International Labour Organization

▶ ILO brief

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Impacts of heat stress on jobs and productivity in Sri Lanka

Climate trends in Sri Lanka over the past three decades

Country Background

With over 22 million inhabitants, Sri Lanka lies in the Indian Ocean, separated from the Indian peninsula by the Gulf of Mannar and the Palk Strait (Fig. 1). The country's legislative capital and largest city is Kotte. The administrative and judicial capital as well as the nation's political and financial centre is Colombo. Sri Lanka has been grappling with a severe economic crisis since 2022 which has led to a sharp contraction of the economy, with GDP declining by approximately 9.5% over 2022 and 2023 due to shortages of essential goods, high inflation, and a steep depreciation of the Sri Lankan Rupee.[i] Agriculture remains a vital sector, employing about a quarter of the workforce and contributing about 8% of GDP.[ii] Industry contributes about 25% of GDP, and about 28% of the labour force is employed in industrial activities.[ii] The services sector is the largest segment of the economy, accounting for 66% of GDP and providing 57% of all jobs.[ii]

Climate

Sri Lanka has a tropical climate characterized by significant regional variation and two primary monsoon seasons: the Maha season, influenced by the northeast monsoon (September to March), and the Yala season, associated with the southwest monsoon (May to August).[iii] With an average temperature of around 27-28°C, Sri Lanka ranks among the hottest countries globally. It experiences elevated average maximum temperature and Wet-Bulb Globe Temperature (WBGT)[iv] during much of the year, particularly during the second (April-June) quarter (Fig. 2). While the country's central highlands tend to be cooler, the coastal lowlands frequently experience conditions above 30°C, with WBGT values often exceeding 33°C in the south-west, the area where the capital, Colombo, is located. This is caused largely from strong solar radiation, high humidity, and consistently warm air masses, creating conditions conducive to higher heat stress.

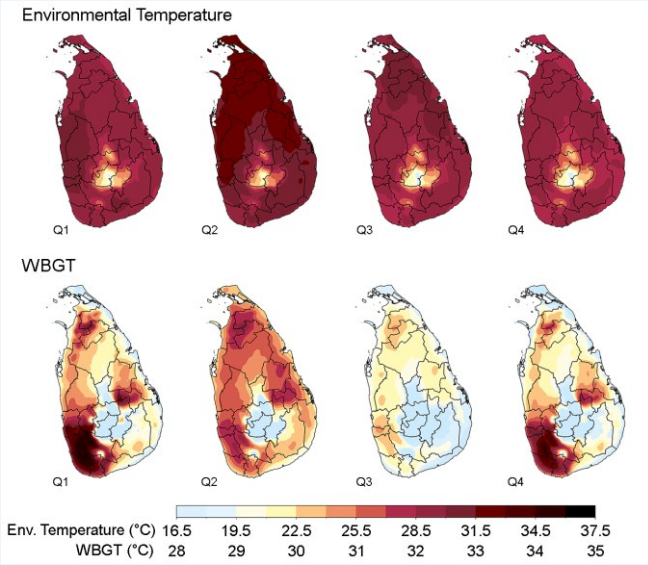
Figure 1. Sri Lanka physical map.[1]



▶ **Temperature vs. WBGT:** While many regions show high heat in both sets of maps, the WBGT maps show particularly high values in the south-west regions during Q1 and Q4. This highlights that humidity and solar radiation, in addition to air temperature, significantly raise heat stress risks.

