

Urban Heat Risk and Cooling Inequality in the Global South: Evidence from South and South-East Asia

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BACKGROUND

Why does cooling inequality matter?

- Extreme heat is increasing across rapidly urbanising cities in South and Southeast Asia.
- As temperatures increase, cooling becomes essential for health, productivity, and urban resilience, but access to cooling is unequal.
- Heat risk depends not only on exposure, but also on vulnerability, cooling access, and electricity affordability.

Research gap

Most urban heat assessments focus on heat exposure alone, overlooking how vulnerability and coping capacity shape unequal cooling risk.

Research question

How can integrated heat-risk assessment reveal cooling inequality across South and Southeast Asian cities?

APPROACH

Study region

The analysis focuses on major cities (>1 mil population) in South and Southeast Asia

Risk framework

Urban heat risk is assessed using the **IPCC risk framework**, adapted with indicators from the **INFORM Risk Index**

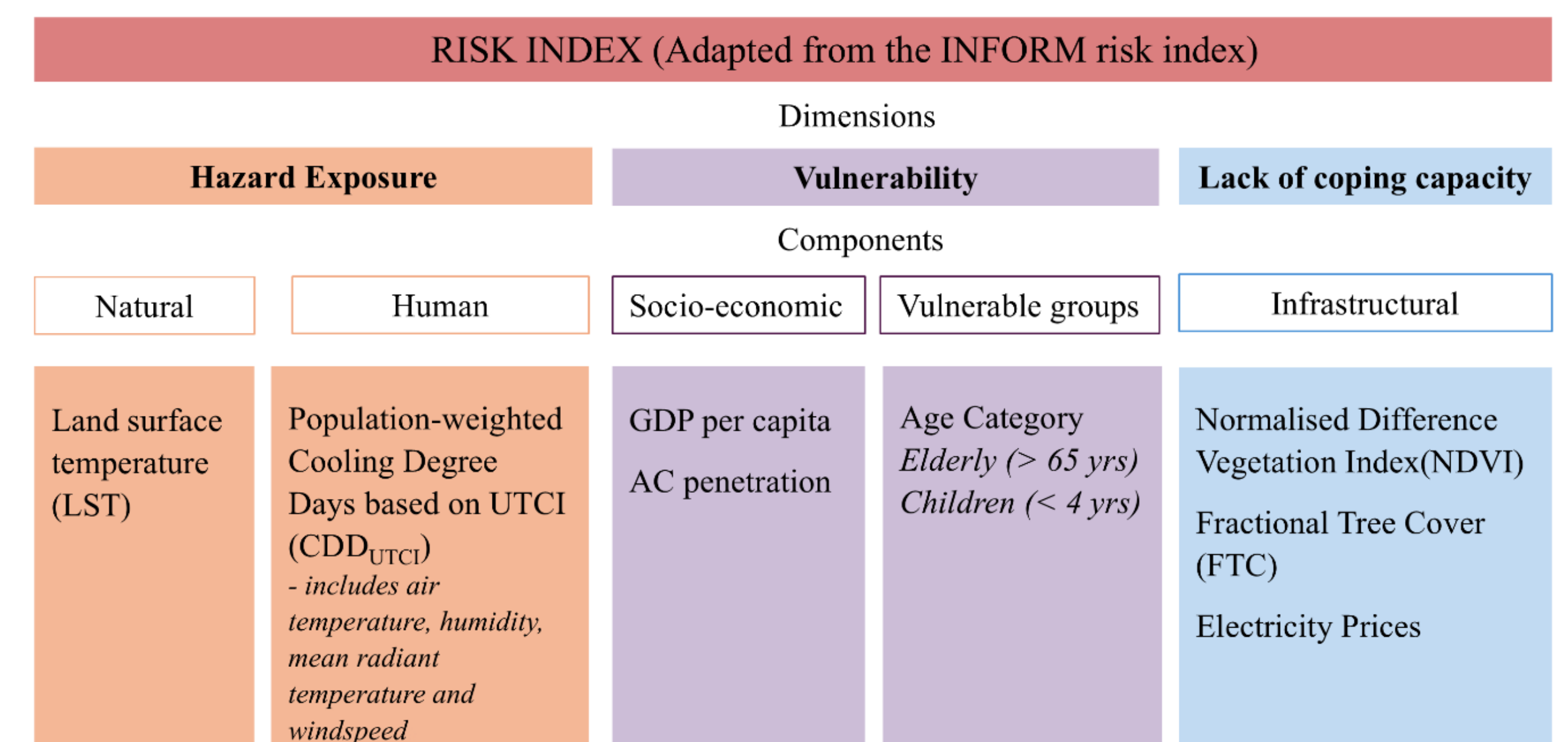


Figure 1 | Risk dimensions and components of the adapted framework.

