# Unearthing the Environmental Impact of Human Activity: A Global CO2 Emission Analysis

Global warming is one of the biggest challenges currently being faced by the human race, although correlation is not causation, a likely cause of global warming is due to increased atmospheric carbon dioxide from human activities. CO2 Emission refers to the Carbon Dioxide emitted throughout the world. For this analysis we will be focusing on CO2 Emissions and its effect on the world we live in as well as some key factors and stats that may play a role in the emission of CO2 globally. Fossil fuel use is the primary source of CO2. The data throws light onto how much fossil fuels are burnt, per year per nation, which amounts to an increase in CO2 every year. This will help researchers and environment experts to predict global warming. So countries should set a goal to decrease this amount yearly.

Analysing Global Co2 Emission across countries from 1975 to 2020. This dataset contains a record of Co2 Emission by each Country and Region of Earth, here we are going to analyse and visualise Country wise, Region wise and Overall Co2 Emission on Earth.

Technical Architecture:
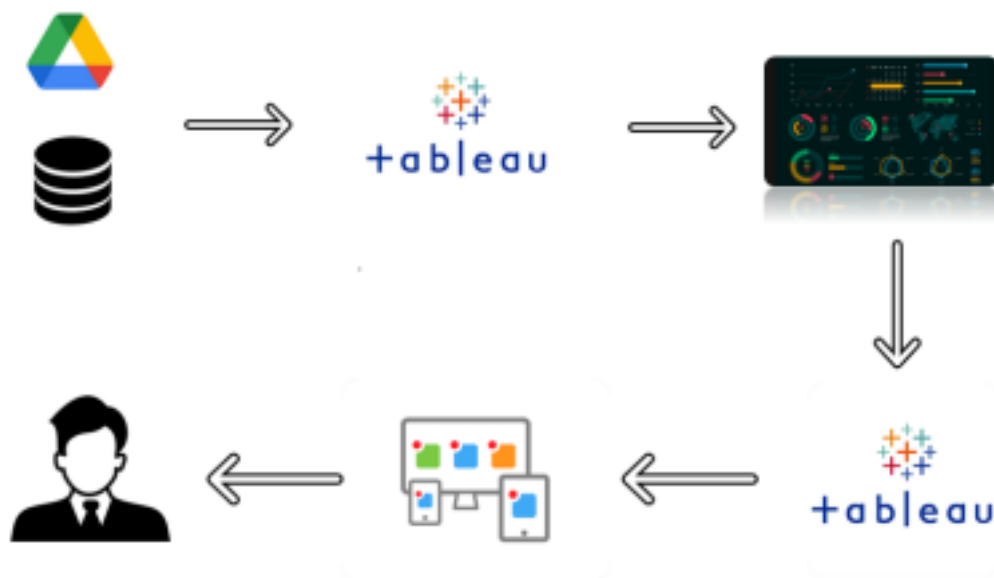
Project Flow

To accomplish this, we have to complete all the activities listed below:

- ❖ **Define Problem/Problem Understanding**
  - ▪ Specify the problem
  - ▪ Requirements
  - ▪ Literature Survey
  - ▪ Social Or Business Impact
- ❖ **Data Collection & Extraction from Database**
  - ▪ Collect the dataset
  - ▪ Storing Data in DB
  - ▪ Perform SQL Operations
  - ▪ Connect DB with tableau
- ❖ **Data Preparation**
  - ▪ Prepare the Data for Visualization
- ❖ **Data Visualizations**
  - ▪ No.of Visualizations
- ❖ **Story**
  - ▪ No.of Scenes of Story
- ❖ **Performance Testing**
  - ▪ Amount of Data Rendered to DB
  - ▪ Utilization of Data Filters
  - ▪ No.of calculations
  - ▪ No.of visualizations/Graphs
- ❖ **Web Integration**
  - ▪ Dashboards and story embed with UI with Flask
- ❖ **Project Demonstration & Documentation**
  - ▪ Record explanation video for project end to end solution
  - ▪ Project Documentation – Step by step project Development Procedure

Milestone 1: Define Problem / Problem Understanding

Activity 1: Specify the problem:

The business problem that this project seeks to address is the alarming increase in global CO2 emissions resulting from human activities. As industrialization, transportation, and energy consumption have risen, the environmental consequences have become more pronounced. The primary objective is to understand the extent of this problem and its impacts on the environment.

Activity 2: Business requirements:

Objective: The project aims to provide an in-depth analysis of global CO2 emissions.
Expectations: Detailed insights into emission sources, trends, and potential mitigation strategies.

Activity 3: Literature Survey:

A comprehensive literature survey was conducted, highlighting the following key findings:
- CO2 emissions are a major contributor to global climate change.
- Human activities, such as burning fossil fuels and deforestation, are significant sources of CO2 emissions.
- The need for sustainable energy sources and emission reduction strategies is critical.

Activity 4: Social or Business Impact:

The social and business impact of addressing this problem includes:
- **Social Impact:** Mitigating CO2 emissions can help reduce the effects of climate change, including extreme weather events, sea-level rise, and disruptions to ecosystems.
- **Business Impact:** Industries and organizations that adopt eco-friendly practices can benefit from reduced operational costs, improved public image, and access to green markets.

- ## **Milestone 2: Data Collection & Extraction from Database**

Activity 1: Collect the dataset:

Please use the link to download the dataset:

Activity 1.1: Understanding the data:

Here's a brief explanation of the dataset attributes:

country: The name of the country for which CO2 emissions data is recorded.

year: The specific year to which the CO2 emissions data corresponds.

co2: The total amount of CO2 emissions in metric tons.

co2_growth_prct: The percentage change in CO2 emissions compared to the previous year, indicating emission growth or reduction.

cumulative_co2: The cumulative total of CO2 emissions for that country up to the specified year.

trade_co2_share: The share of CO2 emissions attributed to international trade, which is related to the import and export of goods and their associated emissions.

population: The population of the country for the given year.

Activity 2 : Storing Data in DB & perform SQL Operations:

