Project Charter on Carbon Emissions

BUAN 6320.001

Group Number: 09

Group Members:

Brian Honea

Navdeep Dhull

Mitali Selot

Shreya Amrutkar

Mohammad Dawood

Project Title

Analyzing Industry Carbon Emissions in the US Automotive Industry

Project Objectives:

● Analyze the carbon emissions across the popular automotive industries.

● Identify key drivers of emissions

● Assess the potential risks associated with current emission levels
● Recommend tailored mitigation strategies for high-emission industries.

● Support the development of carbon reduction policies through evidence-based insights.

● Establish a monitoring framework to track progress on emission reduction initiatives within industries.

● Expedite the implementation of emission reduction strategies.

Scope:

Transportation industry is the largest source of greenhouse gas emissions in the world. CO2 emissions represent roughly 97 percent of the global warming potential of all greenhouse gas emissions from transportation. Aim is to analyze and suggest prescriptive and predictive measures to reduce carbon emissions.

The project will include:

● Data collection and analysis of carbon emissions data from the automotive industry.

● Benchmarking and comparison of emissions against industry standards and regulatory benchmarks.

● Identification of emission hotspots and primary sources of emissions within each automotive manufacturer.

● Development of tailored mitigation strategies for high-emission industries.

● Support for the development of industry-specific carbon reduction policies.

● Establishment of a monitoring framework to track progress on emission reduction initiatives.

● Facilitation of knowledge sharing and capacity-building initiatives within industries.

Deliverables:

- Comprehensive analysis report on carbon emissions for the automotive industry.
- Recommendations for mitigation strategies for high-emission industries.
- Evidence-based insights to support the development of industry-specific carbon reduction policies.
- Monitoring framework for tracking progress on emission reduction initiatives.
- Knowledge sharing and capacity-building materials for industry professionals.

Stakeholders:

- Industry representatives
- Policymakers
- Environmental agencies
- Stakeholder organizations

Risks:

- Data availability and reliability issues.
- Technical challenges in data analysis and modeling.
- Resource constraints for conducting comprehensive analysis.

Risk Mitigation Strategies:

- Ensure confidentiality and anonymity of industry-specific data.
- Utilize data analysis techniques and collaborate with subject matter experts.
- Secure necessary resources and budget allocations for the project.

