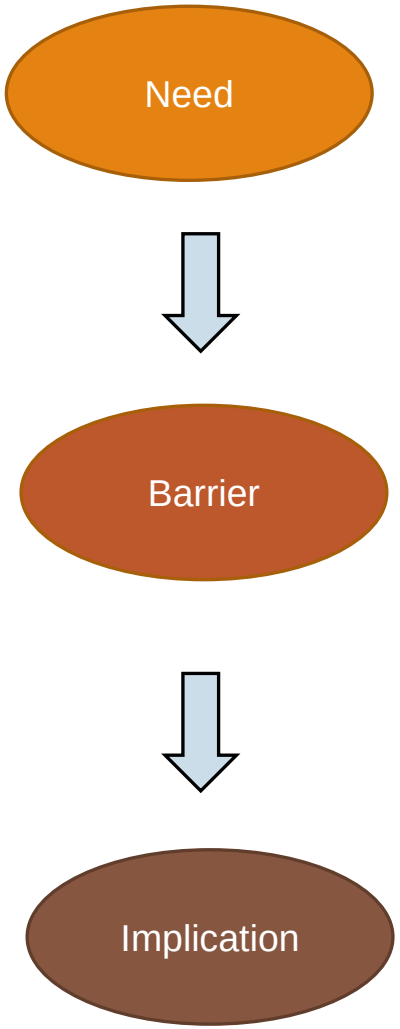
Geospatial data, methods and applications to assess vulnerabilities and access to adaptation services

Giacomo Falchetta[1,2]
1. Department of International Economics, Institutions and Development, Catholic University, Lgo. Gemelli 1, 20123, Milan, Italy
2. FEEM - Fondazione Eni Enrico Mattei, Corso Magenta 63, 20123, Milan, Italy

Email: giacomo.falchetta@feem.it
Twitter: @giacfalk

Motivation



1. Health treatment
2. Adaptation action at home
3. Fundamental energy services

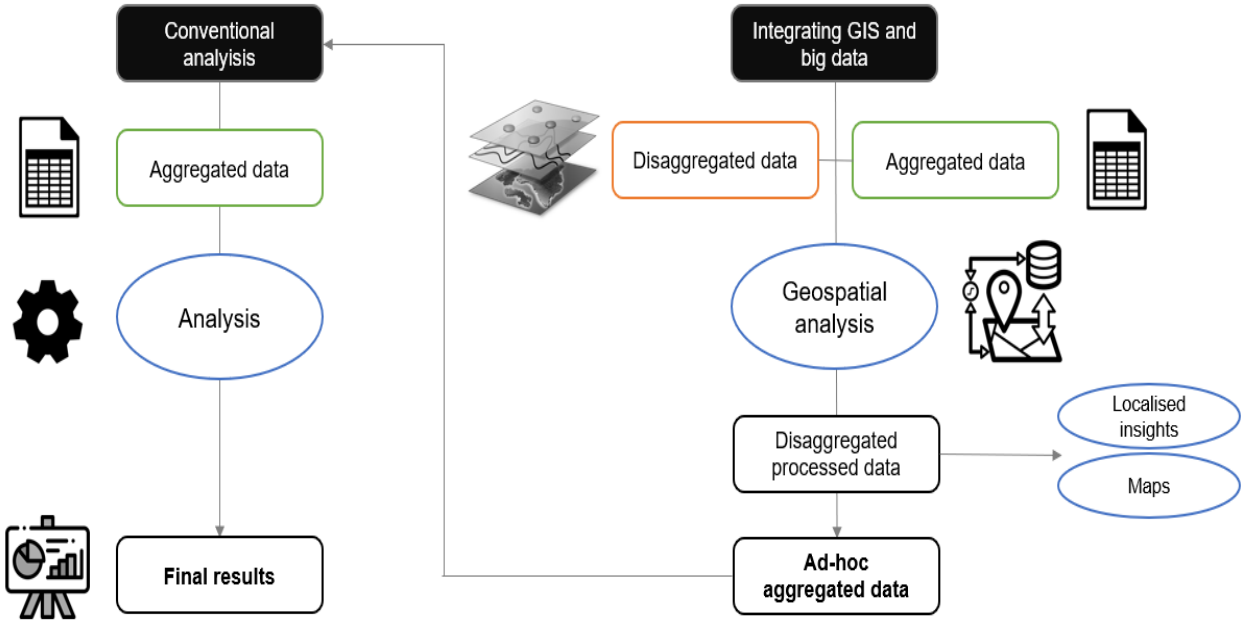
1. Proximity (accessibility)
2. Appliance uptake and use
3. Infrastructure availability

1. Negative health outcomes
2. Distress, lower life quality
3. Poverty trap

Need for evidence-based assessments and planning-oriented decision support tools

1. Localising **vulnerable** populations
2. Predict future trends and decide how to best **respond** to them
3. Improve understanding of **infrastructure** status and deficits