We have used MySQL workbench 8.0 C E for this activity.
➢ We created a database schema to accommodate the dataset's structure, including tables for storing data related to CO2 emissions.
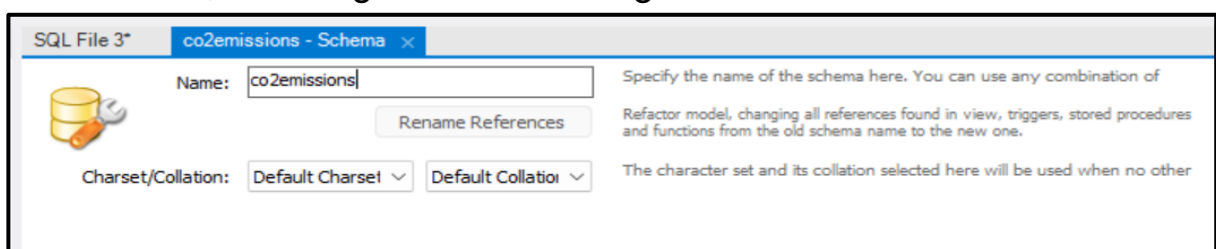
➢ Data Import Process: Develop a data import process that allows you to efficiently transfer collected data into the MySQL database.
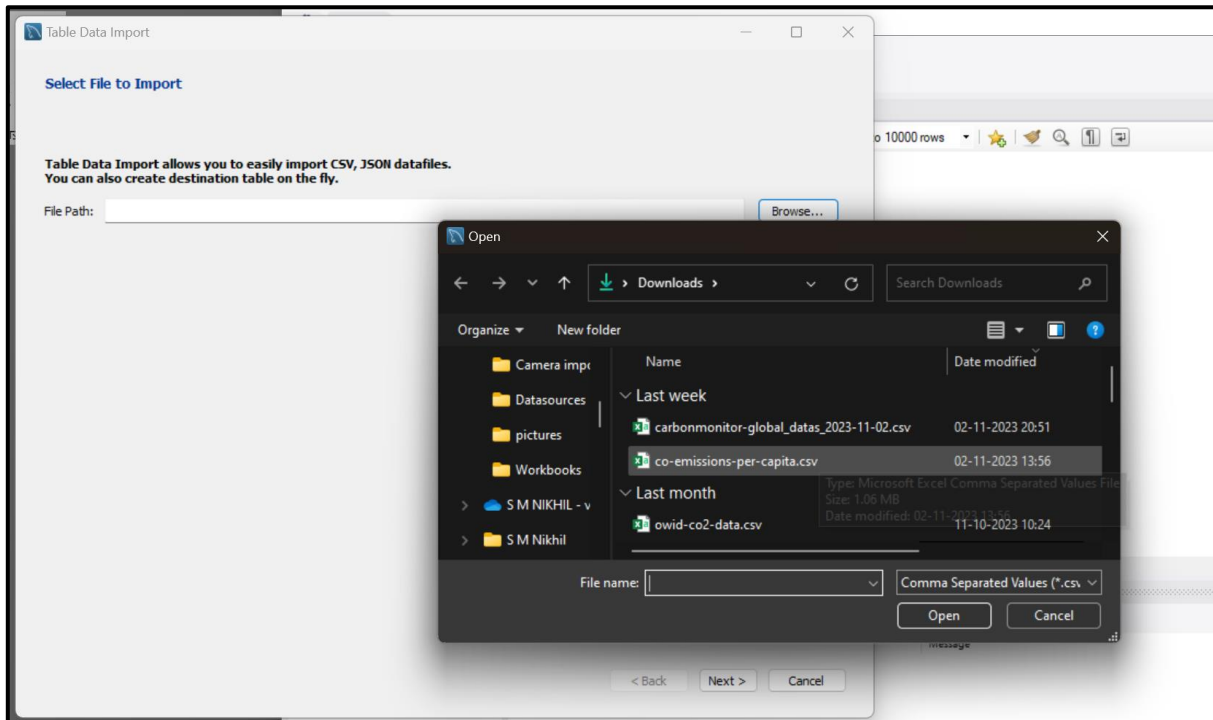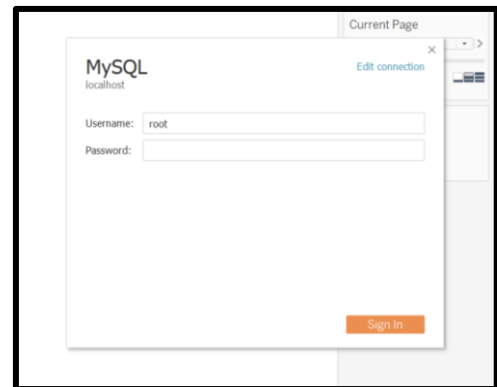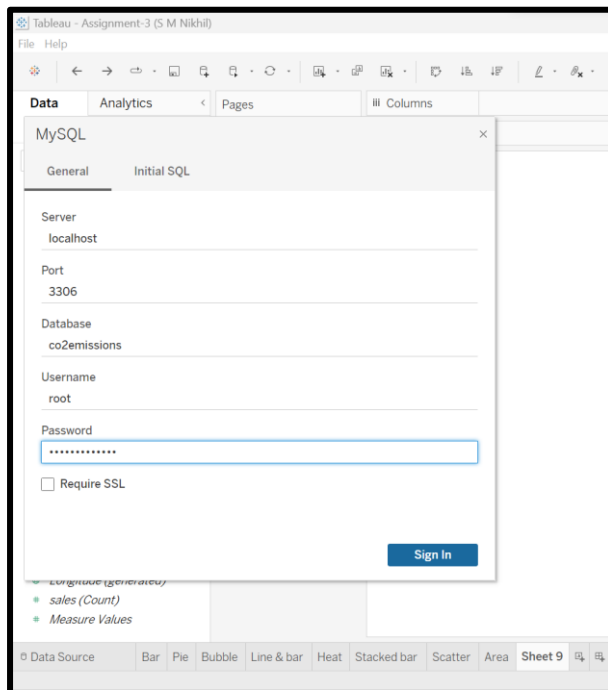

➢ After Completion of the importing the schema looks as below, which is ordered by year attribute.
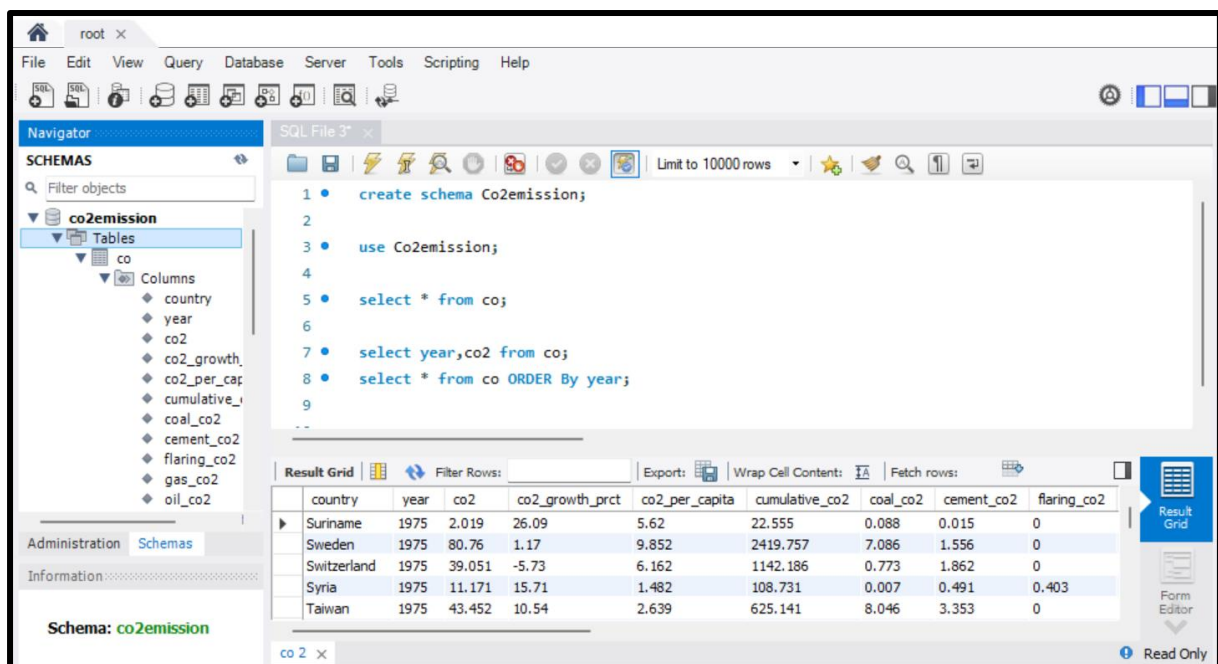
Activity 3: Connect DB with Tableau:

Connect Tableau to the MySQL database where your CO2 emission data is stored. You will need to provide the database connection details, such as hostname, port, username, and password.

