Group 2

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Energy Consumption Analysis for Buildings in San Francisco

Background: The Existing Buildings Energy Performance Ordinance in the City of San Francisco requires commercial and non-residential buildings to report energy use and greenhouse gas emission data to the City. Our project aimed to analyze energy usage and greenhouse gas emission trends, patterns, and relationships for buildings in San Francisco.

Project Overview: Using open-source data from the City of San Francisco's Existing Buildings Energy Performance Ordinance Report, we conducted an analysis to identify key insights and inform strategies for reducing energy use and greenhouse gas emissions.

Findings:

Property Subcategory Analysis: We analyzed the property subcategories to determine which types had the highest source energy use intensity and greenhouse gas emissions per square footage in 2022. The findings revealed that buildings continuously in use in the tech industry had the highest energy use and emissions. Additionally, there was a strong correlation between source energy use intensity and greenhouse gas emissions, indicating that higher energy consumption led to increased emissions.

Year Built and Greenhouse Gas Emission Intensity: In terms of residential buildings, newer constructions emitted fewer greenhouse gasses, indicating a positive trend towards more sustainable practices. However, for commercial buildings, there was an uptick in greenhouse gas emissions for properties built in the new millennium, likely due to high-emitting property types.

Greenhouse Gas Emission Reduction since 2018: The analysis of greenhouse gas emissions for commercial and residential buildings showed a decrease since 2018, aligning with the implementation of the ordinance. Boxplots and statistical measures revealed outliers in both commercial and residential properties, indicating potential areas for further improvements in reducing emissions.

Correlation between Energy Use and Building Floor Area: We examined the relationship between energy use and building floor area. In commercial buildings, there was a weak positive correlation, suggesting that floor area had a negligible impact on energy consumption. However, in mixed residential buildings, there was a weak negative correlation, indicating that larger floor areas were associated with lower energy consumption. This finding suggests the potential benefits of energy-efficient designs and technologies in larger mixed residential properties.

Conclusion:

Based on our analysis, we draw the following conclusions:

The tech industry has a significant impact on energy usage and greenhouse gas emissions in San Francisco, highlighting the need for targeted strategies and policies to address this sector's environmental footprint.

Newer residential buildings demonstrate more sustainable practices, emitting fewer greenhouse gasses. This trend emphasizes the importance of incorporating energy-efficient features in building design and construction.

The implementation of the Existing Buildings Energy Performance Ordinance has led to a reduction in greenhouse gas emissions for both commercial and residential buildings since 2018. However, outliers identified in the analysis indicate areas where additional measures can be taken to further decrease emissions.

The correlation between energy use and building floor area varies between commercial and mixed residential buildings. While floor area has a limited impact on energy consumption in commercial buildings, larger floor areas in mixed residential properties are associated with lower energy consumption, suggesting opportunities for energy-efficient designs and practices.

These findings provide valuable insights for policymakers, building owners, and stakeholders in developing effective strategies for reducing energy use and greenhouse gas emissions in San Francisco's buildings. By targeting sectors with high energy consumption, encouraging sustainable practices, and leveraging energy-efficient technologies, we can work towards a more environmentally sustainable future.