Comparison of Off-Grid Electrification versus Grid Extension: Influencing Parameters and The Role of Renewable Energies from a Geographic Point of View

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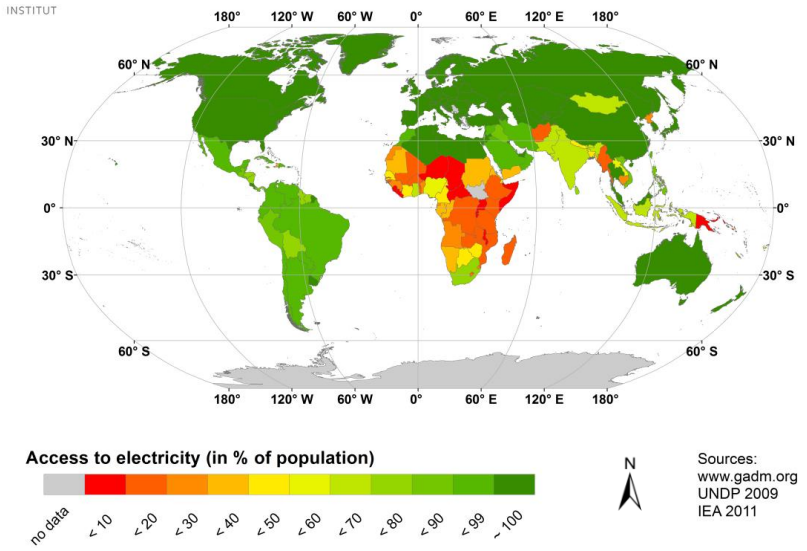
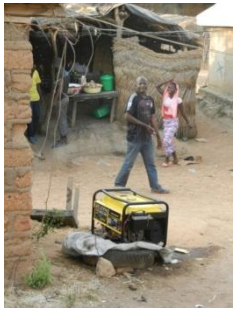
Status quo

- Insufficient power generation facilities in many regions
- Expensive power generation costs
- Outdated infrastructure
- Unreliable grid electricity access
- Dependence on fossil fuel imports
- Renewable energy potentials



Energy kiosk – Extreme Nord, Cameroon (Cader, 2014).



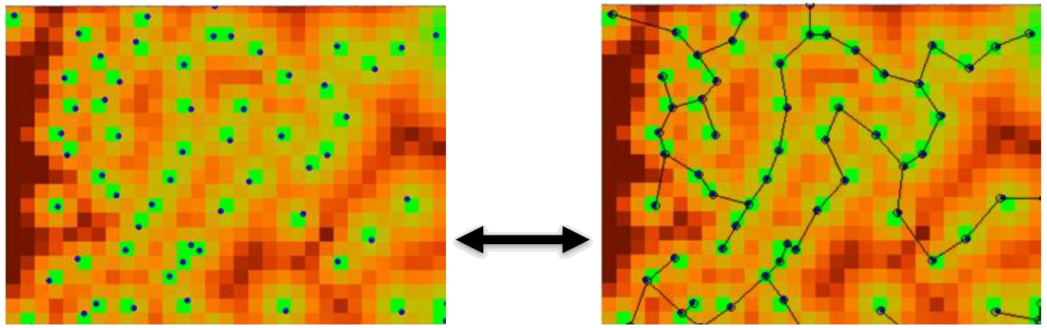
Small diesel generator to power little energy kiosks – Extreme Nord, Cameroon (Cader, 2014).

Mobile diesel generation unit – Siquijor Island, Philippinen (Bertheau, 2013).

Low electricity access, high costs and outdated technology is prevailing

Objective

Decision support tool for the design of electrification pathways for electricity :



Decentralized supply **Grid extension**

→ Which regions should be supplied decentrally, where is grid extension the better option

- Through economical benefits
- Through a simple realizability
- Through technical feasibility

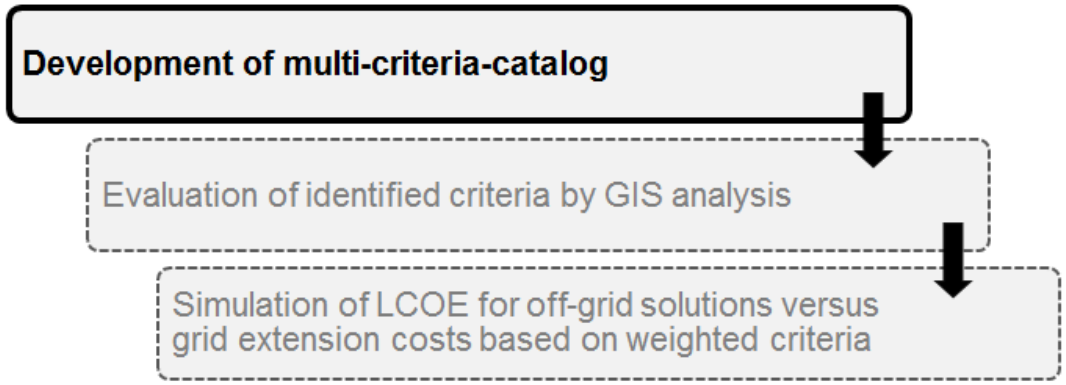
→ How important are renewable energies in this regard?