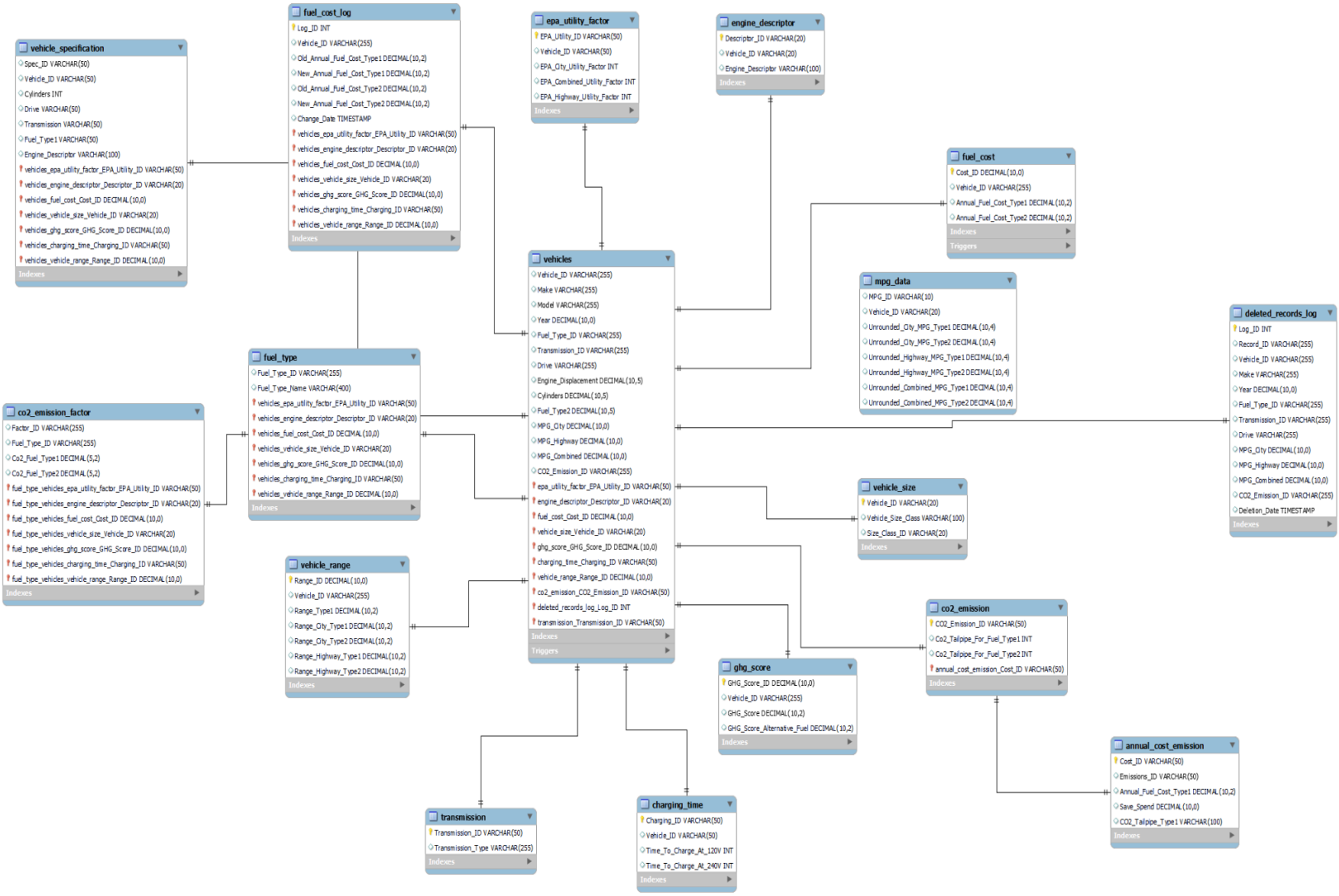
Constraints:

- Budget limitations
- Time constraints for project completion
- Data availability and reliability issues

Assumptions:

- Authenticity of the data for analysis.
- The project team will have access to the required resources and expertise.
- Regulatory environment will remain supportive of the project objectives.

ER DIAGRAM: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Time_To_Charge_At_240V INT
Indexes

Meeting Log:

02/13/2024 - All group members present

- Discussed our goals for the project and decided each member to create a project charter of interest based on topic to decide which to submit.

02/14/2024 - All group members present

- Decided based on charters which to move forward with and submit. We chose to take part from Mitali's charter based on the fast-fashion industry and Navdeep's charter on transportation emissions.
- We discussed creating the tables and assigned each member to create 3 tables.

03/21/2024 - All members present except Ahmed

- Discussed the difficulties with our initial project charter in that it is hard to draw conclusions between fast fashion and transportation because they are very distinct industries that don't share much in common.
- Discussed changing project focus to only transportation industry and would be voted on the following day

03/25/2024 - over teams chat no formal meeting:

- Discussed plan moving forward to meet project deadline
    - By 03/28/2024 have all tables created (3 per member), data imported (50 records), and have major queries created (2 per member)
    - By 04/04/2024 have procedure created (1 per member), functions created (1 per member), and trigger created (3 min)
    - By 04/11/2024 have video completed and begin presentation and word document.
    - By 04/18/2024 have the presentation and word document completed. Finalize we have met all project requirements

03/31/2024 - all group members present

- Brian began building 3 tables and importing data
- We decided we did not find strong enough data for other modes of transportation and will move forward with only focusing on car's CO2 emissions.
- The plan for this week is to finalize tables and get all data entries, brainstorm business plans for car's emissions.
- Next meeting 04/07 at 7:00 PM.

