DataW

Data source:

1.Energy-Related Carbon Dioxide Emissions at the State Level.(Data: table3 2014 State energy-related carbon dioxide emissions by sector)
https://www.eia.gov/environment/emissions/state/analysis/

2. Annual Emissions per Vehicle. (Data: all electric vehicle emission: 4587 pounds of CO2 equivalent. Gasoline vehicle emission: 11435 pounds of CO2 equivalent)
http://www.afdc.energy.gov/vehicles/electric_emissions.php#whee

3. Carbon dioxide price(Page 29). (Data: $ 22.36 per tons)
http://www.synapse-energy.com/sites/default/files/SynapseReport.2014-05.0.CO2-Price-Report-Spring-2014.14-039.pdf

4. Electric cars percentage in 2014(Page 36, Table9). (Data: 190.84 thousands)

https://www.iea.org/publications/freepublications/publication/Global_EV_Outlook_2016.pdf

5. Number of vehicles registered in the U.S..

https://www.statista.com/statistics/183505/number-of-vehicles-in-the-united-states-since-1990/

Data wrangling:

We use **table3.pdf** to do the data wrangling. The python script is **wrangling.py**. And we save the data result in **stateAnnual.json , stateEmission.json , stateList.json** . We use pdftables to get “electrical power”and “transportation”of each state. And combine this data with other data as listed above, to make data analysis.

Data analysis:

The leading question is: how electrical vehicles changes the U.S.?We all know that electrical vehicles have environmental benefits rather than gasoline vehicles. However, if we have more and more electrical vehicles to replace gasoline vehicles, we would like to know: how much CO2 emissions do electrical vehicles reduce exactly? What is the difference between different states?These questions are what we want to analyze, and want to show in our project.

From Data4 and Data5. We find that the percentage of all electrical vehicles is lower than 0.3%, so we estimate it as 0% in the calculation. For each state, we already has the CO2 emission from electrical power and transportation. We use it to compare with total electrical power and transportation power, then we have E(electrical power)/ E(electrical power total) and E(transportation)/ E(transportation total). Suppose the whole number of electrical car in the country is #EV, then the distribution of #EV in different states are different. For the states who have higher electrical power emission, which means they may have more power stations, so they will supply to more EV. We understand it as when #EV is rising , these states have more emission. For the states have lower electrical power emission, the situation is the opposite. The way to understand “transportation” data is almostly the same. When the #EV is rising, the #GV(number of gasoline vehicle) is declining in a same amount, because GV replace EV). For the states who have higher transportation emissions, which means this state have a high gasoline vehicles base. We understand it as these states will reduce more gasoline vehicles than other states.For the states have lower transportation emission, the situation is the opposite.

From Data2. We have annual emission per Vehicle. Because EVs running only on electricity have zero tailpipe emissions, but emissions may be produced by the source of electrical power. So the EV emission data here is equivalent to the emission of producing electrical power.Then we have two data: PerEV and PerGV.

For each state, we have these data：

Total Emission of this state - Etotal

Annual emission per Electrical Vehicle - PerEV

Annual emission per Gasoline Vehicle - PerGV

Total number of EV in the U.S. - #EV

Total declined number of GV in the U.S - #GV = #EV(replacement)

The emission percentage of electrical power: E(electrical power)/ E(electrical power total) = Ep

The emission percentage of gasoline vehicle: E(transportation)/ E(transportation total) = Et

Then, we get this equation for each state:

Etotal = Emission of all GV + Emission of all EV

= (E(transportation total) - PerGV * # GV in this state + PerEV * # EV in this state

= (E(transportation total) - PerGV * #EV * Et + PerEV * #EV * Ep

So, all we need is to set the value of #EV. We change #EV to get the final result.

Besides all the things above, we use Data3. Carbon dioxide price to create another

Graph, the money saved for each state. We know that the government have to pay for the emission of CO_2, which means reducing an amount of emission is equivalent to saving an amount of money.

Data visualization:

The visualization file is **us_map.html**. And css file is **style.css**. We use google charts to visualize our project.