

Background of Heat Stress

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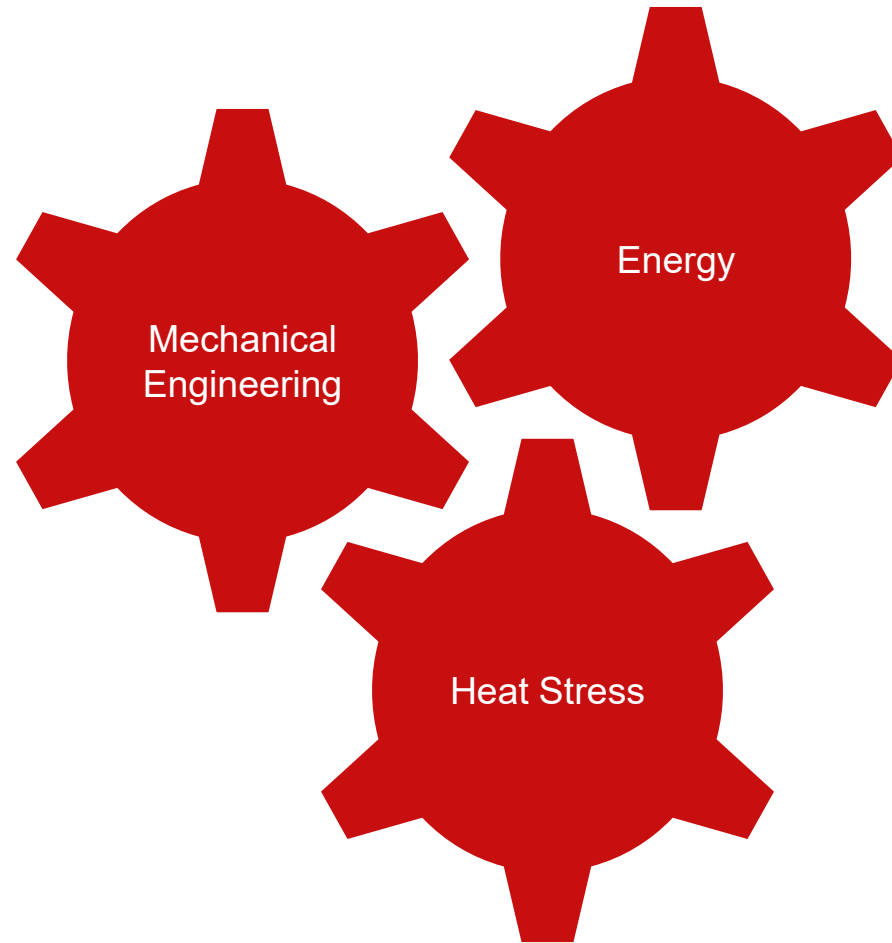
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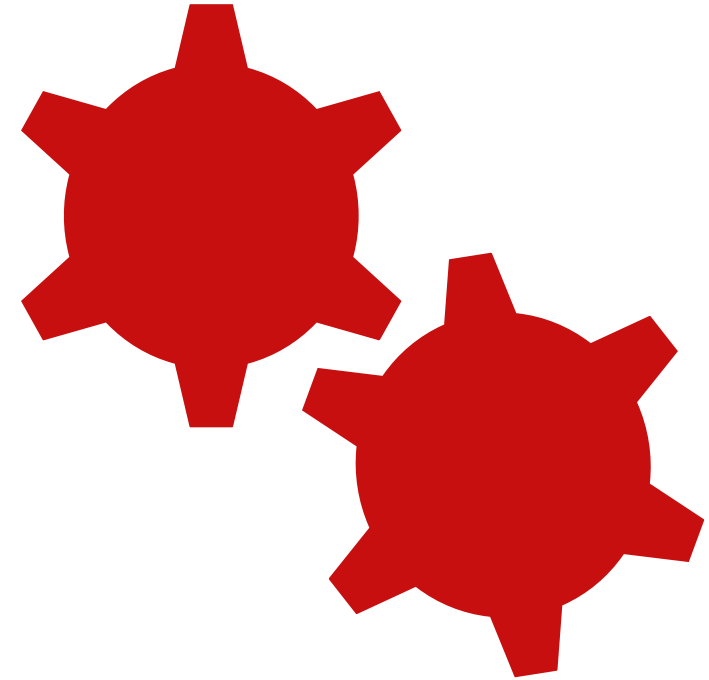
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Why is Heat Stress?





“

The era of global warming has ended;
the era of global boiling has arrived.

