BC2402 Designing and Developing Databases

2023/24 Semester 1

"The Era of Global Boiling has arrived"

Prepared By: Seminar 06, Group 6

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Question 11:
Is EV really green compared with various vehicle types? What about comparing EVs to alternative fuel vehicles?
Electric vehicles (EVs) are typically greener than traditional gasoline and diesel vehicles, According to the CO2 Emissions dataset, natural gas vehicles have lower average CO2 emissions compared to those running on diesel and gasoline, yet they still emit greenhouse gases during operation. EVs, in contrast, have zero tailpipe emissions, making them a more environmentally friendly option during the usage phase.

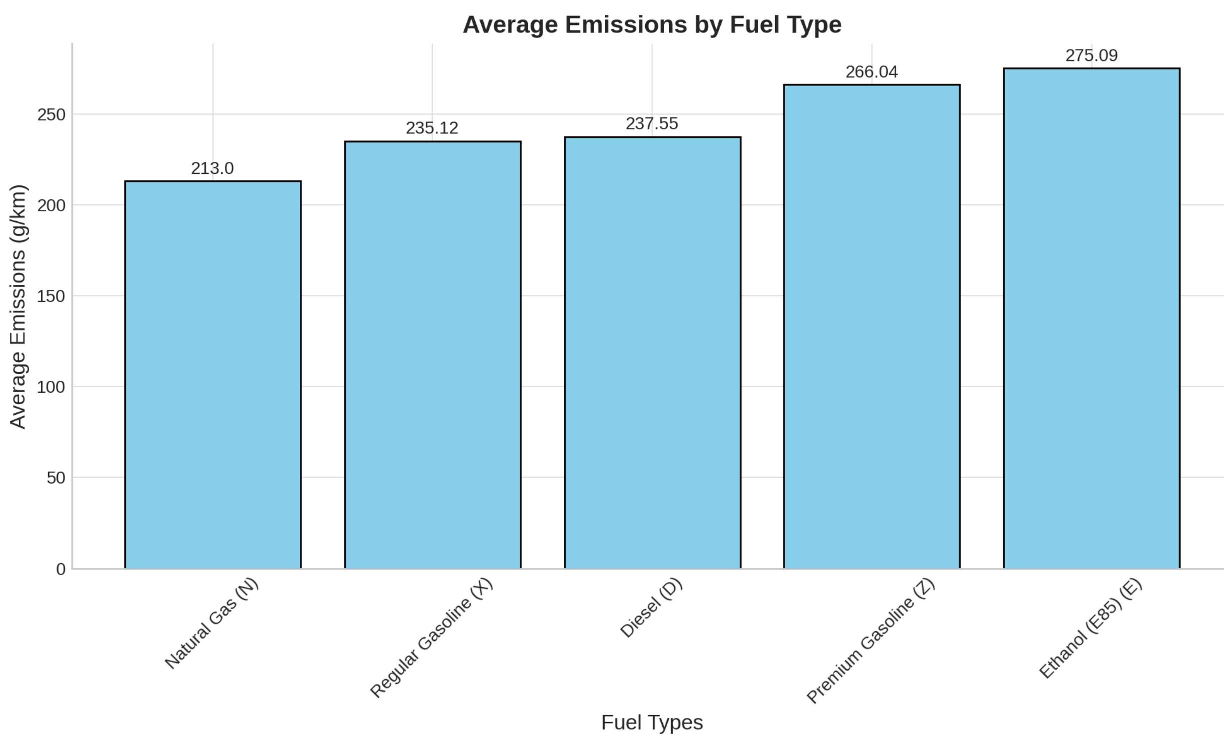

Figure 1: Average Emissions by Fuel Type

According to a consensus among experts, electric vehicles (EVs) generally exhibit a reduced carbon footprint throughout their lifecycle compared to traditional internal combustion engine vehicles. A study conducted by researchers from the universities of Cambridge, Exeter, and Nijmegen in The Netherlands revealed that, in 95% of the world, driving an electric car is more environmentally friendly than driving a gasoline-powered car.

Although many electricity grids worldwide still rely on fossil fuels like coal or oil, and the production of EV batteries remains energy-intensive, the overall environmental impact of electric cars is favourable. The Massachusetts Institute of Technology Energy Initiative conducted a study indicating that the emissions associated with the battery and fuel production for an EV are higher than the manufacturing of a conventional automobile. However, the superior energy

efficiency of EVs over time offsets these initial environmental costs; the total emissions per mile for electric cars are lower than those for comparable internal combustion engine vehicles.
The National Emissions Inventory Dataset also provides direct insights into emissions from the supply chain of EVs. It highlights the importance of a cleaner supply chain for the environmental friendliness of EVs.

When we include alternative fuels in the comparison, such as hydrogen, hydrogen fuel cell vehicles (FCVs) only emit water vapour when driven, presenting them as a clean alternative. However, research indicates that the lifetime cost of owning a hydrogen fuel cell car is around 40% higher than a comparable gasoline vehicle and about 10% more than an EV. EVs benefit from an existing electrical infrastructure, making them more practical for large-scale adoption. Hydrogen faces logistical and cost challenges, and the environmental impact of hydrogen production, especially when derived from natural gas, can be significant. If renewable energy sources can be used for hydrogen production, FCVs could offer a comparable environmental benefit to EVs.

