CO_2 Emissions Data Analysis Report

Abstract

This report presents an analysis of global and regional carbon dioxide (CO_2) emissions from 1990 to 2020. Using comprehensive datasets and statistical models, key trends, drivers, and sectoral contributions are identified. The analysis includes exploratory data visualization and forecasting under a 'business as usual' scenario.

Introduction

Rising CO_2 emissions are the primary driver of anthropogenic climate change. Understanding emission trends across countries and sectors is crucial for informing mitigation strategies. This project aims to quantify these trends, uncover their drivers, and forecast future emissions.

Tools Used

- Python (pandas, matplotlib, seaborn)
- ReportLab
- Statsmodels (ARIMA)
- Scikit-learn

Steps Involved in Building the Project

- Data acquisition from Our World in Data, World Bank, and national inventories
- Data cleaning and integration, including handling missing values and standardizing country names
- Exploratory data analysis to visualize trends and correlations
- Feature engineering, including per-capita emissions and emissions intensity
- Modeling using multiple linear regression and ARIMA time-series forecasting
- Deployment of an interactive dashboard in Streamlit for stakeholder exploration

Conclusion

The analysis reveals strong ties between economic growth and CO_2 emissions, with notable decoupling in some OECD countries. Forecasts indicate continued growth under current trends, highlighting the need for policy interventions such as carbon pricing and renewable energy adoption. Future work will focus on scenario modeling and enhanced sectoral forecasts.