”

António Guterres

UN Secretary General



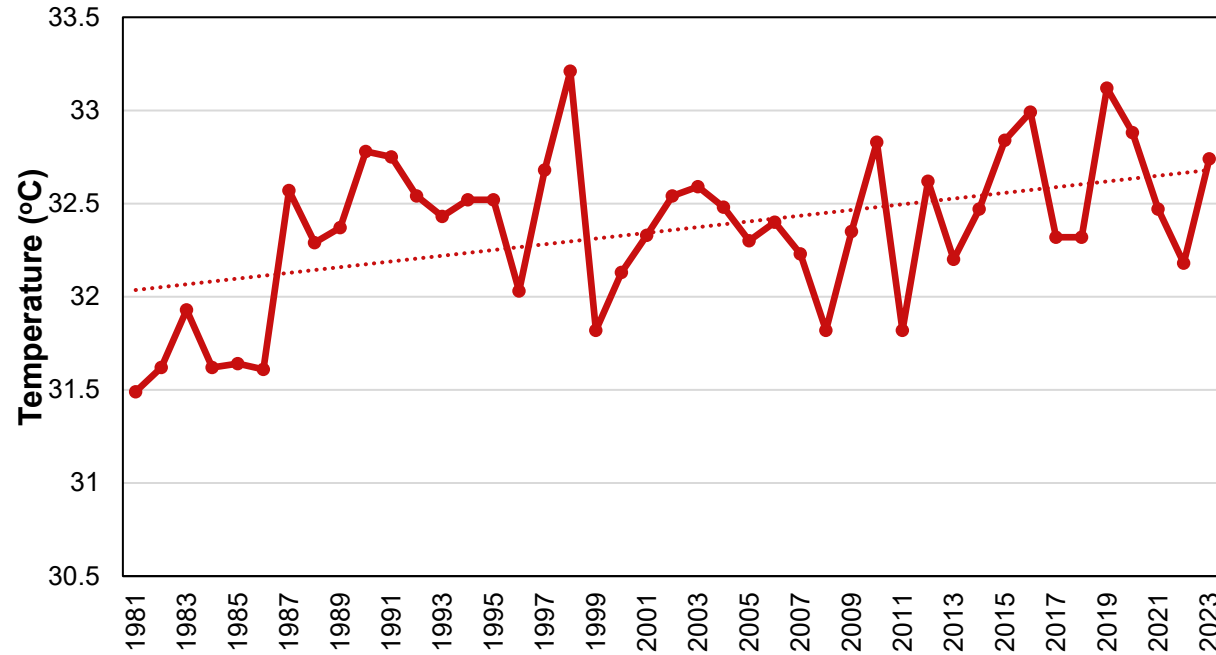
The Boiling Frogs

We are the boiling frogs.

Yet, we don't know that we're being cooked alive.

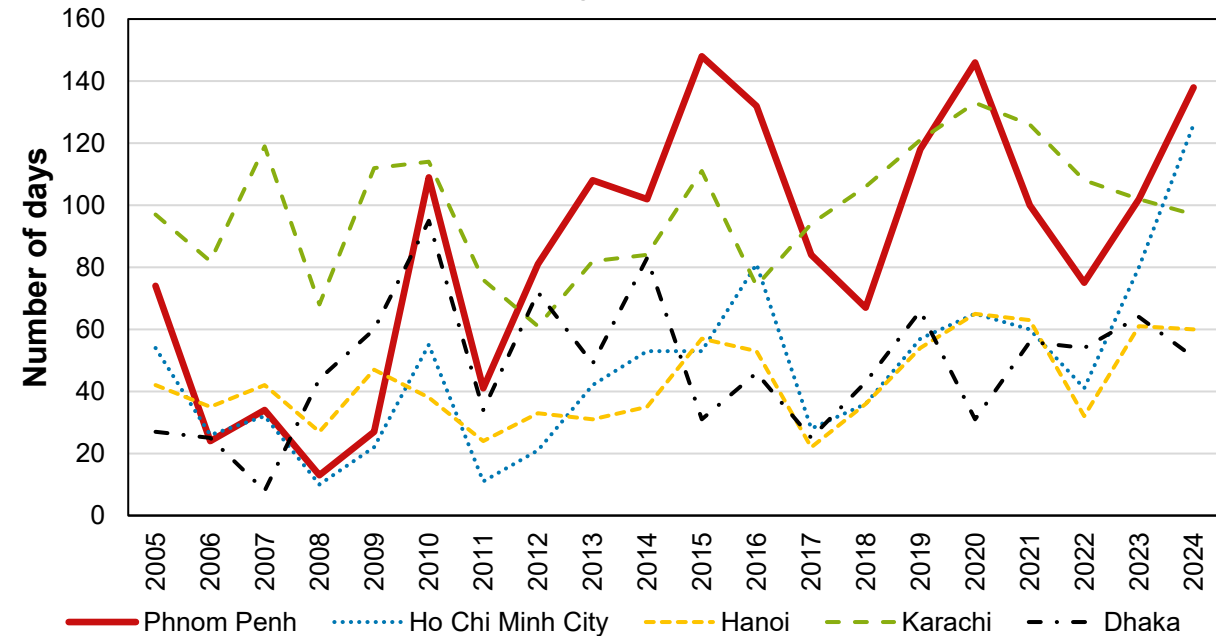
The level of detail in the data matters

Annual mean temperature in Phnom Penh



Source: Author's illustration from HOTHAPS

Annual days above 35°C



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

Phnom Penh: Days $\geq 35^{\circ}\text{C}$ per Year

35 days → 112 days

2005–09 average → 2020–24 average — more than tripled in 15 years

This isn't a future hypothetical — it's already happened, and it's accelerating.

