Human Health and Potential in a Warming World

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Chair, WHO-WMO GHHIN SE Asia Hub



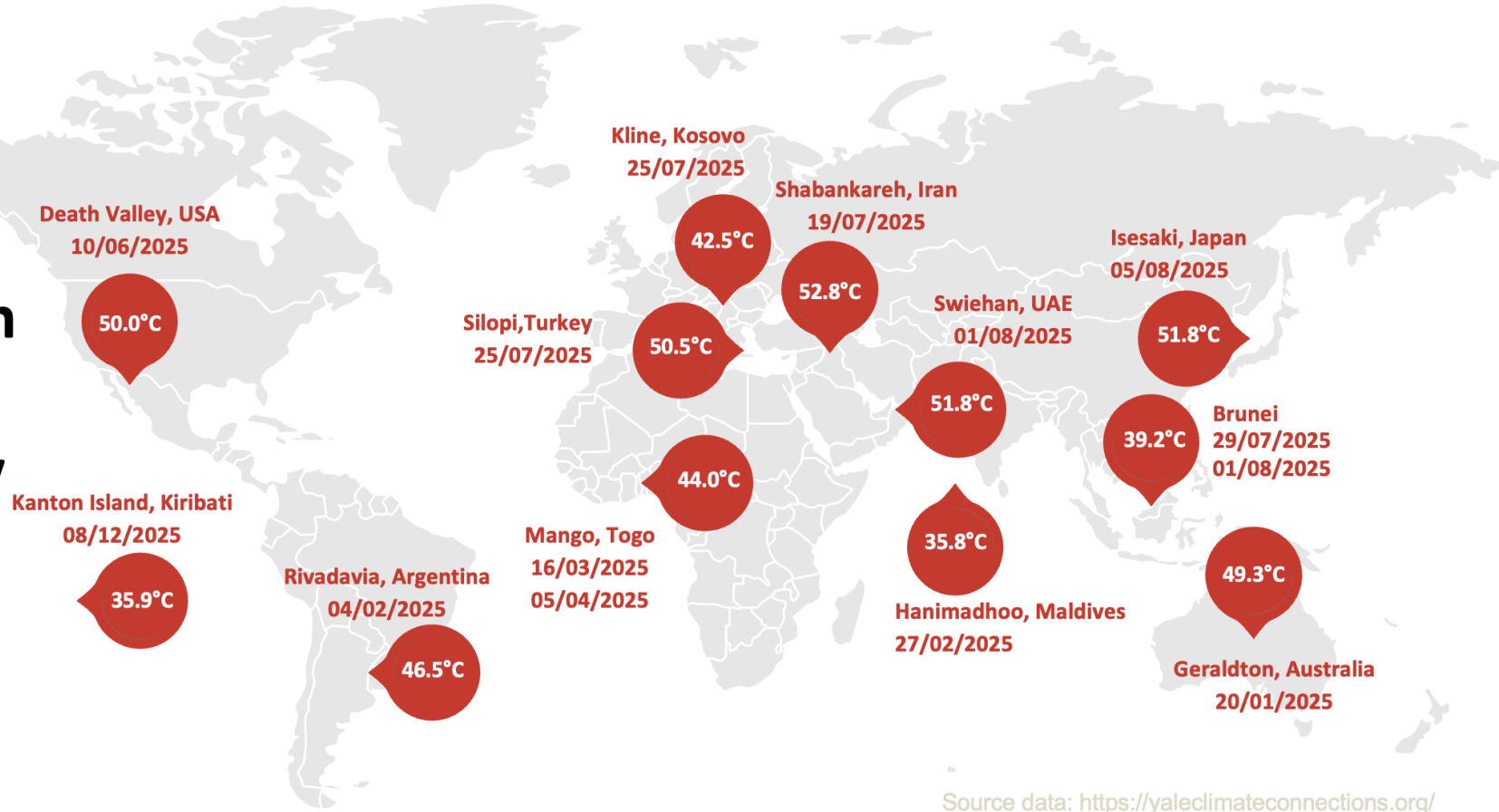
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“The era of global boiling has arrived.”

United Nations Secretary-General
António Guterres
July 2023



2025 was one of the 3 warmest years on record, continuing the streak of extraordinary global temperatures.



Source data: https://yaleclimateconnections.org/

WMO 2025

RAPID URBANISATION

Cities are heating up at twice the global average.



SUPER AGING SOCIETY

The number of older adults is expected to rise by 22% from 77.4 m in 2020 to 173.3m by 2050



‘HEAT-SENSITIVE’
HEALTH CONDITIONS

Health conditions that can worsen or become more difficult to manage in high temperatures

e.g. chronic conditions



Cardiovascular disease



Renal disease



Pulmonary disease



Hypertension

OUR UNIQUE CHALLENGE



HIGH TEMPERATURES

HIGH HUMIDITY

SUSTAINED EXPOSURE



"Relax. Pot temperatures have been going up and down for centuries."

