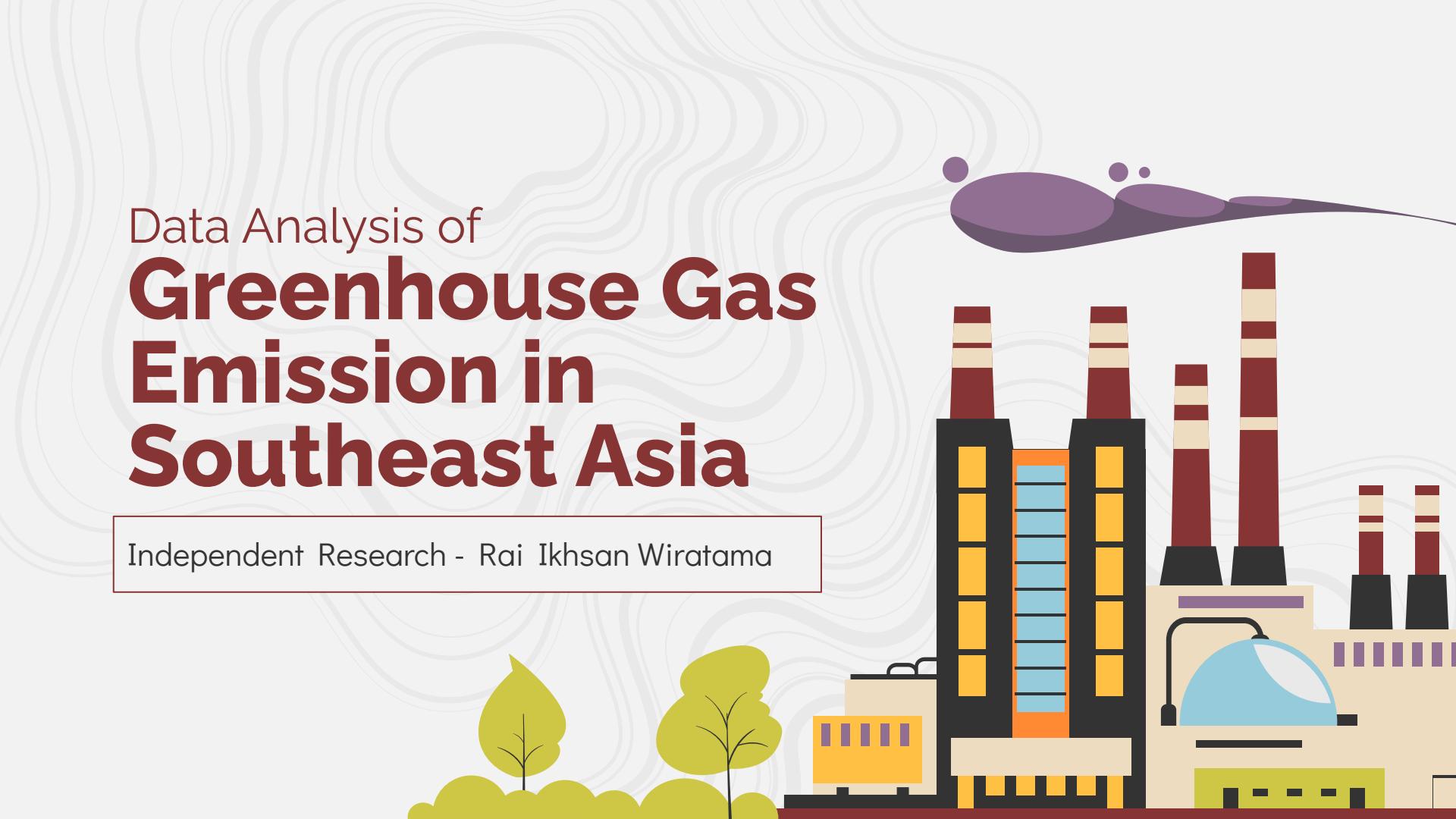


# Data Analysis of **Greenhouse Gas Emission in Southeast Asia**



Independent Research - Rai Ikhsan Wiratama





# Analysis Background

As many people have experienced, the earth feels much hotter recently. Quoted from an article of Greenpeace Indonesia, earth's temperature has increased significantly. Cities In Southeast Asia for example, reached 37° - 50° C in the middle of April, 2023.

