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Phase II: Proposal

**Background & Overview:**

Issues related to sustainability have been widely discussed and debated in recent years, stirring up discussions of global warming and climate change, pollution, and a wide variety of other problems that pose major threats to the environment and the planet. Particularly, greenhouse gas emissions are a major environmental problem discussed today, especially in relation to gas and diesel-powered vehicles. Greenhouse gasses are extremely harmful to the environment, and data suggests that their presence is one of, if not the most, significant influences of global warming today.

Global warming is known to lead to increased temperatures in the atmosphere, rising sea levels, and severe flooding and drought, and research shows that vehicle emissions account for nearly one-fifth of all emissions in the United States (Car Emissions and Global Warming, 2014). According to the United States Environmental Protection Agency, typical passenger cars emit approximately 4.6 metric tons of carbon dioxide per year. These vehicles also emit quite a bit of methane and nitrous oxide, which also contribute to the potential for global warming (Greenhouse Gas Emissions From a Typical Passenger Vehicle 2018). Clearly, the usage of gas-powered vehicles poses a variety of environmental issues that are putting the future of ecosystems, the climate, and the world itself in danger if initiatives aren’t taken to increase sustainability soon. Despite this, the problem continues to persist because individuals aren’t willing to switch to electric vehicles over traditional gas or diesel-powered vehicles and are producing an alarming amount of greenhouse gas emissions from their vehicles as a result. This issue affects a variety of stakeholders, which is virtually every person on the planet given that greenhouse gas emissions impact the entire world and its population, although children, the elderly, the poor, and those with pre-existing health conditions are more vulnerable to negative health effects from climate change issues and are therefore have more stake in the issues surrounding global warming, greenhouse gas emissions, and therefore the use of gas versus electric vehicles than some other groups of individuals (Herring & Lindsey, 2020). Therefore, because of this information, this environmental issue poses a variety of ethical issues as well. Generally, driving gas-powered cars could be beneficial to large groups from a utilitarian perspective. Although it poses the issue of harming others and the environment as a whole from a self-interest standpoint because people don’t want to deal with being inconvenienced by switching vehicle types. Therefore, it poses ethical issues surrounding people putting their own self-interest ahead of the environment’s and the entire future population’s interest by risking increased global warming from increased greenhouse gas emissions from gas-powered vehicles that could be minimized substantially through simply switching to electric or hybrid vehicles. Based on this information, our proposal is to encourage municipalities with relatively lower proportions of electric vehicles and higher numbers of vehicle miles traveled within the municipality to increase overall adoption of electric vehicles in order to work towards the overarching goal of lowering greenhouse gas emissions emitted from vehicles.

**How Can Data Help Analyze Sustainability Problems?**

Data can deliver substantial value in the context and identification of sustainability issues. Organizations such as Sustainable Jersey offer a variety of different data resources that measure and track energy consumption broken down by municipalities, types of vehicles, miles traveled per municipality, and audits summarizing energy efficiency for different businesses, to name a few of several different data sets available surrounding sustainability initiatives. This data can be further analyzed through comparisons to other institutions where their energy efficiency and usage can be contrasted and leveraged to promote different incentives to encourage businesses with higher energy usage or those that emit more greenhouse gasses to adopt programs that will help them be more sustainable. In the context of our proposal surrounding how electric vehicle usage and the number of miles traveled are correlated with greenhouse gas emissions in comparison to traditional gas-powered vehicles, data can be extremely valuable in identifying a correlation between all of the different variables and potentially finding evidence to support claims that would encourage more sustainable practices. More specifically, looking at the data from a county with high vehicle miles traveled and a high proportion of electric vehicles in that area and examining its greenhouse gas emissions emitted from those vehicles and comparing it to another county with similar miles traveled but a lower proportion of electric vehicles and a higher level of greenhouse gas emissions could offer important insight that would help show a correlation between electric vehicles and greenhouse gas emissions. Over time, data could also be useful in showing progress toward sustainability initiatives. For example, in this context, data could be analyzed for greenhouse gas emissions per county with lower electric vehicle proportions, which could then be looked at over time after increased adoption of electric vehicles to see if greenhouse gas emissions decreased with an increase in electric vehicles on the road. Overall, data surrounding sustainability issues are extremely important to have and can deliver a lot of insight into both identifying and resolving sustainability issues.

**What Data Will We Gather?**

We will gather data related to the number of electric vehicles in NJ based on county, as well as the total amount of greenhouse gas (GHG) emissions in each municipality. We will find the number of miles traveled per personal vehicle, as well as reference the number of miles traveled per type of general vehicle, including gas-powered ones. This data set includes the GHG emissions from each category of vehicle. We also plan to use zip codes (in conjunction with the municipality name) in order to uniquely identify each town. We will collect and compile a list of all the municipalities in New Jersey with their corresponding zip codes. This data will be very useful in helping to identify and work to resolve sustainability issues.

**Questions to Explore with Data:**

Through the data we aim to examine for this sustainability issue, there are a variety of questions that could be asked in relation to it. Users of our database could have queries related to whether municipalities with high miles traveled but low populations of electric vehicles demonstrate a correlation with high greenhouse gas emissions. Additionally, the data can help explore questions related to whether municipalities with a higher proportion of electric vehicles have fewer overall greenhouse gas emissions than those with fewer electric vehicles but with a similar number of vehicle miles traveled. An extension of this could answer the question as to what the average greenhouse gas emission is per mile traveled in an electric car versus a gas-powered car, which could be done by finding the average emission per both electric and non-electric vehicle per county and dividing the total greenhouse gas emission by the number of electric and non-electric cars. These are just a few of many different questions that could be asked in relation to the data we identified that would offer valuable insight into this sustainability problem.

**Proposed Use Cases:**

Use Case 1: Entering Range of GHG Emissions:We can propose a use case where the user can enter a range of GHG emissions as a query, and return the counties that fall within that range.

1. The system will prompt the user to enter which county they want to analyze.
2. The User selects an available county (the domain is only in NJ)
3. Within the county selected, the user will then enter a range of values that represent GHG emissions.
4. The user must enter the range of GHG emissions in metric tons.
5. The system validates the range of values from the user.
   1. The range is invalid (i.e User enters a negative value)
   2. The system tells the user that the range is invalid
   3. The use case will go back to step 4 until the user enters a valid range
6. The system will present a list of municipalities (with their corresponding zip codes) with the selected county that falls in the GHG emission range.

Use Case 2: Entering Zip Code to View EV Percentage: A user will be able to select from the municipality list as mentioned in Use Case 1. Then, the system will allow the user to view the number of electric vehicles owned in the selected town. The user will also be able to see the percentage of owned vehicles in the township that are electric.

1. The system prompts the user to enter a zip code.
2. The user enters a valid zip code.
   1. The zip code is invalid (i.e. User’s input is less than 5 digits)
   2. The system presents an error message to the user
   3. The user case will go back to step 1
3. The system displays the specified town and asks the user to verify it.
4. The user chooses to verify or deny the town.
   1. The user denies the town
   2. The user case will go back to step 1
5. The system displays the number of electric vehicles in the verified town as well as the percentage of electric vehicles in comparison to the total number of vehicles owned in the township.
6. The system will present a “status” message when the percentage of EV usage is pretty low relative to the EV sample size in each municipality.

Works Cited

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