A photograph of a city street with cars in traffic, overlaid with an orange semi-transparent rectangle containing white text. The text asks, "How important is the change to electric cars?".

**How important
is the change
to electric cars?**

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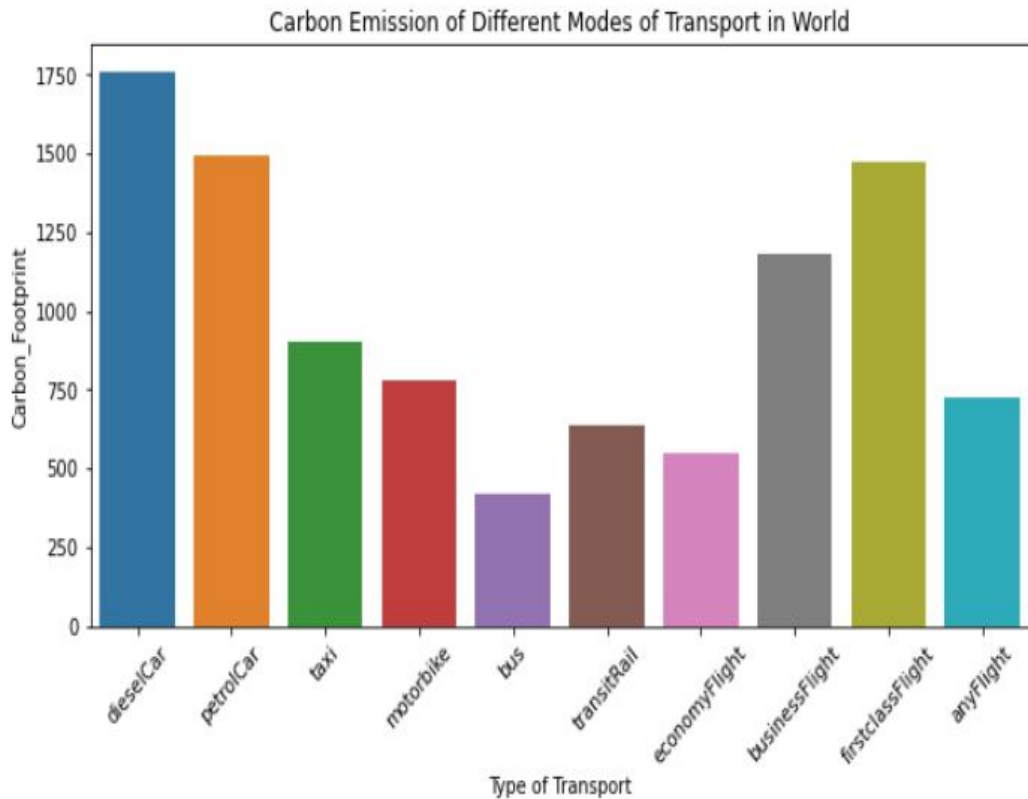
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FINAL CONCLUSIONS

Introduction



Global warming, Carbon Emissions, Environmental pollution have become recurring topics raising everyday questions like what can we do to help?

- ❖ We found an API showing carbon footprints from different modes of transport around the world.

See [main.ipynb](#) for details

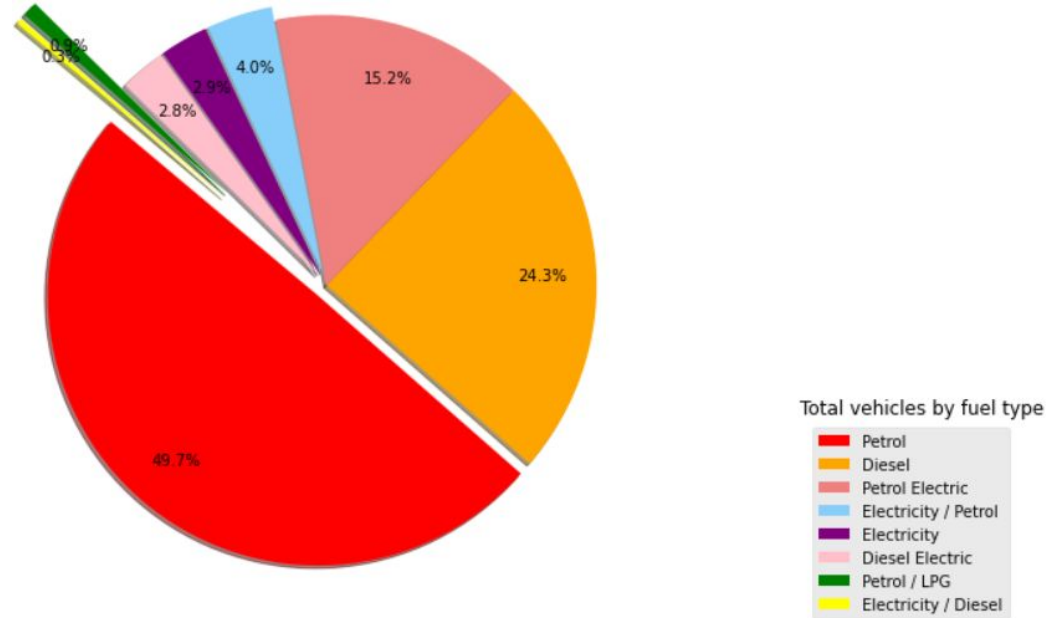
- ❖ How can we help you ask? Perhaps consider going electric!

