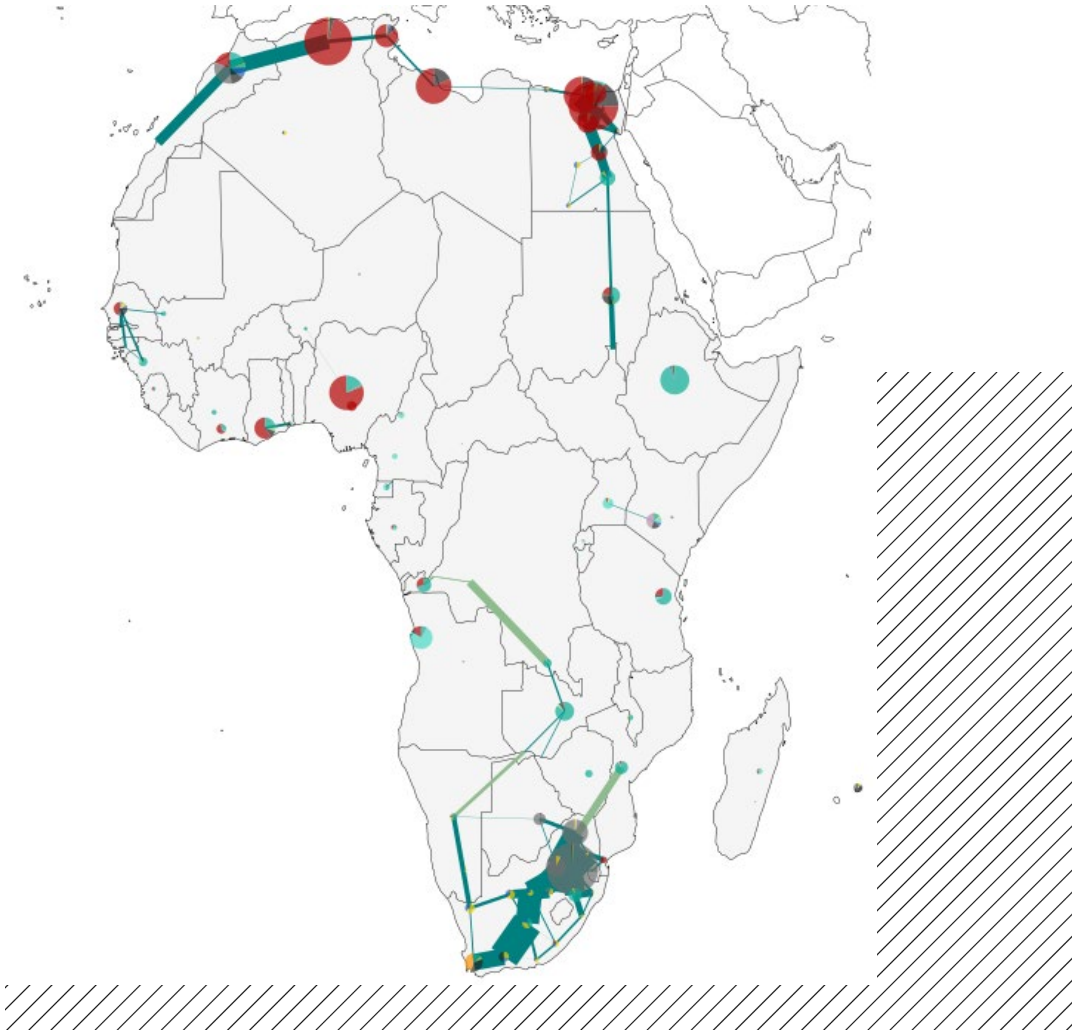

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H2GLOBAL MEETS AFRICA

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H2Global meets Africa

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Projektübersicht

- Projektlaufzeit: 01.01.2023 – 31.12.2025
- Budget: 4.2 Millionen €
- Gefördert vom Bundesministerium für Bildung und Forschung

Projektpartner

H2Global

Fraunhofer IEE

Assoziierte Partner

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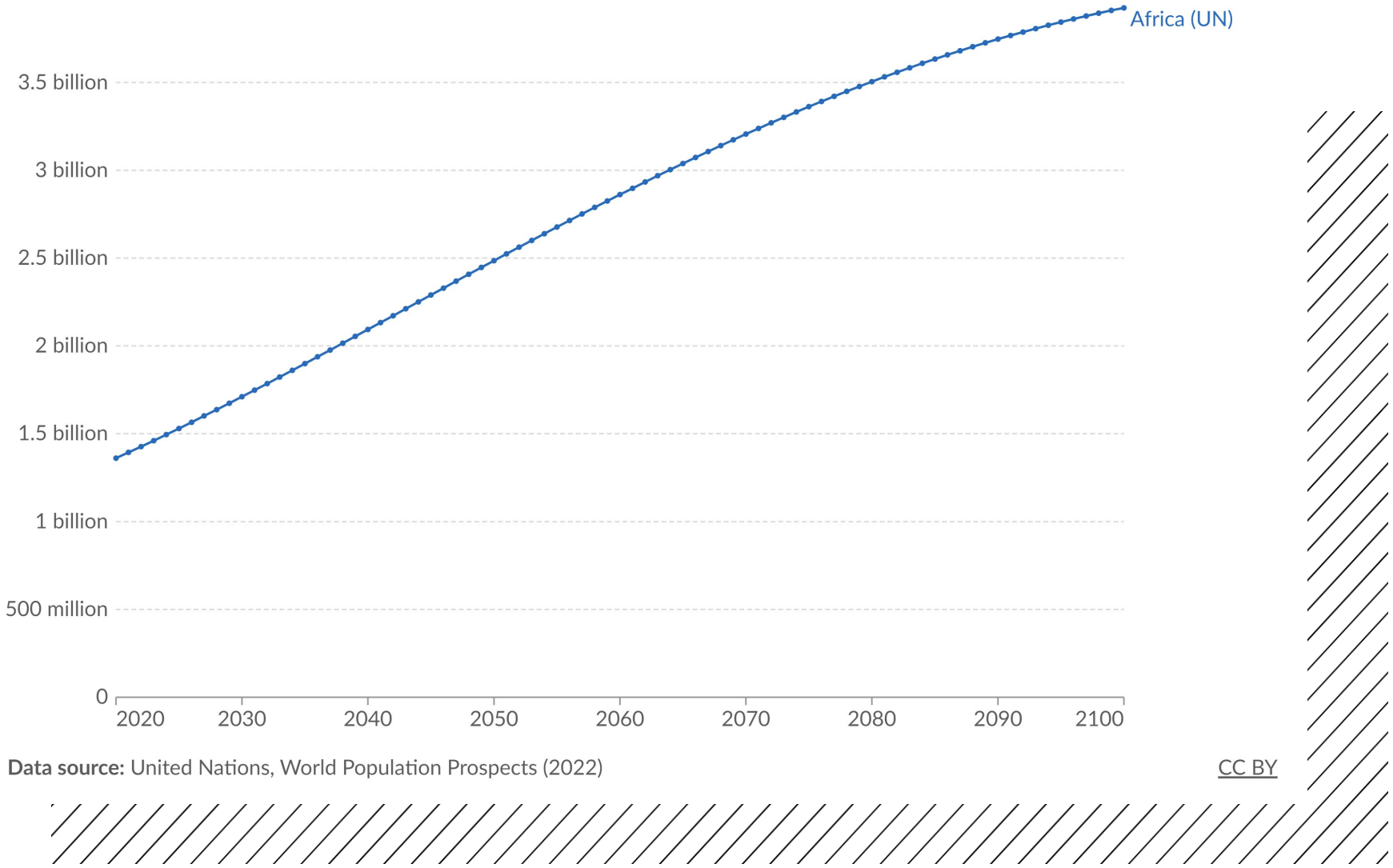
Motivation



