

Dylan Nguyen, Joseph Lucero-Pineda, Michael Pang, Matthew McCloskey

Professor Kevin Michels/Professor John Degood

CSC 315/MGT 385

17 February 2023

Vehicle Emissions Database Proposal

Gathered data to incorporate into the database

Various different datasets have been gathered in order to properly demonstrate the amount of vehicle emissions that have been produced in the past decade. These datasets will help determine the distribution of emissions between different vehicle types, along with miles traveled with these vehicle types. Data gathered on vehicle miles traveled (VMT) can help determine and understand the amount of emissions produced by various vehicle types. The database will also incorporate overall greenhouse gas emissions in order to determine the amount of emissions produced in total vs. on-road vehicles as a way to demonstrate the amount emissions have been produced by daily driven vehicles.

With the rise in vehicle manufacturers creating emissions free alternative vehicles, datasets in electric vehicle (EV) ownership, along with a data set in a means of transportation can help determine the amount of different types of vehicle on the road, and determine what percentage are EVs. Combined with previous gathered datasets, it can help determine how much of an impact EV ownership has in terms of the difference in the amount of emissions produced between 2015 and 2020.

Questions to be Explored:

Exploring the relationship between the usage of different transportation, distance traveled, and portion of greenhouse gas emissions taken by vehicles within the municipalities can give a better understanding of their social infrastructure. For example, we could look at how much a particular type of vehicle is used and get information on the efficiency of different road infrastructures, or how people prefer to travel in different municipalities. We will examine how vehicle usage and emissions have been affected by time by comparing data gathered from 2015 and 2020. Policy makers will be more able to gauge the impact different policies have within different municipalities, such as policies that aim to reduce carbon emissions. Our database will uncover different trends in EV ownerships and their impact on the environment as well, which will be beneficial to the goal of being sustainable.

Identifying Sustainability Problems and an Opportunity for Positive Change:

The data could help us identify sustainability problems by pointing out major greenhouse gas emissions sources and where they are most prominent. A great example is the dataset that shows the “2020 Community-Scale Energy-Related GHG Emissions by Sector and Energy Type”. This dataset showed us where a majority of the greenhouse gases are coming from and in first place with a whopping 43% were from on-road vehicles and in second place was residential natural gas which takes up 15%. This dataset showed that we have a major sustainability problem at hand with on-road vehicles and because of that, we should be focusing on trying to reduce our GHG in those vehicles. An opportunity for positive change for on-road vehicles is switching to

electric vehicles since they don't burn gasoline or emit greenhouse gases while driving. People can make the argument that you are burning fossil fuels to create electricity which powers the car but if the energy for electric vehicles is sustainably sourced then there will be a significant reduction in emissions.

An Overview of the Sustainability Issue We Will Be Exploring

The issue we will be exploring is the use of on-road vehicles and their impact on the environment through GHG emissions. Transportation is a part of our everyday lives and we need it for every aspect of our life. People need to go places, whether it be for work, groceries, school, etc which is why transportation vehicles are an absolute necessity. Transportation for the most part does hurt the environment since on-road vehicles emit greenhouse gases which pollute the air and atmosphere around us. Since transportation is such a necessity we want to explore ways to improve transportation to make it more efficient.

Offering background on the problem

Over the past decades, the issue of pollution has continued to be a persistent problem, with little solutions to resolve it. In recent years, the topic of trying to move away from GHG emitters and turn towards electric alternatives has been brought up, with various electric alternatives being produced. Although this may not severely decrease the amount of GHG emissions, it helps create a path towards a more clean alternative. One of the contributing factors towards emitting greenhouse gasses (GHG), is transportation. The vast majority of the population owns at least one vehicle, and due to the country being vehicle dependent, most will use some form of vehicle transportation in order to

get to their destination. It has become one of the major points of trying to convert from natural gas to electric. If vehicle manufacturers move towards an electric vehicle (EV) alternative, along with more people owning EVs, as the years go by, there could be some significant reduced rate in GHG emissions. In order to determine its significance, data must be collected to determine how much of an impact this can help solve the issue of GHG emissions.

Why the Sustainability Problem persists:

When getting anywhere, whether it be to work, school, or the store, it is almost always easiest to travel by car. That way, you can travel on your own time wherever the roads go. However, this has become a major sustainability issue. With so many roads and so many cars, extreme amounts of greenhouse gasses are produced from all of this transit. More sustainable methods of transportation exist. You could take a train or bus, which transports more people with less energy cost. If your destination is close enough, you could ride a bike. And for those times where you need to drive, electric vehicles, at least in the context of on-road greenhouse gasses, have far lower, if any, emissions. Despite these options, the convenience of cars combined with the spread-out nature of many suburbs in the area can make it difficult for individuals to reduce their impact on the environment.

Affected Stakeholders:

This database is specifically made for Sustainability Jersey, so they could better organize and analyze their datasets on vehicle usage and emissions, as well as possibly uncover new relationships that could promote sustainability improvements

within New Jersey and its municipalities. Since the problem we are addressing is the environmental impact of vehicles, our database will affect many different people. This will change how vehicle distributors, owners, and buyers will see trends in transportation. In particular, this will benefit people investigating the environmental impact of electric and other sustainable vehicles. Policy makers and city planners will also see the impact of different policies and infrastructures on the environment as well as they will have an influence on vehicle usage and distribution.

Ethical Issues Presented by the Problem

There are some ethical issues presented by the use of electric vehicles and switching from a gas vehicle to an electric one. The main issue presented from the switch is the energy source and how both energy sources can be traced back to the same fossil fuel. A gasoline-powered vehicle gets its energy from gasoline which comes from petroleum and petroleum is a non-renewable energy source since it takes a very long time to replenish and won't come back after we use it. We drill for petroleum and then refine it and burn it in its gasoline form which emits greenhouse gases. On the other hand an electric vehicle could indirectly be burning greenhouse gases if it gets its electricity from a non-renewable source. If an electric vehicle is getting its electricity from a power plant that is burning coal then that power plant is emitting greenhouse gases. The only way an electric vehicle would be extremely ethical is if the energy source that it is getting its electricity from is a clean renewable energy source. This would ensure that it is ethical and helps the environment since it is not emitting any greenhouse gases along the way.

Use Case Examples:

Use case 1:

The system presents the options to view information by municipality or across the state.

The user chooses a municipality to view.

The system presents three graphs.

The first graph compares modes of transportations used to get to work for 2015 and 2020, as well as on-road vehicle emissions.

The second graph compares Vehicle Miles Traveled for 2015 and 2020, as well as on-road vehicle emissions.

The third graph compares Electric Vehicle Ownership to Vehicle Miles Traveled for 2015 and 2020, as well as on-road vehicle emissions. In addition, this may contain information on population as well as total greenhouse gas emissions.

Use case 2:

The system presents the options to view information by municipality or across the state.

The user chooses to view data across the state.

The system shows greenhouse gas emissions on a map across the state, which can be viewed for 2015 or 2020.

The user selects the next view.

The system shows a heatmap that can be used to compare any two types of vehicles based on their use to get to work, which can be viewed for 2015 or 2020.