**Regions and Generation Modes using Power BI Global Energy Trends: A Comprehensive Analysis of Key.**

**Introdution:**

Energy plays a vital role in various aspects of modern life, and its importance is expected to increase further as electric vehicles and heat pumps become more prevalent for transportation and heating. Although power generation currently accounts for a significant portion of global CO2 emissions, it is also leading the way in transitioning to net-zero emissions by rapidly adopting renewable energy sources like solar and wind power. Utilizing data analysis techniques within the energy sector holds considerable promise for achieving these goals.

**Scenario 1:**

Smart Grid Implementation in Urban Areas:

In a bustling urban city, the local government has embarked on a project to

upgrade its energy infrastructure to meet the increasing demands sustainably. They have implemented a smart grid system that integrates renewable energy sources like solar and wind power into the existing grid. This system allows for more efficient distribution of electricity, minimizing energy loss during transmission. Moreover, smart meters installed in households provide real-time data on energy consumption, enabling residents to monitor and adjust their usage patterns.

**Scenario 2:**

Industrial Energy Management in Manufacturing Plants:

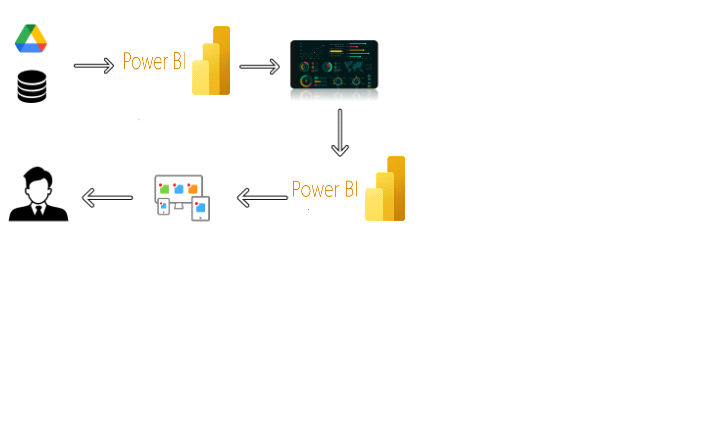
A large manufacturing plant recognizes the importance of optimizing energy usage to enhance its sustainability and cost-effectiveness. Leveraging data analysis techniques, the plant implements an advanced energy management system that monitors energy consumption across various processes in real-time. Through predictive analytics, the system identifies areas of inefficiency and suggests optimization strategies, such as scheduling production during off-peak hours or upgrading equipment to more energy-efficient models. Additionally, the plant integrates renewable energy sources like rooftop solar panels to offset its reliance on grid electricity further. This initiative not only reduces the plant's carbon footprint but also leads to substantial cost savings over time.

**scenario 3:**

Rural Electrification Project in Developing Countries:

In a remote rural community in a developing country, access to reliable electricity has been a longstanding challenge. To address this issue sustainably, a non-profit organization initiated a rural electrification project focused on utilizing renewable energy sources. They install solar microgrids to power homes, schools, and community centers, providing access to clean and

affordable electricity for the first time. Data analytics are employed to optimize the operation of these microgrids, ensuring efficient energy distribution and minimal wastage. As a result, the community experiences significant improvements in living standards, with enhanced educational opportunities, better healthcare facilities, and economic empowerment through small-scale enterprises powered by electricity. This project serves as a model for sustainable development in similar rural areas worldwide, demonstrating the transformative potential of renewable energy and data-driven solutions.

**Technical Architectur**

**Project Flow :**

The activities listed below must be completed:

1. Data Collection
   * Collect the dataset
   * Connect Data to Tableau
2. Data Preparation
   * Prepare the Data for Visualization
3. Data Visualizations
   * Number of Unique Visualizations
4. Dashboard
   * Response and Design of Dashboard
5. Report
   * Report Creation
6. Performance Testing
   * Utilization of Data Filters
   * Number of Calculated Columns/Measures
   * Number of Visualizations/Graphs
7. Project Demonstration & Documentation

Record explanation Video for project end-to-end solution

* Project Documentation - Step by step project development procedure
* Investigate the contribution of various types of sources to the total energy produced.