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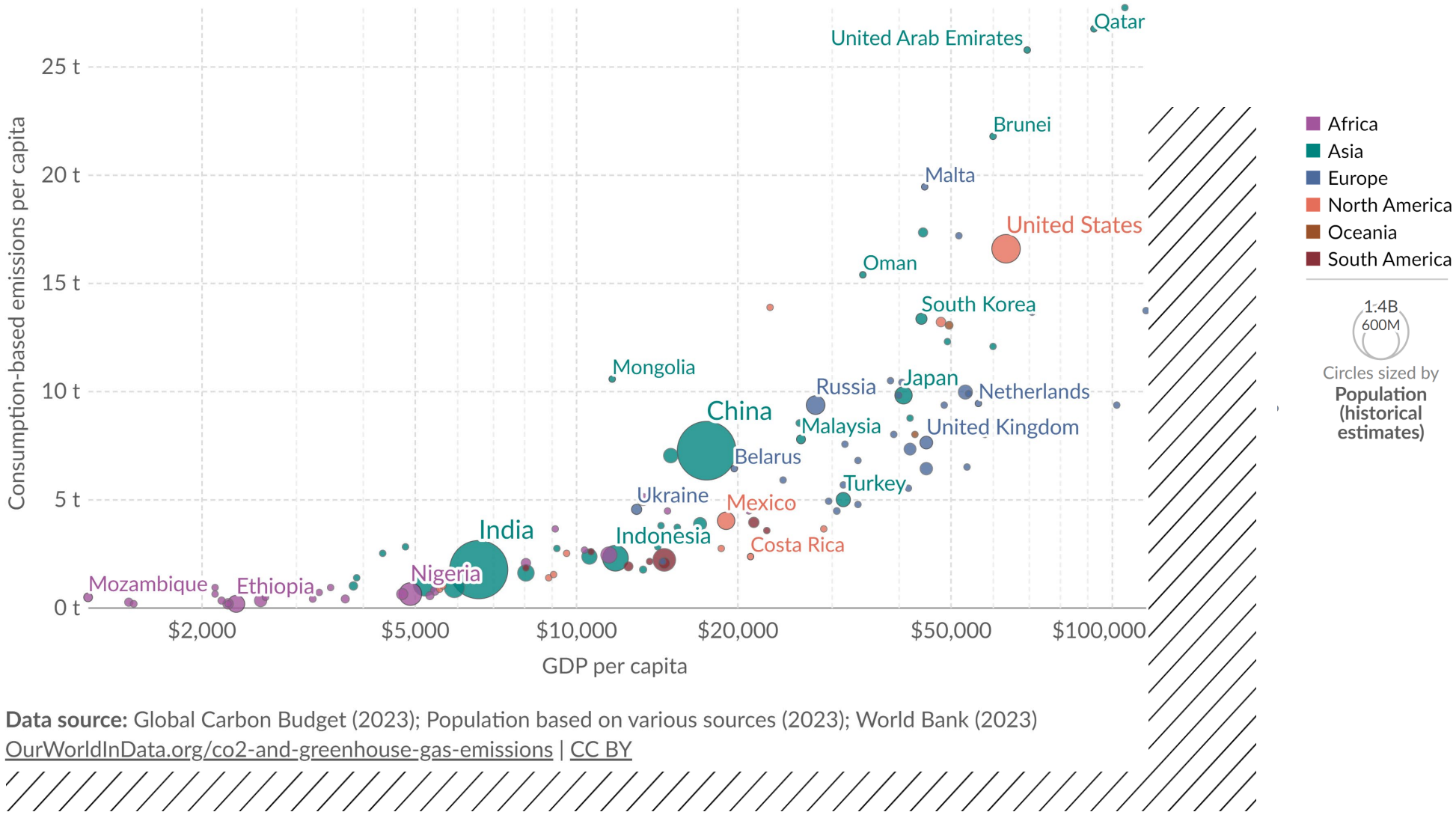
Motivation



