Mitigating Heat Stress in the Garment, Footwear, and Travel Goods Sector

Sustainability Recommendation Paper

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BetterFactories Cambodia

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Cornell University Founded A.D. 1865

ILR Global Labor Institute

TAFTAC Textile, Apparel, Footwear & Travel Goods Association in Cambodia

Responsible Business Hub Cambodia RBH Network

EUROCHAM CAMBODIA

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On behalf of
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Phnom Penh, 2026

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Acronyms

AMPH2012	Administrative Measures on Heatstroke Prevention, China, 2012
APHEDA	Union Aid Abroad – APHEDA
BFC	Better Factories Cambodia
BMZ	German Federal Ministry for Economic Cooperation and Development
C. CAWDU	Coalition of Cambodian Apparel Workers' Democratic Union
CARE	CARE Cambodia
CBA	Collective Bargaining Agreement
CGTI	Cambodian Garment Training Institute
CSDDD	Corporate Sustainability Due Diligence Directive
CSRD	Corporate Sustainability Reporting Directive
DOSH	Department of Occupational Safety and Health
ETI	Ethical Trading Initiative
EU	European Union
EuroCham	European Chamber of Commerce in Cambodia
FLA	Fair Labor Association
GFT	Garment, footwear and travel goods
GHHIN	Global Heat Health Information Network
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
GLI	Global Labor Institute
HR	Human Resources
HREDD	Human Rights and Environmental Due Diligence
HRPC	Heat Resilience & Performance Centre
IFC	International Finance Corporation
ILO	International Labour Organization
IoT	Internet of Things
ITC	Institute of Technology of Cambodia

MLVT	Ministry of Labour and Vocational Training
MLMUPC	Ministry of Land Management, Urban Planning, and Construction
MOH	Ministry of Health
NCR	National Capital Region
NOAA	National Oceanic and Atmospheric Administration
NSSF	National Social Security Fund
NUS	National University of Singapore
OSH	Occupational Safety and Health
PAGE	Partnership for Action on Green Economy
PPE	Personal protective equipment
PVH	PVH Corp.
QCVN	National Technical Regulation, Viet Nam
RBH	Responsible Business Hub
RISE	Reimagining Industry to Support Equality
SRP	Sustainability Recommendation Paper
TAFTAC	Textile, Apparel, Footwear & Travel Goods Association in Cambodia
ToT	Training of Trainers
USD	United States dollar
VF	VF Corporation
WBGT	Wet Bulb Globe Temperature
WE House	Women Empowerment House
WHO	World Health Organization
WMO	World Meteorological Organization

Sustainability Recommendation Paper on Heat Stress in the Garment, Footwear and Travel Goods (GFT) Sector

Disclaimer

This Sustainability Recommendation Paper is intended for information and discussion only. It draws on available evidence, stakeholder consultations, and emerging good practices on occupational heat stress in Cambodia's garment, footwear and travel goods sector.

The findings and recommendations do not necessarily represent the official position of all consulted stakeholders, participating organisations or organisations whose logos appear in this publication. This paper does not create legal obligations and should not be treated as legal, medical, occupational health, engineering or investment advice. As evidence, regulation and climate conditions evolve, the content may change in future updates.

Key Findings from January Stakeholder Consultations

1. **Heat exposure is rising quickly.** Phnom Penh and Ho Chi Minh City have seen some of the sharpest increases in days above 35°C among major apparel production centres. This places Cambodia among the production hubs most exposed to worsening heat risks.
2. **Indoor factory heat remains widespread.** BFC data show that high indoor temperatures are common even when the ten-year trend in violations is slightly downward. In many factories, indoor temperatures exceed both the 32°C threshold and concurrent outdoor temperatures.
3. **Heat stress is both a health and productivity issue.** Heat exposure can cause fatigue, dehydration, headaches, fainting, heat exhaustion, and heat stroke. It can also reduce concentration, increase absenteeism, raise accident risks, and lower output, especially where production pressure limits rest and hydration.
4. **Knowledge gaps remain across the sector.** Workers may not always connect symptoms to heat stress. Employers may have fans or cooling systems but lack risk assessments, maintenance systems, monitoring protocols or heat-response plans. Institutions are still developing the tools needed to regulate and enforce heat protection systematically.
5. **Factories need scalable solutions.** Low-cost measures such as water access, ventilation, fans, shaded rest areas, maintenance and adjusted breaks can be implemented quickly. Larger investments such as roof insulation, evaporative cooling, water curtains, sensors, and building retrofits require capital, planning, and buyer support.
6. **Worker participation is essential.** Workers know where heat accumulates, where airflow is weak, where equipment fails and where uniforms or production systems increase risk. Heat management will be more effective if unions, shop stewards, and OSH committees are involved in monitoring, reporting and remediation.
7. **Brands and buyers are part of the solution.** Buyer requirements shape factory compliance systems, production timelines and investment incentives. Fragmented buyer standards risk creating confusion and duplication. Harmonised expectations, responsible sourcing practices and co-financing for mitigation can accelerate change.
8. **Government policy is moving in the right direction.** The forthcoming OSH Law and the possible revision of Prakas 147 create an important opportunity to introduce clearer heat stress rules, including WBGT-based thresholds, work-rest protocols, inspection tools, incident reporting, and NSSF recognition of heat-related illnesses where linked to workplace exposure.

Executive Summary

Heat stress is no longer a future climate risk for Cambodia's garment, footwear and travel goods (GFT) sector. It is already affecting factory conditions, worker wellbeing, and productivity – and has the potential to impact the sector's longer-term competitiveness.

Phnom Penh's average annual number of days above 35°C increased from 35 days in 2005-2009 to 112 days in 2020-2024. Better Factories Cambodia (BFC) assessment data also show that 82 percent of factories recorded indoor temperatures above the programme's 32°C threshold in their hottest production areas, while one in three factories experienced days above 35°C indoors.

This matters because the GFT sector remains central to Cambodia's economy. It employs nearly one million workers, most of whom are women, supports millions more through wages, remittances and local supply chains, and generated USD 15.7 billion in export revenue in 2025. Heat exposure therefore affects garment workers at scale, particularly those in physically demanding roles and those wearing heat-retaining clothing or protective equipment. It is also especially relevant for a predominantly female workforce, as pregnant workers and workers with long commutes or unpaid care responsibilities may have less time to rest, rehydrate and recover outside working hours.

The paper shows that Cambodia is not starting from zero. The Labour Law, Prakas 147 on Thermal Environment at the Workplace, existing Occupational Safety and Health (OSH) provisions, Better Factories Cambodia assessments, Ministry of Labour and Vocational Training (MLVT) inspection functions, factory-level initiatives, buyer codes of conduct, and development partner programmes already provide a foundation for action. However, current efforts remain fragmented. Cambodia does not yet have a clear, enforceable, sector-wide heat stress framework based on consistent measurement, thresholds, prevention protocols, worker participation, and remediation.

Summary Recommendations

The findings in this Sustainability Recommendation Paper lead to the following recommendations, which we respectfully make to (and in consultation with) the below stakeholders:

1. For the Royaaal Government of Cambodia

- **Pilot and scale heat stress measurement** across a representative sample of GFT factories, using the results to build a sector-wide baseline.
- **Revise Prakas 147 and establish heat-specific OSH standards**, including Wet Bulb Globe Temperature (WBGT)-based thresholds, work-rest protocols, worker participation, incident reporting, and remediation timelines.
- **Recognise heat-related illness in workplace protection systems**, including eligibility for National Social Security Fund (NSSF) coverage where illness is caused or aggravated by workplace heat exposure.
- **Strengthen labour inspection capacity** by equipping inspectors with WBGT meters and integrating heat risks into routine factory inspections.
- **Develop a national heat monitoring and research system**, linking factory-level heat data with meteorological data to identify dangerous heat days and guide prevention.
- **Expand heat-health awareness and training**, delivered in Khmer and accessible formats through BFC, Cambodian Garment Training Institute (CGTI), union networks, and relevant public institutions.
- **Promote heat-resilient factory design**, including passive cooling, roof insulation, ventilation, heat-reflective materials, and stronger oversight of industrial building permits.

2. For Factories

- **Conduct heat risk assessments** using WBGT measurements during the hottest months and across high-risk production areas.
- **Develop written heat stress management plans**, reviewed annually and after serious heat-related incidents.
- **Invest in practical engineering controls**, including fans, ventilation, evaporative cooling, water curtains, roof insulation, and targeted cooling for high-exposure areas.
- **Apply administrative controls**, including adjusted work schedules, rest-cool-water breaks, buddy systems, and acclimatisation protocols for new and returning workers.
- **Ensure immediate compliance on water and basic safety**, including free access to cool drinking water near workstations and shaded or cooled rest areas.
- **Install and maintain heat monitoring systems**, with records made available to labour inspectors and buyers where appropriate.
- **Engage unions, shop stewards, and OSH committees** in heat monitoring, reporting and remediation.
- **Integrate heat protections into Human Resources (HR) and OSH policies**, including sick leave, accommodation for vulnerable workers and protection against retaliation.

3. For Buyers

- **Integrate heat stress further into supplier codes of conduct, audits, and remediation systems**, aligned with Cambodia's OSH framework once enacted.
- **Attempt to harmonise heat-related requirements across buyers**, reducing duplication and confusion for suppliers.
- **Co-finance heat mitigation measures** where needed, particularly for strategic suppliers and factories facing high retrofitting costs.
- **Provide technical support to suppliers**, including guidance materials, engineering expertise, peer learning, and data analysis.
- **Review sourcing practices that may increase heat risk**, including short lead times, last-minute order changes, and production pressure during peak hot-season months.
- **Make public commitments to heat-safe sourcing**, with measurable targets, timelines, and progress reporting.

4. For Worker Organisations and Civil Society

- **Make heat stress a standing issue in social dialogue**, including collective bargaining, factory-level discussions, and OSH committees.
- **Train worker representatives on heat risks**, including symptoms, prevention, reporting channels, and engagement with management.
- **Provide accessible worker information in Khmer**, adapted for low-literacy and gender-specific needs, including through digital tools where useful.
- **Advocate for enforceable heat stress provisions** in the OSH law, Prakas, and related regulations.
- **Document worker experiences, near-misses and heat-related illnesses**, including incidents that factories may not formally record.
- **Bring vulnerable workers' voices into sector platforms**, especially women workers, pregnant workers, workers in high-exposure roles, and workers in non-brand-facing factories.