Cambodia's Unique Heat Challenge



High temperature



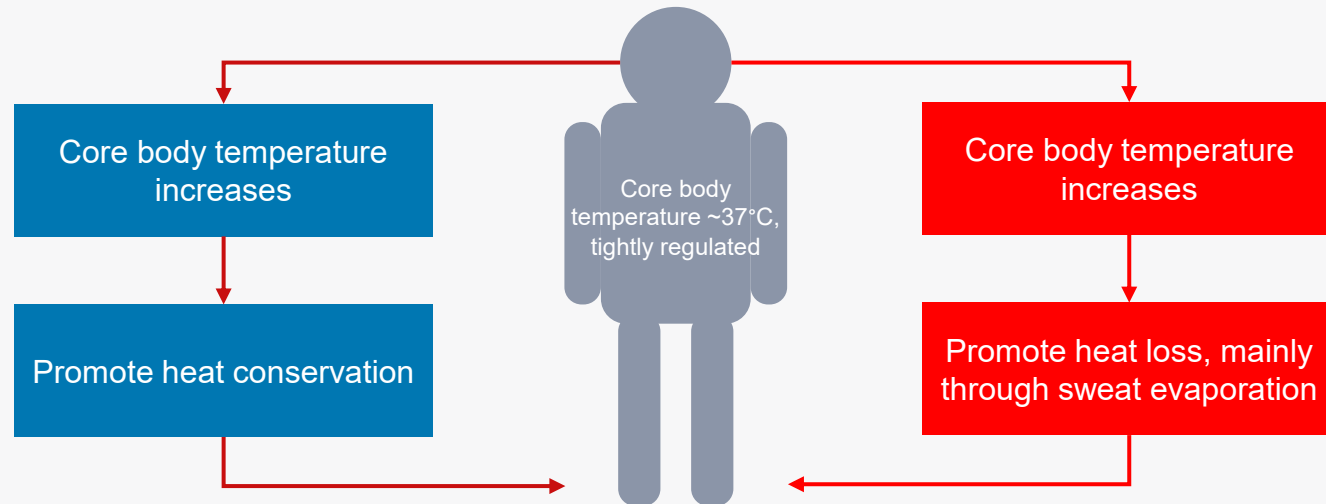
High humidity



Constant exposure

Human's Cooling System - Thermoregulation

The Body's Cooling System (thermoregulation)



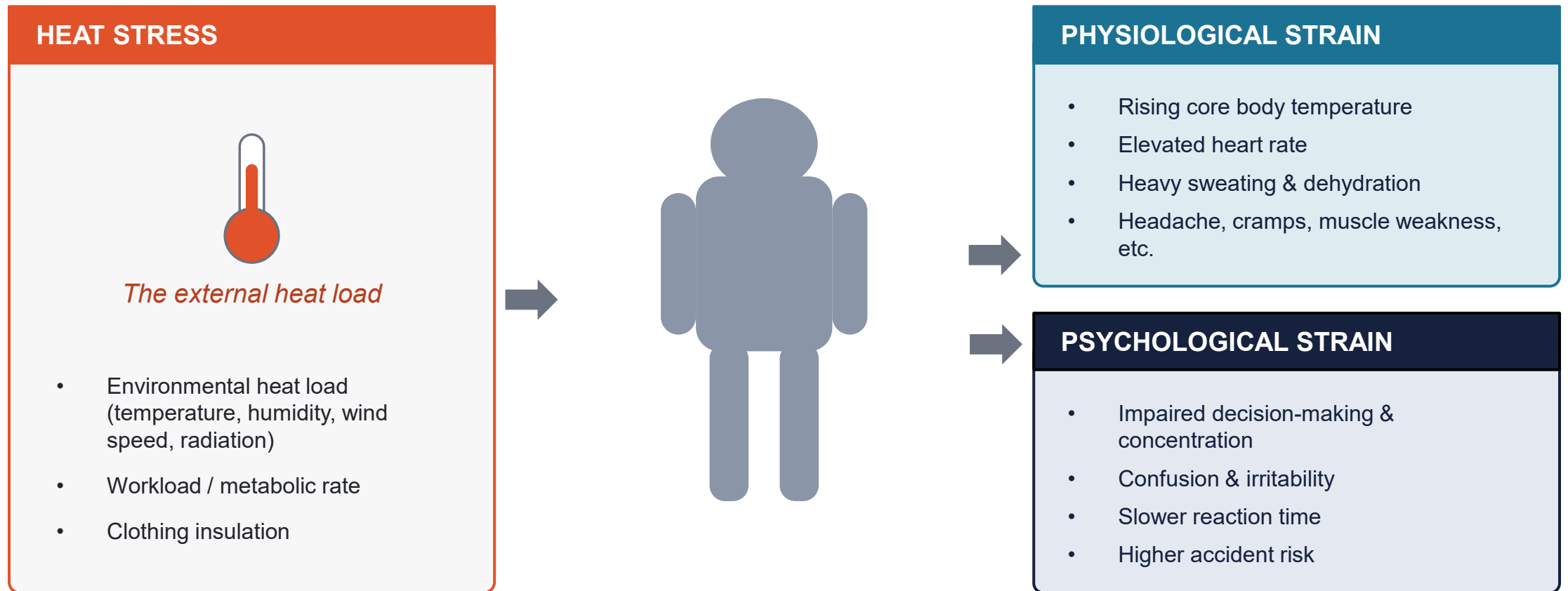
When heat gain exceeds heat loss, core body temperature rises.