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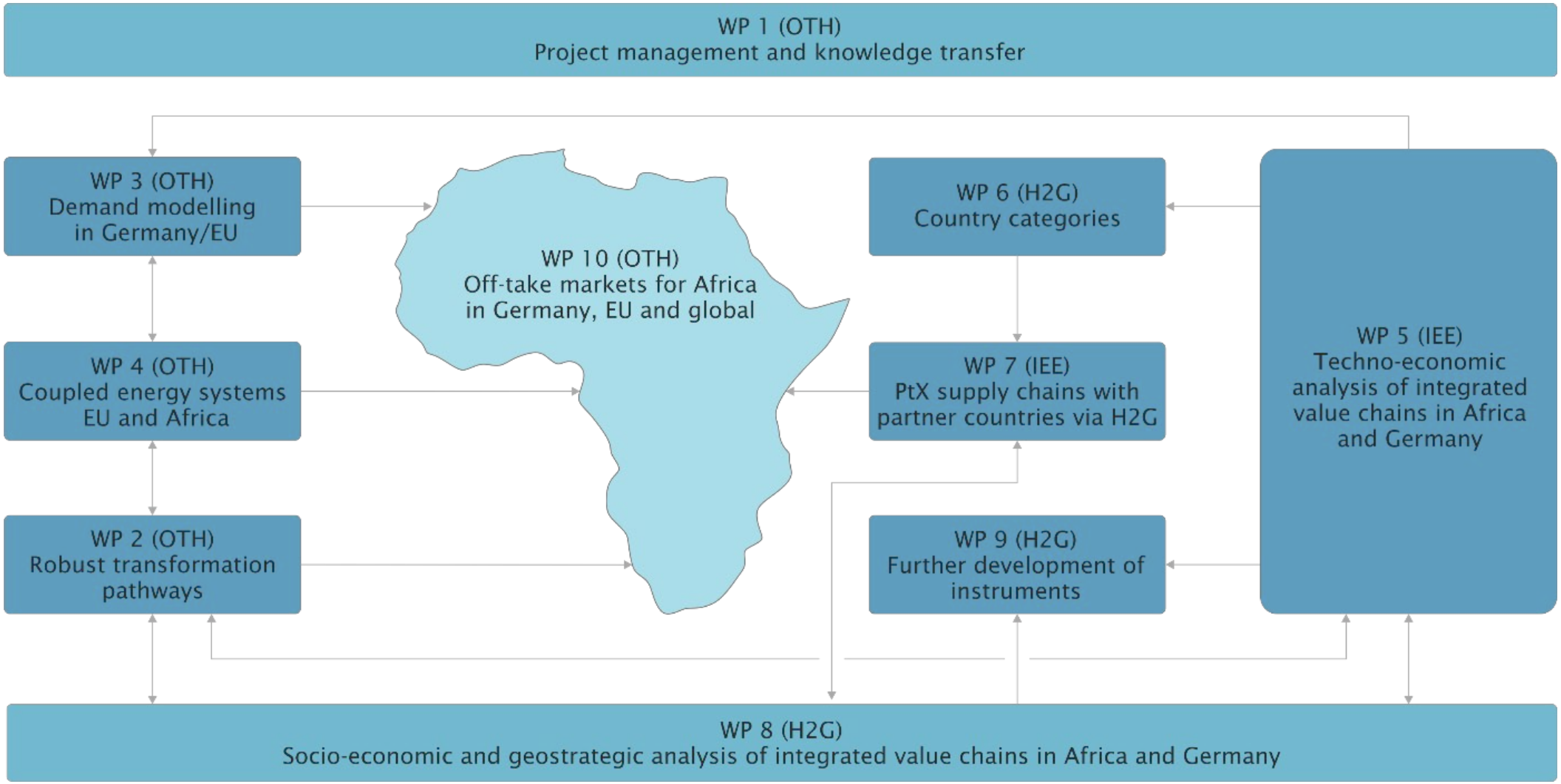
Methodik



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Modellierung von Transformationspfaden für die Energiewende

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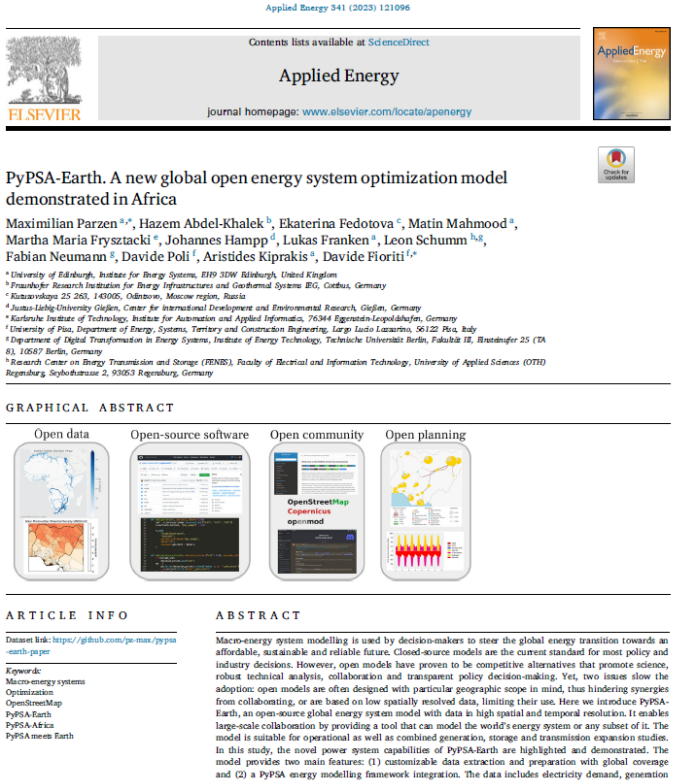
Die wichtigsten Modelle:

- PyPSA-Earth
- PyPSA-Earth-Sec
- PyPSA-Eur



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PyPSA-Earth. A new global open energy system optimization model demonstrated in Africa

Maximilian Parzen [a,*], Hazem Abdel-Khalek [b], Ekaterina Fedotova [c], Matin Mahmood [a], Martha Maria Frysztacki [a], Johannes Hampp [d], Lukas Franken [a], Leon Schumm [b,g], Fabian Neumann [g], Davide Poli [f], Aristides Kiprakis [a], Davide Fioriti [f,*]

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[g] Department of Digital Transformation in Energy Systems, Institute of Energy Technology, Technische Universität Berlin, Fakultät III, Ernst-Reuter-Platz 1 (TA 8), 10587 Berlin, Germany
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GRAPHICAL ABSTRACT