## **Data Collection & Extraction from Database**

Data collection is the process of gathering and measuring information on variables of interest,

in an established systematic fashion that enables one to answer stated

research questions, test hypotheses, evaluate outcomes and generate insights from the data.

## Downloading the dataset

Global Energy Consumption & Renewable Generation | Kaggle..

Global Energy Consumption (1990-2020) & Renewable Energy Generation (1997-2017)..

## **Understand the data**

Data contains all the meta information regarding the columns described in the Excel files.

Description of the Dataset:

There are six data files that collectively form our dataset. The list of files is as follows:

1. Continent Consumption TWH
2. Year
3. World
4. OECD
5. BRICS
6. Europe
7. North America
8. Latin America
9. Asia
10. Pacific
11. Africa
12. Middle East
13. CIS
14. Country Consumption TWH Columns in the dataset:
    1. Year
    2. China
    3. United States
    4. Brazil
    5. Belgium
    6. Czechia
    7. France
    8. Germany
    9. Italy
    10. Netherlands
    11. Poland
    12. Portugal
    13. Romania
    14. Spain
    15. Sweden
    16. United Kingdom
    17. Norway
    18. Turkey
    19. Kazakhstan
    20. Russia
    21. Ukraine
    22. Uzbekistan
    23. Argentina
    24. Canada
    25. Chile
    26. Colombia
    27. Mexico
    28. Venezuela
    29. Indonesia
    30. Japan
    31. Malaysia
    32. South Korea
    33. Taiwan
    34. Thailand
    35. India
    36. Australia
    37. New Zealand
    38. Algeria
    39. Egypt
    40. Nigeria
    41. South Africa
    42. Iran
    43. Kuwait
    44. Saudi Arabia
    45. United Arab Emirates
15. Non-Renewable – Total Power Generation Columns in the dataset:
    1. Mode of Generation
    2. Contribution (TWH)
16. Renewable – Total Power Generation Columns in the dataset:
    1. Mode of Generation
    2. Contribution (TWH)
17. Renewable Power Generation 1997-2017 Columns in the dataset:
    1. Year
    2. Solar (TWH)
    3. Biofuel (TWH)
    4. Hydro (TWH)
    5. Geothermal (TWH)
    6. Top 20 Countries Power Generation Columns in the dataset:
       1. Country
       2. Solar PV (TWH)
       3. Biofuel (TWH)
       4. Hydro (TWH)
       5. Geothermal (TWH)
       6. Total (TWH)

## **Data Preparation**

Preparing the data for visualization involves cleaning the data to remove irrelevant or

missing data, transforming the data into a format that can be easily visualized, exploring the data to identify patterns and trends, filtering the data to focus on specific subsets of data, preparing the data for visualization software, and

ensuring that the data is accurate and complete.

## **Data Visualization**

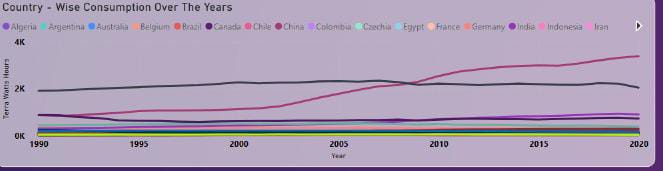
Data visualization is the process of creating graphical representations of data to help people understand information. The goal of data visualization is to make complex data sets more accessible, intuitive, and easier to interpret. By using

visual elements such as charts, graphs, and maps, data visualization can help people identify patterns, trends, and outliers quickly in the data.

