

Final Project Report Template

1. Introduction

1.1. Project overviews :-

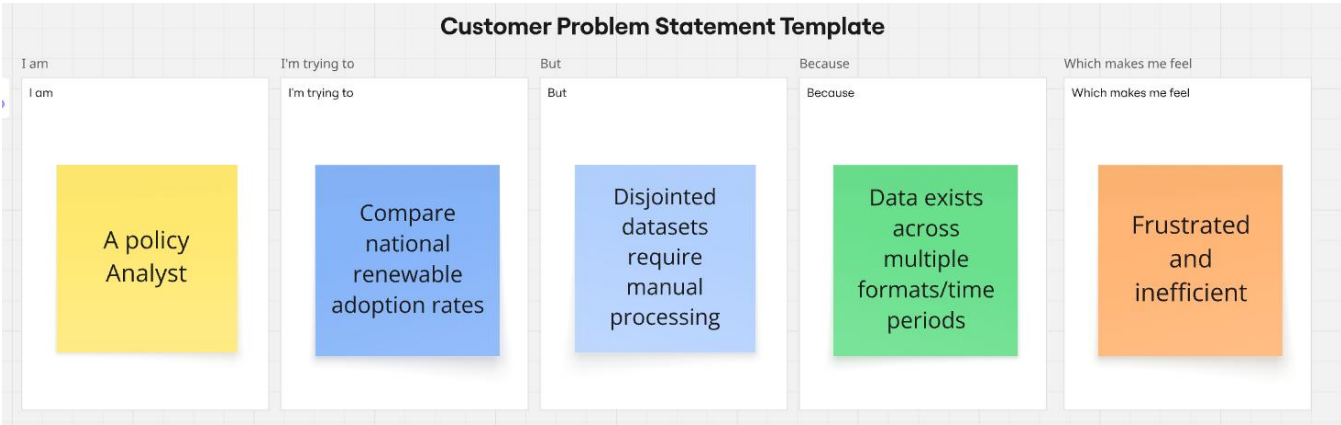
This project analyzes global energy trends, focusing on production, consumption, and sustainability metrics across different regions and time periods. The goal is to identify patterns, shifts, and opportunities in the energy sector.

1.2. Objectives

- Analyze historical and current energy production and consumption data.
- Identify key trends in renewable vs. non-renewable energy sources.
- Visualize regional disparities and growth in energy usage.
- Provide actionable insights for policymakers and industry stakeholders.

