minimise work during periods of (extreme) heat.
- Arrange financial compensation schemes for employers in case of 'unworkable' heat

Technical measures

- Climate resilient workplace design¹⁶.
- Air conditioning/climate system.
- Ventilation.
- Workplace adaptability (use of shading etc), also for outdoor work environments.

¹⁶ Also note Annex to Directive 89/654/EEC:

7. Room temperature

7.1. During working hours, the temperature in rooms containing workstations must be adequate for human beings, having regard to the working methods being used and the physical demands placed on the workers.

7.2. The temperature in rest areas, rooms for duty staff, sanitary facilities, canteens and first aid rooms must be appropriate to the particular purpose of such areas.

Organisational measures

- Take weather forecast into account.
- Tropical work schedule.
- Job rotation.
- Extra (drinking) breaks, in a cool environment¹⁷.
- Use of monitoring devices (sensors) so workers themselves can monitor their exposure to heat and their physical response to heat, and receive early warning if heat is above the OEL or if workers experience symptoms that may indicate the onset of heat-related problems.
- A right for workers to stop work without repercussions.
- Medical surveillance by occupational physicians.
- First-aid measures and emergency plans.

Personal protection

- Sun cream.
- Protective clothing, using clear and evidence-based specifications.
- Use of hats, caps (with or without neck flaps).
- Supply of drinks or other forms of re-hydration.

¹⁷ Also note Annex to Directive 89/654/EEC:

16. Rest rooms

16.1 . Where the safety or health of workers, in particular because of the type of activity carried out or the presence of more than a certain number of employees, so requires, workers must be provided with an easily accessible rest room. This provision does not apply if the workers are employed in offices or similar workrooms providing equivalent relaxation during breaks.

ANNEX II

SOCIAL PARTNERS AND SOCIAL DIALOGUE IN THE PREVENTION OF OCCUPATIONAL HAZARDS ARISING FROM CLIMATE CHANGE AND HEATWAVES IN THE EU.

European social dialogue is a fundamental pillar of the European social model. Thus, Article 152 of the Treaty on the Functioning of the European Union (TFEU) states that the Union shall recognise and promote the role of European social partners at European level and facilitate dialogue between them, taking into account the diversity of national systems and with due regard for their autonomy. The European social dialogue is recognised as a mode of shared governance in the field of social policies, including policies on occupational safety and health, through which the social partners defend their interests while contributing to the achievement of European social policy objectives.

Advisory Committee for Occupational Safety and Health (ACSH)

In the case of OSH legislation, employers' organisations and trade unions, in addition to being consulted for social policy matters, will have a second stage of consultation through their participation in the Advisory Committee on Occupational Safety and Health, set up by Council Decision of 22 July 2003 (2003/C 218/01).

The role of this Standing Committee is to assist the Commission in the preparation and implementation of activities to be carried out in the field of occupational safety and health and to facilitate cooperation between national administrations and trade unions and employers' organisations.

The ACSH is chaired by the person in charge of the Commission's Directorate-General for Social Policy and is composed of the tripartite representation of trade unions, employers' organisations and public administration from each Member State.

In order to carry out its functions, the ACSH may set up working groups with the participation of the various stakeholders to develop the issues specified in their constituent mandates.

European Pillar of Social Rights

At the Gothenburg Social Summit in 2017, the Council of the EU, the European Parliament and the Commission signed up to the European Pillar of Social Rights for fair employment and growth. It aims to promote a social Europe for all citizens by strengthening the social acquis and making citizens' rights more effective.

The fundamental objective of the European Social Pillar is to contribute to social progress by promoting fair and inclusive labour markets and social protection systems in the context of the profound challenges of the 21st century.

The Social Pillar sets out 20 key principles grouped into three categories:

- Equal opportunities and equal access to the labour market.
- Fair working conditions.
- Social protection and social inclusion.

In 2021 the European Commission intends to fully implement the Social Pillar in a context of recovery from the Covid-19 pandemic with the launch of the European Pillar of Social Rights Action Plan following a period of public consultation.

The Plan is divided into 4 sections, which can be briefly summarised as follows:

1. A strong social Europe for recovery and fair transitions.

Social Europe is based on people and their well-being and therefore defines the objective of achieving a sustainable and inclusive growth model that offers the best to people and the planet. Climate change, environmental challenges, digitalisation, globalisation and demographic trends are changing our lives and require us to adapt our “social rulebook”. The 20 principles of the European Pillar of Social Rights should be the focus of this new social rulebook.

2. Three objectives to define the ambition for 2030.

By 2030, 78% of the population aged 20-64 should be in employment. At least 60% of adults should participate in training every year. The number of people at risk of poverty or social exclusion should be reduced by at least 15 million by 2030.

3. Implementation of the principles of the social pillar.

This incorporates objectives such as creating more and better jobs, including improving safety and health standards, improving skills by investing in education, improving equality and enhancing social protection and inclusion systems.

4. Joining forces to achieve results.

There is a need to leverage social investments through EU funds, mobilising all players, strengthening social dialogue at national and EU level, boosting the implementation of the social acquis, enhancing cooperation with Member States on EU labour and social law and strengthening the capacity of labour inspectorates.

The right to a healthy, safe and adapted working environment is explicitly stated in Principle 10 of the European Pillar of Social Rights. Workers have the right to a high level of safety and health protection at work and to a working environment adapted to their professional needs and enabling them to prolong their participation in the labour market.

In the Action Plan, the Commission is aware of the need to adapt working frameworks to environmental challenges and specifically to climate change, and thus to rising temperatures, which have a major impact on jobs. Heat exposure over prolonged periods of time can increase the risk of injury due to fatigue, lack of concentration, poor decision-making and other factors. In addition, extreme heat events can cause significant health problems, such as heat exhaustion, heatstroke and other heat stress-related illnesses.

In section 3 of the Action Plan, implementing the principles of the social pillar, the Commission sets the objective of improving safety and health standards at work to protect the safety and health of workers, but also to improve productivity, employment and the economy in general.

“Occupational safety and health standards for a new world of work.

The EU’s strategic framework for safety and health at work needs to be updated due to rapid technological and societal changes.

Ensuring healthy and safe working environments is therefore essential to protect workers, maintain productivity and enable a sustainable economic recovery. The new EU strategic framework on safety and health at work will set out the principles and objectives for coordinated action by Member States, social partners and other stakeholders to improve workers’ safety and health”.

