Strengthening Resilience to Extreme Heat in Phnom Penh:

Ensuring a safer, healthier, and sustainable urban community for all

A project under the preparation for GCF funding by NCDDs

Executive Summary

Phnom Penh is becoming increasingly exposed to extreme heat due to rapid urbanisation and a changing climate. Poor households living in informal settlements under metal roofs, older people, children, pregnant women and outdoor workers are the most severely affected. The city's electricity and health systems, which are not designed for extreme heat, experience recurrent overloads each hot season. Despite progress in disaster risk management, Cambodia still lacks a structured system for monitoring, early warning and coordinated response to heatwaves.

To address this challenge, NCDDs, Cambodia's National Committee for Sub-National Democratic Development, acting through its Secretariat, is partnering with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH to prepare a proposal to the Green Climate Fund (GCF). As a national entity accredited to access GCF resources directly, NCDDs aims to mobilise climate finance to strengthen Phnom Penh's resilience to extreme heat. The project described in this document aims to build a pilot city-wide approach to heat resilience in Phnom Penh. It will strengthen heat monitoring and early warning through a Heat Surveillance Hub, support Ministry of Water Resources and Meteorology (MoWRAM) and the Phnom Penh Capital Hall (PPCH) in developing a Phnom Penh Heat Action Plan (PP-HAP) with clearly defined thresholds, protocols and responsibilities. Vulnerable households and communities will be supported through the national social-protection system, while schools, health clinics and health facilities, and other social facilities in priority districts will be retrofitted with passive and energy-efficient active cooling solutions. In addition, a forecast-based financing mechanism will release pre-arranged funds and trigger early actions, including in the health sector, while the city's public investment programme will begin to earmark resources for long-term urban-heat mitigation.

The Challenge

Climate Change and Rising Temperatures

Phnom Penh is facing a significant warming trend, as historical data since 2010 show a notable increase in the number of days where the heat index exceeded 35°C[1]. The heat index combines air temperature and humidity to indicate how hot it *feels* to people, which is often higher than the actual temperature. This warming is expected to continue according to future climate projections. Cambodia could see temperature rises of up to 2.6°C by the period 2041-2070 and 3.6°C by the 2090s under RCP8.5[2], as heatwaves across Southeast Asia are broadly expected to intensify in frequency, duration, and amplitude. Additionally, increasing temperatures will lead to higher humidity, intensifying heat stress and posing greater risks to human health[3].

Heatwave Impacts

While heatwaves naturally occur in Cambodia, climate change is now increasing their frequency and intensity[4], with significant effects on people's health, livelihoods and overall well-being. They increase the risk of heat exhaustion, heat stroke[5], and both cardiovascular and respiratory conditions[6], as well as mortality[7]. These impacts are particularly acute for children[8], older adults[9], women and people with chronic illnesses or disabilities, and significantly increase the risk of morbidity[10]. Outdoor workers and informal-settlement residents often face prolonged heat exposure with few protections, leading to reduced productivity and increased accidents[11]. In Phnom Penh, non-climatic factors such as Urban Heat Island (UHI) effects further intensify heat risks, with daytime temperature differentials between rural and urban areas reaching up to 4°C[12]. Socioeconomic vulnerabilities, including poverty and poor housing quality, also limit people's ability to cope with extreme heat. As a least developed country (LDC), Cambodia requires urgent and coordinated adaptation measures.

