Lack of thermal comfort as a dimension of energy poverty:

Towards an SDG for space cooling?

This project has received funding from the European Research Council under the European Union's Horizon 2020 research and innovation programme. (grant agreement no. 637462)

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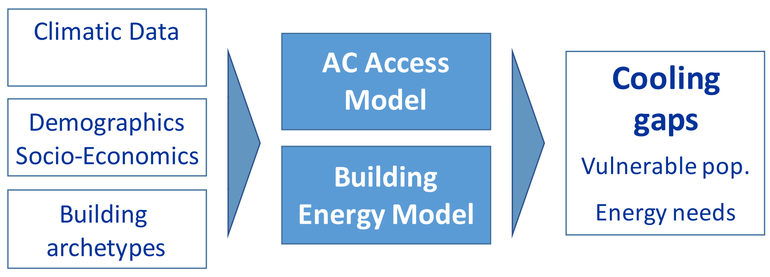
Introduction

The Global South is increasingly exposed to severe climatic conditions with major risks for health and well-being of population. **Lack of basic thermal comfort**, due to insufficient access to space cooling, is more frequently considered a dimension of energy poverty, despite being overlooked by the Sustainable Development Goals (SDG) framework.

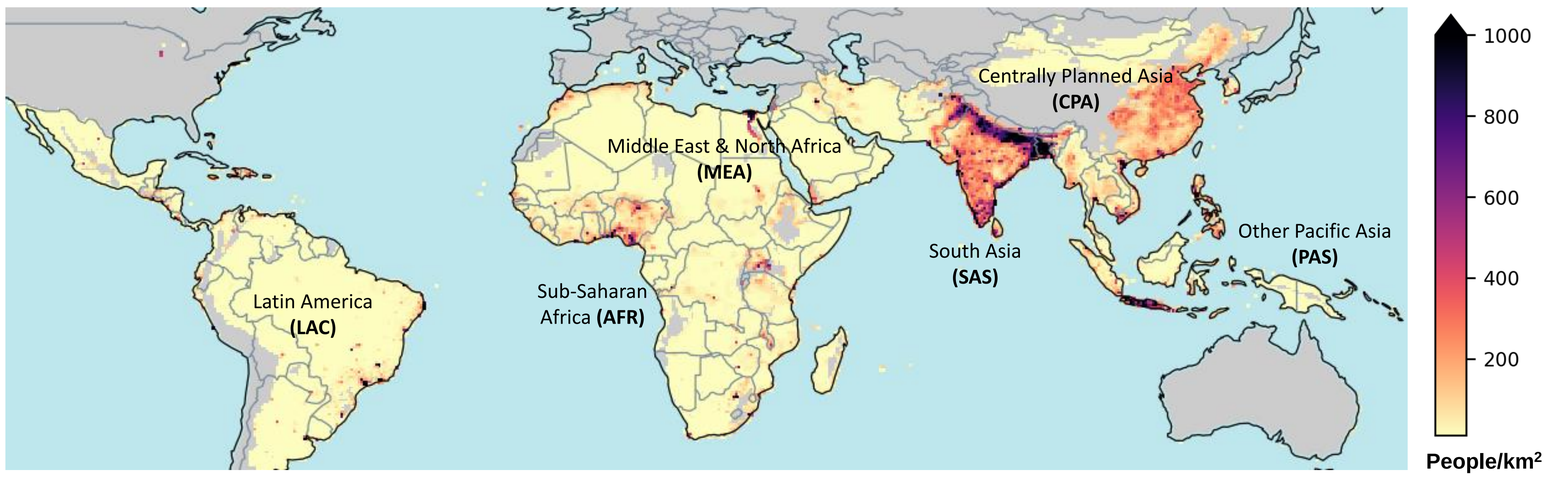
We estimate the **potential exposure to heat stress of populations** across the Global South and **energy requirements to bridge the space cooling gap**.

Methods

We combine a **variable degree-days** model applied on a spatially-explicit global grid and an **air-conditioning (AC) adoption** model to estimate energy requirements for residential indoor thermal comfort on a spatial-explicit grid.