2. Project Initialization and Planning Phase

2.1. Define Problem Statement

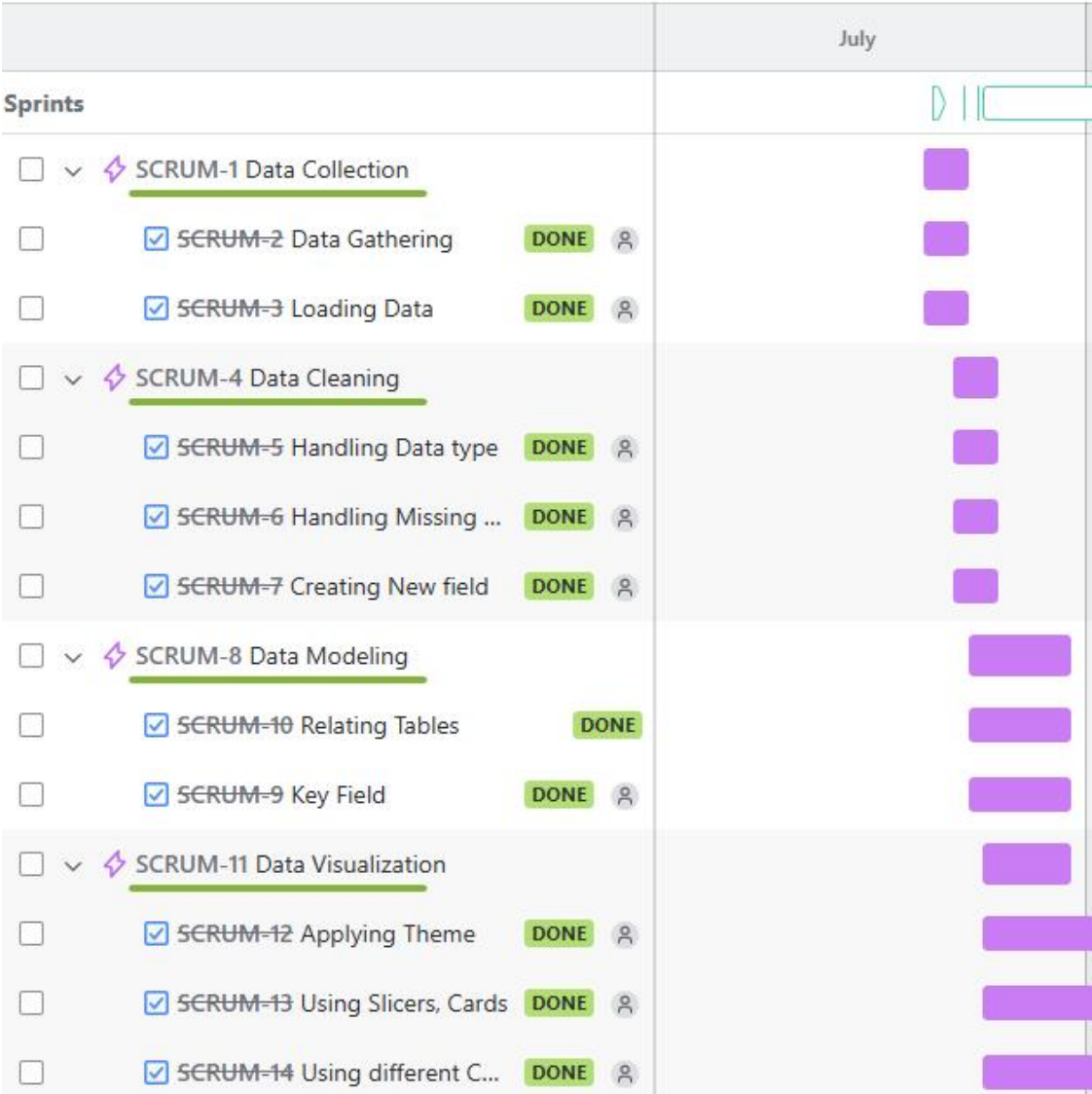


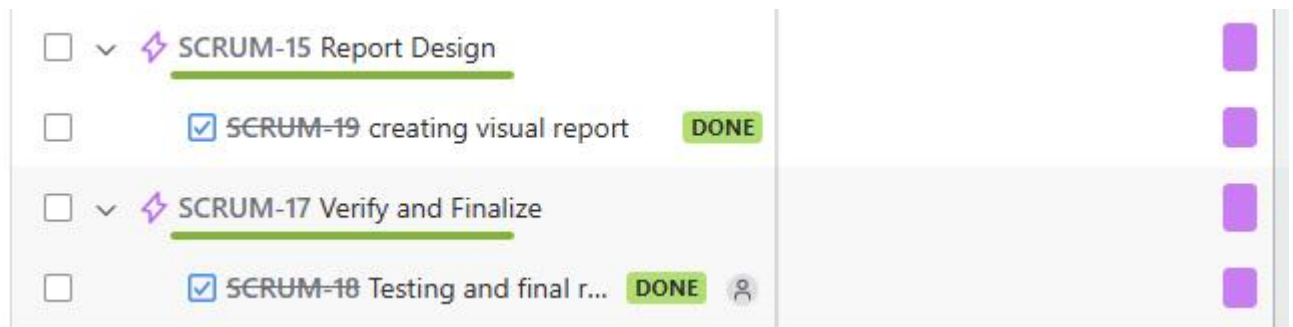
Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	A policy Analyst	Compare national renewable adoption rates	Disjointed datasets require manual processing	Data exists across multiple formats/time periods	Frustrated and inefficient

2.2. Project Proposal (Proposed Solution)

Proposed Solution	
Approach	1. Data Integration: Merge all datasets into unified star schema 2. Time Intelligence: Implement DAX measures for YoY analysis 3. Visual Storytelling: Develop interactive dashboard and report pages
Key Features	<ul style="list-style-type: none">• Animated consumption timelines• Country bench-marking matrix• Emission calculator (TWh→CO2)• Renewable adoption scorecards• Mobile-responsive design

2.3. Initial Project Planning





3. Data Collection and Preprocessing Phase

3.1. Data Collection Plan and Raw Data Sources Identified

Data Collection Plan	Data will be Collected from Smart Bridge and apart from that we are using datasets from kaggle
Raw Data Sources Identified	https://www.kaggle.com/datasets/jamesvandenbergh/renewable-power-generation