OUR UNIQUE CHALLENGE

GLOBAL HEAT HEALTH INFORMATION NETWORK
SOUTHEAST ASIA

HEAT IMPACTS: THE TIP OF THE ICEBERG



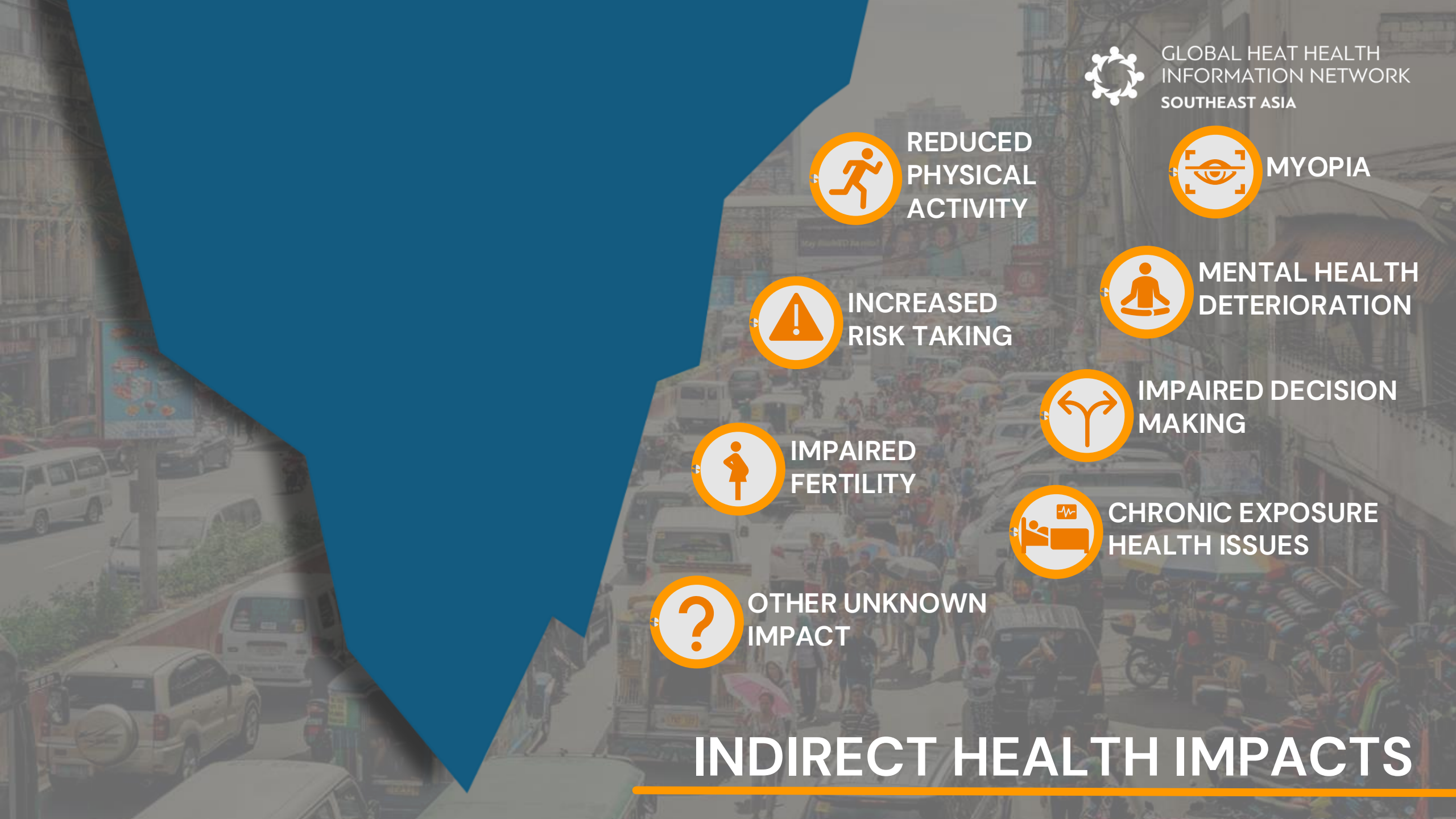
HEAT STROKE & DEATH

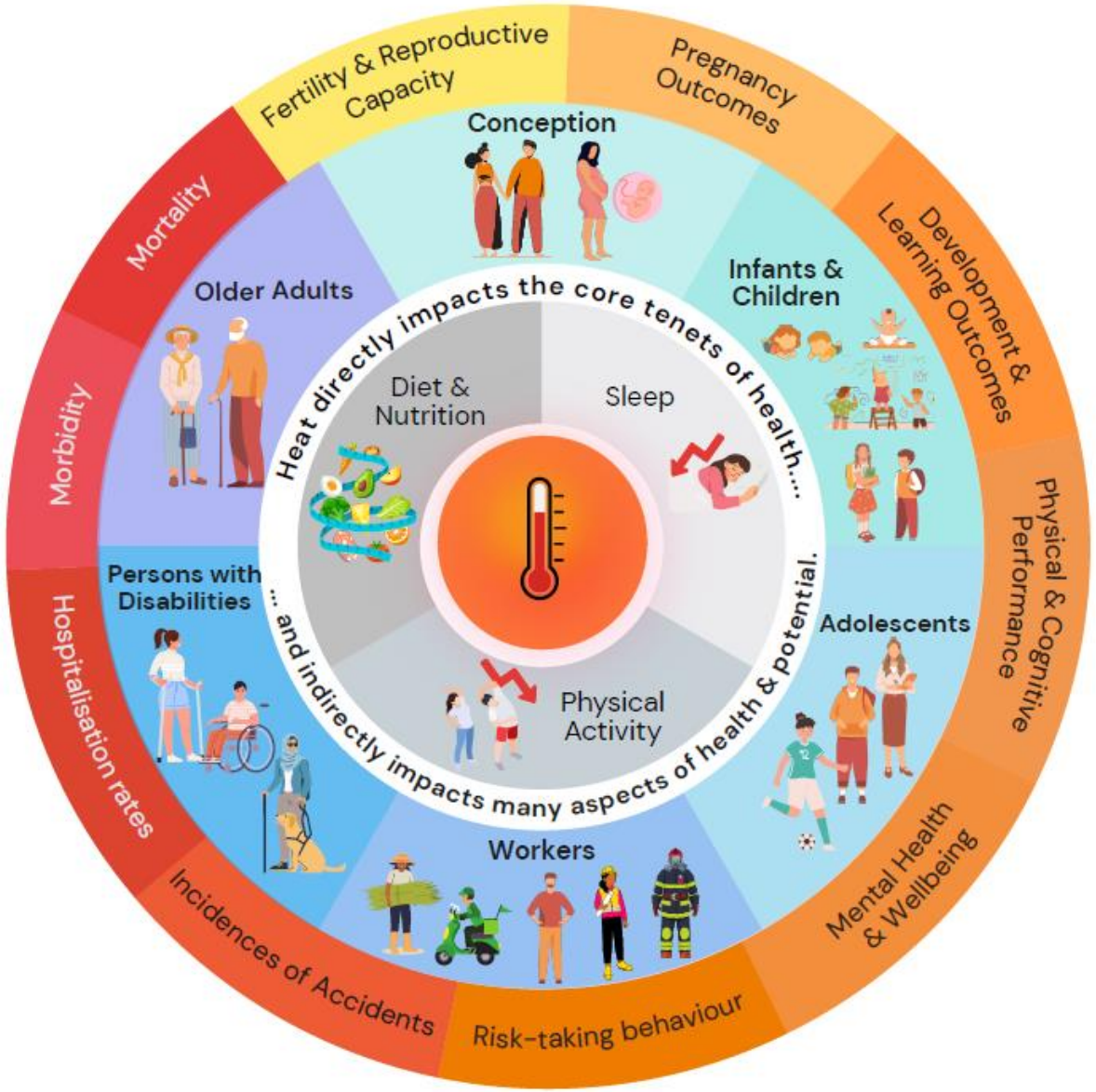
INCREASED HOSPITALISATIONS

STRAIN ON HEALTHCARE SYSTEM

INCREASED ACCIDENTS, TRAUMA & SUICIDES

ECONOMIC & PRODUCTIVITY LOSS


GLOBAL HEAT HEALTH INFORMATION NETWORK
SOUTHEAST ASIA
REDUCED PHYSICAL ACTIVITY
MYOPIA
INCREASED RISK TAKING
MENTAL HEALTH DETERIORATION
IMPAIRED DECISION MAKING
IMPAIRED FERTILITY
CHRONIC EXPOSURE HEALTH ISSUES
OTHER UNKNOWN IMPACT
INDIRECT HEALTH IMPACTS



HEAT STRESS AS A "HORIZONTAL"

Extreme heat impacts are multi-sectoral and cascading



Natural & Built Environment

Increased risk of fires, poor air & soil quality, water scarcity & drought, urban heat island, flash flooding and cyclones.