This situation makes many people wonder, what could probably cause it? Therefore, this independent research is conducted to describe the possibility cause of the rise of earth's temperature through data analytics. In order to determine the cause, this research analyzed the world greenhouse gas emissions data in Southeast Asia countries.

The output of this research is to describe what type of emissions that increased over 1990 - 2020, what are the sources, which country produced the highest emission, and to diagnose the cause of the emission increase.



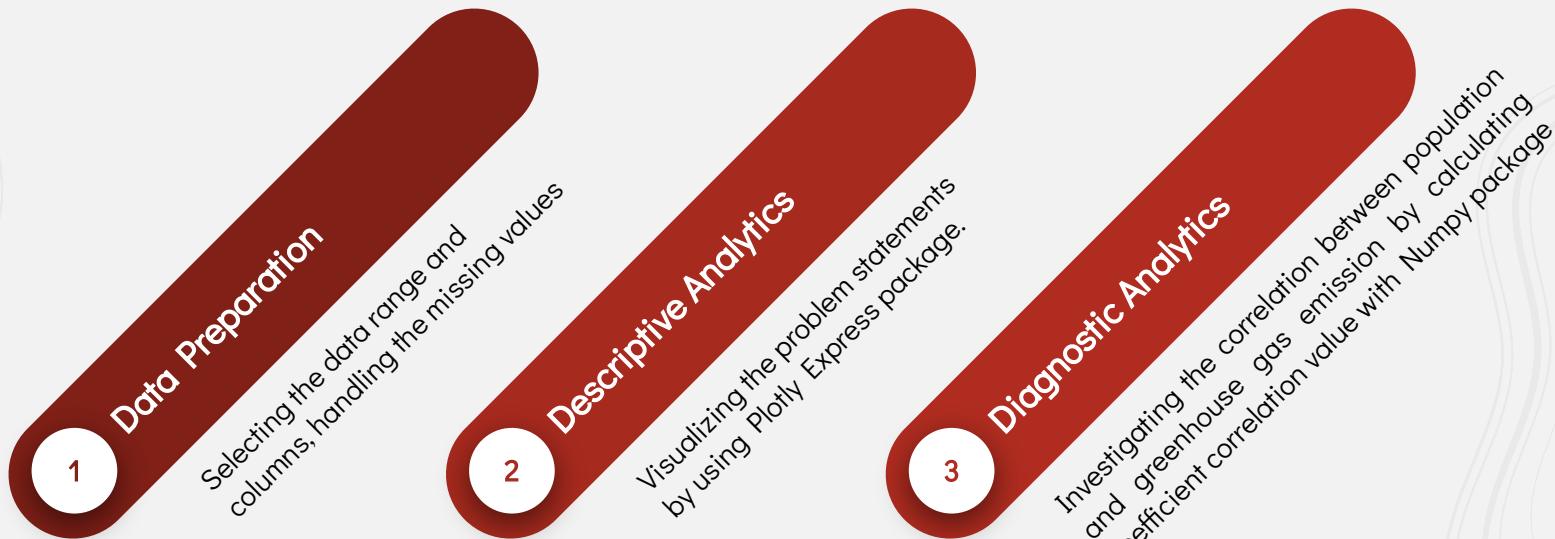
# Problem Statement



<b>Descriptive Analysis</b>	<ul style="list-style-type: none"><li>• How the greenhouse gas emission level changes in Southeast Asia in 1990 - 2020?</li><li>• What substance of emissions produced between 1990 - 2020?</li><li>• Where are the emission sources?</li><li>• Which country in Southeast Asia produced the most greenhouse gas?</li></ul>
<b>Diagnostic Analysis</b>	<p>What caused the emission increase?</p> <ul style="list-style-type: none"><li>• <b>Hypothesis:</b> number of population affects the number of greenhouse gas emission</li></ul>



