

Sustainability

COLUMBIA CLIMATE SCHOOL
Center for Integrated
Earth System Information

*Presentation at the Climate Mobility Summit
Scandinavia House
25 September 2025*





Outline

- 1) Data and knowledge gaps in climate mobility
- 2) Open data on climate risks, vulnerability and mobility

1) Data and Knowledge Gaps



Global Centre for
Climate Mobility

**Global
Knowledge Hub**



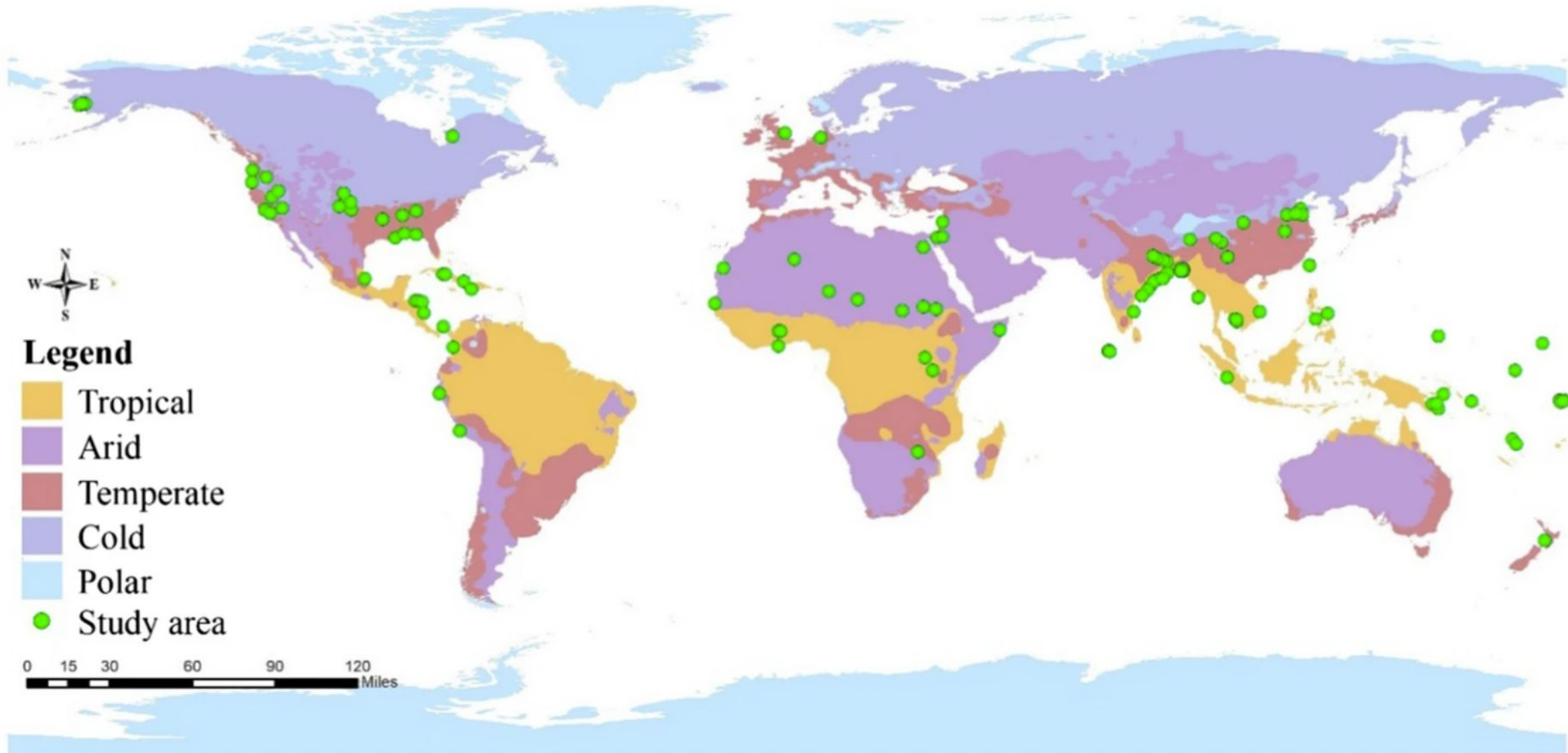
COLUMBIA CLIMATE SCHOOL
Climate, Earth, and Society