The value added of GIS data and methods

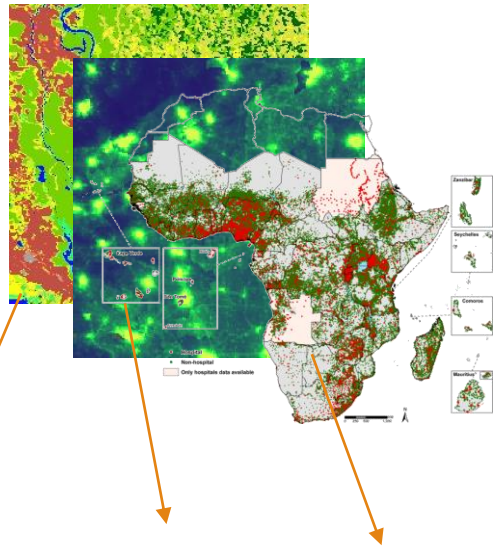


Source: author's elaboration

- "**Beyond aggregates**, as long as the **data** is allowing for it".
- **Development indicators** have mostly been provided at **national** scales → masking underlying variations and distributions; average out uneven patterns of changes and **impacts across regions and groups within the same nation.**
- Often **policies** and conditionality agreements are based on such indicators, which however rely **overwhelmingly on simple averages and aggregates.**

Application example 1: healthcare accessibility

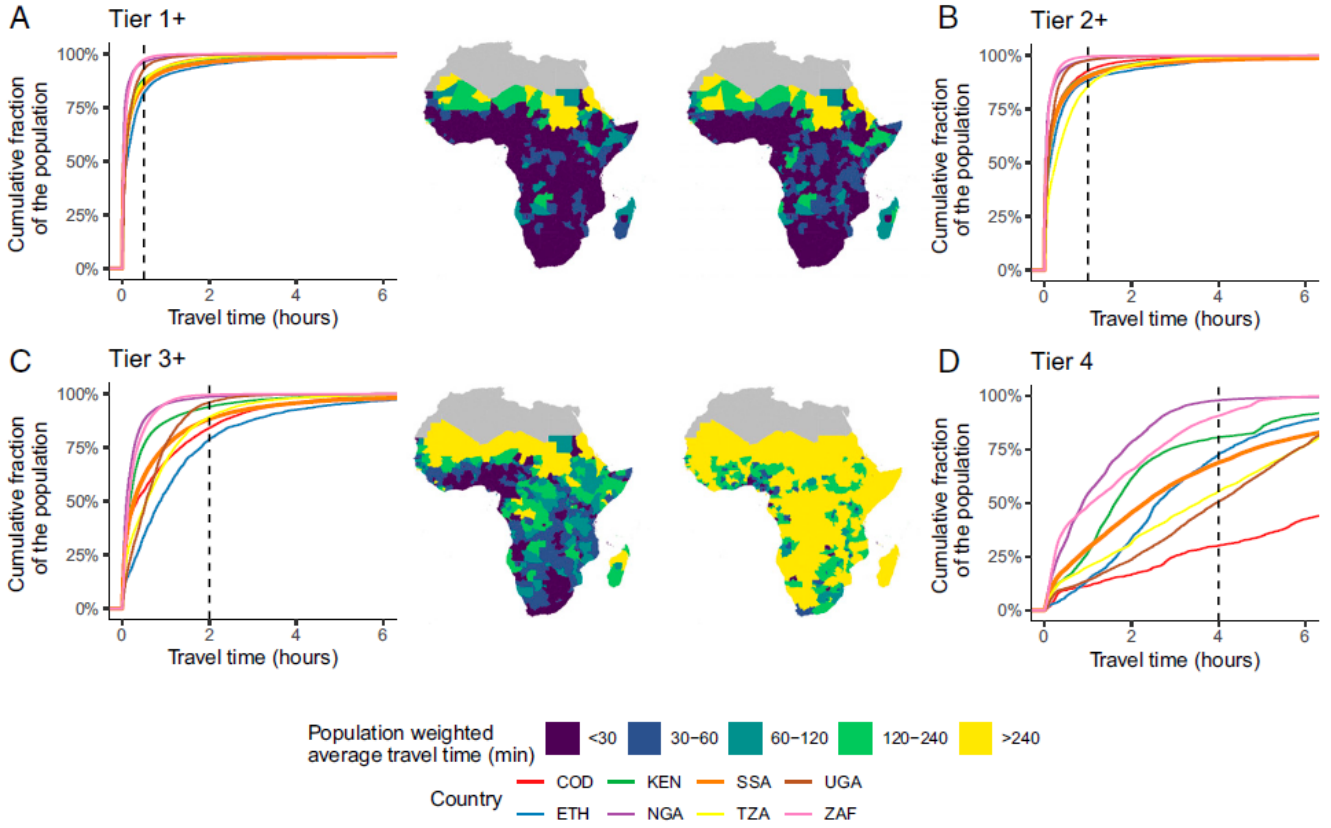
How easily can people in sub-Saharan Africa **reach healthcare facilities** of different levels?
→ need to **receive treatment**, in the future harshened by population growth, climate change, etc.