# Data Analysis Flow

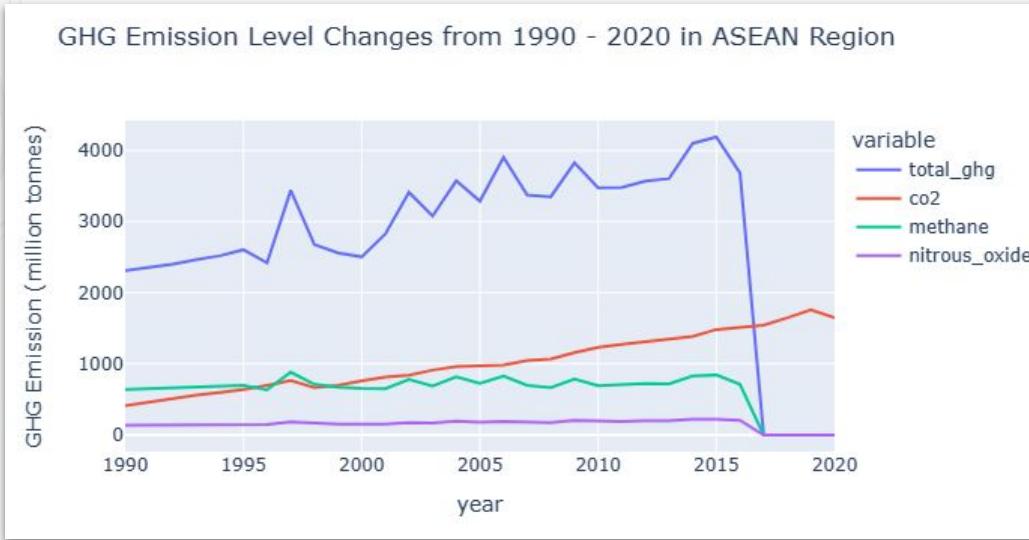


Dataset source:

<https://www.kaggle.com/code/danielrpdiاس/co2-data-notebook/data>

# Insights - Descriptive Analysis

## 1. Emission Level changes from 1990 - 2020 in Southeast Asia

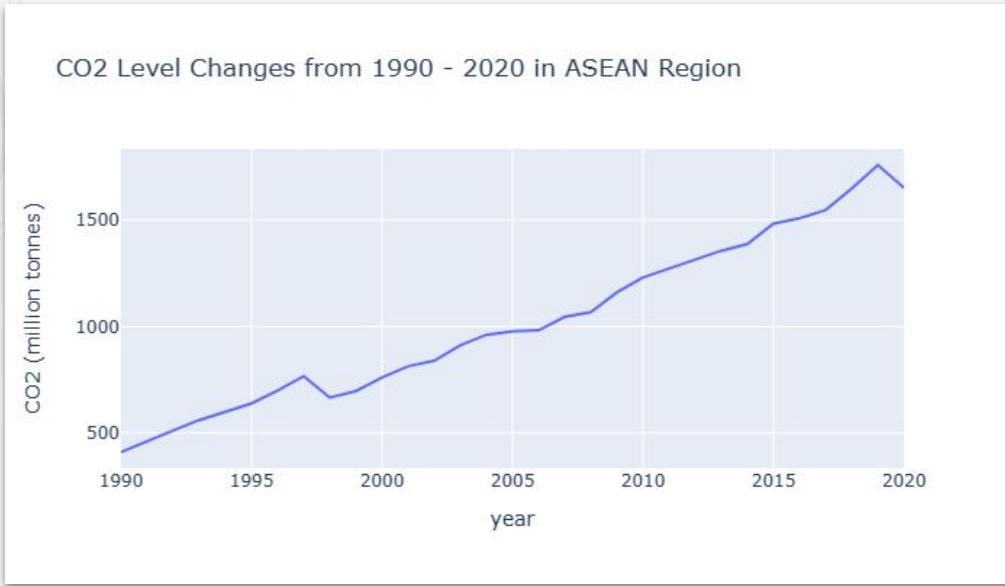


- a. The data of total greenhouse gas emission (blue line) fluctuated, yet it showed an increasing trend from 1990 - 2016.
- b. There is a continuous increasing trend in the CO2 emission data (orange line)..
- c. Methane and nitrous oxide emission data (green & purple line) showed constant trend from 1990 - 2016.
- d. The data for total greenhouse gas, methane, and nitrous oxide experienced a significant decline to 0 in 2017 afterwards due to **missing values** after the year 2016.