Economy

Direct and compounding impacts through sectors, systems and geographies threaten the economic viability of many businesses, industries, and thus livelihoods and functioning societies.

Labour

Extreme heat impacts rural & urban workers and lowers productivity across many sectors.

Stability

Extreme heat can amplify humanitarian crises, societal fragilities & instability, stress democracies, and may drive violence & migration.

Education

Extreme heat can cause school closures and reduces attendance and learning outcomes.

Agriculture

Extreme heat can lead to crop failure and reduced yields, through drought, pests, fire, and wilt, with impacts that can disrupt food systems and provoke food insecurity.

Health

Extreme heatwaves stress healthcare systems. Exposure to high temperatures increases risk of illness and death, including from some infectious diseases.

Transport

Extreme heat can disrupt transportation systems, supply and cold chains through impacts to infrastructure and the workforce.

Social services

Vulnerable persons face heightened risk, which can place additional strain on social services. Service delivery can be disrupted by heat impacts on personnel and infrastructure.

Energy, utilities & technology

Utilities and technology can fail under high temperatures, leaving people and industry without electricity, including for cooling.

World Health Organization | WORLD METEOROLOGICAL ORGANIZATION | CLIMATE AND HEALTH JOINT PROGRAMME

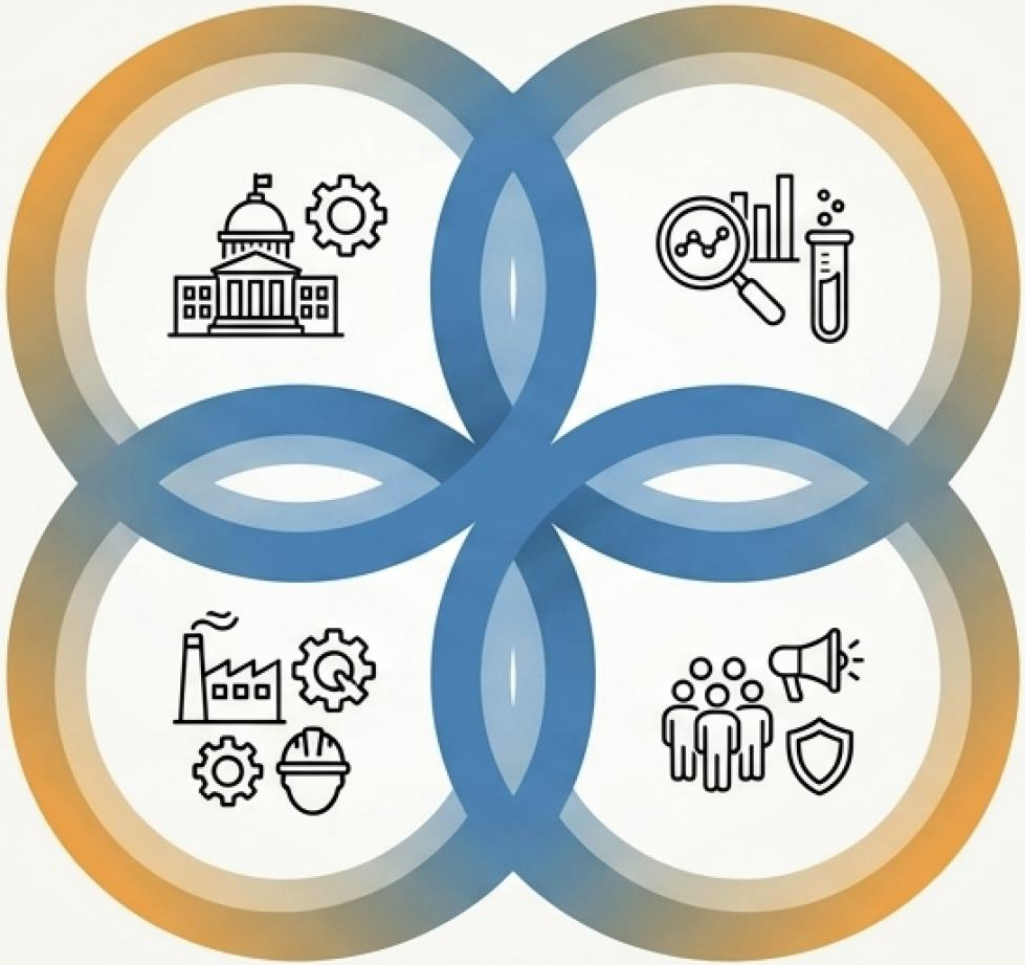
GLOBAL HEAT HEALTH INFORMATION NETWORK

www.heathealth.info
www.climahealth.info

THE MULTI-STAKEHOLDER FRAMEWORK

GOVERNMENT:
Whole-of-Government Coordination

INDUSTRY:
Employer Action & Worker Protection

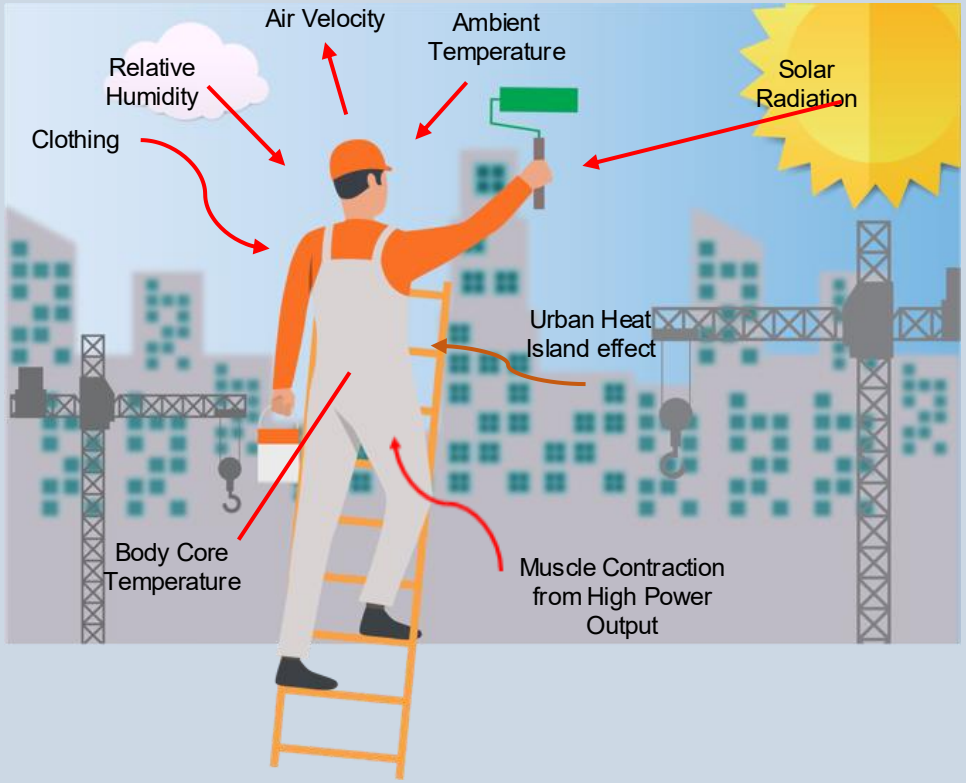


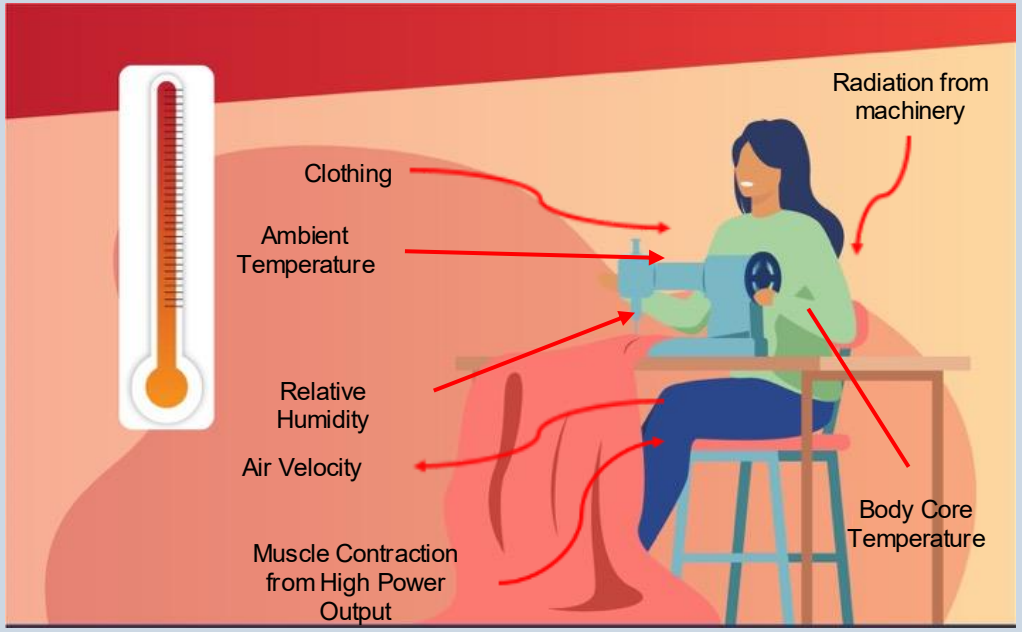
SCIENCE:
Research & Evidence Partnerships

COMMUNITY:
Public Empowerment & Advisories

A synchronized societal machine where no single pillar works in isolation.

HEAT STRESS VS. HEAT STRAIN?