Transport infrastructure and terrain-specific friction surface

Population distribution

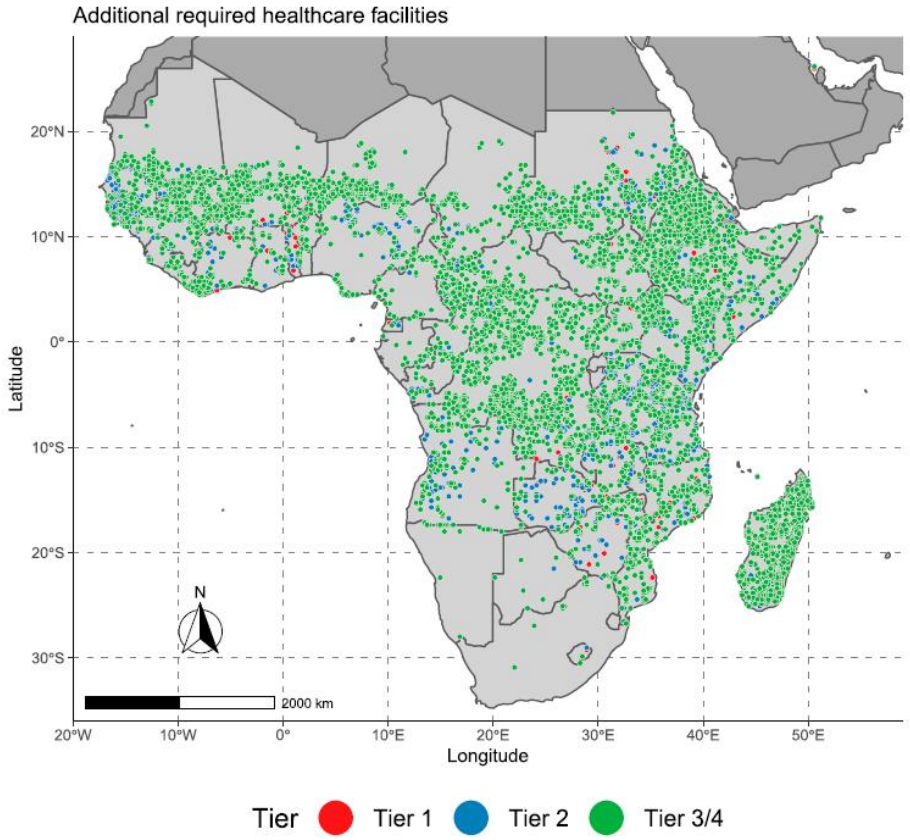
Georeferenced healthcare facilities

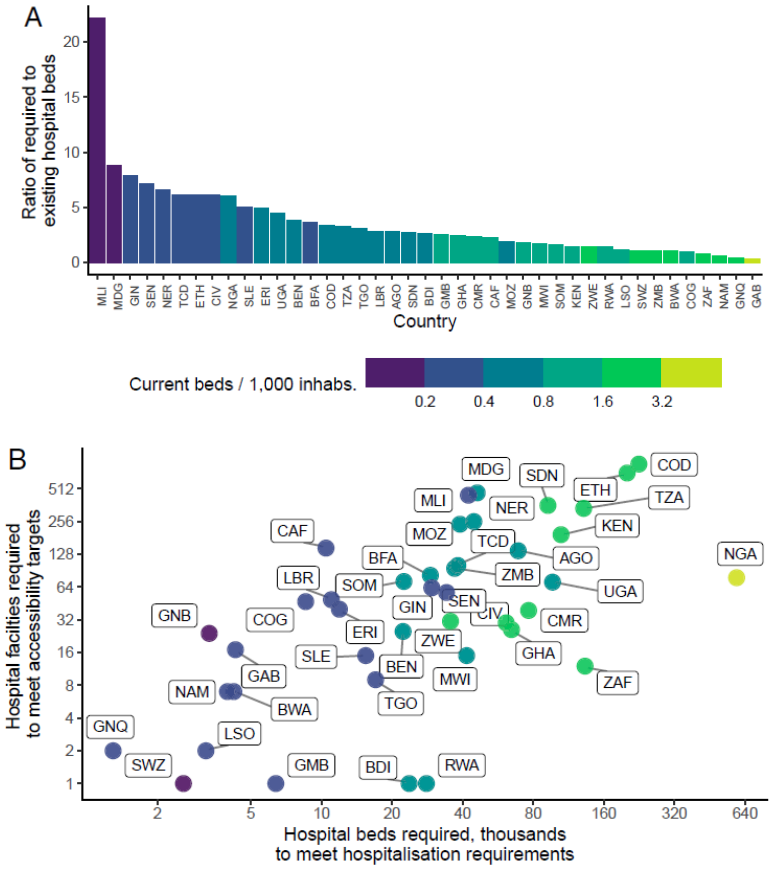


Falchetta, G., Hammad, A. T., & Shayegh, S. (2020). Planning universal accessibility to public health care in sub-Saharan Africa. *Proceedings of the National Academy of Sciences*, *117*(50), 31760-31769.

Application example 1: healthcare accessibility

How to **optimise the location and characteristics of future public healthcare** facilities to maximise coverage? High-resolution data + multi-objective GIS framework → optimal allocation of new healthcare facilities and hospitals expansion requirements (including sufficient available hospital beds).

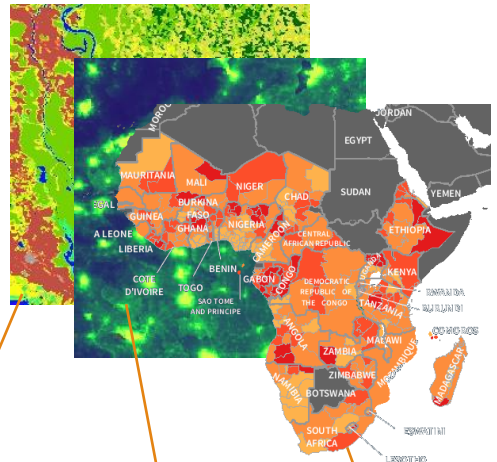




Application example 2: AC demand growth

How do we expect **residential air cooling demand** to expand in sub-Saharan Africa?

→ Based on income, urbanisation, climate change...