Milestone 3: Data Preparation

Activity: Prepare the Data for Visualization:

Milestone 4: Data Visualization

Data visualization is essential for communicating complex findings effectively. Visualizations make it easier to comprehend trends and patterns in the data. Visualization techniques include:

- Bar Charts and Pie Charts: Represent categorical data and show the distribution of emissions sources.
- Line Charts: Illustrate trends in CO2 emissions over time, highlighting changes and patterns.
- Scatter Plots: Display relationships between two continuous variables, such as emissions and GDP, revealing correlations.
- Heatmaps: Visualize large datasets to identify patterns through color-coded representations, aiding in identifying emission clusters.
- Geospatial Maps: Display regional or global emissions data on maps, providing a visual understanding of emissions' geographical distribution.
- Interactive Dashboards: Develop interactive dashboards using tools like Tableau or Power BI, enabling stakeholders to explore data dynamically.
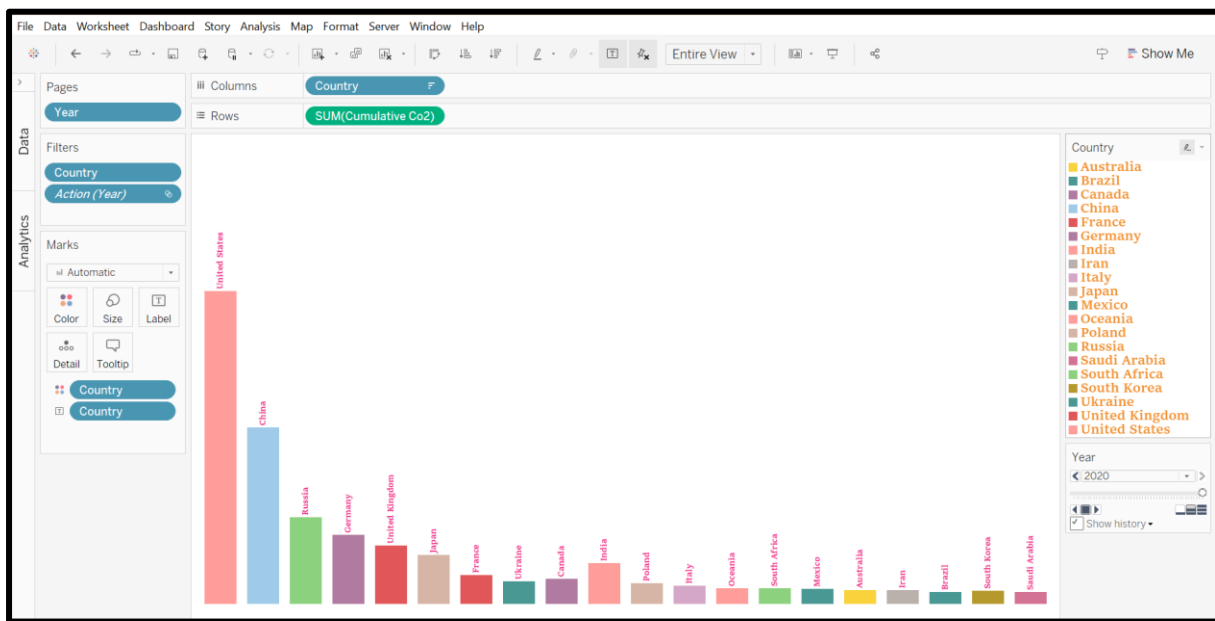
Activity 1: No of Unique Visualizations:

Total World Co2 Emission:
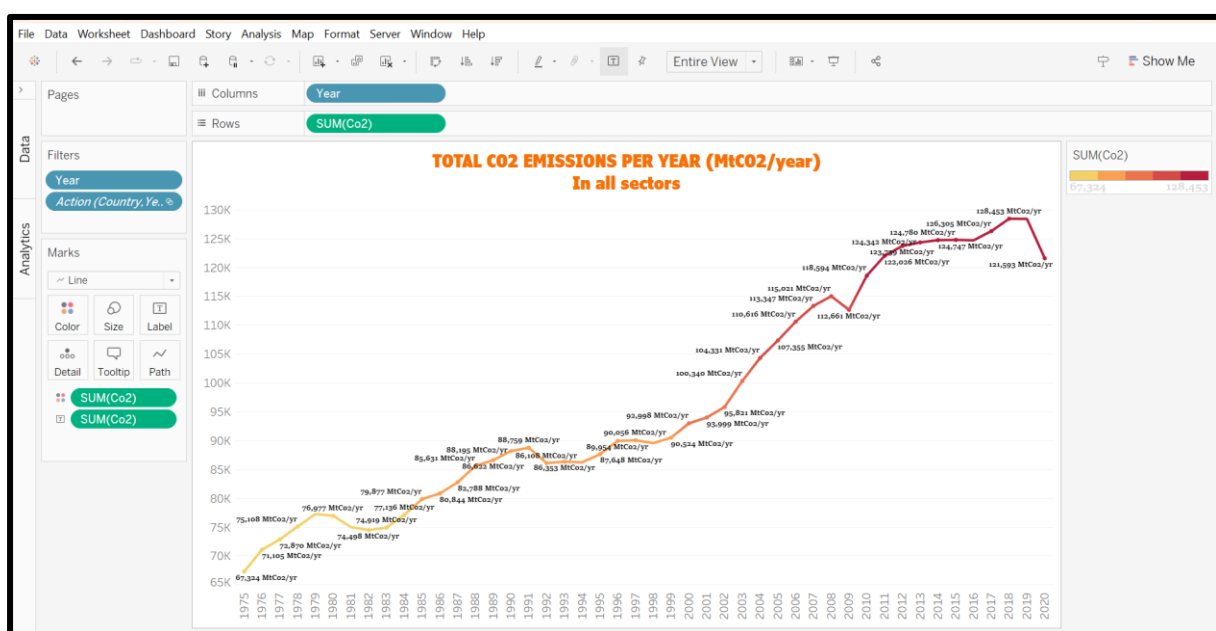
The above graph displays the Co2 Emission every year.

🔸 Top CO2 Emission Countries(Bar chart):

Sum of Cumulative_Co2 for each Country. Colour shows details about Country. The marks are labelled by Country. The data is filtered on Action(Year), which keeps 46members.The view is filtered on Country, which keeps 20of 244 members.