The concreteness of the announced Strategic Framework is set out in the following section.

EU Strategic Framework for Health and Safety at Work 2021-2027

The consultation process carried out for the approval of the Strategic Framework is undoubtedly the most important tripartite social dialogue process in recent years. For its preparation, contributions were received from the social partners, an open public consultation was carried out and an opinion was issued by the Advisory Committee on Safety and Health at Work, in addition to the participation of the different EU institutions and bodies: Council, Parliament, EU-OSHA.

The Strategic Framework is based on the premise that occupational safety and health legislation provides protection for almost 170 million workers in the European Union, according to Eurostat data, and that proper implementation is essential to ensure decent working conditions.

Despite the progress made in reducing risks in recent decades, it is clear that new challenges are appearing in order to achieve healthy and safe workplaces, as pointed out in the European Social Pillar. In this sense, the OSH Strategic Framework 2021-2027 sets out priorities and actions for the coming years marked “by ecological and digital transitions, economic and demographic challenges and the evolving notion of the traditional working environment”.

The strategic framework sets out the need for an updated vision on OSH for workplaces to adapt to such changes. It focuses on three key cross-cutting objectives for the coming years:

- anticipating and managing change in the new world of work brought about by the green, digital and demographic transitions;
- improving prevention of workplace accidents and illnesses;
- increasing preparedness for any potential future health crises

To meet these objectives the Commission recognises the need for action both at EU legislative, national, sectoral and company level. In conclusion, it is a challenge for the whole legal, institutional and occupational safety and health structure at European level.

The implementation of these three objectives will be underpinned by:

- i. social dialogue;
- ii. strengthening the evidence base;
- iii. strengthening enforcement of legislation;
- iv. awareness-raising
- v. funding.

Within this objective of anticipating and managing change, the Commission places the need to consider climate change explicitly, as it can affect the safety and health of workers, for example through increases in ambient temperature, atmospheric pollution and extreme weather events.

The text of the Strategic Framework does not contain any further reference to climate change and rising temperatures.

Although this is clearly insufficient in terms of the commitment to analyse the risks derived from exposure to heat, it does at least allow us to interpret that there is a will to incorporate these risk factors into the general framework for action in the face of the ecological transition.

In the context of the ecological transition, the lines of action are somewhat more precise: the need to modernise OSH standards is raised and Member States are urged to update their national legal frameworks in consultation with the social partners in order to address the occupational safety and health risks and opportunities related to the green and digital transitions.

In terms of funding, it is noted that EU funds can be used to mobilise investments in occupational safety and health measures in the framework of support for EU modernisation.

As noted above, for the development and implementation of the Strategic Framework, the Commission intends to mobilise the EU's institutional framework for OSH and specifically notes the involvement of:

- The Advisory Committee on Occupational Safety and Health (ACSH), a tripartite advisory body.
- The European Agency for Occupational Safety and Health (EU-OSHA), whose constituent objective is to provide Community bodies, Member States and interested parties with all useful technical, scientific and economic information in the field of occupational safety and health.
- The Senior Labour Inspectors' Committee (SLIC), which is responsible for issuing opinions on the implementation of EU legislation on occupational safety and health by the Member States.

OSH legislative framework and protection from the risk of heat exposure

The Council Directive (89/391/EEC) on the introduction of measures to encourage improvements in the safety and health of workers at work—the Framework Directive—is the cornerstone of the European preventive model.

It lays down minimum requirements for promoting improvements in the working environment in order to raise the level of safety and health protection for workers.

In contrast to the traditional model focused on reactive prevention, which did not place prevention at the source as a priority and which lacked integration in the ordinary management of companies, the Framework Directive establishes the general principles for implementing a model of action and application of procedures to achieve the effective integration of prevention in the management systems of companies.

It incorporates a set of common principles and minimum standards that all Member States must ensure through transposition into their regulatory frameworks, putting into force the laws, regulations and administrative provisions necessary to comply with the Directive.

One essential element of the model is the obligation of employers to guarantee the safety and health of workers, adopting the necessary measures to this end, including prevention, information and training activities, as well as the necessary organisational measures and the provision of resources.

The Framework Directive specifies the general principles of preventive action that employers must apply in Article 6.2: avoid risks, assess those that cannot be avoided, combat risks at source, adapt work to the individual, take account of technical developments, eliminate hazards, plan prevention, give priority to collective protection and give workers the necessary instructions.

There is therefore a generic obligation on employers to avoid or assess all the risks present in the company and, consequently, by being aware of the effects that exposure to heat can have on workers, employers are obliged to incorporate these risks into the preventive management of companies. This obligation is reinforced by the requirement for employers to take account of technical developments.

However, there is no specific mandate, an approach that reinforces the need to consider the risks arising from exposure to episodes of heat, which undoubtedly weakens the scope of the duty to protect.

In addition to the Framework Directive, the EU legislative framework on occupational safety and health consists of 24 specific directives issued under Article 16(1) of Directive 89/391/EEC.

A number of them contain specific references to temperature:

- Council Directive (89/654/EEC) concerning the minimum safety and health requirements for the workplace.

Annexes I and II of this Directive state that the temperature in working premises must be suitable for the human body during working hours, taking into account the working methods and the physical stresses imposed on workers.

Rest areas, staff on duty, toilets, canteens and first-aid facilities must be suitable for their specific use.

- Council Directive (92/57/EEC) on the minimum safety and health requirements to be applied at temporary or mobile construction sites.

Annex IV, Part A .7. The temperature must be suitable for the human body during working hours, taking account of the working methods used and the physical strain imposed on the workers.

Annex IV Part B.4 The temperature in rest areas, etc. shall correspond to the specific use of such premises.

- Council Directive (92/85/EEC) on the introduction of measures to encourage improvements in the safety and health at work of pregnant workers and workers who have recently given birth or are breastfeeding.

The employer must determine the nature, degree and duration of exposure in workers' undertakings in order to be able to assess any risk to safety or health and any impact on pregnancy or breastfeeding and to determine the measures to be taken. Physical agents which may cause foetal injury and/or placental abruption include extreme cold and heat (Annex I).

- Subsequently, the Commission Communication [COM (2000) 466] established guidelines for the assessment of chemical, physical and biological agents and industrial processes considered hazardous to the health or safety of pregnant workers and workers who have recently given birth or are breastfeeding.