3.2. Data Quality Report

Data Source	Data Quality Issue	Severity	Resolution Plan
Smart Bridge	The dataset showed missing values, inconsistent dates, duplicate regions, blank source types, unit mismatches, and outliers	Moderate	These were fixed through interpolation, format standardization, duplicate removal, value replacement, unit conversion, and outlier validation.
Kaggle Datasets	Missing data entries in training set; inconsistent data types (e.g., string instead of integer).	Moderate	Use Power Query to impute missing values with averages/medians; add data type transformation steps in Power Query Editor

3.3. Data Exploration and Preprocessing

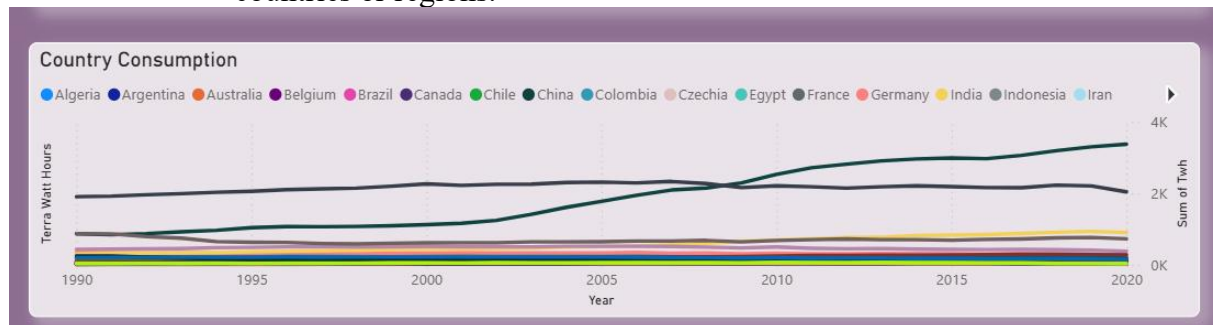
Section	Description
Data Overview	<i>"Six datasets of global energy trends and covering Continent and country-level energy consumption, production, and renewable and non-renewable , 45+ countries (1990–2020) 5 energy sources (Hydro,Solar,Wind,Biofuel,Geothermal) Key Metrics: Consumption (TWh), These are brief overview of datasets which underpin our analysis of global energy patterns and transitions to renewable in Power BI."</i>
Data Cleaning	<i>Reviewed datasets for missing values and removed rows with nulls. Eliminated duplicate entries. Corrected rounding issues in consumption figures. Ensured key columns ("Year", "Index") remained unchanged for modeling and relational integrity.</i>
Data Transformation	<i>Performed "Unpivot Columns" in Power Query to transform wide data (continents/groups as columns) into long format. Renamed columns for clarity ("Continent", "TWH"), duplicated queries to preserve raw data, and maintained key columns (Year, Index) for relationships. Transformation prepares data for flexible analysis and visualization in Power BI.</i>
Data Type Conversion	Converted date fields to proper date format and numeric fields to appropriate decimal/integer types.
Column Splitting and Merging	<i>In both Country_Consumption and Country_Generation datasets, all columns (except Index and Year) were merged to create a single Combined Metrics column for streamlined analysis. This helped simplify the structure while retaining key identifiers for filtering and comparison.</i>
Data Modeling	Created a new column named Index in each datasets to serve as a unique identifier. Established relationships between multiple datasets (e.g., consumption, generation, renewable trends) using the Index field in Power BI's model view. This enabled accurate joining and filtering across tables for unified analysis.
Save Processed Data	Cleaned and transformed data stored in Power BI data model (.pbix) for use in dashboard creation and future updates.

