A Compounding Problem: The Atmospheric Impacts of Global Industrialization

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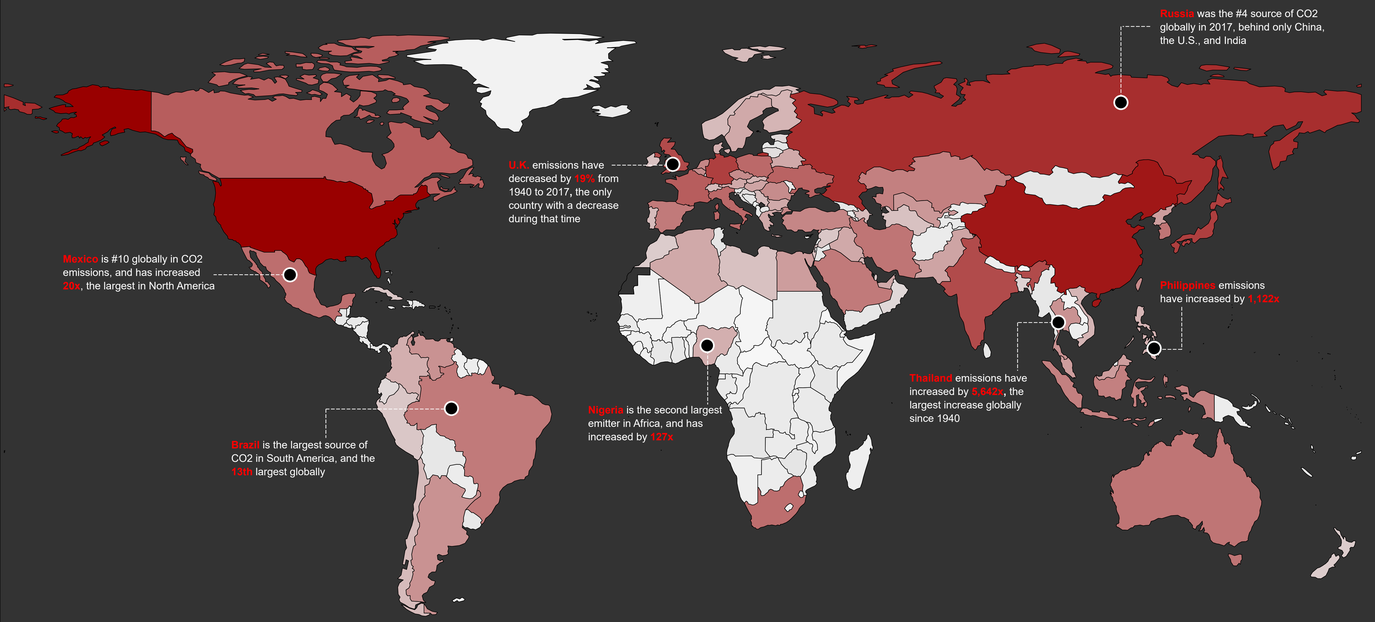
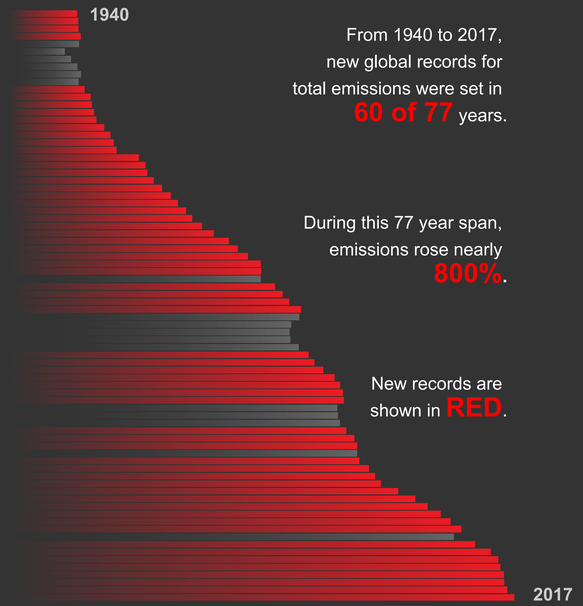
IST719 - Data Visualization
Source: http://www.globalcarbonatlas.org/en/CO2-emissions

Greenhouse Gas Emissions (CO2) from 1940 to 2017





From 1940 to 2017, new global records for total emissions were set in **60 of 77** years.

During this 77 year span, emissions rose nearly **800%**.