ARTICLE INFO

Dataset link: https://github.com/pz-max/pypsa-earth-paper

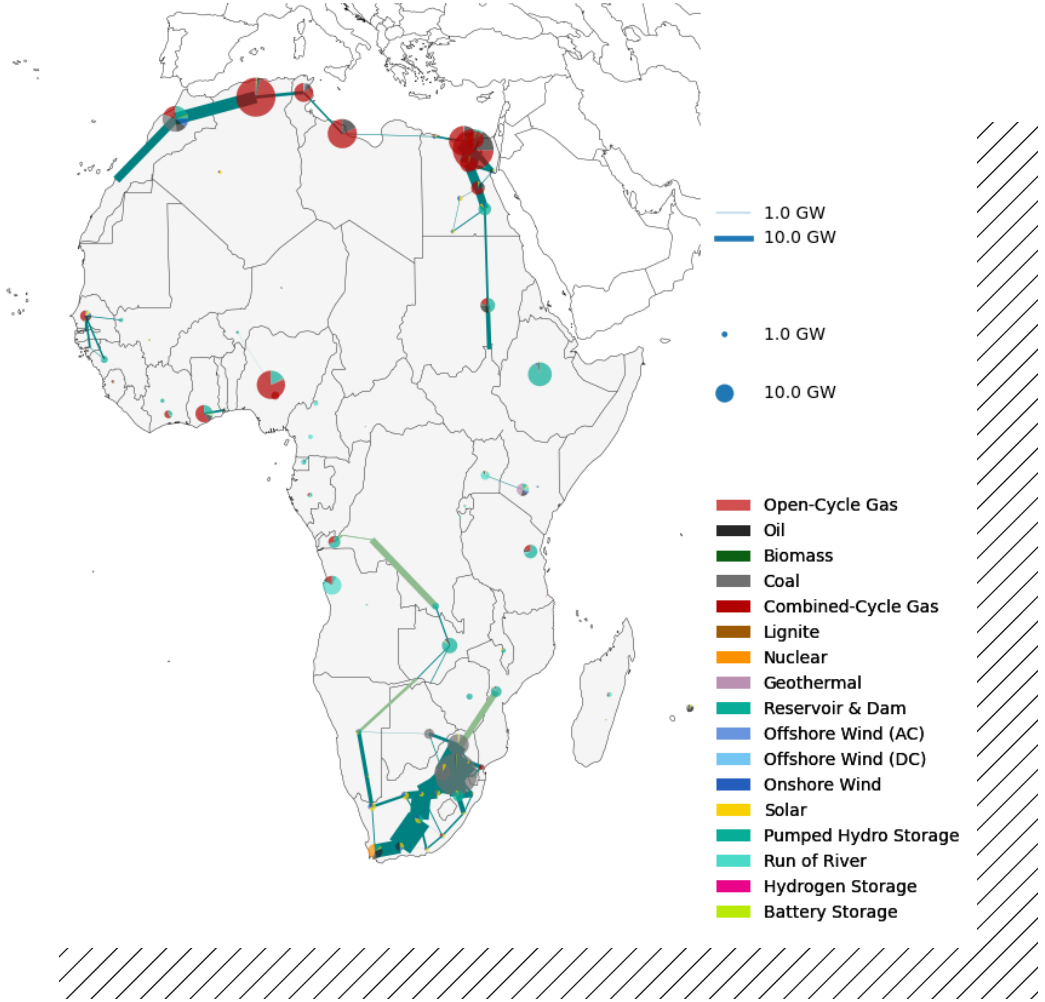
Keywords:
Macro-energy systems
Optimization
OpenStreetMap
PyPSA-Earth
PyPSA-Africa
PyPSA meets Earth

ABSTRACT

Macro-energy system modelling is used by decision-makers to steer the global energy transition towards an affordable, sustainable and reliable future. Closed-source models are the current standard for most policy and industry decisions. However, open models have proven to be competitive alternatives that promote science, robust technical analysis, collaboration and transparent policy decision-making. Yet, two issues slow the adoption: open models are often designed with particular geographic scope in mind, thus hindering synergies from collaborating, or are based on low spatially resolved data, limiting their use. Here we introduce PyPSA-Earth, an open-source global energy system model with data in high spatial and temporal resolution. It enables large-scale collaboration by providing a tool that can model the world's energy system or any subset of it. The model is suitable for operational as well as combined generation, storage and transmission expansion studies. In this study, the novel power system capabilities of PyPSA-Earth are highlighted and demonstrated. The model provides two main features: (1) customizable data extraction and preparation with global coverage and (2) a PyPSA energy modelling framework integration. The data includes electricity demand, generation

Check out PyPSA-Earth here:

Check out PyPSA-Earth-Sec here:



Quelle: Erstellt mit PyPSA-Earth und https://github.com/pypsa-meets-earth/documentation/blob/main/notebooks/viz/regional_transm_system_viz.ipynb