5. For Development Partners and Sector Institutions

- **Support practical implementation tools**, including model heat stress policies, training modules, factory checklists, and worker communication materials.
- **Support buyer coordination**, including a harmonised heat assessment protocol for social compliance audits.
- **Support factory pilots**, especially those testing sensors, cooling investments, adjusted work-rest schedules, and worker reporting systems.
- **Help mobilise financing pathways** for factory-level heat mitigation, including co-financing models involving buyers, factories, government, and development partners.
- **Use existing platforms** such as BFC, Textile, Apparel, Footwear & Travel Goods Association in Cambodia (TAFTAC), CGTI, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, International Labour Organization (ILO), and Responsible Business Hub (RBH) to align standards, share lessons, and avoid fragmented initiatives.

Way Forward

Heat stress is a shared risk and a shared responsibility. Regulation alone will not solve it. Nor will isolated factory pilots or individual brand initiatives. Cambodia needs a coordinated sector response built around measurement, prevention, worker participation, buyer alignment, and practical factory support.

The opportunity is clear. By acting early, Cambodia can protect workers, reduce productivity losses, strengthen compliance, and show global buyers that its GFT sector is preparing seriously for a hotter climate. Heat-safe production should become part of Cambodia's responsible sourcing proposition. In a warming world, it is not only good worker protection. It is sound industrial strategy.

1. Introduction

1.1. Background of the Sustainability Recommendation Paper (SRP)

This paper presents recent findings on the impact of heat stress in Cambodia's garment, footwear and travel goods (GFT) sector, alongside examples of heat adaptation by employers, workers, buyers, and governments in Southeast Asia. It draws on analysis by Cornell University's Global Labor Institute (GLI), the International Labour Organization (ILO), and International Finance Corporation (IFC) Better Work programme, and technical experts. Based on two consultations held in Phnom Penh in January 2026 with the Cambodian government, employers, fashion brands, worker organisations, and experts, it sets out recommendations to better regulate, prevent, and reduce occupational heat strain.

German development cooperation has supported the sustainable development of the textile industry in Asia, including Cambodia, since 2014 through various projects on the national, regional, and global levels. The relevant cooperation activities in Cambodia are implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH under the project title "FABRIC Cambodia" (Sustainable Textile Industry in Cambodia). To support the roll-out of the GFT Sector Development Strategy in Cambodia, FABRIC Cambodia is engaging in extensive dialogue with public and private partners as well as with civil society to develop concrete recommendations for action to realise an ambitious agenda. These efforts are conducted in cooperation with key industry stakeholders and the Responsible Business Hub (RBH), which is embedded in the European Chamber of Commerce in Cambodia (EuroCham) and supported by the Textile, Apparel, Footwear & Travel Goods Association in Cambodia (TAFTAC).

Better Factories Cambodia (BFC) started in 2001 as the foundational programme of Better Work, which is a joint programme between the International Labour Organization (ILO) and the International Finance Corporation (IFC), a member of the World Bank Group. BFC has been instrumental in improving working conditions in the garment sector while increasing the competitiveness of Cambodia as a smart sourcing destination. With over 800 participating factories, employing more than 790,000 workers of which approximately 78% are women, BFC is committed to gender equity and empowerment in the workplace and aims to improve the lives of workers, their families and communities - as well as the competitiveness of Cambodian factories in the global market.

1.2. Temperature Rises Can Lead to Heat Strain

GLI reports that two-thirds of major apparel production centres worldwide recorded significant increases in daily maximum ambient temperatures over the past two decades, defined as a rise of at least 10 percent in the average number of days above 35°C. As shown in the **Table 1** below, Phnom Penh sits alongside Delhi and Karachi among production centres with some of the highest numbers of days above 35°C. It also sits alongside nearby Ho Chi Minh City among the centres with the largest percentage increases in days above 35°C.[1]

Table 1. Top 10 apparel production centres with annual days over 35°C by production centre (five-year averages), 2005 to 2024

City	Country	Days >35 °C, 2005 - 2009	Days >35 °C, 2010 - 2014	Days >35 °C, 2015 - 2019	Days >35 °C, 2020 - 2024*	Change (%) first to last
Delhi	India	141	118	141	116	-18%
Karachi	Pakistan	96	83	101	113	18%
Phnom Penh	Cambodia	34	88	110	112	226%
Yangon	Myanmar	76	92	98	85	11%
Cairo	Egypt	72	69	88	79	10%
Bangkok	Thailand	81	69	62	77	-5%
Ho Chi Minh	Viet Nam	29	36	51	74	158%
Managua	Nicaragua	58	60	72	72	25%
Tiruppur	India	39	70	73	67	72%
Hanoi	Viet Nam	39	32	44	56	46%

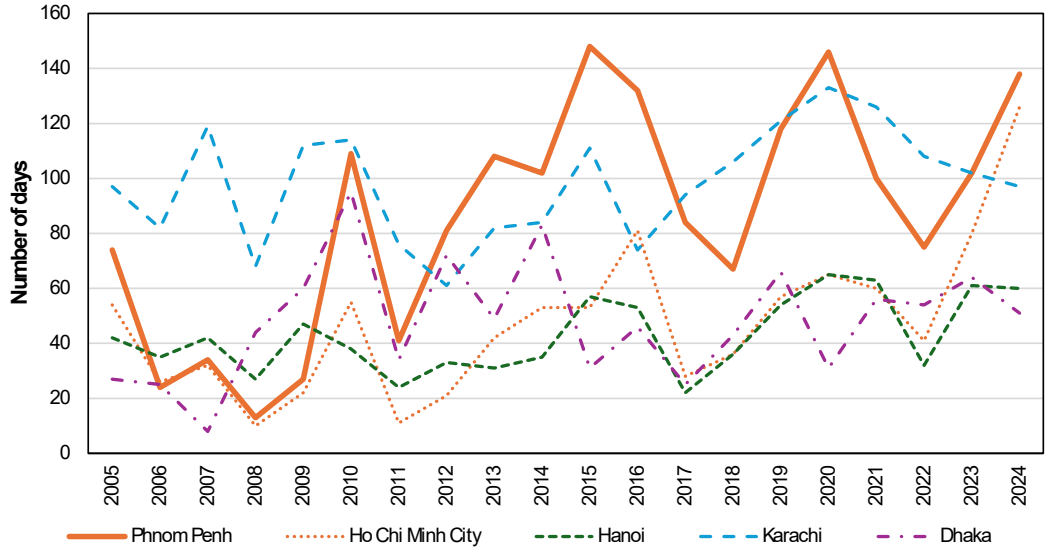
*Data is up to September 30, 2024. Source: GLI anaalysis using direct observations/station data from Visual Crossing.

[1] Many of the other centres saw significant increases and significant swings in the average number of days over 35°C, and this is partly attributable to short-term variability in weather patterns. Delhi, for example, recorded fewer average days over 35°C from 2019-2023 compared to 2014-2018, but it experienced 23 heat waves during that 2019-2023 period.

Focusing on key Asian production centres that compete with Cambodia's apparel industry, the data show clear annual variation but also a strong overall trend (**Figure 1**): the number of days when ambient temperatures[2] exceed 35°C has increased between 2005 and 2024. Phnom Penh and Ho Chi Minh City have seen particularly sharp increases in these "exceedance days," underlining the growing heat exposure faced by major apparel production hubs in the region.

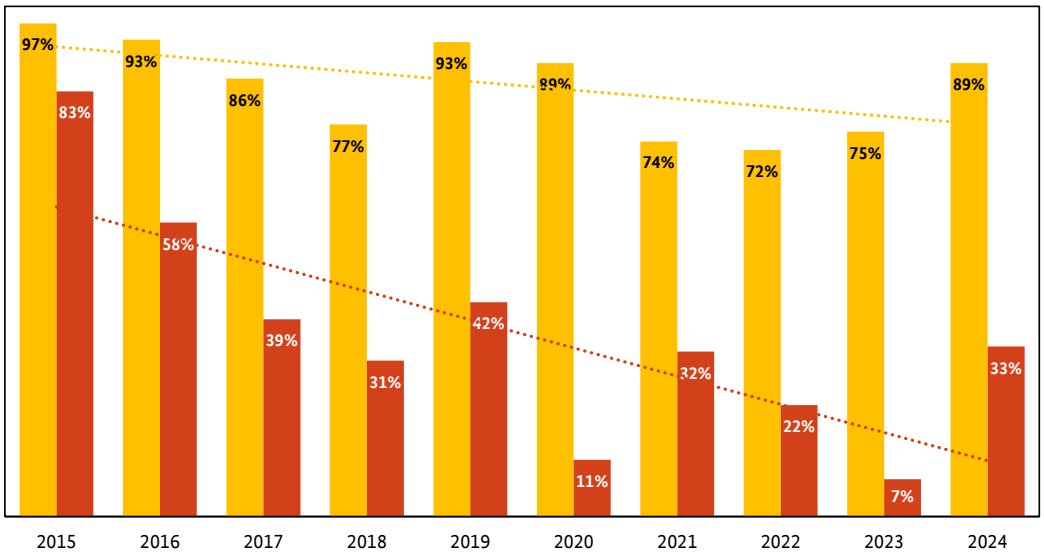
What about temperatures inside factories? The Better Work programme in Cambodia, Better Factories Cambodia, assesses all exporting apparel and footwear factories and applies its own 32°C threshold for acceptable levels of indoor temperature. This threshold is not set by local law or regulation. Better Factories Cambodia uses dry-bulb (air) temperature readings to assess factory temperatures in production areas. GLI analysed findings from this unique dataset of 800 assessments, conducted during the hottest months of March, April and May from 2015 to 2024, as shown in **Figure 2** below.