New records are shown in **RED**.

Narrative

Carbon Dioxide (CO2) is an important component to global climate change, as increased levels of CO2 attribute to increasing global temperatures. CO2 restricts the ability of solar energy to be reflected back into space, and has been imperically linked to global warming.

While CO2 emission is a natural occuring process, human activity such as deforestation, land use changes, burning of fossil fuels, and idustrial farming have been shown to increase the amount of CO2 present in the atmosphere, thus contributing to global warming.

Questions

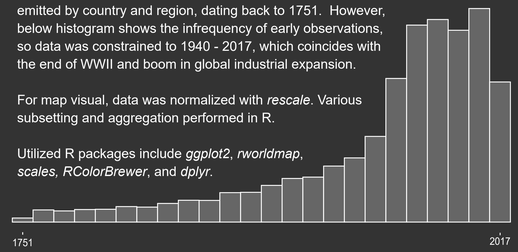
- How have global CO2 emissions changed since the World War II era?
- How are CO2 emissions distributed by country and/or geographic region?
- Which countries and/or regions show the highest rate of change from 1940 to 2017?
- Which countries and/or regions are responsible for the majority of CO2 emissions?

Data Description

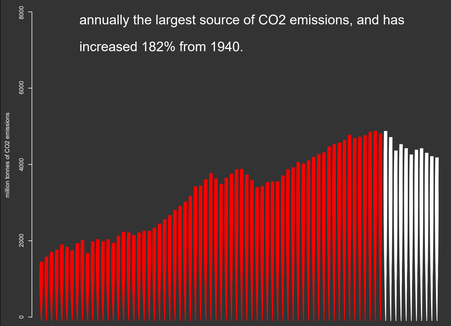
Data was obtained from the Global Carbon Atlas, which lists CO2 metric tonnes emitted by country and region, dating back to 1751. However, below histogram shows the infrequency of early observations, so data was constrained to 1940 - 2017, which coincides with the end of WWII and boom in global industrial expansion.

For map visual, data was normalized with *rescale*. Various subsetting and aggregation performed in R.

Utilized R packages include *ggplot2*, *rworldmap*, *scales*, *RColorBrewer*, and *dplyr*.

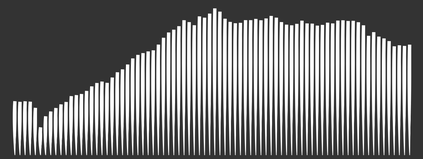


From 1940 to 2006, the **United States** was annually the largest source of CO2 emissions, and has increased 182% from 1940.



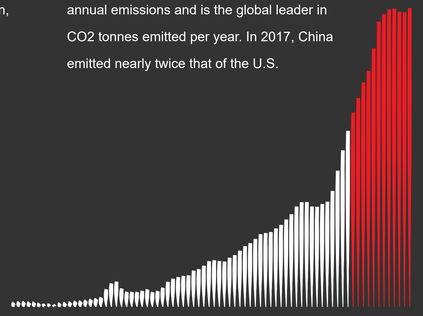
United States

Up till 2006, the **European Union** was the second largest source of CO2 emissions annualy. Over that span, the E.U. emitted roughly twice the amount of all non-E.U. European countries combined



European Union

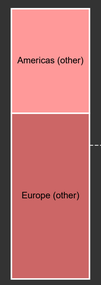
Since 2006, **China** has had the highest annual emissions and is the global leader in CO2 tonnes emitted per year. In 2017, China emitted nearly twice that of the U.S.



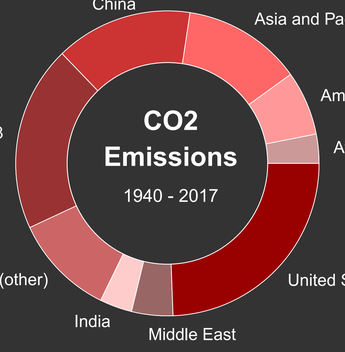
China

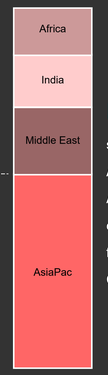
China emissions since 1940 account for roughly **15%** of global CO2, and has increased by a factor of **113x**

E.U. emissions since 1940 are more than non-E.U. European + non-U.S. Americas countries, totaling **20%** of output



EU−28





U.S. emissions since 1940 are more than African / Middle Eastern / Asia & Pacific (excl. China) countries + India, accounting for **25%** of total CO2 emitted