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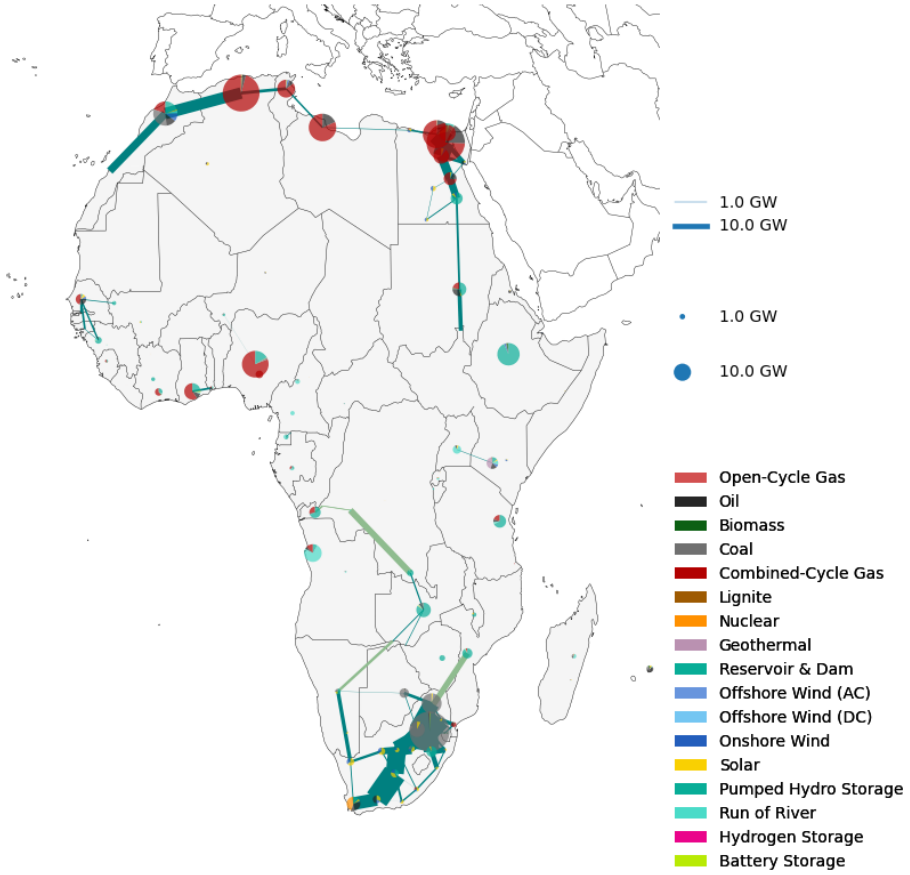
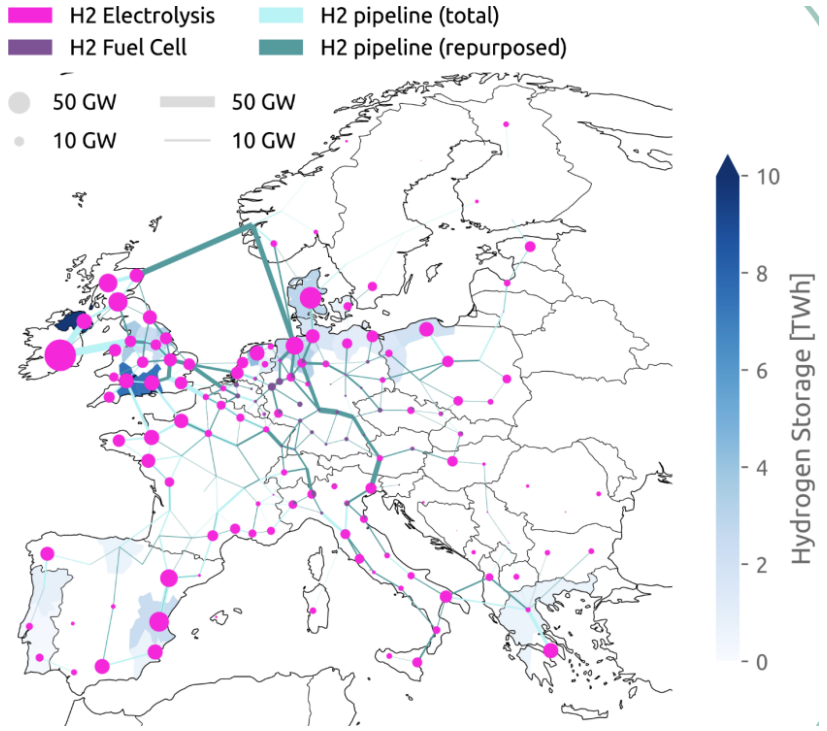
Weitere Möglichkeiten – Modellierung Afrika/Europa



Quelle: Erstellt mit PyPSA-Earth und https://github.com/pypsa-meets-earth/documentation/blob/main/notebooks/viz/regional_transm_system_viz.ipynb

Direkte Modellkopplung

Gemeinsame Optimierung ausgewählter Ländern



Quelle: Neumann, Fabian; Zeyen, Elisabeth; Victoria, Marta; Brown, Tom (2022): Benefits of a Hydrogen Network in Europe

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Following the Idea of Open Energy Modelling

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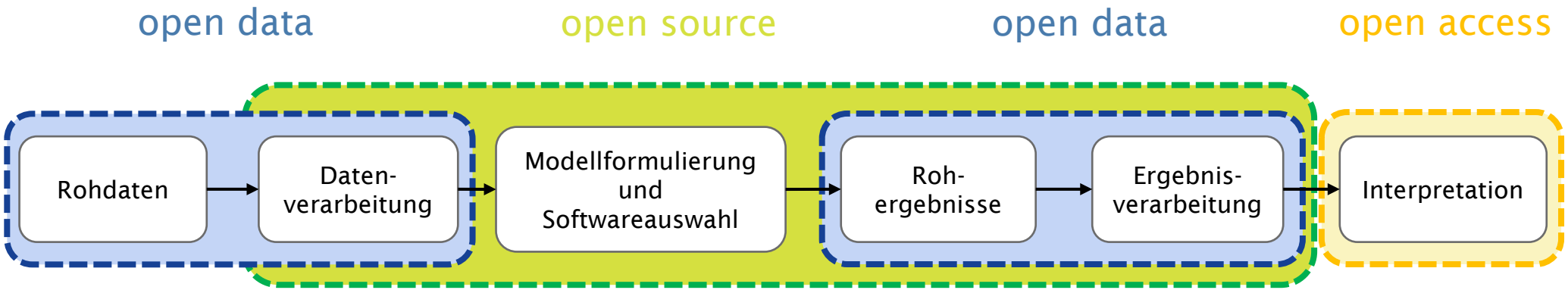
Die gesamte Kette von den Rohdaten bis zu den Modellierungsergebnissen sollte offen sein:



Offene Daten + freie Software → Transparenz + Reproduzierbarkeit

Quelle: Maximilian Parzen & Dr. Martha Frysztacki, 2023. Summary from Workshop: Stanford Training. Open Energy Transition.

