

GLOBAL ENERGY CONSUMPTION: A COMPARATIVE AND PREDICTIVE ANALYSIS

AUTHORS

Medha Jani, John Thornton,
Sai Srujana Sri Vangapandu, Aishwarya Pandiyan

AFFILIATIONS

Department of Computer Science at
University of North Carolina at Charlotte

INTRODUCTION

Global energy consumption has increased dramatically over the past century, driven by industrialization, population growth, and technological dependence. Understanding how energy use differs across countries—and how it has evolved over time—is essential for addressing climate change, energy inequality, and resource planning.

This research explores long-term global energy patterns using international datasets to examine how energy use correlates with population growth and shifts in energy sources.

Our study is significant for the fields of sustainability analytics, energy policy, and global development.

OBJECTIVE

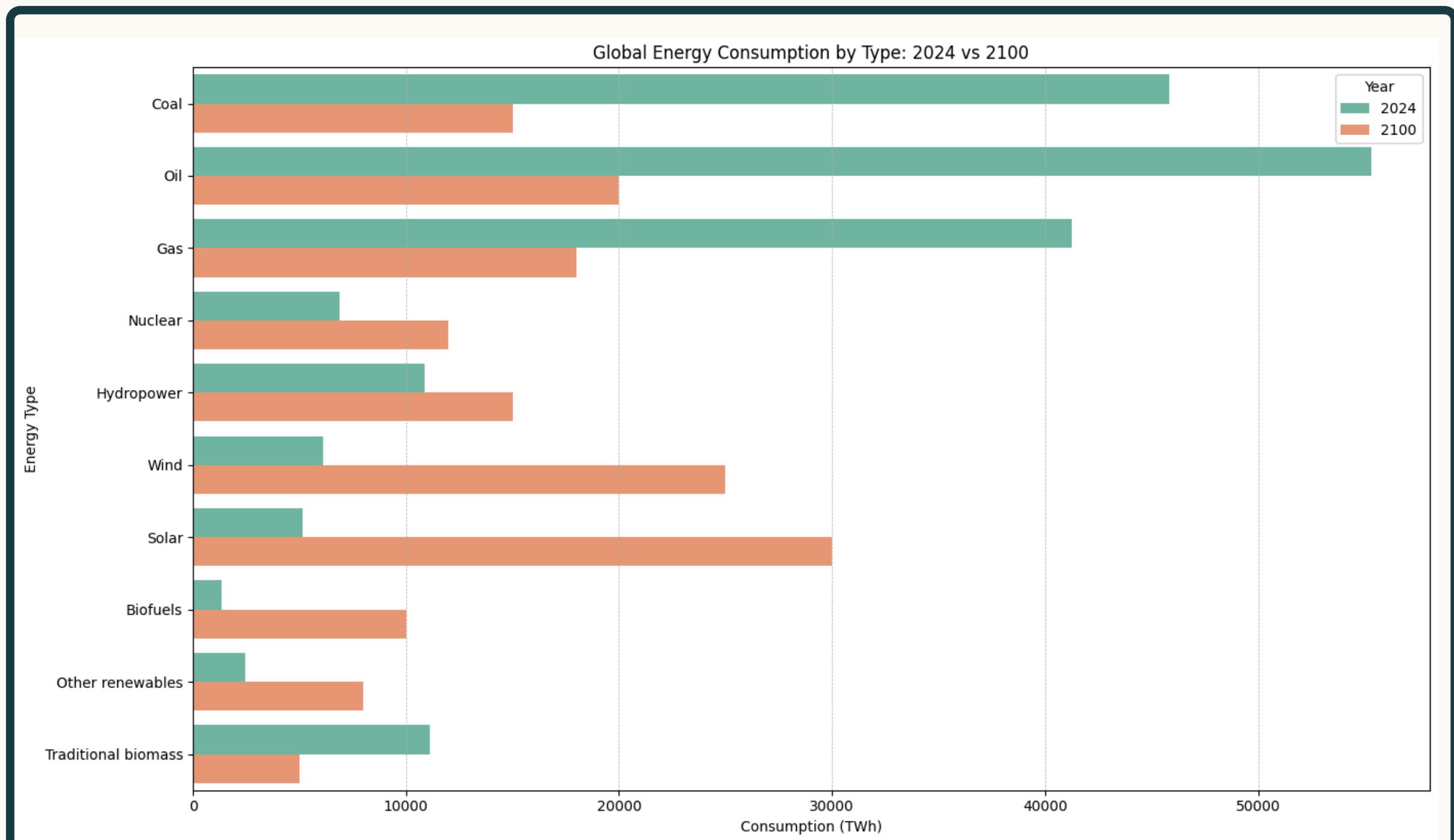
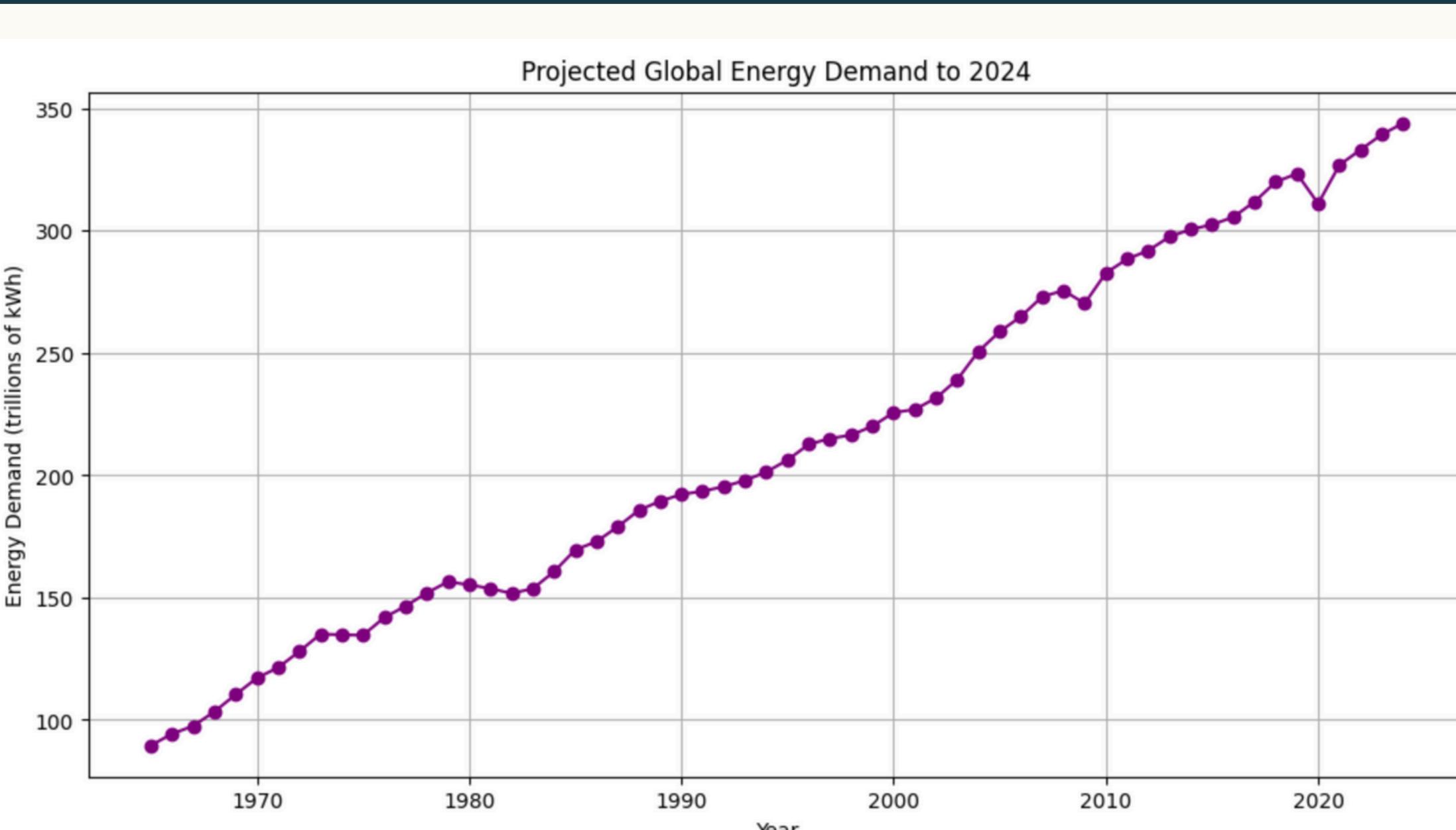
- Analyze global trends in per-capita energy consumption from 1964–2024.
- Compare energy use between developed and developing nations.
- Examine long-term shifts in global energy types (coal, oil, gas, solar, wind, nuclear, etc.).
- Evaluate continental growth rates and future projections through UN 2100 population estimates.