Sweating alone does not cool the body; it is the **evaporation of sweat** that helps lower body temperature.

The effectiveness of sweat evaporation depends heavily on humidity: **higher humidity slows evaporation** and reduces the body's ability to cool itself.

Heat Stress vs. Heat Strain

- Heat stress is the net heat load on the body — from what it generates internally, what it wears, and what surrounds it — in excess of what it can safely dissipate.
- Heat strain is the response of a body under heat stress. Heat exposure produces both physiological and psychological strains — the same input, but the body's response has two faces.



Two people under the **SAME** heat stress can experience very **DIFFERENT** heat strains.

Other Factors that Shape Heat Stress Risk

Beyond the environment, personal and occupational factors change how much risk any individual worker faces.

● Biological / physiological factor

● Occupational / socio-economic factor



Gender

Sweat rate and heat tolerance differ physiologically between men and women



Age

Older and younger workers can have reduced thermoregulatory capacity



Fitness & health

Cardiovascular, kidney, or chronic conditions reduce heat-coping capacity



Pregnancy

Higher metabolic rate and reduced heat tolerance during pregnancy



Work type

Physically demanding tasks generate more internal heat than seated work



Knowledge & education

Awareness of symptoms and prevention shapes how early workers respond



Income

Financial pressure can discourage rest breaks or reporting symptoms



Heat acclimatisation

Unacclimatised workers face substantially higher risk than acclimatised ones



WASH

Limited access to clean water or toilets discourages hydration and worsens heat risk

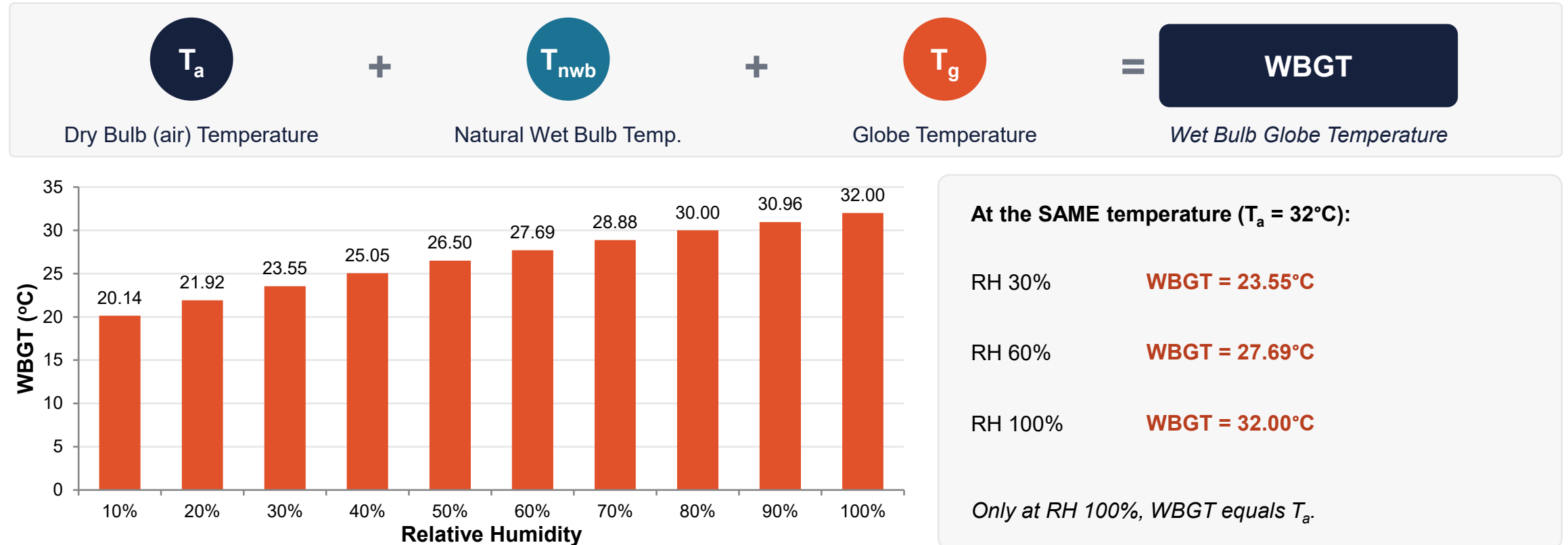
?

Unknown factor(s)

Other individual risk factors not yet identified by research

Measuring Heat Stress: Wet Bulb Globe Temperature (WBGT)

Many heat stress indices exist (Heat Index, Humidex, UTCI...) — but WBGT is the international standard for occupational heat stress.



Key message: the **SAME** dry bulb temperature, with **DIFFERENT** relative humidity, gives a very **DIFFERENT** WBGT.

