Group 13

Balancing the Equation: Exploring Energy Production and Consumption Dynamics

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Introduction

This is an analytical project that delves into the intricate balance between energy production and consumption across the globe. Through examining data from 1990 to 2022, this initiative seeks to shed light on the trends and disparities in energy dynamics, highlighting the contrast between countries with surplus production and those facing consumption challenges. By assessing regional patterns and individual country profiles, the project aims to understand the evolution of the energy landscape, the role of renewable sources, and the impact of economic and policy shifts on energy sufficiency and sustainability.

Problem Statement

The aim of this project is to address the following issues :

1. How does the energy consumption in the United States compare to that in China?
2. What is the difference in energy production versus consumption in Russia?
3. What trends can be observed in the region-wise energy consumption over the years?
4. Which region has shown the most significant increase in energy consumption over the last decade?
5. What countries show rising behavior in consumption trends?
6. Why is Europe showing a decline in consumption 2019 to 2022?
7. Why does Japan show a negative from 2007 to 2021 in country wise consumption ?

Data Description

The project's dataset encompasses a historical series from 1990 to 2022, detailing global energy production and consumption metrics including country-specific data illustrating the differences between energy output and usage, renewable energy adoption rates, and CO2 emissions. Regional trends reveal Asia's rising energy demands, contrasted by Europe's declining consumption, reflecting broader economic, demographic, and policy influences on the energy sector.It harnesses datasets sourced from Enerdata's Yearbook, offering insights into global energy production and consumption. These datasets provide comprehensive statistics, detailing various aspects of energy consumption across various regions.

Links:

World Energy Primary Production

Total Energy Annual Data - U.S. Energy Information Administration (EIA)

Renewables in Electricity Production | Statistics Map by Region | Enerdata
United States Renewable Energy - dataset by doe | data.world
Wind & Solar Share in Electricity Production Data | Enerdata

Methodology:

1. **Data Compilation and Structuring:** Extracted data from the source was organized into multiple tables within an Excel format, segmenting information on energy production and consumption. Tables were interlinked and pivoted based on years and countries to see over the year trends in various regions.
2. **Derived Metrics and Relationships:** Calculated fields were generated to quantify the differences between energy consumption and production. These metrics were used to create relationships across regions and countries, focusing particularly on major nations like India, China, and the USA.
3. **Visualization of Insights:**The methodology aimed to visually present trends and anomalies in energy dynamics. Visualization techniques were employed to highlight discrepancies and patterns, emphasizing key insights within regions and countries of interest.

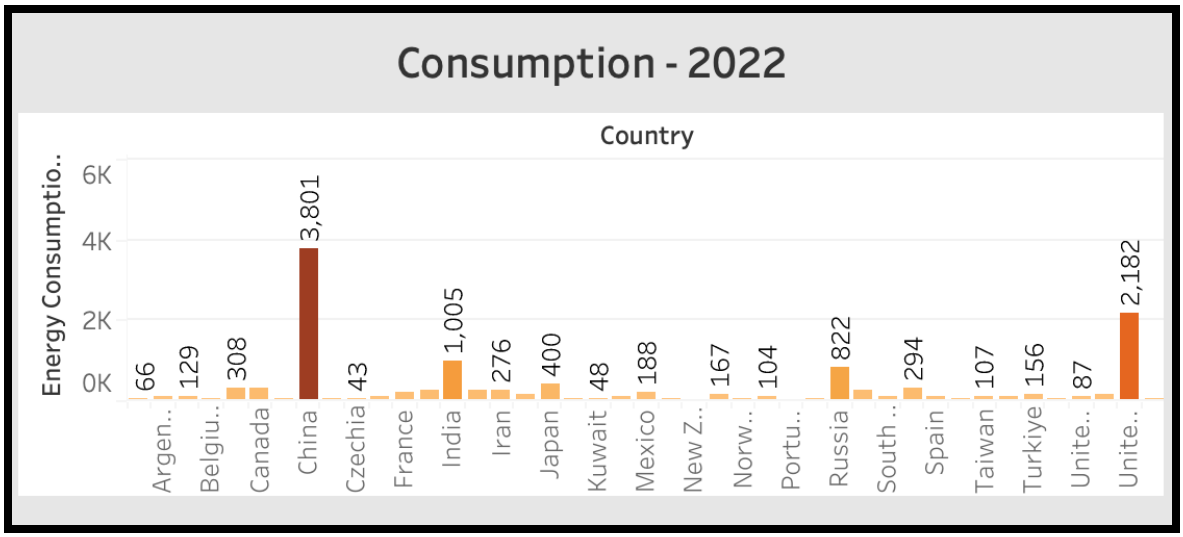
Design Process:

Our design begins with a world map illustrating energy production and consumption disparities from 1990 to 2022. Red countries lack energy, green overproduce, and gray balance both. Bar graphs depict production, consumption, and CO2 emissions. Our interactive interface lets users filter data for insights.
The second dashboard categorizes nations by regions, aiding region-specific consumption trend analysis. We highlight % reductions in electricity consumption between 2021-2022 and average reductions from 2000-2022. Red highlights reductions, green indicates increases, offering a clear view of regional consumption

Key Insights

1. How does the energy consumption in the United States compare to that in China?

For the year 2022 China's energy consumption appears to be the highest among all listed countries, with a value visually estimated to be just over 3801 Mtoe(Million tons of oil equivalent) and for the US, it's 2,382 Mtoe indicating that China's consumption is higher than that of the US.