METHODOLOGY

We collected global energy consumption data from 1964–2024 and compared trends between developed and developing regions. The dataset was cleaned, standardized, and organized for analysis. Using statistical summaries and visualizations, we examined changes in per-capita use, fuel type shifts, and population energy relationships. Future projections were estimated by extending historical patterns alongside UN population forecasts.

RESULTS

- Global energy use shows a steady increase over time, rising sharply as population and technology demand grow.
- Fossil fuels (oil, coal, and natural gas) remain the dominant energy sources as of 2024.
- Renewable energy (solar, wind, hydropower) is growing rapidly but still represents a smaller share of total consumption.
- Projections for 2100 indicate a major global shift toward clean energy, especially solar and wind, driven by policy, economics, and environmental concerns.



CONCLUSION

- Global energy demand has quadrupled since the 1960s, surging sharply after 2000.
- Developed countries use 10–20× more energy per person than developing countries.
- Low-income nations show low per-capita use due to limited access, lower industrialization, and cost constraints.
- Long-term trends show that fossil fuels remain dominant, but renewables are growing faster than any other source. The world is shifting toward cleaner energy, yet the overall system is still led by oil, coal, and gas.
- Asia shows the strongest long-term growth in per-capita energy consumption, rising steadily from 1960 to 2024, indicating it will continue to be a major contributor to future global demand.
- Meeting 2100 demand requires large renewable energy investment in fast growing regions, especially Africa, to match rising needs without increasing global emissions.

QR Code