Example of Sectors impacted by heat stress

Outdoor workers



Image source: [Link](#)



Image source: [Link](#)



Image source: [Link](#)

Indoor workers



Image source: [Link](#)



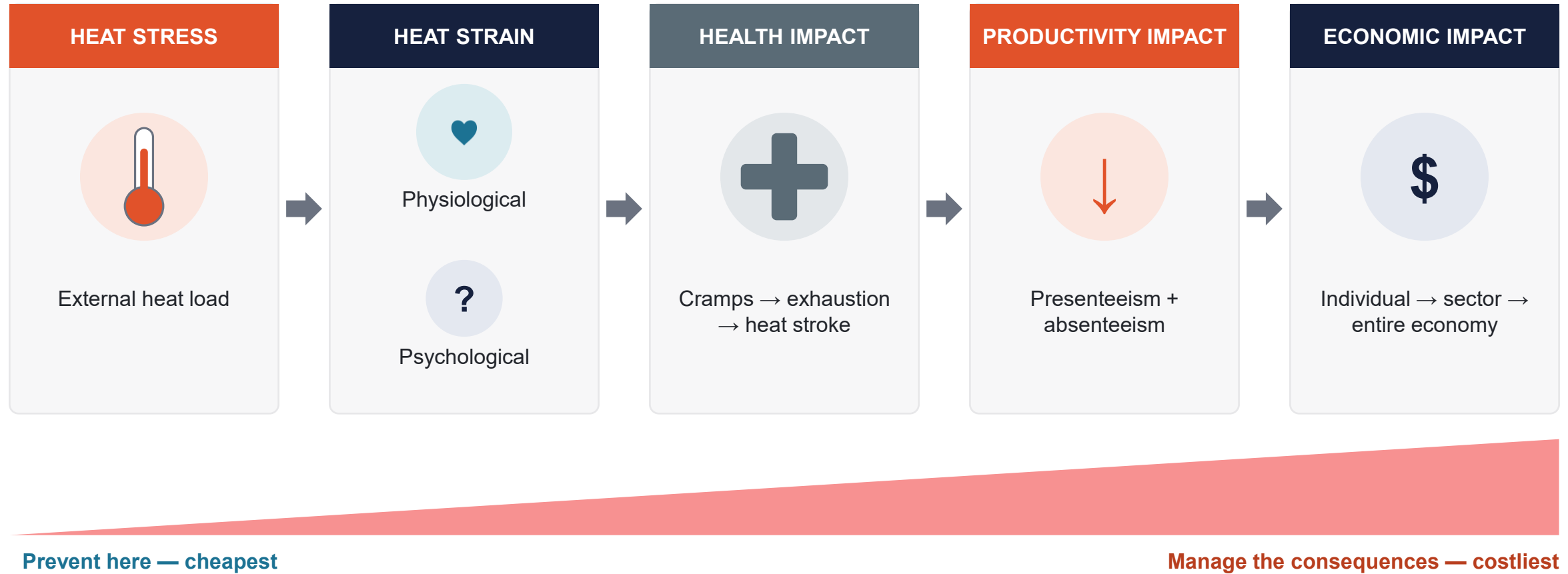
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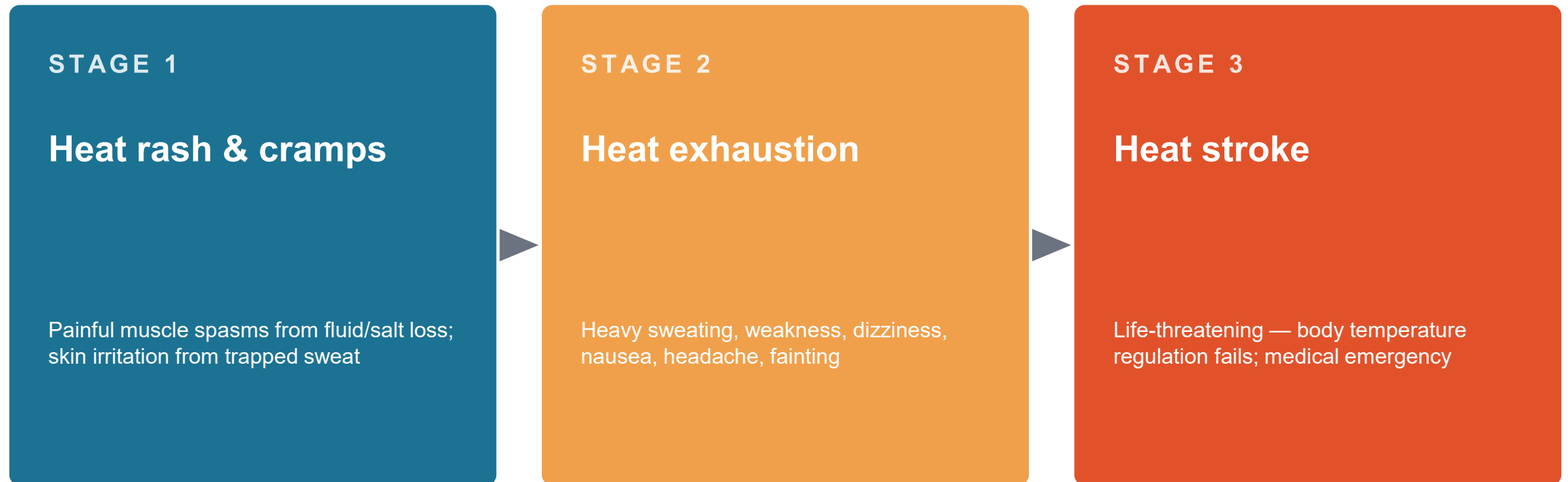
The Impact Chain

How one exposure cascades into measurable economic loss.