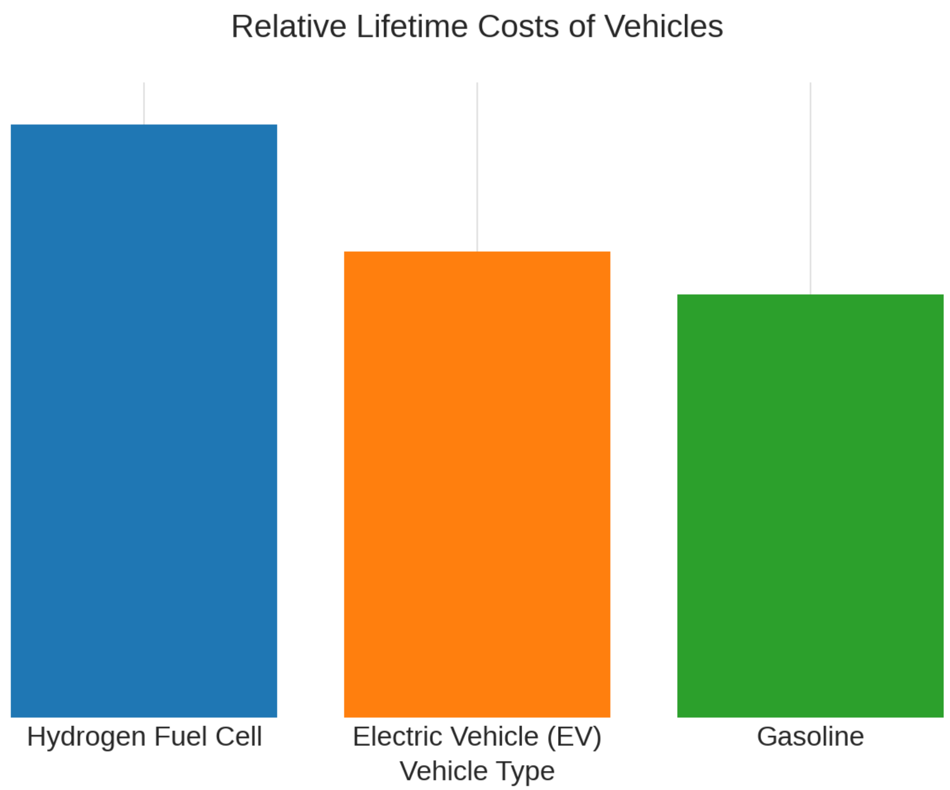

Figure 2: Relative Lifetime Costs of Vehicles

To sum up, EVs are greener than traditional gasoline and diesel vehicles and many alternative fuel vehicles when considering direct and lifecycle emissions. The comparative advantage of EVs is expected to increase with the ongoing decarbonization of the power sector. The continued growth in EV technology, infrastructure, and the shift towards renewable energy will likely cement EVs as a central element in the transition to sustainable transportation.

Question 12:
Does it make sense for Singapore to fully convert fossil-fuel vehicles to EVs?

The previous section highlights how EVs are greener and have lower emissions than traditional fossil-fuel vehicles. This is further supported by Figure 3 below, which shows that EVs (PHEV and BEV) have lower CO2 emissions relative to fossil-fuel vehicles.

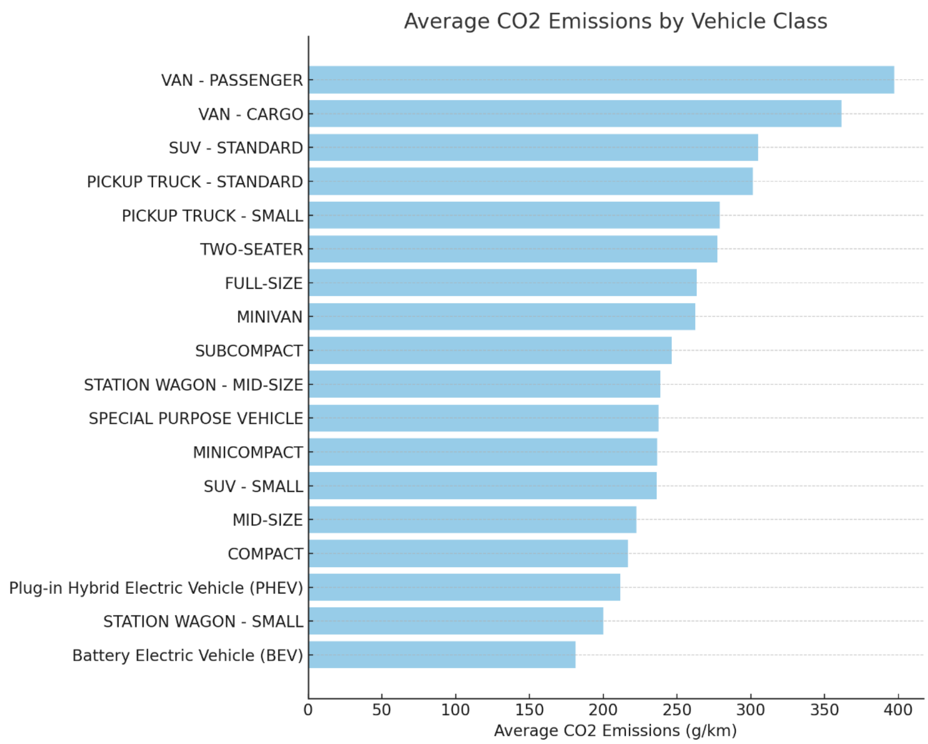

Figure 3: A bar chart showing the average CO2 emissions of various vehicle classes. Derived from CO2 Emission by Vehicles dataset. (*CO2 Emission by Vehicles*, 2020)

There are many factors that support Singapore pursuing a conversion to EVs. Firstly, climate change poses an existential threat to nations worldwide, and requires immediate and decisive action. For Singapore, a city-state with limited natural resources, the impetus to transition to a low-carbon future is not only environmental but also strategic. The Singapore Green Plan 2030 encapsulates this vision, charting a roadmap for national sustainability efforts and the achievement of long-term net zero emissions by 2050. Given the potential for EVs to reduce overall carbon emissions, adopting EVs is an effective strategy to address climate change. It also aligns with Singapore's sustainability goals and commitments to the United Nations 2030 Sustainable Development Agenda and the Paris Agreement.