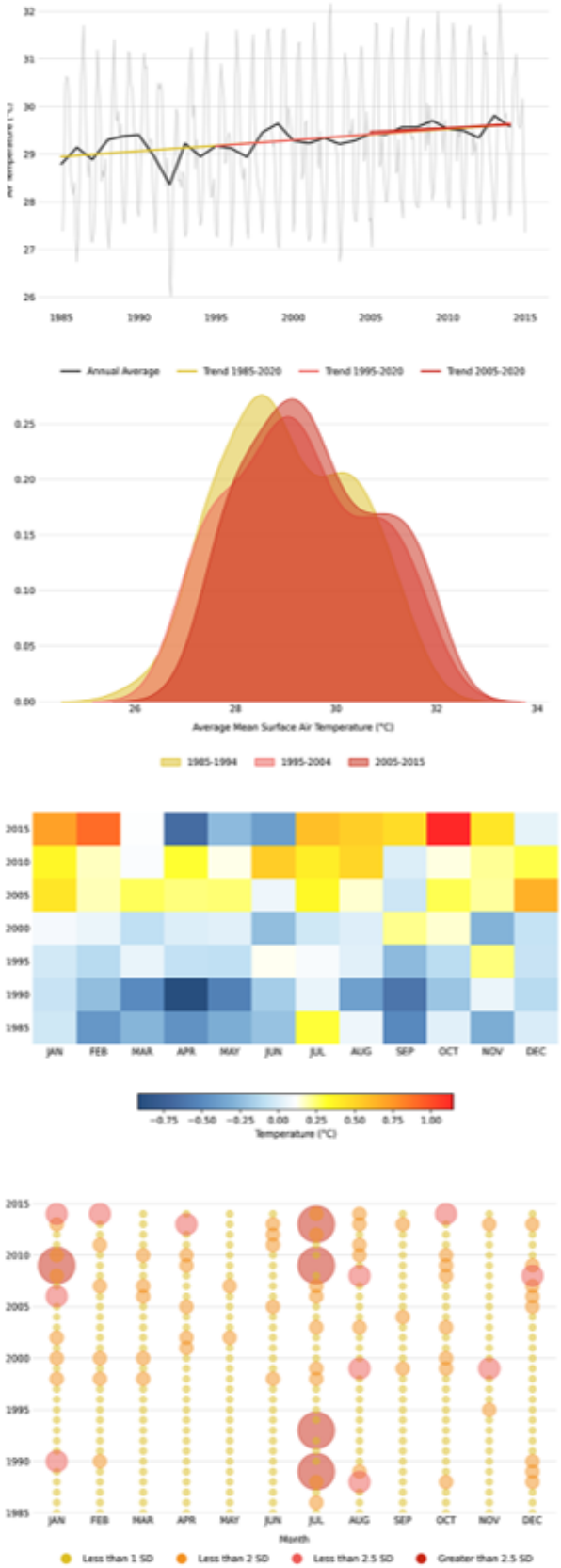
▶ **Policy Implications:** Relying solely on ambient temperature data may understate heat risks, particularly in south-western Sri Lanka where Colombo is located. Employing WBGT as a heat assessment measure can provide a more accurate foundation for developing occupational safety guidelines, especially in labour-intensive sectors such as agriculture, construction, and transport.

Figure 2. Quarterly average maximum environmental temperature (top) and WBGT (bottom) across Sri Lanka during the reference historical period (1985-2014).



Climate data covering the last three decades show a clear and accelerating warming trend in Sri Lanka; warming has intensified, particularly in the period 2010-2014, while the frequency and intensity of extreme temperature events are increasing (Fig. 3).

Figure 3. Climatological trends in Sri Lanka during 1985-2015: average daily mean environmental temperature trends (first and third graphs); change in distribution of average mean environmental temperature (second graph); change in intensity of extreme daily maximum temperature events (fourth graph).



In compliance Sri Lanka's mean temperature has risen by ~1°C since the 1960s, while rainfall patterns have become more erratic. The main impacts on key industries are:

- **Agriculture:** Agriculture employs about a quarter of the workforce and contributes about 8% of GDP.[ii] Primarily rain-fed, it is vulnerable to shifting rainfall and heat, which can lower yields and cause periodic floods, destroying crops and displacing communities.[iii]
- **Fisheries:** This sector directly and indirectly supports about 3.6 million people (17% of the population).[iii] Warming ocean temperatures and coral reef degradation affect fish breeding grounds and stocks, potentially reducing catches available to fishers.[iii]
- **Manufacturing:** This sector contributes about 25% of GDP.[ii] Extreme weather and power shortfalls undermine manufacturing output, which relies on inputs from agriculture and mining as well as robust infrastructure.
- **Tourism:** A large portion of Sri Lanka's tourism is nature-based, which is sensitive to climate conditions. Heatwaves, beach erosion and unpredictable rainfall strain tourism.