Data Exploration and Cleaning

- ❖ We found data from <https://carfueldata.vehicle-certification-agency.gov.uk/> containing various information from cars across Europe.
- ❖ Initial data exploration was done to better understand and visually identify anomalies in the data.
- ❖ There were errors and inconsistencies in our data and had to be corrected for example:
 - a) Two different columns for CO2 emissions that needed to be combined into one
 - b) Inconsistent use of the THC + NOx Emissions [mg/km] column which needed to be corrected.

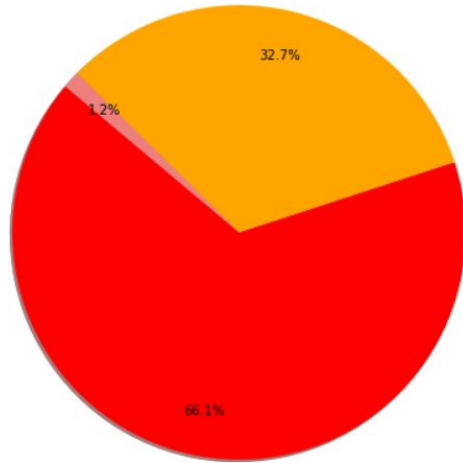
What are the most popular fuel types?

- ❖ This chart represents the results of our analysis of the overall popularity of fuel type
- ❖ As our chart shows, the most popular fuel type is Petrol giving us an average of 49.7% of overall popularity through the years followed by diesel with 24.3%

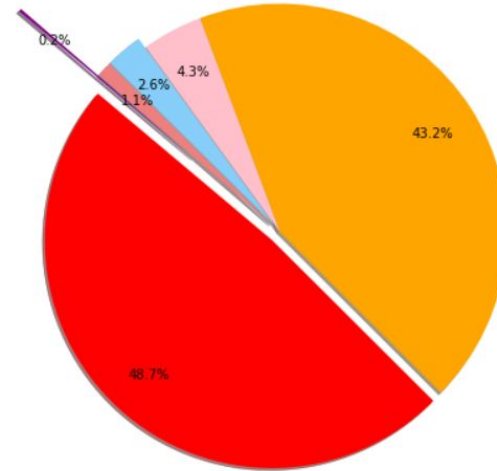


2019 VS 2020

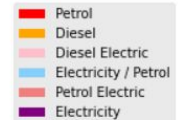
It is noticeable that a slight shift of fuel type usage occurred in the year 2020 compared to the year 2019. Consumers started switching to more hybrid fuel type, although the change is slight as petrol and diesel are still the most popular in these years.