In addition to the general hazards assessment required by the Framework Directive and Directive 92/85/EEC, once a worker is known to be pregnant, the employer must assess the specific risks and take the necessary measures to avoid any exposure which could damage her health or that of her child during pregnancy.

As a preventive measure, and considering that pregnant women have a lower tolerance to heat, it is stipulated that pregnant workers should not be exposed to excessive and prolonged heat or cold.

- Council Directive (94/33/EC) on the protection of young people at work.

Article 7.2 establishes that Member States shall prohibit the employment of young people (under 18 years of age) in work that endangers their health by exposing them to cold or heat, noise or vibration.

In all cases, this is a generic form of protection which must be based on the assessment of jobs taking into account the condition of the worker's body, very explicitly in the case of pregnant women and young people, the characteristics of the task performed, especially the workload, and the environmental conditions. However, it does not establish any reference either to threshold values to be considered or to specific methodologies for hazards assessment, which, in practice, constitutes a reference to technical criteria that may often be susceptible to controversy in their application.

Being aware that there is increasing evidence of the impacts that exposure to heat has on the health of the population as a whole and specifically on workers, and that all climate models predict a greater frequency and intensity of heatwaves, it seems obvious that there is a need to advance in preventive models adapted to this new situation.

Beyond legislative developments in some Member States, it is urgent to update the European prevention framework to address the risks arising from climate change and exposure to extreme thermal phenomena.

ANNEX III

PROBLEMS IDENTIFIED AND RECOMMENDATIONS FOR EACH OF THE COUNTRIES ANALYSED

Spain

- 1. Insufficient protection of legal regulations in the face of the magnitude of the problem:** the regulations on prevention and protection against heat exposure lag far behind the available scientific evidence. Even though RDL 486/1997 on environmental conditions predates the strategic plans, no major legislative changes had been promoted for 26 years, precisely when the highest temperature increases on record and extreme weather events have accelerated. RDL 4/2023 is a step forward by removing arbitrary exclusions from the previous standard and incorporating outdoor work; however, heat warnings are insufficient to ensure effective heat protection.

Recommendation: update and strengthen the regulations to match the current magnitude of the problem and, above all, provide them with mechanisms for action and sufficient force to translate into real changes that will effectively protect the health of working people. More initiatives are needed, such as the new Technical Guide for the new RD 4/2023 or the NTP for the use of the WBGT, to facilitate the applicability of the standard in workplaces and overcome the limitations of this text.

- 2. Lack of specificity, and specificity in existing policies:** the absence of the work environment in population policies against heat and, consequently, of concrete measures against this risk factor in occupational safety and health policies is noted. The National Action Plans against Heat and the Occupational Safety and Health Strategy establish hardly any concrete actions aimed at ensuring protection against heat in companies beyond general mentions of the vulnerability of workers to the outdoors or the challenges of the green transition. They ignore the particularities of this environment or the specific weight of heat, which is becoming increasingly critical.

Recommendation: instruments like national action plans must clearly establish an obligation for the employer to provide workers with the necessary protective measures and/or adaptation of working conditions to ensure the health of workers, bearing in mind that those most exposed to excessive heat are usually the most vulnerable segments of the working population.

- 3. Increased awareness of the risk of heatwaves and heat exposure:** awareness of the risk posed by global warming and heatwaves to the health of the population and specifically to workers has increased in recent years. However, it has been found that awareness alone is not yet sufficient on its own to ensure the heat-related adaptation of workplaces. The evidence analysed shows that the leap in scale between increased risk awareness and effective transformation of working conditions to deal with excessive heat has not yet been made.

Recommendation: continue to build up “risk awareness” to make further progress in the prevention and protection of the health of workers exposed to heat. Concrete actions and objectives and more resources are needed to raise the awareness of workers and employers about existing heat protection measures and the consequences of not applying them or applying them insufficiently.

- 4. Adaptation of heatwave warning systems to the actual situation in terms of work and companies:** the EU framework has treated heatwaves as an emergency within a Heat and Health action plan in which early warning systems play a central role; however, this approach is designed for public health of the general population only and falls short in the workplace:

- Heat assessment and prevention systems based on “traditional” prevention principles that must always operate for heat at work, whether or not there is a heatwave alert, must be harmonized with heatwave warning systems. Failure to do so hinders preventive action.

Recommendation: warning systems and environmental condition monitoring systems should be indicative. Routine safety measures based on reliable and accurate on-site heat assessments should be operated on an ongoing basis and updated accordingly. There have been cases of heat-related deaths in outdoor work in settings where no weather service alert was activated. Thus, direct observation of heat stress symptoms should always be prioritized. Weather alerts must be used to augment the usual heat measures, but never to curtail them. Physical activity should be stopped when heat exceeds a certain threshold in a systematic way, except in justified situations of maximum urgency.

- The AEMET-Meteoalerta alerts used by many plans do not include humidity, but rather only temperatures. It is also urgent to harmonize heatwave alert systems to ensure the same coverage for all working people. These systems should be easy to consult and should incorporate not only temperature, but also humidity and heat mortality records. Any warning system should be calibrated according to the metabolic load involved in the activities to be performed in the workplace and the degree of breathability of the corresponding clothing or PPE.

Recommendation: harmonize the warning systems and move forward in their technical improvement and accuracy by including variables such as the intensity of physical activity at the workstation, delimiting the geographical area, incorporating humidity and mortality records.

5. Heat action plans, a key tool in the prevention of heat exposure in the workplace: heat action plans and protocols are currently the main channel through which collective bargaining at company level (and sector level in some cases, such as construction) on heat protection is developed. In other words, in Spain, collective bargaining in relation to heat nowadays takes the form of company action plans and protocols. Most of them involve the participation of the RLTs and are binding, although not always. Their number has increased significantly following the approval of RDL 4/2023, which shows that delegates do not act in a vacuum, but rather that legislation is key to producing tangible results and conditioning the form they take. Heat action plans translate the principles of prevention into concrete actions based on the reality of the company (or sector). However, a wide variety is observed currently both in their contents and in their structure, which will foreseeably influence the scope and effectiveness of the resulting preventive action.

