Evaluating The Present Energy Demand and Electricity Market in Mozambique: A Thorough Examination of The Energy System

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Abstract

Energy accessibility and reliability contribute to economic development and social welfare enhancement. Mozambique, situated in southern Africa, is currently undergoing a rapid increase in energy consumption and a significant reliance on imported oil products for electricity generation. This scenario underscores the imperative need for the country to transition towards sustainable energy solutions to ensure long-term economic stability and social progress.

Keywords: Energy Systems; Energy market; Optimization; Renewable Energy Sources;

Objectives

- Using the Long-range Energy Alternatives Planning (LEAP) system to analyze alternative scenarios for transitioning Mozambique's electricity generation to sustainable energy.
- Investigate the factors contributing to transitioning scenarios, such as insufficient infrastructure investment and limited access to finance.
- Explore the significance of renewable energy in Mozambique's energy portfolio, focusing on the potential for increased investment in this sector.

Renewable Energy Resources Options

Mozambique's energy sources include solar electricity, hydropower, and wind power.

Most of the installed capacity comes from hydropower, and some capacity is designated for export or self-consumption.

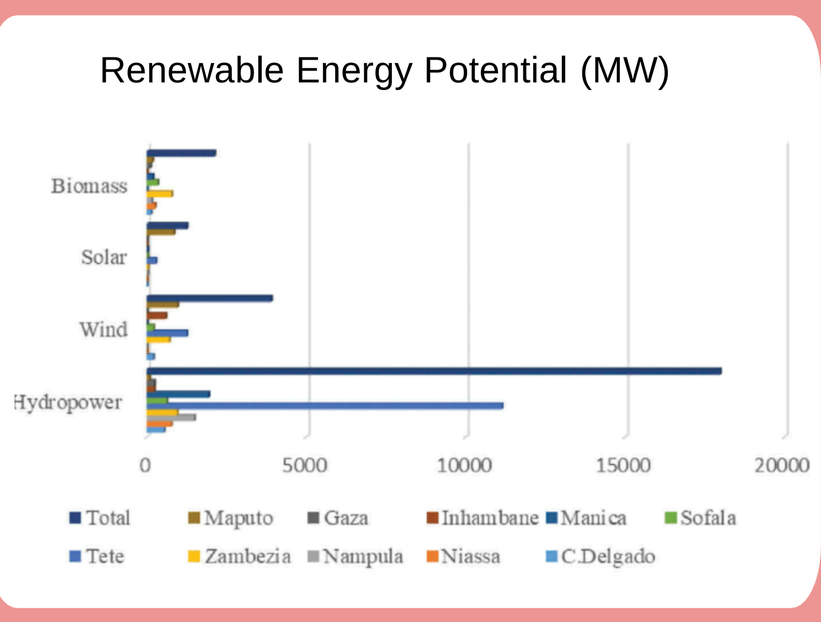


Figure 1. Renewable Energy Potential in Mozambique

Methodology

The study used the Long-range Energy Alternatives Planning (LEAP) system to model and analyze scenarios for transforming the existing electricity generation system [1]. It focused on converting the petroleum-fueled system to emphasizing renewable energy sources such as hydroelectric, wind, solar, biomass, biogas, and natural gas [2]. Three scenarios were evaluated to identify the most viable pathway toward sustainable energy generation.

- **Scenario 1:** Analyze the electric sector over the last 10 years and predict future trends without new energy policy measures or significant system changes;
- **Scenario 2:** Explore the conversion of the existing Electricity Generation Master Plan;
- **Scenario 3:** Provide the updated Sustainable Power Generation System;