Future heat exposure and impacts on productivity

To understand how future heat conditions might affect working people in Sri Lanka, this analysis uses four "storylines" known as Shared Socioeconomic Pathways (SSPs). These scenarios were used by the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report[v] to describe how different levels of greenhouse gas emissions might impact our world. In simple terms, they help us imagine a range of possible futures: from a sustainable world with clean energy (SSP1-2.6) to one that continues heavy use of fossil fuels (SSP5-8.5).

By considering these global SSPs, Sri Lankan policymakers can better understand the potential risks and opportunities that different climate futures may bring. For instance, adopting policies aligned with a more sustainable scenario (e.g., SSP1-2.6) could help mitigate the severity of heat stress, protect worker health, and reduce economic losses from reduced productivity. Conversely, inaction or insufficient adaptation measures (e.g., SSP5-8.5) might expose Sri Lanka to extreme heat conditions, with significant repercussions for labour productivity and overall economic resilience. In essence, the global SSPs enable Sri Lanka to tailor its climate adaptation and economic policies to protect its citizens and secure a more stable, sustainable future.

Table 1. Characteristics of the global SSPs used in the present study.

SSP	Scenario	Estimated warming (2041-2060)	Estimated warming (2081-2100)	Very likely range in °C (2081-2100)
SSP1-2.6 (Sustainability Pathway)	**Low GHG emissions** CO_2 emissions cut to net zero around 2075	1.7	1.8	1.3 – 2.4
SSP2-4.5 (Middle of the Road Pathway)	**Intermediate GHG emissions** CO_2 emissions around current levels until 2050, then falling but not reaching net zero by 2100	2.0	2.7	2.1 – 3.5
SSP3-7.0 (Regional Rivalry Pathway)	**High GHG emissions** CO_2 emissions double by 2100	2.1	3.6	2.8 – 4.6
SSP5-8.5 (Fossil-fueled Development Pathway)	**Very high GHG emissions** CO_2 emissions triple by 2075	2.4	4.4	3.3 – 5.7

Key: GHG = greenhouse gas.

Future Heat Exposure

The analyses conducted in the main part of the report indicate that Sri Lanka is projected to experience a significant rise in both ambient temperature and WBGT

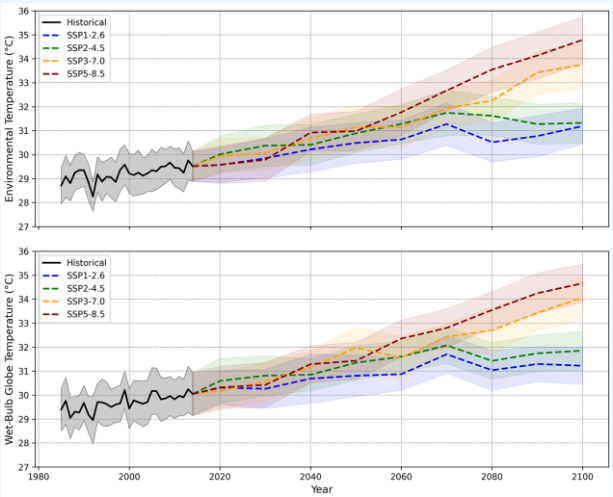
compared to historical conditions (1985-2014). Even the lower-emission scenarios (SSP1-2.6 and SSP2-4.5) suggest warming of 2°C for maximum temperature, while the highest emission pathways (SSP3-7.0 and SSP5-8.5) indicate increases of up to 6°C by late century. The WBGT trends follow a similar pattern, with low-emission trajectories adding around 2°C by 2100 and high-emission pathways reaching as high as 5°C, denoting severe heat stress.

These projections emphasize that the level of warming that Sri Lanka will face depends largely on global emissions and that more ambitious mitigation leads to less severe impacts. But, even lower-emission scenarios (SSP1-2.6 and SSP2-4.5) pose a substantial risk to health and labour productivity, necessitating the adoption of adaptation measures and strategies to protect workers from rising heat.

Future climate in Sri Lanka

Across all SSPs, the analyses for Sri Lanka suggest a clear warming trend, with varying degrees of severity depending on the scenario (Fig. 4). Even in the most optimistic scenarios (SSP1-2.6 and SSP2-4.5), Sri Lanka will face increases of 2°C. The high emission scenarios (SSP3-7.0 and SSP5-8.5) suggest more significant warming of up to 6°C. Without effective adaptation strategies, these would lead to significant health impacts and severely reduce the capacity to perform manual labour.