🔸 CO2 Distribution Map:
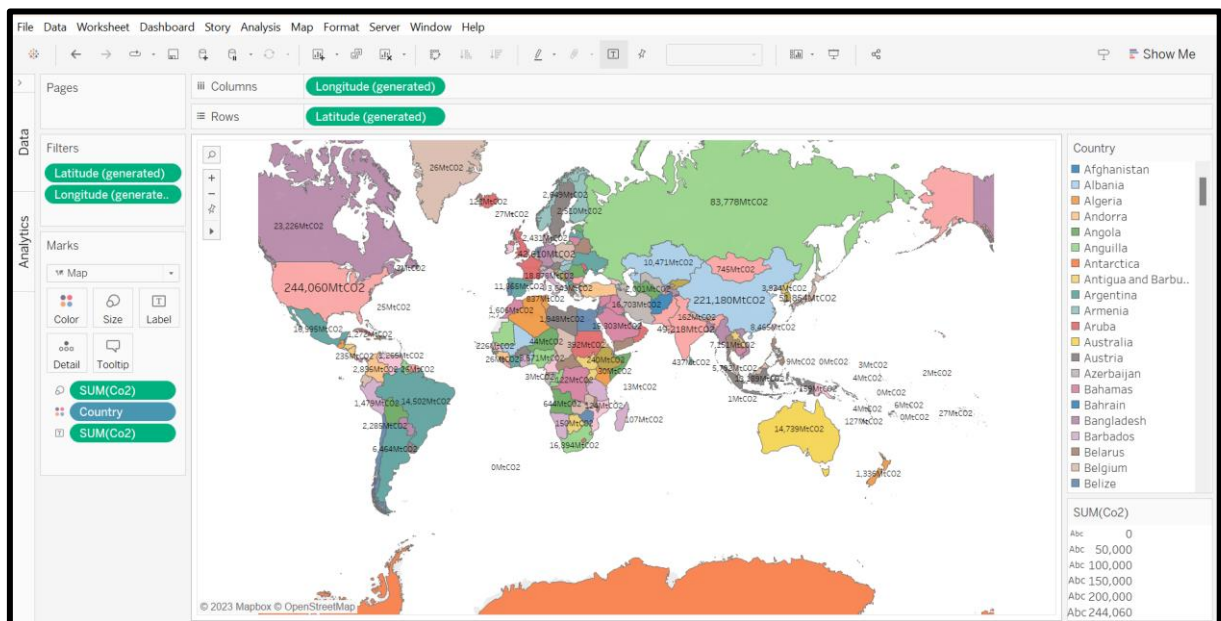
 Map based on Longitude(generated) and Latitude(generated). Colour shows details about Country. Size shows sum of Co2. The marks are labelled by sum of Co2. The view is filtered on Latitude(generated) and Longitude(generated). The Latitude(generated) filter keeps non-Null values only. The Longitude(generated) filter keeps non-Null values only.
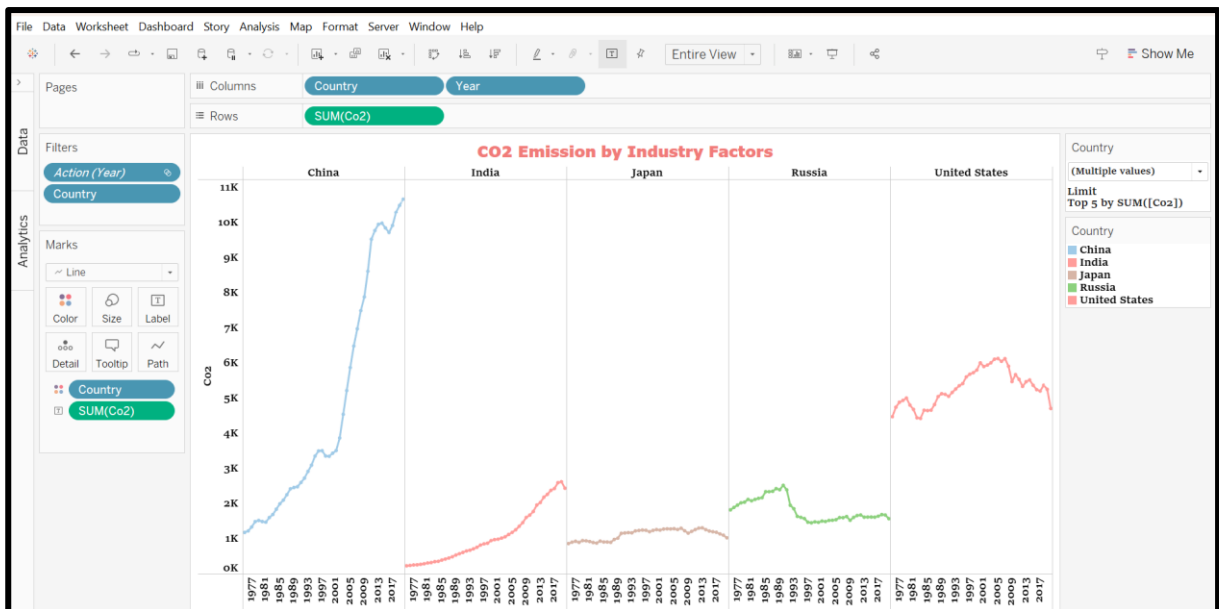
CO2 Emissions By Each Continent:
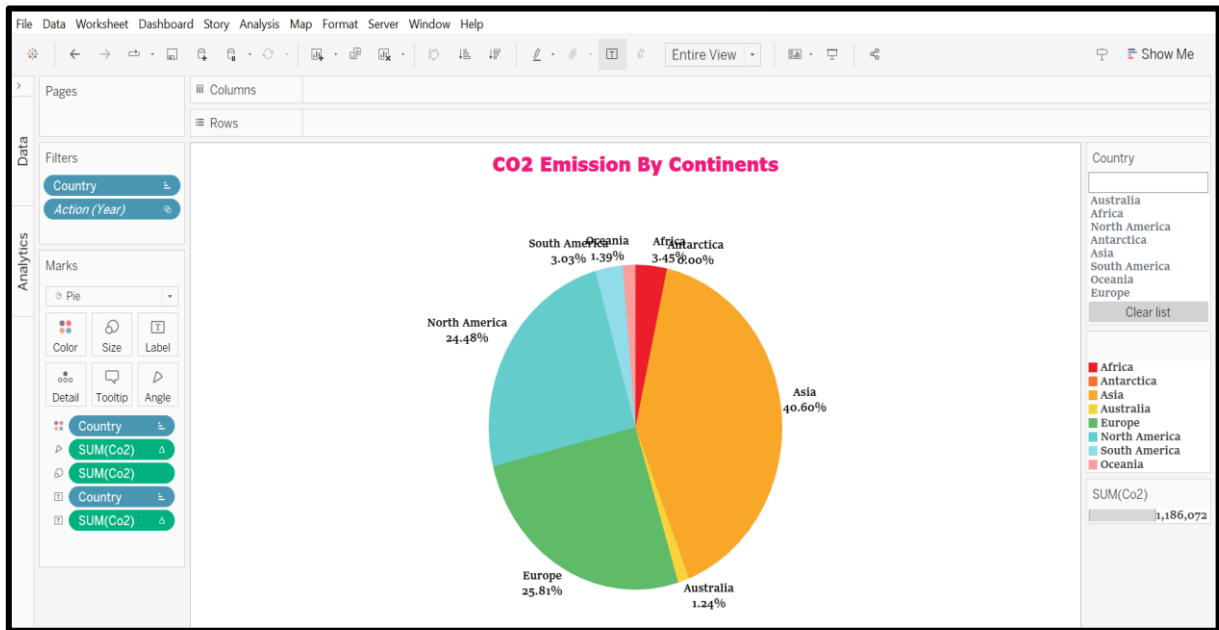
The trend of sum of Co2 for Year. Colour shows details about Country. The data is filtered on Action(Year), which keeps 46 members. The view is filtered on Country, which keeps 7 of 244 members.

CO2 Emission By Country Over Time:

Sum of Co2 for each Year broken down by Country on page 1975. Color shows details about Country. The data is filtered on Action(Year), which keeps 46 members. The view is filtered on Country, which keeps India, China, Japan, Russia, USA.
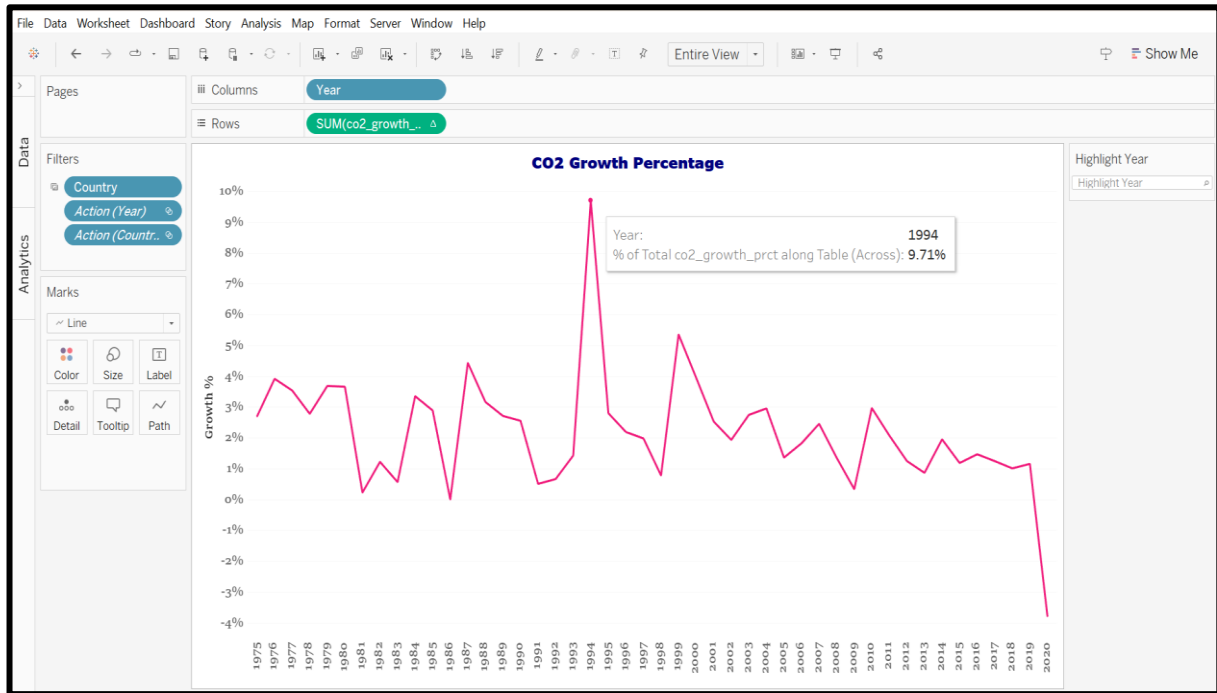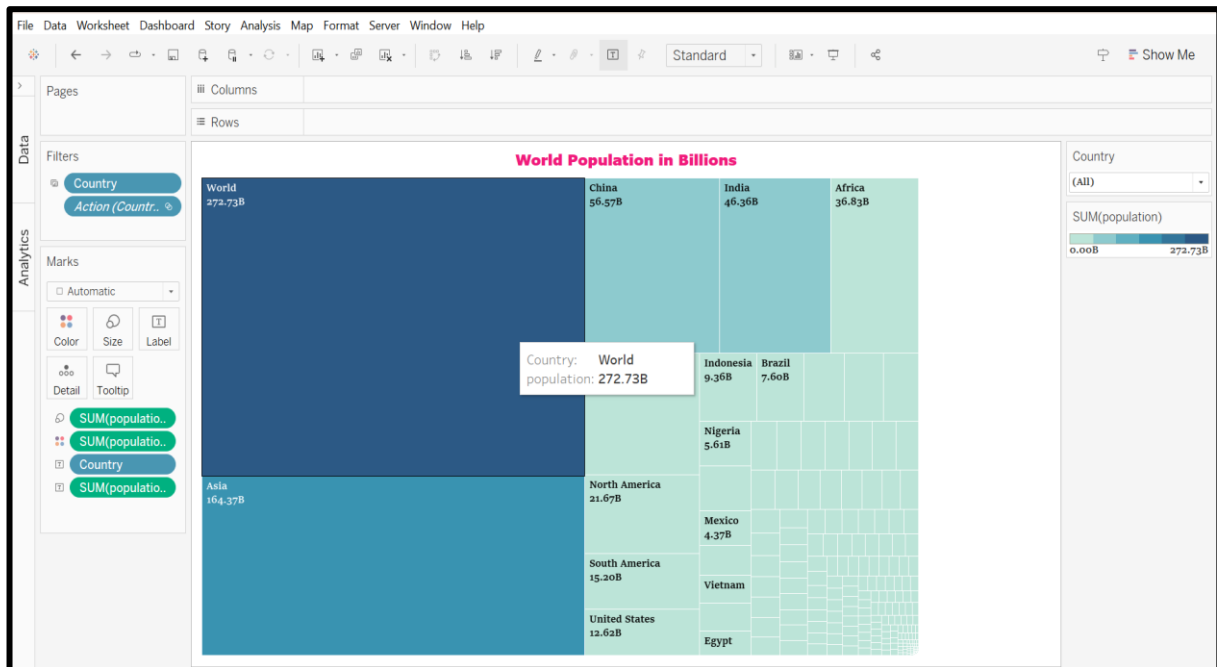
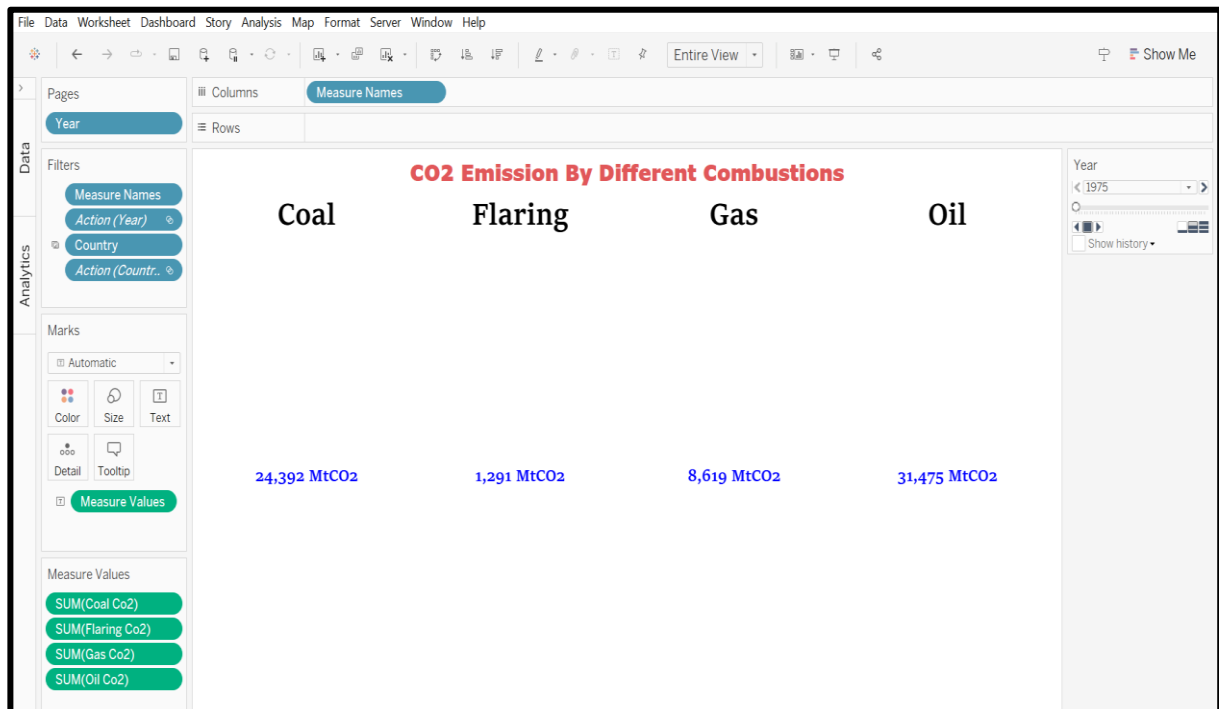# CO2 Emission Per Capita:
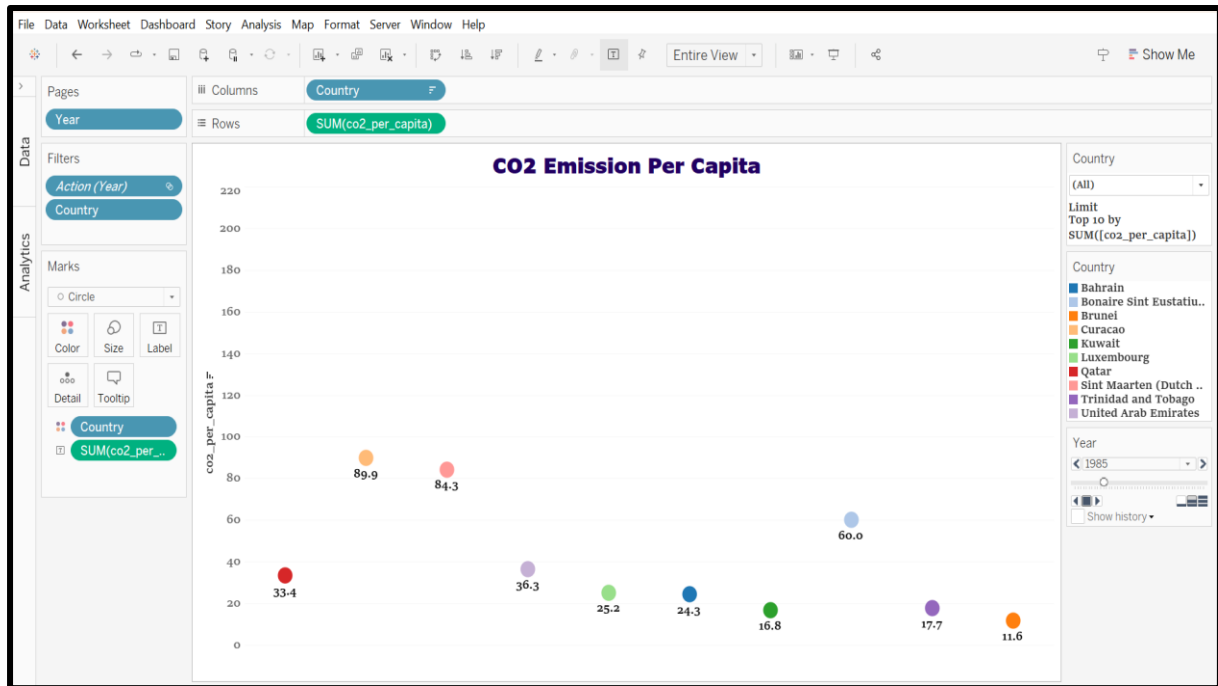
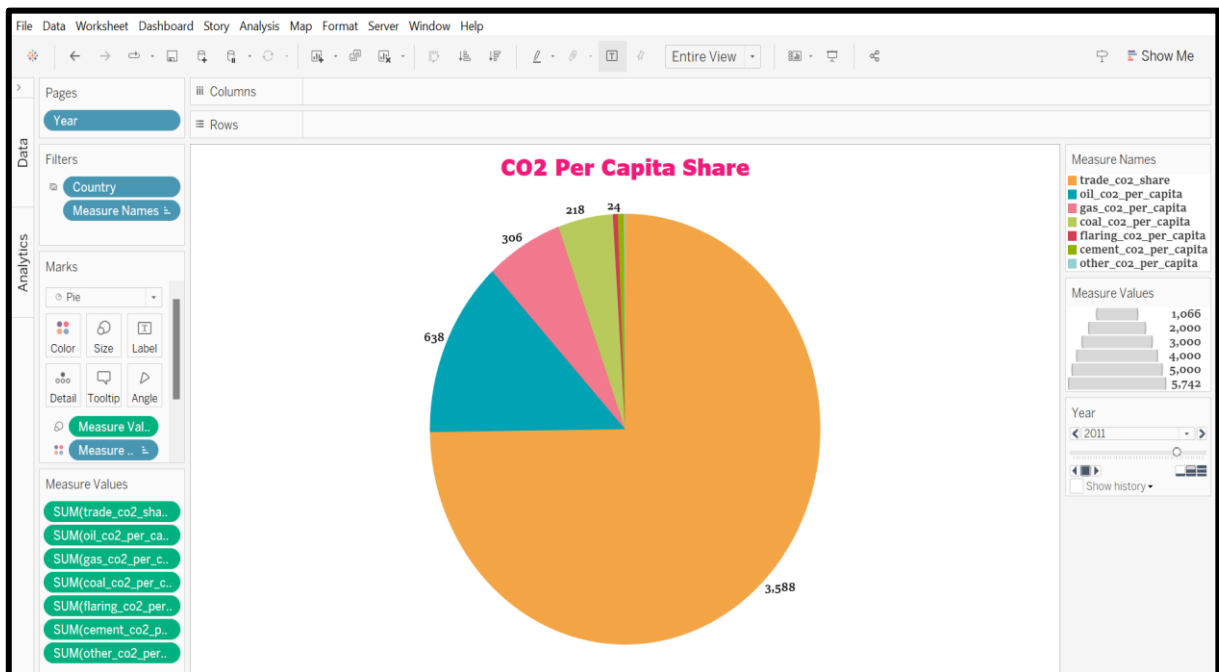# CO2 Emission by Industry Factors:

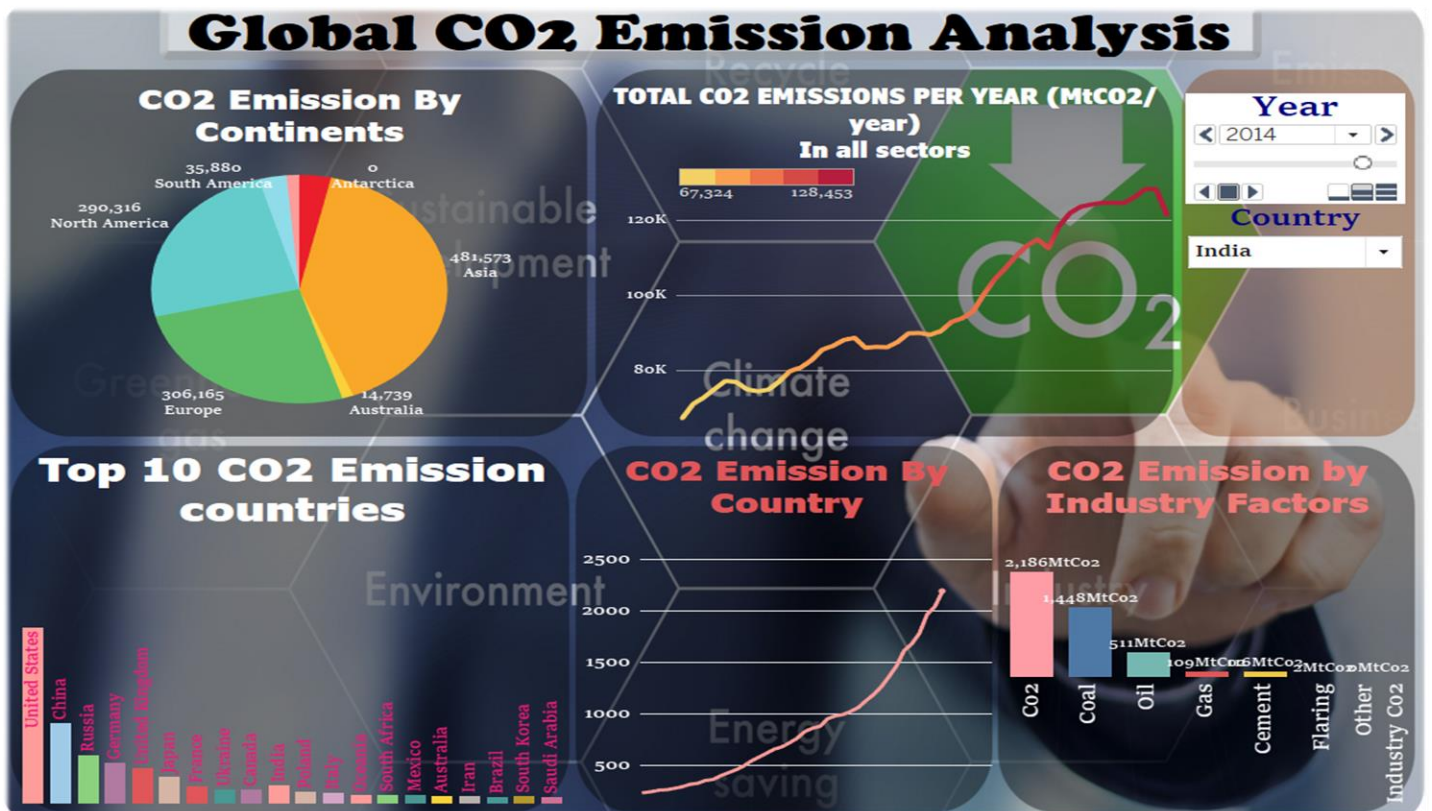# ⊞ CO2 Growth Percentage:

⊞ World Population (Heat Map):

🔳 KPI's:

🔳 CO2 Per Capita Share Fossils Combustions

Milestone 5: Dashboard

Global CO2 Emission Analysis

CO2 Emission By Continents

35,880 South America
0 Antarctica
290,316 North America
481,573 Asia
306,165 Europe
14,739 Australia

TOTAL CO2 EMISSIONS PER YEAR (MtCO2/year)
In all sectors

67,324 128,453

120K
100K
80K

Year
2014

Country
India

Top 10 CO2 Emission countries

United States, China, Russia, Germany, United Kingdom, Japan, France, Ukraine, Canada, India, Poland, Italy, Turkey, South Africa, Mexico, Australia, Iran, Brazil, South Korea, Saudi Arabia

CO2 Emission By Country

2500
2000
1500
1000
500

CO2 Emission by Industry Factors

2,186MtCo2
1,448MtCo2
511MtCo2
109MtCo2 6MtCo2 2MtCo2 MtCo2

Co2, Coal, Oil, Gas, Cement, Flaring, Other Industry Co2

CO2 Emission By Different Factors

Coal	Flaring	Gas	Oil
26,385 MtCO2	1,504 MtCO2	9,904 MtCO2	35,549 MtCO2

1978

Country
(All)