[1] World Bank, Climate Change Knowledge Portal (2025). URL: https://climateknowledgeportal.worldbank.org/. Date Accessed: 22 June 2025
[2] World Bank Group. Climate Change Knowledge Portal: Cambodia.
[3] Wet-bulb temperature is a measure of heat stress that combines air temperature and humidity. It represents the lowest temperature that can be reached by evaporating water into the air at constant pressure. Essentially, it measures how effective a body is able to regulate itself through the evaporation of sweat.
[4] IPCC (2021). Sixth Assessment Report, Working Group I: The Physical Science Basis.
[5] Bouchama, A., Mündel, T., & Laitano, O. (2024). Beyond heatwaves: A nuanced view of temperature-related mortality. Temperature, 11(3), 190-202.
[6] Aghababaeian, H., Sharafkhani, R., Hamidipour, N., & Ahvazi, L. A. (2025). Analyzing cardiovascular disease hospitalization risks due to cold and heat waves in Dezful. Scientific reports, 15(1), 1-11.
[7] Ebi, K. L., Capon, A., Berry, P., Broderick, C., de Dear, R., Havenith, G., ... & Jay, O. (2021). Hot weather and heat extremes: health risks. The lancet, 398(10301), 698-708.
[8] Schapiro, Laura H., Mark A. McShane, Harleen K. Marwah, Megan E. Callaghan, and Mandy L. Neudecker. "Impact of extreme heat and heatwaves on children's health: a scoping review." The Journal of Climate Change and Health (2024): 100335.
[9] Åström, D. O., Bertil, F., & Joacim, R. (2011). Heat wave impact on morbidity and mortality in the elderly population: a review of recent studies. Maturitas, 69(2), 99-105.
[10] GHHIN Southeast Asia Hub. (2025). First GHHIN Southeast Asia Heat Health Forum - Summary Report. Global Heat Health Information Network (GHHIN). https://ghhin.org/2025-southeast-asia-heat-health-forum/
[11] GHHIN Southeast Asia Hub. (2025). First GHHIN Southeast Asia Heat Health Forum - Summary Report. Global Heat Health Information Network (GHHIN). https://ghhin.org/2025-southeast-asia-heat-health-forum/
[12] Climate Risk Profile: Cambodia (2021): The World Bank Group and Asian Development Bank.

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DEUTSCHE ZUSAMMENARBEIT

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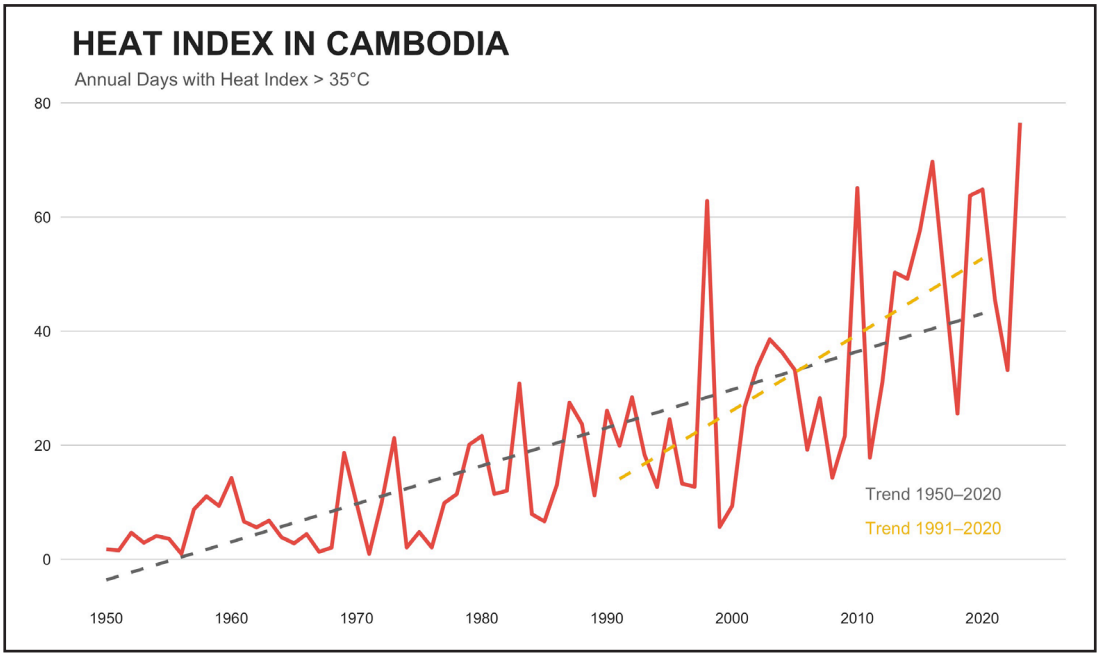