→ Which political incentives and policies are needed?

Research Approach

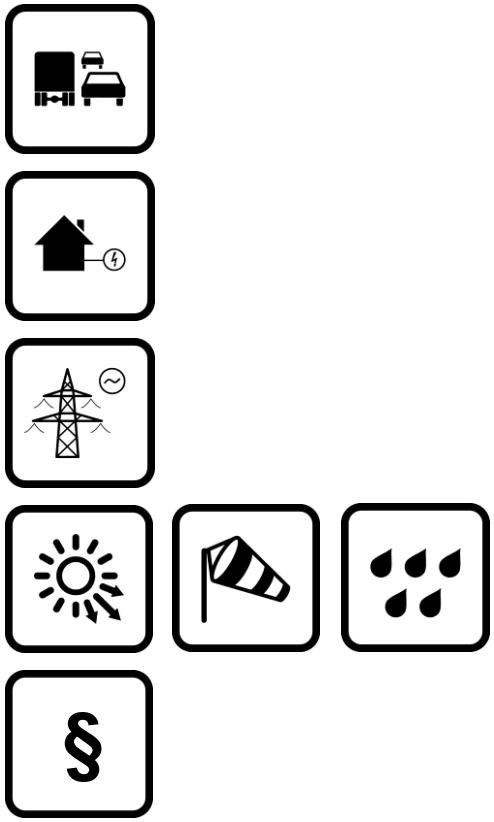
1. Development of the grid extension cost simulation and decentralized costs simulations to compare the electrification options
2. Multi Criteria Decision Analysis (MCDA) to include non-spatial parameters (policies, regulations) into the comparison framework.
   a) Definition of the methodology
   b) Establishing a weighting scale
3. Validation with empirical data

Next research steps to calculate the cost comparison of electrification alternatives.