Total vehicles by fuel type 2019

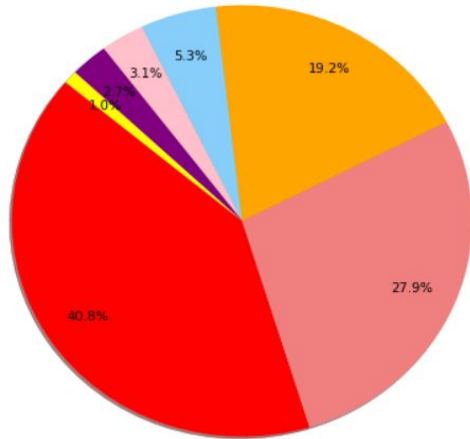


Total vehicles by fuel type 2020

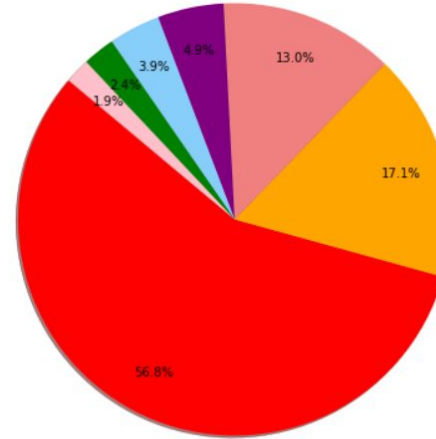


2021 VS 2022

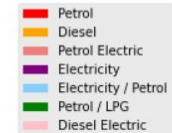
In the year 2021 hybrid fuel type, petrol electric, massively increased in usage, becoming the second most popular fuel type after petrol. Purely electric fuel type started gaining more popularity, in the same year, however is still remains one of the least used fuel types. The data of the year 2022 shows us that once again diesel has taken the second lead in popularity, however this data is incomplete since the year has not ended.



Total vehicles by fuel type 2021

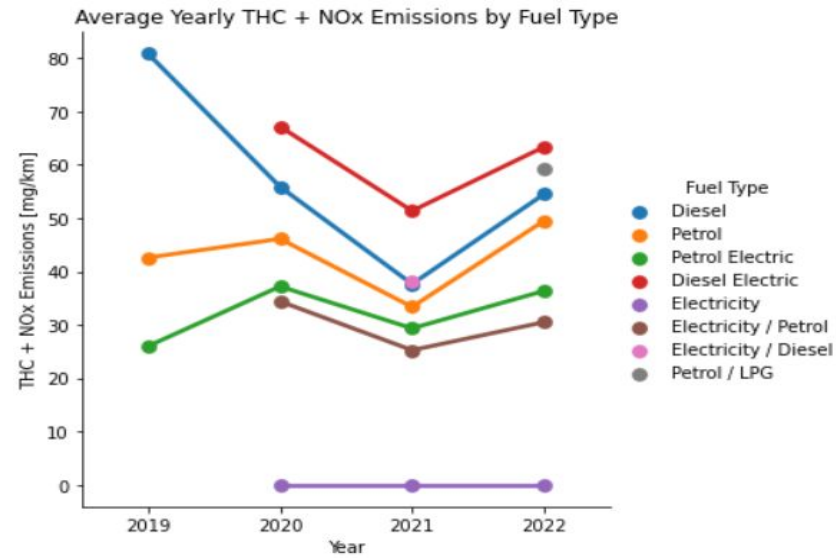
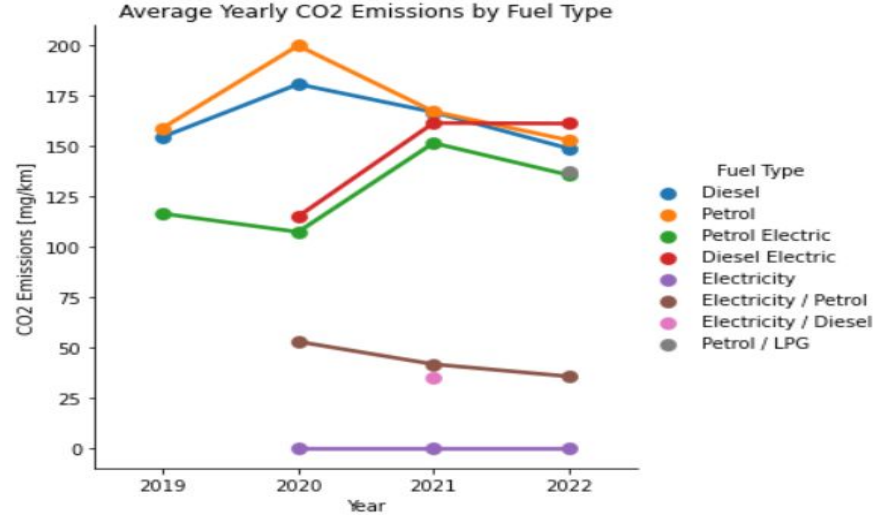


