

Executive summary

HEAT-SHIELD

This EU funded project addresses the negative impacts of workplace heat stress on the health and productivity of the EU workforce. We are analysing the impact of increasing heat levels in certain work situations due to climate change during this century and the effects of climate change mitigation on occupational health and productivity.

We will provide adaptation strategies for major EU industries: manufacturing, construction, transportation, tourism, and agriculture. Together, these industries represent 40% of the EU GDP and 50% of its workforce.

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Integrated inter-sector framework to increase the thermal resilience of European workers

The Consortium: We are a group of twelve research institutions, two policy-making organisations, four industrial entities, and two civil society organisations from across the EU (Table 1). Moreover, the project is endorsed by policy making and civil society stakeholders.

Mission: To address the negative impacts of workplace heat stress on the health and productivity of workers in strategic European industries (manufacturing, construction, transportation, tourism and agriculture) and the potential increase of these impacts as climate change progresses.

Climate change and its associated workplace heat exposure are amongst the biggest global health threats of the 21st century with enormous consequences for humanity. Rising heat stress has become a growing challenge for most communities. In addition to the well-known effects of heat exposure, studies across the globe have confirmed significant productivity losses when workplace heat levels are increased.^{1,2} Moreover, occupational heat-related injuries and deaths result in insurance claims and litigation, as well as degraded public opinion towards industry. As the workforce ages, its resilience to heat stress degrades with further negative effects on health and productivity. Therefore, it is not surprising that, out of an estimated total economic cost of US\$ PPP 4.3 trillion due to climate change in 2030, US\$ 2.4 trillion (56%) is due to workplace heat, reducing work capacity and productivity (the projected global GDP in 2030 is US\$ 140 trillion). Reducing the impacts of rising workplace temperatures in manufacturing, construction, transportation, tourism and agriculture will produce two strategic benefits for industries:

- (i) it will ensure the wellbeing of their workforce;
- (ii) it will improve their competitiveness by mitigating the productivity loss associated with rising workplace heat.

Development Steps: The above outcomes will be achieved by completing a series of development steps:

- Step 1: Forecast weather patterns and workers' future conditions across Europe for various climate change scenarios.
- Step 2: Assess the effects of the above forecasts on the health and productivity of manufacturing, construction, transportation, tourism, and agriculture workers across Europe. The age and gender distribution in these industries and the heat vulnerability of different population groups will be assessed.
- Step 3: Screen and optimize technical and biophysical solutions to reduce workers' heat stress.
- Step 4: Formulate guidelines to promote workers' health and prevent productivity loss, based on high-resolution heat strain data (per industry, per region and per climate scenario).
- Step 5: Develop an online open access service to help industry and society anticipate threats to workers' health and to disseminate adaptation guidelines to relevant stakeholders.
- Step 6: Gauge the efficacy of formulated guidelines and open access service for their health, economic, and social benefits.

Vision: To improve the heat resilience of European workers considering the current and future climatic heat scenarios. To provide know-how to the European community ranging from the individual citizen to public and private policy makers towards implementing methods and procedures that will secure health and productivity despite aggravated heat workplace levels.

Table 1. The HEAT-SHIELD partners and the supporting stakeholders by sector type.

PROJECT PARTNERS		
Research Institutions	University of Copenhagen	Denmark
	University of Florence	Italy
	University of Florence – Interdepartmental Centre of Bioclimatology	Italy
	Swiss Federal Laboratories for Materials Science & Technology – EMPA	Switzerland
	Netherlands Organisation for Applied Scientific Research – TNO	Netherlands
	Loughborough University	UK
	Institute Joze Stefan	Slovenia
	University of Porto	Portugal
	University of Nicosia	Cyprus
	University of Ljubljana	Slovenia
	University of Wolverhampton	UK
	Lund University	Sweden
Policy Advisors	Federal Office of Meteorology and Climatology – MeteoSwiss	Switzerland
	Bulgarian National Health Service	Bulgaria
Private Sector	Delela Slovenia d.o.o.	Slovenia
	Center for Technology Research and Innovation	Cyprus
Society	Kardifis Travel Bureau	Greece
	ACCIONA	Spain
Society	Tuscany Centre of Injuries & Occupational Diseases	Italy
	Age UK	UK
SUPPORTING STAKEHOLDERS		
Policy Advisors	Intergovernmental Panel on Climate Change	Switzerland
	Ministry of Health – Public Health England	UK
Society	Ministry of Environment	Cyprus
	IGW (Institute for Safety & Health of Transport Workers)	Germany
Society	Tuscany Region Health Care System	Italy
	Union of Food, Agricultural, Hotel & Restaurant Workers Associations	Switzerland

Innovation Outcomes: HEAT-SHIELD will produce a series of state-of-the-art innovation outcomes including:

- (i) assessment report on the current occupational health risks due to workplace heat, as well as the likely increasing problems in certain jobs due to climate change;
- (ii) testing of appropriate technical and biophysical solutions to counter the heat-induced risk to workers' health for key EU industries;
- (iii) development of an online open access service anticipating and warning for events that may pose a threat to workers' health;
- (iv) dissemination of guidelines aimed at protecting workers' health, well-being, and productivity among relevant stakeholders;
- (v) assessment of formulated guidelines' effects concerning their health, economic and social benefits and their impact on reducing inequalities.

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