4. Data Visualization

4.1. Framing Business Questions

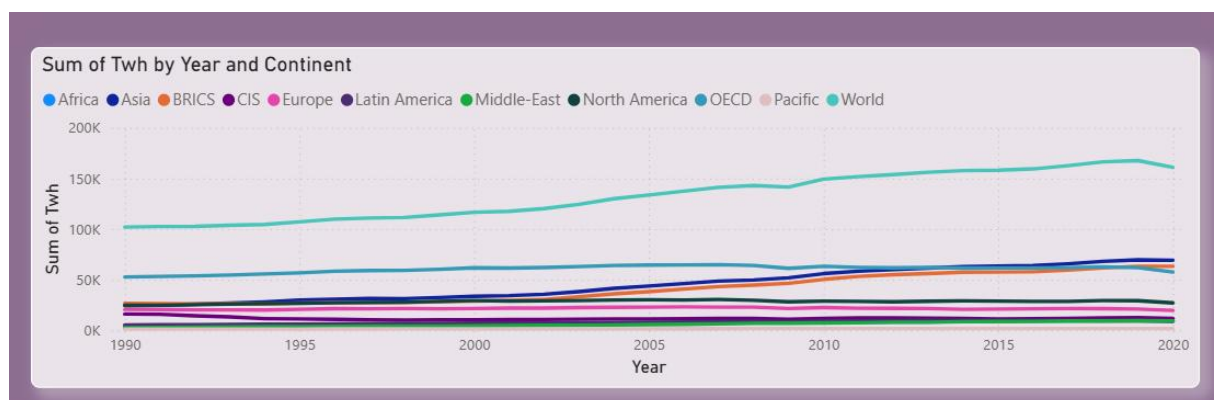
Q1. How has global energy Country consumption (1990–2020)?

Visualization: line chart comparing renewable consumption growth across countries or regions.



Q2. How has global energy Continent consumption (1990–2020)?

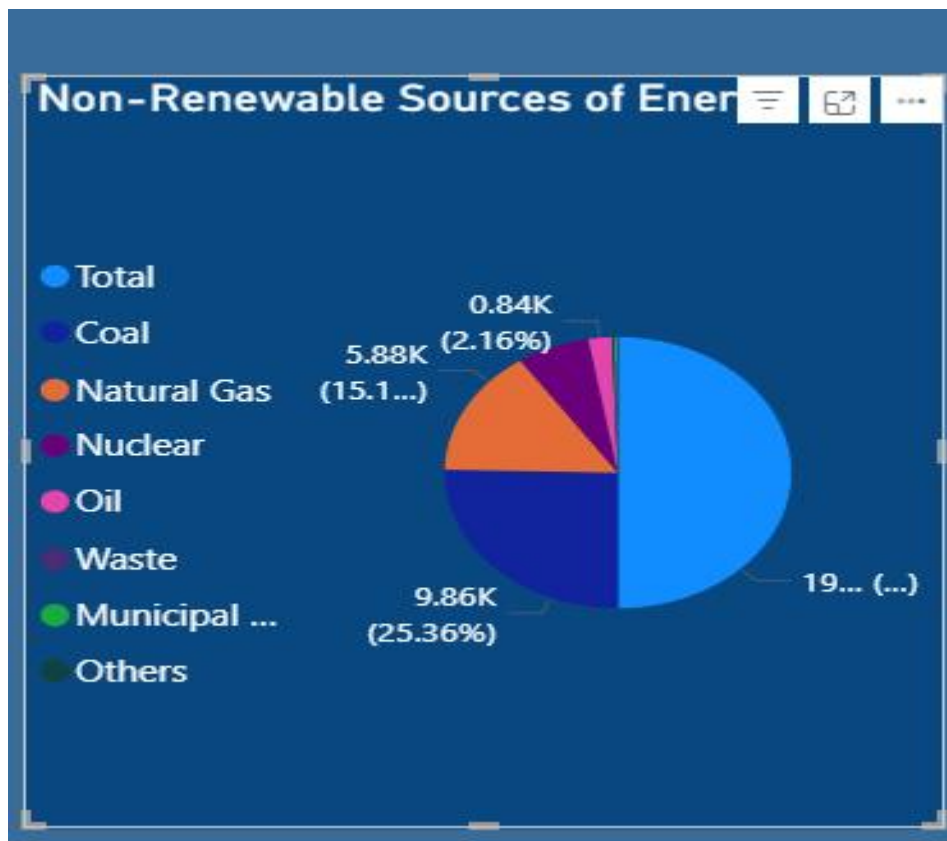
Visualization: line chart comparing renewable consumption growth across countries or regions.



Q3 : What is the composition of global non-renewable energy sources?