Total vehicles by fuel type 2022

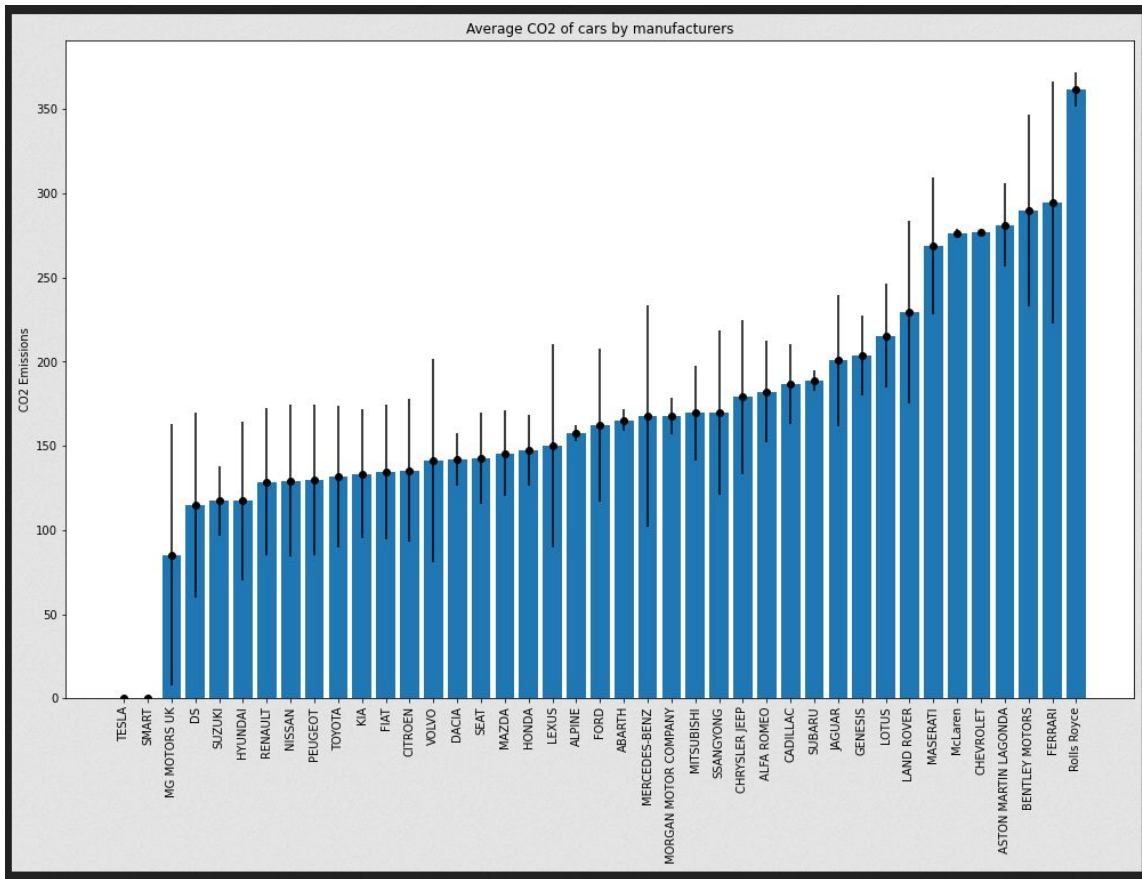


Average Yearly Emissions

- ❖ To further collaborate our initial observations, Diesel and Petrol cars are shown to give off the highest year on year emissions.
- ❖ On the flip side, the lowest emissions were observed to be coming from electric cars yearly.
- ❖ Worthy of mention also is the fact that NOx emissions, which research has shown to be more harmful than CO2 are on the rise.



Comparing Manufacturers by Emissions



This graph plots mean and SD to show the diversity of manufacturers.

