Data: Monthly Utility Bills for all city of Boston accounts.

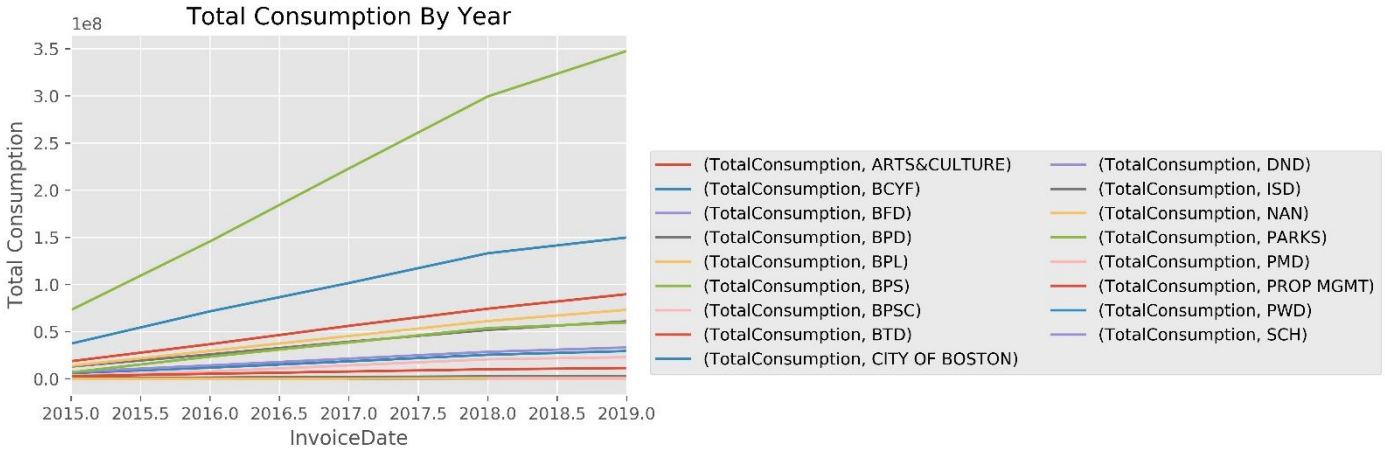
Obtained via:
https://data.boston.gov/dataset/city-of-boston-utility-data/resource/35fad26c-1400-46b0-846c-3bb6ca8f74d0 , Analyze Boston.

Dataset and Project description:

Original dataset contains fields invoice number, account number, invoice date, energy type, total consumption, department name, zip codes etc.

In this project, utility is treated as one entity to reflect human activities – electricity, steam or water, are all essential components for human societies. By looking into trends and information on the total consumption of utility, we can draw information about active population in a region, or degree of popularity of a department (a popular department would be one being visited more frequently than others, and as a result, using more utilities such as electricity and water to facility the needs of more visitors.)

Organization 1:

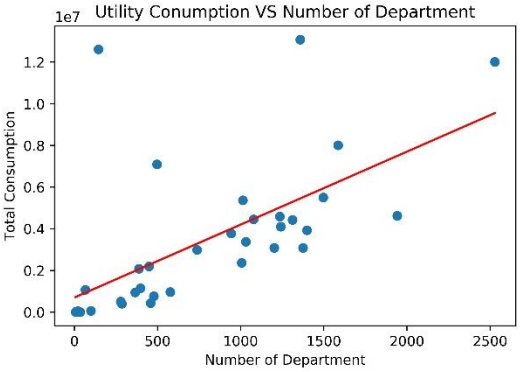


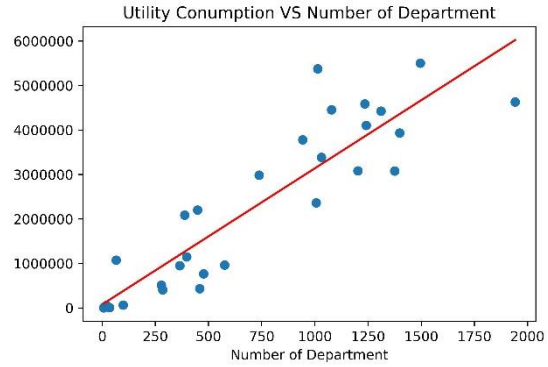
Grouped by year and department, this line graph provided a glimpse of the utility consumption. Total utility consumption has gone up rather rapidly for most of the cities in Boston. In particular, Boston Public School department has the highest amount and highest increase in the utility consumption among all. This could be due to the fact that Boston schools are admitting more students than before, or public schools are increasingly lack efforts in conservation of energy. Such visualization is useful in serving as a guide when administrators want to assess areas where conservation is urgently needed, or areas where the most reduction in utility spending could be realized.