Secondly, the move positions Singapore at the forefront of global sustainability efforts and opens avenues for economic opportunities within the burgeoning environmental, social, and governance (ESG) investment sector. The global shift towards ESG investing marks a transformative trend in the financial landscape. As a financially robust nation, Singapore is uniquely positioned to capitalise on the trend. By spearheading the transition to EVs, Singapore can attract ESG-focused investments, furthering economic growth. The nation's proactive stance in embracing EV technology also enhances its competitive edge, potentially establishing it as a hub for green technology and innovation.

What can be the important determinants for a successful conversion?

There are several determinants of Singapore's successful transition to EVs. Firstly, the availability of charging stations for EVs is crucial. Singapore's plan to roll out 60,000 charging points by 2030 will help in making these stations more accessible to EV users and promote the adoption of EVs (Lee, 2023). However, the placement of these stations is critical. They should be strategically located where they are most needed and where they can best support the existing and potential EV market. Furthermore, to maximise the effectiveness of EV adoption, the thorough consideration of cost-effective strategies for infrastructure development is vital. Collaborations with private enterprises for the construction and management of EV-related infrastructure can help the government to share the fiscal burden of development, while spurring economic growth. These partnerships can lead to job creation, stimulate the economy, and encourage innovation in sustainable technologies.

Secondly, the implementation of robust policies paired with attractive incentives is pivotal in spurring the adoption of electric vehicles. Strategies such as tax breaks, subsidies for EV purchases, or higher taxes on fossil-fuel vehicles create a favourable economic landscape for consumers to switch to EVs. They also underscore Singapore's commitment to a sustainable future. Such incentives could be complemented with educational campaigns to elevate public consciousness about the economic and environmental benefits of EVs to bolster consumer interest and acceptance. Sierzchula et al. (2014) found a strong positive correlation between financial incentives, the availability of charging infrastructure, and a nation's electric vehicle market share.

Current global leaders in EV adoption, such as Norway, demonstrate the benefits of an approach that comprises well-developed charging infrastructure and compelling financial incentives. The proportion of electric vehicles within Norway's fleet has doubled from 10% to 20% in under three years, a testament to the effectiveness of their strategies (Ummelas, 2022). Norway has successfully established fast charging stations on all its main roads. It also has a wide range of financial incentives such as tax and road toll exemptions, import duty waivers and free parking for EVs that cultivate a conducive environment for EV uptake (*Norwegian EV Policy - Norsk*

Elbilforening, 2023). By tailoring these strategies to local contexts and integrating lessons from global leaders, Singapore can maximise the success and effectiveness of EV adoption.

Lastly, as the greenness of EVs largely depends on the carbon intensity of the electricity used for charging, Singapore's energy mix is a vital factor. The effectiveness of adopting EVs can be enhanced through ensuring that a significant portion of Singapore's electricity supply comes from renewable energy sources. While EVs have zero tailpipe emissions, their manufacturing process, especially battery production, is energy-intensive. Singapore will also need to consider how to manage these lifecycle emissions, possibly by adopting battery recycling or other green manufacturing practices.

If you believe a full conversion is not feasible, what else can we do?

Large-scale adoption of EVs is likely to be feasible in Singapore, supported by favourable government policies and its affluent consumer base. Annual disposable income per capita in Singapore was US$28,000 (S$37,000) in 2020, and is expected to reach US$47,000 by 2030 (Ang, 2023). Thus, Singaporean consumers are better suited to purchase EVs despite the higher upfront costs, relative to traditional fossil-fuel vehicles.

However, a complete shift to EVs may not necessarily be the best strategy to adopt for Singapore. Yuen (2018) concludes that the adoption of battery electric vehicles (BEVs) in Singapore may not be currently desirable due to elevated social costs, nor likely, given the steeper private costs. The higher costs could disincentivise consumers from transitioning to EVs, particularly where the prevalent high-rise living diminishes the feasibility and cost savings of home-based charging solutions, leaving consumers dependent on more expensive communal charging stations.

In light of these considerations, if a complete conversion to EVs is deemed to be unfeasible, alternative strategies that incorporate plug-in hybrids or clean fuels, such as biofuel, could offer more immediate benefits while circumventing some of the limitations of BEVs. Additionally, investing in public transportation to make it a more viable option for the majority can also reduce the country's reliance on personal vehicles. Electrification of car-sharing fleets and ride-hailing services is also an effective strategy to increase access to electric transportation without the need for individual ownership.

In conclusion, the successful transition to EVs in Singapore hinges on the judicious consideration of the costs and benefits associated with various strategies and approaches of EV adoption. The government should consider the interests of various stakeholders, such as automotive industry players, energy providers, urban planners, and consumers. By engaging with these groups, Singapore can harness insights and foster a conducive environment for the EV market to thrive. While pursuing large-scale transition to EVs is a critical component in reducing transportation emissions in Singapore, it's not a panacea. It must be implemented as part of a broader strategy that includes increasing the share of renewable energy, improving energy efficiency across all sectors, and reducing overall energy consumption.