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Ergebnisse

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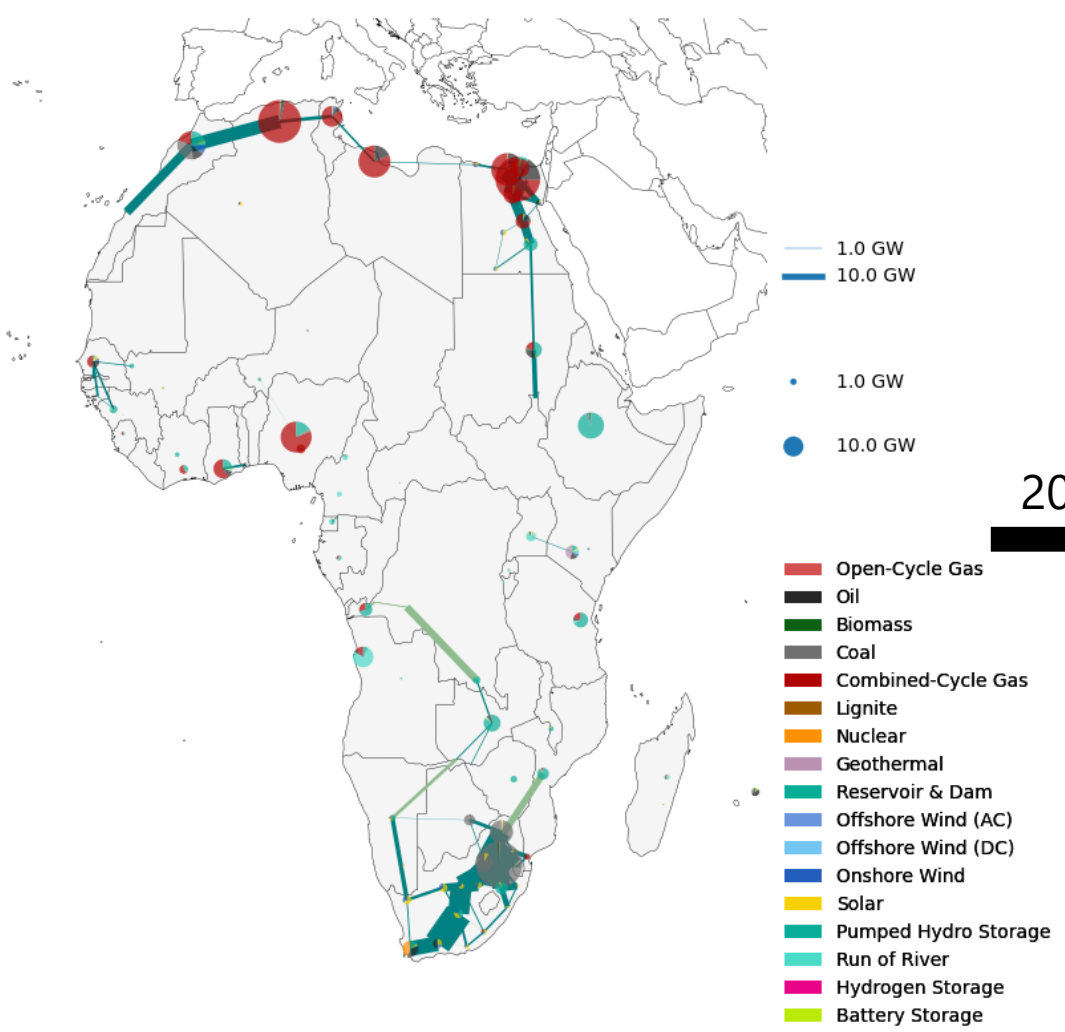
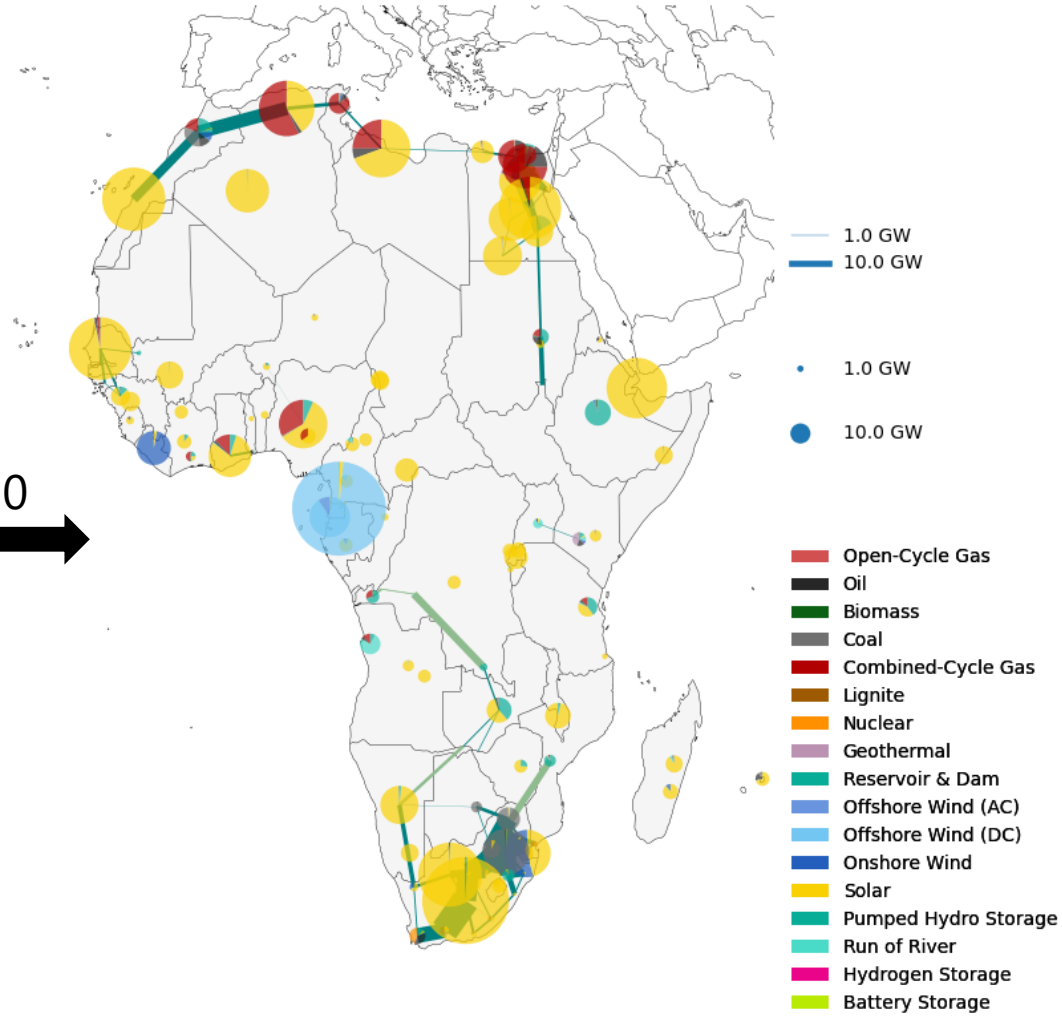