The Heat-Illness Spectrum

Heat-related illness is progressive — mild symptoms are an early-warning signal, not a separate problem from heat stroke.



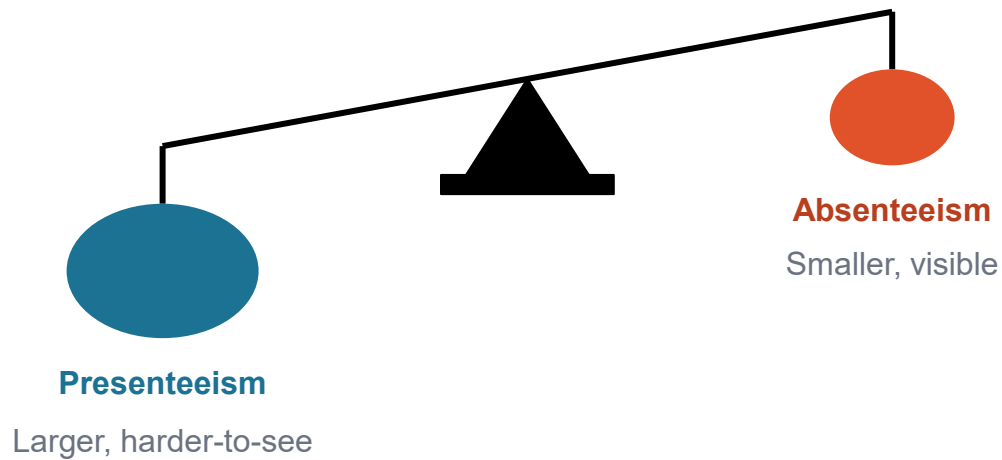
Two Faces of Productivity Loss

Heat stress reduces productivity in two distinct ways — one visible in attendance records, one hidden in work output.

Presenteeism

Reduced output while still at work, from thermal discomfort and impaired cognitive performance.

- Reduced actual sewing line efficiency
- More defects
- Invisible in HR records

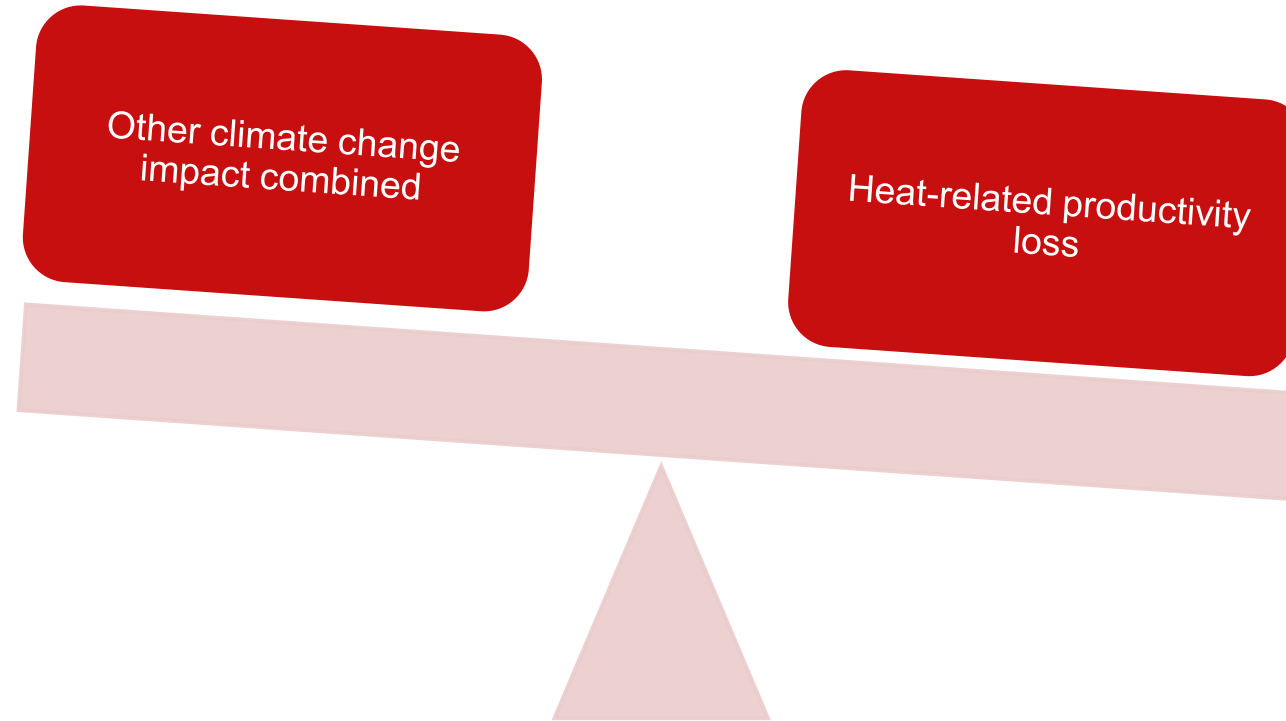


Absenteeism

Sick leave or missed shifts due to heat-related illness or injury.