Question 13:
Singapore plans to roll out 60,000 charging points island-wide by 2030. Where should these charging stations be located? Substantiate your team's opinion with the data provided.

As of current, there are more than 3,600 charging points in Singapore, with another 12,000 to be installed across all Housing Board car parks by 2025 (Lee, 2022). HDB car parks were an immediate priority for this charging point roll out initiative because there was an inherent demand for charging points from the residential sector of Singapore. However, as this demand grows due to policy changes that encourage EV uptake, other sectors of Singapore would need their fair share of charging points. As such, the following analysis on the provided data set would shed some light on where the remaining 44,400 expected charging points should be located in Singapore.

Before deciding which sectors in Singapore should be a focus for this charging point initiative, identifying the state in which to draw insights from should be the first step. The decision for state selection from the provided data is based on the EV to EV station ratio and by using this selection criteria, we are able to identify which state should be compared to Singapore. States with a high EV to EV station ratio would be of interest because this indicates an EV uptake that is outpacing EV station development – which is a situation that Singapore is trying to avoid with this initiative.

From the provided data, there is only one state where the EV uptake far surpasses the EV station development, which is the state of Washington (State abbreviation: WA). For this state, the EV to EV station ratio is 62, which means that for every EV station, there are approximately 62 EVs.

According to chargepoint, which is the current leader of EV charging stations in the USA, there are 3 main types of charging ports available at their facilities as shown in the following diagram.

Type	Miles of Range Per Hour of Charging (RPH)	Time to Fully Charge	When to Use	Connector
Level 1, Standard Wall Outlet (AC)	5 RPH	+ 16 hours for an 80-mile battery + 40 hours for a 200-mile battery	+ Get some charge while you sleep Note: slower for cars with large batteries	Note: you'll need your own cable to plug in to the wall for Level 1
Level 2 Charging Station (AC)	+ 12 RPH for cars with 3.7 kW on-board charger + 25 RPH for cars with 6.6 kW on-board charger	+ 3.5 hours for an 80-mile battery + 8 hours for a 200-mile battery	+ At work + While you sleep + Topping up around town	J1772 connector
DC Fast Charging	100 RPH or more, depending on the power level of the charger + 24 kW (up to 100 RPH) + 44 to 50 kW (up to 200 RPH)	Depends on the power level of the charger and car model, but could be 80% charged within 30 minutes	+ Short stops + Express Corridor locations	SAE Combo (CCS) CHAdeMO Tesla

Figure 4: Types of EV Charging Stations

With charge times ranging from 30 minutes to 40 hours, coupled with the fact that the fastest charging option (DC Fast Charging) being an upgrade package that not all EVs enjoy, 62 EVs to every single EV station is a clear sign of charging point underdevelopment. Additionally, the state of Washington and Singapore share similarities in terms of maritime trade and technology based economies, thus further analysis on the state of Washington would be useful in determining where future EV charging stations in Singapore should be located.

By compiling the naicsCodes by sector level in the state of WA, the main drivers of the economy based on frequency are mainly the manufacturing industry and the transportation/warehousing industry. This indicates that a large majority of the populace of WA are associated with these industries, which translates to a large number of workers travelling from home to either manufacturing plants or transportation companies/warehouses. Relating this insight back to Singapore, the remaining 44,400 charging points should also meet the demand at workplaces and since both economies are similar, specifically targeting the same industries as WA is an appropriate course of action for this charging point initiative.

Using these insights, identifying the spread of manufacturing plants and transportation companies/warehouses in Singapore would be the next course of action. The following pictures give a general understanding on the spread of these industries in Singapore respectively.

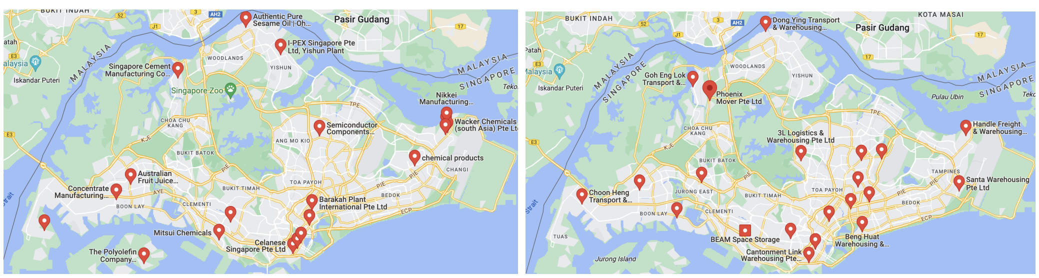

Figure 5: Spread of manufacturing plants and transportation companies/warehouses in Singapore

From these two Google images, there is an obvious pattern regarding industry placement. Both industries are typically situated around the perimeter of Singapore, with a slight concentration at the south as compared to the north. Accompanied by the fact that these areas are considered rural compared to the bustling central business district, the remaining 44,400 charging points should be built in these areas so that access to charging points is both optimised and fairly distributed to the populace of Singapore.

Question 14:
Would a general, robust adoption of EVs be adequate to turn around the climate crisis?