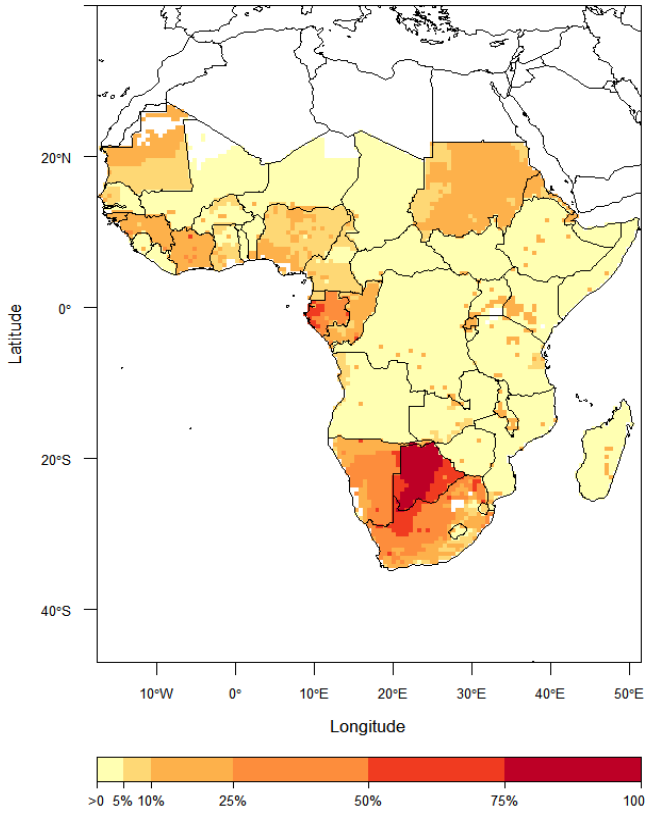


Cooling degree days

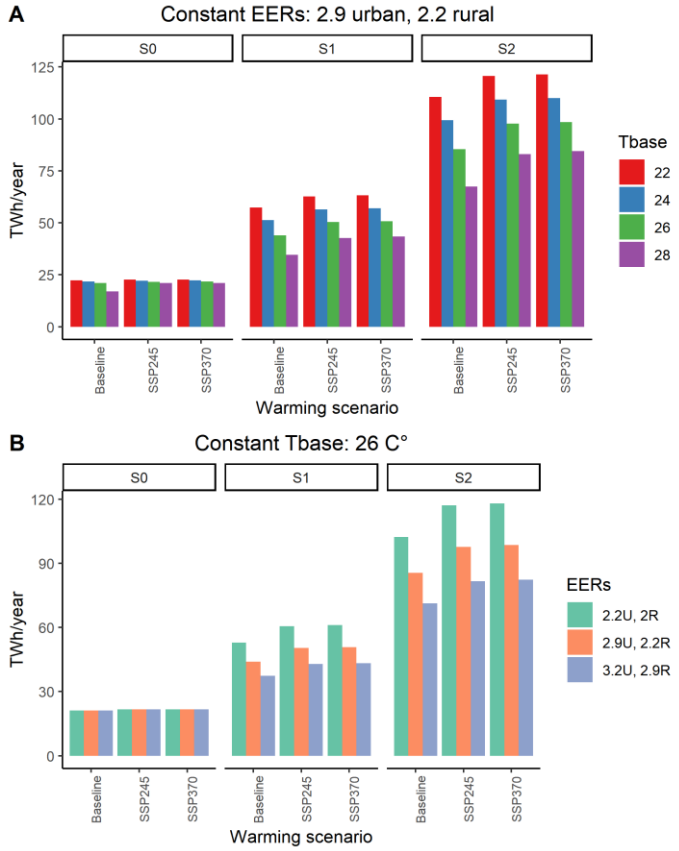
Population distribution, urban/rural

Local income level

Estimated **AC penetration rate** around year **2050** (SSP2)



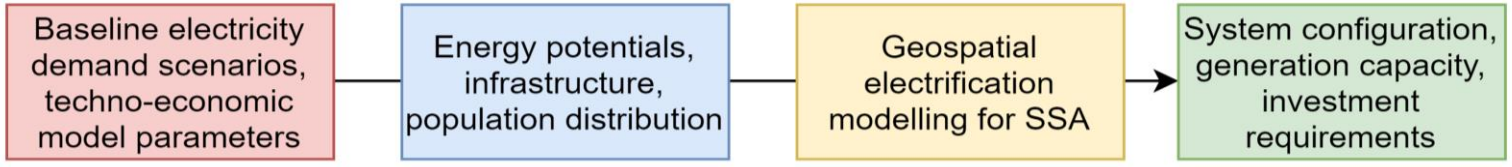
Electricity demand under different scenarios and targets

