Working on a **WARMER** planet

The impact of heat stress on labour productivity and decent work

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Executive summary

Global warming will make heat stress and extreme weather events more common

Climate projections point towards an increase in the frequency and intensity of extreme weather events, and one result of this trend is the loss of jobs and productivity. The rise in global temperatures caused by climate change will also make the phenomenon of "heat stress" more common. Heat stress refers to heat received in excess of that which the body can tolerate without suffering physiological impairment. Such excess heat increases workers' occupational risks and vulnerability; it can lead to heatstroke and, ultimately, even to death. The proliferation of so-called "urban heat islands", areas of concentrated heat inside cities resulting from growing population numbers and urbanization, will further intensify the impact of heatwaves, aggravating the risks faced by workers. The world of work's response to global warming should include: adaptation policies and actions to protect workers from these conditions; an overall strategy to mitigate climate change and limit further temperature increases; structural reforms to help agricultural workers achieve the transition to other sectors; and measures to prepare for climatic hazards. Equally important is a coherent approach to sustainable economic development.

Heat is an occupational safety and health hazard

Excessive heat during work creates occupational health risks; it restricts a worker's physical functions and capabilities, work capacity and productivity. Temperatures above 24–26°C are associated with reduced labour productivity. At 33–34°C, a worker operating at moderate work intensity loses 50 per cent of his or her work capacity. Exposure to excessive heat levels can lead to heatstroke, sometimes even with a fatal outcome. Workers in all sectors are affected, but certain occupations are especially at risk because they involve more physical effort and/or take place outdoors. Such jobs are typically found in agriculture, environmental goods and services (natural resource management), construction, refuse collection, emergency repair work, transport, tourism and sports. Industrial workers in indoor settings are also at risk if temperature levels inside factories and workshops are not regulated properly. At high heat levels, performing even basic office and desk tasks becomes difficult as mental fatigue sets in.

Heat stress is projected to reduce total working hours worldwide by 2.2 per cent and global GDP by US$2,400 billion in 2030

Projections based on a global temperature rise of 1.5°C by the end of the twenty-first century, and also on labour force trends, suggest that, in 2030, 2.2 per cent of total working hours worldwide will be lost to high temperatures – a productivity loss equivalent to 80 million full-time jobs. This is, however, a conservative estimate because, apart from postulating that the long-term increase in global mean temperature will not exceed 1.5°C, it rests on the assumption that agricultural and construction work is carried out in the shade. This assumption is based partly on the fact that in tropical countries about 40 per cent of days are cloudy, not sunny, and partly on the fact that some tasks, especially in subsistence agriculture, can often be moved to times of the day when it is less hot. If, instead, we assume that agricultural and construction work is carried out in the sun, the projected loss of working hours worldwide in 2030 goes up to 3.8 per cent – the equivalent of 136 million full-time jobs. As global warming continues beyond 2030, greater temperature rises are expected to diminish labour productivity even further.

The economic losses due to heat stress at work were estimated at US$280 billion in 1995; this figure is projected to increase to US$2,400 billion in 2030, with the impact of heat stress being most pronounced in lower-middle- and low-income countries.

Heat stress is more prevalent in countries with decent work deficits

On the whole, the countries that are most affected by heat stress have higher rates of working poverty, informal employment and subsistence agriculture. In addition, disadvantaged and vulnerable population groups and communities – including indigenous and tribal peoples who are dependent on agricultural or coastal livelihoods – are at greater risk of suffering the adverse consequences of rising temperatures. Given that the United Nations 2030 Agenda for Sustainable Development emphasizes the simultaneous achievement of environmental, social and economic goals, it is worth noting that the countries that are expected to be most affected by heat stress are also those with the greatest decent work deficits. A general pattern for most countries is that the greater the number of working hours expected to be lost as a result of heat stress, the lower the coverage of their social protection systems.

The impact of heat stress is unevenly distributed geographically, with the expected reduction in working hours in 2030 amounting to around 5 per cent in both Southern Asia and Western Africa

Some subregions are at a higher risk of suffering the adverse consequences of global warming. Southern Asia and Western Africa are expected to be the worst affected. Under a scenario of 1.5°C global warming by the end of the century, heat stress in these two subregions would lead to the loss of 5.3 per cent and 4.8 per cent of working hours in 2030, corresponding to around 43 million and 9 million full-time jobs, respectively. The European subregions are expected to experience a smaller impact, with their productivity losses projected to be less than 0.1 per cent in all cases. However, in Europe and North America the health, social and economic losses could be substantial during unusually intense heatwaves.