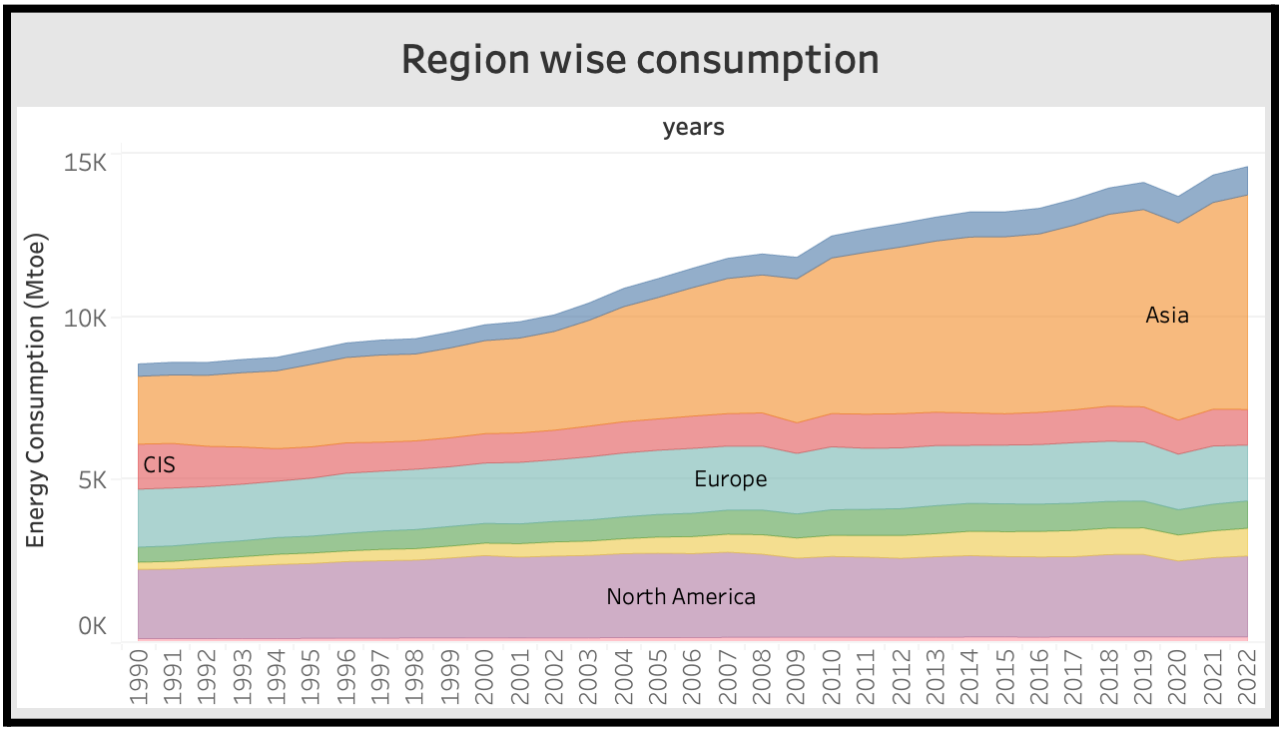


2. What is the difference in energy production versus consumption in Russia?

The bar for energy production is green and indicates that Russia produced 1,455.3 Mtoe of energy and the bar for energy consumption is orange and indicates that Russia consumed 822.3 Mtoe of energy. Hence, the difference between energy production versus consumption comes out as : (1455.3 - 822.3)Mtoe = 633 Mtoe.

3. What trends can be observed in the region-wise energy consumption over the years

The area chart shows a continuous increase in energy consumption for Asia over the years, while other regions also show growth but not as pronounced.
Europe has shown gradual decrease in the consumption after 2021 due to various factors like COVID and the Russia-Ukraine war.