Figure 1. Annual days over 35°C in five focus cities, 2005-2024



Source: GLI analysis using direct observations/station data from Visual Crossing. See 'Warming to the Idea?' (2025)

Figure 2. Share of all assessments of Cambodian apparel factories with indoor (dry-bulb) temperatures above 32°C and 35°C, March, April and May 2015 – 2024



Source: GLI analysis using Better Factories Cambodia data. See 'Heat is On' (ILO/IFC/GLI) and 'Warming to the Idea?'

[2] Ambient temperature refers here to dry-bulb (air) temperature, measured by a standard thermometer. It does not capture humidity, air movement or radiant heat, which are reflected more fully in heat stress indicators such as the Wet Bulb Globe Temperature (WBGT).

Although the overall trend across the ten-year series is downward, with the share of factories exceeding BFC's 32°C threshold slightly falling on average since 2015, high indoor temperatures remain widespread. Variability in the data partly reflects changes in the timing of same-factory assessments, COVID-era assessment patterns, and Cambodia's historically hot year in 2024. Even so, the share of factories with high temperature levels remains stubbornly high:

- Eighty-two percent of factories in Cambodia recorded indoor temperatures above the 32°C threshold in their hottest production areas.
- One in three factories experienced days when indoor temperatures exceeded 35°C.
- Almost 53 percent of factories recorded indoor temperatures above 32°C while also being hotter than concurrent outdoor temperatures.

1.3. Heat Stress and Its Impact on Workers' Health and Productivity

In many garment-producing countries, including Cambodia, workers are exposed to high temperatures and humidity. These risks are intensified by poorly ventilated factory buildings, heat-generating machinery, dense production areas, physically demanding tasks, and clothing or protective equipment that traps heat.

Production systems can also increase heat risk. Where workers are paid by output or face pressure to meet tight targets, they may be less able to slow down, rest, drink water or report symptoms during hot periods. Together, these conditions create heat stress, now widely recognised as a serious occupational hazard in the global apparel industry.

Heat strain is the body's physiological response to excessive heat stress. It occurs when the body absorbs and accumulates more heat than it can naturally dissipate. As this imbalance continues, the body becomes increasingly unable to cool itself, overwhelming normal heat-regulation mechanisms and putting the person at risk.

Occupational heat stress is often assessed using the Wet Bulb Globe Temperature (WBGT), a composite index that accounts not only for air temperature, but also for humidity, air movement and radiant heat. WBGT is different from the more familiar dry-bulb (air) temperature, which is measured by a standard thermometer and used in **Figure 1** above.

Because dry-bulb temperature does not capture the role of humidity in limiting the body's ability to cool through sweat evaporation, it can underestimate real-world heat stress. Wet-bulb values are lower on the scale than dry-bulb values - but can represent higher heat stress. A wet-bulb value of 25°C at 65 percent humidity, for example, corresponds to a dry-bulb reading of 31°C in low humidity (Somanathan et al., 2021)[3].

For garment workers, heat stress can begin to cause discomfort at a WBGT of 28°C, reach a moderate level at 30.5°C, and become high and dangerous at 32°C, even for heat-acclimatised workers. At the moderate threshold, the ILO recommends that workers rest as much as they work in an hour, meaning 30 minutes of work should be matched by 30 minutes of rest to allow the body to recover.

As heat exposure increases, workers face rising risks of heavy sweating, headaches, skin rashes, nausea, dehydration, exhaustion, fainting, and even life-threatening heat stroke and other longer-term impacts. Beyond these acute health effects, chronic heat exposure undermines workers' overall wellbeing and long-term physical resilience (Malaysia Ministry of Human Resources, 2016; Schwingshackl et al., 2021; Chea et al., 2025). [4, 5]

The economic costs of heat stress extend well beyond the factory floor. Heat-stressed workers experience measurable declines in concentration, physical capacity, and output, a phenomenon known as presenteeism, where workers are

[3] Somanathan, E., Somanathan, R., Sudarshan, A. and Tewari, M. (2021). The Impact of Temperature on Productivity and Labour Supply: Evidence from Indian Manufacturing. Journal of Political Economy, 129(6), 1797-1827. https://doi.org/10.1086/713733

[4] Malaysia Ministry of Human Resources. (2016). Guidelines for heat stress management at workplace 2016. https://www.dosh.gov.my/index.php/competent-person-form/occupational-health/regulation/guidelines/industrial-hygiene-1/2017-guidelines-heat-stress-management-at-workplace/file, Schwingshackl, C., Sillmann, J., Vicedo Cabrera, A. M., Sandstad, M., & Aunan, K. (2021). Heat stress indicators in CMIP6: estimating future trends and exceedances of impact relevant thresholds. Earth's Future, 9(3), e2020EF001885.

[5] The Institute of Technology of Cambodia (ITC), in collaboration with the National University of Singapore (NUS), conducted a study: two surveys with more than 700 female workers in Cambodia during both cool and hot months. The study found that workers experienced more heat-related symptoms during hot months—88% reported symptoms compared to 68% in the cool months. The most common symptoms were thirst, feeling hot, and heavy sweating, alongside headaches, irritability, and difficulty concentrating. Notably, workers sought heat relief measures year-round, not just in hot months, suggesting constant exposure to high temperatures and humidity throughout the year. See Chea et al (2025) at Perceived impact of heat stress on health and productivity of tropical female garment workers– a comparison between cool and hot months | BMC Public Health | Springer Nature Link.

present but unable to perform at full capacity.[6,7] Heat stress also drives absenteeism, as workers fall ill and require time to recover. In addition, heat stressed workers may suffer compromised decision making, leading to a higher risk of workplace accidents. Together, these effects translate into reduced productivity, lower wages for piece-rate workers, and broader losses for businesses and national economies in garment-producing regions.

Using projections for high heat stress days above 30.5°C WBGT in Cambodia in 2030 and 2050, GLI and Schroders, a London-based investment fund, estimated the potential impact of extreme heat on apparel export earnings and employment. Without immediate adaptation, Cambodia's apparel industry is projected to lose 18 percent of potential export earnings by 2030 compared with an adaptation scenario. This decline in export earnings could lead to the sector creating 50,000 fewer new jobs by 2030 if it does not adapt to rising heat.

[6] The impact of heat stress on garment worker productivity is well-documented across multiple studies. Research from Indian garment factories found a clear negative, nonlinear relationship between heat stress and worker efficiency—above a WBGT threshold of 19°C, each additional degree Celsius reduced production line efficiency by more than 2 percentage points. See Adhvaryu et al (2019) at The Light and the Heat: Productivity Co-Benefits of Energy-Saving Technology | The Review of Economics and Statistics | MIT Press.

[7] The study from ITC and NUS also found qualitatively that heat stress can reduce worker productivity. During hot months, 68% of workers reported that heat degraded their ability to work, compared to 59% in cool months—with reduced motivation, slower task completion, and decreased physical capacity. More than half felt less productive overall and needed more time to complete the same tasks.

2. Existing Government and Sector Initiatives

2.1. Legal and Regulatory Framework and Government Initiatives

Cambodia's heat inspection regime is made up of provisions in the Labour Law (Articles 229–230) and multiple Prakas regarding the thermal environment (No. 147, 2002); drinking water (No. 054, 2000), ventilation and sanitation (No. 125, 2001; No. 075, 2011), and sector-specific Occupational Safety and Health (OSH) conditions (No. 307, 2007). The Department of Occupational Safety and Health (DOSH), under the Ministry of Labour and Vocational Training (MLVT), implements these requirements, guided by the Third OSH Master Plan (2023–2027).

Specifically, Prakas 147[8] on Thermal Environment at the Workplace lays out a set of rules on workplace temperatures:

- **Thermal comfort:** Employers are required to create a thermal environment that meets "acceptable standards". The temperature needs to be "comfortable" for workers and "should not disturb their work". The thermal environment shall be measured by the temperature shown on a thermometer at the workplace.
- **Workspace:** In a building or a workshop with a normal working environment, each worker needs to have a space of at least 10 cubic meters. The workplace shall be protected from excessive heat caused by sunlight. Production methods that do not generate heat should be preferred whenever possible.
- **Heat and industrial processes:** If production processes generate excessive heat, employers need to reduce the heat by having the heat generating parts or machinery insulated and isolated, and having the heat absorbed and diverted from the original source.
- **Cooling:** In case the heat at the workplace is high affecting the workers' health or disturbing their work, the "employer shall seek every possible means to cool the workplace" such as installing fans, air coolers, and air conditioners.

Enforcement of Prakas 147 and other related workplace heat and safety regulations is conducted by the MLVT. They have the authority to enter workplaces, and inspect facilities to see if they are following the law. They can also fine employers (in accordance with Chapter 16 of the Labour Law) and enact stop-work orders for non-compliance if they determine conditions are dangerous. They can also issue notices that require factories to remedy the issues causing the violations, and in some cases bring criminal charges if the violations are found to be "wilful".

Until recently, heat measurement and enforcement had not been a priority for either employers or government. MLVT has now begun taking steps to strengthen heat risk management, including procuring WBGT and related inspection equipment, training OSH inspectors, issuing worker safety notifications to industry, disseminating heat-health posters, and working with partners such as ILO and GIZ. These efforts are also linked to MLVT-led bodies, including the National Committee on Occupational Safety and Health and the Committee for Preventing Mass Fainting of Workers.

Acceleration in heat stress levels in recent years and the vagueness of the government's workplace thermal comfort standard were widely recognised - in recent analyses and in the January 2026 multi-stakeholder consultation - as key drivers of the problem.

The next steps planned include strengthening OSH inspection mechanisms with a focus on heat stress, reviewing the thermal environment regulation (Prakas 147), developing a new Prakas on OSH Management Systems, and conducting a baseline study to assess heat stress risks in garment, footwear and travel goods, and other high-risk sectors.

2.2. Private Sector Initiatives

Most brands and retailers operate supplier codes of conduct (and multi-stakeholder programmes) that include guidelines for water accessibility, but most do not include requirements protecting workers during extreme climate events.