Recommendations:

- Continue to make progress in the negotiation of comprehensive and binding action plans for the employer whenever possible. Draw up homogenization guides and training courses for specific delegates. Open roundtables and spaces for dialogue on health and risk prevention and ensure the presence of the RLTs in these spaces. It can be seen that the most complete proposals for action plans/protocols correspond to companies where there is a space for continued dialogue between management and representatives on preventive activities. It seems that trust between the parties is key to achieving an optimal result in this type of heat protocol.
- Action plans (and collective bargaining agreements where applicable) should pay special attention to the future recovery of hours not worked due to excessive temperatures. Clear limits must be set to avoid contravening the right of workers to protect their health without incurring additional costs, salary or otherwise. If not, incentives are created to break the rules and take fewer breaks than necessary. On the side of the administrations, clauses should be introduced in tender specifications to avoid this problem (e.g. extending the work completion period when there are heat alerts). In any case, the minimum breaks and hydration necessary to avoid heat overload should always be considered working time, as dictated by current legislation and basic industrial hygiene standards. Two different key informants have independently said with respect to the problem of hours lost due to heat that “companies refuse anything that costs them money”. It is important to take this restriction into account when negotiating, but it is not a valid justification for not paying for mandatory breaks (or hours not worked due to a red alert).

- 6. Collective bargaining agreements, the big absentees:** most collective agreements analysed have a great deal of room for improvement in terms of protecting workers against heat exposure hazards. It is reasonable to think that the agreements are too broad to correctly reflect the prevention needs of individual companies. However, it is advisable that they incorporate more and better preventive measures, protection, information, etc. against heat in their final wording. Firstly, because we know that compliance with current legislation is the greatest incentive for employers to establish prevention measures. Secondly, because due to the characteristics of the Spanish productive fabric, with a high proportion of small companies and without union representation, the negotiation of action plans against heat is more complicated.

Recommendation: if a hazards assessment has not been carried out at the time of negotiating the agreement or if there is insufficient bargaining power at that time, it may be advisable to include a clause that makes it mandatory to negotiate a specific action plan on heat exposure at a later date.

- 7. Vigilance is essential to ensure compliance with the standard:** the main reason argued by employers for the implementation of prevention measures is compliance with the standard. In addition, at company level, exposed workers do not have the agency, capacity and resources to protect themselves from the threat of heat. The law in force establishes the “safety debt” of employers: it is employers who must ensure the safety of their workers as they are the ones who organize the work and therefore their degree of exposure to the hazard.

Recommendation: the labour inspectorate and the authorities in charge of ensuring compliance with working conditions should increase the intensity of their supervision. Surveillance of the correct implementation of protective measures should be stricter and penalties for those who fail to comply should be higher, in line with the increasing seriousness of the problem, which shows no signs of stopping. As shown in this report, in the last two years there has been a significant increase in the number of proceedings and sanctions that would indicate that we are moving in this direction. CCOO’s campaign of complaints in Andalusia also delves into this problem and gives it visibility.

- 8. To decisively promote adaptation to climate change:** the commitment to reduce emissions and mitigate climate change is essential, but so far, all efforts have proven to be ineffective. It is increasingly likely that we will exceed the +1.5°C horizon established in international agreements before the end of the decade. It is important to continue efforts to reduce global greenhouse gas emissions, but inertia is too great and change is too slow.

Recommendation: push more strongly for an adaptive approach that addresses urgent challenges. Climate change is already here and is a real threat to the lives and health of working people. Its consequences must be minimized. In the context of occupational hazards prevention, this approach is the most important and still has a long way to go.

Italy

- 1. The lack of established national protocols and guidelines creates a void in institutional procedures and information.** Despite the legal reference to climate-related risks in Legislative Decree 81/08, there is a lack of regulatory benchmarks and information on heatwaves. Despite the evidence of the urgency to address hazards for workers related to heatwaves, Italy lacks a national “occupational” adaptation plan. The characteristics of the productive fabric, mostly composed by SMEs, further complicate the application of protection measures for “weaker” workers, e.g. those not covered by collective bargaining, or immigrant/illegal workers. The lack of established and universally agreed guidelines adds an extra layer of complexity to overseeing adherence and ensuring the prompt implementation of organisational measures, such as stopping work, to safeguard OSH during extreme temperatures.

Recommendation: enhance and update workplace climate regulation by establishing standardised guidelines for managing thermal stress risks at national/sectorial/territorial level. These “missing” guidelines should be part of a National Plan for adaptation to climate change, focusing on occupational impacts on workers and measures to prevent the increase of injuries/deaths related to thermal stress. The definition of an OSH catalogue pertaining to thermal stress should be based on empirical research and recommendations from the scientific community, such as the Workclimate project. Standard protocols should be provided, especially for SMEs, where the absence of collective bargaining protection and trade union representatives at territorial/site/organisational level might expose workers to higher risks during heatwaves.

- 2. At organisational level, there is a lack of attention paid to the potential OSH risks caused by heatwaves.** In protecting workers from heatwaves, territorial and national protocols overlook the importance of tailoring guidelines on the specificities of industries, workplaces, and individual characteristics.

Recommendations: inclusion of heatwaves in the Hazards Assessment Document, rescheduling working hours, spaces, and activities to protect workers in terms of OSH. For example, best practices at organisational level should include the rescheduling of working hours to manage or avoid working activities during the hottest hours (in particular between 12.00 and 16.00 p.m.); increase the number and duration of work breaks; reconsider use/type of personal protective equipment (PPE) (work uniforms, boots, hats, etc.); ensure the availability of water and spaces to rest in the shade; reorganise and innovate workplaces through the creation of spaces (e.g. tents), the adoption of technologies (e.g. industrial fans) or the energy efficiency of buildings; disseminate information and provide specific training for workers, OSH Representatives, entrepreneurs; joint/constant monitoring of temperatures by OSH Representatives, local institutions and entrepreneurs according to an estimation of OSH hazards based on real temperature, perceived temperature (humidity), specific activities (e.g. professions/tasks, etc.) and individual characteristics (pathologies).

- 3. Lack of coordination among social actors at different level.** It is necessary to enhance vertical and horizontal subsidiarity among all players for protecting OSH during heatwaves. In order to enhance the exchange of expertise on hazards and prevention measures related to extreme temperatures, it is necessary to strengthen interactions between the scientific community, social partners, administrations, and monitoring bodies.

Recommendation: foster closer collaboration and cooperation among social players, including institutions, social partners, surveillance organisations and the scientific community at national, sectoral, and territorial levels. An effective approach should be to establish a permanent joint observatory and committee on OSH hazards (as during the Covid-19 pandemic) or to exploit the potential of Regional Coordination Committees (art. 7, Dlgs. 82/08), which will help avoid the situation where this issue is monitored during emergency phases only.