# Insights - Descriptive Analysis

## 2. CO<sub>2</sub> Level changes from 1990 - 2020 in Southeast Asia



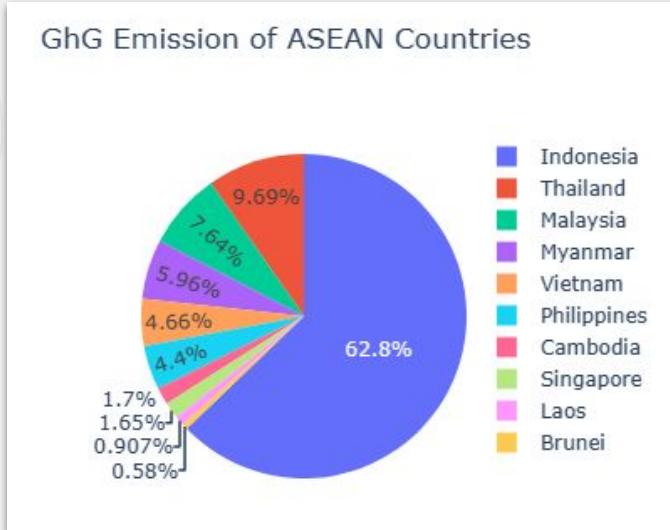
As there is no missing value in CO<sub>2</sub> data, let's take a deeper look at CO<sub>2</sub> emissions.

The data showed a constant increasing trend from 1990 - 2020. The peak happened in 2019 where the CO<sub>2</sub> level was approximately 1.7 million tonnes.



# Insights - Descriptive Analysis

## 3. Total Greenhouse Gas Emission by Countries

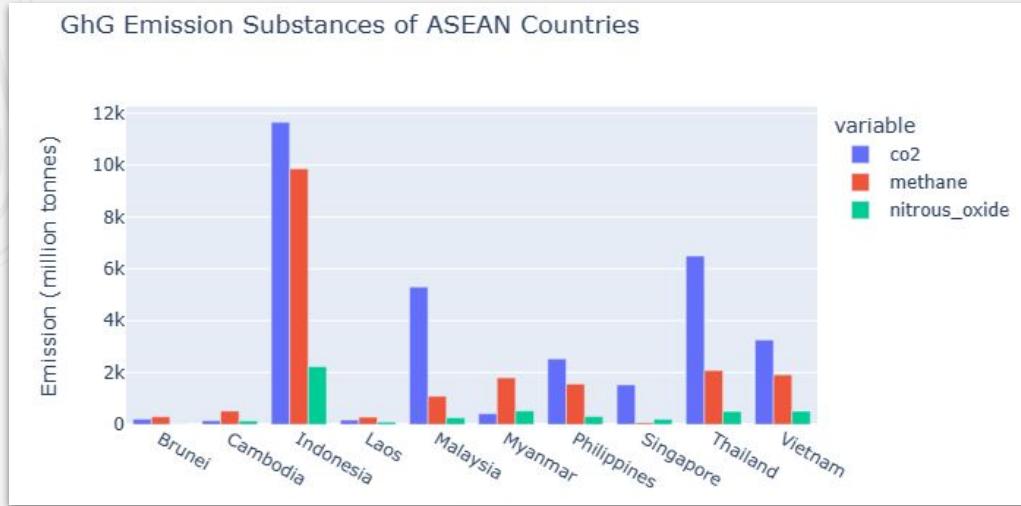


Indonesia's greenhouse gas emission is significantly higher than the other ASEAN countries. On the other hand, Singapore, Laos, and Brunei were the countries where greenhouse gas were least produced.