Only a handful have clear heat thresholds and fewer still have protocols. Access to shade or cooler environments as well as rest breaks when temperatures are high are mandated by Nike[9], Levi's[10], and VF[11]. Nike and VF both discuss or list specific heat thresholds that should be avoided and call for worker protocols for excessively high temperatures. VF instructs manufacturers to avoid dry-bulb (air) temperatures below 10°C or above 35°C with 10 – 15°C and 30 – 35°C as 'borderline' and 15 – 30°C as 'ideal'. PVH tells their suppliers that dry-bulb temperatures should "generally be maintained between 18.3°C and 29.5°C" and should not ever get higher than 35°C[12]. Nike's range for sedentary work is 16 to 30°C, and

[8] Cambodia, Ministry of Social Affairs, Labour, Vocational Training and Youth Rehabilitation [now Ministry of Labour and Vocational Training]. 2002. Prakas No. 147/02 on Heat Temperature in Workplace. Phnom Penh, 11 June 2002. Available at: https://www.arbitrationcouncil.org/download/prakas-147-02-on-heat-temperature-in-workplace/

[9] NIKE (2025). 2025 Code Leadership Standards. Nike Code Leadership Standards

[10] Levi Strauss & Co. (2023). 2023 Supplier Code of Conduct Implementation Guidebook. Levi Strauss & Co. 2023 Supplier Code of Conduct Implementation Guidebook / February 2023

[11] VF Corporation. (2022). Facility Compliance Standards. VF GUIDELINE PUBLIC VERSION_2022.10.03

[12] PVH Corp. (n.d.). Corporate Responsibility Supply Chain Guidelines. PVH CR Supply Chain Guidelines

for physically exertive work, 13 – 27°C. Nike's guidance also includes standards for:

- **Hydration:** Facilities must provide access to sufficient potable drinking water to supply each worker with up to one liter per hour, with ice made available when temperatures exceed 30°C.
- **Shade and recovery:** Shade must be accessible within 200 metres or a five-minute walk, and workers must be allowed preventative recovery periods if they feel the need for rest or show signs of heat-related illness.
- **Safe temperatures:** Work environments should maintain safe and comfortable temperature ranges of 16–30°C for sedentary work and 13–27°C for physically exertive work.
- **Protective clothing:** Employers must consider the impact of protective clothing or equipment on a worker's ability to manage heat.
- **Medical response:** Procedures must be in place to respond promptly to symptoms of possible heat illness, including contact with emergency medical services.
- **Training:** Workers and supervisors must be trained to recognise, prevent, and respond to heat stress.

These codes of conduct do not yet appear to require real-time remote temperature monitoring, although some apparel brands and manufacturers are beginning to test digital heat-tracking sensors in Cambodia and elsewhere in the region. The International Accord, which oversees programmes in Bangladesh and Pakistan, is also developing a heat stress protocol for possible inclusion in its inspection and remediation requirements in mid-to-late 2026.

More broadly, most multi-stakeholder initiatives still lack meaningful heat standards or protocols where national law does not provide them, with Better Factories Cambodia remaining an important exception. However, several actors are now moving toward the adoption and implementation of clearer heat stress standards.

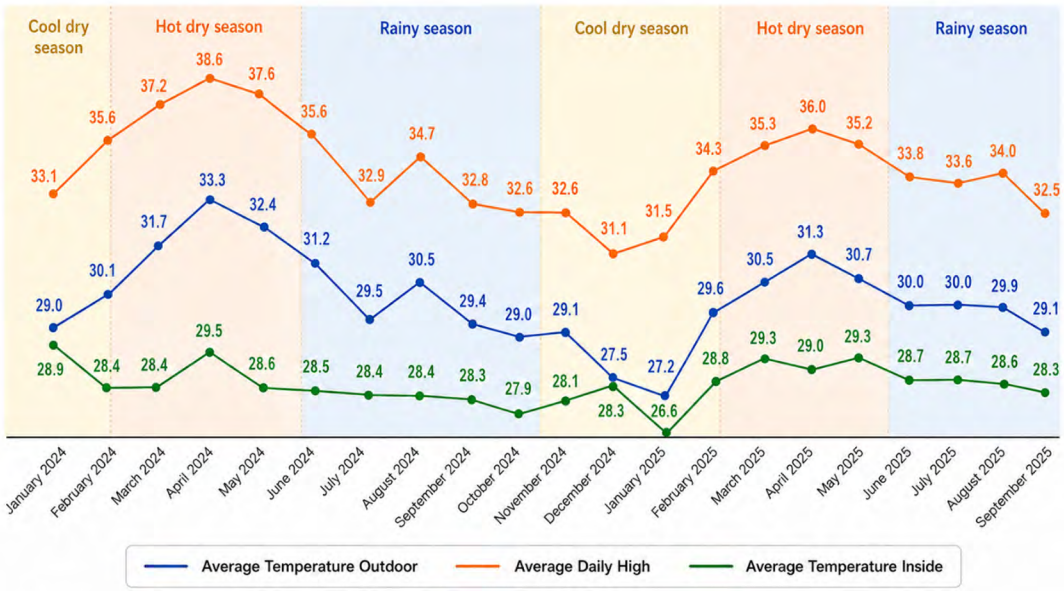
CGTI and TAFTAC

The Cambodian Garment Training Institute (CGTI) is TAFTAC's sector training institution, providing skills development and capacity-building services for Cambodia's garment, footwear, and travel goods industry. TAFTAC represents Cambodia's GFT manufacturers and brings the employer perspective into sector dialogue, including practical considerations around factory operations, costs, retrofitting constraints, and feasible mitigation measures.

In the context of heat stress, CGTI and TAFTAC provide existing channels through which factory management, supervisors and technical staff can be engaged on workplace safety, ventilation, cooling-system maintenance, and practical factory-level responses.

Cambodia adaptation case study: Sabrina Garments

Figure 3. Comparison of indoor and outdoor temperatures, Sabrina, 2025



Sources: Sabrina Garments internal temperature readings and the Iowa Environmental Mesonet of Iowa State University

While many factories assessed by Better Factories Cambodia recorded indoor temperatures above the programme's 32°C threshold, Sabrina Garments in Kampong Speu Province provides an example of practical factory-level heat adaptation. Using an evaporative water-cooling system, exhaust fans, 13-metre-high ceilings and a heat shield on the roof, the factory has kept recorded dry-bulb temperatures for its 6,300 workers largely within the 32°C threshold over the last several years, including in 2025, as shown below:

As seen in Figure 3, indoor temperatures remained largely consistent despite rising outdoor temperatures. Sabrina Garments management reports that monthly production output did not show a consistent decline during hotter periods. Output remained high in several warm months, including March 2025, suggesting that production variability cannot be attributed to heat alone. However, production data should not be read as a full measure of worker health or heat strain. The available data cautiously suggests that the cooling system is helping buffer production output from outdoor heat, while worker health impacts still require direct monitoring.

Sabrina Garments currently has 46 water curtains covering 97,600 square meters of production space, including the warehouse, cutting area and sewing areas. As sewing operations expanded to additional floors, the factory extended the evaporative cooling system. New water curtain walls, pumps, piping and drainage sections were added at an investment of USD 250,000. The expansion was implemented floor by floor, based on experience and worker feedback.

The system places water curtains on one side of the room and exhaust fans on the other, distributing cooled air across the sewing floors. Workers stationed near curtain walls often wear sweaters, while those in central aisles experience milder airflow. When workers raise concerns about cold drafts, the factory temporarily adjusts fans.

Sabrina management reported that water curtains and exhaust fans are a cost-effective way to reduce heat. Pads are cleaned or replaced every 8 - 10 months at a cost of roughly USD 110 per square meter, or USD 10,000 per year, while maintenance costs about USD 12,000 per year.

Worker organisations also play an important role in heat adaptation. The Coalition of Cambodian Apparel Workers' Democratic Union (C. CAWDU) is the majority union at Sabrina Garments in Phnom Penh and has a collective bargaining agreement with the factory, as does its sister union at an older Phnom Penh facility in the Sabrina Garments group. Workers report that outdoor temperatures during Cambodia's hottest months, March, April and May, have risen in recent years from 35°C or 36°C to 37°C or 38°C, and sometimes as high as 40°C in the last two years.

At Sabrina Garments, union leaders are familiar with Better Factories Cambodia's 32°C heat standard and report engaging management on indoor heat levels. Workers use channels such as Telegram and C. CAWDU to report warm corners, stagnant air pockets and discomfort near machinery. Management reports that this feedback loop helped drive cooling expansion, and that cooling is "integral to workplace safety considerations in the collective bargaining agreement (CBA)" and the employer's "responsibility for maintaining a safe workplace."

At the older Phnom Penh facility, union leaders stated that factory engineers indicated the building design prevented structural cooling improvements. As a result, the factory could not make what the union called "a systems improvement" and instead relied on short-term measures to reduce heat levels on the hottest days (GLI, Cooling before It Got Cool, 2026).

2.3. Development Partner and Civil Society Initiatives

Cambodia is not starting from zero in addressing occupational heat stress in the GFT sector. Several development partners, civil society, research, union, and buyer-linked initiatives are already contributing to the evidence base.

Better Factories Cambodia (BFC), part of Better Work, a joint programme of the International Labour Organization (ILO) and the International Finance Corporation (IFC)

BFC works to improve working conditions and competitiveness of Cambodia's GFT sector through factory assessments, advisory support, training, social dialogue, and data sharing. In the context of heat stress, BFC's factory assessment system

is particularly important because it has generated one of the strongest available datasets on indoor factory temperatures in Cambodia. This provides a practical evidence base for identifying where heat risks are occurring, informing corrective action and supporting discussion on future regulatory thresholds and factory-level guidance.

International Labour Organization (ILO), PAGE, and ILO-Japan OSH Programming

The International Labour Organization (ILO), the Partnership for Action on Green Economy (PAGE), and ILO-Japan OSH programming provide a policy and technical platform for addressing heat at work. PAGE, co-implemented by the ILO in Cambodia, supports the country's transition towards a sustainable economy through policy development, institutional capacity building and social dialogue. In the garment sector, this links heat stress to wider goals on sustainable industrial development. The ILO-Japan project on promoting a safe and healthy working environment in Thailand and Cambodia, implemented as part of the ILO's Safety + Health for All flagship programme, addresses persistent and emerging OSH risks, including heat-related health issues. It supports tripartite constituents to strengthen OSH frameworks, policies, and programmes.