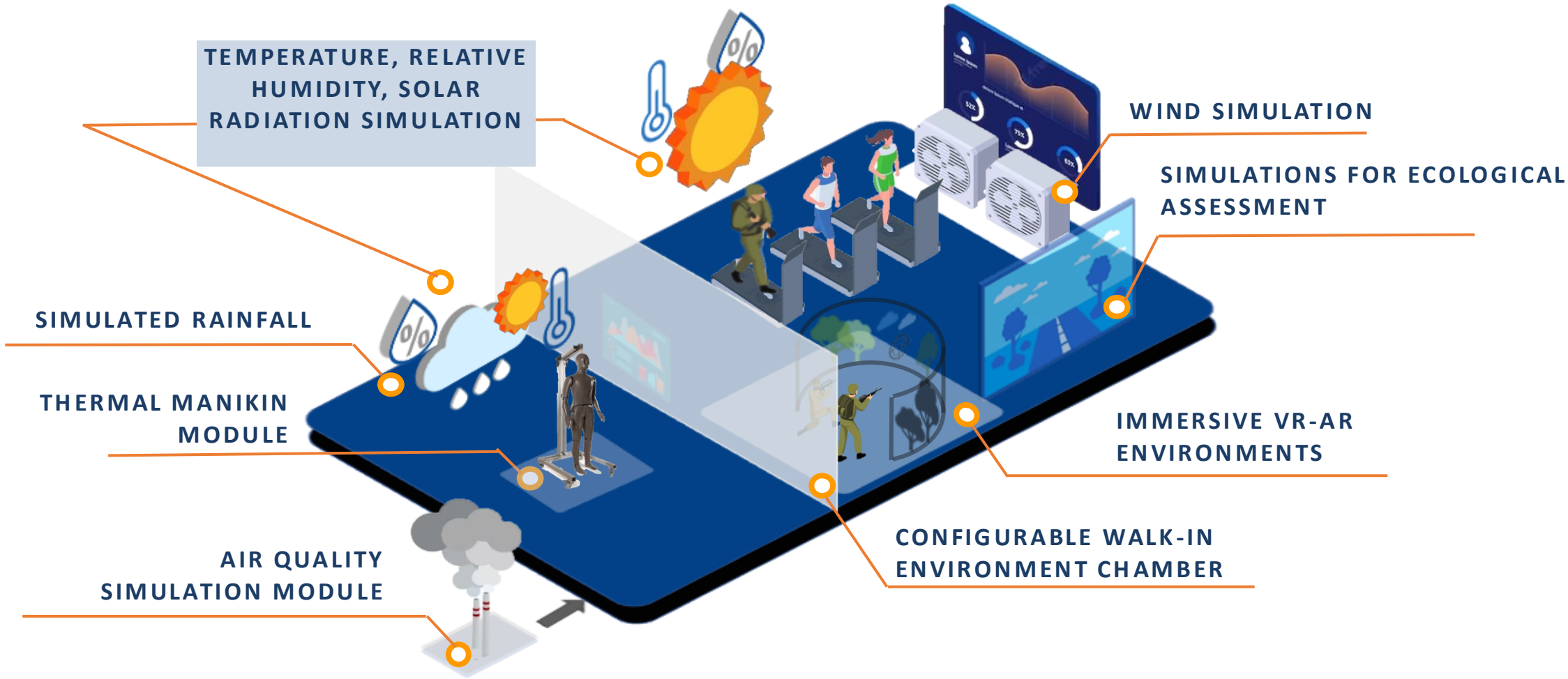




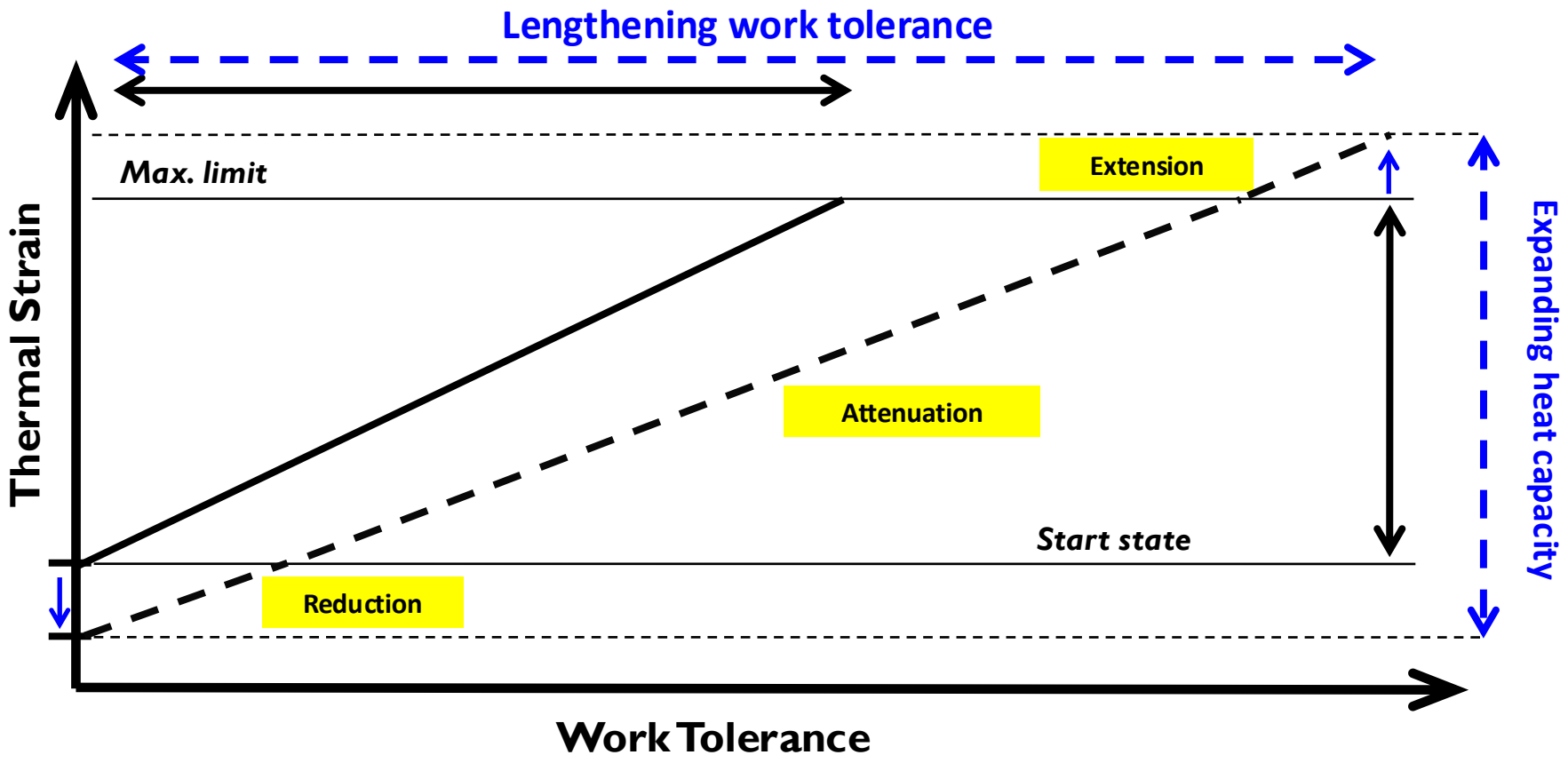
Weather + Attire + Physiology

(Heat Stress) → **Heat Strain** ⚠

INTEGRATED CLIMATIC SIMULATION LABORATORY



PHYSIOLOGICAL SOLUTIONS



Alhadad et al. (2019); Front. Physiol.



