

Research Proposal: Electricity Access in Africa

1. Introduction:

Access to electricity is vital for economic development and societal well-being. Nations with reliable electricity tend to exhibit higher productivity, an improved standard of living, and enhanced competitiveness in the global market. Electricity plays a crucial role across various sectors, including agriculture, education, and healthcare, ensuring their efficient operations. This research endeavours to analyze data from 1990 to 2021 to discern patterns and trends in electricity access across African countries. Leveraging regional and income data, alongside predictive modelling techniques, our goal is to offer insights that can guide policy decisions and interventions aimed at understanding electricity access in the region.

2. References and Ideas:

According to data analysis and projections from the International Energy Agency (IEA), approximately 110 million new connections are required annually starting in 2022. However, given the current pace observed in recent years, this target remains significantly off track (IEA, 2023). (<https://www.iea.org/reports/sdg7-data-and-projections>). The idea of this project is to analyze to track the trend of electricity access in Africa and attempt to develop predictive modelling of electricity access in Africa to identify significant statistical relationships and differences through the forecast and trends.

3. Problem Statement:

The problem that this study addresses revolves around the persistent challenge of low electricity access in various African countries.

If this issue remains unaddressed, it could have severe consequences, impacting millions of people and impeding socio-economic development in these countries. The lack of electricity access hinders progress towards achieving the United Nations' Sustainable Development Goals (SDGs) of promoting inclusive and sustainable economic growth.

To effectively tackle this challenge, robust forecasting techniques like the ARIMA model need to be utilized to project electricity access levels until 2030. This approach aligns with the recommendations of scholars like Ma et al. (2019), who advocate for extended-duration forecasting models to address the complexities of energy access planning in African countries.

4. Objectives:

- Analyze historical trends in electricity access across African countries relative to region and income.
- Identify similarities, differences, and patterns in electricity access among African countries.
- Develop predictive models to forecast future electricity access levels based on regional and income data.
- Provide valuable analysis to inform targeted interventions for understanding electricity access in Africa.

5. Methodology:

5.1 Datasets:

- The World Bank data on Access to electricity - <https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS>

5.2 Data Analysis and Modelling:

- Apply advanced data cleaning and preprocessing techniques to ensure data accuracy, and utilize statistical methods to identify correlations and trends associated with poor access rates to electricity.
- Conduct exploratory data analysis to identify electricity access patterns across African countries.
- Utilize clustering techniques to group countries with similar access profiles based on regional and income characteristics.
- Develop predictive models using machine learning algorithms to forecast future electricity access levels.

5.3 Intervention Assessment:

- Extend the analysis to assess the insightful patterns among African countries using crossed-key indicators.
- Apply Data Science Storytelling to narrate the statistical conclusions for interventions and recommendations.
- Generate comprehensive reports detailing the findings of the data analysis and predictive modelling.

5.4 Solution Deployment:

- Create an intuitive and user-friendly Streamlit web application for deploying the improved predictive model and intervention assessment tools.

6. Expected Outcomes:

- Provide insights into the variations and disparities in electricity access among African countries.
- Develop predictive models to forecast future electricity access levels using regional and income data.
- Conduct a comprehensive summative assessment of electricity access across the African continent spanning 1990 - 2021.

7. Conclusion:

This research seeks to provide valuable insights into electricity access patterns in African countries, leveraging regional and income data along with predictive modelling techniques. By understanding the indicators showing electricity access disparities and forecasting future trends, policymakers can develop targeted interventions to understand electricity access and drive socio-economic development across the continent.