GIZ FABRIC Cambodia and Responsible Business Hub (RBH)

GIZ's project, FABRIC Cambodia, has contributed to the sector's sustainability and policy dialogue. FABRIC Cambodia II, funded by the German Federal Ministry for Economic Cooperation and Development (BMZ), supports the positioning of Cambodia's GFT sector to meet international environmental and social sustainability requirements. In the heat stress agenda, FABRIC Cambodia has helped convene evidence-based dialogue and connect heat stress to broader sector competitiveness, climate adaptation, social sustainability, and responsible business priorities. At the policy level, FABRIC Cambodia donated WBGT monitoring equipment to the MLVT's DOSH and provided training for the MLVT's labour inspectors. It is currently supporting the MLVT, together with the ILO and BFC, in implementing the upcoming OSH Law, including reviewing and revising Prakas 147. At the worker level, FABRIC Cambodia is building trainer capacity on gender-related heat stress and heat relief measures through a training of trainers (ToT) programme delivered via union networks, while raising broader awareness through platforms such as the WE (Women Empowerment) House and community-based events. FABRIC Cambodia also contributed to the establishment of the Responsible Business Hub (RBH) - embedded in EuroCham Cambodia, which offers advisory services on sustainability and due diligence risk management.

CARE Cambodia

CARE Cambodia contributes to the heat stress agenda through its long-standing work with women workers in Cambodia's garment, footwear and travel goods sector, and through newer climate resilience work focused on how extreme weather affects workers and productivity. Its role is therefore especially relevant to gender-responsive workplace adaptation, worker well-being, women's voice, social protection, climate-resilient factory practices, and practical awareness-raising for workers and employers.[13]

[13] CARE Cambodia, Climate Resilience: Strengthening community awareness, preparedness, and adaptation, 2024, available at: https://care-cambodia.org/our-work/climate-resilience/

Solidarity Center

The Solidarity Center supported research by the Royal Holloway University of London into Oppressive Heat, which provides an evidence base on how heat stress is experienced in Cambodian workplaces. The 2024 *Heat Stress in the Cambodian Workplace* study examined heat stress across garment workers, transport workers and informal food sellers in six Cambodian locations: Phnom Penh, Kampong Saom, Poipet/Banteay Meanchey, Kampong Speu, Kampong Chhnang and Svay Rieng. The study surveyed participants and combined core thermal sensors worn during a working day, socio-economic and behavioural surveys, and qualitative interviews with workers experiencing high heat stress.

Trade Unions, Worker Organisations (C. CAWDU)

Trade unions and worker organisations, including C. CAWDU, are essential to heat stress prevention because workers are often the first to identify where heat accumulates, where fans or cooling systems are not functioning, and where production conditions create avoidable risks. Worker organisations can support awareness-raising, encourage hydration and safe practices, communicate problems to management, and participate in factory-level OSH committees or collective dialogue. Evidence from factory-level engagement also shows the value of worker feedback loops, including reporting warm corners, stagnant air pockets and discomfort near machinery through union channels and digital communication tools.

Union Aid Abroad – APHEDA

APHEDA is relevant as a civil society and union-capacity actor working on women workers' rights, decent work, and occupational health and safety in Cambodia. Its Women Workers' Rights and Decent Work project works with Cambodian unions and the Ministry of Women's Affairs. In the heat stress agenda, APHEDA's role is best understood as supporting worker voices, union participation, gender-related OSH, and awareness-building foundations needed for effective prevention.

2.4. Heat Stress Standards from Other Countries

On the national level, rules on access to drinking water, for example, are similar across the apparel-producing world but standards governing heat stress or simply temperature in factories vary widely in terms of specificity and enforceability.

In 2024, ILO published *Heat at Work: Implications for safety and health*, which includes an analysis of national legislation on workplace heat stress across 21 countries. The major apparel producing countries of India, Viet Nam, Thailand and Brazil are featured in this analysis.

Indonesia, Malaysia, Singapore, Thailand, and Vietnam have detailed regulations or compliance requirements with heat thresholds for indoor and/or outdoor work. Malaysia's

Table 2. Examples of legislation on maximum temperature thresholds in the workplace

Country	Heat Stress Indicator	Safety Threshold (Work Intensity)
Viet Nam	Wet-bulb globe temperature	30°C WBGT for continuous light work, 26.7°C WBGT for medium, 25°C WBGT for heavy work
Thailand	Wet-bulb globe temperature	34°C for 'low intensity' work, 32°C for 'moderate' work, 30°C for 'very high intensity' work
India	Wet-bulb globe temperature	30°C WBGT is the safe threshold for all work
Brazil	Wet-bulb globe temperature	31.7 – 33.7°C WBGT for 'very low intensity' work 20.7 – 24.7°C for 'very high intensity' work

Sources: Brazil's Regulatory Standard No. 9 (Annex 3), China's Administrative Measures on Heatstroke Prevention (AMPH2012), India's Factories Act No. 63, 1948, Viet Nam Ministry of Health's Permissible values of microclimate parameters in the workplace following QCVN 26:2016/BYT, Viet Nam's National Technical Regulation on Microclimate, and Thailand's Occupational Standard.

Guidelines on Heat Stress Management[14] lists WBGT thresholds for different levels of work (32°C for light work, 30°C for moderate, 29°C for heavy, and 28°C for very heavy) that employers need to follow for their factories. It also spells out specific requirements for factory design including insulating materials and whitewashing of walls to prevent heat transfer. Thailand's Occupational Standard[15] says there must be rest periods when WBGT goes above specific thresholds for low, moderate, and high intensity work and mandates personal protective equipment (PPE) and cooling fans to reduce heat stress.

In Vietnam[16], employers are required to monitor the 'microclimate' of the working environment. The Occupational Safety and Health Law of 2015 requires employers to regularly inspect and meet requirements for steam, heat, moisture, and other factors. The 2016 Technical Regulation on Microclimate sets 32°C air temperature as the upper limit for medium-effort work, including in apparel and footwear production. The rule also provides specific requirements for heat and humidity - and limits the amount of time that workers are exposed to heat and humidity based on their level of effort and the wet-bulb globe temperature in the workplace. For example, employees in a garment factory are generally classified as engaging in light and medium work and are therefore permitted to work continuously up to 26.7°C WBGT (medium) and 30°C WBGT (light). But at 28°C WBGT, for example, workers in ironing, cutting, warehousing and some sewing tasks should rest 25 percent of the time, which translates to 15 minutes of rest in an hour.

Measurement and enforcement of Vietnam's specific indoor temperature standard is left largely in the hands of employers. Environmental audit firms are licensed by the government to record indoor temperatures and certify factory compliance with the legal requirements. Continuous digital readings can provide stronger evidence than once-a-year monitoring but require clear data governance and implementation arrangements.

Table 3. Permissible value (°C) by wet-bulb globe temperature, Vietnam Min. of Health Circular, 2016

Heat Exposure Duration	Light work (WBGT, °C)	Medium work (WBGT, °C)	Heavy work (WBGT, °C)
Continuously	30.0	26.7	25.0
75%	30.6	28.0	25.9
50%	31.4	29.4	27.9
25%	32.2	31.4	30.0

Source: Vietnam Ministry of Health Circular No. 26/2016, National Technical Regulation on 'Permissible Value of Micro-climate in the Workplace'

[14] Department of Occupational Safety and Health (DOSH), Malaysia, Guidelines on Heat Stress Management at Workplace 2016, published 6 May 2016, available at: https://www.dosh.gov.my/index.php/guidelines-heat-stress-management-at-workplace/file

[15] Government of Thailand, Thailand occupational standard to protect workers from excessive heat, 2016, available at: https://www.preventionweb.net/publication/policies-and-plans/thailand-occupational-standard-protect-workers-excessive-heat

[16] Viet Nam, Ministry of Health. 2016. Circular No. 26/2016/TT-BYT on National Technical Regulation on Microclimate – Permissible Value of Microclimate in the Workplace / QCVN 26:2016/BYT: Technical Regulation on Microclimate – Permissible Value of Microclimate in the Workplace. Hanoi, 30 June 2016. Available at: https://aigavn.com.vn/wp-content/uploads/2021/06/26_2016_TT-BYT_ON-NATIONAL-TECHNICAL-REGULATION-ON-MICROCLIMATE-PERMISSIBLE-VALUE-OF-MICROCLIMATE-IN-THE-WORKPLACE-E.pdf

Viet Nam Case Study: An Giang Samho

Samho managers and its 10,500 workers in An Giang Province know that they have a heat problem.

The factory faces a difficult structural challenge: its open-air, shed-style production building was not designed for the level of heat risk now facing the sector, and cooling areas that handle chemical processes remain technically complex. Existing measures have reduced some heat exposure, but they do not fully offset the climate risks likely to intensify in the years ahead.

However, taken together, the factory's efforts to adapt to high heat show what early, incremental adaptation looks like inside a complex manufacturing environment built at a time (2014) when extreme heat was not yet a central concern, and when the expectation was that fans and open walls would be enough.

Samho's management started with what was feasible, tested what worked, and expanded from there. Ice machines addressed heat stress while also solving a separate problem of access to safe drinking water. Solar panels and roof insulation reduced indoor temperatures and steadied energy costs. Exhaust-fan upgrades reshaped airflow across the production floor, even as they made clear the limits of fan-based cooling in chemical-intensive spaces. None of these steps solve the whole problem, but together they make the workday more tolerable for the people on the line.

Looking ahead, Samho is considering whether solar installations could be extended to parking structures, made more plausible by newer, lighter panels that do not require reinforced roofing. Management is also exploring more targeted cooling in chemical-intensive zones, an approach that would need to be carefully designed to avoid redistributing fumes. The path forward is constrained, but it is not static. Samho's experience suggests that in manufacturing, adaptation is rarely a single decisive leap. More often, it is a series of small, deliberate moves, taken early enough to buy time in a warming climate (GLI, Cooling before It Got Cool, 2026). [17]

2.5. Good Practices from Other Countries

A growing number of international organisations, multi-stakeholder initiatives, research institutions, and industry bodies have carried out studies and developed initiatives to measure, manage, and mitigate heat stress risks for workers. The following examples illustrate how different actors are responding to this challenge and offer lessons that might be relevant for Cambodia.