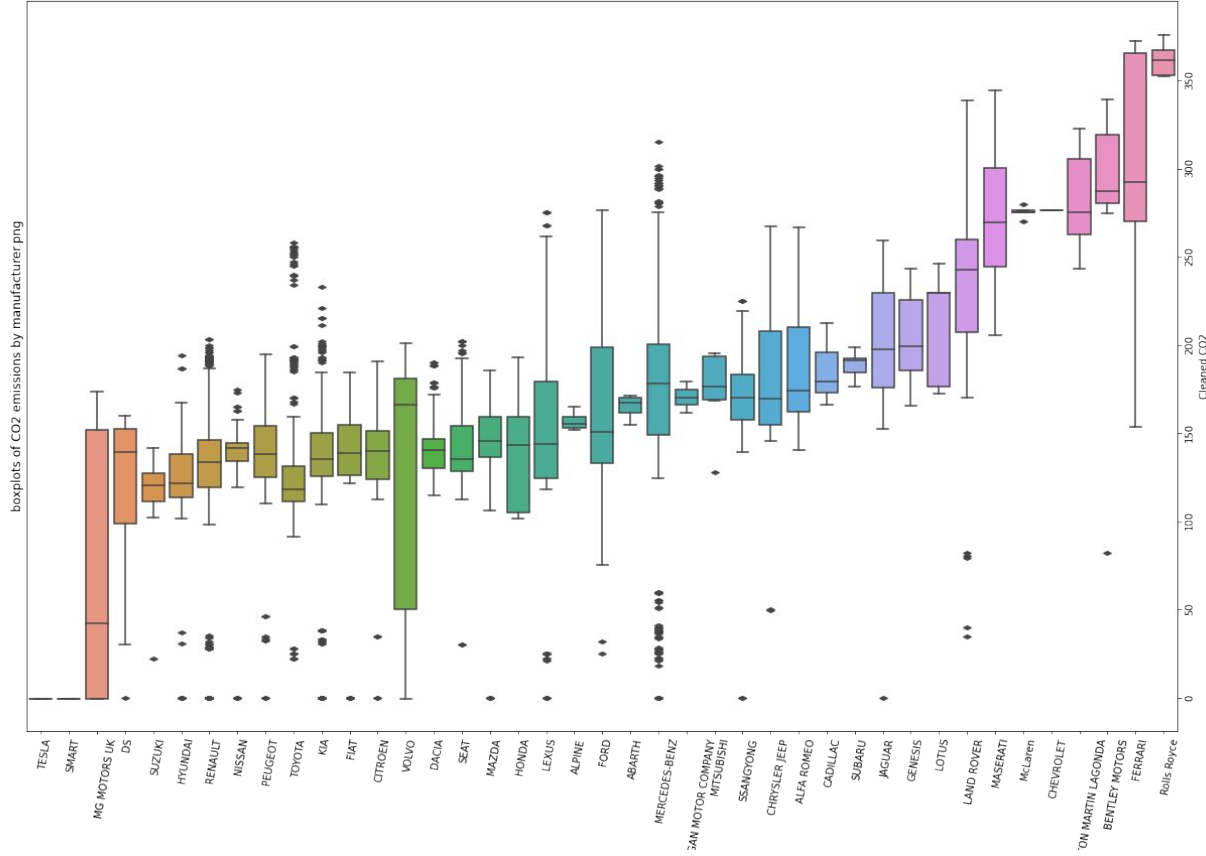
Most manufacturers produce vehicles with a wide variety of emissions. Cars with low or zero emissions are still mostly outliers, showing there is some choice for consumers, but very little compared to the large swathe of cars between 100-200 CO2.

In order for carbon emissions to come down, electric and hybrid cars will have to become the normal model of production, not an outlier.