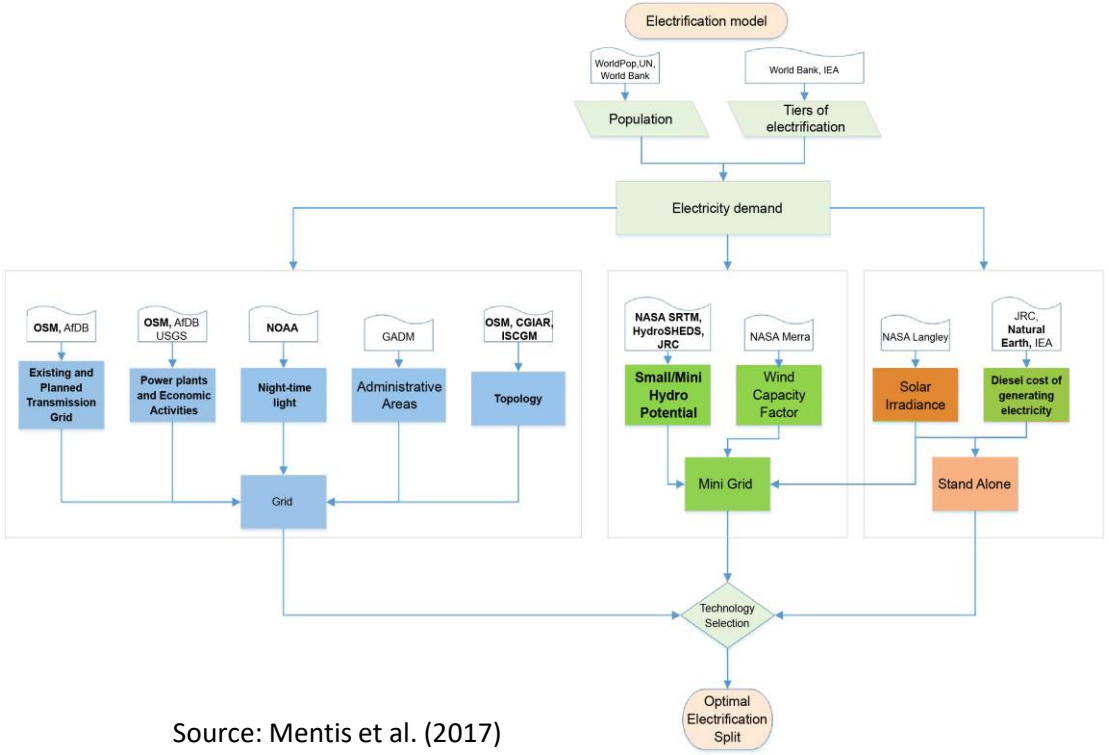


Falchetta, G., Mistry M. The role of residential air circulation and cooling demand for electrification planning: Implications of climate change over sub-Saharan Africa. *Work in progress*

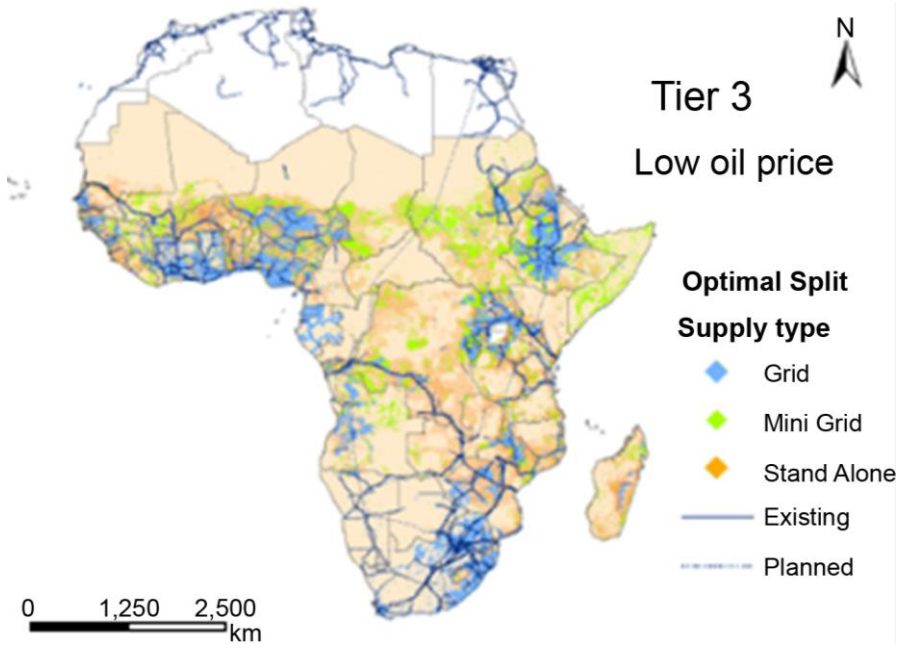
Application example 2: AC demand growth

How to ensure electricity access infrastructure planning is inclusive of growing electricity demand from air conditioning and cooling?





Source: Mentis et al. (2017)