Based on our extensive research on the areas of Evs and climate crisis, it is not adequate to turn around the climate crisis but should be able to reduce the impact of climate crisis with the reason being carbon dioxide is one of the main causes for the climate crisis (NASA, 2023). Having EVs introduced and rolled out globally would help to reduce the emissions of carbon dioxide (CO_2). This is because the global transportation sector contributes largely to CO_2 emissions, releasing more than seven billion metric tons a year (Statista, 2022). Additionally, the group, cars and vans, was the major polluter of the global transportation sector, contributing 48% of CO_2 emissions for the global transportation sector (Figure 1) (Statista, 2022). Currently, there are 10.64 millions of EV sales worldwide and is expected to continue to rise (Figure 2) (Statista, 2023). This is also the same for charging stations (Figure 3) (Statista, 2023).

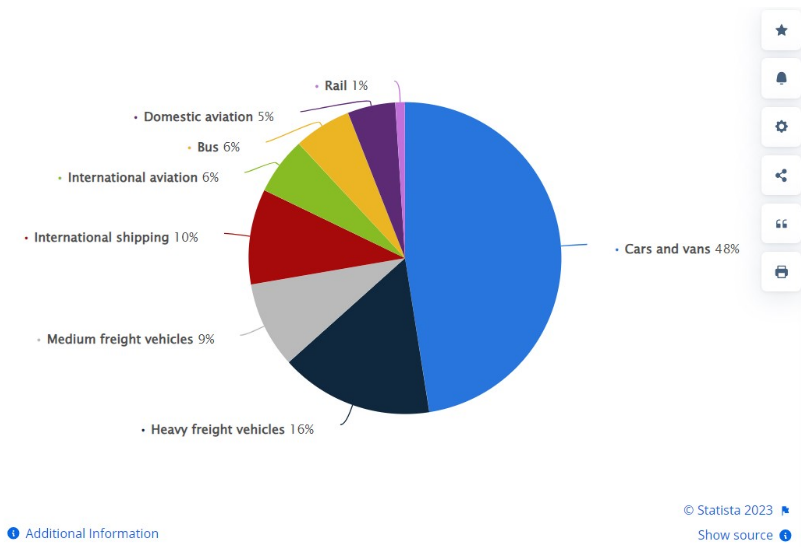

Figure 6: Cars and Vans CO_2 Emissions for 2022

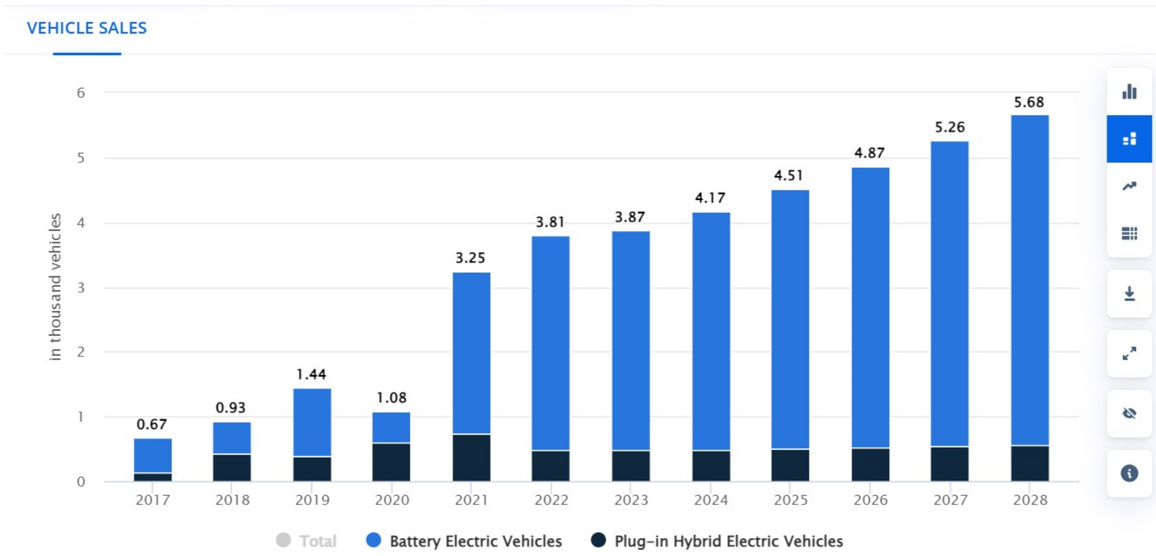

Figure 7: EVs Sales Volume

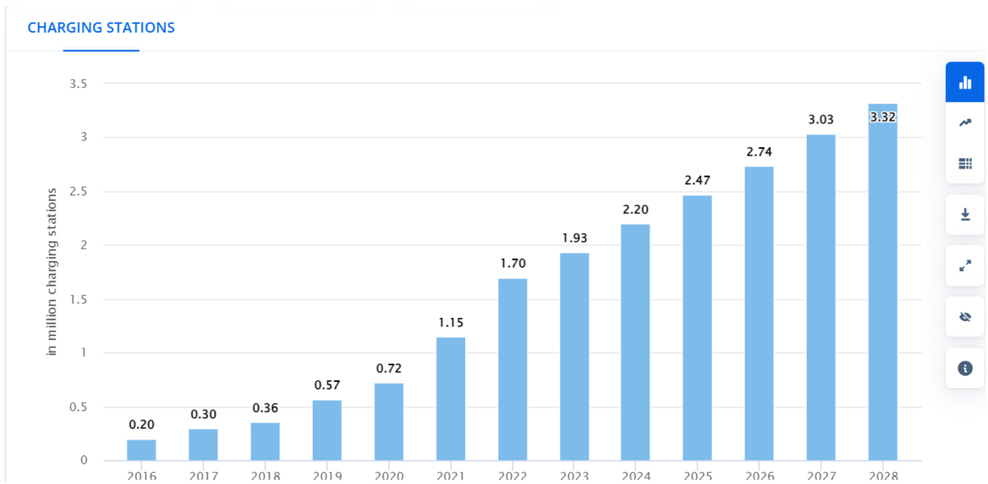

Figure 8: Number of Charging Stations

Our team analysed that an increase in EVs sales would definitely decrease the percentage of CO_2 emissions for the group, cars and vans, and the global transportation sector. This would further lead to a decrease in CO_2 emissions globally and reduce the degree of climate crisis. However, it might take several years to see a vast drop in the percentage of CO_2 emission as most people have the perception that petrol cars are much better than EVs. (Ceenergy News, 2022). Examples would be convenience and performance purposes. Hence, debunking the misconception is the top most priority and also not all electricity was generated from renewable energy.

Would electricity generation remain to be largely fossil-based, nonetheless?

In the short to medium term future, most projections tell us that electricity generated will continue to remain largely fossil-based, according to DNV's Energy Transition Outlook

(Lovegrove, 2023). This is because although renewables are on the rise - evidenced by record-breaking numbers of global EV sales and solar and battery installations in 2022 - they are merely meeting additional energy demand, and not replacing fossil fuels from the energy mix. Fossil fuels are thus still growing in absolute terms.

Using datasets from Statista (2023), it is possible to determine the percentage of world energy mix that comes from renewables, by taking the amount of world renewable energy consumption divided by the amount of primary energy consumption worldwide. Using data from 2000 to 2022, we do observe that the percentage has been rising, from a miniscule 0.725% in 2000 to 7.48% in 2022. This trend can be extrapolated to the year 2050 using exponential regression. The model forecasts renewables to make up about 36% of the world's total energy mix by 2050 (Figure 9). This means that the majority of energy will still originate from fossil fuel sources.