Figure 4. Average maximum environmental temperature (top) and WBGT (bottom) with 95% confidence intervals across the different SSPs in Sri Lanka.



Productivity loss due to rising heat stress from climate change

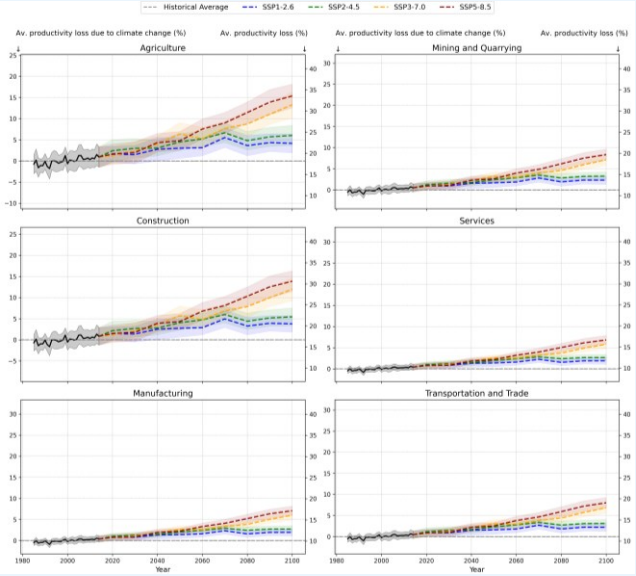
The physical effort required for high-intensity work naturally increases the body temperature and produces metabolic heat.[vi,vii] When this internal heat generation combines with external (environmental) heat stress, the body's cooling mechanisms can be overwhelmed.[vii] Workers engaged in physical work are, therefore, at a greater risk of experiencing the negative effects of heat.[viii] As the body becomes stressed by the combined internal and external heat loads, it responds by slowing down work pace as a protective mechanism. This slowdown can lead to significant loss of labour productivity.[ix,x,xi]

Reduced labour productivity under high heat stress is not only a matter of slower movement; it also includes reduced work output, and increased error rates. This occurs because workers must take more frequent breaks, reduce their pace, or even stop working to avoid heat-related health risks.[ix,x,xi] The cumulative effect of these adjustments is a measurable loss in productivity, as well as increased risks of accidents and long-term health impacts.[ix,x,xi] This also has particular implications for workers in the informal economy, as well as for micro, small and medium enterprises, which often have limited adaptation capacities.[xii]

The analysis of productivity loss due to rising heat stress from climate change is illustrated in Fig. 5 (for the average, experienced, and acclimatized worker performing their typical shift). In agriculture and construction, productivity loss due to heat stress fluctuated between 15% and 18%, during the historical period. Under SSP1-2.6 and SSP2-4.5, climate change is expected to further increase productivity loss by 4-6% by 2100, reflecting milder impacts due to climate change mitigation. Under SSP3-7.0 and SSP5-8.5, climate change will lead to further increases in productivity loss compared to the average year of the reference historical period, which will be as large as 15% toward the end of the century. Agriculture and construction are thereby particularly vulnerable sectors to productivity loss due to climate change. In manufacturing, mining and quarrying, services, as well as transportation and trade, productivity loss due to heat stress remained stable at about 10% to 12% during the historical period. Under SSP1-2.6 and SSP2-4.5, climate change is anticipated to further increase productivity loss by 3-4% by the end of the century. This will be higher under SSP3-7.0 and SSP5-8.5, resulting in additional productivity loss of up to 8% in these scenarios

by 2100, compared to the average year within the reference period.

Figure 5. Average productivity loss in Sri Lanka during the reference historical period (1985-2014) and until 2100 across the different SSPs. Vertical axes in each graph show productivity loss in a given year (right hand side axis) and productivity loss due to climate change, calculated as a change from the baseline historical period 1985-2014 (left hand side axis). Shaded areas represent 95% confidence intervals.