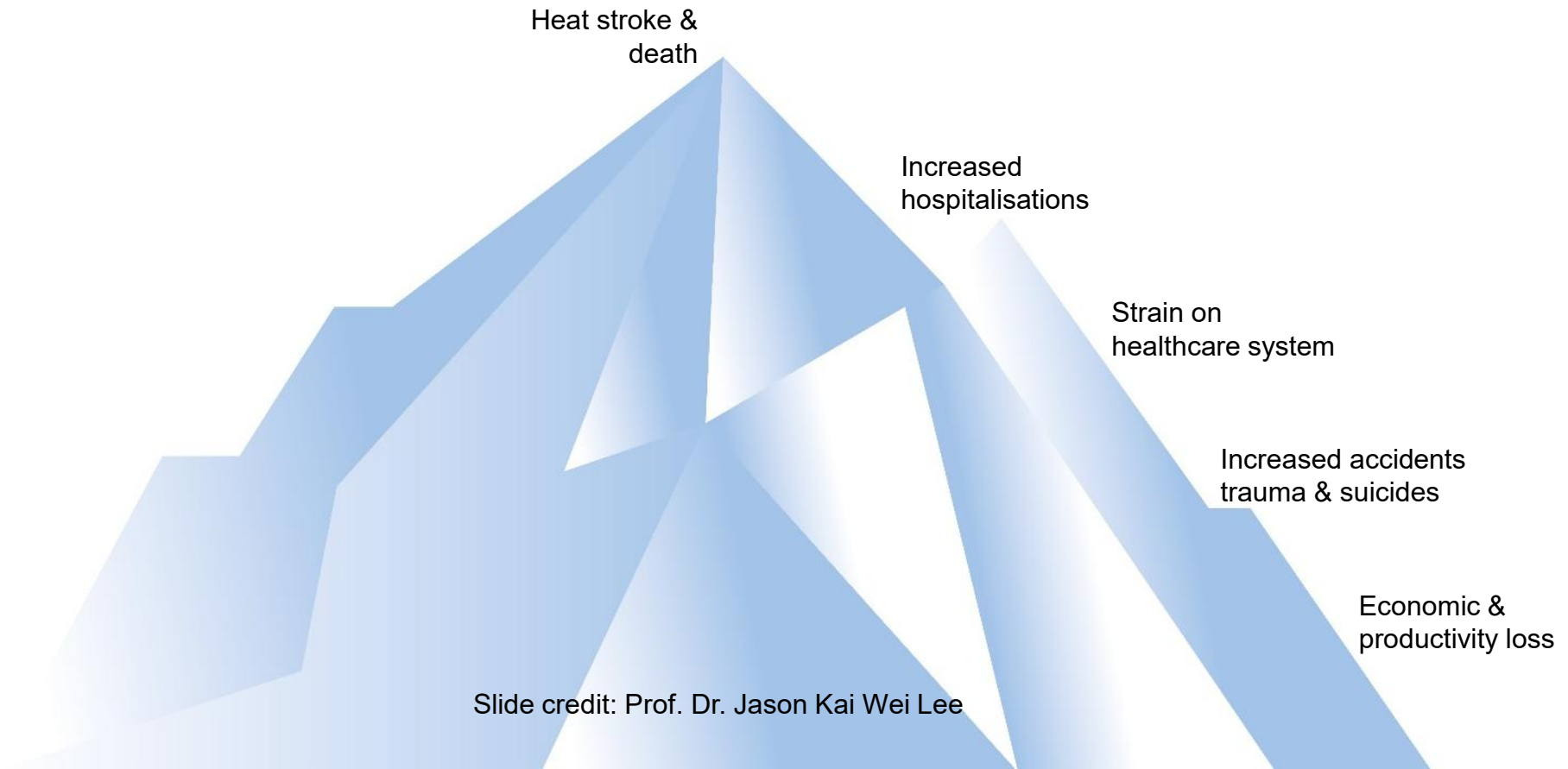
- Heat exhaustion, fainting
- Missed shifts = lost capacity
- Visible in attendance records