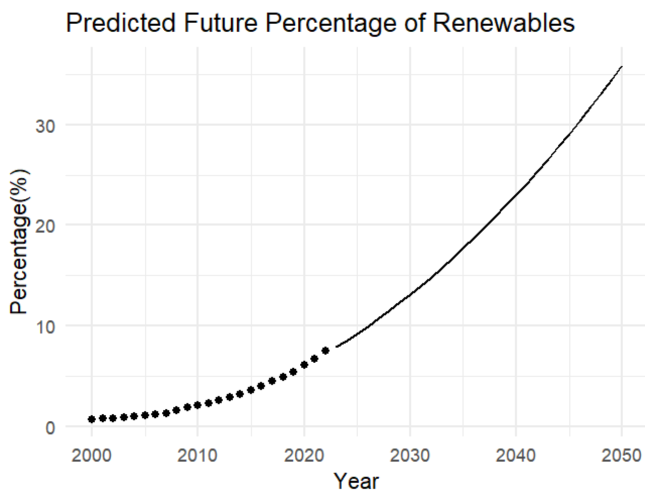

Figure 9: Predicted Future Percentage of Renewables

Despite the continued growth of the renewables market, it is seemingly unable to catch up to meet the world's energy needs based on the aforementioned forecasts. There are a few reasons for this, and the continued persistence of fossil fuels.

First, global economic growth, especially in the developing world, leads to higher energy consumption that renewables cannot keep pace with. For example, India has had sustained high year-on-year GDP growth for the past two decades (Statista, 2023). Developing countries often turn to traditional fossil fuels like coal and oil as they are more easily accessible and less expensive, and consider it unfair to be pushed into making the renewable transition before they achieve economic prosperity (Tongja, 2022).

Second, major hydrocarbon-producing countries, such as Russia, Iran and Saudi Arabia struggle to divest away from fossil fuels, being reliant upon such exports for the economy. With prices high and robust demand, there is no incentive to change track.

Third, some countries such as Germany pursue anti-nuclear policies. Nuclear power is a clean method to produce energy and can help to reduce fossil fuel usage. As renewables are still unable to produce at the scale that nuclear does, this leads to the burning of more coal. According to a MIT study (Chu, 2023), the closure of nuclear power plants will lead to the gap filled not by renewables, but by polluting energy sources that will adversely impact air quality.

What else can we do in the short term and long term?

For short term plans with the purpose of developing a good habit, one could first spread awareness to each other about the current situation about global boiling (transit from global warming) so as to understand the seriousness of it and serve as a motivation to take immediate action. Furthermore, one can also minimise carbon footprint in our daily lives by using energy-efficient appliances (i.e. using those with very good or excellent energy efficiency rating from the energy label (Figure 5)).

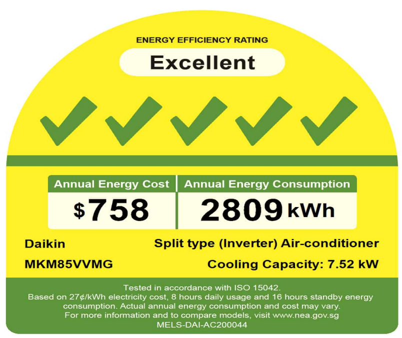

Figure 10: Energy label

In the long term, decarbonisation needs to occur at multiple levels. It is thus important to explore and identify the various sources of carbon emissions and their respective contributions. In the transport sector, aside from road vehicles, aviation accounts for approximately 10% of transport-related carbon emissions (Statista, 2023). Additionally, planes also emit methane, an even more potent greenhouse gas than carbon dioxide (Moseman, 2023). As such, it is important that actions be taken to cut down aviation emissions. However, electrification of aircrafts is not feasible due to the weight of the battery (Kamal and Chang, 2021). As such, major manufacturers such as Airbus and Boeing should look into sustainable aviation fuel (SAF) and hydrogen to fuel future aircraft.