Subregions in tropical and subtropical latitudes are at higher risk of heat stress because of a combination of both extreme temperatures and the high share of agriculture in total employment, a sector particularly exposed to heat stress. These are densely populated geographical areas characterized by high rates of informality and vulnerable employment, making workers there particularly susceptible to rising temperatures.

Agricultural and construction workers are expected to be the worst affected, accounting for 60 per cent and 19 per cent, respectively, of working hours lost to heat stress in 2030

The effects of rising average temperatures are felt differently across occupations and employment sectors. For example, jobs involving high levels of physical exertion or prolonged work outdoors are particularly affected by increasing heat levels. Agricultural and construction workers are expected to be the worst affected. The agricultural sector alone accounted for 83 per cent of global working hours lost to heat stress in 1995 and is projected to account for 60 per cent of such loss in 2030. Further temperature rises will make some agricultural areas unproductive, displacing a large number of workers. Whereas construction accounted for just 6 per cent of global working hours lost to heat stress in 1995, this share is expected to increase to 19 per cent by 2030. Significantly, most of the working hours lost to heat stress in North America, Western Europe, Northern and Southern Europe and in the Arab States are concentrated in the construction sector.

Heat stress exacerbates inequality and contributes to the displacement of people

Labour productivity losses caused by heat stress are concentrated in subregions with already precarious labour market conditions, such as high rates of vulnerable employment and working poverty. Additionally, heat stress is more common in agriculture and construction – two sectors that are characterized by a high level of informality. The challenges of heat stress could widen existing gender gaps in the world of work, notably by making working conditions worse for the many women employed in subsistence agriculture (although, of course, conditions for men working on construction sites would also become more arduous). Heat exposure during work adds to the health and productivity risks faced by pregnant women.

Heat stress may also act as a push factor prompting agricultural workers to leave rural areas in search of better prospects in the cities or in other countries. Although various factors ultimately contribute to the decision to migrate (e.g. inequality, lack of opportunities or social ties, conflicts and other security issues), heat stress is increasingly becoming a driver of international migration. Higher levels of heat stress were associated with higher out-migration in recent years, suggesting households take climate conditions into account in their migration decisions.

The age distribution of populations will be an important determinant of the future of work under conditions of heat stress because, for both women and men, ageing results in changes to the regulation of body temperature. Moreover, people aged over 50 are at greater risk of suffering from cardiovascular diseases. These factors need to be considered in the design of adaptation measures.

For workers and businesses to be able to cope with heat stress, appropriate policies, technological investments and behavioural change are required

Efforts to improve the capacity of workplaces to adapt to rising temperatures are necessary if the goals of the 2030 Agenda are to be achieved. Although governments are instrumental in creating a regulatory and institutional environment that facilitates behavioural change at the workplace level, the role of both employers' and workers' organizations is no less crucial to a successful implementation of adaptation measures. In addition to the enforcement of occupational safety and health standards, appropriate measures are necessary to improve early warning systems for heat events and to ensure that social protection covers the entire population. International labour standards, such as the Occupational Safety and Health Convention, 1981 (No. 155), can help to guide governments when designing national policies to tackle the occupational safety and health hazards associated with heat stress.

A sectoral response to heat stress in agriculture and construction should include technological improvements, skills development and awareness raising

Around 60 per cent of the reduction in working hours projected to take place worldwide in 2030 as a result of heat stress is concentrated in the agricultural sector. Indeed, agriculture is expected to account for more than 90 per cent of the working hours lost in Central and Eastern Africa in that year owing to heat stress. Because of the impact of such productivity losses on the yields of subsistence agriculture and hence on food prices, the consequences would be greater poverty and food insecurity. The long-term options for reducing the impact of heat stress on agriculture include promoting mechanization and skills development in order to ensure higher productivity and food security. Measures for monitoring and raising awareness of local weather conditions, such as those currently being applied in Kenya, can help rural households to adapt to heat stress conditions.

As for the construction sector, smart urban planning could help significantly to mitigate heat stress on construction sites in large cities in the medium and long term. Moreover, specific measures for the monitoring of on-site weather conditions, enhanced information sharing and communication, and technological improvements can enable construction workers and their employers to adapt more effectively to heat stress.

Governments, employers and workers are the primary drivers of change in adaptation to, and mitigation of, the effects of rising temperatures on the world of work

Governments must work together with workers' and employers' organizations, through social dialogue, in designing, implementing and monitoring mitigation and adaptation policies, as recommended in the ILO's 2015 *Guidelines for a just transition towards environmentally sustainable economies and societies for all*. Social dialogue plays a crucial role in the development of national policies, including policies on occupational safety and health. With the help of social dialogue tools, such as collective agreements, employers and workers can design and implement policies for dealing with heat stress that are tailored to the specific needs and realities of their workplace.