- 4. Lack of workers' participation and representation; limits for industrial relations and prevention systems and for the role of OSH Representatives.** It is necessary to strengthen the role of workers' participation and trade unions' representatives in the hazards assessment, as well as in the definition of the solutions to cope with heatwaves, especially considering small companies.

Recommendations: put in place guidelines and formal procedures at company, production site and territorial level for the active involvement of workers and OSH Representatives. Organise periodical meetings with workers and their representatives to anticipate and manage the risks related to heatwaves. Set up joint committees at company/production site/territorial level with the participation of OSH Representatives and Trade unions.

- 5. Lack of awareness on heatwave hazards workers, entrepreneurs, social partners, and citizens.** Despite the growing public attention surrounding the rise in accidents and deaths caused by the failure to adapt to climate change, there remains a lack of preventive measures and a focus on emergency responses.

Recommendations: following the request of the trade unions, the Ministry of Labour and Social Policies should increase information campaigns on the risks of heatwaves and provide standards for companies to evaluate heat hazards in collaboration with OSH Representatives. To enhance heatwave protection, there is a need to raise overall awareness of the significance of occupational safety and health (OSH) practices. To facilitate this cultural turn, schools can play a crucial role by introducing information and training initiatives for the new generations. The scientific community can contribute to joint training activities tailored for workers, OSH representatives, and entrepreneurs, creating opportunities for mutual learning and cooperation. To strengthen knowledge of hazards and preventive measures, it is crucial to also consider the implementation of interactive and engaging methods, such as gamification tools.

- 6. Lack of adequate training and competences of OSH representatives, workers, entrepreneurs, social partners, and labour inspectors on heatwaves risks.** Although the subject of microclimate is present in the normative references, this risk is still greatly underestimated because there is a lack of awareness of the symptoms connected to it and the potential scope of the consequences for workers.

Recommendations: improve information campaigns and provide specific training to prevent the occurrence of risk and *potential* occupational injuries and accidents, and to adopt adequate organisational practices for their mitigation or elimination. Establish shared and clear standards to evaluate the presence and entity of OSH hazards for workers related to extreme temperatures, and organisational/territorial/site protocols to deal with them.

- 7. Inspection/surveillance activities, competences, and coordination with territorial social actors on OSH related to heatwaves.** Workplace inspections are mostly performed by Local Health Boards and extended by Legislative Decree No. 146/2021 to the National Labour Inspectorate for all sectors of activity. In response to a series of workplace deaths, the Labour Inspectorate has been reassigned the supervisory functions of checking and ensuring proper employment conditions (previously limited to the construction sector). There are ongoing problems associated with the need to monitor various situations in different territories, especially in cases involving work exploitation and irregularities (such as for agricultural workers). To address this issue, D.L. 146/2021 highlights the need to increase the workforce of the National Labour Inspectorates. Around 1000 new resources are expected to be recruited to strengthen inspection activities. Better coordination can be achieved through joint training sessions with LHBs, which would also facilitate upskilling and knowledge-exchange regarding new functions and surveillance activities. Despite the provision for a Regional Committee (arts. 5 and 7 D.Lgs. 81/08) to coordinate and plan territorial inspections, this organisation is not effective in certain regions.

Recommendations: Increase the number of inspection personnel and improve coordination with LHBs, especially during heatwaves, to strengthen surveillance on the adoption of OSH protection measures at organisational/territorial level. Ensure the establishment of Regional Coordination Committees across all regions, promoting regular meetings to facilitate joint planning with all stakeholders in the area. This might grant the ability to consider the distinct features of the organisational population and local climatic conditions, enabling the adaptation of national standards for improved protection.

- 8. Lack of economic resources to support workers and employees during heatwaves.** There is a shortage of funds in the Ordinary Fund to provide financial/economic support to workers and employees during heatwaves, whose intensity has become longer than “expected” periods. Because of this, companies might be less motivated to prioritise the suspension or rescheduling of work activities, hindering efforts to ensure OSH protection. Financial penalties for employees for non-compliance might not be sufficient motivation. In turn, the scarcity of economic support can lead the most vulnerable workers to disregard the risks associated with OSH hazards during heatwaves in order to avoid reductions in their wages.

Recommendation: increase the financial resources to accommodate extended work stoppage periods, particularly in areas where rearranging schedules and spaces cannot effectively mitigate prolonged exposure to thermal stress. To encourage compliance with hazard prevention measures during extreme temperatures, consider increasing financial incentives for companies and workers while reducing the burden of penalties. To ensure fairness, economic incentives and support should be specifically tailored to consider the sector’s level of exposure and the scarcity of organisational resources for dealing with the consequences of heatwaves (e.g. SMEs and agriculture).

Greece

- 1. Lack of specific legislation on heat stress.** Although a circular including the WBGT index is issued by the Ministry of Labour and Social Security every summer, this is not mandatory for companies. A new Ministerial Decision (65581/2023) was enacted this year, for the first time, in response to the heatwave “Cleon”, and it was valid while it lasted. Heatwaves are announced by the Hellenic National Meteorological Service (EMY).

Recommendations: new universal legislation on heat stress is required in due time (not only applicable for the duration of a heatwave), with the WBGT index according the ISO 7243, as it was in the previous circular on heat stress, and with technical and organizational measures. The new legislation should be mandatory, require companies to have the equipment for WBGT measurements, take measurements and communicate the results to the Labor Inspectorate, taking into account particularities of different sectors.

- 2. Collective agreements including heat stress provisions are scarce in Greece.** Common sectors exposed to heat stress, such as construction, municipalities, companies with thermal processes, first-responders, police force and others, do not have collective agreements at all or if they have, they do not include provisions on heat stress. Only two sectoral collective agreements include provisions on heat stress. These agreements are in the ship repair sector and the delivery sector on the island of Santorini. Agreements at company level involving heat stress issues are even rarer. Usually, company-level agreements, where they do exist, only include salary issues.

Recommendations: sectoral unions and employers’ associations in sectors exposed to heat should start negotiations to include OSH issues and, in particular, heat stress in collective agreements. The resistance of employers to include heat stress issues can be overcome by trade union action and strikes to exert pressure. However, if heat stress is included in collective agreements, not only temperature but also relative humidity must be taken into account to suggest prevention measures. In addition, the collective agreement for the ship repair sector should apply prevention measures for outdoors (currently included) and inside the ship. Although hazards assessment is provided in the basic OSH law (3850/2010), including the risk of heat exposure, it should be also included in collective agreements.