Research gaps (understanding)

- What are the **gender dynamics** of climate mobility, and what are the differential barriers and opportunities for moving across genders?
- How to measure “involuntary immobility” or **trapped populations**?
- How does mobility to new areas increase or decrease **climate risk**?
- What is the **awareness** and the **public perception** of the issue of climate mobility?
- Where are the **geographic gaps** in the study of climate mobility?

Location of 161 studies in climate mobility

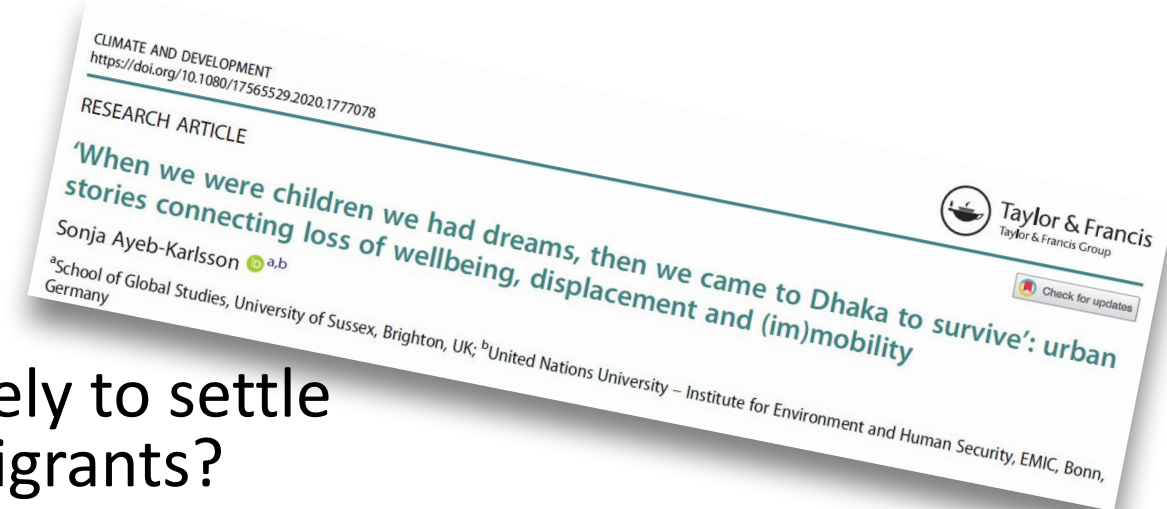


Ghosh, R. C., & Orchiston, C. (2022). A systematic review of climate migration research: gaps in existing literature. *SN Social Sciences*, 2(5), 47.