Figure 1: Number of Days with Heat Index > 35 °C annual trends with significance of trend per decade: 1951-2023; Phnom Penh[13]

Urban Heat Island Effect

The Urban Heat Island (UHI) effect occurs when city areas become significantly warmer than their surrounding rural zones. This happens because dense buildings, paved surfaces and limited vegetation absorb and retain more heat, while natural cooling processes like shade and evaporation are reduced[14]. In East Asia, cities are on average 1.6–2.0 °C warmer than nearby rural areas[15]. As a result, the UHI effect amplifies the impact of heatwaves, making streets, rooftops, and indoor spaces hotter for city dwellers, especially for vulnerable groups and poorer communities who often live where vegetation is minimal and insulation is weak.

Because the UHI effect is a local phenomenon, city-level action, such as increasing green cover, improving building materials, and designing cooler public spaces, can make a real difference in reducing heat stress and improving liveability.

Key Challenges and Opportunities for Strengthening Heatwave Preparedness

Policy and Institutional: Cambodia has made strong progress in disaster risk management, but existing frameworks focus mainly on floods and droughts. There is now an opportunity to enhance coordination across ministries and integrate heatwave preparedness into national and sub-national systems, including social protection and public services, in particular the health sector.

Socioeconomic: Many urban households, especially in informal settlements, face structural constraints such as limited space, poor insulation, and high-density living conditions, which make passive cooling more challenging. Tailored solutions can help ensure these communities and health care providers are not left behind.

Information, Awareness, and Capacity: Climate and heat information systems are improving, yet data and early warning systems (EWS) remain dispersed across different platforms and heatwave-specific surveillance is lacking. Strengthening data sharing, harmonising warning messages, and expanding public awareness can help communities prepare and respond more effectively. Capacity building on heat effects will also target health workers.

Financial: Heatwave preparedness is an emerging topic globally and Cambodia's public finance systems are still adapting to the growing need for anticipatory and climate-responsive funding. Strengthening budget planning and expanding access to affordable coping options can improve household and system-level resilience.

[13] World Bank, Climate Change Knowledge Portal (2025). URL: https://climateknowledgeportal.worldbank.org/. Date Accessed: 22 June 2025
[14] UN ESCAP, 2025. Rising Heat, Rising Risk. Policy Pathways for Regional Resilience.
[15] Roberts, Mark, Chandan Deuskar, Nicholas Jones, and Jane Park. 2023. Unlivable: What the Urban Heat Island Effect Means for East Asia's Cities. Washington DC. The World Bank.

Objective and Approach

The objective of this project is to strengthen the resilience of Phnom Penh's residents to extreme heat by developing and implementing a comprehensive heatwave management system. This will be achieved through the following approaches:

1. **Shift from reactive to proactive action:** The project helps Phnom Penh move from responding to heatwaves after they occur to anticipating risks and managing them systematically.
2. **Strengthen systems that protect people:** It reinforces the institutions, services and infrastructure needed to safeguard vulnerable households and groups, combining climate information, social protection and urban development.
3. **Embed heat resilience in everyday governance:** By working through national and local structures, the project creates a scalable, long-term model for planning and investing in a cooler and safer Phnom Penh.

Core Components

Component 1: Improved Data Management and Dissemination for Heatwave Forecasting and Surveillance

This component enhances the country's ability to anticipate and respond to heatwaves. It establishes a Heat Surveillance Hub to consolidate meteorological and satellite data and helps Phnom Penh develop its first Heat Action Plan (PP-HAP) with clear roles, thresholds, and communication protocols. It also integrates heatwaves into disaster management systems and strengthens social protection mechanisms so they can activate early support for vulnerable households and groups.