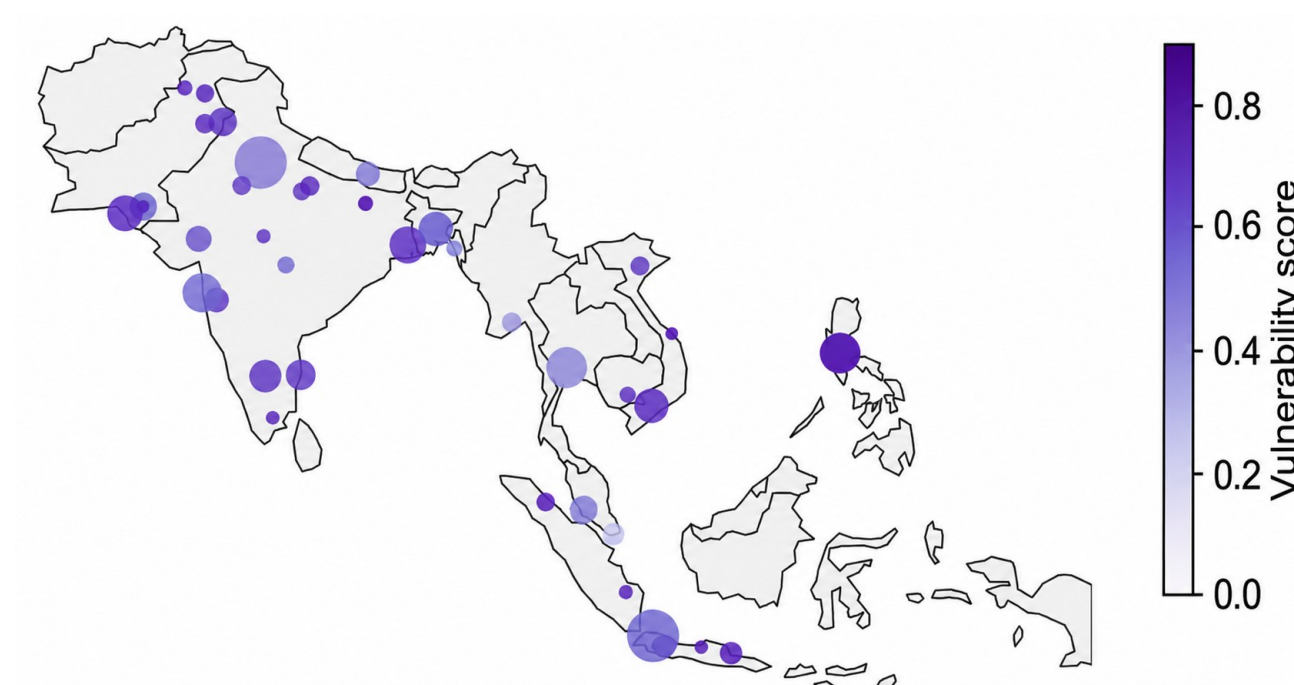
KEY FINDINGS

a) Hazard Exposure

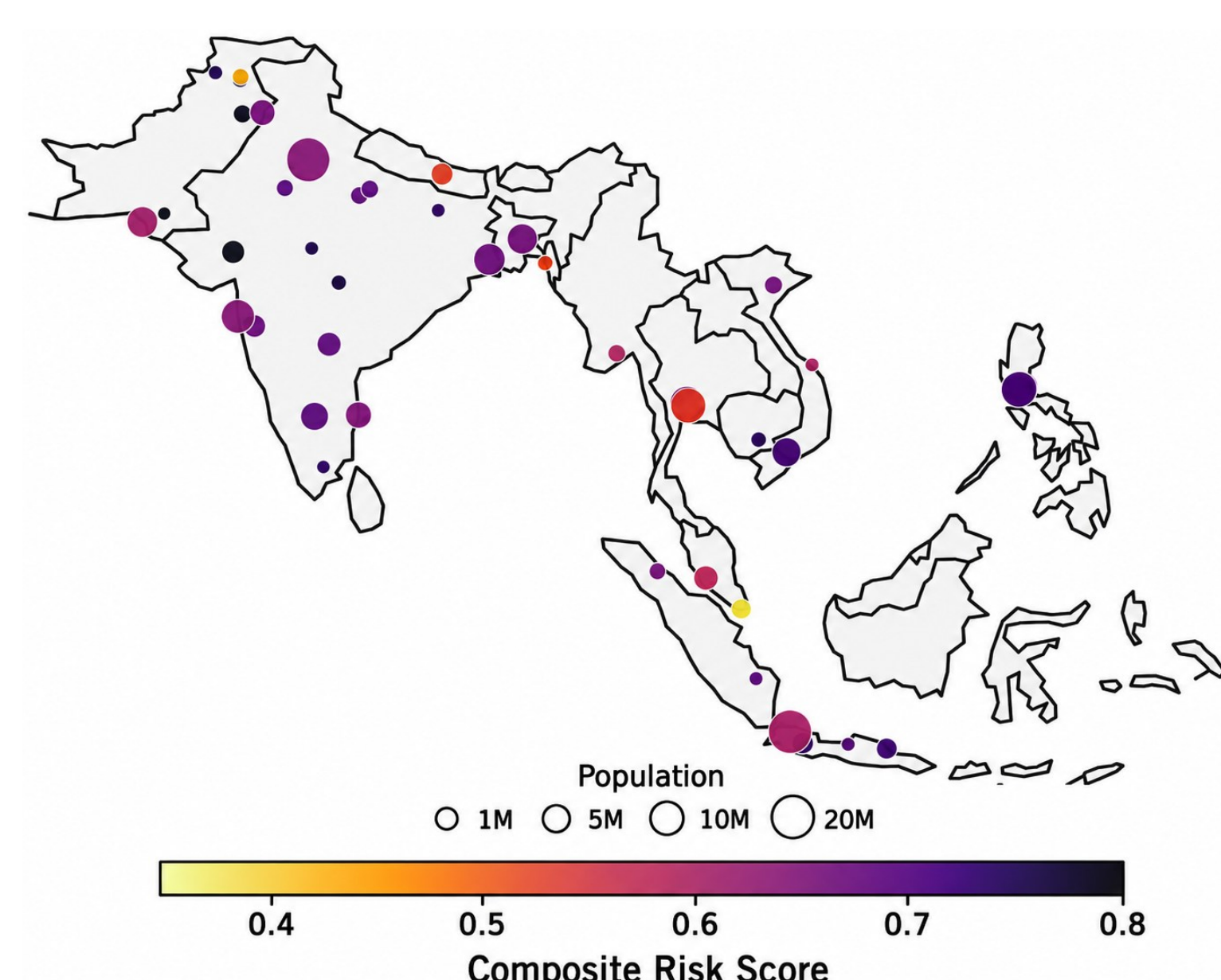


- **Exposure alone doesn't explain cooling risk**
Cities with similar heat exposure show different risk levels once vulnerability and adaptive capacity are considered.
- **Cooling inequality reshapes heat risk**
Limited cooling access, low vegetation cover and high electricity costs weaken coping capacity, especially in vulnerable cities.