- 3. Companies have low awareness on heat stress issues.** Large companies are an exception in that they have instruments for WBGT analysis. They also have policies that go beyond the provisions of the circular for heat stress. Most companies do not have the necessary infrastructure or even the understanding of the WBGT index.

Recommendations: concrete actions to raise the awareness of companies are required. More training and dissemination activities are required to improve current knowhow on WBGT in enterprises. ELINYAE could play a significant role in that area in collaboration with the Ministry of Labour and Social Security and the FameLab at the University of Thessaly. Small businesses have a greater need for information. SMEs need sector-specific policies, outlining the appropriate measures. Simple tools such as videos with practical solutions of champion companies will help other companies prepare for heatwaves. Specific guidelines should be drafted relating to specific occupations exposed to heat. Chambers and municipalities could also participate in dissemination activities.

4. **There is low preventive action for heat stress in SMEs.** SMEs only take measures following Labour Inspection audits.

Recommendations: the effects of heat stress on human health (short-term effects and long-term effects) and loss of productivity could persuade employers to invest more in prevention measures and be proactive, and not only after an audit by the Labour Inspection. SMEs could receive special funding for prevention measures to combat heat stress.

5. **Prevention policies and action plans by the government support workers' protection from heat stress:** the national strategy for OSH of the Ministry of Labour and Social Security 2022-2027 provides the following for heat stress:

- a. improvement and updating of existing national legislation for OSH (including green economy and climate change).
- b. research activity in areas such as the heat strain of workers taking into account the effects of climate change.
- c. development of efficient and permanent synergies between the fields of Occupational Safety and Health and Public Health (e.g. issuance of circulars and practical guides, preparation of preparedness plans, coordination meetings, etc.).

An innovative tripartite action on heat stress prevention was taken in 2018 by the Ministry of Labour and Social Security and the social partners to improve the heat stress circular and raise awareness at large enterprises and SMEs. The application developed by the FameLab at the University of Thessaly was suggested by the new Ministerial Decision on heat stress. Officials of the Ministry of Labour and Social Security drafted a directive on heat stress and presented it to the European Commission. A special guide on heat stress was developed by the FameLab at the University of Thessaly. A pilot study is underway with the FameLab at the University of Thessaly.

Recommendations: empowerment of social dialogue and collaboration with ELINYAE for the implementation of the actions provided in the national OSH strategy. A good practice guide for heat stress prevention is recommended.

6. **The laws on climate change and just transition do not include worker's exposure to heat provisions.** All stakeholders involved in the field study agree that social partners should play a significant role in addressing heat exposure in climate change policies.

Recommendations: a forum for climate change (4936/2022, article 26), where trade unions and companies, among others, participate in the framework of a national observatory currently provided in the law for climate change, with the power to discuss heat stress issues. What is also needed is synergy between the Ministry of Labour and Social Security and the Ministry of the Environment and Energy.

Netherlands

- 1. Worker health not a priority issue, but awareness is growing.** As the Dutch climate is rather moderate, working in heat due to climate change has not been a priority issue in the Netherlands. However, awareness has increased in the last few years, mainly as a result of activities by the Dutch trade unions. The first impetus for trade union activity has come from an increased awareness of work-related skin cancer in some sectors with a high number of outdoor workers. But over the last few years, heat itself has also become an issue on the agenda of trade unions. This can also be seen in the (rising) number of sectoral OSH catalogues addressing the issue. In addition, trade union members are pushing for trade unions to take up the subject of heat at work in collective bargaining.

Awareness is also growing in the field of *public* health (notably focused on vulnerable groups). The Dutch Institute for Public Health and the Environment (RIVM) is drafting new approaches on the subject, together with the Netherlands Meteorological Institute (KNMI), paying attention not only to air temperature in risk notices, but also to air humidity (WBGT). More recently, the RIVM and the KNMI have also taken up the issue of *workers'* health—mainly from the point of view of a methodology to communicate on heat in a more precise manner, specifically as part of the Dutch Heat Plan.

Finally, the Netherlands Labour Authority (Labour Inspectorate) launched a project on heat stress in 2023, investigating whether or not this is a risk to be dealt with in the near future. It is not yet clear whether the NLA will continue its activities in the field.

Recommendation: it appears helpful to link heat stress to the issue of skin cancer, since this is much more compelling when reporting risks.

The burden of disease of working in heat is not known for the Netherlands. It is thought to be rather low (no known cases of work-related deaths, little or no data on work-related hospitalisations, only a limited number of complaints addressed to the Labour Inspectorate). This may be one reason why the risk of working in heat is underestimated (except for working in hot environments such as bakeries or industrial ovens). But as there is little data, it is hard to tell if the risk is underestimated. However, it is clear that most interventions aimed at protecting workers from direct sun (to prevent skin cancer) will also be helpful to reduce heat exposure.

Recommendation: more scientific research is needed to monitor the size of the population at risk as well as the burden of disease due to working in heat.

2. **Coverage by labour or OSH legislation:** no clear-cut legal standards (neither occupational exposure limit nor methodology on how to assess heat hazards).

Until 2013, Dutch OSH legislation clearly referred to ISO 7243 in its legislation as the state-of-art in assessing the risks of working in hot ambient conditions. However, in 2013 all detailed regulations were struck from public legislation, leaving room for “tailor-made” agreements at sectoral level (OSH Catalogues). Only a very small number of these catalogues refer to scientifically based methodologies to assess risks. This leads to *legal uncertainty and ambiguity*: when is it too hot to work safely and healthily? It may also give rise to conflicts between employers and workers (or trade unions), as they may continue to disagree on whether or not it is too hot to work (or if measures should be taken).

Recommendation: reinstall a science-based occupational exposure limit (as well as a methodology for hazards assessment) in public legislation, to provide for legal clarity and certainty, as well as equal protection of all workers. This threshold value will form the basis for social partners to build on in their negotiations concerning necessary and/or effective measures. It will also help to bring clarity on how to assess risks in a methodologically sound way.

Some of the OSH catalogues do refer to “threshold temperatures”, but this is mainly based on air temperature (which is not the current state of the art), disregarding other elements that increase heat at work (such as air humidity or work load). Using a flawed methodology may give rise to a false sense of safety and therefore inadequate (legal) protection. Furthermore, as the various OSH catalogues have very different threshold values, this is in breach of the notion of *equal protection*.