While electrification is a major trend, evident in the uptick in EV numbers, it means that the energy source of our electricity grid has to change in order for it to be meaningful. This will require more adoption of renewable energy sources. The best form of alternative renewable energy source actually depends upon the regional and local context of the place in question. For example, solar, wind and geothermal energy all rely on existing geography to harness and convert into useful energy.

Lastly, governments can also improve the adoption of nuclear energy. It has proven to reduce emissions, as evident in how Germany with anti-nuclear policies has about twice the amount of per capita emissions (Lafrance and Wehrmann, 2023) as neighbouring France, where over 70% of electricity generation comes from nuclear power.

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Appendix

Fuel Type	Average Emissions
Natural Gas (N):	213.00 g/km
Regular Gasoline (X):	235.12 g/km
Diesel (D):	237.55 g/km
Premium Gasoline (Z):	266.04 g/km
Ethanol (E85) (E):	275.09 g/km

Key suppliers of Tesla	Total Emissions (Tonnes)
'Allegheny Techs. Co'	'696759.21'
'Albemarle Corporation'	'181510645.4266252'
'Nucor Corporation NA (51%); Yamato Kygyo (49%) Japan'	'788384307.3008401'
'NUCOR CORPORATION'	'690080576.4438449'
'DANA HOLDING CORP'	'14286017.403919442'
'ALBEMARLE CORP'	'14401249.077466112'
'ALLEGHENY LUDLUM STEEL CORP'	'131832353.22932'
'NUCOR CORPORATION'	'365754945.8666524'
'Vulcraft - Division of Nucor Corporation'	'206757.691494'
'Albemarle Corp'	'76847.50426'
'Schneider Electric USA Inc.'	'8387'
'SCHNEIDER ELECTRIC'	'25458.420586900003'
'ALLEGHENY WOOD PRODUCTS INTERNAITONAL INC.'	'253631.58413810996'
'ALBEMARLE CORPORATION'	'348681867.0148833'
'Nucor Steel'	'413391470.4165009'
'Micron Technology Inc'	'42674133.089080006'
'ALLEGHENY LUDLUM LLC'	'261147731.9151966'
'NUCOR STEEL AUBURN INC'	'245787727.658596'

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'TDY Industries a division of Allegheny Technologies Inc'	'135867775.824986'
'ALLEGHENY & TSINGSHAN STAINLESS LLC'	'1299408.30743564'
'Nucor Steel'	'724231314.9775479'
'IAC Albemarle LLC'	'76615567.90677999'
'ALLEGHENY TECHNOLOGIES INC'	'221'
'Schneider Mill Inc.'	'4595.6606'
'Emerson Electric Co.'	'19581.75963512'
'J R SCHNEIDER COMPANY INC'	'2.7980840000000002'

Supply Chain	**Sum of total emissions (Tonnes)**
'Automotive Body Paint and Interior Repair and Maintenance'	'344676.391846192'
'All Other Automotive Repair and Maintenance'	'4.7738715759999995'
'Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance'	'24471.886517571977'
'General Automotive Repair'	'3625.9809924660003'
'Motor and Generator Manufacturing'	'154063.1682407611'
'Automotive Parts and Accessories Stores'	'39.836299956000026'
'Motor Vehicle Metal Stamping'	'131626.97327240257'
'Motor Vehicle Body Manufacturing'	'1101782.1322261824'
'Metal Crown Closure and Other Metal Stamping (except Automotive)'	'187625.1095237721'
'Motor Vehicle Gasoline Engine and Engine Parts Manufacturing'	'105113.258160374'
'Bus and Other Motor Vehicle Transit Systems'	'15294.611334043'
'Other Motor Vehicle Parts Manufacturing'	'1108529.9682271606'
'Motorcycle ATV and All Other Motor Vehicle Dealers'	'889.131470992'

'Automotive Glass Replacement Shops'	'97.71457234'
'Automobile and Other Motor Vehicle Merchant Wholesalers'	'8378.73050465398'
'Motor Vehicle Brake System Manufacturing'	'91443.29154084701'
'Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing'	'109295.8176396539'
'Automobile Manufacturing'	'8674183.408138698'
'Motor Vehicle Transmission and Power Train Parts Manufacturing'	'142632.35227924262'
'Motor Vehicle Electrical and Electronic Equipment Manufacturing'	'194284.85968359266'
'Motor Home Manufacturing'	'396436.46866907994'
'Other Automotive Mechanical and Electrical Repair and Maintenance'	'34.07627463219999'
'Motor Vehicle Parts (Used) Merchant Wholesalers'	'1168.903227530001'
'Motorcycle Bicycle and Parts Manufacturing'	'42663.688014635016'
'Automatic Environmental Control Manufacturing for Residential Commercial and Appliance Use'	'14472.678591178099'
'Fluid Power Pump and Motor Manufacturing'	'37656.495903137984'
'Motor Vehicle Seating and Interior Trim Manufacturing'	'18197.079834871696'
'Automobile and Light Duty Motor Vehicle Manufacturing'	'15.2497865'
'Motor Vehicle Supplies and New Parts Merchant Wholesalers'	'1198.129888125'
'Transportation Equipment and Supplies (except Motor Vehicle) Merchant Wholesalers'	'973.2138466129996'
'Motor Vehicle Parts Manufacturing'	'429.8697228330001'
'Automotive Transmission Repair'	'0.32870061'