My own list of research questions

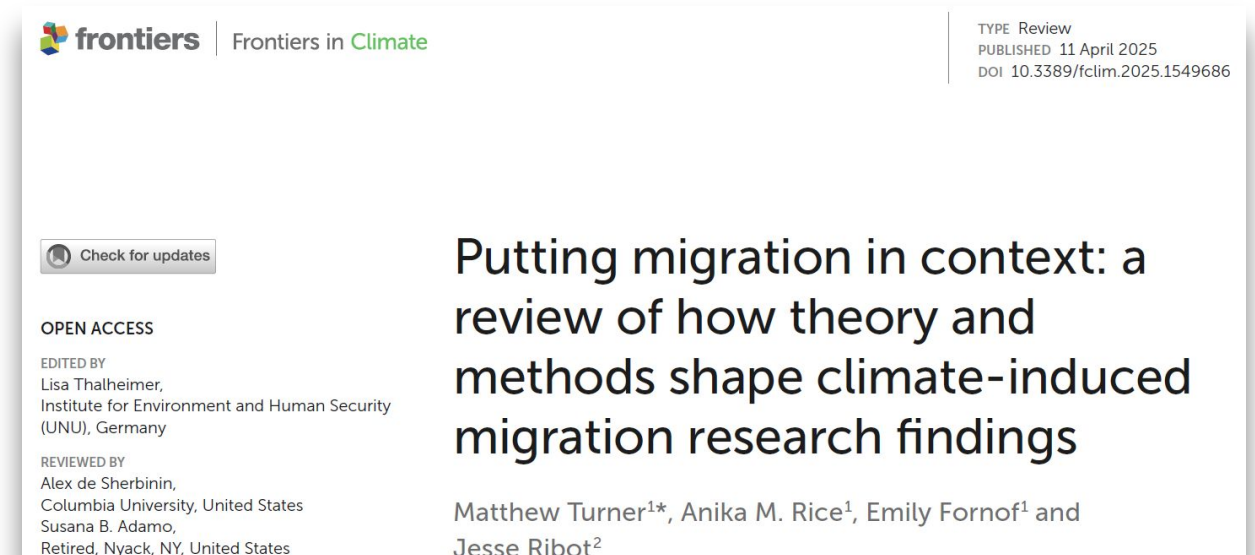
- Who will farm the land?
 - Do young people still see a future in agriculture?
 - How do climate risks factor into their evaluation of agricultural versus other livelihood options?
 - What kinds of vocational training might help to make agriculture more resilient and attractive?
 - How can we make smallholder agriculture more profitable?
 - What are the implications for food security?
- Will climate mobility result in larger informal settlements in urban areas?
 - Where will climate migrants settle?
 - When they move to cities, are they more likely to settle in slums/informal settlements than other migrants?





Research gaps (approaches)

- **Longitudinal studies** are needed to understand how changes in climate relate to (im)mobility, and how livelihoods are changing
- **Comparative studies** are needed to better understand drivers and dynamics (e.g. Central America & West Africa*)
- **Mixed methods** approaches that are **contextualized**, asking migrants themselves their reasons for moving
- More **policy-oriented** research



* see de Sherbinin et al. (in prep). *Ethnic and Migration Studies*.



Research gaps (adaptation)

- How do we integrate **adaptation and development planning** for better mobility outcomes, including securing the right to stay?
- Which **nature based solutions** increase resilience?
- When are **planned relocation / managed retreat** warranted, and how do we protect people's rights in the process?
- When is mobility **adaptive** or **maladaptive**, and for whom?

