Data Visualization: Project Proposal
Visualizing the Energy Consumption and Carbon Footprints in NYC

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Abstract

The project aims to provide a comprehensive and visually engaging representation of energy consumption and carbon footprints in New York City (NYC). This project will visually communicate the impact of human activities on the environment and highlight trends and patterns of energy consumption and carbon emissions in NYC. Using accurate and reliable data from reputable sources, the project will showcase energy consumption levels and carbon emissions various scales. The project aims to raise awareness, facilitate understanding, and support informed decision-making for reducing greenhouse gas emissions and promoting sustainability in NYC.

1. Introduction

Energy consumption and carbon footprints are critical topics in the context of sustainability and climate change. As the global population continues to grow, and urban areas like New York City (NYC) expand, the demand for energy rises, leading to increased energy consumption and associated carbon emissions. NYC, with its dense population, high-rise buildings, and extensive transportation systems, is a major consumer of energy and contributor to greenhouse gas emissions. The burning of fossil fuels for electricity, heating, transportation, and industrial processes is a significant source of carbon emissions, which are the main driver of climate change. NYC has set ambitious goals to reduce its carbon emissions and transition to cleaner energy sources in line with global efforts to mitigate climate change. Understanding the patterns, trends, and impacts of energy consumption and carbon footprints in NYC is crucial for policymakers, urban planners, and residents to make informed decisions and take effective actions towards sustainability and emissions reduction.

Related work includes existing interactive maps and dashboards that provide real-time or near-real-time data on energy consumption, carbon emissions, and other sustainability indicators in cities, such as the Environmental Protection Agency's (EPA) Energy Star Portfolio Manager and the City of New York's online energy bench marking visualization tools.

The objective of the project is to create comprehensive and visually engaging data visualizations that depict energy consumption and carbon footprints in New York City, using accurate and reliable data from reputable sources. The project seeks to raise awareness about the impacts of energy consumption and carbon emissions on the environment and climate change, promote understanding and informed decision-making by visually communicating patterns, trends, and progress towards emissions reduction goals, and contribute to ongoing efforts towards sustainability and climate action in NYC.

2. Design and Implementation

Data Collection and Preparation: Collect accurate and reliable data on energy consumption, carbon emissions, and sustainability metrics in NYC from data sources, such as the New York City government, energy utilities, and research institutions. Clean, organize, and prepare the data using Python data manipulation libraries, such as Pandas and NumPy, ensuring data integrity and consistency. This will include removing inconsistencies, handling missing values, and addressing outliers in the data.

Visualization Design: Use Python data visualization libraries, such as Matplotlib, Seaborn, and Plotly, to create visualizations that effectively depict the energy consumption and carbon footprint data. Select appropriate visualization types, such as bar charts, line charts, heatmaps, and geographic maps, based on the project objectives. Customize the visualizations to be visually appealing, informative, and accessible, incorporating best practices in data visualization. Use Tableau to further enhance the visualizations and create interactive dashboards.

3. Demonstration Plan

The input for the demonstration will be the raw data on energy consumption, carbon emissions, and sustainability metrics in NYC, which will be collected and prepared during the demonstration. The output will be visually appealing and informative data visualizations, including bar charts, line charts, heatmaps, geographic maps, and interactive dashboards, that effectively depict the energy consumption and carbon footprint data. The demonstration will showcase how the visualizations and dashboards can be used to gain insights and understand patterns and trends in energy consumption and carbon emissions in NYC.

Features:

- Energy Consumption: This could include data on electricity, natural gas, and other forms of energy consumption in various sectors, such as residential, commercial, and industrial, at different spatial and temporal scales (e.g., hourly, daily, monthly, yearly).
- Carbon Emissions: This may involve data on greenhouse gas emissions, such as carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O), associated with energy consumption and other human activities, also at different spatial and temporal scales.
- Sustainability Metrics: This could encompass a wide range of indicators related to sustainability, such as energy efficiency, renewable energy generation, and water consumption.

Data Dictionary:

1. Weather Normalized Source Energy Use Intensity (EUI): Total amount of the energy from all the raw fuel required to operate a property expressed in kBtu per gross square foot (kBtu/ft2)
2. Water Use Intensity (WUI): The annual consumption of water in gallons per gross square foot (gal/ft2) of the property.
3. Greenhouse Gas Intensity (GHG): The total direct and indirect greenhouse gases emitted due to energy used by the property per gross square foot of the property, reported in kilograms of carbon dioxide equivalent per square foot (kgCO2e/ft2)
4. Borough, Block, Lot Number (BBL): It is a 10-digit identifier assigned by NYC Department of Finance for each property in New York City
5. Gross Floor Area: Gross square footage of the property, per Department of Finance records.
6. ENERGY STAR Score: A 1-to-100 percentile ranking for specified building types with 100 being the best score and 50 the median. It compares the energy performance of a building
7. Property Type: The self-reported property type
8. Number of Buildings: The total number of buildings located on the tax lot per Department of Finance records.
9. Number of Floors: In the primary building on the tax lot, the number of full and partial stories starting from the ground floor per Department of Finance records.

4. Timeline

- April 10 - 11: Project Proposal and Data Collection
- April 12 - 14: Data Cleaning and Preprocessing
- April 15 - 17: Data Analysis
- April 18 - 23: Data Visualization
- April 24 - 26: Storytelling and Interpretation
- April 27 - 30: Project Report and Presentation

References

https://energy.cusp.nyu.edu/

NYC Energy and Water Performance Map: This dataset, available from the NYC Open Data portal, provides information on energy and water consumption, as well as greenhouse gas emissions, for different buildings in the city.