Project Proposal

World Energy Consumption

DS8003 | Mgt of Big Data and Tools

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1. Problem Definition

The world's energy dynamics have witnessed significant shifts over the past 50 years. With advancements in technology, emergence of new energy sources, and the increasing awareness about climate change, it has become imperative to understand and analyze these patterns.

In this project we will analyze energy production and consumption trends for different regions and countries over the past few decades, to understand the world's energy consumption.

- Where does the world's energy come from? Who consumes it the most?
- What trends do we see in energy consumption and how much dependency is there on the different sources of energy (e.g. coal, oil, gas etc.)?
- How is a country's energy consumption and growth related?
- Is there a correlation between renewable energy and non-renewable energy?
- Which countries have the highest percentage of renewable energy in their energy mix?

Use those trends and analysis to answer questions like -

- What will be the future demand of energy in the upcoming years?
- Are renewable energy sources catching up to the pace of the increasing energy demands?
- If not, what steps should be taken by each country / region to be less reliant on non-renewable energy?

2. Suggested solution

- Formulate a time-series forecasting model for predicting future energy demands of the world. Analyze whether the renewable energy sources are catching up to the pace of the increasing energy demands.

- Generate localized recommendations/targets for countries & regions to increase their renewable energy production to become increasingly sustainable and less dependent on fossil fuels.

- Suggesting an optimal mix of renewable energy sources to decarbonize electricity production as a priority, which is a key component of total energy production.

3. Dataset descriptions

We will be using a csv dataset sourced from Kaggle - World Energy Consumption. As mentioned by the author, the dataset was originally collected by Hannah Ritchie, Max Roser and Edouard Mathieu. It consists of 17432 rows and 122 features with information on the world's energy consumption on a country level as well as a region level.

These features consist of change and change percentage measured in production and consumption different energy sources(i.e. Coal, gas, oil, wind, nuclear etc.) over the years from 1920 till 2020. Dataset also captures crucial data of different countries such as gdp, population, consumption of sources per capita.

Few of the important features that will be used along with their description -

Feature	**Description**
country	Geographic location
year	Year of observation
iso_code	ISO 3166-1 alpha-3 three-letter country codes
population	Population
gdp	Total real gross domestic product, inflation-adjusted
biofuel_consumption	Primary energy consumption from biofuels, measured in terawatt-hours
biofuel_electricity	Electricity generation from biofuels, measured in terawatt-hours
carbon_intensity_elec	Carbon intensity of electricity production, measured in grams of carbon dioxide emitted per kilowatt-hour
coal_consumption	Primary energy consumption from coal, measured in terawatt-hours
coal_electricity	Electricity generation from coal, measured in terawatt-hours
coal_production	Coal production, measured in terawatt-hours
electricity_demand	Electricity demand, measured in terawatt-hours
electricity_generation	Electricity generation, measured in terawatt-hours
energy_per_gdp	Energy consumption per unit of GDP. This is measured in kilowatt-hours per 2011 international-$.
fossil_electricity	Electricity generation from fossil fuels, measured in terawatt-hours. This is the sum of electricity generation from coal, oil and gas.
fossil_fuel_consumption	Fossil fuel consumption, measured in terawatt-hours. This is the sum of primary energy from coal, oil and gas.
gas_consumption	Primary energy consumption from gas, measured in terawatt-hours
gas_electricity	Electricity generation from gas, measured in terawatt-hours

gas_production	Gas production, measured in terawatt-hours
greenhouse_gas_emissions	Greenhouse-gas emissions produced in the generation of electricity, measured in million tonnes of CO2 equivalent
hydro_consumption	Primary energy consumption from hydropower, measured in terawatt-hours
hydro_electricity	Electricity generation from hydropower, measured in terawatt-hours
low_carbon_consumption	Primary energy consumption from low-carbon sources, measured in terawatt-hours
low_carbon_electricity	Electricity generation from low-carbon sources, measured in terawatt-hours. This is the sum of electricity generation from renewables and nuclear power
net_elec_imports	Net electricity imports, measured in terawatt-hours
nuclear_consumption	Primary energy consumption from nuclear power, measured in terawatt-hours
nuclear_electricity	Electricity generation from nuclear power, measured in terawatt-hours
oil_consumption	Primary energy consumption from oil, measured in terawatt-hours
oil_electricity	Electricity generation from oil, measured in terawatt-hours
oil_production	Oil production, measured in terawatt-hours
other_renewable_consumption	Primary energy consumption from other renewables, measured in terawatt-hours
other_renewable_electricity	Electricity generation from other renewable sources including biofuels, measured in terawatt-hours
other_renewable_exc_biofuel_electricity	Electricity generation from other renewable sources excluding biofuels, measured in terawatt-hours
primary_energy_consumption	Primary energy consumption, measured in terawatt-hours
renewables_consumption	Primary energy consumption from renewables, measured in terawatt-hours
renewables_electricity	Electricity generation from renewables, measured in terawatt-hours
solar_consumption	Primary energy consumption from solar, measured in terawatt-hours
solar_electricity	Electricity generation from solar, measured in terawatt-hours
wind_consumption	Primary energy consumption from wind, measured in terawatt-hours
wind_electricity	Electricity generation from wind, measured in terawatt-hours

4. References

1. https://en.wikipedia.org/wiki/Renewable_energy
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3. https://www.kaggle.com/datasets/pralabhpoudel/world-energy-consumption/data
4. https://www.proquest.com/scholarly-journals/causality-relationship-between-economic-growth/docview/2256123472/se-2