Recommendation: develop (or rather prescribe) a general methodology for heat hazards assessment to be used in the OSH catalogues. Currently, draft OSH catalogues have to be submitted to the Netherlands Labour Authority (Labour Inspection), which then checks if provisions in the catalogue are in breach of OSH legislation. It would be very helpful if the Labour Inspectorate were more directive on how employers in the relevant sector should establish the risk, and that OSH catalogues should contain threshold levels (OELs) based on scientific/standardized approaches such as ISO 7243. It would also be very useful to provide guidance that may be used in the current branch-level risk-assessment tools developed for SMEs, which are very poor as regards the assessment of heat at work. Developing one general methodology would lead not only to better hazards assessments, but also to lower transaction costs at sectoral level (not every sector would have to re-invent the wheel).

The number of collective labour agreements addressing the issue of heat at work is very limited, and they focus mainly on the question when heat is to be considered “unworkable”. In that case, employers may ask for compensation from social security schemes for having to interrupt work. But the current regulation on “unworkable weather” only applies when cold weather conditions lead to an unworkable situation. This is one of the main (financial) reasons that employers may be reluctant to interrupt work even if it is dangerously hot for workers.

Recommendation: the current regulation on “unworkable weather” should be extended to working in extreme heat, such that employers will be compensated if they have to interrupt work in order to protect their workers.

3. Measures differ widely among sectors and are clearly skewed to personal protection instead of real prevention using technical control measures higher up the hierarchy of control. Furthermore, measures prescribed in OSH catalogues are so general that they often leave employers empty-handed.

From the analysis of sixty OSH catalogues, it is clear that “provide drinks” and “wear protective clothing” are the “control” measures most often recommended. In addition, the advice on “protective clothing” is very vague in almost all cases, failing to indicate what makes *effective* protective clothing. In short, heat-health guidance differs widely from one sector to another, is not always in line with the state-of-art, and clearly does not always give the technical guidance needed. One of the reasons might be that the catalogues are developed by general OSH-experts, lacking in thermo-physiological knowledge or relevant knowledge in the field of occupational hygiene.

Recommendation: make sure that the quality of OSH catalogues is improved, specifically in the field of occupational heat. In the Netherlands, hazards assessments (or RA tools for SMEs) have to be controlled by certified OSH-professionals. As of 2022, OSH-professionals may only control the elements in the hazards assessment (tools) that fall within the scope of their specific area of knowledge (e.g. an ergonomic specialist may not advise on hazardous substances). It is recommended that this approach also be extended to OSH catalogues, so that measures prescribed in the field of occupational heat may only be developed by occupational hygienists who are knowledgeable in thermo-physiology.

4. It is not known how often the issue of heat at work is discussed at company level, particularly in consultations with the works council or other worker representatives.

Works councils (and other worker representatives) have a strong legal position in the field of occupational safety and health. Furthermore, OSH ranks among the top-3 issues on the agenda during the regular consultation meetings at company level. However, many companies do not have a works council, and the knowledge of works councils in OSH may not always be adequate (and training has been dwindling over the last decade). Whether or not the latter also applies to knowledge on heat is unclear. Finally, it is not known how often heat is on the agenda of the works council itself or in formal consultation with the employer.

Recommendation: more research is needed on actual practices at company level considering the issue of heat at work. In general, more training of works council members is needed, in OSH matters as well as (and very likely so) the field of heat.

Hungary

- 1. Insufficient protection of legal regulations in the face of the magnitude of the problem:** the minimum requirements for heat protection in occupational safety and health are primarily determined by legislation. Act XIII of 1993 on Occupational Safety and Health contains the general requirements. The Decree on Minimum Requirements for Occupational Safety and Health contains more detailed rules, especially for working in confined spaces. The Act also mentions air temperature as one of the main risks, including the dangers of both cold and heat. This law mainly lays down general obligations for all players in OSH, and the specific provisions are found mainly in the regulation.

Recommendations: the enforcement of recent legislative changes and OSH regulation should actually be guaranteed in practice by the authority. For this purpose, the inspection powers of the authority should be extended. Both employers and workers should receive proper information about heat risks and related rights and obligations through appropriate information leaflets.

- 2. Lack of specificity, and specificity in existing policies:** recently, Hungarian experts/authorities have commissioned a 140-page study on the effects of climate change on behalf of the authority. This study examines all aspects of climate change, extreme cold, heatwaves, and their impact on the economy and workers. Accordingly, professionals are dealing with the consequences of climate change, but these professional materials are mostly achieved by occupational safety professionals. The national action plans for the strategy for occupational safety and health (2024-2027) contain a number of important statements that relate indirectly to working in heat. Brochures published on “Vision Zero” and other issues are incomprehensible for users (especially for SMEs), and therefore they cannot be expected to have a positive impact. This strategy relates to the agricultural sector, in which the safety awareness of employers is to be increased and the working conditions of seasonal workers are to be better monitored.

Recommendations: it would be necessary for these brochures produced by the authority to include rules and protocols for heatwaves and heat work. Small and medium-sized enterprises need more help with regular heatwaves and safety and health regulations. More attention should be paid to heat work in the strategy, and it should be much more focused on SMEs and agricultural employers.

- 3. Increased awareness of the risk of heat exposure:** The impacts of climate change are being felt more and more in our daily lives, with many negative consequences affecting our lives. Information about these impacts and preparation for preventive measures would be extremely important. Heatwaves are occurring more and more frequently in our country, i.e. periods of warmth in which the daily mean temperature is significantly higher than the average and lasts longer. Therefore, legislators are trying to adapt to the challenge of heat through continuous research and legislative changes.

Recommendations: we need more guidance, brochures and campaigns on the risk of heat work. SMEs that do not work with heat-intensive technologies may not be aware of safety and health regulations for heat. Therefore, such a campaign or something else that draws attention to this issue would be useful. It is necessary to raise the awareness of heat protection measures and safety and health obligations.