Comparing Manufacturers by emissions

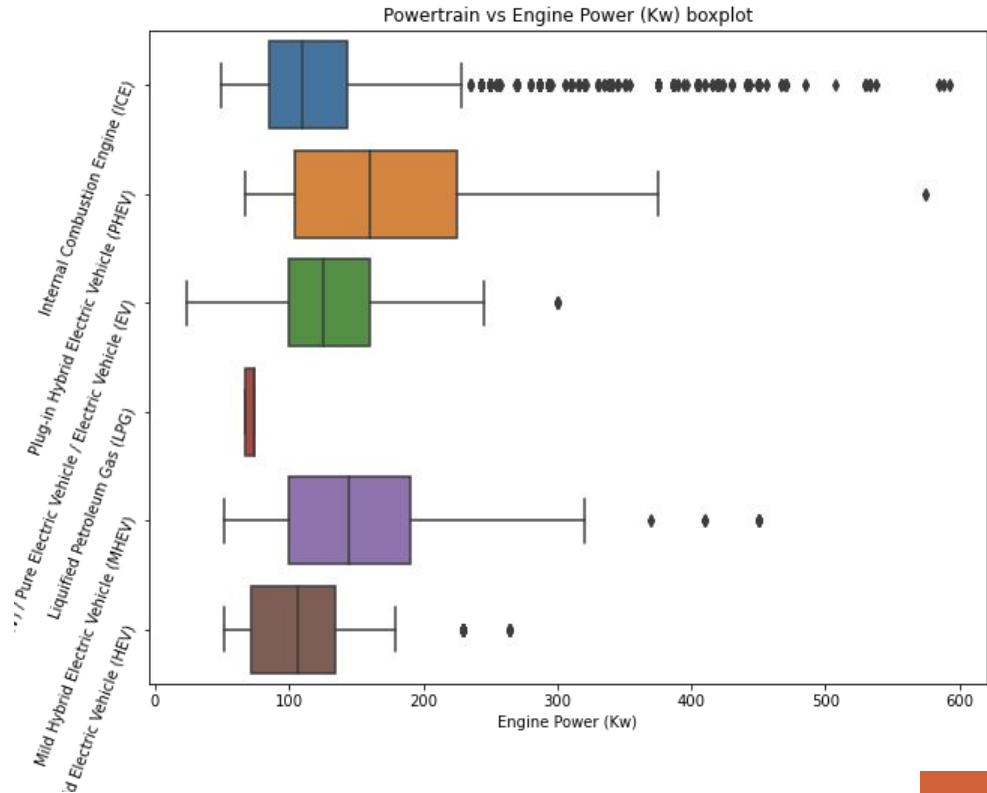
This graph represents the same data, but with more detailed box plots. This shows how many outliers exist in the data.

Many manufacturers produce zero carbon vehicles, but they are often token gestures.



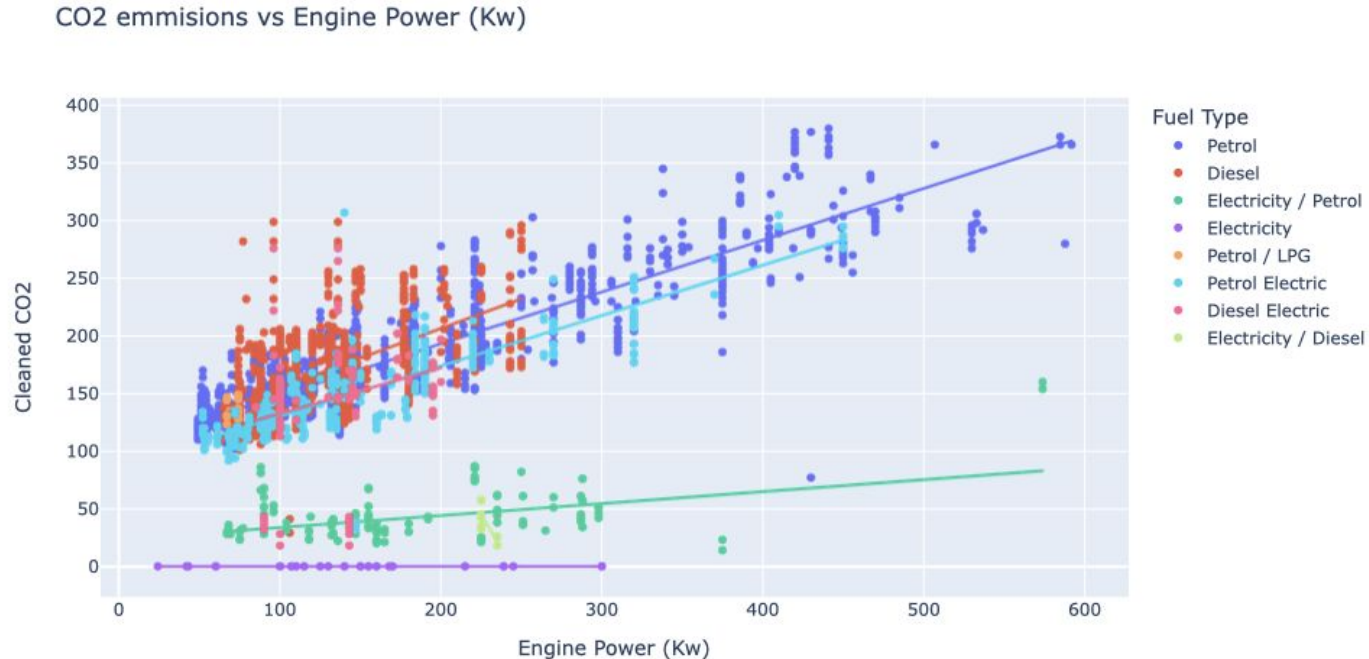
The Future is Electric Power

- 6 different types of engines
- Internal combustion engines have a wide range of power output
- Smaller range of engines for electric vehicles