04/07/2024- Everyone but Ahmed present

- Look for more data to weave the project in a story and have a broader picture.
- ER Diagrams will be shared by Shreya and Mitali.
- Make the ER diagram to connect all the tables.
- Divide the dataset shared by Brian into smaller CSV tables and make an ER diagram for the same.

04/09/2024 - all members present

- Split tables for everyone and start coding in SQL

04/25/2024 - all members present

- Export the data to the server
- Write commands to make tables and share the SQL queries with Brian
- Video:
  - Car rentals and advertisements from Honea, Brian Robert
  - Lead pencils
- Research about the functions, triggers, and other things.
- Next meeting is at 12 pm on 04/26th.

04/26/2024- all members present

- By 10:00 PM today: have tables finalized and code sent in txt/word file in chat
- By 10:00PM Saturday, everyone has 2 queries, 1 procedure, 1 function, and 1 trigger(min 3) .
- Meet 10:00 PM Saturday to finalize presentation

04/28/2024- all members present

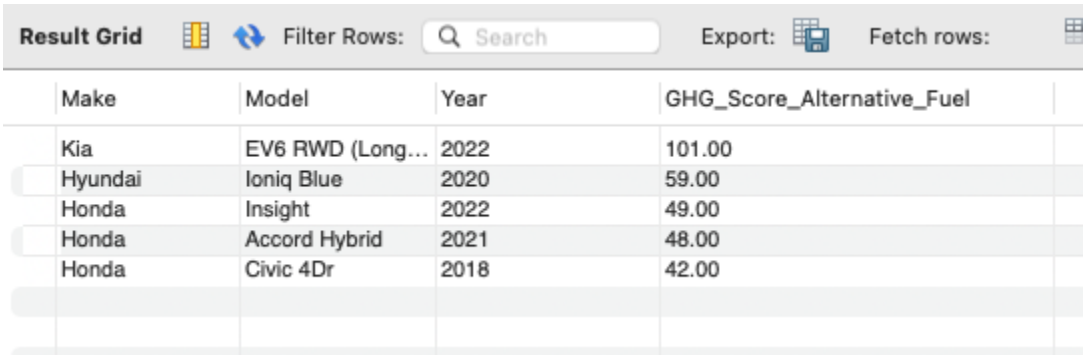
- Finalize project charter and documentation
- Brian will finalize debugging SQL code
- Meet tomorrow 1:00 PM and 8:00 PM to discuss presentation format

04/29/2024- all members present

- Going over sql document to ensure everything is running
- Prepare presentation
- Brian still debugging code, will finish by EOD and have ready
- Prepare Project Charter final submission

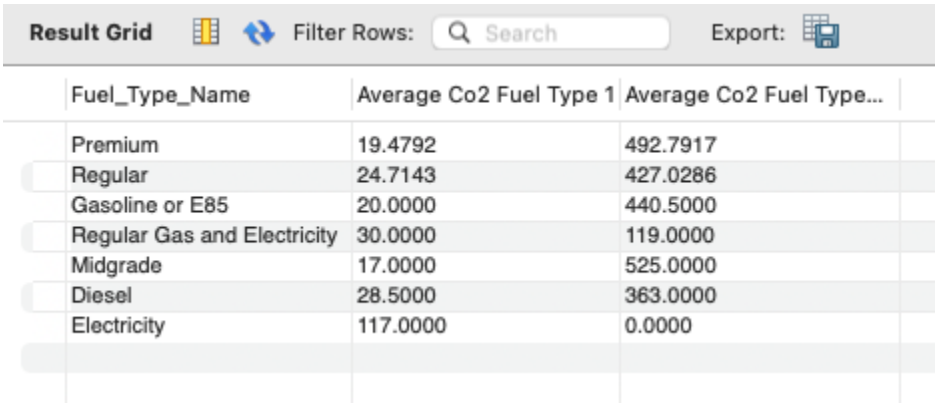
Overview of Queries and Use Cases:

1) **Finding the top 5 vehicles with the highest GHG score for alternative fuel:** This query helps identify the vehicles with the best(highest) greenhouse gas scores, showcasing which alternative fuel technologies are most effective in reducing emissions. By monitoring this over time, it allows for the identification of trends and advancements in eco-friendly vehicle technology.