- 4. Adaptation of heatwave warning systems to the reality of work and companies:** Heat assessment and prevention systems based on “traditional” prevention principles has changed in Hungary since 01/01/2024. Today, our occupational safety and health regulations state that, *“the workplace is considered hot if the working climate at the work station exceeds 24°C or, in an outdoor work station, the daily average temperature exceeds 25°C for at least one day and the national chief medical officer has issued a heat warning or a heat alert.”*

Recommendations: heat alarm monitoring in legislation should actually be guaranteed in practice by the authority. More emphasis on heat should lead to more effective safety and health measures at workplaces.

In Hungary, statistics on occupational accidents are compiled annually by the Occupational Safety and Health Authority on the basis of the occupational accident reports received. The annual reports are examined according to many aspects of the accident figures. Hungary also has statistics on occupational diseases caused by heat. Based on the registration of the number of sickness benefit days, the Hungarian Central Statistical Office can only obtain limited information on occupational diseases. But even on the basis of these annual figures, we cannot determine how the heat affected the health of the workers.

Recommendation: it would be important to take heat stress into account when investigating accidents and diseases, because it would offer a real picture of domestic conditions. The result could encourage employers to take preventive measures and workers would be more aware of the risks and applicable rules. Heat stress can make workers in vulnerable groups even more vulnerable. It would therefore be important to focus the attention of occupational health and the employer on this group in terms of prevention.

- 5. Heat action plans, a key tool in the prevention of heatwaves and heat exposure at the work station:** The authority is responsible for compliance and information, but is unable to fulfil its former role due to staff shortages. The brochures are not effective according to employers and experts, as they are not used by the recipients, due to their length and technical language. The authority informs employers about heat risks before stage III. Heat warning periods. They warn employers about the specific dangers of heat and publish the necessary preventive measures on their website. We conclude, however, that all this is not enough to prevent health damage in practice.

Recommendation: we recommend creating more understandable and easy-to-use information that can be used in any workplace, even if it is posted. The new national OSH policy has also set this goal for the next 3 years, so the authority will produce more useful information material. Therefore, we hope that they will be produced for employers and employees when a heatwave is predicted.

Action plans: employers are obliged to draw up an action plan, which is regulated by the Occupational Safety and Health Act. In most cases, employers do not have this plan or do not use it, almost exclusively where there is a well-developed prevention system (see railroad industry or second case study) and where the trade union or safety and health representative is active.

Recommendation: We already know that the authority's information materials are not very well used, so it would be extremely important to have a visible campaign describing the risks of thermal stress for both the employer and the employee. This would perhaps help to take heat stress into account when reviewing hazards assessments and to take additional measures in relation to it, but pay more conscious attention to at least the minimum rules. Many people in the country do self-employed work in one of the most dangerous sectors, i.e. agriculture. Therefore, it might be worthwhile to review the relationship between occupational safety and health and the individual entrepreneur, because according to the research, the employer only applies a rule if it is required by law; the campaign and the information alone may not be enough.

- 6. Collective bargaining agreements, the big absentees:** during our research work, we had the opportunity to look at a number of employer regulations, i.e. the hazards assessment, the collective agreement and the employer's instructions. We have found that in companies where trade union representation is in place or a safety and health representative is actually able to advocate for workers' interests (no trusted employee of the employer has been elected to this position), employers also provide for action against heat in some written form. Unfortunately, this is not observed in the case of smaller employers, which may be the result of their ignorance. We see two types of these agreements. For large companies, such as those in railway sector, the hazards assessment contains rules for heatwaves, but for smaller employers, such as local governments, this document does not contain rules for heat. In this case, the action plan was drawn up by a safety and health representative. Statistics showed that there are very few official inspectors working in the country. Therefore, it is not possible to inspect even the majority of employers, but the trade unions would like to see some form of more frequent inspections, or at least, if the trade union finds an irregularity in the area of safety, the authority visits the employer and takes action on the basis of a notification. The experiences of trade unions and advocacy groups are very different with regard to employers. The employer's attitude to OSH depends on the employer's OSH culture; if it is low, trade unions and professionals have difficulties. In such cases, cooperation is difficult and trade unions are forced to turn to the authorities and report irregularities. Accordingly, trade unions would like employers and authorities to work with them to prevent accidents more effectively.

Recommendation: trade unions and elected OSH representatives should have a bigger role in determining safety and health measures at the workplace. Also, worker representations should be more conscious about their legally guaranteed opportunities, but OSH related rights should also be enforced in practice, particularly by the authority.

- 7. Vigilance is essential to ensure compliance with the standard:** the authority is also responsible for compliance, and for research and development in occupational safety; however, due to the small number of employees, they cannot carry out the audit task as frequently as the trade union representatives demand. Last year's target controls included employers issuing a Level 2 heat alert, but we found no information on the outcome in the authority's report. The unions also criticised the fact that the authority was notified, but failed to inspect an employer whose store registered an indoor temperature of 29 degrees. The most common demand from trade unions is for more frequent inspections.

According to the report for the period 2018-2022, there were only 113 OSH inspectors in the country in 2022 compared to two million employers, which suggests that the authority is struggling to conduct inspections due to the unrealistic shift in rates/quotas. We conclude this from the report on the controls on irregular employment and the fact that most agricultural workers do this work with their families as sole proprietors. Here, the problem is raised anew that sole proprietors do not fall within the scope of the OSH Act, which leads not only to non-compliance and ignorance of the rules, but also to the fact that the occupational safety and health authority has no control over them. Such small entrepreneurs employ many temporary workers to cultivate the land in summer and, even if they are given some of the three general obligations, may not be able to reduce workers' exposure to heat through responsible measures.

Recommendation: the authority's staff has not changed significantly and we do not know whether it will. However, on a more positive note, the new national safety and health policy will pay special attention to agriculture and seasonal work. We hope that in addition to chemicals and other safety and health risks, the authority will also monitor the regulations on heat.

- 8. To decisively promote adaptation to climate change:** studies show that heatwaves are becoming more and more frequent in Hungary, and that also affects the working environment. It is therefore important to be aware of the preventive measures required in such a situation. The rules for occupational safety and health in the event of heat damage are laid down by legislation. In addition to legislation, literature also addresses the issue of heatwaves and climate change, and helps professionals and employers prevent the risks they pose.

Recommendation: occupational health is an essential component of occupational safety and health, which is why we considered it important to keep it to a minimum. We have focused attention primarily on improper operation, which further complicates consideration of the risks associated with heatwaves. In fact, if employers are given information about heat stress and which workers belong to vulnerable groups, together with a description of the additional measures that concern them, they would make a significant contribution to reducing the damage to health caused by heatwaves.

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