Phase III: The Database Model Explained

Relational databases organize data into rows and columns specifying attributes and relationships of entities. Entities are things in the world, attributes are traits about those entities, and relationships are how entities are connected. Relational databases are valuable because they explain how different entities are connected and organize information in an easy to read, tabular form. Our diagram contains 4 main entities- municipality, means of transportation, energy, and emissions. Means of transportation contains subclasses taxicab, motorcycle, bicycle, public transportation, and car. Car is also broken down into the gas powered and electric powered subclasses. Our diagram shows the relationship between vehicles and emissions, as well as municipalities and energy consumption. Our database model focuses on these relationships and how emissions compare from different modes of transportation, with a heavy focus on cars. We designed the database in this way because our goals involve finding ways to reduce emissions and encourage people to switch to vehicles with less emissions. We are also looking for ways to reduce energy consumption, because that also contributes to emissions. We want to encourage sustainability by giving users different ways of looking at how energy and vehicles impact emissions. Here are the calculations to estimate the rough size of our database.

File name: Vehicle_Miles_Traveled-On-Road_Vehicle_GHG_Emissions_Data_08.11.22

- This is the VMT Data Section
- Municipality: assuming that max string strength is 20 chars * 1 byte = 20 bytes
- County name: assuming that max string length is 15 chars * 1 byte = 15 bytes
- MPO: the string length is 5 = 5 chars * 1 byte = 5 bytes
- Year: integer type so 4 bytes

- The columns after Year includes all integer types: 14 * 4 bytes = 56 bytes
- Total number of entries in the excel sheet: 1129 entries (this doesn't include the row for the column name and info): 1129
- The rough size is: 1129 * (20 + 15 + 5 + 4 + 56) = 112,900 bytes

File name: Community-Scale_GHG_Emissions_08.22.2

- This is the Community-Scale_GHG_Emissions - Metric Ton Carbon Dioxide Equivalent
- Municipality: assuming that max string strength is 20 chars * 1 byte = 20 bytes
- County name: assuming that max string length is 15 chars * 1 byte = 15 bytes
- Year: integer type so 4 bytes
- The columns after Year includes all integer types: 11 * 4 bytes = 44 bytes
- The total number of entries in the excel sheet (this doesn't include the row for the column name and info): 1129
- The rough size is: 1129 * (20 + 15 + 4 + 44) = 93, 707 bytes

File name: Electric_Vehicle_Ownership_Data_06.01.22

- This is Electric Vehicle (EV) Ownership Data
- Municipality: assuming that max string strength is 20 chars * 1 byte = 20 bytes
- County name: assuming that max string length is 15 chars * 1 byte = 15 bytes
- Year: integer type so 4 bytes
- Total personal vehicles: can be integer type so 4 bytes
- # of Evs: can be integer type so 4 bytes
- % of Evs: can be integer type so 4 bytes

- The rough size is: 1129 * (20 + 14 + 4 + 4+ 4 + 4) = 57, 579 bytes
- The total size of the database is: 112,900 + 93,707 + 57,579 bytes = 264, 186 bytes

The estimated average number of searches is approximately 70 searches and the type of databases are numerical and string.

Use case I: Add a map to the website

Primary Actor: User

Goal in Context: Add a map of NJ and the user can press a certain municipality and it will link to another page that shows that area's facts and emission release/data specific to that area.

Trigger: User decides to view the map data on the website

Scenario:

1. User hovers over the map of New Jersey
2. User clicks on a specific municipality on the map to view data
3. User is transported to a new website that holds that areas emission data.

Use case II: Car feature button

Primary Actor: User

Goal in Context: Adding two separate car shaped buttons (electric and gas) that'll show how much gas emissions a gas car will release within the municipality (drop down bar) and how much an electric car releases.

Trigger: User decides to view how much emissions both cars release within the same area.

Scenario:

1. User chooses an municipality from the drop down bar

2. User presses on whichever car icon they prefer (electric vs gas)

3. User is shown data that’ll depict the emissions of whichever car they choose.

References

Sustainable Jersey. (2022, August). *Community-Scale Greenhouse Gas (GHG) Emissions.* Retrieved February 16, 2023, from https://www.sustainablejersey.com/resources/data-center/sustainable-jersey-data-resources/#c4736.

Sustainable Jersey. (2022, June). *Electric Vehicle(EV) Ownership Data.* Retrieved February 16, 2023, from https://www.sustainablejersey.com/resources/data-center/sustainable-jersey-data-resources/#c4734.

Sustainable Jersey. (2022, August). *Vehicle Miles Traveled(VMT)/On-Road Vehicle GHG Emissions Data.* Retrieved February 16, 2023, from https://www.sustainablejersey.com/resources/data-center/sustainable-jersey-data-resources/#c4734.