Make	Model	Year	GHG_Score_Alternative_Fuel
Kia	EV6 RWD (Long…	2022	101.00
Hyundai	Ioniq Blue	2020	59.00
Honda	Insight	2022	49.00
Honda	Accord Hybrid	2021	48.00
Honda	Civic 4Dr	2018	42.00

2) **Locating the average CO2 emission from each fuel type:** Understanding the average CO2 emissions from each fuel type provides crucial information for targeting the most polluting fuel sources. This insight enables the development of strategies and policies to reduce emissions by focusing on the most significant contributors.



Fuel_Type_Name	Average Co2 Fuel Type 1	Average Co2 Fuel Type…
Premium	19.4792	492.7917
Regular	24.7143	427.0286
Gasoline or E85	20.0000	440.5000
Regular Gas and Electricity	30.0000	119.0000
Midgrade	17.0000	525.0000
Diesel	28.5000	363.0000
Electricity	117.0000	0.0000

3) **Selecting the top 10 vehicles with the highest CO2 emissions:** Select the top 10 vehicles with the highest CO2 emissions: This query identifies the vehicles emitting the most CO2, pinpointing areas for emission reduction efforts and technological improvements.

Make	Model	Year	Co2_Tailpipe_For_Fuel_Typ...	Co2_Tailpipe_For_Fuel_Typ...
Kia	EV6 RWD (Long...	2022	117	0
Hyundai	Ioniq Blue	2020	58	154
Honda	Insight	2022	52	170
Honda	Accord Hybrid	2021	48	183
Honda	Civic 4Dr	2018	36	247
GMC	Terrain AWD	2018	32	319
Kia	Seltos FWD	2021	31	285
Dodge	Dart	2016	31	285
Ford	Focus FWD	2017	31	289
Audi	A4 Ultra	2018	31	284

4) **Total annual fuel cost joining fuel cost with vehicles table:** Linking fuel cost with vehicle data allows for the estimation of the financial impact of vehicle emissions. By identifying the vehicles with the highest emissions and correlating them with fuel costs, stakeholders can make informed decisions regarding cost-effective emission reduction strategies.

Result Grid Filter Rows: Search Export:

Make	Model	Annual Sum Fuel Type 1	Annual Sum Fuel Type 2
Acura	RLX Hybrid	123.12	120.00
Acura	MDX AWD	170.04	0.00
Acura	ILX	127.56	0.00
Acura	NSX Hybrid	170.04	0.00
Acura	RDX FWD	148.80	0.00
Aston Martin	V8 Vantage	237.96	0.00
Aston Martin	DB9 Volante	274.68	0.00
Aston Martin	Lagonda	446.28	0.00

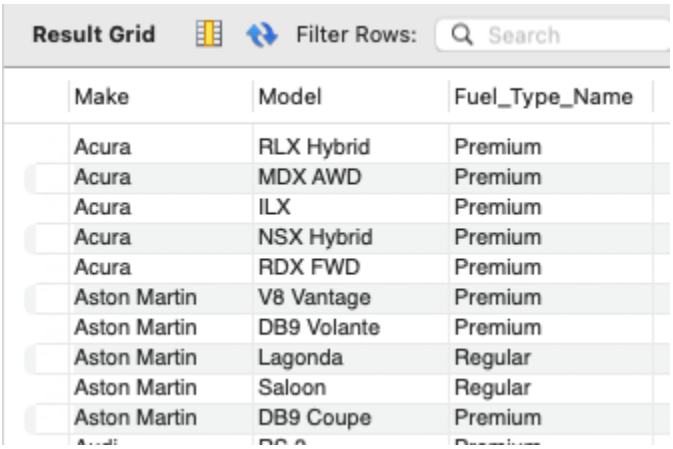
5) **Assessing the GHG score count per vehicle count:** Monitoring GHG scores across all vehicles provides valuable insights into overall market emissions trends. Tracking changes in GHG scores over time allows for the evaluation of the effectiveness of emission reduction efforts and the impact of regulatory measures.