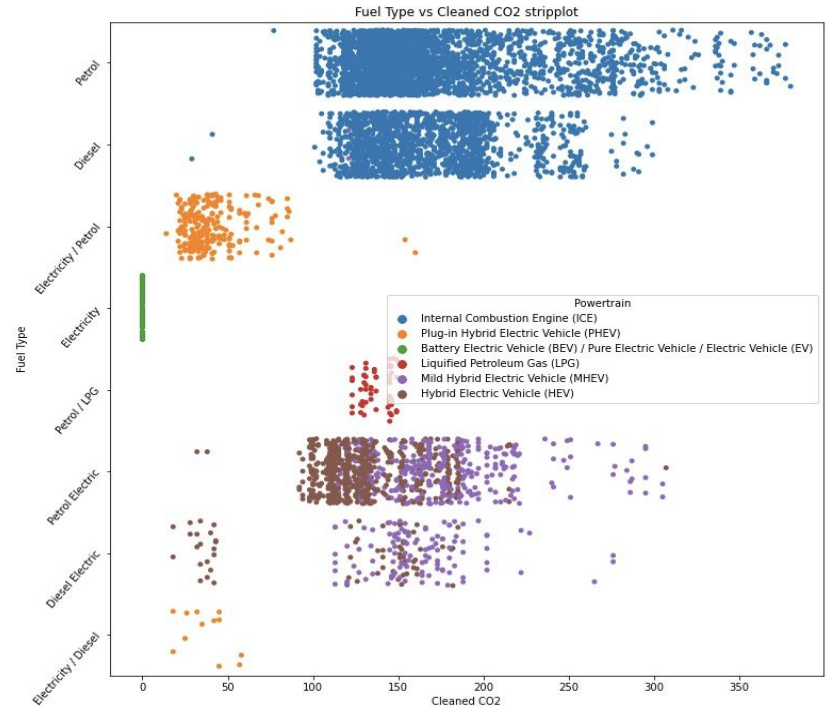
The Future is Electric Power

- For electricity powered cars, CO₂ emissions remain zero with increasing engine power
- Electric cars with engines below 300 kw outperform other types of engines
 - Can cars with bigger electric engines be produced?



The Future is Electric Power

- Petrol and diesel powered internal combustion engines can not produce less than ~ 100 mg/km CO₂
- This is the limit, any further reduction can only be done by switching to electric fuel type



Final Conclusions:

- There is a limit to how clean fossil fuels can be, and even hybrid cars are not as clean as pure electric (section 6).
- The Co₂, THC, and NO_x emissions of vehicles is not falling fast enough (section 4).
- The availability of pure electric and hybrid cars is small, but growing (sections 3 and 5)
- **Finally**, because of the above three conclusions, and in light of the opening data regarding the contribution of internal combustion engines to climate change, moving to electric cars should be a priority. Their production and purchase should be encouraged ahead of petrol and diesel cars

Two caveats:

- Li-Ion batteries for cars are going to be a limiting factor; governments must ensure that Lithium can be responsibly sourced [<https://www.theguardian.com/news/2020/dec/08/the-curse-of-white-oil-electric-vehicles-dirty-secret-lithium>].
- The infrastructure to support electric cars - including large amounts of renewable electricity - must be put into place [<https://www.wwf.org.uk/updates/how-do-i-charge-my-electric-car-renewable-energy>]



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**ANY
QUESTIONS?**

A photograph of a city skyline at sunset. The sky is a mix of blue and orange. Dark smoke or clouds are rising from the city, forming a large heart shape in the upper half of the image. The city lights are visible in the lower half, partially obscured by a semi-transparent orange rectangle.

Thank you!

David, Kudzanai, Chisimnulia, Emmanuela