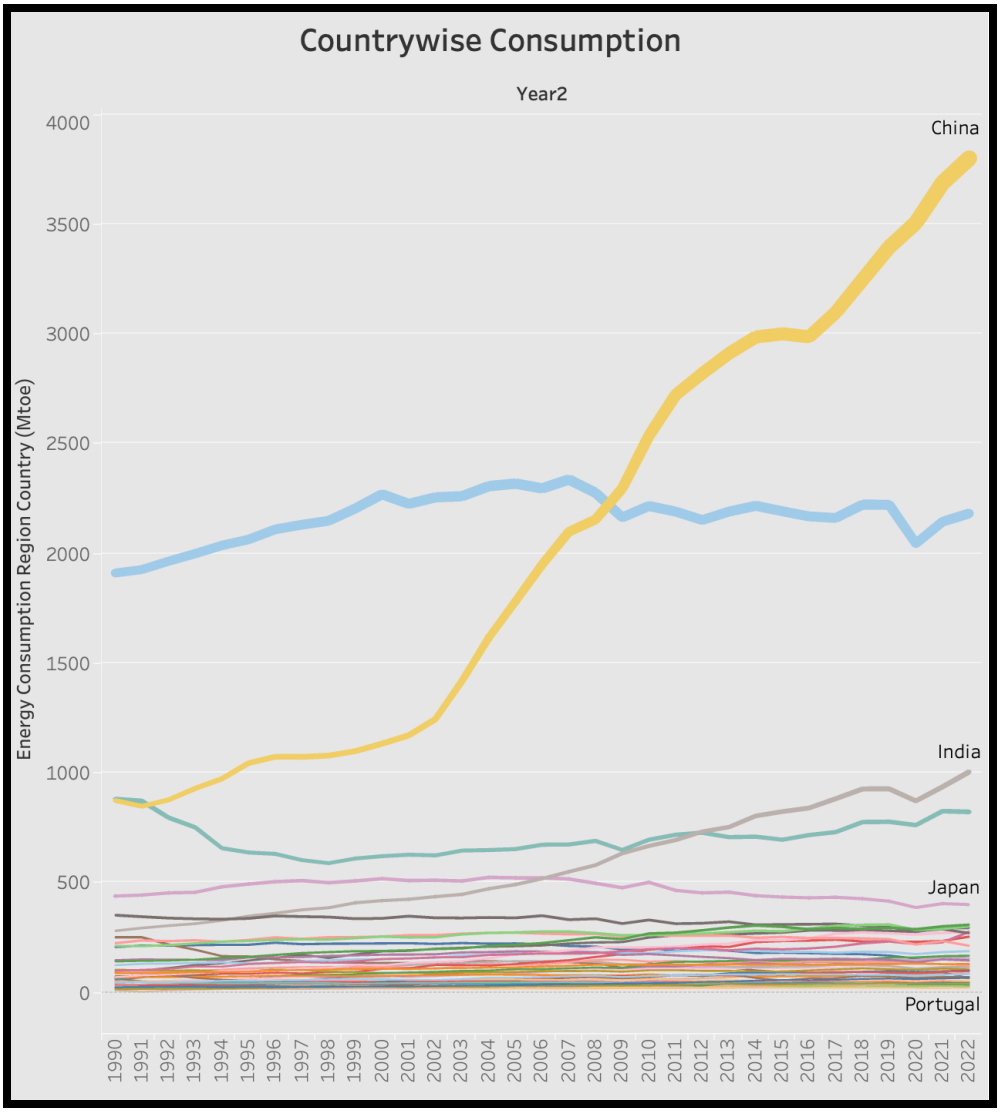
4. Which region has shown the most significant increase in energy consumption over the last decade?

Over the last decade, Asia has seen the steepest rise in energy consumption among all regions, as depicted by the area and line graphs indicating a substantial and consistent growth rate.(Refer Q3 Chart)

5. What countries show rising behavior in consumption trends?

China: The data for China shows a pronounced increase in energy consumption across the years, with figures significantly rising from 881 Mtoe (Million tons of oil equivalent) in the first column to 2,506 Mtoe in the last column.

India: There is a consistent upward trend for India as well, starting from 255 Mtoe and increasing to 527 Mtoe.



6. Why is Europe showing a decline in consumption 2019 to 2022?

The "Region wise consumption" area chart shows that in Europe, there is a decline in energy consumption in recent years, particularly from 2019 to 2022, the reasons being :

Increased Energy Efficiency: European countries have been focusing on energy efficiency, which reduces overall energy consumption.

Transition to Renewables: Europe has been actively transitioning to renewable energy sources, which might affect the consumption statistics, especially if energy efficiency and conservation measures are also in place.

Technological Advancements: Adoption of more energy-efficient technologies in homes, industry, and transportation. (Refer Q3 Chart)

7. Why does japan show a negative from 2007 to 2021 in country wise consumption

Japan's declining energy consumption is due to economic shifts towards less energy-intensive industries, a decreasing and aging population, and a post-Fukushima move from nuclear to increased renewables and energy efficiency measures. (Refer Q5 Chart)