Result Grid Filter Rov

GHG_Score	Vehicle_Count
7.00	7
4.00	19
6.00	5
5.00	14
NULL	22
3.00	9
1.00	5
2.00	2
10.00	3
8.00	2
9.00	2

-

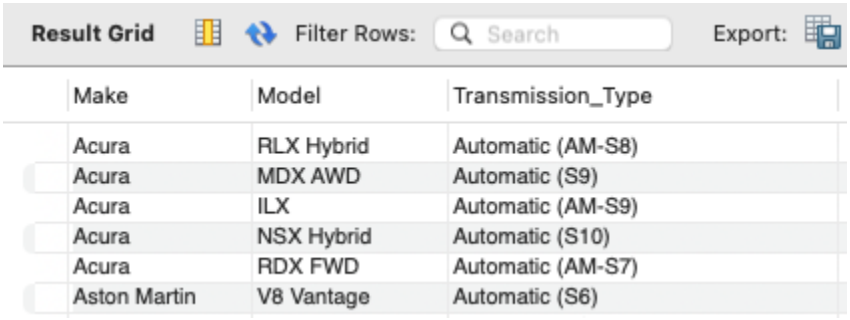
6) **Retrieving all fuel types of vehicle:** Understanding which fuel types are commonly used in vehicles helps identify opportunities for promoting cleaner alternatives. This query facilitates the analysis of market trends in fuel usage, informing efforts to incentivize the adoption of low-emission fuels.



Result Grid | Filter Rows: Search

Make	Model	Fuel_Type_Name
Acura	RLX Hybrid	Premium
Acura	MDX AWD	Premium
Acura	ILX	Premium
Acura	NSX Hybrid	Premium
Acura	RDX FWD	Premium
Aston Martin	V8 Vantage	Premium
Aston Martin	DB9 Volante	Premium
Aston Martin	Lagonda	Regular
Aston Martin	Saloon	Regular
Aston Martin	DB9 Coupe	Premium

7) **Retrieving the transmission type of all vehicles:** Transmission type influences vehicle fuel efficiency and, consequently, emissions. By examining transmission types, stakeholders can identify opportunities for improving efficiency and reducing emissions through technological advancements or regulatory measures.



Result Grid | Filter Rows: Search | Export:

Make	Model	Transmission_Type
Acura	RLX Hybrid	Automatic (AM-S8)
Acura	MDX AWD	Automatic (S9)
Acura	ILX	Automatic (AM-S9)
Acura	NSX Hybrid	Automatic (S10)
Acura	RDX FWD	Automatic (AM-S7)
Aston Martin	V8 Vantage	Automatic (S6)

8) **Joining Vehicles with CO2 Emissions and showing the make, model, and CO2 emissions per fuel type:** This query provides detailed information on CO2 emissions by vehicle make, model, and fuel type. It allows for the identification of emission hotspots and facilitates targeted interventions to reduce emissions from specific vehicle categories.

Result Grid Filter Rows: Search Export:

Make	Model	CO2_Tailpipe_For_Fuel_Type1	CO2_Tailpipe_For_Fuel_Typ...
Acura	RLX Hybrid	29	306
Acura	MDX AWD	21	424
Acura	ILX	28	316
Acura	NSX Hybrid	21	420
Acura	RDX FWD	24	370

9) **Calculating average MPG for each transmission type:** MPG is a critical factor in determining vehicle fuel consumption and emissions. By calculating average MPG for different transmission types, stakeholders can identify opportunities for improving efficiency and reducing emissions through technology upgrades or behavioral changes.