PHYSIOLOGICAL SOLUTIONS



AEROBIC FITNESS CONDITIONING

- Reduction
- Attenuation
- Extension



HEAT ACCLIMATIZATION

- Reduction
- Attenuation



PRE-ACTIVITY COOLING

- Reduction



WORK REST CYCLES

- Reduction
- Attenuation

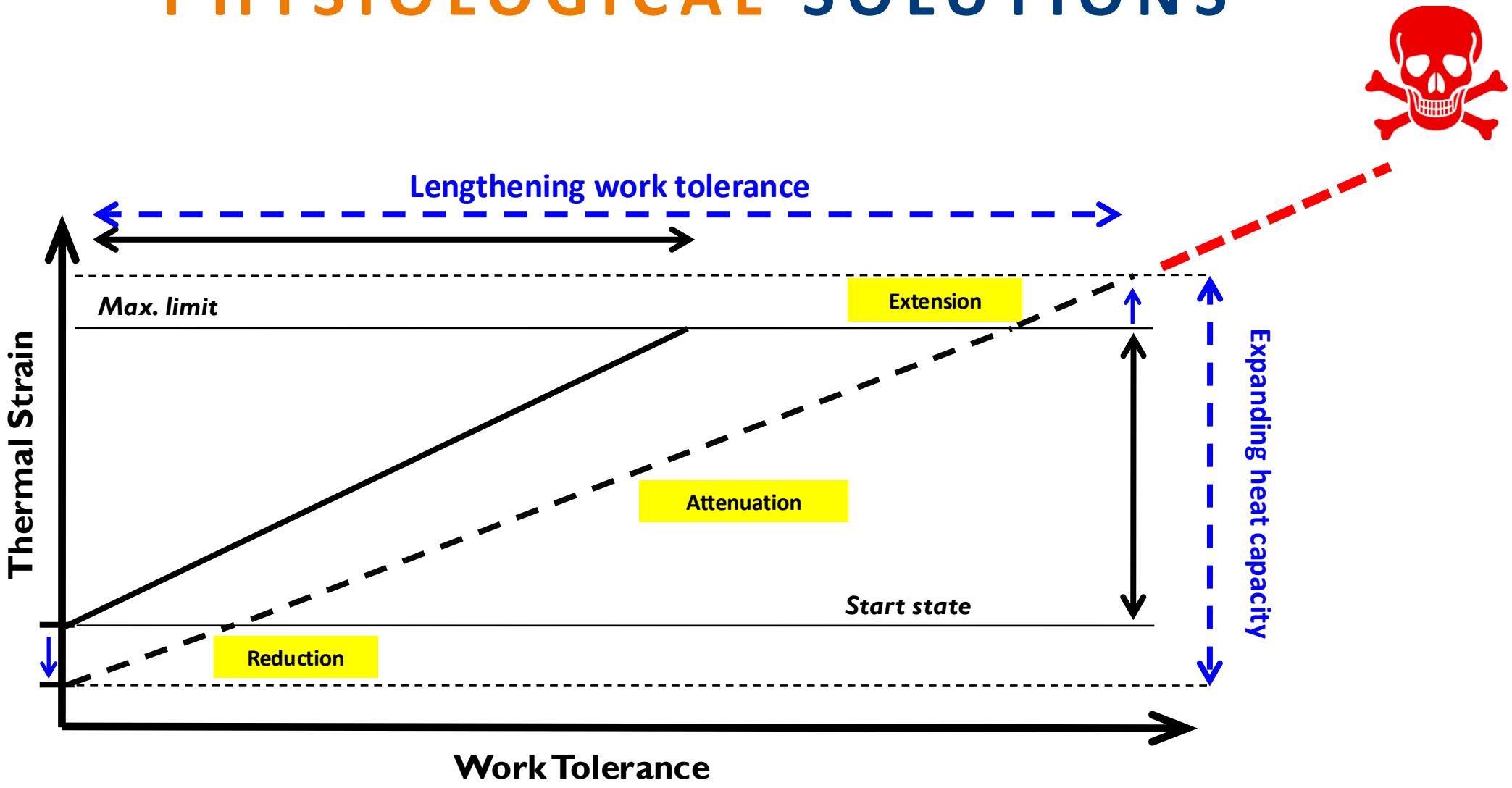


HYDRATION

- Attenuation

Alhadad et al. (2019); Front. Physiol.

PHYSIOLOGICAL SOLUTIONS



Alhadad et al. (2019); Front. Physiol.

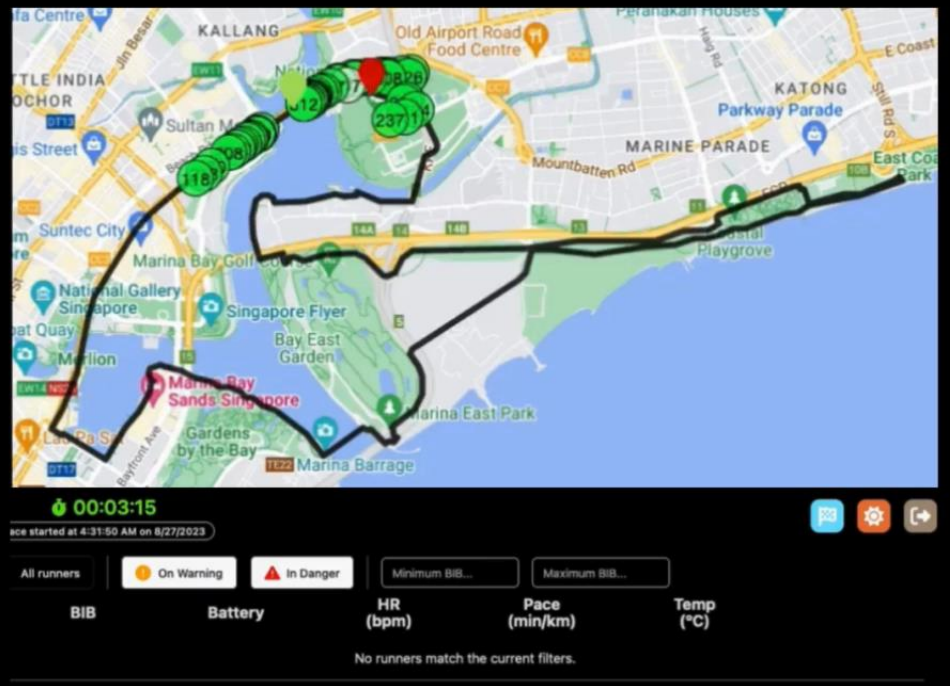
PROOF OF CONCEPT:

REAL TIME HEAT HEALTH MONITORING

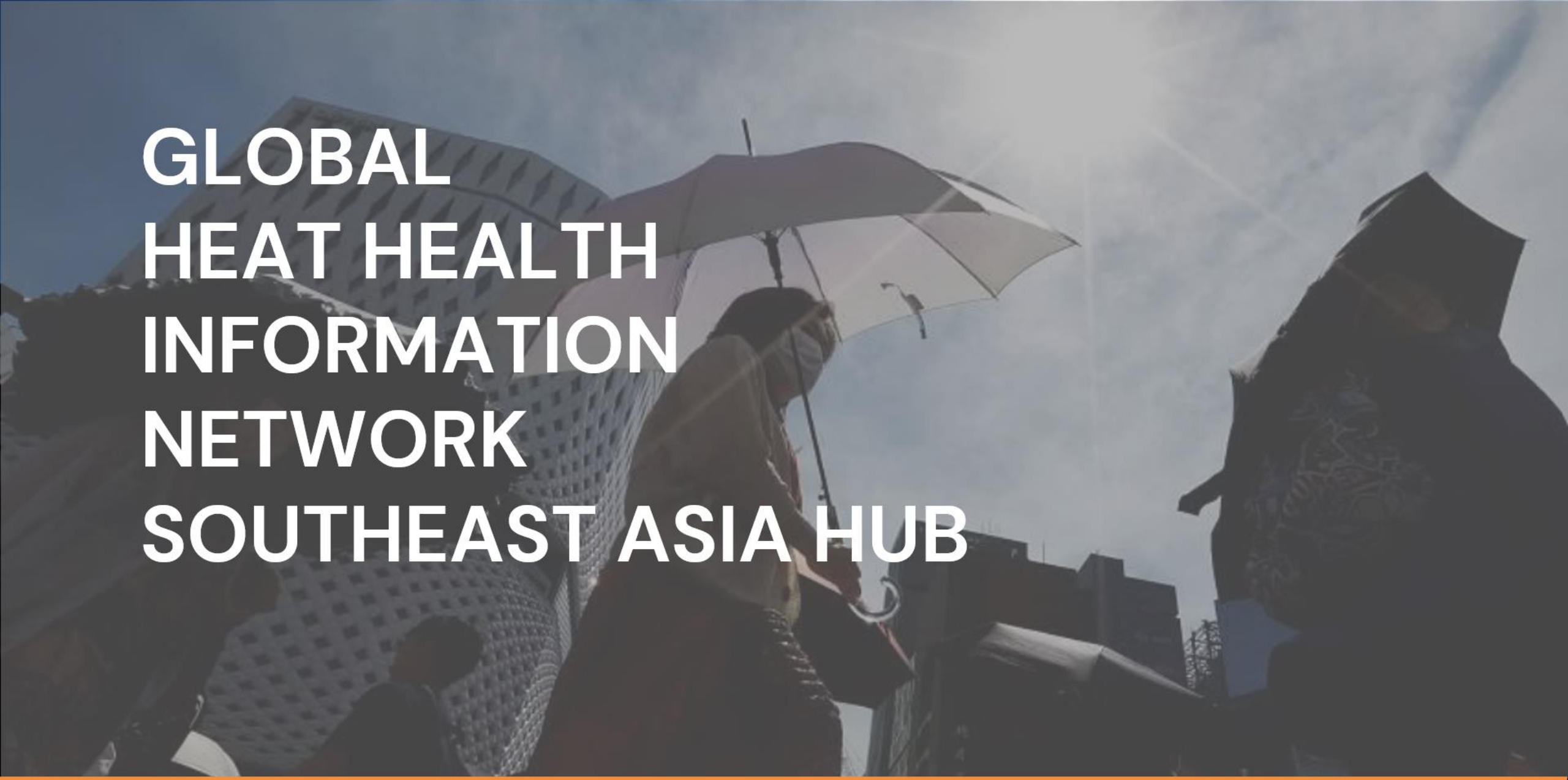


HRPC

Start of the 21 km race



CREATING IMPACT



GLOBAL HEAT HEALTH INFORMATION NETWORK SOUTHEAST ASIA HUB

NUS National University of Singapore | Heat Resilience & Performance Centre
Yong Loo Lin School of Medicine

GLOBAL HEAT HEALTH INFORMATION NETWORK

WORLD METEOROLOGICAL ORGANIZATION

World Health Organization

OUR OBJECTIVES & FOCUS AREAS

GLOBAL HEAT HEALTH INFORMATION NETWORK
SOUTHEAST ASIA

Strengthen Heat Governance & Integration

Invest in Heat Risk Reduction

Understand Heat Risk

Enhance Preparedness

OBJECTIVES

FOCUS AREAS

Weather & Climate

Traditional & Cultural Practices of Heat Management

Public Health

Urban Heat

Heat at Work

THE STEERING COMMITTEE (2026-2028)

GLOBAL HEAT HEALTH INFORMATION NETWORK
SOUTHEAST ASIA



Prof Jason Lee (Chair)

Director
Heat Resilience & Performance Centre
National University of Singapore



Dr Sushma Bhusal

Regional Thematic Lead,
Health and Care,
IFRC Asia Pacific



Prof Cai Wenjia

Professor
Department of Earth System Science
Tsinghua University



Mr Ben Churchill

Director
WMO Regional Office for Asia and the South West Pacific



Dr Jeffery Cutter

Senior Consultant
Ministry of Health, Singapore



Dr Sandro Demaio

Director and Head of Office
WHO Asia-Pacific Centre for Environment and Health



Ms Catherine Jones

Natural Resources Officer (Disaster Resilience and Inclusion)
Food and Agriculture Organization of the United Nations



Ms Koh Li-Na

Deputy Chief Executive Officer / Director-General Meteorological Services and
Radiation Protection
National Environment Agency, SG



Ms Claire Oei

Climate & Nature Lead
Philanthropy Asia Alliance



Ms Xiaoyan Qian

Director of ILO Decent Work Technical Support Teams (DWT) for East and South-East Asia and the Pacific
International Labour Organization



Mr Hussain Rasheed

Chef de Cabinet
Office of the Regional Director
WHO-South East Asia Region (SEARO)



Ms Sarah Rauzana (Youth Representative)

Chairperson
ASEAN Youth Organization



Prof Ren Chao

Professor
Faculty of Architecture
University of Hong Kong



Dr Madhurima Sarkar-Swaisgood

Deputy Chief of Section
Disaster Risk Reduction
United Nations ESCAP



Dr Joy Shumake-Guillemot

Chief
WHO – WMO Climate and Health Joint Programme

STAKEHOLDER MAP

ACADEMIA & RESEARCH

- ASEAN University Network
- Chulalongkorn University (CU)
- Duke-NUS Medical School (Duke-NUS)
- Durham University (DU)
- Griffith University (GU)
- Institut Teknologi Bandung (ITB)
- Institute of Technology of Cambodia (ITC)
- Kasetsart University (KU)
- Mahidol University (MU)
- Monash University Malaysia (Monash)
- Nanyang Technological University (NTU)
- National University of Singapore (NUS)
- Singapore Management University (SMU)
- Singapore University of Technology and Design (SUTD)
- Sunway Centre for Planetary Health (SCPH)
- United Nations University (UNU-IIGH)
- Universitas Gadjah Mada (UGM)
- Universitas Muhammadiyah Metro (UM Metro)
- University of Hong Kong (HKU)
- University of Malaya (UM)
- University of Medicine and Pharmacy at Ho Chi Minh City (UMP-HCMC)
- University of Medicine, Yangon (UM1)
- University of Sydney (USyd)
- University of Tokyo (UTokyo)
- Vietnam Military Medical University (VMMU)