b) Vulnerability



d) Composite Heat Risk



c) Adaptive Capacity

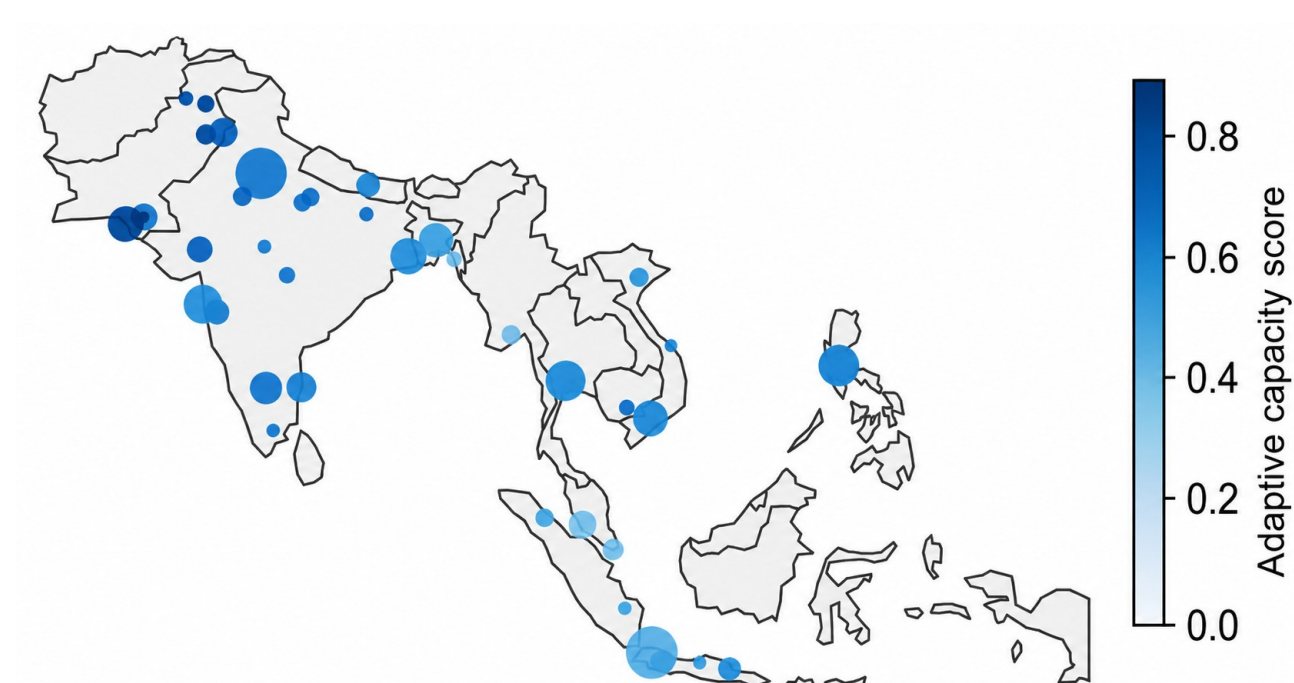


Figure 2 | Spatial distribution of urban heat risk across South and Southeast Asia. Left: (a–c) heat risk components. Right: (d) composite heat risk.

- **Highest risks emerge where heat, vulnerability and weak coping capacity overlap**
Cities such as Hyderabad and Karachi show elevated risk, while some highly exposed cities have lower risk due to stronger adaptive capacity.

CONCLUSIONS

What does this mean for energy resilience?

Heat exposure alone cannot identify where cooling resilience is most needed. The greatest risks occur where high exposure, social vulnerability and limited capacity to cope overlap.

Policy implications

For hazard-driven cities:

Prioritise urban greening, shading, reflective surfaces, and heat-sensitive planning.

For vulnerability-driven cities:

Target support towards low-income households, elderly populations, children, and communities with limited cooling access.

For adaptive-capacity-constrained cities:

Improve affordable electricity access, expand sustainable cooling options, and strengthen passive cooling through vegetation and urban tree cover.

Conclusion

- Urban cooling needs in South and Southeast Asia cannot be understood from heat exposure alone. The greatest risks occur where heat overlaps with vulnerability and limited capacity to cope.
- By combining hazard, vulnerability, and adaptive capacity, this study identifies where cooling inequality is greatest and where resilient cooling interventions are most urgently needed.

The cities most in need of cooling resilience are not always the hottest; they are where heat, vulnerability, and limited adaptive capacity overlap.

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