The key findings of this analysis are as follows:

- **Vulnerability is unequal:** agriculture and construction show the highest productivity losses due to rising heat stress from climate change, reaching as high as 15% by the end of the century in the worst-case scenario. Manufacturing, mining and quarrying, services, transportation, and trade are also heavily impacted, but at a lesser degree.
- **Scenario divergence:** This under more optimistic scenarios (SSP1-2.6, SSP2-4.5), productivity losses remain relatively low across all intensity levels. However, in scenarios where climate action is delayed or absent (SSP3-7.0, SSP5-8.5), productivity losses increase significantly, particularly for high-intensity work.
- **Long-term trends:** This regardless of the SSP, productivity losses generally increase towards the latter half of the century, reflecting the long-term effects of climate change on productivity in Sri Lanka.

Economic and labour market impacts of climate change

Current Economic Impacts

Economic production relies on the total available work hours, and when those hours diminish due to rising heat stress from climate change, the overall contribution of the workforce to production is reduced.[ix,x,xi] Thus, climate change affects not only individual workers but also has far-reaching implications for national economies. When workers are exposed to higher levels of heat due to climate change, they tend to slow down, take more frequent breaks, or may even be unable to work at all – all of which reduce productivity.[ix,x,xi] This reduction in labour input directly translates into lower economic output, which is reflected in a decrease in GDP.[ix,x,xi]

The economic impacts of rising heat stress due to climate change in Sri Lanka are significant. The country lost 6.5 billion USD more from heat stress in 2023 compared to the average year during the reference historical period (1985-2014) (Table 2). The added GDP losses in the services as well as the transport and trade sectors far outweigh those from all other sectors, representing 41.9% and 19.3% of the climate change-induced GDP losses, respectively.

Table 2. Change in the contribution of each sector to GDP due to rising workplace heat stress caused by climate change, between 2023 and the reference historical period 1985-2014.

Sector	Change in GDP (million USD) *	Change in GDP (distribution; %)
Agriculture	-749.6	11.5
Construction	-654.5	10.0
Manufacturing	-920.2	14.1
Mining and Quarrying	-211.4	3.2
Services	-2,729.2	41.9
Transport and Trade	-1,254.9	19.3
Total GDP change	-6,519.7	

* million USD (fixed 2015 prices), with negative values indicating a GDP reduction compared to the baseline historical period 1985-2014.

The regional distribution of the impact of rising workplace heat stress due to climate change on each sector of economic activity is illustrated geographically in Fig. 6. The map shows that climate change impacts on GDP are particularly high in the capital, Colombo, and the surrounding region. This reflects the high concentration of economic activities and formal-sector employment in the south-western coastal zone, where service industries, manufacturing, and commerce are clustered. Because these activities are especially vulnerable to productivity declines due to workplace heat, this area experiences a more pronounced impact on output. In contrast, other parts of the island incur relatively smaller absolute losses, partly because of more dispersed populations and a predominance of less industrialized or lower-density economic environments. The key findings are as follows:

- **Agriculture** losses are spread across the dry-zone lowlands and the interior surrounding the mountainous region of Sri Lanka, suggesting that heat-related productivity declines are intensified in relatively dry, crop-dependent regions.
- **Mining and quarrying,** though smaller in its overall economic footprint, shows local clusters of heightened losses wherever extractive activities are concentrated, reflecting how labour-intensive tasks in open pit or underground operations are strongly affected by elevated heat.
- **Services, manufacturing, transport and trade, as well as construction** show the highest climate change impacts in the coastal districts to the south-west, underlining the economic significance of the Colombo-Gampaha industrial corridor and the pronounced effect of heat stress on service- as well as factory-based employment as well as key transport corridors and hubs.

