Group 12: Nizar Mohammad, Devin Stapleton, Dan Keseling, Carlos Webster

CSC315/BUS385/MGT385

<u>Effectiveness of NJ Energy Efficiency Programs and Solar Installations Project</u>

<u>Proposal</u>

What data the group will gather for incorporation into their database.

The data to be incorporated into the database include the "Aggregated Community-Scale Utility Energy Data", "Solar Installation Data", "Community-Scale Greenhouse Gas (GHG) Emissions Data", "Community Profile Data by Municipality", and "Lifetime Commercial Participation"/"Lifetime Residential Participation" data sets from the Sustainable Jersey Data Resources. The "Aggregated Community-Scale Utility Energy Data" will provide us with the total amounts of electricity and gas per sector in each municipality, and the "Community-Scale Greenhouse Gas (GHG) Emissions Data" will show us the greenhouse gas emissions per sector. Comparing these data sets to the "Solar Installation Data" and the "Lifetime Commercial Participation"/"Lifetime Residential Participation" (data regarding the participation in energy efficiency programs of businesses and homes per municipality) data sets we hope to see whether or not there is any relation between municipalities that participate in these programs and that have higher solar installations compared to their greenhouse gas emissions and energy consumption. We also want to incorporate the "Community Profile Data by Municipality" to determine if average income per municipality/sector has any effect on the relationship.

What questions they will explore with the data.

There are many questions that the user can answer when retrieving data from the database. There are two main comparisons that a user can make with our data. The first is how sustainability programs improve the state from municipality to municipality. The user can see how much each municipality participates in these programs and the amount of utilities used per capita. They can then use this data to see if their neighbors are using the programs and how it has impacted their community compared to other municipalities. The second comparison the person can make is how much each municipality did these programs in different years and the number of utilities used during that time. A user can then understand how much programs have affected their community over time, and see if it is worth it for that individual to apply these programs to their business or home. If people can see the improvement these programs make for their community they would be more likely to use them. It is very hard to see how your everyday utilities affect the climate.

How the data could help them identify sustainability problems, and opportunities to propose positive change.

The data could help Sustainability Jersey determine the effectiveness of New Jersey energy efficiency programs, as well as the efficiency of solar installations, so as to better decide where to allocate resources when considering sustainability programs in the future. The data can also be used to help Sustainability Jersey ascertain the extent to which a community's average income affects their ability to participate in energy efficiency programs and solar installations, or the amount of energy consumption and greenhouse gas emissions as well. If a relationship exists, the data

could be used as evidence to help raise awareness to improve conditions for certain communities in order to improve sustainability as well.

An overview of the sustainability issue you will be exploring, offering background on the problem, why it persists, the various stakeholders affected by the problem, and ethical issues presented by the problem.

The sustainability issue we will be looking at is how sustainability programs affect utility usages such as electricity and greenhouse gas. One of the main issues we are trying to address is that it is very hard for people to see the positive impacts these sustainability programs have on their communities. It is very hard to notice how your everyday utilities affect the climate. The stakeholders are mainly the business owner who gets the most benefit from these programs and the people who live in the area that also use the utilities. Even though this change is hard to see it makes a big difference to the people who live in these areas. The other stakeholders are the groups that are offering and promoting these sustainability programs. If our project helps promote people to use these programs it will give these groups more funding to help with sustainability and potentially cause there to be more programs to support sustainability. We will also be helping groups such as Sustainability New Jersey achieve their goal.

Choose two representative user interactions with your completed project. Write a detailed textual use case for each.

1) A slider with different years from 2015 to 2020 each year will have its own graph explained in interaction 2. A user will have two of these maps and each one will

have its own slider. This will allow the user to compare different time periods in NJ while still being able to look at all the municipalities.

Use case: Interactive year slider that allows users to see which year's data will be on the map.

Actors: Sustainability Jersey staff, or interested users.

Goal: allow the user to compare utility and program usage in different time periods in NJ.

Typical Course of Events: As the user interacts with the gradient map described below, on the bottom of the map will be the slider. The slider is a simple bar with a draggable button that can slide either left or right until it gets to one of the ends of the bar. It's initial state is on the most current year of records available in the database. The slider will be marked with the previous year at evenly spaced intervals. The user will click and drag the slider with their mouse to their desired year of research. Once the slider is let go of, the map will update the presented information to the corresponding year. If the database does not have data for a particular year, it may be able to interpolate values to give the presented data a more cohesive look instead of having missing values for years without recorded data.