International Accord for Health and Safety in the Textile and Garment Industry

The International Accord for Health and Safety in the Textile and Garment Industry (Accord) is currently developing a protocol to prevent and mitigate the risks of heat stress for workers at garment and textile factories. While matters related to excessive heat have been addressed thus far via the Accord's worker complaints mechanism, the development of a protocol will allow the Accord to address this risk in a systemic and preventative manner by integrating heat stress within the Accord's inspection and remediation programme as well as its occupational safety and health training programme. The Accord's Protocol is being developed in consultation with different stakeholders, including technical experts, academia, brands, trade unions, suppliers, and other organisations working on the topic. The protocol will seek to define best practices for brands and suppliers to prevent and address risks relating to heat stress, including monitoring of temperatures, determining temperature thresholds, and developing appropriate engineering and administrative controls. The Accord's protocol will take into account the specificities of its country programmes and seek to introduce targeted protections for vulnerable worker groups.

Global Heat Health Information Network (GHHIN)

Launched in 2016 by the World Health Organization (WHO), the World Meteorological Organization (WMO) and the National Oceanic and Atmospheric Administration (NOAA), the Global Heat Health Information Network (GHHIN) brings together stakeholders working on heat and health. For Cambodia, the most relevant entry point is the GHHIN Southeast Asia Hub, based at the Heat Resilience & Performance Centre (HRPC), National University of Singapore. The Hub supports action and policy engagement on heat-health risks, including urban heat, heat at work, and practical heat-management responses. It was launched at the first GHHIN Southeast Asia Heat Health Forum in Singapore in January 2025.[18]

[17] Krasley, Sarah. 2026. Cooling Before It Got Cool: Case Studies in Heat Adaptation in Southeast Asian Factories. GLI Case Study. Ithaca, NY: Cornell University ILR School, Global Labor Institute. Published 22 January 2026. Available at: https://www.ilr.cornell.edu/global-labor-institute/research-0/cooling-it-got-cool-case-studies-heat-adaptation-southeast-asian-factories

[18] Global Heat Health Information Network (GHHIN). 2025. First Southeast Asia Heat Health Forum: Overview & Launch of the Southeast Asia Hub. Singapore, 7–10 January 2025. Available at: https://heathealth.info/2025-southeast-asia-heat-health-forum/

Ethical Trading Initiative (ETI)

ETI has integrated extreme heat into its broader "*Just Transitions*" work, recognising heat stress as a human rights risk linked to gender-based violence and harassment, excessive working hours and forced labour. Since 2024, ETI has convened cross-sector meetings, published guidance linked to the ETI Base Code, and partnered with researchers on a worker exposure study at a supplier factory in Delhi National Capital Region (NCR), which led the factory to develop its own heat action plan[19].

Global Labor Institute (GLI) / Cornell University

Cornell's GLI is conducting ongoing research in Bangladesh's apparel industry on heat stress levels in factories and workers' homes, remediation costs, and return on investment of cooling interventions. GLI has also published two key briefs, The Heat is On (jointly with IFC and Better Work) and Cooling Before It Got Cool, presenting case studies of heat adaptation in Southeast Asian factories. GLI's research is informing both industry standards and national policy frameworks, demonstrating the value of connecting academic research with practical supply chain applications.

Royal Holloway, University of London – Oppressive Heat Project

The Oppressive Heat project focuses on Cambodia, producing detailed empirical research on how heat stress affects garment, construction, and informal sector workers. The project involved over 2,200 survey participants, each of whom undertook core temperature and heart rate monitoring, and qualitative interviews. A subset of workers also undertook kidney function testing and intervention studies to deepen understanding of heat health impacts and preventative measures. Key findings have directly informed brand sustainability strategies and have been shared with the ETI, Fair Labor Association (FLA), ILO's Heat Health Advisory Committee for Southeast Asia, and Cambodian government officials.

RISE: Reimagining Industry to Support Equality

RISE takes a worker-centred, gender-responsive approach to climate resilience, recognising that heat stress overlaps with flooding, poor air quality and other climate risks affecting workers' health, finances and safety at work and at home. Its 2025 report, Weaving Fairness: How Women Workers Hold the Key to Climate Resilience in the Garment, Footwear, and Textile Sectors[20], looks at workers in Cambodia and Bangladesh and sets out three priorities: better factory environments, redesigned schedules and operations, and stronger wellbeing and social protection systems. RISE is also developing a Climate Resilience Industry Program for workers and factory managers, to be piloted in Cambodia and Bangladesh in early 2026.

[19] A write-up of the Delhi NCR work is available here: Taking action on workplace heat | Ethical Trading Initiative

[20] Levy, Ariela, and Laura Macías. 2025. Weaving Fairness: How Women Workers Hold the Key to Climate Resilience in the Garment, Footwear, and Textile Sectors. RISE. Available at: https://rise.euwest01.umbraco.io/media/kpsildvr/rise_weaving-fairness_how-women-workers-hold-the-key-to-climate-resilience-in-the-garment-footwear-and-textile-sectors.pdf Accessed 2 June 2026.

3. Key Findings from Multi-stakeholder Consultations

A multi-stakeholder consultation on heat at work in Phnom Penh was jointly organised by Better Factories Cambodia and GIZ-FABRIC Cambodia. Below are the takeaways, which inspired the recommendations in chapters 4 and 5 of this paper.

3.1. Heat Stress is Already Affecting Cambodia's GFT Sector

Participants recognised that extreme heat is already affecting working conditions in Cambodia. The issue is significant for the GFT sector because it employs approximately 1.2 million workers and affects the livelihoods of around 3 million people, and because many production environments involve heat, humidity, heat-generating machinery, physically repetitive work and limited ventilation. Evidence presented during the consultation showed that heat stress can contribute to fatigue, reduced concentration, discomfort, accidents, heat-related illness, lower productivity, and long-term health risks. The consultation also presented Cambodia-specific economic evidence.

3.2. Knowledge Gaps Remain Among Workers, Employers , and Institutions

The consultation highlighted persistent knowledge gaps across the sector. Workers may recognise that they feel hot, fatigued or unwell, but may not always connect these symptoms to heat stress risks or know which preventive measures to take. Employers may have cooling equipment in place but lack consistent systems for monitoring heat exposure, assessing risk by work areas, maintaining equipment, or adjusting production practices during hot periods. Relevant institutions (such as MLVT) are also still developing the legal, technical and enforcement tools needed to manage heat systematically. A key technical gap is the difference between environmental heat exposure and the body's internal heat strain.

3.3. Factories Need Practical and Scalable Mitigation Options

Factories need to protect workers from heat, but many operate in buildings that were not designed for increasingly hot and humid conditions. Employers noted that simple measures such as improved ventilation, fans, access to water and better maintenance can be implemented relatively quickly, while larger investments such as cooling systems, structural retrofits and heat-resilient building design require more capital and planning. Retrofitting older factories is particularly challenging, and building ownership matters because factory-owned buildings allow for longer-term investment decisions than leased premises.

The consultation identified practical measures that can be scaled or adapted according to factory conditions. These include drinking water access, water coolers, water curtains, adequate fans, roof watering, shading, white roofs, tree

planting, improved ventilation, heat-resistant materials, other passive cooling designs, shaded rest areas, scheduled or flexible breaks, adjusted work patterns, better maintenance of cooling equipment, and targeted measures for high-exposure areas such as boiler rooms, ironing sections, warehousing, or areas with stagnant air. Participants also stressed that interventions should be assessed not only by cost, but by their effect on worker health, productivity, and absenteeism.

3.4. Workers and Unions Need a Strong Voice in Heat Management

Worker participation emerged as a core condition for effective heat management. Workers know where heat accumulates, where airflow is weak, where fans are broken, where machinery creates hot spots, and where uniforms or protective equipment make work more uncomfortable. Trade unions and worker representatives can help raise awareness, encourage hydration and safe practices, communicate problems to management, and ensure that heat stress is addressed through factory OSH systems rather than treated as an individual coping issue.

Inputs from worker representatives highlighted that heat affects daily working conditions through physical stress, fatigue, reduced concentration, and discomfort from uniforms, gloves, and head coverings. The discussions also underlined that workers' heat vulnerability is shaped by conditions outside the factory, including commuting, nutrition, rest, household conditions and access to safe food and water.

3.5. Brands and Buyers are Part of the Solution

Brands and buyers are increasingly relevant to heat stress management because their requirements influence factory compliance systems, production schedules, peak output expectations, and investment incentives. During the consultation, brands reported existing and emerging initiatives such as heat stress assessments in audit systems, supplier training, thermal comfort pilots, OSH management strengthening, worker and union training, monthly incident data collection, factory visits to review temperature data, code-of-conduct development, and research partnerships to test practical measures such as breaks, fans, and adjusted schedules.

At the same time, the consultation pointed to the need for stronger alignment among brands. Factories are unlikely to invest confidently if buyer expectations are fragmented or if purchasing practices undermine adaptation by compressing production timelines during hot periods.

3.6. Government Policy Direction is Moving Toward Clearer Heat Regulation

The January consultation took place during an important policy window. The Ministry of Labour and Vocational Training (MLVT) expressed its intention to amend the existing Prakas or develop a new Prakas on heat in the workplace, alongside the forthcoming Occupational Safety and Health (OSH) Law. The consultation and follow-up

technical dialogue on 20 January 2026 were designed to inform this process by bringing together policymakers, OSH authorities and technical experts to discuss regulatory pathways, technical standards, institutional roles and implementation challenges.

Participants identified several areas for policy development: clear heat thresholds, monitoring methods, risk assessment requirements, training, inspection systems, advisory services by inspectors, maintenance responsibilities, incident reporting, protection of vulnerable workers, enforcement mechanisms, compliance costs, and resource mobilisation.

The consultation also pointed to the role of OSH training centres in strengthening practical capacity for heat prevention, OSH culture, and workplace response. The policy challenge is to develop a framework that is protective enough to reduce health risks, practical enough for factories to implement, and enforceable enough to create consistent expectations. The framework also needs to support Cambodia's competitiveness by helping factories manage heat before it becomes a larger source of productivity loss.