# Insights - Descriptive Analysis

## 3. Greenhouse Gas Substances by Countries

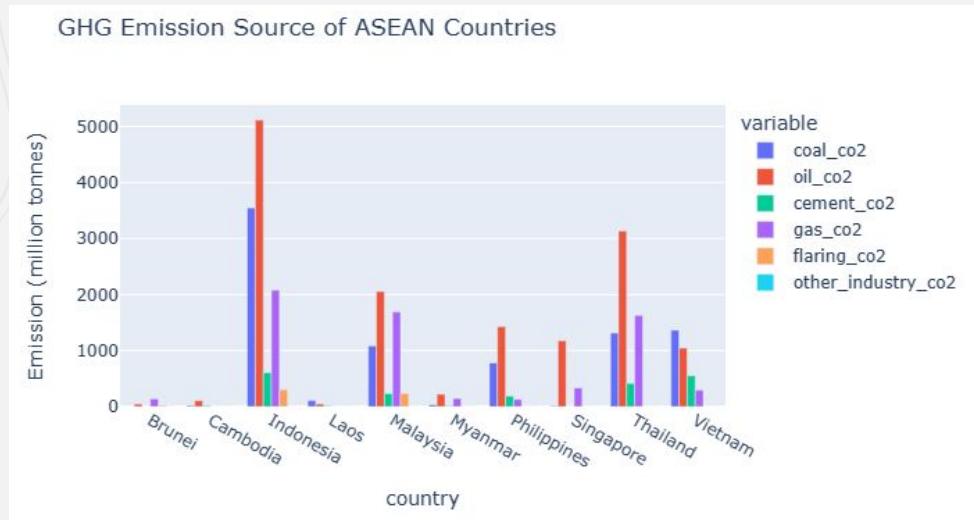


If we take a deeper look into the data of greenhouse gas substances, CO<sub>2</sub> is the highest compound produced by most of the ASEAN countries with Indonesia as the highest contributor. On the other hand, the least substances produced were nitrous oxide.



# Insights - Descriptive Analysis

## 3. Greenhouse Gas Substances by Countries



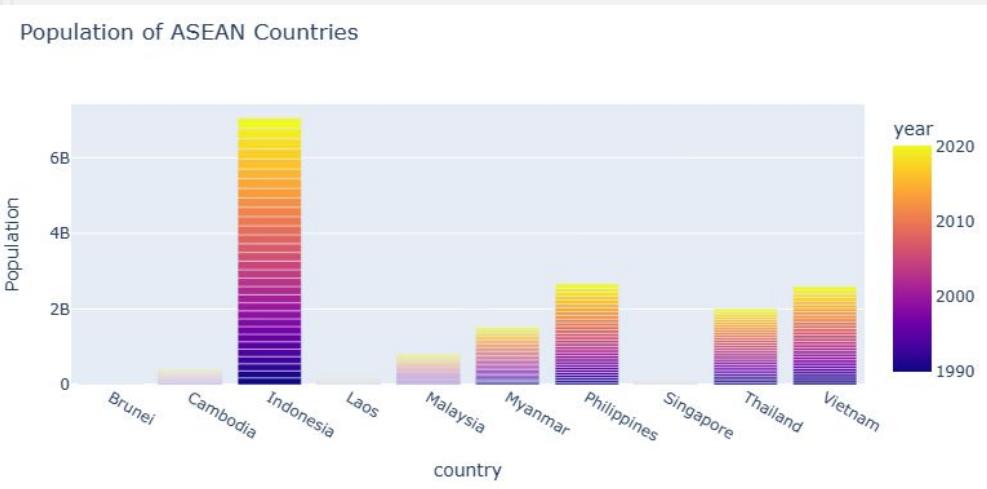
For most of the countries, the highest source of CO<sub>2</sub> came from oil and gas. The least source came from flaring and the other industries.



# Insights - Diagnostic Analysis

## Population of Southeast Asian Countries

Population of ASEAN Countries



Not only Indonesia produced the highest greenhouse gas emission, but Indonesia also has the highest population number amongst all of the ASEAN countries as seen in this chart. This indicates that there might be a correlation between the number of population and greenhouse gas emission level.



# Insights - Diagnostic Analysis

Correlation coefficient is calculated to measure how the number of population might influence greenhouse gas emissions level.

Independent Variable	Dependent Variables	Correlation Coefficient
Number of Population	Total Greenhouse Gas Emission	0.90
	CO2 Emission	0.81
	Nitrous Oxide Emission	0.94
	Methane Emission	0.93

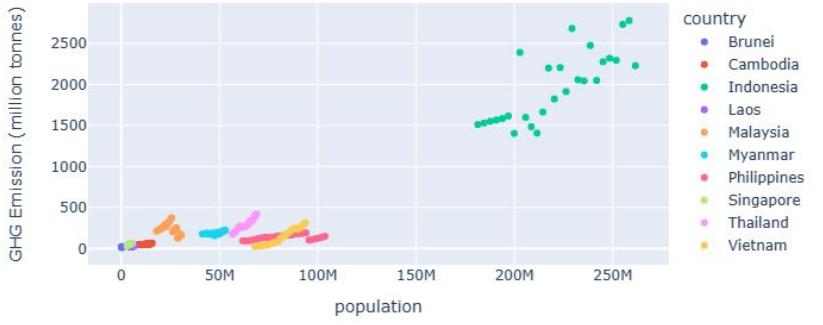
It turns out that all of the coefficient values are approaching 1.00 which means that there is a strong positive correlation between population number and greenhouse gas substances. In other words, the emission level is greatly affected by the number of population.