2) Gradient map of New Jersey of the aggregated community-scale utility energy data, where municipalities with higher energy consumption are colored red, and those with lower energy consumption are colored green. Each municipality sector will be clickable, which will then display the sector's energy efficiency program

participation data, and average income. The user can then select one of the

sector's variables to display a correlation graph between the two variables.

Use Case: Gradient Interactive Map of New Jersey of the Aggregated

Community-Scale Utility Energy Data by Sector

Actors: Sustainability Jersey staff, or interested users.

Goal: To assist users in identifying the effectiveness of New Jersey community's

energy efficiency programs on a sector's energy consumption. Also assists in

determining the effect of the average income of a sector with its energy

consumption.

Typical Course of Events: The user can click on sectors in a map of New

Jersey, which will in turn display the sector's energy consumption rate. Each

sector will also be color coded with red indicating a high and green indicating a

low energy consumption rate. Once a user selects a sector, they can also see the

sector's participation rate in energy efficiency programs, and the sector's average

income. The user can then select either the participation rate, or the average

income to display the correlation between the selected variable and the sector's

energy consumption.

Diagram for the Above Use Cases:

Gradient Map & Slide Bar Use Case
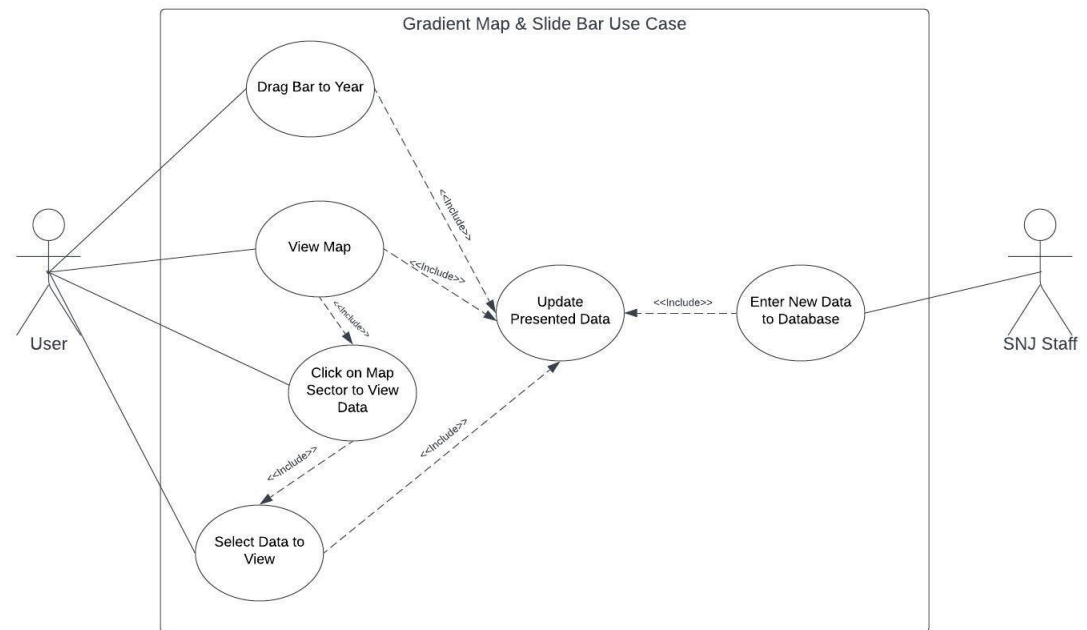
MAY 2nd Revision:

Our project has morphed and strayed from the original proposal idea. With the limitations of our knowledge in using Flask, our web GUI had to be reworked. We had big ambitions to make an interactive map that had to be scraped. Instead our project offers a simple UI that is still effective. There are 4 (possibly 5) main functions of our we application.

The first is our municipality index search. This takes a towns name and returns all municipalities and their index that match the name. This index is a number assigned by us in order to better differentiate municipalities that have the same name across different counties. The user is also able to enter partial or "close" search terms and still get the desired result. The next functionality uses the municipality index to return information about solar installations for that

municipality. It will return each year of data on that specified municipality. The third functionality takes no input. This shows the users a list of each municipality and their green house gas emissions and participation in energy efficiency programs. Finally our web app offers users who are versed in SQL to enter their own commands. While this may be vulnerable to malicious attacks, it was essential in testing the final product.