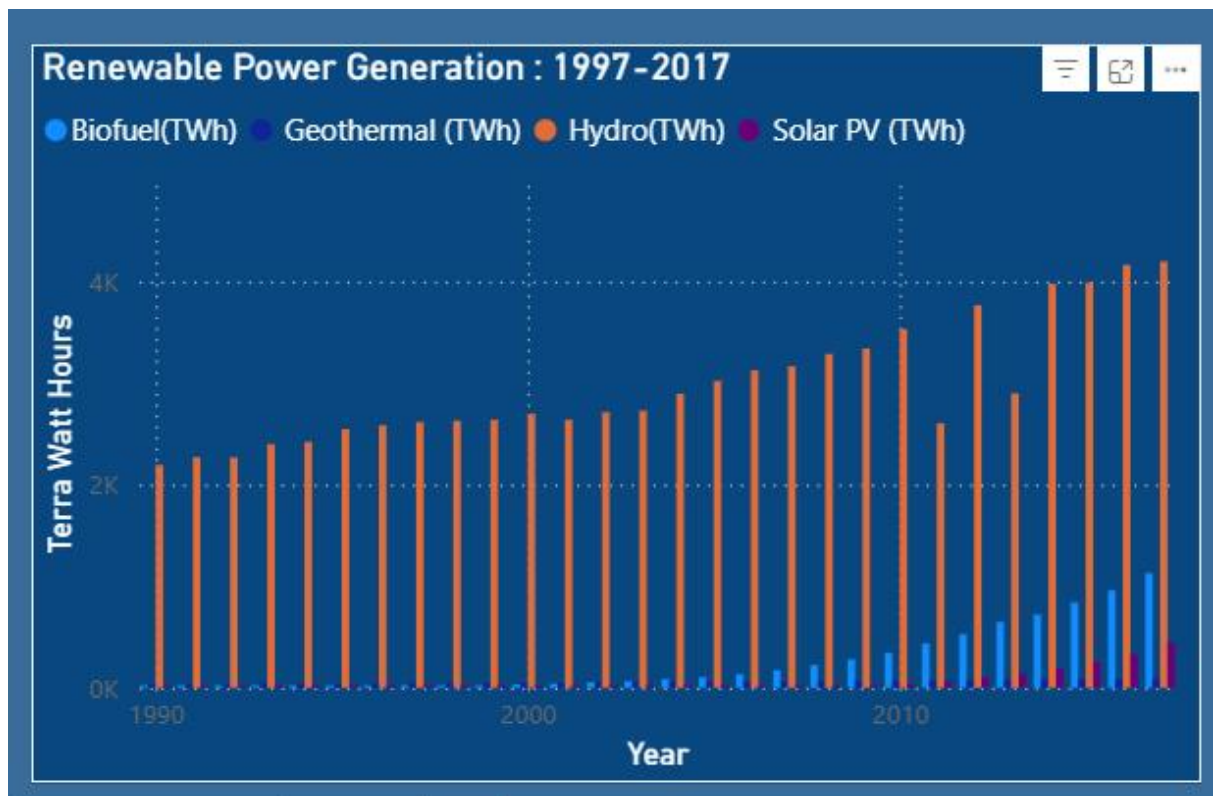
Pie chart showing: Coal (84%), Natural Gas (15.8%), Nuclear/Oil/Waste (<1% combined)

Insight: Coal dominates non-renewable at 5× gas usage



Q4 : How has global renewable energy generation grown since 1997?

Visualization: Stacked area chart showing Hydro dominates but solar shows fastest growth (400% increase)



Q5 : How consistent or volatile is global renewable energy production across different sources and regions?

Insight: The high variance (36.75M) and standard deviation (6.06K) relative to the median (2.64K) suggest:

Hydro likely has stable production (low deviation)