3.7. Call for Coordinated Action

The consultation confirmed the need for a coordinated sector response. Regulation alone will not be enough without factory-level prevention, worker participation, brand alignment, technical guidance, and development partner support. At the same time, isolated factory pilots or individual brand initiatives will have limited impact without common standards and clear policy direction.

The next step is to translate the January dialogue into shared action:

- Measure heat risk more consistently;
- Prioritise low-cost and high-impact prevention measures;
- Strengthen worker voices on the topic;
- Build education and awareness across the supply chain;
- Support factories with practical tools and financing pathways;
- Align buyer expectations;
- Use the forthcoming OSH framework to embed heat stress prevention into Cambodia's long-term GFT sector resilience strategies.

4. Recommendations

Heat stress in Cambodia's GFT sector is a shared responsibility. With the pending Occupational Safety and Health (OSH) law providing a new legal foundation, all stakeholders — the government, factories, buyers, civil society organisations, and development partners — must act in concert to protect workers from the growing risks of occupational heat exposure. The recommendations below are organised by stakeholder group and draw on findings from multi-stakeholder consultations and international good practices.

4.1. For the Government

Pilot and Scale Heat Stress Measurement: The government should pilot heat stress measurement in partnership with relevant partners, establishing data governance rules for the sharing of heat stress data with government, employers, worker organisations, and experts. Based on pilot results, the approach should be revised and expanded to more factories, serving as a sector-wide baseline analysis of heat stress levels and dynamics.

Revise Prakas 147 and Establish Heat-Specific OSH Standards: The incoming OSH law and the revision of Prakas 147[21] create a critical and time-sensitive opportunity to put heat stress protections into legislation. This should be developed in consultation with all relevant stakeholders, so that the final standards are technically sound, practical for factories and aligned with buyer expectations. Heat stress regulation should include a balanced set of provisions covering:

- WBGT-based thresholds by role and work intensity, with corresponding work-rest protocols;
- Measurement by remote-access sensors and reporting requirements;
- Consultation and worker participation mechanisms;
- Identification of heat-stress risk among workers and heat illness response plans;
- Heat stress training on identification and protocols;
- Heat stress warnings for outdoor and indoor levels, and heat action plans;
- Onsite treatment and reporting of heat-related illness and injury;
- Heat-related illness, paid time off, and sick leave entitlements;
- Heat-related illnesses explicitly recognised as eligible for National Social Security Fund (NSSF) coverage when caused or aggravated by workplace heat exposure.
- Right to refuse unsafe work and protection against retaliation;
- Provisions for leave and worker pay on unsafe high-heat days;
- Acclimatisation schedules for new, returning, and vulnerable workers;
- Remediation timelines and measures of compliance with heat stress outcomes.

Supporting Prakas or sub-decrees should provide sector-specific guidance for the GFT industry. These standards should be developed in collaboration with development partners, including ILO, BFC, GIZ, and relevant technical experts to ensure they are practicable for Cambodian conditions.

Strengthen Social Dialogue and Consultation Mechanisms: The government should ensure the systematic consultation and participation of worker and employer organisations in the development of heat stress and OSH policies, including the revision and the implementation of the OSH related laws, Prakas and related regulations.

Strengthened social dialogue helps ensure that policies are practical, evidence-based, responsive to workplace realities, and supported by both workers and enterprises.

Strengthen Inspection Systems and Technical Capacity: Labour inspectors should be trained and equipped to assess heat risks during routine factory visits, using portable WBGT meters as standard inspection equipment. Inspection checklists should cover cooling systems, access to cool drinking water, written heat stress management plans and records of heat-related illness. Once the revised Prakas is in place, the government could consider publishing data on heat stress levels, violations and remediation actions.

This data could help BFC, MLVT labour inspection teams and TAFTAC identify higher-risk factories and target technical support more proactively.

Establish a National Heat Monitoring & Research System: The government, led by MLVT and working with relevant ministries and technical partners, could develop a central digital dashboard to track heat conditions in GFT factories. Larger factories could be required to install IoT-enabled sensors measuring ambient temperatures, relative humidity, and WBGT, with a phased roll-out for smaller factories. The system should link factory-level data with national meteorological data, helping to identify dangerous heat days in advance and guide practical prevention measures. This should also be backed by investment in research, so Cambodia can build its own evidence base on workplace heat

[21] Cambodia Government. 2002. Prakas No. 147/02 on Heat Temperature in Workplace. 11 June 2002. Khmer. Available via the Arbitration Council of Cambodia at: https://www.arbitrationcouncil.org/download/prakas-147-02-on-heat-temperature-in-workplace/

exposure, productivity, health impacts, and the most effective factory-level solutions.

Expand Awareness and Training Programmes: The government could lead or co-fund a national occupational heat awareness campaign targeting factory managers, supervisors, unions and workers across the GFT sector, delivered through BFC advisory visits, National Institution of Labour, CGTI training programmes, and union networks. Training content should be developed in Khmer and in accessible formats, with particular attention to reaching workers in non-brand-facing factories.

Promote Heat-Resilient Factory Design: The Ministry of Land Management, Urban Planning, and Construction (MLMUPC) could update technical standards for industrial buildings to require passive cooling features in new or renovated factories, including roof insulation, cross-ventilation and heat-reflective roofing materials. These standards should also be supported by stronger monitoring of building permits and actual building use, including tighter controls where warehouse permits are used for main production buildings. Development banks and investment facilitation bodies should be encouraged to offer preferential financing for factories that retrofit their premises to meet these standards.

4.2. For Factories

Participate in the Pilot and Conduct Heat Risk Assessments: Factories should begin with participation in a heat stress measurement pilot and, more broadly, conduct systematic assessments of heat hazards across production areas using WBGT measurements taken at representative times of day and during the hottest months. Assessments should identify high-risk zones, peak heat periods, and vulnerable worker populations – including pregnant workers, older workers, and those with underlying health conditions. Based on this assessment, factories should develop and implement a written Heat Stress Management Plan, reviewed annually and following any serious heat-related incident.

Implement Engineering Controls: Factories should ensure production floors are equipped with sufficient industrial fans, evaporative coolers, or air-cooling systems appropriate to their layout and heat exposure. Investment in roof insulation, heat-reflective coatings, and heat-control glazing should be explored in consultation with TAFTAC and technical experts. Factories should log their infrastructure investments and the resulting changes in measured WBGT to demonstrate progress to buyers and inspectors.

Apply Administrative Controls: Factories should implement staggered shift scheduling to avoid peak heat hours for the most physically demanding tasks, mandatory rest-cool-water breaks keyed to WBGT readings, buddy systems to enable workers to watch for signs of heat illness in colleagues, and acclimatisation protocols for new and returning workers. These controls should be formalised in the Heat Stress Management Plan and communicated clearly to all supervisors and production line leaders.

Ensure Immediate Compliance on Water and Basic Safety: All workers should have consistent, free access to cool drinking water near their workstations – at least one litre per hour during peak heat periods – and shaded or cooled rest areas. Compliance with existing rules on drinking water access and basic safety protections is an immediate obligation, not contingent on the revision of Prakas 147.

Install Heat Monitoring Sensors and Maintain Records: Factories should be encouraged to install low-cost IoT temperature and humidity sensors at key points on the production floor. Readings should be logged continuously and used to trigger pre-defined operational responses. Records should be maintained and made available to labour inspectors and buyers upon request - and shared with the national monitoring dashboard once that infrastructure is in place.

Train Workers and Supervisors: All production workers and supervisors should receive training on the early signs and symptoms of heat exhaustion and heat stroke, how to respond when a colleague shows signs of heat illness, and the factory's emergency response procedures. Training content should be delivered in Khmer and in accessible formats, including visual guides posted in production areas and rest zones.

Engage Unions and Shop Stewrds on Heat Stress: Factories should establish or strengthen consultation with unions and elected shop stewards, health and safety committees, and bipartite committees at factory level, including on heat stress protocols, data reporting, management of monitoring systems, and remediation. Workers should be able to report uncomfortable or dangerous heat conditions through a clear, accessible, and anonymous channel, with assurance against reprisal. Strengthened workplace dialogue can help identify practical solutions, improve trust and cooperation, support early identification of risks, and facilitate more effective implementation of heat stress measures at factory level.

Integrate Heat Protections into HR and OSH Policies: Factories should formally embed heat stress provisions into their human resources and OSH policies, including access to paid sick leave for heat-related illness, accommodations for vulnerable workers, and explicit protection for workers who report unsafe heat conditions.

4.3. For Buyers

Integrate Heat into Compliance and Auditing Frameworks: Buyers should update their supplier codes of conduct to explicitly address occupational heat stress, requiring suppliers to have documented heat risk assessments, management plans, functional cooling infrastructure, and worker training programmes in place.

Social compliance audits should include specific heat-related criteria, aligned with the OSH law's requirements once enacted. Buyers should work collectively to harmonise heat-related requirements, reducing the burden of duplicative reporting on suppliers.

Support Financing of Heat Mitigation Measures: The cost of engineering controls –fans, insulation, cooling systems, sensor installations – can be prohibitive for smaller suppliers. Buyers should allocate resources to co-finance factory-level heat mitigation investments, particularly for strategic

suppliers, and explore contract terms that explicitly permit suppliers to invest in heat-effective controls. This support should be framed as a responsible sourcing investment, not a penalty mechanism.

Provide Technical Support for Heat Stress Remediation: Buyers should offer direct technical support to supplier factories, including sharing guidance materials, connecting suppliers with vetted engineering consultants, facilitating peer learning across their supply base, and embedding heat stress expertise into advisory services provided to key suppliers. Buyers should also support data collection, analysis, and disclosure of heat stress exposure and remediation outcomes, including case studies.

Align Sourcing Practices with Heat Conditions: Buyers should examine whether their purchasing practices – including short lead times, last-minute order changes, and productivity targets – inadvertently increase heat risk. Responsible sourcing frameworks should include a review of how production scheduling and order management interact with heat exposure, particularly during Cambodia's peak hot-season months of March through May.

Make Public Commitments on Heat-Safe Sourcing: Buyers sourcing from Cambodia could be encouraged to make public commitments to support heat-safe working conditions across their supply chains, with measurable targets, timelines and annual progress reporting, in line with their responsibilities under the European Union (EU) Corporate Sustainability Due Diligence Directive (CSDDD), the Corporate Sustainability Reporting Directive (CSRD) and equivalent legislation.