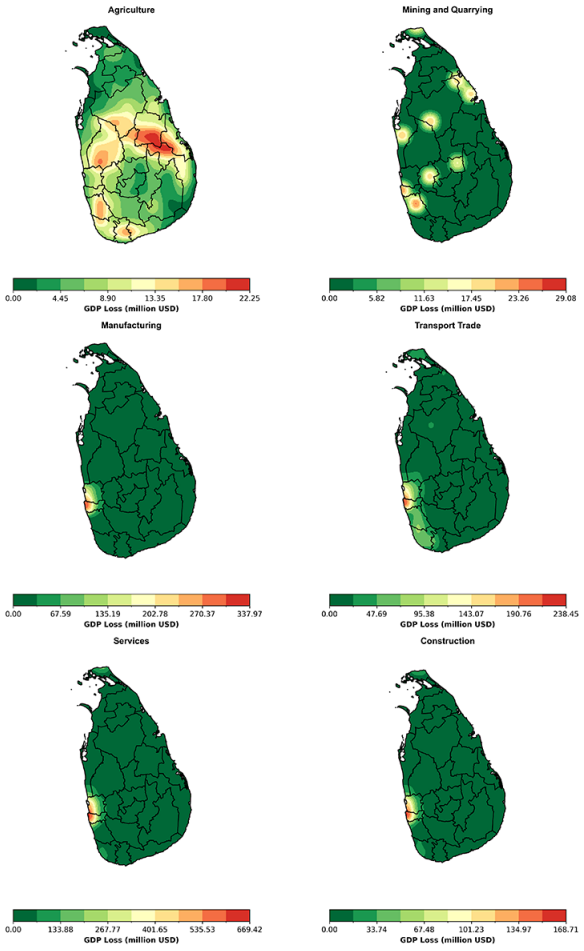


Figure 6: GDP loss across Sri Lanka due to rising workplace heat stress caused by climate change, between 2023 and the baseline historical period 1985-2014, in each sector of economic activity.

Current Labour Market Impacts

The impact of rising heat stress from climate change on Sri Lanka's labour market is sig-nificant, with varying degrees of productivity and jobs lost across all key economic sectors:

- **Over 120,000 more full-time jobs were lost** due to workplace heat stress during 2023 compared to the average year during the historical period.
- Overall, **35% of the jobs lost** occurred during the 2nd quarter, reflecting a seasonal pattern where the highest impacts occur during the period of most intense heat.

- Climate change impacts are industry-specific. The full-time jobs lost were:
  - **48% in agriculture**
  - **22% in services**
  - **13% in manufacturing**
  - **11% in construction**
  - **6% in transport and trade.**

- These results highlight the urgent need for adaptive policies, such as regulated work-rest cycles, access to cooling measures, and the integration of heat mitigation into occupational safety standards, to safeguard worker productivity and health in Sri Lanka.

Table 3: Annual impact of rising heat stress due to climate change on full-time equivalent jobs lost (proxied from work hours lost) in each sector of economic activity and across the entire economy in Sri Lanka, calculated as the change between 2023 and the reference historical period 1985-2014.

Sector	Available Work Hours (n)	Change in Work Hours (n)	(% FTE)	Change in Jobs (FTE)
Agriculture	4,275,384,583	-114,803,962	-2.69	-57,230
Construction	1,139,534,537	-26,387,496	-2.32	-13,154
Manufacturing	2,705,859,000	-30,442,576	-1.13	-15,176
Mining and Quarrying	107,859,291	-1,367,105	-1.27	-682
Services	5,491,230,531	-53,216,709	-0.97	-26,529
Transport and Trade	1,161,105,994	-15,104,068	-1.30	-7,529
TOTAL	14,880,973,937	-241,321,916	-1.62	-120,300

n: number; FTE: full-time equivalent.

Future Economic and Labour Market Impacts

Sri Lanka's macro-economic exposure to rising workplace heat stress is set to intensify between 2040 and 2060, with outcomes highly sensitive to global emissions scenarios (Table 4). Even on a Paris-aligned trajectory (SSP1-2.6), heat-related productivity losses will reduce GDP by about 11.8% and 13.0% more in 2040 and 2060, respectively, relative to the losses during the average year within the 1985-2014 baseline. This is equal to an annual loss of 26 billion USD in 2040 and 65.6 billion USD in 2060. Under a "middle-of-the-road" scenario (SSP2-4.5), the contraction deepens from 11.5% (21.1 billion USD) in 2040 to 13.7% (51.7 billion USD) in 2060, while a regional-rivalry world (SSP3-7.0) will drastically increase the burden to 13.5% by 2060. Given the slow economic growth foreseen in SSP3 (see Section 2.4.2), this higher per cent loss is equal to 37.3 billion USD. Should fossil-fuel development continue unabated (SSP5-8.5), rising workplace heat stress could cut 15.2% (87.1 billion USD) off annual national output by 2060, eliminating the cumulative GDP value of several medium-sized manufacturing subsectors.