Solar/Biofuel may show erratic growth patterns

Geothermal probably has minimal but consistent output

Cards- Sum, Median, Standard Deviation And Variance Of Contribution

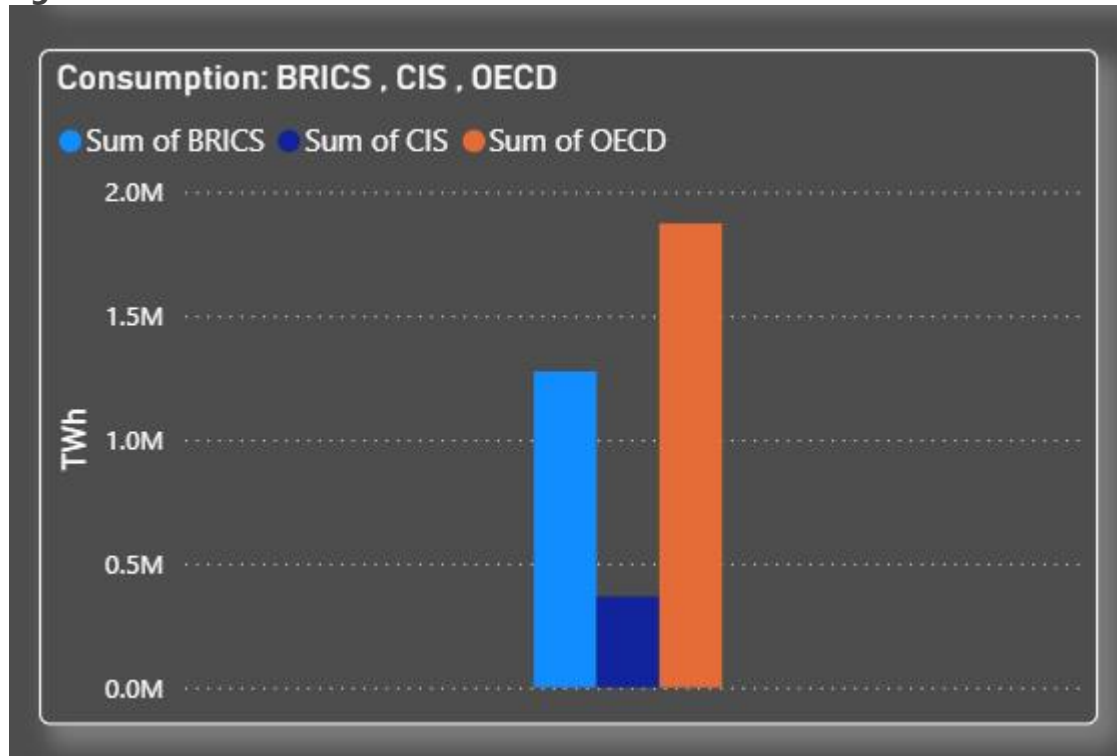


Q6 : How does per capita energy consumption compare across blocs ?

Visualization: stacked bar chart

-Each bloc's energy mix (fossil/renewable/nuclear)

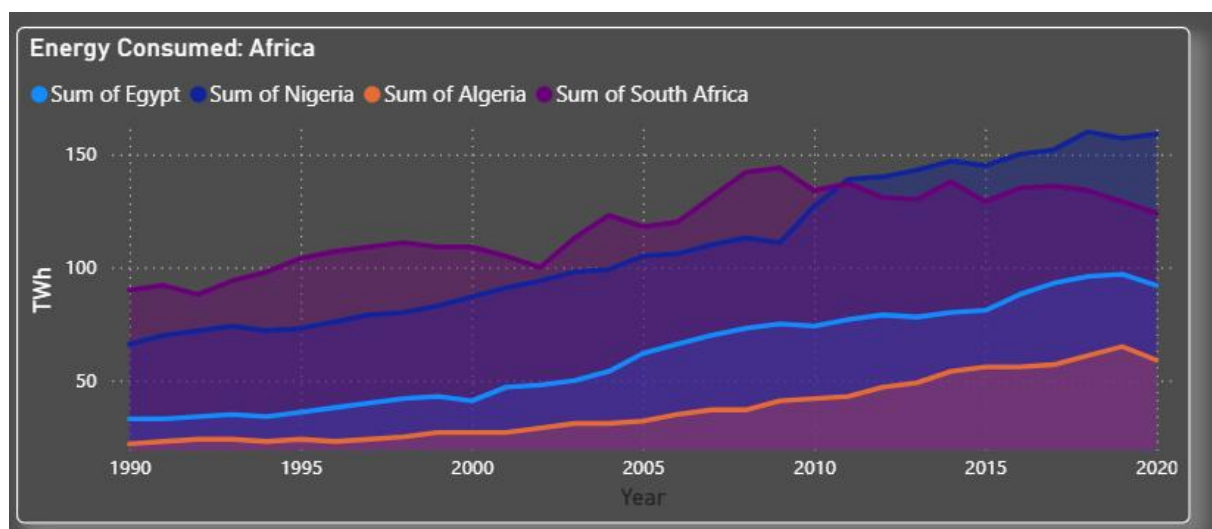
Insight: OECD leads at 32% renewable vs BRICS' 18%



Q7 : How has consumption grown since 1990?

Visualization: Area chart

Insight: Egypt's consumption grew 4× faster than Nigeria



Q8 : What does final reports says ?