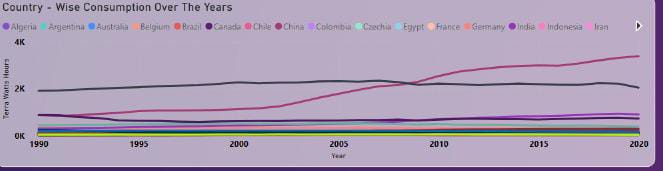
## Number of unique visualizations

The number of unique visualizations that can be created with a given dataset. Some common types of visualizations that can be used to analyze include bar charts, line charts, heat maps, scatter plots, pie charts, maps, etc. These visualizations can be used to compare, and track changes over time, show distribution, relationships between variables, breakdown of one category, and much more

**Country wise consumption**



## Continent Consumption



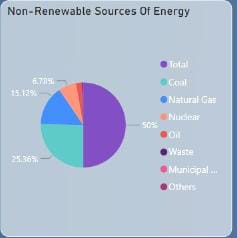
Continent Average



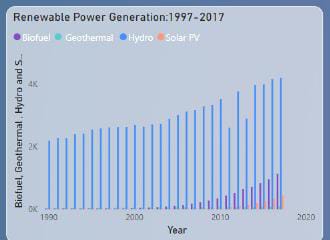
Country Average



Non-Renewable Sources



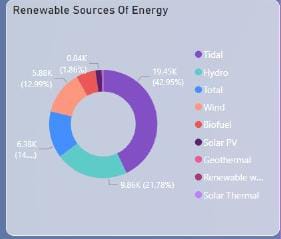
Renewable Generation 1997-2017



Cards- Sum, Median, Standard Deviation and Variance of Contribution



Renewable Sources



Cards - Geothermal, Biofuel, Hydro and Solar PV



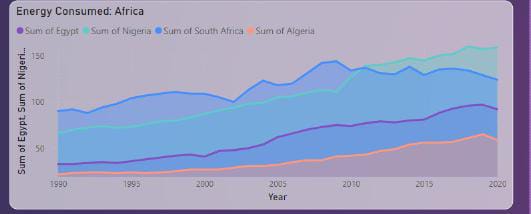
Report Narrative



BRICS, OECD and CIS



# **Energy Consumption in Africa**

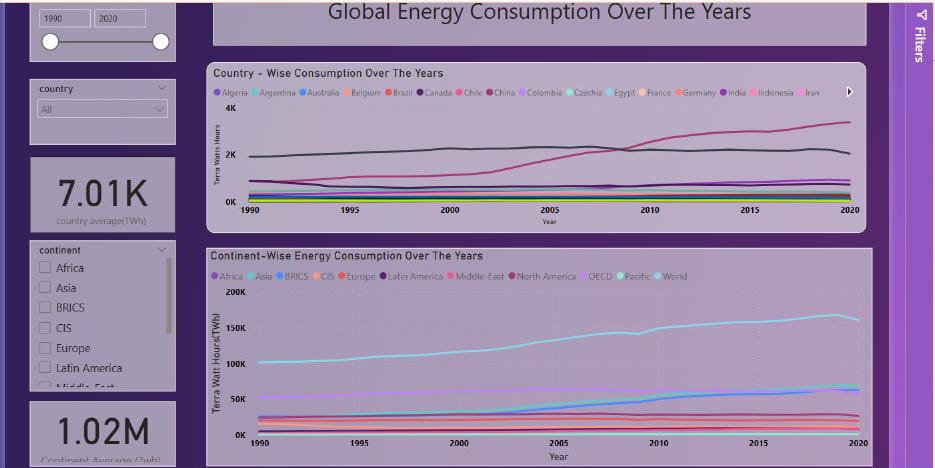


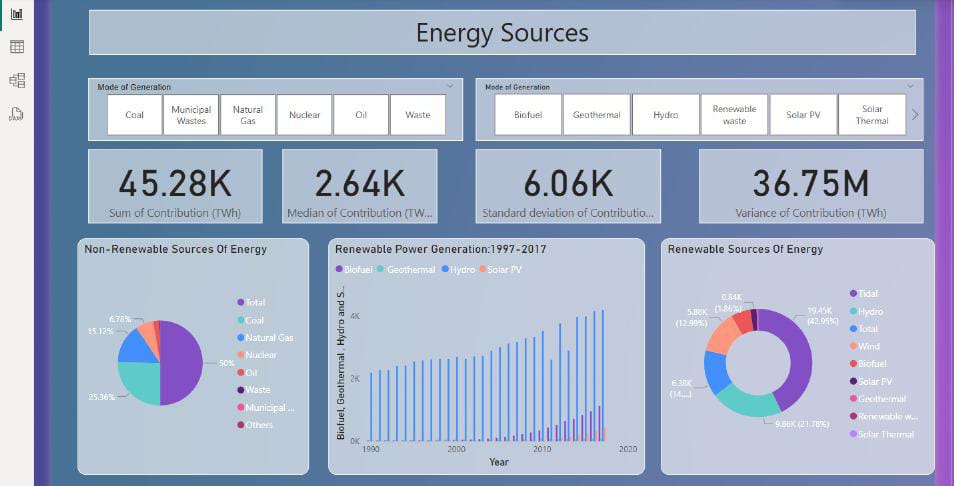
Dashboard

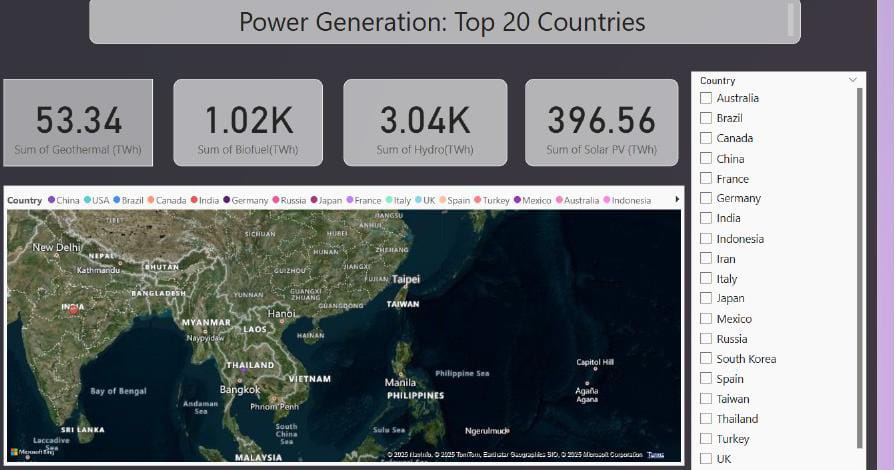