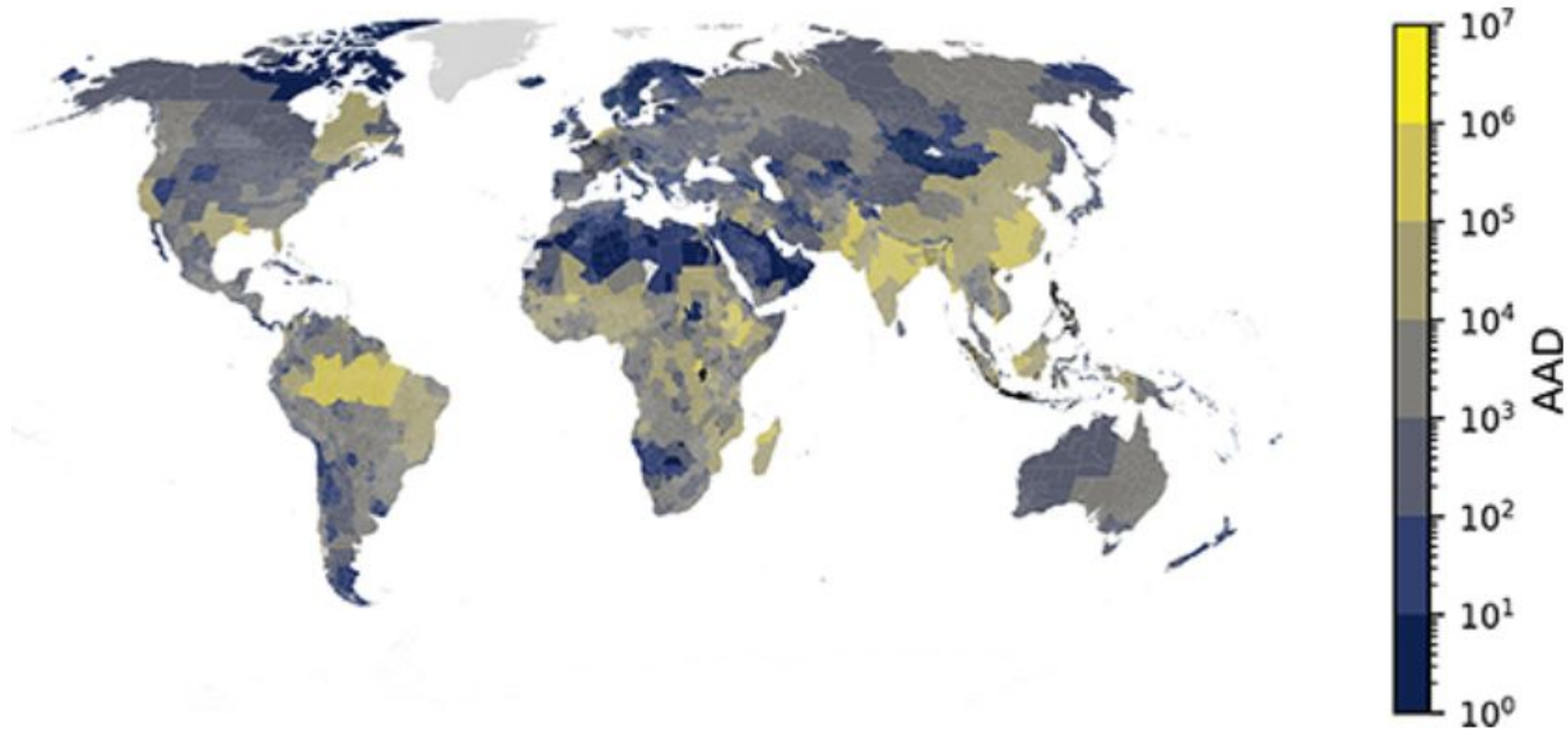
Coming soon - Adaptation Journeys: Evidence from the Field on Adaptive
Forms of Climate (Im)mobility
Guest Editors: Sarah Rosengaertner and Ann-Christine Link



2) Open Data on Climate Risks, Vulnerability and Mobility



Climate risk data are now more available



Global, multi-hazard, present-day displacement risk. Annual average displacement estimates for the four hazards (tropical cyclone wind, coastal flood, river flood, and drought) combined are displayed at the admin1 level.

Source: Meiler et al. (2025) "A natural hazard risk modelling approach to human displacement", *Environmental Research Climate*