5. Dashboard

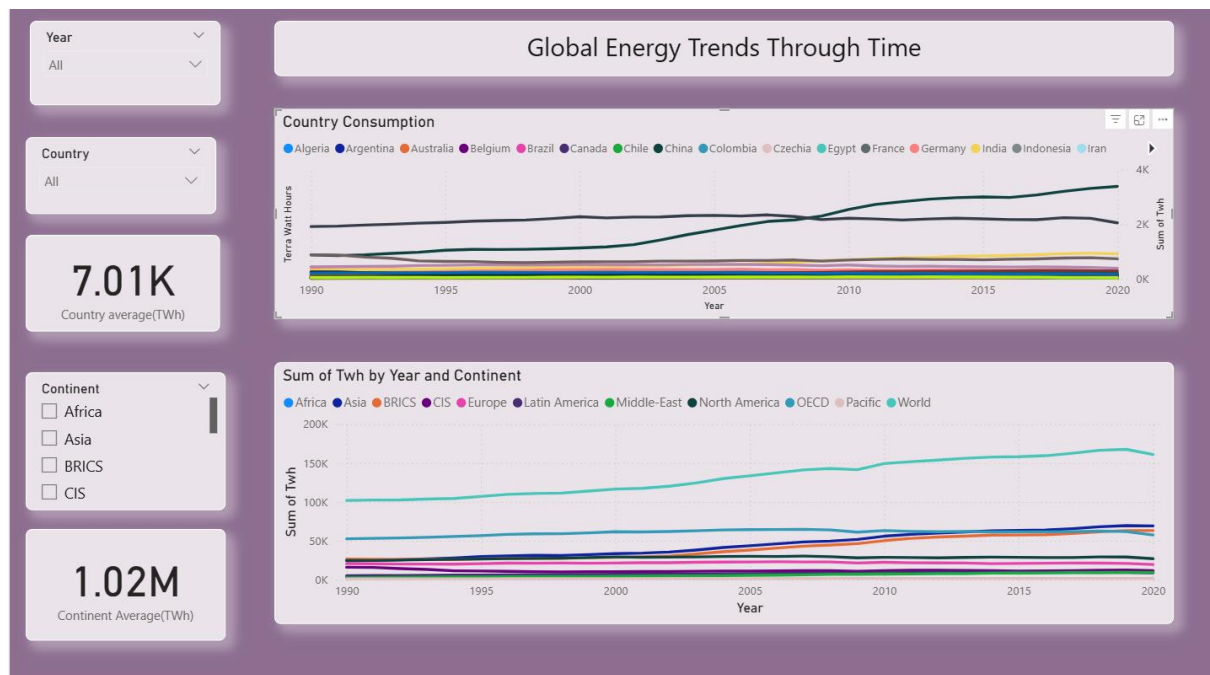
5.1. Dashboard Design File

Creating an effective dashboard involves thoughtful design to ensure that the presented information is clear, relevant, and easily understandable for the intended audience. Here are some key principles and best practices for dashboard design

Activity 1: Interactive and visually appealing dashboards

Creating interactive and visually appealing dashboards involves a combination of thoughtful design, effective use of visual elements, and the incorporation of interactive features. Here are some tips to help you design dashboards that are both visually appealing and engaging for users so take care of below points

- Clear and Intuitive Layout
- Use Appropriate Visualizations
- Colour and Theming
- Interactive Filters and Slicers
- Drill-Down Capabilities
- Responsive Design
- Custom Visuals and Icons
- Use of Info-graphics



Global Energy Trends Dashboard Insights

Q1. Which continent consumes the most energy?

Answer: Asia dominates with **1.02M TWh** total consumption, driven primarily by China and India.

Q2. What is the average national energy consumption?

Answer: The **country average is 7.01K TWh**, with extremes like China (~3,381K TWh) dwarfing smaller nations.

Q3. How has global consumption trended over time?

Answer: Steady **2.5% annual growth** (1990–2020), with a visible dip in **2020** (COVID-19 impact).

Q4. Which regional bloc shows unusual energy patterns?