A dashboard is a graphical user interface (GUI) that displays information and data in an organized and easy-to-read format. Dashboards are often used to provide real- time monitoring and analysis of data. They are typically designed for a specific purpose or use case. Dashboards can be used in a variety of settings, such as

business, finance, manufacturing, healthcare, and many other industries. They can be used to track key performance indicators (KPIs), monitor performance metrics, and display data in the form of charts, graphs, and tables.

## Responsive and Design of Dashboard

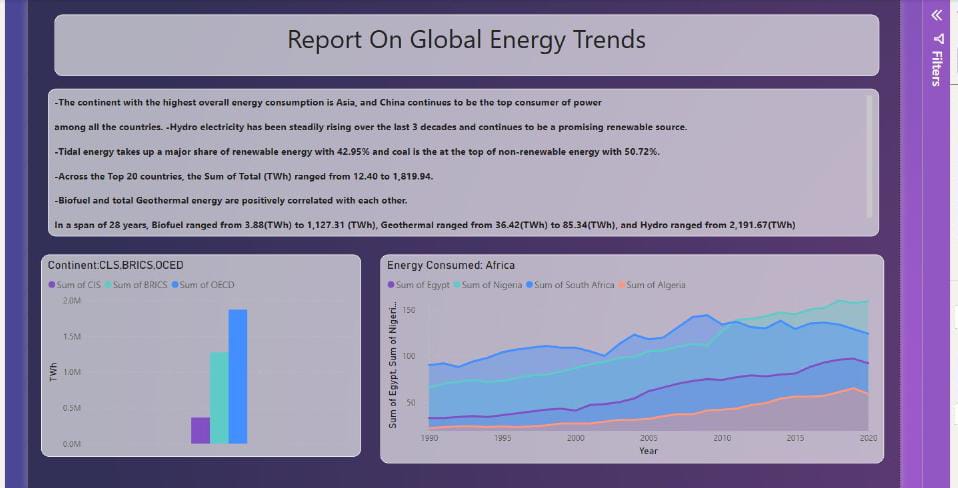






## Design of Report

## A data report is a way of presenting data and analysis in a narrative format, with the goal of making the information more engaging and easier to understand. A data story typically includes a clear introduction that sets the stage and explains the context for the data, a body that presents the data and analysis in a logical and systematic way, and a conclusion that summarizes the key findings and highlights their implications. Data Report can be told using a variety of mediums, presentations, interactive visualizations, and videos.