Organization 2:

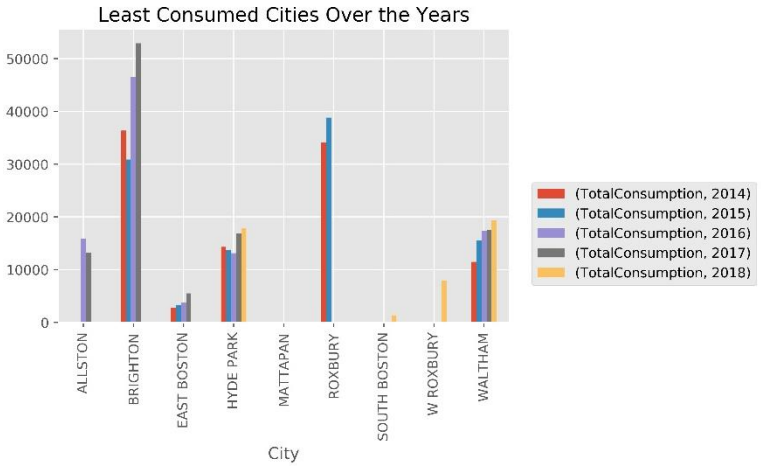
Grouped by zip code, this organization examines the determining factors for utility consumption. Figure on the left shows the ordinary linear regression (OLR) between number of departments per by a zip code and the total consumption for the same zip code in 2019. It is encouraged to remove the top anomalies and reproduce the OLR on the right. After removing the anomalies, R^2 value increased from 0.787 to 0.951. This suggests that for most

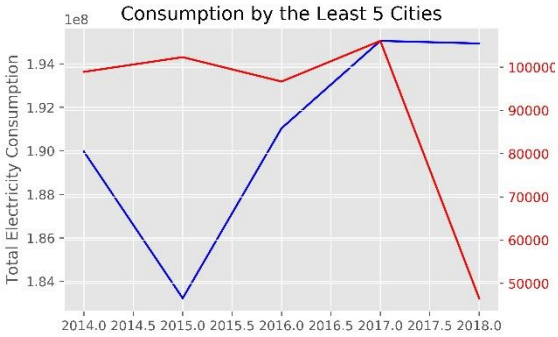
of the areas and departments, utility consumption per department is generally similar such that each region determined by zip code will have linear relation with the number of departments. These visualizations could be useful in identifying regions that have extraordinary utility consumptions than the rest of the Greater Boston. As these regions (as defined by zip codes) do not fit nicely into the OLR like the rest of the departments, such visualization encourages researches to explore possible independent factors affecting the utility consumptions in those departments or regions.





Organization 3:





As total utility consumption could be used as an indicator for human activities, the lower the consumption the lower the active human population could be present in the region. In this organization, 5 least consumption from year 2014 to 2018 were visualized on the left, and their total (red line) compared to total consumption of all cities (blue line) is visualized on the right. These visualizations could be useful for city planners as they could identify regions where economic potentials have yet to be explored.

For example, on the left figure, Brighton, East Boston, Hyde Park, Waltham all appeared in the bottom 5 at least four times over the five years. If such regions have approximately similar number of departments than other regions, it is important to explore further why these regions consumed so little utilities – it could be lack of economic activities which deter further investors or entrepreneurs from investing in the region, resulting in possible spiral traps. Figure on the right also sends out similar messages if the number of departments for these regions are explored – after 2014, the bottom cities' utility consumption was not in correspondence to the macro environment. This could mean that while the rest of the Greater Boston has been doing well, these cities benefited little, or even were possibly harmed as production and economic activities were drained to other regions.