The projected labour market impacts attributable to heat stress rise from climate change will grow markedly with the global emissions trajectory and become substantial for Sri Lanka by 2040 (Table 5). Relative to the 1985-2014 baseline, the economy will lose the equivalent of 145,000 full-time jobs under a low-emissions pathway (SSP1-2.6). The losses rise to 161,000 full-time jobs under SSP2-4.5 and reach 210,000-220,000 under the high-emissions scenarios (SSP3-7.0 and SSP5-8.5). In proportional terms this represents a 1.9% contraction in total labour force under the most optimistic scenario and 2.8% under unabated fossil-fuel development.

By 2060, the rise in heat stress driven by climate change will remove the equivalent of 158,000-349,000 full-time jobs from Sri Lanka's economy each year, depending on the global emissions pathway (Table 5). Under the Paris-consistent trajectory (SSP1-2.6), Sri Lanka will lose 158,000 full-time jobs, or 2.1% of total labour force. The toll rises to over 272,000 full-time jobs under SSP2-4.5, 314,000 under SSP3-7.0, and peaks at nearly 349,000 under SSP5-8.5, where heat cuts more than 4.6% of total work hours.

Table 4. Annual impact of rising workplace heat stress caused by climate change on GDP in Sri Lanka during 2040 and 2060 across different SSPs, compared to the historical period 1985-2014.

	Change in GDP			
	2040		2060	
	*(M USD)**	*(%)*	*(M USD)**	*(%)*
SSP1-2.6	-26,068.0	-11.78	-65,556.4	-12.96
SSP2-4.5	-21,096.8	-11.47	-51,731.2	-13.67
SSP3-7.0	-19,425.2	-11.79	-37,248.8	-13.53
SSP5-8.5	-30,164.6	-12.59	-87,076.6	-15.19

*million USD (fixed 2015 prices), with negative values indicating a GDP reduction compared to the baseline historical period 1985-2014.

Table 5. Annual impact of rising heat stress during 2040 and 2060 due to climate change on full-time equivalent jobs lost across different SSPs, calculated as the change from the historical period 1985-2014.

Scenario	Period	Change in Work Hours (n)	Change in Work Hours (% FTE)	Change in Jobs (FTE)
SSP1-2.6	2040	-290,070,261	-1.91	-144,601
	2060	-317,547,276	-2.09	-158,299
SSP2-4.5	2040	-323,048,733	-2.13	-161,041
	2060	-546,447,749	-3.60	-272,407
SSP3-7.0	2040	-443,465,024	-2.93	-221,069
	2060	-629,258,204	-4.15	-313,688
SSP5-8.5	2040	-419,118,029	-2.76	-208,932
	2060	-699,455,936	-4.61	-348,682

SSP: shared socioeconomic pathway; n: number; FTE: full-time equivalent.

Key recommendations per sector

Rising heat stress is already undermining worker health, productivity, and overall economic resilience in Sri Lanka. In light of the evidence presented in this analysis, it is imperative to adopt sector-specific adaptation strategies that not only protect workers but also support continued economic activity. The following recommendations outline targeted measures for each key economic sector, integrating the sector-specific vulnerabilities in this analysis with practical, evidence-based adaptation strategies, ensuring that policy-makers and stakeholders have clear guidance on protecting workers and supporting economic stability in the face of rising workplace heat stress. Importantly, these recommendations should be applied in addition to – not in place of – the general occupational safety and health protection framework for heat stress recommended by the ILO.[xii] A comprehensive list of recommendations is available in the main text of the country study.

Agriculture: In agriculture, where the majority of work is performed outdoors and workers are directly exposed to the sun and natural environment, adaptation strategies must focus on minimizing heat exposure. Adjusting work schedules to avoid the hottest parts of the day is essential, alongside implementing on-site measures such as the installation of shade structures, provision of adequate hydration, and cooling stations. Additionally, adapting crop management practices by shifting planting cycles and choosing heat-tolerant crop varieties can reduce the vulnerability of agricultural production to extreme heat. Worker training on recognizing the signs of heat stress and on implementing first-aid measures further enhances resilience in this critical sector.