Future climate risks are also more available

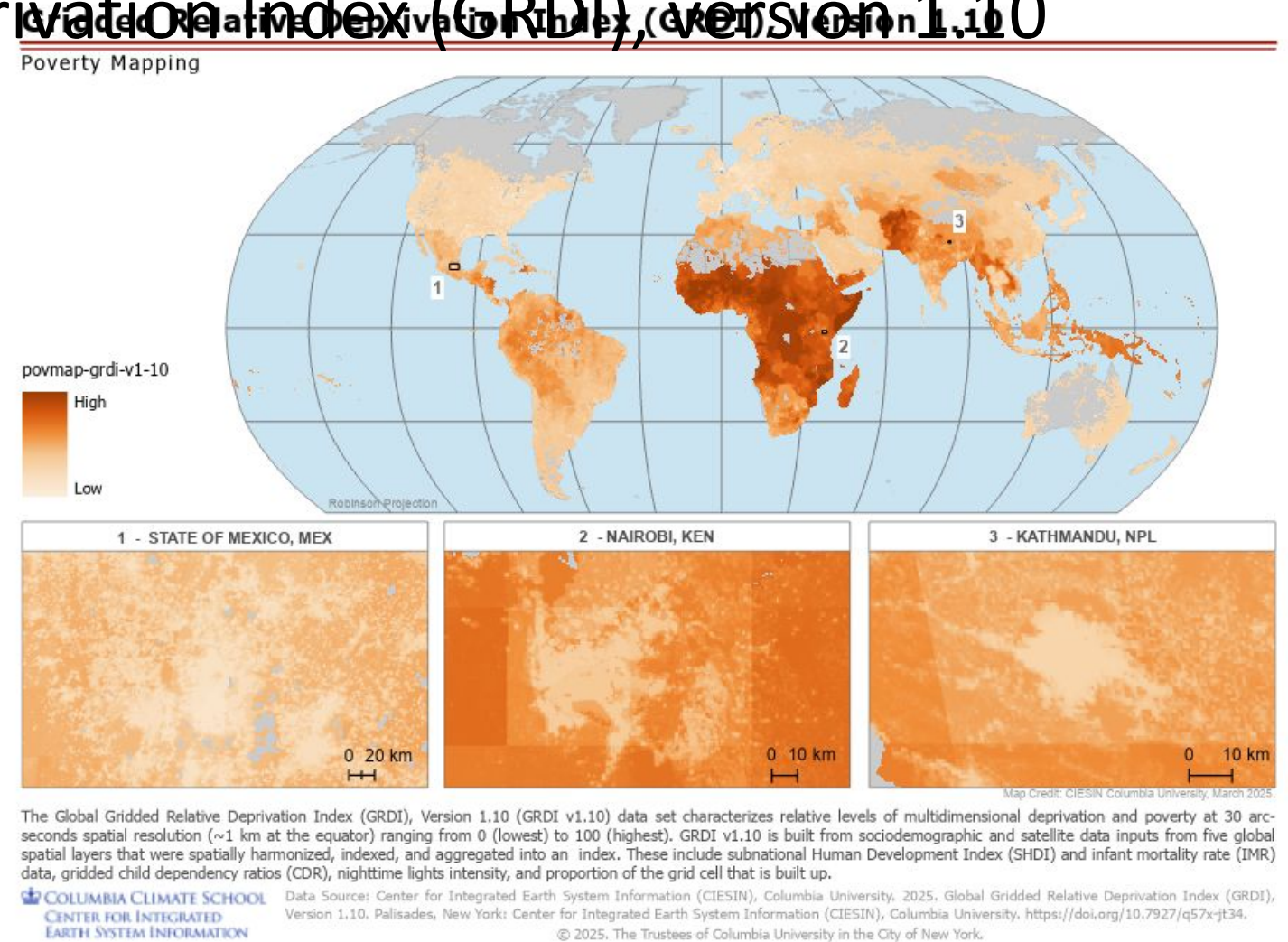
RISK	0 - NONE	1 - V Low	2 - Low	3 - Mid	4 - High	5 - V High
High Temperature <i>Projected 2050 max air temp >45C for days per year</i>	0 days	1-2 days	3-6 days	7-13 days	14-29 days	30+ days
High WBGT <i>Projected 2050 max WBGT >30C for days per year</i>						
Water Scarcity <i>Most severe scarcity level of any watershed within city bounds</i>	No water scarcity	NA*	NA*	Arid & low water use	Seasonal water scarcity	Perennial water scarcity
Riverine Flooding <i>2025 population expected to experience a 1 in 100 year flood</i>	No pop in city	1-10% pop in city	10-20% pop in city	20-30% pop in city	30-40% pop in city	40-50% pop in city
Storm Surge <i>2025 low-elevation coastal zone population expected to experience a 1 in 100 year event</i>	No pop. in LECZ	<1% pop in LECZ	1-2% pop in LECZ	2-3% pop in LECZ	3-6% pop in LECZ	>6% pop in LECZ
Cyclone wind <i>Projected 1 in 100 year sustained wind speeds of...</i>	<Cat 1 Hurricane	Cat 1 Hurricane	Cat 2 Hurricane	Cat 3 Hurricane	Cat 4 Hurricane	Cat 5 Hurricane
Landslide <i>Average landslide susceptibility</i>	No risk	Very low	Low	Moderate	High	Very high

Source: Thomson et al. (in review) "Global cities dataset reveals urban poor are exposed to compounding social, environmental and climate risks", *npj Urban Sustainability*.