Component 2: Integrated Community Heat Resilience through Adaptive Social Protection and Cooling Solutions

This component focuses on reducing the immediate risks faced by vulnerable households and improving living conditions in priority areas. It supports communities with basic cooling solutions, heat-resilient public spaces, and cooling centres, and promotes behaviour change and awareness of safe practices during extreme heat. Schools, health clinics and health facilities, and other essential facilities will be upgraded with passive and energy-efficient cooling solutions, while local capacities for climate-aware building design are strengthened.

Component 3: Climate Responsive Risk Financing for Sustained Urban Heat Resilience

This component supports the shift from reactive crisis management to proactive planning and investment. It pilots Cambodia's first Forecast-based Financing (FbF) mechanism for heatwaves and strengthens the ability of local governments to integrate climate-responsive budgets and long-term heat-resilient infrastructure planning. It also promotes multi-stakeholder financing partnerships to ensure sustained investments in urban heat resilience.

Expected Results and Impacts

Short-Term Results *(by the end of the project)*

- **Enhanced preparedness and coordination:** Key national and local institutions test and refine heat monitoring, alerting, and response procedures through the pilot system.
- **Targeted support for vulnerable groups:** Selected communities benefit from practical cooling solutions and improvements in priority public facilities and community spaces.

Long-Term Results *(beyond the pilot)*

- **Stronger basis for city-wide heat management:** Lessons from the pilot inform the gradual development of a more coordinated heatwave management approach in Phnom Penh.
- **Better integration of heat resilience into planning:** Local and national actors incorporate heat considerations into social protection, public infrastructure, and local investment decisions.

Broader Impacts *(what the project ultimately contributes to)*

- **Reduced heat-related risks for Phnom Penh's residents,** particularly among vulnerable groups.
- **A viable model for scaling heat resilience,** offering evidence, tools, and financing mechanisms that other Cambodian cities can adapt.

Social Protection Approaches to Heatwaves

Social protection systems can play multiple roles in helping households and communities cope with extreme heat. For example, Ahmedabad's Heat Action Plan (India)[16] prioritises vulnerable groups, including older people, children, outdoor workers and low-income households, and has contributed to significant reductions in heat-related mortality. The plan integrates early warnings, community outreach and designated cooling spaces, and has since been replicated in more than 30 Indian cities. In Bangladesh[17], the Bangladesh Red Crescent Society has worked with government to pilot anticipatory cash top-ups through existing social protection programmes, such as the Old Age Allowance, demonstrating how mobile-wallet transfers can provide rapid support to vulnerable households ahead of heatwaves. Building on such experiences, social protection systems can contribute in several ways:

- **Provide rapid liquidity** through cash transfers, enabling households to afford water, medicine, cooling, and access cooling kits or hydration/cooling stations during heatwaves.
- **Protect workers** by adjusting public works and employment schemes to reduce exposure (e.g. shorter shifts, shaded work areas, hydration breaks).
- **Strengthen preparedness** by linking early warning systems to social registries and pre-arranged cash or service delivery.
- **Support health outreach** through coordination with health services for awareness, referrals, and monitoring of heat-related risks.
- **Ensure continuity of income and care** for vulnerable populations during and after extreme heat events.
- **Modify programme delivery** by implementing heat-responsive measures, such as changing payment schedules or providing heat-sensitive top-ups.

Partnership and Implementation

The project will be implemented by the National Committee for Sub-National Democratic Development Secretariat (NCDDs) with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH as an executive partner, in close collaboration with national ministries and relevant technical agencies.

NCDDs serves as the lead government Executing Entity and coordinates implementation across ministries and partners. As a national institution with deep experience in decentralisation and multi-stakeholder programme management, NCDDs will oversee project administration, ensure alignment with national systems and facilitate coordination with government partners at all levels. A dedicated Project Management Unit within NCDDs will manage day-to-day operations, quality assurance and reporting, supported by a national Steering Committee that provides strategic guidance and oversight.