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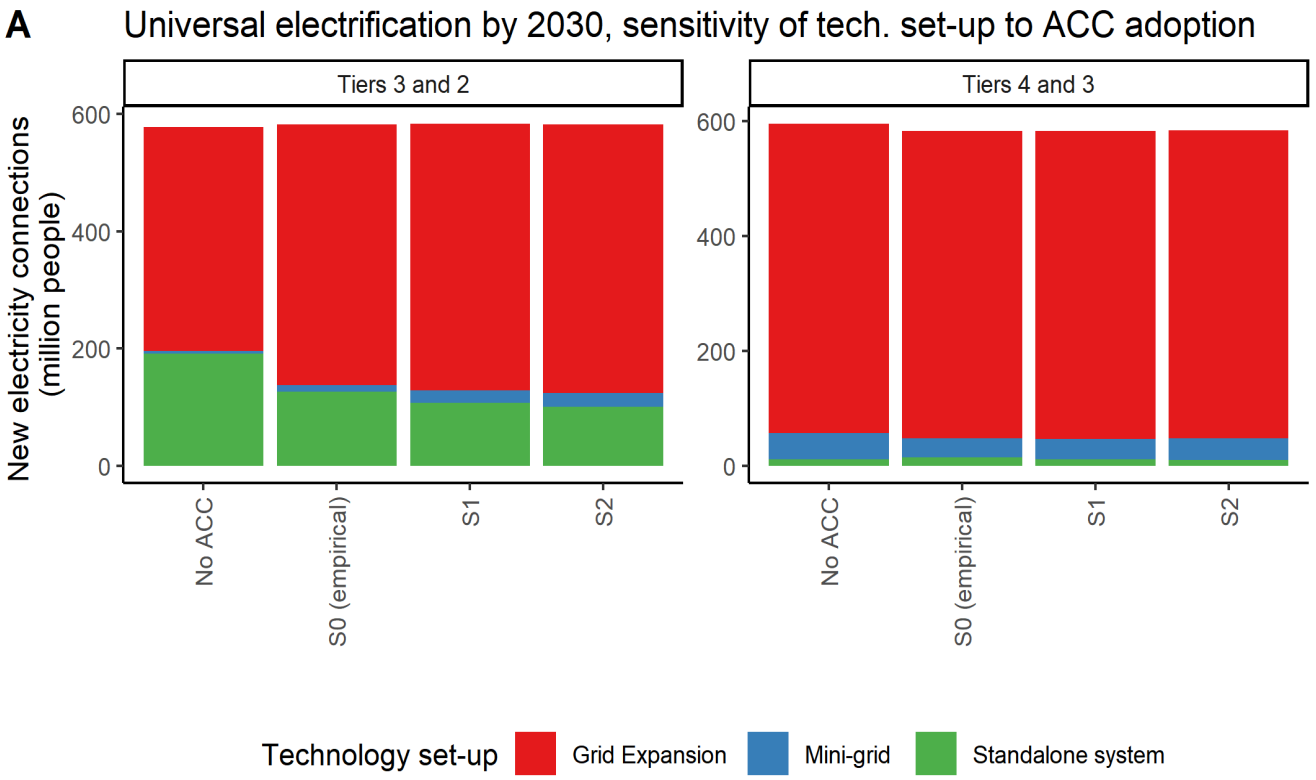
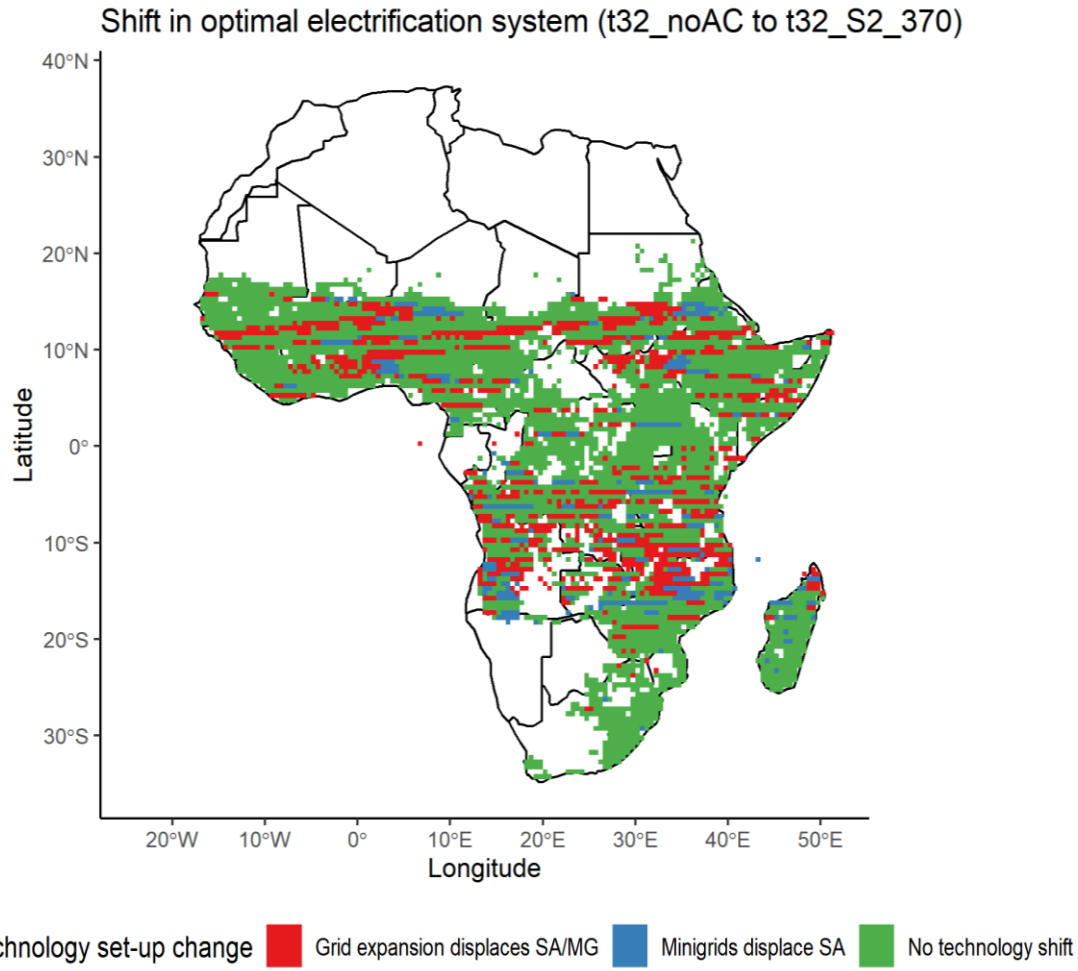
Application example 2: AC demand growth