HEALTH

- World Health Organization (WHO)
- Kementerian Kesihatan (Brunei)
- Ministry of Health (Singapore)
- Department of Health (Philippines)
- Department of Disease Control (Thailand)
- Vital Strategies

WEATHER & CLIMATE

- World Meteorological Organization (WMO)
- ASEAN Specialised Meteorological Centre (ASMC)
- Badan Meteorologi, Klimatologi, dan Geofisika (BMKG)
- Thai Meteorological Department (TMD)
- MET Malaysia
- National Environment Agency (NEA)
- Meteorologial Service Singapore (MSS)
- Ministry of Sustainability and the Environment (MSE)
- Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)
- Met Office UK
- Vietnam Institute of Meteorology, Hydrology and Climate Change (IMHEN)
- Department of Meteorology and Hydrology (Myanmar)

GLOBAL HEAT HEALTH INFORMATION NETWORK
SOUTHEAST ASIA

OCCUPATIONAL & ECONOMICS

- International Labour Organization (ILO)
- Ministry of Manpower (Singapore)
- ASEAN Occupational Safety and Health Network (ASEAN-OSHNET)
- Economic and Social Commission for Asia and the Pacific (ESCAP)

URBAN DEVELOPMENT

- C40 Cities
- Ministry of National Development (Singapore)
- Urban Redevelopment Authority (Singapore)

DISASTER

- Asian Disaster Preparedness Center (ADPC)
- International Federation of Red Cross and Red Crescent Societies (IFRC)
- Medecins Sans Frontiers (MSF)
- Myanmar Red Cross Society

FINANCE & PHILANTHROPY

- Rockfeller Foundation
- Wellcome
- Temasek Trust
- Asian Development Bank (ADB)

COMMUNITY ENGAGEMENT

- ASEAN Youth Organization (AYO)
- Southeast Asian Cultural Heritage Alliance (SEACHA)

GLOBAL HEAT HEALTH INFORMATION NETWORK
SOUTHEAST ASIA

OUR REGIONAL REACH

11 SOUTHEAST ASIAN COUNTRIES COLLABORATING TOGETHER



OUR NETWORK AT A GLANCE

8 SECTORS

59+ ORGANISATIONS

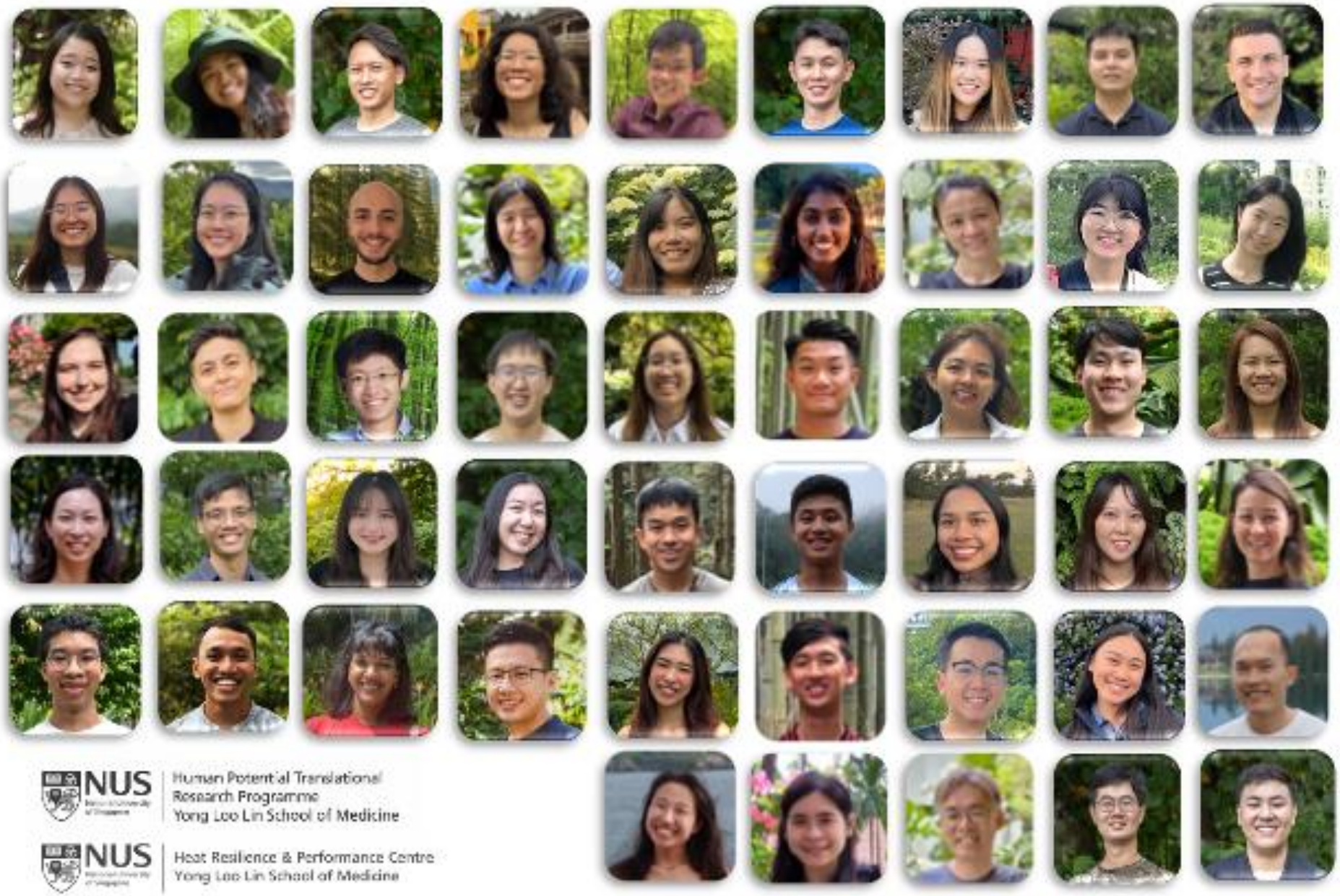
16 COUNTRIES

AS OF AUGUST 2026

Heat is testing our society, challenging our wellbeing, lives, and livelihoods

Our immediate actions matter

INTERDISCIPLINARY TEAM



NUS | Human Potential Translational Research Programme
Yong Loo Lin School of Medicine

NUS | Heat Resilience & Performance Centre
Yong Loo Lin School of Medicine