CO2 Per Capita Share

142 00
231
145
770

World Population in Billions

World 272.73B
China 56.57B
India
Asia 164.37B

Total CO2

75,108 MtCO2

Bahrain   Bonaire Sint E...   Brunei   Curacao   K   j

CO2 Emission Per Capita

co2_per_capita
200
100
0

CO2 Growth Percentage

Growth %
10%
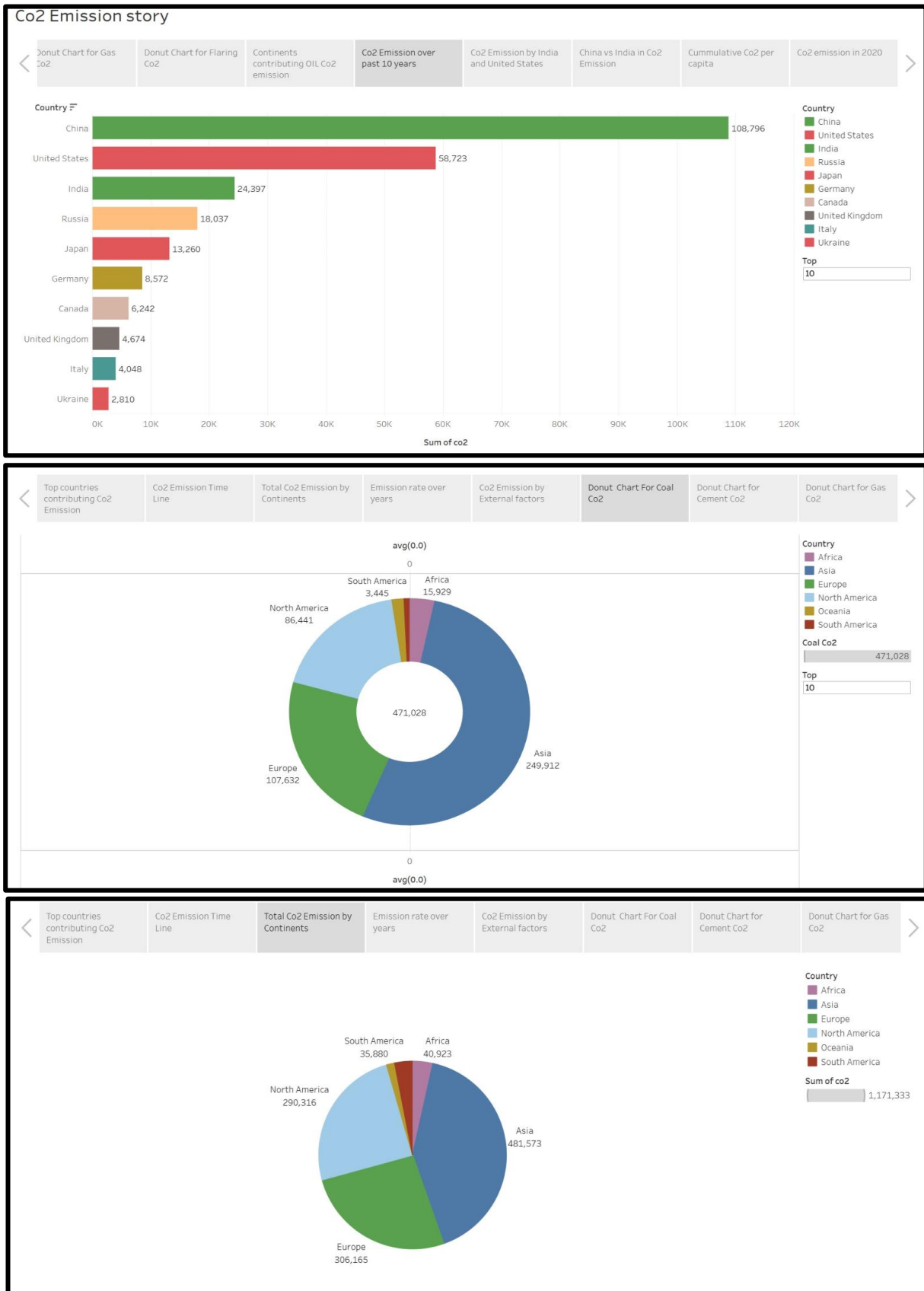5%

Activity :1- Responsive and Design of Dashboard:

Milestone 6: Story

Activity: 1- No of Scenes of Story:

Co2 Emission story

Tabs: Donut Chart for Gas Co2 | Donut Chart for Flaring Co2 | Continents contributing OIL Co2 emission | Co2 Emission over past 10 years | Co2 Emission by India and United States | China vs India in Co2 Emission | Cummulative Co2 per capita | Co2 emission in 2020

Country bar chart (Sum of co2):
- China: 108,796
- United States: 58,723
- India: 24,397
- Russia: 18,037
- Japan: 13,260
- Germany: 8,572
- Canada: 6,242
- United Kingdom: 4,674
- Italy: 4,048
- Ukraine: 2,810

Country legend: China, United States, India, Russia, Japan, Germany, Canada, United Kingdom, Italy, Ukraine. Top 10.

Tabs: Top countries contributing Co2 Emission | Co2 Emission Time Line | Total Co2 Emission by Continents | Emission rate over years | Co2 Emission by External factors | Donut Chart For Coal Co2 | Donut Chart for Cement Co2 | Donut Chart for Gas Co2

Donut chart (avg(0.0), 471,028):
- South America: 3,445
- Africa: 15,929
- North America: 86,441
- Asia: 249,912
- Europe: 107,632

Country legend: Africa, Asia, Europe, North America, Oceania, South America. Coal Co2: 471,028. Top 10.

Tabs: Top countries contributing Co2 Emission | Co2 Emission Time Line | Total Co2 Emission by Continents | Emission rate over years | Co2 Emission by External factors | Donut Chart For Coal Co2 | Donut Chart for Cement Co2 | Donut Chart for Gas Co2

Pie chart:
- South America: 35,880
- Africa: 40,923
- North America: 290,316
- Asia: 481,573
- Europe: 306,165

Country legend: Africa, Asia, Europe, North America, Oceania, South America. Sum of co2: 1,171,333.

Co2 Emission story

Sum of co2
67,324 — 128,453

Country
- India
- United States

Country
(All)
- Afghan...
- Africa
- Albania
- Algeria
- Andorra
- Angola
- Anguilla
- Antarct...
- Antigu...
- Argenti...
- Armenia

Limit
Top 5 by
SUM([Co2])

Measure Names
- Co2
- Coal
- Oil
- Gas
- Cement
- Flaring
- Other Indust...

Year
2008

Milestone 7: Performance Testing:

Activity 1: Amount of Data Rendered to DB:

Activity 2: Utilization of Data Filters:
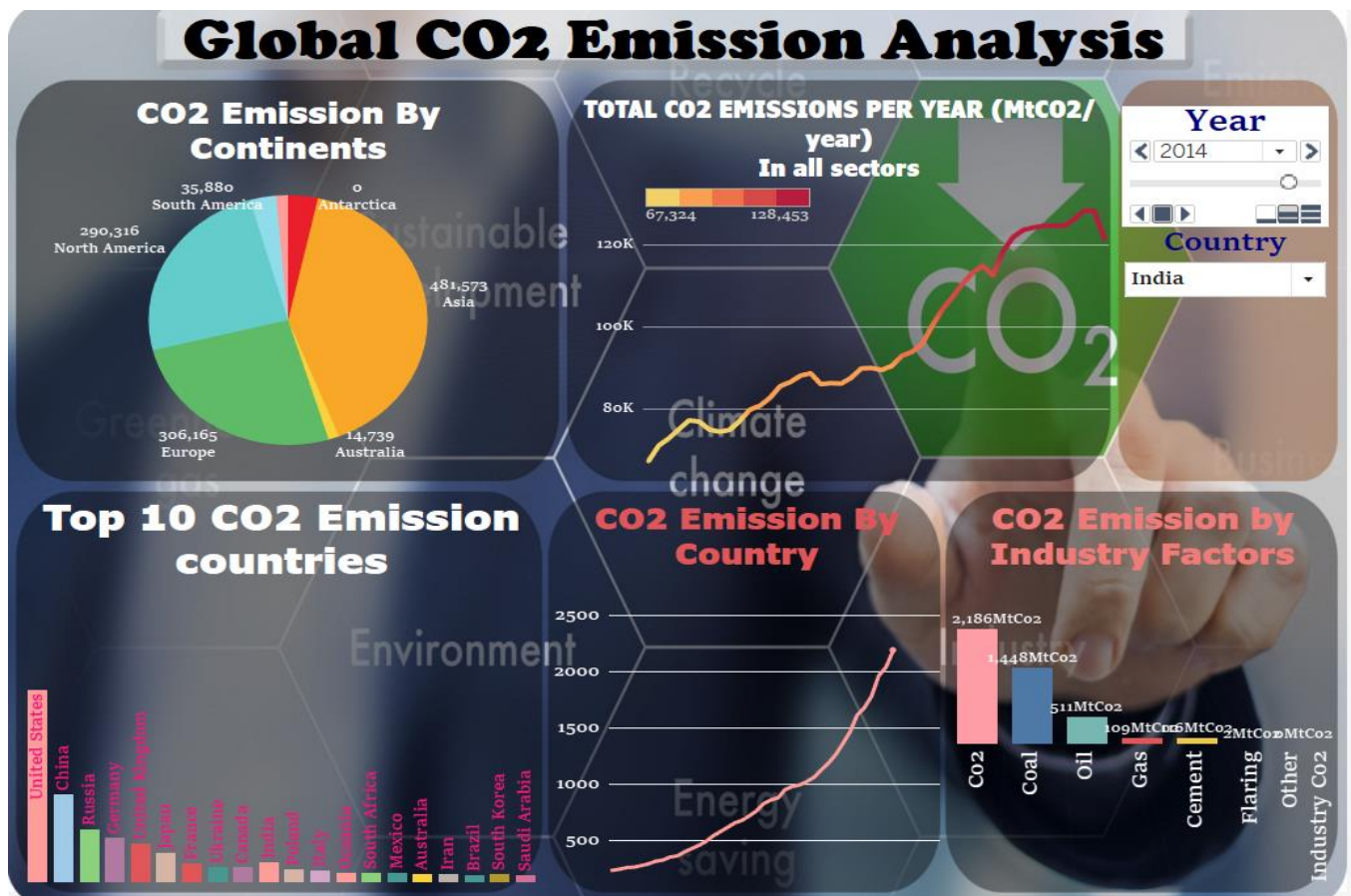

Activity 3: No of Visualizations/ Graphs:

1. Total World Co2 Emission
2. Top CO2 Emission Countries(Bar chart)
3. CO2 Distribution Map
4. CO2 Emissions By Each Continent
5. CO2 Emission By Country Over Time.
6. CO2 Emission Per Capita
7. CO2 Emission by Industry Factors
8. CO2 Growth Percentage
9. World Population (Heat Map).
10.   KPI's
11.   CO2 Per Capita Share Fossils Combustions

Milestone 8: Web integration

Publishing dashboard and reports to tableau public.

Step 1: Go to Dashboard/story, click on share button on the top ribbon
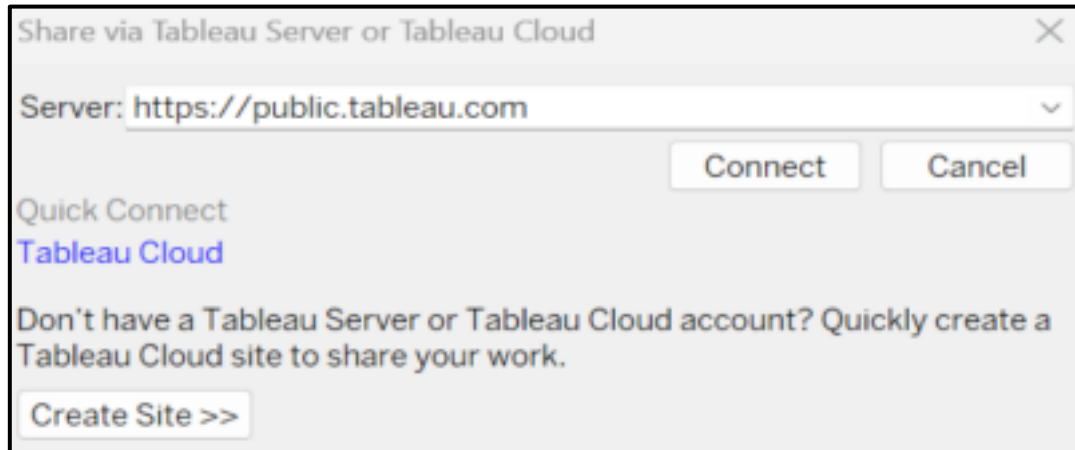
Give the server address of your tableau public account and click on connect.

Step 2: Once you click on connect it will ask you for tableau

public user name and password

Once you login into your tableau public using the credentials, the particular visualization will be published into tableau public

Activity 1: Dashboard and Story embed with UI:

Unearthing The Environmental Impact Of Human Activity: A Global CO2 Emission Analysis

Revealing Earth's Climate Story: A Global CO2 Emission Odyssey

Get Started   ▶ Watch Video

ABOUT US

We are a team of four bright and passionate students pursuing B.Tech in Computer Science and Engineering. Our journey into the world of data analytics started when we embarked on this exciting project as part of our externship under Smart Bridge. Equipped with the power of IBM Cognos and Tableau, we have taken on the challenge of unraveling the complex web of global CO2 emissions.

Our mission is to harness the potential of data analytics to unearth the environmental impact of human activity. We're committed to using the tools and knowledge gained during our externship to drive meaningful change. By understanding the nuances of carbon dioxide emissions, we aim to raise awareness and promote actionable steps towards a sustainable future.

Learn More

Annual CO$_2$ emissions, 2021

Carbon dioxide (CO$_2$) emissions from fossil fuels and industry. Land use change is not included.

⊞ Table   ⊕ Map   ⤒ Chart   World   ▼

0 t   50 million t   200 million t   1 billion t   5 billion t   20 billion t

No data   20 million t   100 million t   500 million t   2 billion t   10 billion t

▶   1750   ● 2021

Data source: Global Carbon Budget (2022) - Learn more about this data

OurWorldInData.org/co2-and-greenhouse-gas-emissions | CC BY

Related: CO$_2$ data: sources, methods and FAQs ↗

Explore the data →

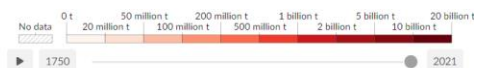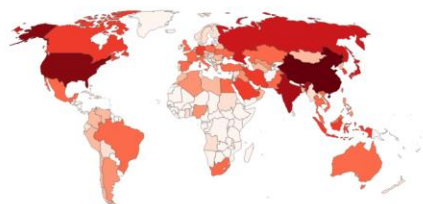## The global CO2 emission insights

The highest CO2 emission per capita in 2019 was from Qatar, with 37.29 metric tons, followed by Trinidad and Tobago, with 30.06 metric tons. The lowest CO2 emission per capita in 2019 was from Burundi, with 0.03 metric tons, followed by Chad, with 0.05 metric tons. The largest increase in CO2 emission per capita from 1960 to 2019 was from United Arab Emirates, with +29.69 metric tons, followed by Qatar, with +28.64 metric tons.

Co2 Emission story

Top countries contributing Co2 Emission	Co2 Emission Time Line	Total Co2 Emission by Continents	Emission rate over years	Co2 Emission by External factors	Donut Chart For Coal Co2	Donut Chart for Cement Co2	Donut Chart for Gas Co2

avg(0.0)

0

Country
- Africa
- Asia
- Europe
- North America
- Oceania
- South America

Coal Co2
471,028

Top
10

Milestone 9: Project Demonstration & Documentation

Activity 1:- Record explanation Video for project end to end solution:

[https://drive.google.com/file/d/1r_KOo04aYaRVfeHGROAr WdNUgJna0-X5/view?usp=sharing](https://drive.google.com/file/d/1r_KOo04aYaRVfeHGROArWdNUgJna0-X5/view?usp=sharing)