Impact of **ACC needs explicit consideration on optimal electrification policy**

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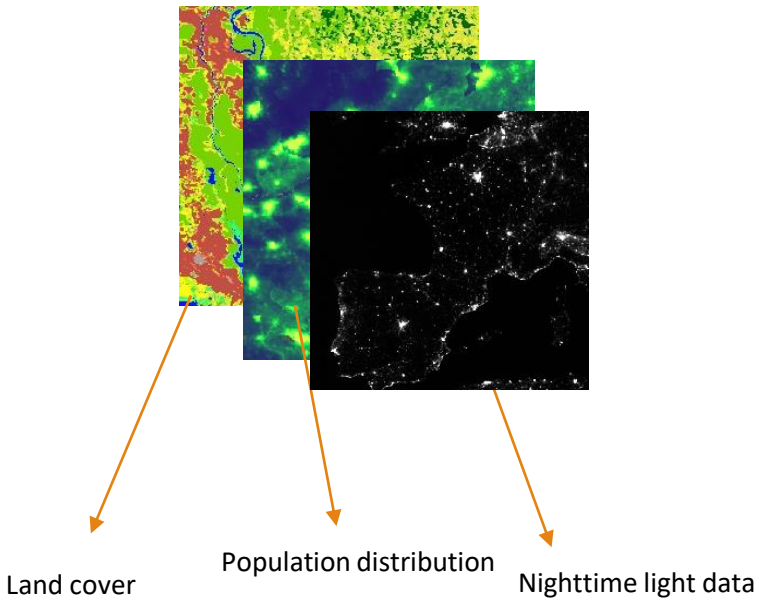
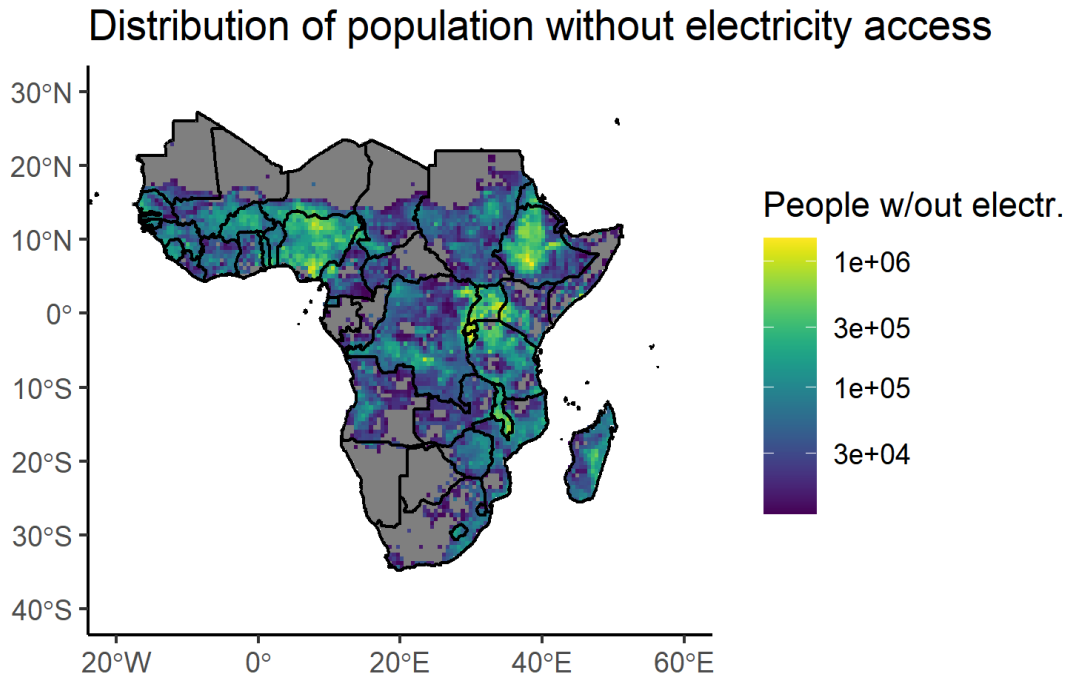
Application example 3: electricity access

How are **populations without access to electricity distributed** across sub-Saharan Africa?
→ Necessary condition for autonomous adaptation, poverty abatement, agricultural productivity and profitability growth, human development...