Heat-Induced Economic Impact



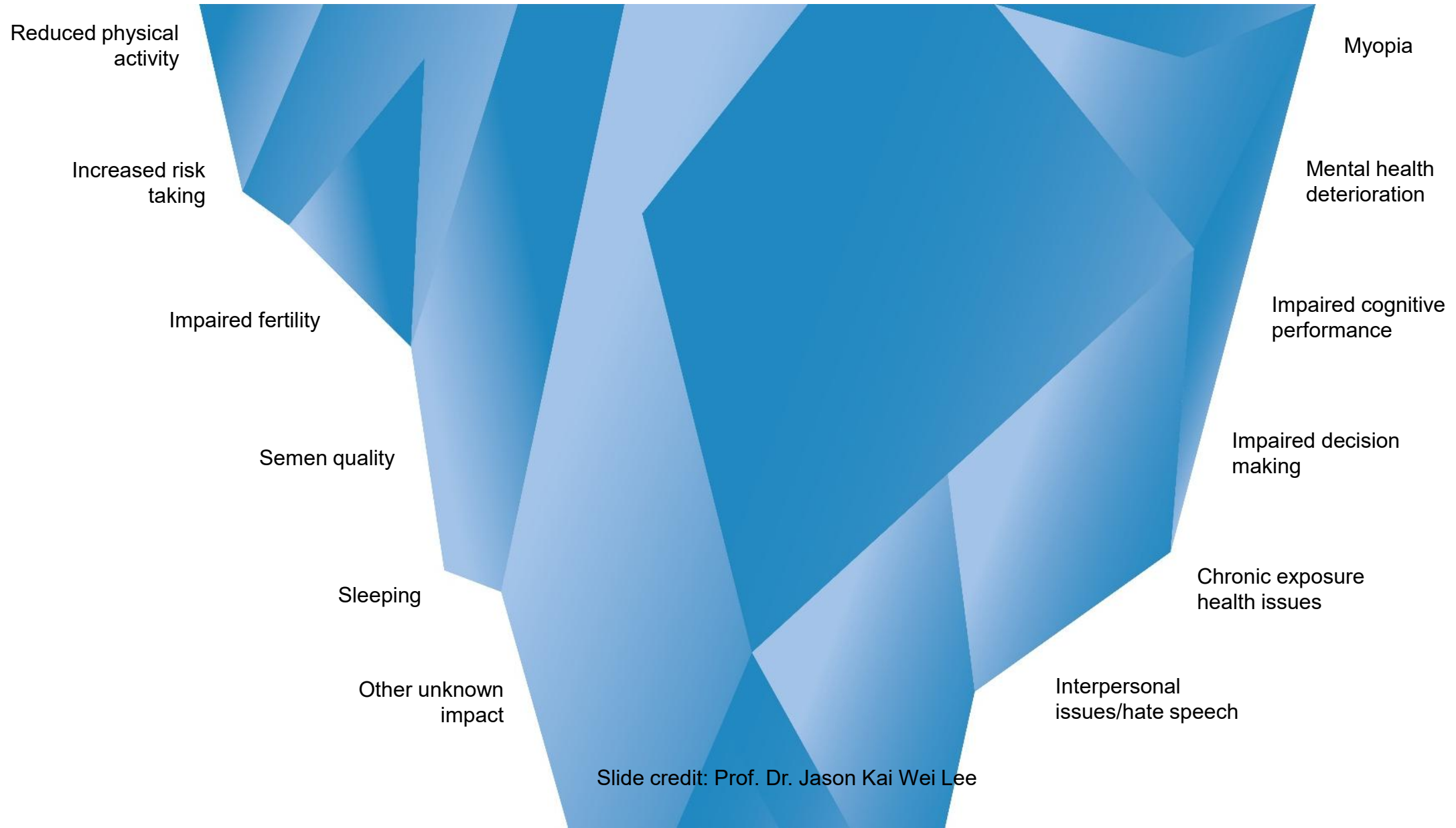
Heat related labour productivity loss was estimated to result in the **largest climate change impact on the world economy** and accounted for the **biggest share of economic impacts**.

Impacts of Heat Stress: Tip of the Iceberg



Slide credit: Prof. Dr. Jason Kai Wei Lee

Indirect Impacts of Heat Stress



Slide credit: Prof. Dr. Jason Kai Wei Lee

Who is Most at Risk?



Women workers

Especially pregnant workers, and those with care duties and long commutes



High-exposure roles

Ironing, cutting, boiler areas, warehouses, construction



New or returning workers

Not yet acclimatised to the heat



Older workers and chronic conditions

Lower ability to cope with heat



Piece-rate workers

Pressure to skip rest, water and reporting



Informal and low-protection workplaces

Fewer rules, less monitoring

Heat Mitigation at Three Levels

Effective heat management combines action at all three levels — no single measure is sufficient alone.

Individual

What workers can do themselves

- Stay hydrated — drink water regularly, not just when thirsty
- Wear light, breathable clothing where the job allows
- Recognise early symptoms and speak up
- Take rest breaks proactively, especially after returning from leave

Managerial

What employers (factories) can do

- WBGT-based work-rest scheduling
- Heat-health training for workers & supervisors
- Access to cool drinking water & shaded rest areas
- Acclimatisation protocols for new/returning workers
- Adjust shift timing to avoid peak-heat hours

Engineering

Technical & physical measures

- Improved ventilation & exhaust fans
- Roof insulation / reflective heat shields
- Evaporative cooling / water curtains
- Reducing radiant heat from machines & equipment

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