Results: space cooling gap



Population without access to AC where needed. Indoor set point temp. 26°C. *Adapted from Mastrucci et al, 2019*

Cooling gap:

1.8 – 4.1

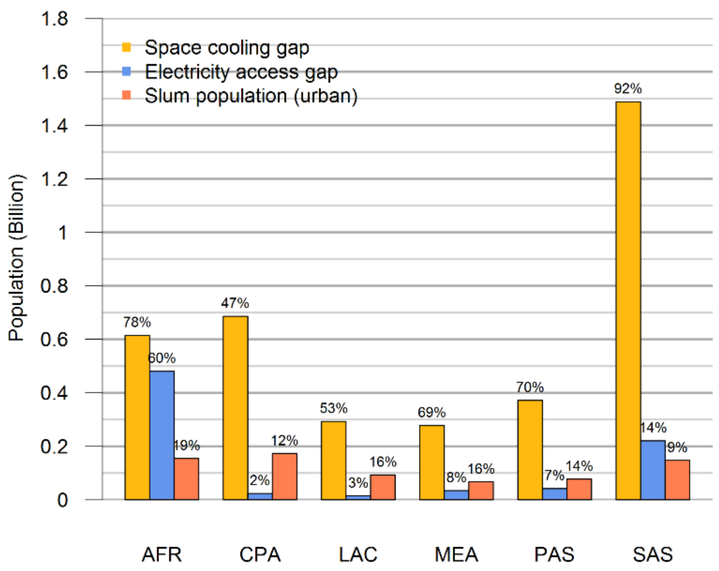
billion people

in the Global South

14%

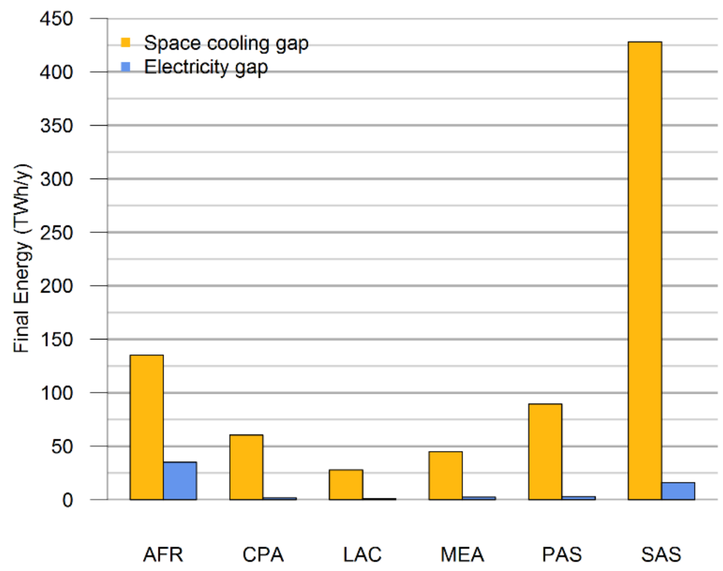
of global residential electricity consumption

median growth required to bridge the gap using fans and AC



Population lacking space cooling, electricity access and urban slum population. *Share on total population reported on top of the bars (share of slum is on urban pop.).*

Source: Mastrucci et al, 2019. Indoor set point temp. 26°C. Electricity access and slum population data from World Bank.



Space cooling energy gaps and basic electricity access gaps.

Source: Mastrucci et al, 2019. Indoor set point temp. 26°C. Tier 2 threshold of household electricity supply (200 Wh/day) assumed for basic electricity access (Bhata et al., 2015).

Conclusions

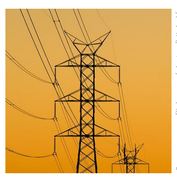
Cooling gaps are much larger, in both population and energy requirements terms, **than the current energy poverty gap for electricity access (SDG7).** Important interactions also exist between meeting cooling gaps and achieving other SDGs.

Broad strategies encompassing access to efficient cooling systems, low-cost and energy efficient housing, and improved urban design are urgently needed to limit environmental burdens.

Addressing cooling gaps is therefore **key to designing sustainable development policies** in several domains.

Strategies to bridge the gap and interaction with SDGs

Efficient, affordable cooling technologies → 7 AFFORDABLE AND CLEAN ENERGY; 3 GOOD HEALTH AND WELL-BEING; 13 CLIMATE ACTION



Electrification → 7 AFFORDABLE AND CLEAN ENERGY

Energy-efficient and affordable housing → 1 NO POVERTY; 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE; 11 SUSTAINABLE CITIES AND COMMUNITIES; 13 CLIMATE ACTION

SUSTAINABLE DEVELOPMENT GOALS

https://sustainabledevelopment.un.org/

References

Mastrucci et al. (2019) Improving the SDG energy poverty targets: residential cooling needs in the Global South, Energy and Buildings, 186, pp. 405-415.

Hamza-Goodacre et al. (2018) Chilling Prospects: Providing Sustainable Cooling for All (SEforALL Report).

Bhatia & Angelou (2015) Beyond Connections Energy Access Redefined, Technical Report 008/15.