In addition, the visualizations can be accessed in the scatter plots at the next slide. Most of the data spread from bottom left to the upper right, indicating strong correlation between the population and greenhouse substances..

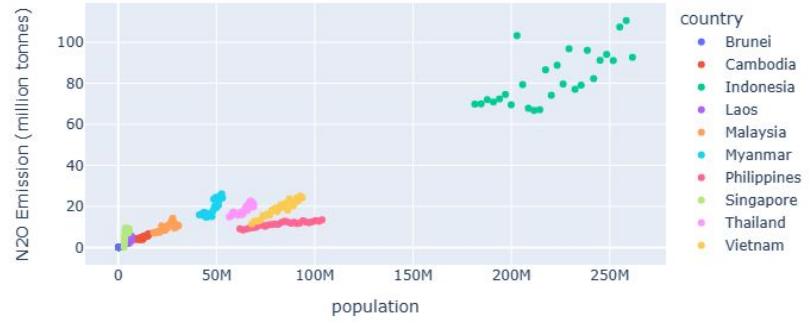


# Scatter Plots: Population and Greenhouse Gas Substances

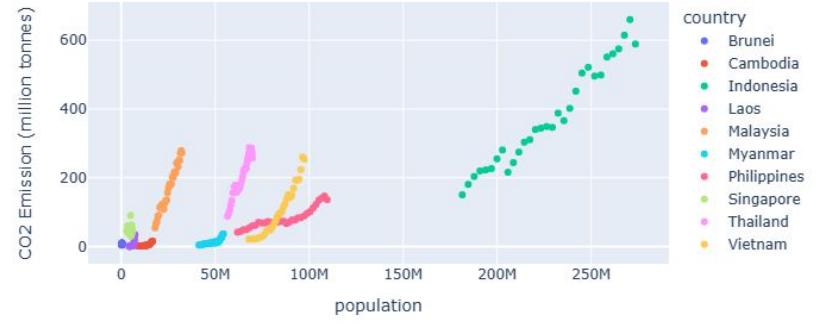
Population vs GHG Emissions



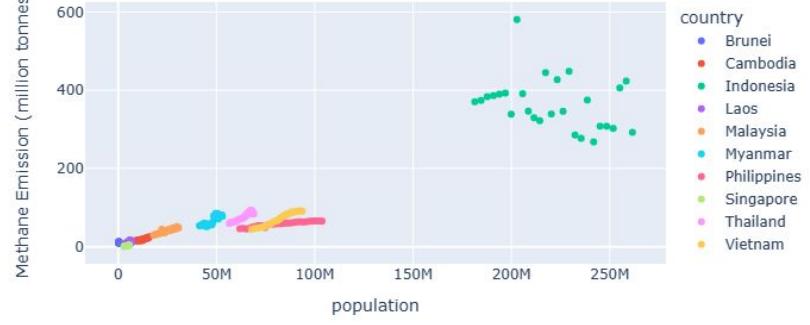
Population vs N2O Emissions



Population vs CO2 Emissions



Population vs Methane Emissions



# Conclusion



- In Southeast Asia, total greenhouse gas emission and CO<sub>2</sub> level experienced increasing trend in 1990 - 2020.
- CO<sub>2</sub> were the highest greenhouse gas substance produced by most of the Southeast Asian countries. On the other hand, nitrous oxide were the least substance.
- For most of the countries, the highest source of CO<sub>2</sub> came from oil and gas. The least source came from flaring and the other industries.
- Indonesia is the country with the highest production of greenhouse gas emission.
- The dataset has high correlation coefficient between number of population and greenhouse gas level which indicates that the number of population strongly affecting the greenhouse gas emission level.