2030



Check out PyPSA-Earth here:

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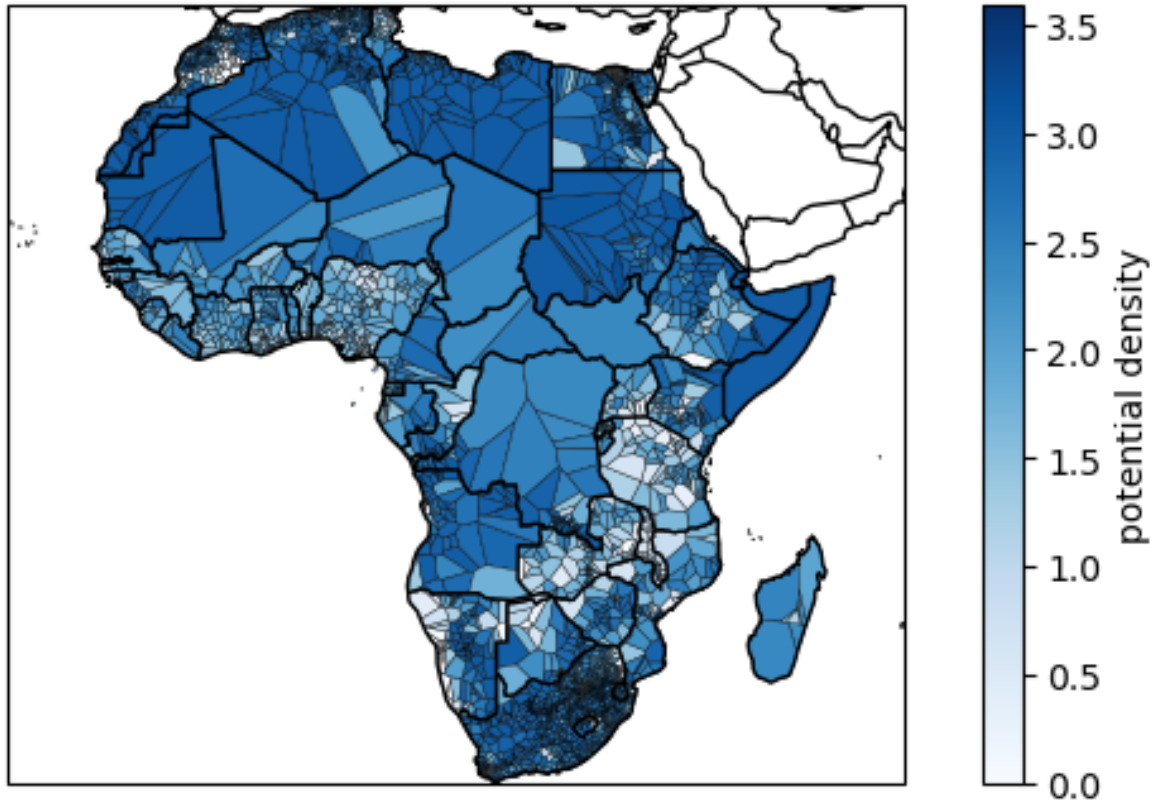
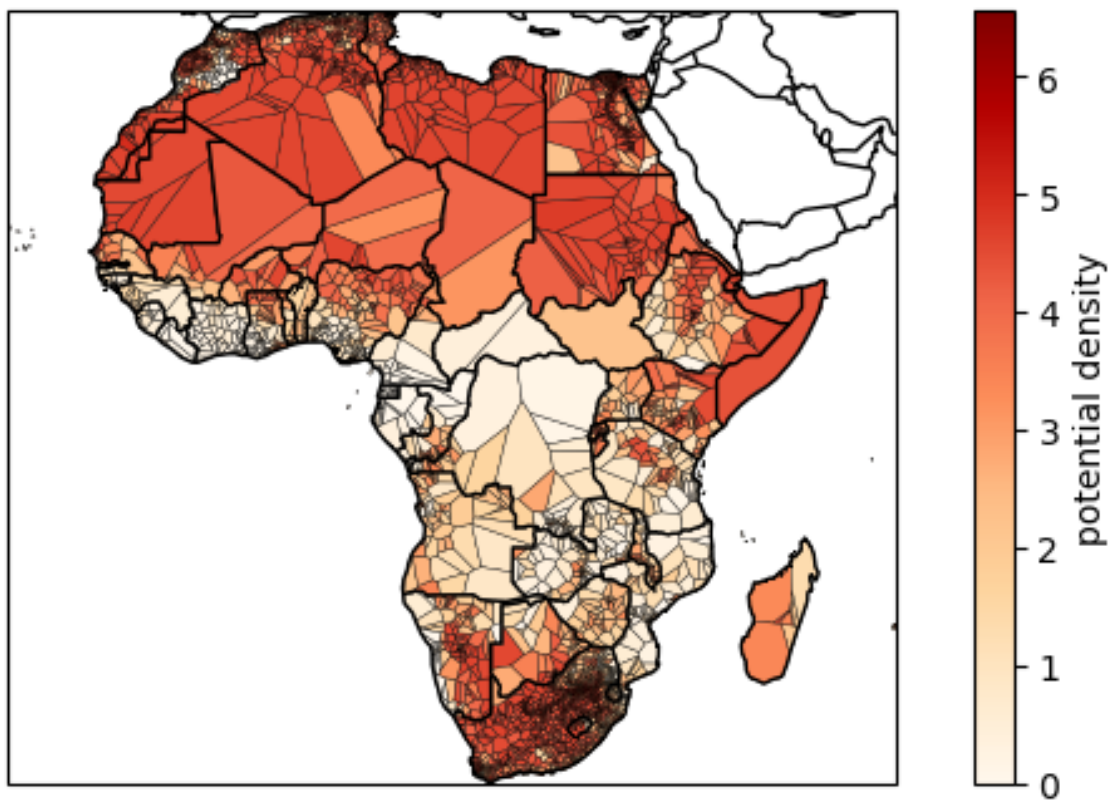
Onshore Wind Potential Density [MW/km2]



Solar Photovoltaic Potential Density [MW/km2]