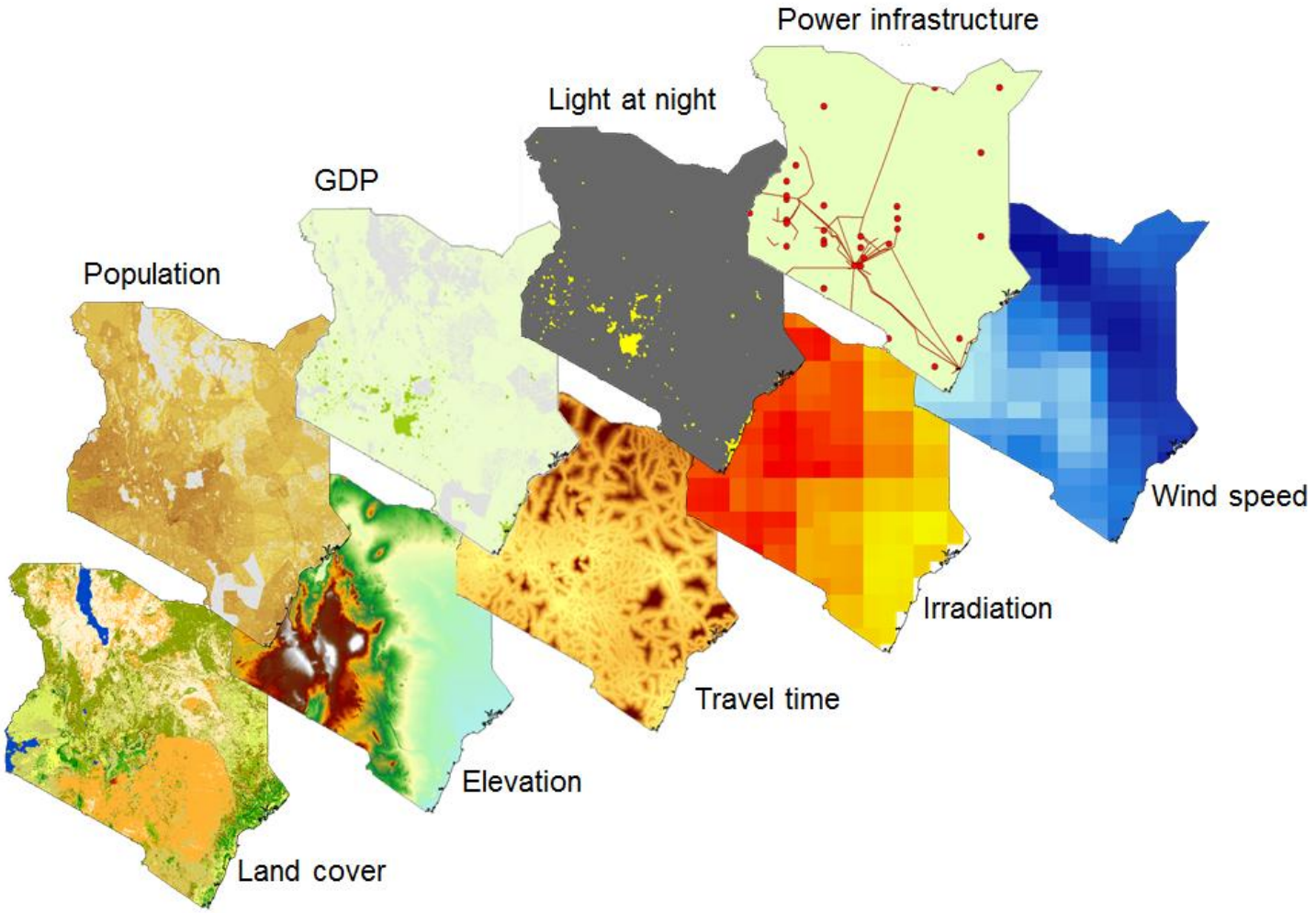
Criteria Catalog

- Remoteness
- Electricity Demand
- Existing Electricity Generation and Transmission Schemes
- Natural Resource Assessment
- Non-Spatial Parameters
  (e.g. policies, regulations, investment incentives)



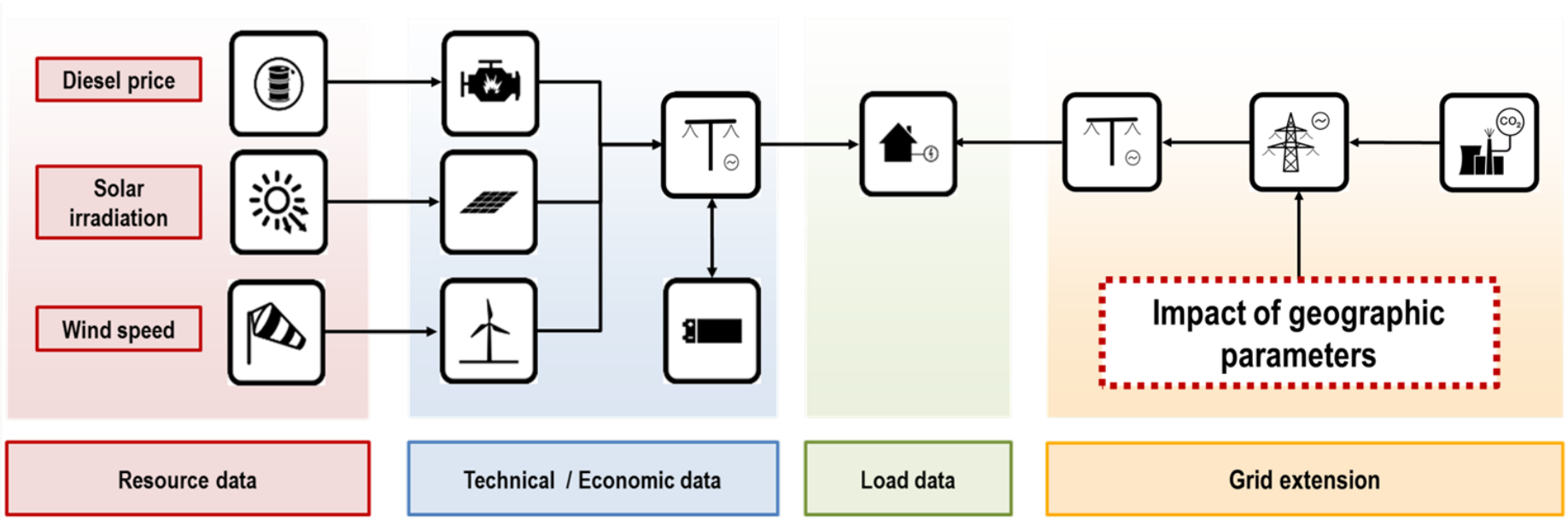
⇒ Using GIS Analysis for spatial criteria

GIS Analysis



Energy Cost Modelling

For a given set of input parameters (resources, technical characteristics, load data, …) a cost optimized hybrid configuration is calculated (PV, wind, diesel, battery) and compared to the respective grid extension costs.



Thank you!