Result Grid Filter Rows: Search Export:

Transmission_Type	Avg_MPG_Combined_Type1	Avg_MPG_Combined_Typ...
Automatic (AM-S8)	23.06785000	0.00000000
Automatic (S9)	23.37353333	0.00000000
Automatic (AM-S9)	27.92490000	0.00000000
Automatic (S10)	21.00000000	0.00000000

10) **Getting vehicles with the highest combined MPG by make:** Identifying vehicles with the highest combined MPG helps highlight manufacturers that prioritize fuel efficiency and emission reduction. This information can guide consumer choices and incentivize automakers to develop more environmentally friendly vehicles.

Result Grid Filter Rows:

Make	Max_MPG_Combined
Acura	29
Aston Martin	15
Audi	31

Overview of Procedures and Use Cases:

1) **Stored Procedure for Retrieving MPG Data by VehicleID:** Quickly retrieves MPG data for a specific Vehicle_ID, facilitating trend analysis with minimal input required.
2) **Stored Procedure for Inserting New Vehicle Entry:** Simplifies data entry by allowing easy insertion of new vehicle information into the Vehicles table, enhancing database update efficiency amidst a growing number of new vehicle entries.
3) **Stored Procedure to Calculate Total Annual Fuel Cost per Vehicle:** Swiftly computes estimated annual fuel costs by joining relevant tables, aiding in the examination of fuel cost trends alongside carbon emissions for effective emission reduction strategies.
4) **Stored Procedure to Generate Total Sum of CO2 Emissions:** Aggregates CO2 emission values across all vehicles, providing a metric for tracking progress towards reducing carbon emissions over time and aligning with organizational emission reduction objectives.
5) **Stored Procedure for Generating GHG Score Report:** Generates GHG scores for all vehicle makes and models, facilitating the analysis of the relationship between vehicles and their greenhouse gas emissions. Monitoring score changes over time informs progress towards emission reduction goals.

Overview of Triggers and Use Cases:

1) **Trigger for Creating Change Log on Fuel Cost Updates:** Automatically generates a change log capturing old and new values of fuel_cost following an update command. This log aids in monitoring fuel cost changes over time, facilitating the identification of market trends and informing emission reduction strategies.
2) **Trigger to Preserve Data Before Delete Command:** Safeguards against accidental deletion by storing deleted records in a log, ensuring the preservation of vital information in the event of inadvertent data loss. This measure maintains the integrity and security of the Vehicles table, safeguarding its valuable data.
3) **Trigger for Automatic Update of Vehicle_Size Table:** Dynamically updates the vehicle size classification in the Vehicle_Size table upon the addition of a new record to the Vehicles table. This automation assigns vehicle sizes (Small, Medium, or Large) based on specific column values, enabling swift analysis of how vehicle size influences carbon emissions and aiding in emissions reduction efforts.

Overview of Functions and Use Cases:

1) **Function to Identify VehicleID with Lowest CO2 Emission:** Efficiently identifies the vehicle with the lowest CO2 emissions in the dataset, providing valuable insights into emission trends and enabling the monitoring of emissions reduction progress over time.
2) **Function to Calculate Total Annual Fuel Cost by VehicleID:** Quickly computes the total annual fuel cost for a specific vehicle by simply providing its Vehicle_ID, streamlining the process of determining fuel expenses for individual vehicles.
3) **Function to Generate GHG Scores by VehicleID:** Enables users to swiftly retrieve the GHG score for a given vehicle using its Vehicle_ID, facilitating the selection of vehicles with high or low GHG scores for reporting purposes and aiding in emissions analysis and reduction efforts.
4) **Function to Obtain Average CO2 Emission by Fuel Type ID:** Rapidly calculates the average CO2 emissions for a particular fuel type using its Fuel Type ID, allowing users to efficiently gather emission data and estimate emission levels per vehicle model to inform emissions reduction strategies.
5) **Best GHG Score Calculator Function:** Quickly identifies the vehicle with the best GHG score, aiding in the selection of environmentally friendly vehicles and facilitating the assessment of changes in vehicle industry performance regarding emissions reduction over time.