# **Performance Testing**

For the aforementioned energy project focusing on incorporating renewable energy sources and optimizing energy usage, performance testing plays a

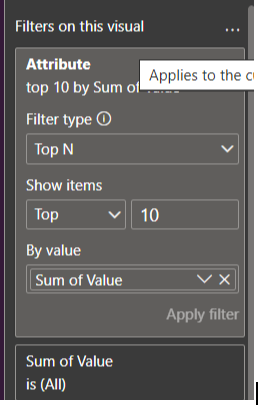
critical role in ensuring the effectiveness and reliability of the implemented systems. Performance testing involves assessing various aspects, including the efficiency of energy generation from renewable sources, the effectiveness of

energy distribution through smart grids or microgrids, and the accuracy of data analytics algorithms in identifying optimization opportunities.

## Application of Data Filters

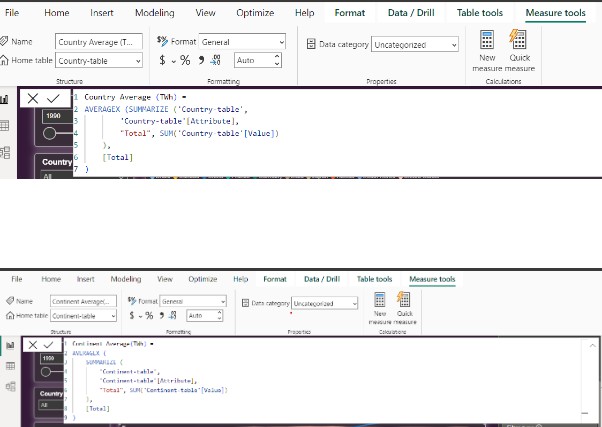
Selections within the data allow users to filter data based on individual fields or dimensions. Users can choose specific values within a field to include or

exclude from analysis. Complex filters based on predefined conditions and logic can also be created.

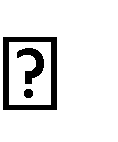
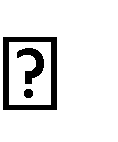
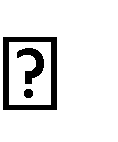
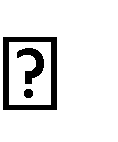


Use of Measures/Calculated Columns

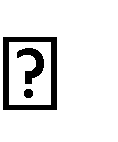
Power BI allows the creation of reusable filter objects like Measures, and Calculated Columns which can simplify the process of applying consistent filters across multiple visualizations and dashboards.

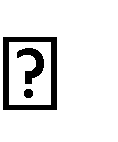


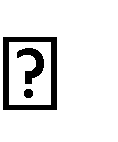
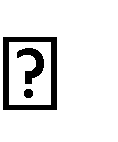
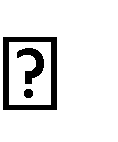
## Number of Graphs/ Visualizations

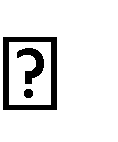
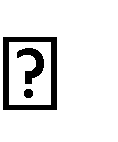
Country-wise energy consumption Continent Energy Consumption Continent Average(TWh)

Country Average(TWh)

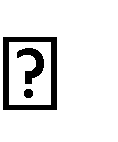
Non-renewable sources of Energy

Renewable Generation 1997-2017 (TWh)

Cards - Sum, Median, Standard Deviation and Variance of Contribution(TWh) Renewable Sources of Energy

Cards - Geothermal, Biofuel, Hydro and Solar PV BRICS, OECD, and CIS Comparison

Report Narrative

Energy Consumption in African countries

**Project Demonstration & Documentation**

Below mentioned deliverables are to be submitted along with other deliverables.

Activity 1: Record explanation video for the project's end-to-end solution

Activity 2: Project Documentation-step by step project development procedure Create the document as per the template provided.

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