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Phase II Proposal - Empowering Municipal Sustainability

Greenhouse gas metrics allow emissions of different gasses to be reported in a common unit called CO2-equivalent. Greenhouse gas is a gas that absorbs and emits radiant energy within the thermal range. In simpler terms, it is a gas that lets sunlight pass through the atmosphere, but it is also preventing the heat that sunlight brings into earth's atmosphere. The unit CO2-equivalent enables comparisons of the efficiency of different farms and production systems and of alternative mitigation strategies across all gasses.

The greenhouse effect and greenhouse gasses are often associated with global warming and manmade climate change, but it is important to realize that it is actually necessary to have some base level greenhouse gasses or greenhouse effect just for earth to be habitable in the way that it is. Without greenhouse gasses, earth's surface would be about -18 degrees celsius, which is the same as 0 degrees fahrenheit. The issue with this would be if the concentration of these greenhouse gasses go out of equilibrium, become unusually high, and that seems to be what is occurring. The stakeholders may include a combination of investors, shareholders, litigants, non-governmental organizations (NGOs) and activists, governments, communities, suppliers, customers and employees. These stakeholders are increasingly focused on climate-related matters.

There are many other issues that are coming from the constant usage of combustible engines. Increased use of traditional gas-powered vehicles can lead to

major air pollution which will do astronomical amounts of damage to the atmosphere through time. As stated above, the biggest threat is manmade climate change through the combustible engine in relation to the greenhouse effect. The Environmental Protection Agency (EPA) lists 6 categories of pollutants resulting from the use of fossil fuels today. These are Ground-Level Ozone, Particulate Matter, Carbon Monoxide, Lead, Sulfur Dioxide, and Nitrogen Dioxide. For the reduction of these common pollutants, we hope to shift the focus onto using more Electric Vehicles (EVs), by providing more information on sustainability attempts and their effectiveness in communities. The Environmental Protection Agency has stated that “while charging the battery may increase pollution at the power plants, total emissions associated with driving electric vehicles are typically less than those for gas cars - particularly if the electricity is generated from renewable energy sources like wind” (*Explaining Electric & Plug-In Hybrid Electric Vehicles* 2023). Using EVs is proven to cause less of the pollution listed above on average, pointing to the benefits of increased EV adoption in the future.

The data we will use is presented in the form of municipality-specific statistics, regarding electric vehicle usage as well as greenhouse gas emissions from both vehicles and other sources. The specific datasets we will be using are the Electric Vehicle Ownership Data, Community-Scale Greenhouse Gas Emissions Data, and Greenhouse Gas Emissions by Vehicle Type Data. This data is provided as sourced from multiple sources for each datapoint in each municipality. The duality of the data will allow us to calculate the average annual change of municipalities’ sustainability metrics using SQL queries. This can then be compared to that of other municipalities in the state or the average in the county or the state. Providing these metrics local to individual

municipalities helps to inform a town or city's government in tracking their progress on sustainability issues over the past several years, or to help interested constituents track the progress of their municipality. The user will be able to select the municipality or county whose data will be displayed in the user interface. Additionally, users will be able to select a certain county on the map to see comparative visual data across the given county regarding either electric vehicles or greenhouse gas emissions, represented using color.

Use case: Select region for data display

1. System displays county selection options to User.
2. System displays municipality selection options to User.
3. System validates municipality selection.
4. System retrieves relevant data from the database.
5. System calculates comparative metrics based on aggregated data across the state.
6. System displays requested information and comparative metrics to User.

Use case: Select data for visual display

1. System displays counties and municipalities in a graphical user interface in the form of a map.
2. System displays selection options for comparative display to User.
3. System retrieves data from the database based on the user's selection.

4. System calculates a normalization value for each region based on the selected data and the maximum datum displayed in the interface.
5. System calculates the color value to be displayed on the graphical user interface map for each county and municipality.
6. System displays the retrieved data to the User as a color mapping on the provided map interface.

Works Cited

Environmental Protection Agency. (n.d.). *Criteria Air Pollutants* . EPA. Retrieved February 17, 2023, from https://www.epa.gov/criteria-air-pollutants

Environmental Protection Agency. (2023, January 17). Explaining Electric & Plug-In Hybrid Electric Vehicles. EPA. Retrieved February 17, 2023, from https://www.epa.gov/greenvehicles/explaining-electric-plug-hybrid-electric-vehicles

Public health: Green Energy Consumers. Green Energy Consumers. (n.d.). Retrieved February 17, 2023, from https://www.greenenergyconsumers.org/drivegreen/learnmore/environmenthealth/publichealth

Reflections on greenhouse gasses. National Grid Group. (n.d.). Retrieved February 17, 2023, from https://www.nationalgrid.com/stories/energy-explained/what-are-greenhouse-gases

Appendix

Last paragraph:

- The data we will use is presented in the form of municipality-specific statistics, regarding electric vehicle usage as well as greenhouse gas emissions from both vehicles and other sources. The specific datasets we will be using are the Electric Vehicle Ownership Data, Community-Scale Greenhouse Gas Emissions Data, and Greenhouse Gas Emissions by Vehicle Type Data. This data is provided as sourced from multiple sources for each datapoint in each municipality. The duality of the data will allow us to calculate the average annual change of municipalities' sustainability metrics, specifically EV usage data and carbon emission metrics, using SQL queries. This can then be compared to that of other municipalities in the state or the average in the county or the state. Providing these metrics local to individual municipalities helps to inform a town or city's government in tracking their progress on sustainability issues over the past several years, or to help interested constituents track the progress of their municipality. Furthermore, this comparison of data across municipalities will promote statewide adoption of sustainable practices when it comes to greenhouse gas emissions and electric vehicle ownership, in order to make these metrics for individual municipalities become better over time. The user will be able to select the municipality or county whose data will be displayed in the user interface. Additionally, users will be able to compare a number of municipalities or counties based on a specified statistic.

Data retrieved from:

- https://www.sustainablejersey.com/resources/data-center/sustainable-jersey-data-resources/#c4734
- https://www.sustainablejersey.com/resources/data-center/sustainable-jersey-data-resources/#c4735
- https://www.sustainablejersey.com/resources/data-center/sustainable-jersey-data-resources/#c4736

Second use case:

- **Use case: Select data for comparative display**

1. System allows User to view either the entire state or an individual county.
2. System displays selection options for comparative display to User, specifying Greenhouse Gas emission data or Electric Vehicle ownership data.
3. System retrieves data from the database based on the user's selection.
4. System calculates a normalization value for each region included in the selected area (either counties or municipalities in a county) based on the selected data and the maximum datum displayed in the interface.
5. System calculates the ranking of each county and municipality compared to all selected regions.
6. System displays the retrieved data to the User as a list of ranked percentile scores.