Construction: Construction work is characterized by intense physical labour and significant exposure to outdoor heat. To protect construction workers, employers should consider rescheduling work to cooler periods, such as early mornings or late afternoons, and enforcing regular, scheduled breaks during the day. The deployment of portable shading, misting systems, and on-site hydration stations is critical to reducing heat exposure. Engineering controls, such as using reflective materials or temporary insulation, can further mitigate the thermal load on construction sites. In addition, worker acclimatization programs and ongoing risk assessments are vital to ensure that adaptation measures remain effective as environmental conditions evolve.

Manufacturing: Manufacturing facilities, whether operating indoors or in partially exposed environments, must address both process-generated and environmental heat. Enhancing indoor climate control through improved ventilation and energy-efficient air conditioning systems is a key priority. Implementing structured work-rest cycles and staggered shifts can help manage cumulative heat exposure. In addition, installing real-time monitoring systems to track WBGT levels enables a proactive response to emerging heat stress risks. Employee education and training on the importance of hydration and heat stress symptom recognition can further support a healthier and more productive workforce.

Mining and Quarrying: For mining and quarrying operations, which often occur in environments with high ambient temperatures or in confined underground spaces, robust environmental controls are crucial. Recommendations include upgrading ventilation and cooling systems to maintain safer working conditions, as well as scheduling operations to reduce exposure during peak heat periods. Establishing mandatory rest breaks with access to cooled rest areas can help mitigate the physiological strain experienced by workers. Regular monitoring of WBGT, paired with comprehensive risk assessments, will ensure that protective measures are effectively tailored to fluctuating conditions. Where feasible, increased mechanization may reduce the need for direct human exposure to hazardous thermal conditions.

Services: Although the formal services sector is predominantly indoor, many subsectors (including retail, hospitality, and tourism) and the large informal street vendors are vulnerable to environmental and work-related heat stress. Especially in facilities with inadequate climate control or in areas where outdoor work is required heat stress reduces productivity. Employers should consider fitting workplaces with efficient cooling and ventilation systems, to ensure that indoor temperatures remain within safe limits during heat waves. Social protection programs for informal service sector jobs, notably street vendors, small outdoor shops, and hawkers, are required to allow workers to shift work hours, protect lost income, and potentially search for less exposed job opportunities. Flexible scheduling and remote work options can also help mitigate risks for employees, particularly those performing heat-vulnerable jobs/tasks. In addition, service providers are encouraged to develop contingency plans and to conduct regular training and awareness campaigns about the risks of workplace heat stress. Such measures not only protect worker health but also support uninterrupted service delivery during periods of extreme heat.

Transportation and Trade: The transportation and trade sector, which encompasses both outdoor activities and logistics operations, faces unique challenges from heat stress. It is recommended that work schedules be modified to avoid extreme heat, with the establishment of climate-controlled rest areas and loading docks. Equipping drivers and logistics personnel with cooling equipment and appropriate personal protective gear is essential. Moreover, infrastructural improvements, such as installing shading and misting systems at key transport hubs, can reduce heat exposure and maintain the efficiency of supply chains. These measures are critical to ensuring that the sector's operational continuity is not compromised by rising heat levels.

Collectively, the above recommendations provide a framework for tailoring climate adaptation measures to the unique challenges and opportunities within each economic sector. By implementing these strategies, Sri Lanka can protect its workforce, sustain productivity, and enhance the resilience of its economy in the face of a warming climate.

This factsheet is based on a study (Impacts of heat stress on jobs and productivity in Sri Lanka: Quantitative and qualitative employment estimates for evidence-based decision-making) commissioned by the ILO with support from the Climate Vulnerable Forum and the Vulnerable 20 Finance Ministers (CVF–V20), and with funding provided through the CVF–V20 Joint Multi-Donor Fund.

The study is authored by Andreas D. Flouris, Leonidas G. Ioannou and Konstantinos Mantzios.

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Contact details
International Labour Organization
Route des Morillons 4
CH-1211 Geneva 22
Switzerland

E: justtransition@ilo.org

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