RESEARCH

The Impact of Heat Stress on Human Productivity and Economy in Cambodia

Global warming is exacerbating heat stress, posing a major threat to workers and students. This leads to health problems, reduced productivity, and increased occupational hazards. Heat stress negatively impacts well-being, and increases heat-related illnesses, and even mortality. It also affects workers' willingness to work, overall well-being, and productivity, while raising the risk of accidents.

OBJECTIVES

- Build knowledge of heat stress
- Investigate the productivity loss due to heat stress
- Build evidence on the impacts of heat stress in three selected sectors: construction, garment, and education

RESEARCH METHODOLOGY AND APPROACH

CONSTRUCTION

74 respondents (rebar and molding workers) **(100% M)**, age range: **18-57**, in **5** construction sites in Phnom Penh, both cool (Nov 22 to Feb 23) and hot (Mar to Jun 23) seasons

GARMENT

778 respondents **(97% F)**, age range: **19-55**, in **3** factories, both cool (Jul 2022) and hot (Feb 2022) seasons

EDUCATION

493 respondents **(52% F, 48% M)**, grade **6**, **2** primary schools in Phnom Penh

DATA COLLECTION

Environmental Parameters
Air temperature, radiant temperature, humidity and air movement

Personal data collection
Age, body mass index, alcohol and smoking habits, medical history

Physiological factors
Heart rate, monitored every minute for 8 hours per day

Productivity observation
Direct, indirect, and non-productive time with observation every 15 minutes

Psychometric factors
Thermal sensation and rate of perceived exertion

Energy audit
Energy adaption measures and energy efficiency recommendations

RESEARCH RESULTS

- Heat stress significantly reduces construction labor productivity and work duration due to physiological strain.
- Workers experience more severe heat impact in hot months than in the cold months.
- Working during the hottest month of the year increases the negative impacts on work pace and accuracy.
- Students experience heat stress symptoms while studying, including low concentration, mild headache, dizziness, and weakness.

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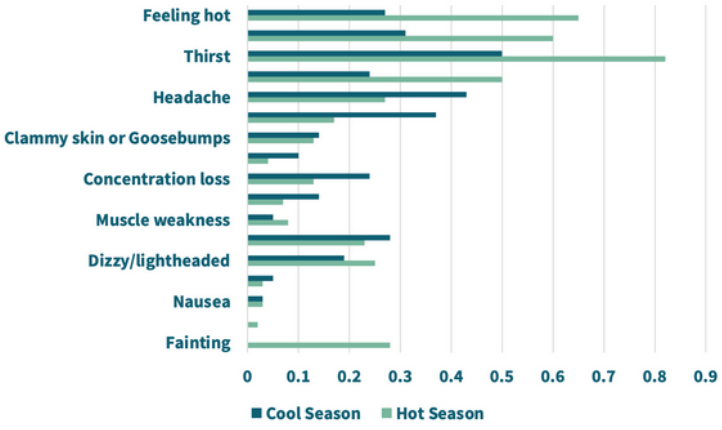
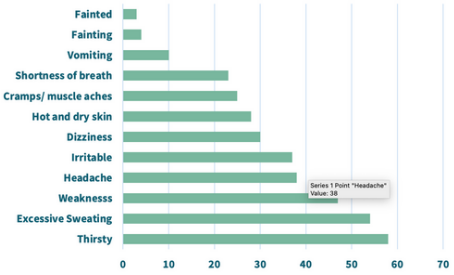
Heat Stress Cambodia
NUS National University of Singapore
The Hong Kong Polytechnic University 香港理工大學

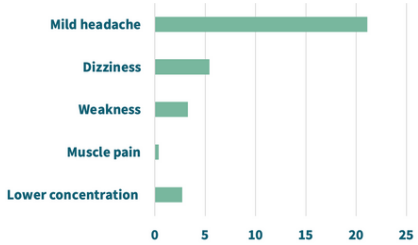
Graph: *Garment workers' perceived heat strain and symptoms of heat-related illness*



Graph: *Effects of heat stress on construction workers*



Graph: *Heat stress symptoms for students while learning*



RESEARCH ON PRODUCTIVITY LOSS

Objective: To assess the macroeconomic impacts of heat exposure in Cambodia

All sectors: **11.2%** annual decrease in industrial productive working time **USD 2,638 million** economy-wide output loss in 2018.

By **2035** further **USD 634 million** output loss is estimated

Affecting the agriculture **16.7%**, construction **9.8%**, manufacturing **3.5%**, and services **3.2%**

RECOMMENDATION

CONSTRUCTION SECTOR

- Provide regular breaks of 5-15 minutes for every 45 minutes
- Ensuring adequate hydration with access to cool drinks
- Establishing cooling areas and shadow
- Provide workers with appropriate uniforms

GARMENT SECTOR

- Have good ventilation and make drinking water available
- Green spaces around buildings can help to protect from heat
- Provide regular training on heat-related risks in daily work and health, and coping mechanisms for managers and workers

EDUCATION SECTOR

- Provide good ventilation in the classes
- Provide drinking water available
- Create green spaces around buildings
- Train teachers on the impact of heat on human health so they can educate students on coping strategies during hot weather

PRODUCTIVITY LOSS

- Build resilience against current and future effects of hot climate conditions
- Adaptation measures to protect workers from current and future high heat levels
- Apply "green technology" for energy systems, cooling of buildings, and transport

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