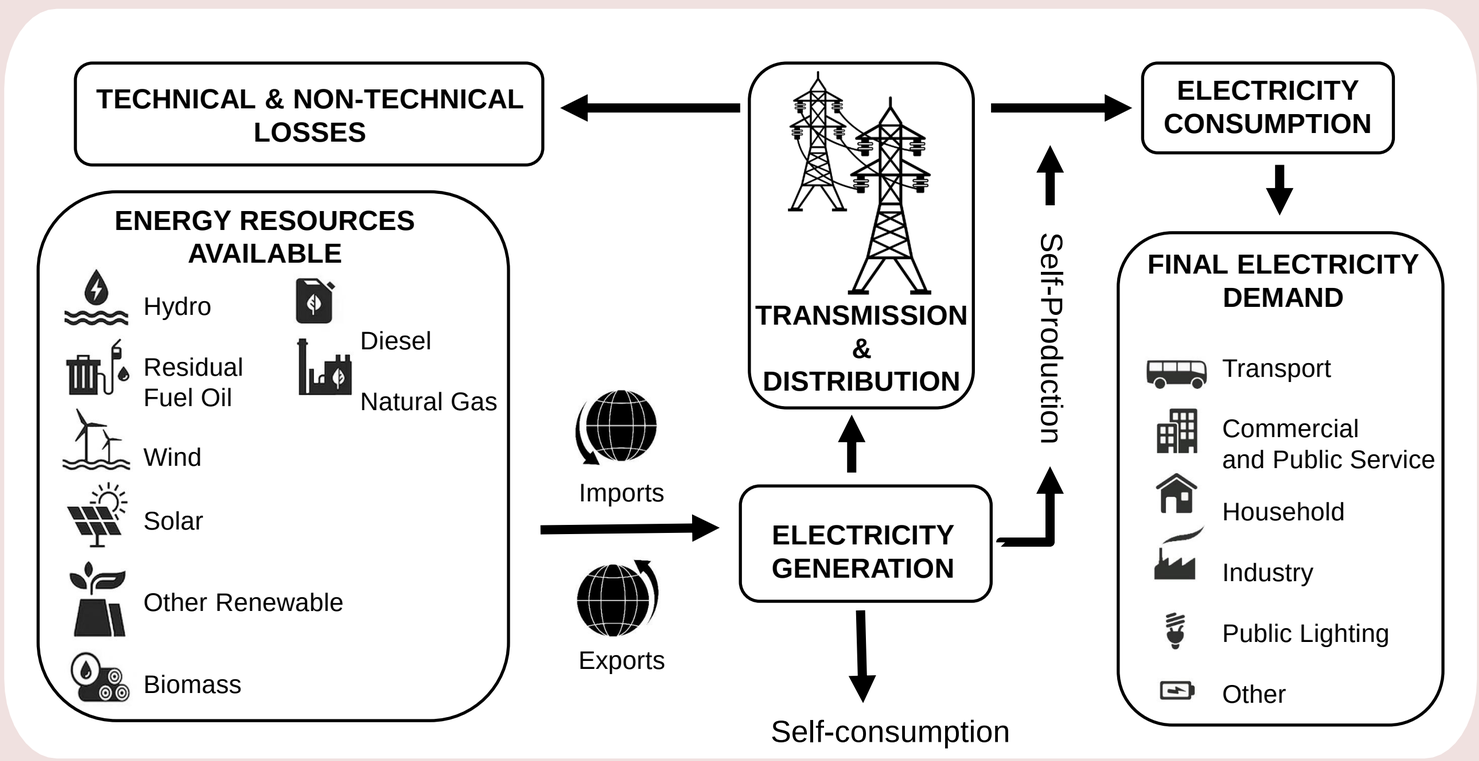


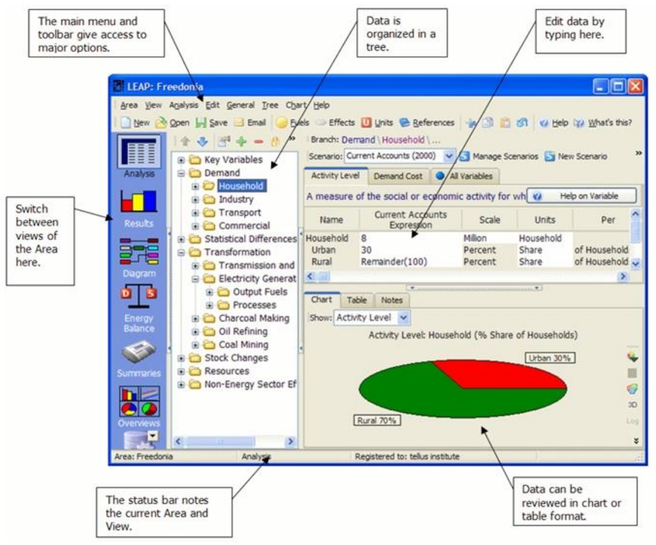
Figure 2. Electricity generation module framework for Mozambique in the Long-range Energy Alternatives Planning (LEAP) model.

Materials & Results

The LEAP software system analyzed the long-term forecast for electricity supply and demand using statistical data from 2017 as the baseline year.

$$EC_i = \sum AL_i(t) \times TE_i(t),$$

EC denotes the total energy consumption of sector i, defined by the activity level (AL) as a percentage of the sector's activity for year t, and the annual total final energy consumption (TE).



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Data availability statement

Data can be made available upon request to the corresponding author.

Conclusions

The LEAP system analysis of different scenarios offers valuable insights into transitioning Mozambique's electricity generation to sustainable energy. Using renewable energy sources and natural gas, Mozambique can achieve a more reliable, affordable, and environmentally friendly electric sector.

Future Research Guidelines

The research is focused on the Mozambique case. Still, the model could be applied to other countries with similar characteristics, particularly in their development conditions, natural resources, and economic resources.

References

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