Vulnerability data are also available from global...

Global Gridded Relative Deprivation Index (GRDI), version 1.10

- **Child Dependency Ratio (CDR):** Higher CDR implies higher dependency on working population (UN DESA, 2006). Reprocessed at coarser resolution.
- **Infant Mortality Rate (IMR):** Common indicator of population health.
- **Subnational Human Development Index (SHDI):** Assesses human well-being through “three dimensions: Education, health, and standard of living (Smits and Permanyer, 2019).”
- **Ratio of built-up area (BUILT):** Rural populations more likely to experience higher degree of multidimensional poverty when compared to urban populations, other things being equal.
- **Nighttime Lights (VNL 2020):** Stable night lights are closely associated with anthropogenic activities, economic output, and infrastructure development.



Data are available at the CIESIN Collection on Harvard Dataverse

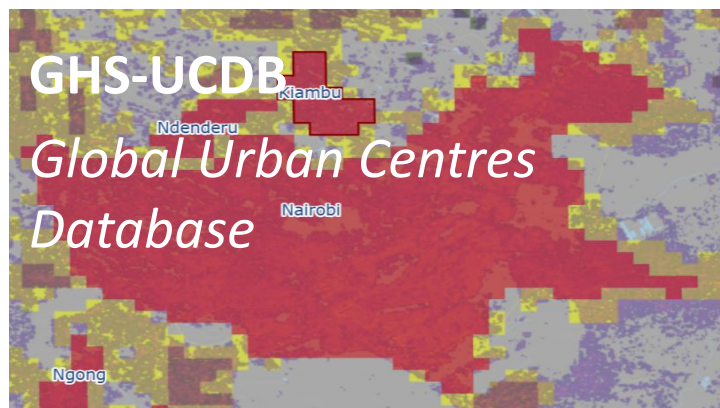
<https://dataverse.harvard.edu/dataverse/CIESIN>