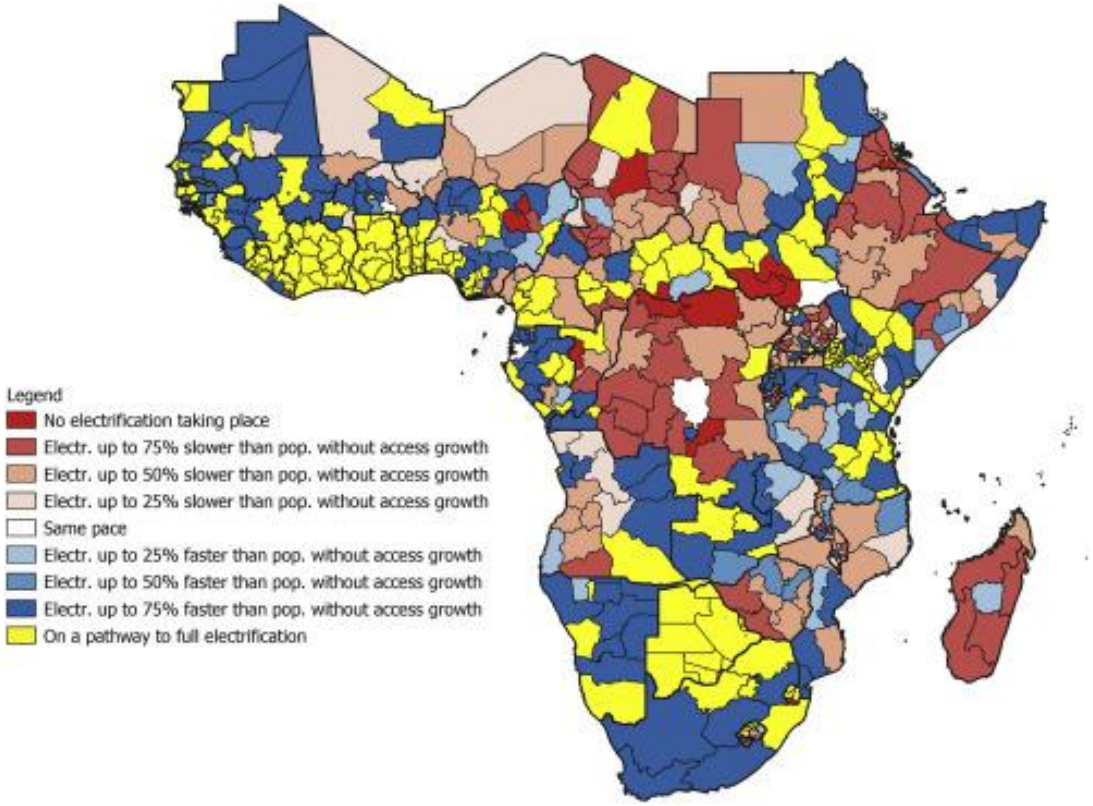


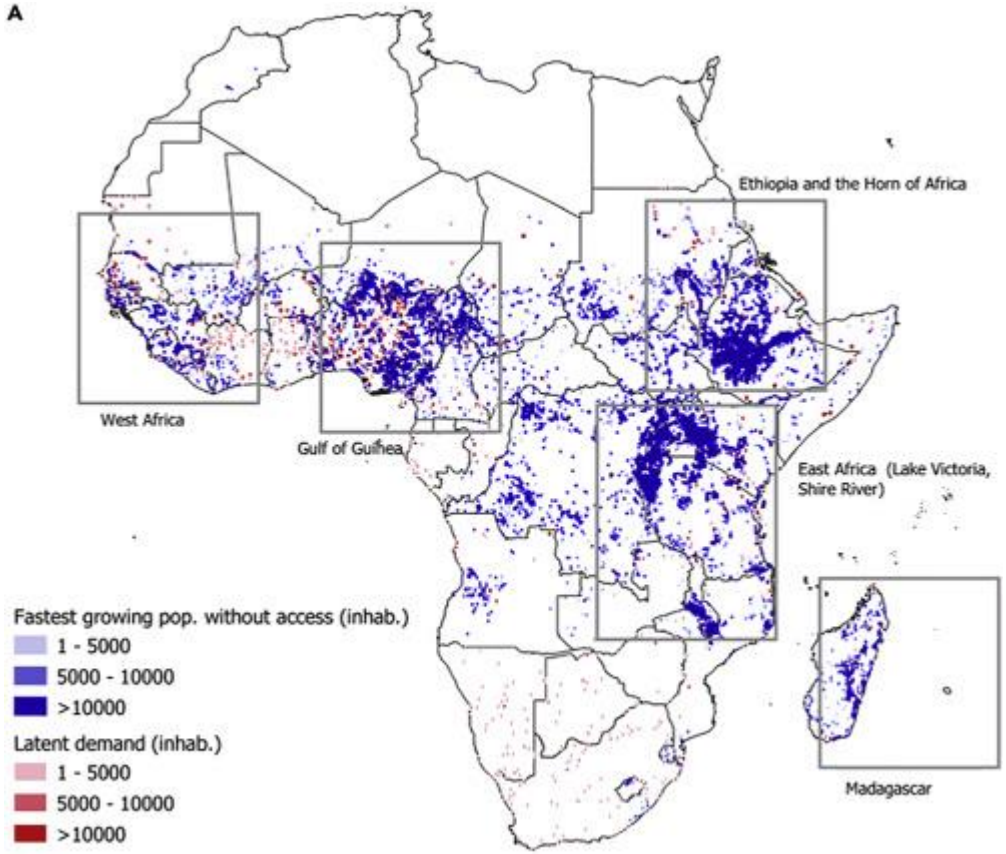


Falchetta, G., Pachauri, S., Parkinson, S., & Byers, E. (2019). A high-resolution gridded dataset to assess electrification in sub-Saharan Africa. Scientific data, 6(1), 1-9.

Application example 3: electricity access

6 years of data for sub-Saharan Africa to derive **multi-dimensional estimates of electricity access progress and inequality**. Analysis updated regularly as satellite data is published.





Falchetta, G., Pachauri, S., Byers, E., Danylo, O., & Parkinson, S. C. (2020). Satellite Observations Reveal Inequalities in the Progress and Effectiveness of Recent Electrification in Sub-Saharan Africa. One Earth.

Discussion

- Assessments of **vulnerability** and (climate change) **impacts mitigation potential** can greatly benefit from using **geospatial data and methods.**

- **A more granular understanding** → a more prompt response and efficient planning

- **GIS data is thriving**: an increasingly large number of available geodatabases and satellite data that can greatly enhance the decision making process

- This is very crucial in the **climate change adaptation sphere**:
  1. Evaluating phyisical accessibility to facilities
  2. Evaluating hotspots of growing pressure and vulnerability
  3. Evaluating infrastructure quality
  4. ...

Questions to the audience:

- In what area / topic related to adaptation do you see a **lack of insightful analyses**?
- Do you see **potential** to apply similar GIS-based data and methods on such topic for a **better understanding**?
- Do you see a **trade-off** between **analysis granularity** and **complexity to convey policy-relevant messages**?

Thank you

GIACOMO.FALCHETTA@FEEM.IT

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