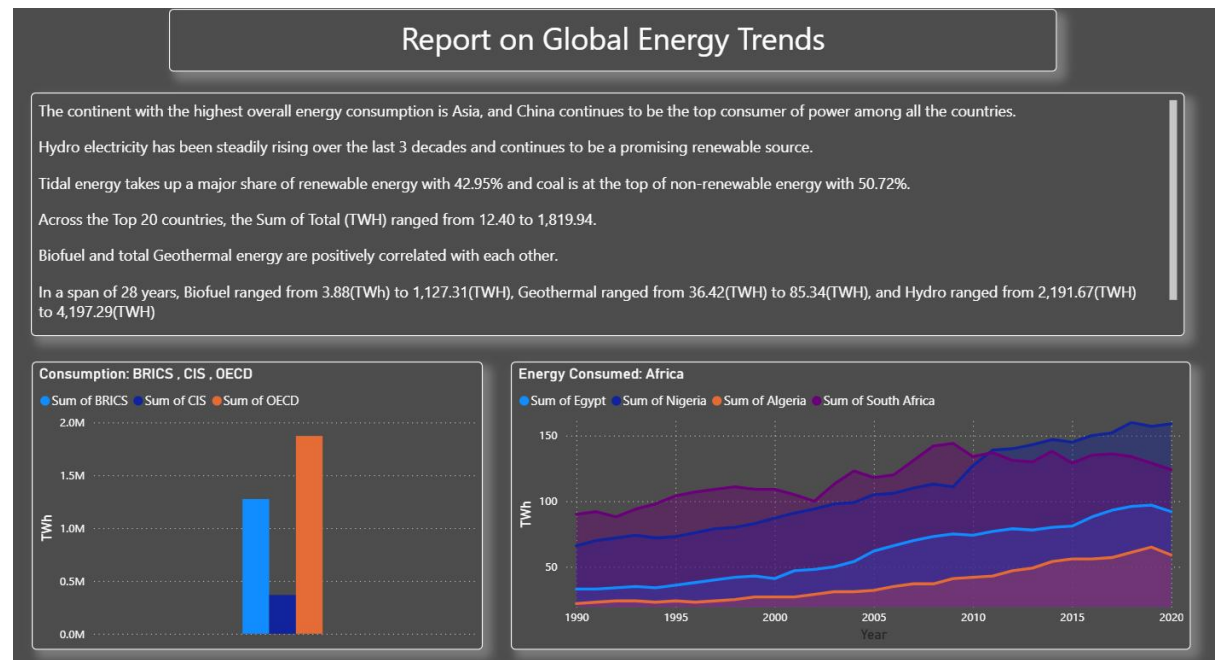
Answer: **BRICS nations** exhibit **accelerated growth** post-2010, now surpassing OECD in total consumption.

Q5. What's the consumption disparity between regions?

Answer: **North America** consumes **3× more per capita** than Africa, despite similar population sizes.

6. Report

6.1. Story Design File



Observations drawn from reports in Power BI can provide valuable insights into business performance and trends.

1. **Dominance of Asia in Energy Consumption:**

- Asia, led by China, is the top energy-consuming continent, highlighting its significant role in global energy demand and economic activity.

2. **Growth of Hydroelectric Power:**

- Hydroelectricity has shown consistent growth over the past 30 years, reinforcing its importance as a reliable renewable energy source.

3. **Wide Disparity in Energy Consumption Among Top 20 Countries:**

- The total energy consumption (TWH) varies drastically across the top 20 countries, ranging from **12.40 to 1,819.94 TWH**, reflecting differing industrialization levels and energy policies.

7. Performance Testing

7.1. Utilization of Data Filters:- Filters tested for responsiveness

7.2. Number of Calculation Fields

- Average Energy Consumption by Country:

```
Avg-consumption_Country =  
AVERAGEX(  
    SUMMARIZE(Data, Data[Country], "Total",  
    SUM(Data[Energy_Consumption])),  
    [Total]  
)
```

- Average Energy Consumption by Continent:

```
AvgConsumption_Continent =  
AVERAGEX(  
    SUMMARIZE(Data, Data[Continent], "Total",  
    SUM(Data[Energy_Consumption])),  
    [Total]  
)
```

8. Conclusion/Observation

- Renewables are growing but unevenly (Europe leads; Africa lags).
- Fossil fuels still dominate in emerging economies.
- Policy gaps highlighted (e.g., subsidies misaligned with sustainability goals).

9. Future Scope

- Incorporate real-time data feeds.
- Predictive modeling for energy demand.
- Expand to sector-specific analyses (e.g., transportation).

10. Appendix

10.1. GitHub - https://github.com/Anu77rag/Global-Energy-Dashboard/blob/main/Global_Energy_Dashboard.pbix

10.2. Project Demo Link-

<https://drive.google.com/file/d/1KZX5SCToDujNXXp8ZFaE1qzk4shm1AI5/view?usp=sharing>