



ENERGY CONSUMPTION TREND ANALYSIS USING POWER BI

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Objective :

This project focused on analysing energy usage data (water, electricity, and gas) across different buildings to uncover patterns, optimize costs, and provide actionable insights. The goal was to help stakeholders better understand how energy was being consumed, identify areas where resources were being wasted, and suggest opportunities for saving money. Using Power BI, I built interactive dashboards that presented this data visually, making it easier for decision-makers to spot trends and make informed choices.

Dataset and Problem Context:

- The dataset encompassed detailed records of energy consumption, including water, electricity, and gas usage, measured across various buildings and locations over several years. Supplementary datasets provided key contextual information such as energy rates (updated annually) and the geographic distribution of buildings. Together, these datasets formed a robust foundation for analysis, revealing complex interrelations between energy usage, costs, and geographical factors.
- Challenges included managing large volumes of data with missing or inconsistent entries, aligning data from multiple sources, and ensuring compatibility for seamless integration into Power BI. Overcoming these challenges required meticulous preprocessing and cleaning, ensuring the reliability and integrity of insights derived from the analysis.

Dataset : [Dataset which I used in this project](#)

Approach and Methodology:

1. Data Preprocessing and Transformation:

The first step involved cleaning the raw data to address inconsistencies and fill missing values, ensuring a uniform structure across datasets. Dates were standardized, and numerical columns were validated to eliminate anomalies. Data from the "Rates" sheet was used to compute the monetary costs of energy consumption, linking it to the corresponding time periods and buildings. The "Building Master" dataset added geographic and demographic context, enriching the analysis with location-based insights.

2. Exploratory Data Analysis (EDA):

A thorough EDA phase uncovered critical insights about consumption trends and patterns. Time-series analysis revealed seasonal peaks in water and electricity usage, highlighting times of inefficiency. Building-wise consumption analysis identified high-energy consumers and their corresponding cost implications. Patterns such as increasing gas prices and their impact on operational costs across regions were also examined.

3. Integration into Power BI:

A robust data model was built within Power BI, incorporating relationships between consumption, cost, and building location. Interactive dashboards were created to display energy consumption trends dynamically. Advanced features

like slicers and filters empowered users to drill down into specific metrics, such as analysing the costs incurred by a particular building or comparing consumption across cities.

4. **Visualization and Insights:**

Key insights were represented visually to facilitate intuitive understanding. Line charts illustrated temporal consumption trends, while bar charts compared costs across buildings and energy types. Heatmaps and geospatial visuals provided a comprehensive view of city-wise energy usage, allowing stakeholders to identify hotspots of inefficiency.

Key Takeaways:

The dashboards made it possible to:

- Spot buildings or time periods with unusually high energy consumption.
- Understand how much was being spent on utilities and why costs might vary.
- Pinpoint geographical differences, like cities or regions with higher usage patterns.
- Develop actionable plans, like introducing energy-efficient practices or focusing on the most expensive buildings for improvements.

Tools I Used:

- **Power BI:** To design and build interactive dashboards.
- **Microsoft Excel:** For cleaning and organizing the raw data.

Changes I made:

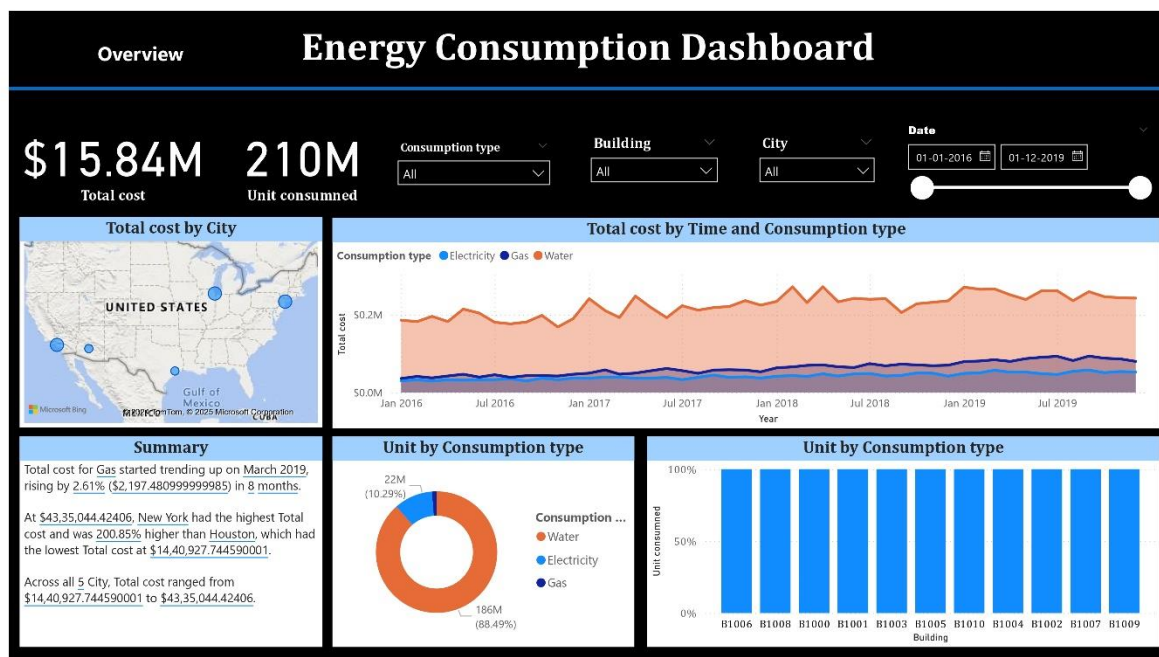
- And Also, I can use Power BI for cleaning and organizing the raw data well I didn't have any errors in my dataset so I transformed it directly to the Power BI and added some relationship btw the three tables which are
 1. Consumption Types
 2. Rates
 3. Buildings master
- These three tables were present in the dataset and after adding them in the power bi I have created relationship btw the tables for insights btw the tables and I have created key Between the tables in order to link them with same relevant colours and the column which I linked all the tables were “ **KEY**” , and after recreating a link or relationship btw the tables

- After joining the links between the tables in the “**MODEL VIEW**” , I have successfully had all the links to the tables
- And now I have added the new measures which is significant to this project in order to complete the project we need some measures which are
 1. Total cost
 2. Unit consumed
 3. Average cost
- For creating this measure there are some formulas same as excel I will explain the process of creating the measure as well
 1. (**For creating Average cost** > right click on the Budling master table> click on the new measure > Average Cost = AVERAGE('Energy Consumptions'[Unit])) > after adding this formula > click enter > it will take some times (depends on the pc or laptop))
 2. (**For creating Total cost**> right click on the Energy consumption table > click on the new measure > Total cost = SUMX('Energy Consumptions', 'Energy Consumptions'[Unit] * RELATED(Rates[Price Per Unit]))> type these formulae>(what I have done here is I added the total cost of the units where I took the units consumed and multiple it with the price per unit which was in the rates table and “ **RELATED**” this related keyword used to do the calculation outside the tables like the unit where present in the energy consumption tables and price per unit where present in the rates table so the related keyword used us to make the calculation outside the tables)
 3. (**For creating Unit consumed**> right click on the Energy consumption table > create a new measure > Unit consumed = SUM('Energy Consumptions'[Unit])> click enter

Impact:

This project gave a clear picture of energy usage and costs in a way that was easy to understand and act on. It helped uncover inefficiencies, provided insights into reducing waste, and supported better decision-making. Overall, it showcased how data can drive meaningful change when presented effectively.

Output or Results:



Conclusion:

This project highlights the importance of leveraging data analytics and visualization to drive smarter decisions in resource management. By analysing energy consumption patterns, identifying inefficiencies, and providing actionable insights through interactive dashboards, the project demonstrated the potential for significant cost savings and operational improvements. It also showcased how tools like Power BI and Excel can transform raw data into meaningful visual stories, enabling stakeholders to better understand their challenges and opportunities.

Overall, this experience not only enhanced my technical skills in data analysis and visualization but also reinforced the value of presenting complex information in an accessible, user-friendly way to empower decision-making.