4.4. For Worker Organisations and Civil Society

Engage in Social Dialogue on Heat Stress: Trade unions and workers' organisations should make heat stress a standing agenda item in collective bargaining and factory-level dialogue, including protocols, data reporting, monitoring systems and remediation. Women-led unions should be supported to frame heat as a gendered occupational safety issue.

Raise Worker Awareness and Train Worker Representatives: Civil society organisations and trade unions should provide accessible information on heat-related rights, including the right to refuse dangerously hot work and the right to cooling, hydration and rest during shifts. Worker representatives should be trained to engage management on heat risks. Outreach should be delivered in Khmer, adapted for low-literacy and gender-specific needs, and could include digital tools such as a chatbot or an expanded "Our Rights" App, which already helps workers understand their rights under Cambodian labour law.

Advocate for Stronger Standards and Enforcement: Civil society organisations and trade unions should actively participate in the consultative process for the OSH law, advocating for heat stress provisions, and monitoring the quality of government enforcement once the law is in place.

Contribute to Research and Data Collection: Civil society organisations should collect and document workers' experiences of heat stress, near-misses and heat-related illness, including incidents that factories may not formally record. This evidence can support advocacy, inform policy and strengthen the sector-wide evidence base.

Bring Vulnerable Workers' Voices into Sector Platforms: Civil society organisations are well positioned to serve as neutral conveners bridging factories, buyers, government ministries, and workers. They should use platforms and other multi-stakeholder dialogues to ensure that workers' perspectives, especially those of women, vulnerable workers and workers in non-brand-facing factories, are reflected in heat stress policy and practice.

5. Turning Recommendations into Actions

The following priority actions are designed to be implemented in the near term, building on the momentum created by the OSH law:

5.1. Actions by the Government

Embed Heat Stress Provisions in the OSH Law and Implementing Regulations: As the OSH law moves forward, MLVT should ensure that heat stress is named explicitly in the law, with WBGT-based thresholds and employer obligations defined in supporting regulations. A dedicated technical working group should be convened to develop sector-specific guidance for the GFT industry within six months of the passage of the law. This working group should also establish a shared protocol for the collection, analysis, and reporting of heat strain data from factories, to be used by inspectors, manufacturers, and the national monitoring system.

Commission a Baseline Heat Risk Assessment of the GFT Sector: Before the first OSH inspection cycle under the new law, MLVT – with support from development partners – should conduct a baseline heat risk assessment across a representative sample of GFT factories. This assessment should measure WBGT levels across factory types, production areas, and seasons; map the current state of engineering controls and administrative practices; and identify the worker groups facing the greatest exposure. Findings should be made publicly available to inform both regulatory implementation and the private sector's own investment decisions.

Launch a Pilot National Heat Monitoring Dashboard: MLVT, in partnership with relevant governmental bodies and development partners, should initiate a pilot heat monitoring dashboard swiftly after adoption of the OSH law. The pilot should test the architecture for sensor data collection, real-time visualisation, and alert generation, and should inform a national roll-out plan. ILO, BFC, and GIZ can serve as coordination platforms for this initiative, connecting government with willing factory participants and technology providers.

Train and Deploy Heat-Competent Labour Inspectors: MLVT should develop a dedicated training module on heat stress risk assessment for all active labour inspectors, including practical instruction in the use of portable WBGT meters. This training should be completed within the first year of the OSH law's implementation. An accountability mechanism should be put in place to ensure that heat inspections are conducted, findings are recorded, and corrective action is followed up consistently. Inspection data on heat compliance should be integrated into any existing or planned factory transparency reporting systems.

Develop a National Heat-Health Awareness Campaign for GFT Workers: In coordination with Ministry of Health (MOH) and relevant industry stakeholders, MLVT should develop and launch a national heat-health awareness campaign targeted at GFT workers, ahead of the peak hot season. The campaign should address heat illness prevention, recognition, and response, and should be delivered in cooperation with development partners and civil society in Khmer across multiple formats suitable for workers with varying literacy levels.

5.2. Support to Factories

Develop a Model Heat Stress Management Policy and Toolkit: TAFTAC and CGTI, with technical support from development partners and occupational health and safety experts, could develop a model Heat Stress Management Policy and accompanying implementation toolkit for GFT factories. The toolkit should include a WBGT-based factory heat risk self-assessment checklist, a template heat management plan, guidance on cost-tiered engineering interventions, a supervisor and worker training module, a template worker heat-reporting survey, and an incident recording template. This toolkit should be made freely available to all TAFTAC member factories and promoted through CGTI training programmes.

Integrate Heat Stress into Existing Factory Capacity-Building Programmes: BFC advisory services and CGTI training programmes should be updated to include heat stress modules as a standard component. Heat stress should also be added to BFC's compliance monitoring framework, consistent with the integration of other OSH topics. This ensures that factories already engaged with existing sustainability support structures receive heat management guidance without requiring a separate, parallel programme.

Facilitate Access to Financing for Heat Infrastructure Upgrades: Development partners and the government should collaborate to map existing financing mechanisms and identify gaps in support for factory-level heat mitigation. A heat infrastructure co-financing pilot, in which brands, development partners, and factories share the cost of cooling upgrades in a defined set of supplier factories, should be designed and tested, with results shared across the industry to demonstrate the return on investment.

Create Peer Learning Networks Among Factories: TAFTAC should facilitate peer exchange among factories that have already implemented effective heat management practices, creating a network through which factory managers can share experiences, cost-saving approaches, and lessons learned. Structured study visits to factories with demonstrated good practice – including those that have successfully installed monitoring systems or achieved measurable reductions in heat-related productivity loss and absenteeism – can accelerate adoption across the sector, particularly among smaller and non-brand-facing facilities.

5.3. Support to Buyers

Engage Buyers Through BFC and the Responsible Business Hub: BFC could lead buyer coordination on heat stress, building on its existing relationships with more than 120 brands and retailers sourcing from Cambodia. This coordination should bring together buyers, suppliers, government representatives and civil society to align on shared heat-related expectations, timelines and responsibilities.

The dialogue should support an agreed set of heat-related requirements that buyers can incorporate into their codes of conduct, supplier engagement and remediation processes, alongside commitments to provide financial and technical support where needed. The RBH could potentially complement this by providing a public-private dialogue platform for broader alignment across buyers, suppliers and sector stakeholders, helping reduce the risk of fragmented or conflicting requirements reaching the same factories.

Develop a Harmonised Heat Assessment Protocol for Buyer Audits: Buyers and their industry associations should work with TAFTAC, BFC, GIZ and relevant partners to develop a single heat stress assessment protocol that can be integrated into existing social compliance audit processes. GIZ could support this process by providing technical input, facilitating alignment between public and private stakeholders, and helping pilot the protocol with selected factories and buyers.

The protocol should reduce duplication by replacing fragmented buyer requirements with a common approach. It should align with the OSH law's requirements once enacted, and include standardised metrics on WBGT measurements, incident reporting, cooling infrastructure and worker training that feed transparently into buyers' human rights and environmental due diligence (HREDD) disclosure obligations.

Promote Public Commitments and Recognise Leadership: Buyers sourcing from Cambodia should be encouraged to make public commitments to supporting heat-safe working conditions across their Cambodian supply chains. Integration of a heat safety category in existing award programmes could celebrate and incentivise factory-level leadership. Recognition programmes of this kind have proven effective in driving voluntary uptake of sustainability standards across other issue areas in the sector and can build momentum ahead of mandatory OSH enforcement.

6. Conclusion

Heat stress is an escalating health, productivity and competitiveness challenge for Cambodia's garment, footwear and travel goods sector.

Phnom Penh's average annual number of days above 35°C increased from 34.4 days in 2005-2009 to 112.2 days in 2020-2024. BFC factory assessment data also show that 82 percent of Cambodian factories recorded indoor temperatures above the 32°C threshold in their hottest production areas. One in three factories experienced days above 35°C indoors, and almost 53 percent recorded indoor temperatures above 32°C while also being hotter than concurrent outdoor temperatures. These levels of heat exposure create clear risks for workers' wellbeing, factory performance and the long-term resilience of a sector employing nearly one million workers, most of whom are women.

The gender dimension matters because heat exposure affects women workers at scale in Cambodia's GFT sector, and because some groups may face additional risks or reduced recovery time. Pregnant workers, workers in physically demanding roles, workers wearing heat-retaining uniforms or protective equipment, and workers with long commutes or unpaid care responsibilities may find it harder to rest, rehydrate and recover outside working hours. Heat stress should therefore be treated not only as a factory temperature issue, but as an occupational safety and health issue linked to worker wellbeing, productivity, gender-responsive protection and social dialogue.

Cambodia is not starting from zero. A legal and regulatory framework already exists and is evolving, while government agencies, factories, buyers, worker organisations, civil society and development partners have begun to respond. However, current efforts remain fragmented and are not yet equal to the scale of the challenge. The consultations that informed this paper showed strong agreement that Cambodia needs a more coordinated sector response, combining clearer regulation, practical factory-level action, worker participation, buyer alignment, better data and sustained technical support.

Addressing heat stress is both a duty of care and a strategic investment. GLI and Schroders estimate that, without immediate adaptation, Cambodia's apparel industry could forego 18 percent of potential export earnings by 2030 and create 50,000 fewer new jobs compared with an adaptation scenario.[22] Protecting workers from excessive heat can reduce health risks, support productivity, strengthen compliance and help preserve Cambodia's competitiveness as global buyers place greater emphasis on climate resilience and worker wellbeing. With the forthcoming OSH framework, active sector institutions and growing evidence on what works, Cambodia has an opportunity to move early, set a credible standard for heat-safe production, and position its GFT sector as a more resilient and responsible sourcing destination in a warming world.

[22] Judd, J., Bauer, A., Kuruvilla, S., Williams, S., and Long, A. (2023). Higher Ground? Fashion's Climate Breakdown and its Effect for Workers. Cornell University Global Labor Institute and Schroders. https://www.ilr.cornell.edu/global-labor-institute/higher-ground-fashions-climate-breakdown

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