...to local scales

City Segments, v.1



Data generated for 5,218 cities in 107 countries



OSM Roads

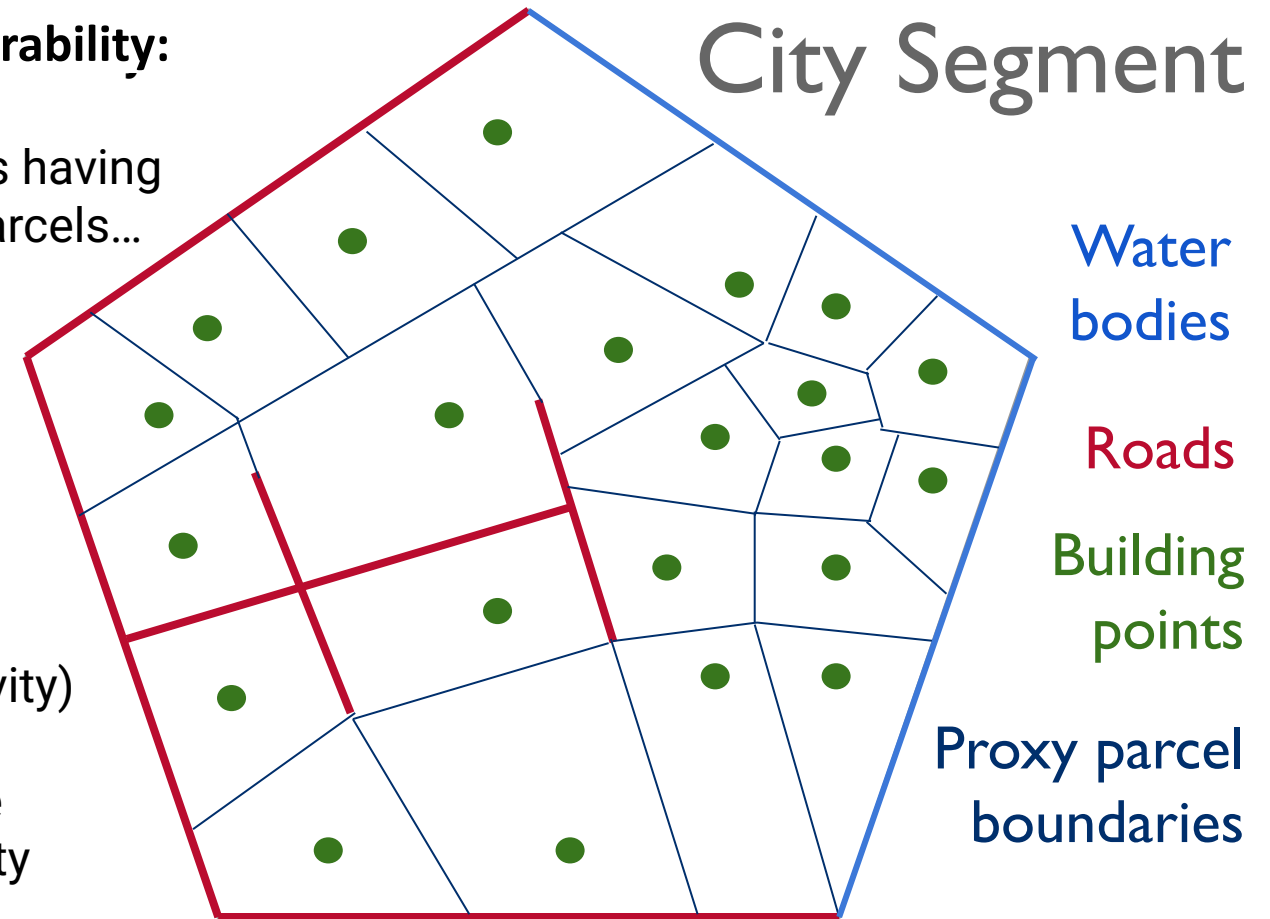
SES Vulnerability:

Defined as having smaller parcels...

AND

Fewer meters of roads per building... (connectivity)

... than the median city segment



Data are available at the CIESIN Collection on Harvard Dataverse

<https://dataverse.harvard.edu/dataverse/CIESIN>



Mobility data

- **Census** and census-derived data (e.g. UN International Migration Stock, IPUMS)
 - Exhaustiveness and broad set of information
 - Can be used to indirectly estimate migration (e.g., Global Net Migration Grids)
- **Systematic datasets**: asylum applications, irregular migration /apprehensions, IOM Displacement Tracking Matrix, IOM Flow Monitoring Registry, etc.
 - Exhaustiveness, but *specific information*: locations or types of migration flows (i.e. long-distance migration).
- **Large-scale surveys**: Demographic and Health Surveys, World Bank Living Standards Measurement Study, IOM Flow Monitoring Surveys, etc..
 - Random surveys, but cover large-set of locations across countries.
 - Comparison possible between surveys.
- **Small, location specific random surveys (incl. research purpose)**:
 - Random surveys, but limited to a single country (or a few) or specific locations within a country:
 - Rich, in-depth set of information on migration decisions
 - Comparison generally not possible



Mobility data

HDX

 Search Datasets

DATA | LOCATIONS | ORGANISATIONS | PRODUCTS ▾

ADD DATA

HOME / DATASETS / IOM - GLOBAL PROFILES FOR INTERNAL DISPLACEMENT (GPID)

IOM - Global Profiles for Internal Displacement (GPID)

 GET NOTIFIED

While the total numbers of internal displacements – by cause, location, and time – are well documented, global estimates of the demographic and socio-economic profiles of impacted communities have been largely missing. This lack of disaggregated data on variables such as age, sex, income, education, health, and land use, has limited understanding of the diverse ... [More](#)



Thanks for your attention!

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