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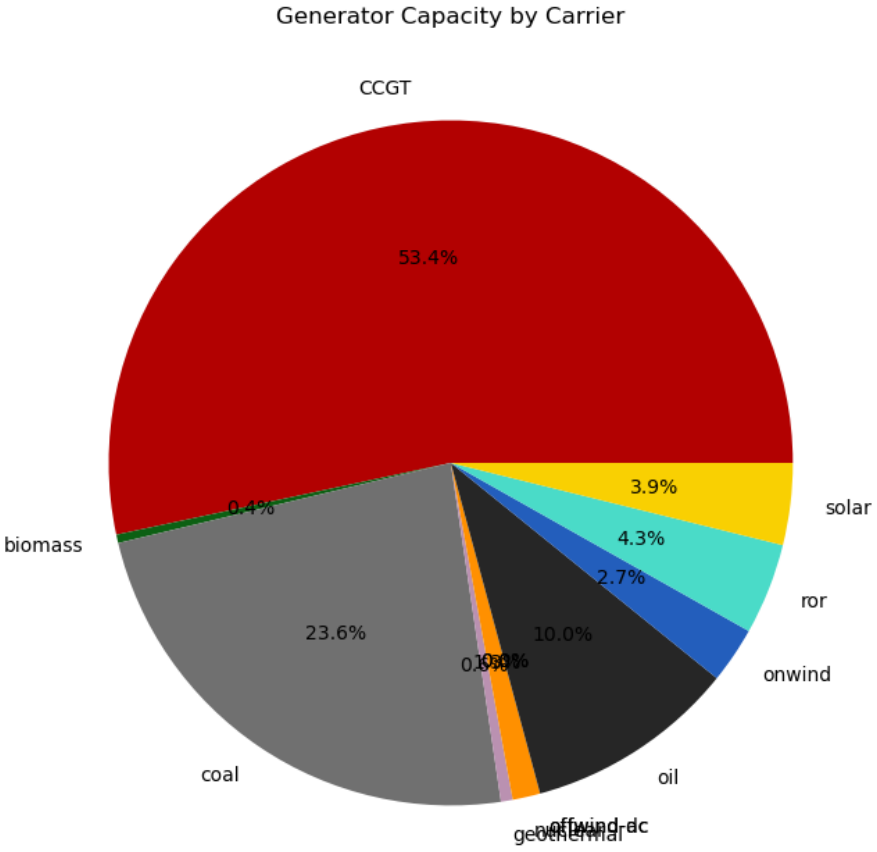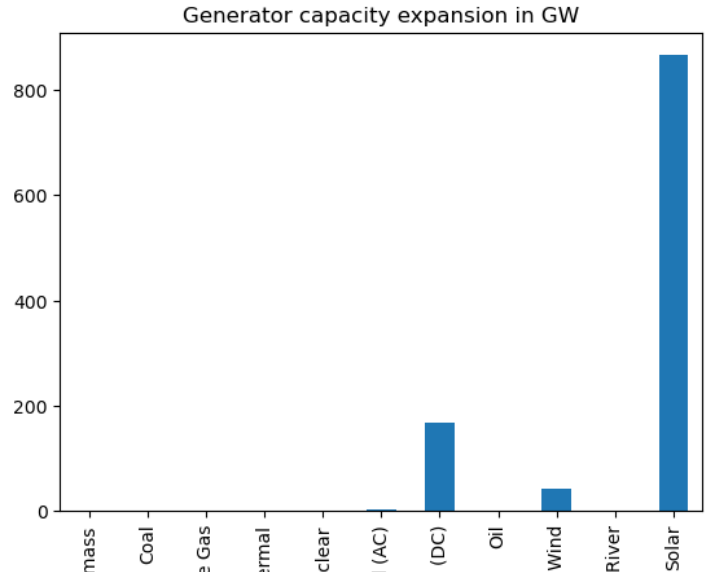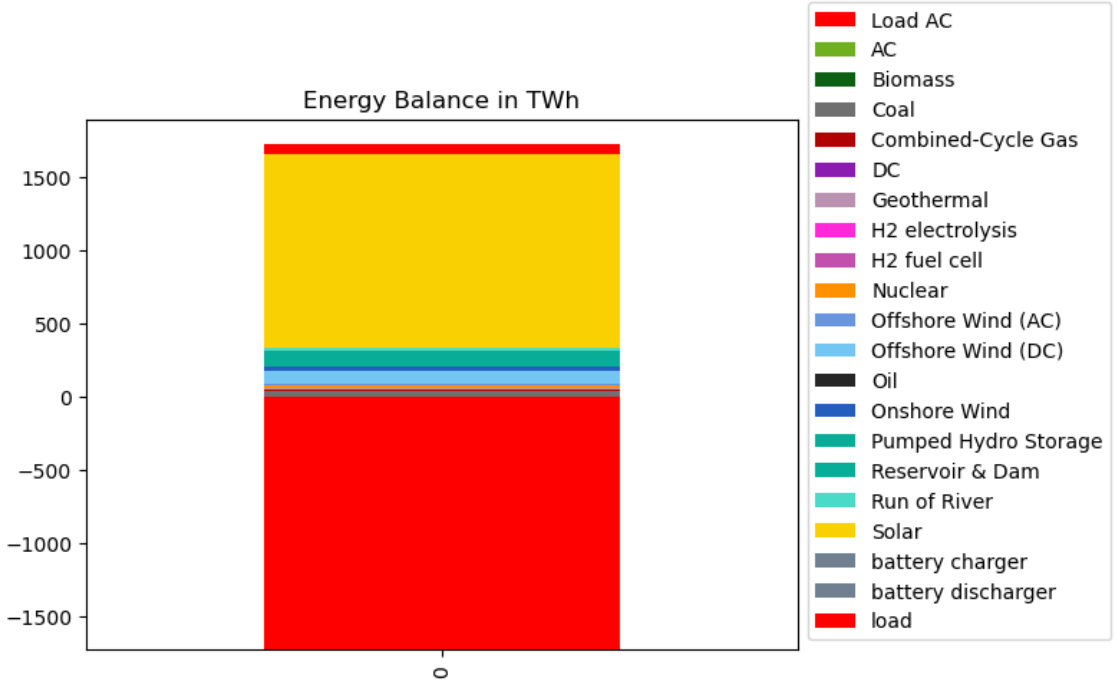
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