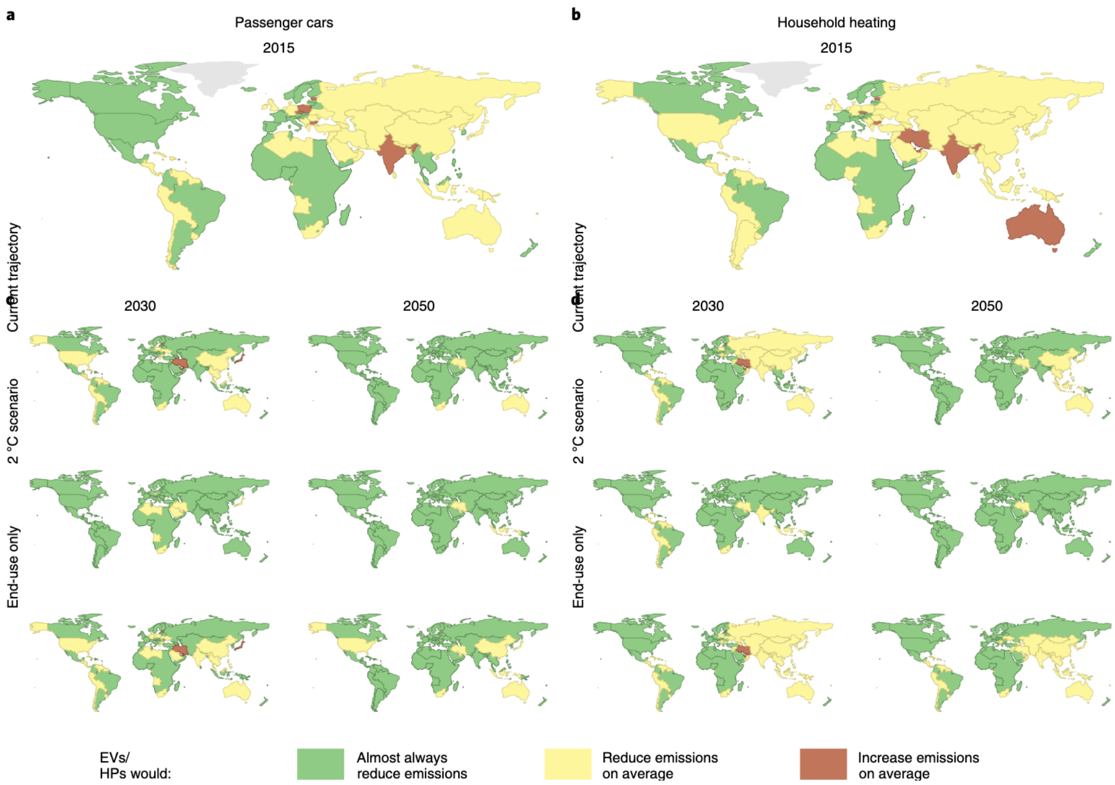

Fig. 5 | Relative GHG emission intensities of EVs and HPs around the world. a,**b**, World regions in which EVs (**a**) and HPs (**b**) have lower projected life-cycle GHG emissions than new petrol cars/fossil boilers in almost all cases (green) or on average (yellow), or are more GHG emission intensive on average (red). **c**,**d**, Projections for 2030 and 2050 for EVs (**c**) and HPs (**d**) under the current technological trajectory (current trajectory), the 2 °C policy scenario (2 °C scenario) and the end-use without power policies scenario (end-use only).

BC2402 Group Project – Task Allocation

S/N	Tasks	Member(s) In-charge
1	*[relational database] SQL development (specific to query 1 to 4)*	*Teo Wei Pin*
2	*[relational database] SQL development (specific to query 3 to 6)*	*Ng Chun Quan*
3	*[relational database] SQL development (specific to query 5 to 8)*	*Patel Dhairya Nayanbhai*
4	*[relational database] SQL development (specific to query 7 to 10)*	*Ian Koh Jin*
5	*[relational database] SQL development (specific to query 9 to 10, 1 to 2)*	*Jain Yash*
6	*[nonrelational database] SQL development (specific to query 1 to 4)*	*Teo Wei Pin*
7	*[nonrelational database] SQL development (specific to query 3 to 6)*	*Ng Chun Quan*
8	*[nonrelational database] SQL development (specific to query 5 to 8)*	*Patel Dhairya Nayanbhai*
9	*[nonrelational database] SQL development (specific to query 7 to 10)*	*Ian Koh Jin*
10	*[nonrelational database] SQL development (specific to query 9 to 10 & 1 to 2)*	*Jain Yash*
11	*[Open-ended question using provided data] (specific to query 11)*	*Jain Yash*
12	*[Open-ended question using provided data] (specific to query 12)*	*Patel Dhairya Nayanbhai*
13	*[Open-ended question using provided data] (specific to query 13)*	*Ian Koh Jin*
14	*[Blue-sky question] (specific to query 14: Would a general, robust adoption of EVs be adequate to turn around the climate crisis? & What else can we do in the short term and long term?)*	*Ng Chun Quan*
15	*[Blue-sky question] (specific to query 14: Would electricity generation remain to be largely fossil-based, nonetheless? & What else can we do in the short term and long term?)*	*Teo Wei Pin*