GIZ acts as the second Executing Entity and is responsible for implementing the components related to community resilience, social protection and climate-responsive public investment. GIZ will manage its share of the project budget, coordinate closely with NCDDs and government partners, and support monitoring, capacity development and technical backstopping.

Implementation will be carried out in collaboration with sector ministries and specialised agencies. This collaborative structure ensures that the project strengthens existing national and sub-national systems, promotes shared ownership and builds the foundations for future scale-up.

	FOCUS	LEAD	KEY PARTNERS
COMPONENT 1	Data management and dissemination for heatwave surveillance	GIZ, NCDDs	MoWRAM in collaboration with RUPP
	Heatwave risk management for Phnom Penh residents through the development of the Phnom Penh Heat Action Plan (PP-HAP)		NCDM, MoWRAM/ CREWS Team, PPCH, MoH
COMPONENT 2	Climate adaptation measures for vulnerable communities	GIZ	PPCH, MoH, MoE
	Social infrastructure for heatwaves and heat-resilient building design through capacity building		MoLMUPC and PPCH
COMPONENT 3	Forecast-based financing (FbF) mechanism for proactive heatwave response	NCDDs	MEF, PPCH, MoH
	Climate finance is integration into local budgets and development programmes to support heat-resilient infrastructure		PPCH

[16] NRDC, 2019. URL: https://www.preventionweb.net/news/india-new-evidence-shows-pioneering-heat-action-plan-helps-millions-avoid-killer-heat
[17] IFRC, 2023. URL: https://heathealth.info/wp-content/uploads/EAP_Heatwave_Bangladesh.pdf

Innovation and Sustainability

Innovation:

The project will pilot Cambodia's first Forecast-based Financing (FbF) mechanism for proactive heatwave response. As heat is often described as a silent killer, causing rising illness, mortality and productivity losses without the visibility of other hazards, the project introduces new tools to detect, prepare for and reduce these impacts before they escalate. By integrating heatwave forecasting, temporary cooling centres, and forecast-based financing, the project provides a replicable model for Southeast Asian cities facing similar heat stress challenges.

Leveraging social protection for heatwave management is a particularly innovative element, as it enables support to reach vulnerable households quickly and equitably through established government systems. The project's focus on low-tech cooling solutions, retrofitting social infrastructure, and adaptive social protection represents a new frontier for climate adaptation in Cambodia. GCF grant funding can de-risk these approaches and generate the evidence base needed to mobilise future investment from the government, development partners and the private sector.

Sustainability and Exit Strategy:

The project is designed to generate lasting impact beyond its implementation period. By strengthening institutional capacities and embedding the PP-HAP within government systems, it ensures that heatwave management will continue as an integral part of public service delivery. This foundation also enables future scale-up to other Cambodian cities, supporting a national shift in heat resilience and complementing related initiatives in Siem Reap led by ADB and UNICEF in the education and tourism sectors.

At the community level, temporary cooling centres under Component 2 will foster strong local ownership. Site selection and retrofitting of existing infrastructure will be guided by active community consultations, ensuring relevance and acceptance. Maintenance responsibilities will be transferred to local authorities and community structures in line with national policies, supporting long-term functionality and sustainability.

Acronyms

ADB	Asian Development Bank
CREWS	Climate Risk and Early Warning Systems
EWS	Early Warning Systems
FbF	Forecast-based financing
GCF	Green Climate Fund
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
LDC	Least Developed Country
MEF	Ministry of Economics and Finance
MoE	Ministry of Environment
MoH	Ministry of Health
MoLMUPC	Ministry of Land Management, Urban Planning and Construction
MoWRAM	Ministry of Water Resources and Meteorology
NCDDs	National Committee for Sub-National Democratic Development Secretariat
NCDM	National Committee for Disaster Management
PPCH	Phnom Penh Capital Hall
PP-HAP	Phnom Penh Heat Action Plan
RCP	Representative Concentration Pathway
RUPP	Royal University of Phnom Penh
UHI	Urban Heat Island
UNICEF	United Nations International Children's Emergency Fund

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