



# UNEARTHING THE ENVIRONMENTAL IMPACT OF HUMAN ACTIVITY : A GLOBAL CO<sub>2</sub> EMISSION ANALYSIS

Project Based Experimental Learning program



# Project Flow

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

- **Define Problem / Problem Understanding**

- ✓ Specify the business problem
- ✓ Business requirement
- ✓ Literature Survey
- ✓ Social or Business Impact.

- **Data Collection & Extraction from Database**

- ✓ Collect the dataset,
- ✓ Storing Data in DB o Perform SQL Operations
- ✓ Connect DB with Tableau

- **Data Preparation**

- ✓ Prepare the Data for Visualization

- **Data Visualizations**

- ✓ No of Unique Visualizations

- **Dashboard**

- ✓ Responsive and Design of Dashboard

- **Story**

- ✓ No of Scenes of Story

- **Performance Testing o Amount of Data Rendered to DB**

- ✓ Utilization of Data Filters
- ✓ No of Calculation Fields
- ✓ No of Visualizations/ Graphs

- **Web Integration**

- ✓ Dashboard and Story embed with UI With Flask

- **Project Demonstration & Documentation**

- ✓ Record explanation Video for project end to end solution o Project Documentation-Step by step project development procedure

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

## **Milestone 1: Define Problem / Problem Understanding :**

### **Activity 1: Specify the business problem.**

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.

### **Activity 2: Business requirements.**

The business requirements for analysing the Co2 Emission Globally over time, identifying affecting factors, creating interactive dashboards and reports, identifying areas for improvement, making data-driven decisions, comparing to countries average and creating forecasting models for future performance. The ultimate goal is to gain insights and reduce the emission through data visualization techniques.

### **Activity 3: Literature Survey.**

A literature survey is a method of researching existing literature and studies related to a specific topic. In the context of analyzing the Global Co2 Emission, a literature survey would involve reviewing studies and

articles that have been published on the topic of Emission, as well as studies specific to Co2. The literature survey would include sources such as academic journals, industry reports, and online articles. It would aim to identify different internal and external factors that are responsible and commonly used to determine Co2 Emission, as well as any best practices or strategies that have been identified for reducing emission. The literature survey would also explore any existing research on Co2 Emission specifically, and would aim to identify any challenges or opportunities that the Countries can opt to reduce emission.

## **The survey articles :**

- CO<sub>2</sub> emissions: A quantitative analysis among the BRICS nations:**

### **Abstract ;**

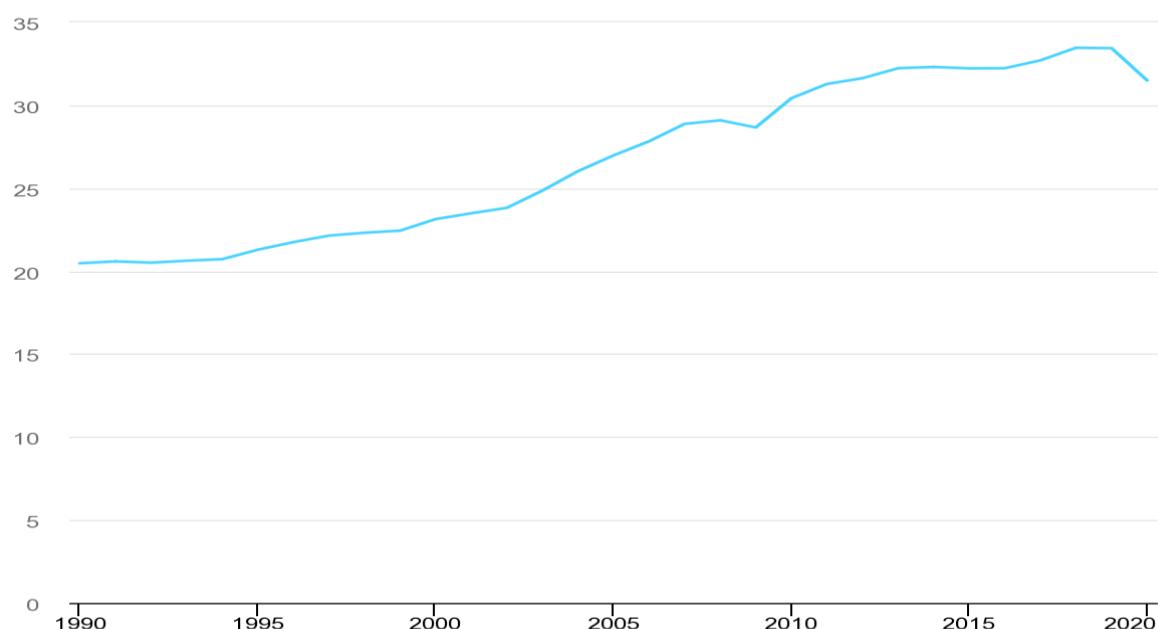
This study aims to examine the volume of carbon dioxide (CO<sub>2</sub>) emissions by lag of the emissions and by the Gross Domestic Product (GDP) for the BRICS (Brazil, Russia, India, China, and South Africa) countries from 1980 to 2011. Due to the heterogeneity of CO<sub>2</sub> emission among the BRICS countries, we organized the countries into two groups. In Group 1 (Brazil and Russia), we identified that the main causes of the variation of CO<sub>2</sub> emission in time t are the emission of CO<sub>2</sub> in time t-1 and the annual GDP of the country. In Group 2 (China, India, and South Africa), the findings do not depend on the income level of individual countries, but only from the emission of CO<sub>2</sub> in the lag period. Therefore, the main contribution of this study is that the environmental consequences of growing economic activity may be very mixed and must be examined on a case-by-case basis.

- Global Energy Review: CO2 Emissions in 2020  
By IEA :**

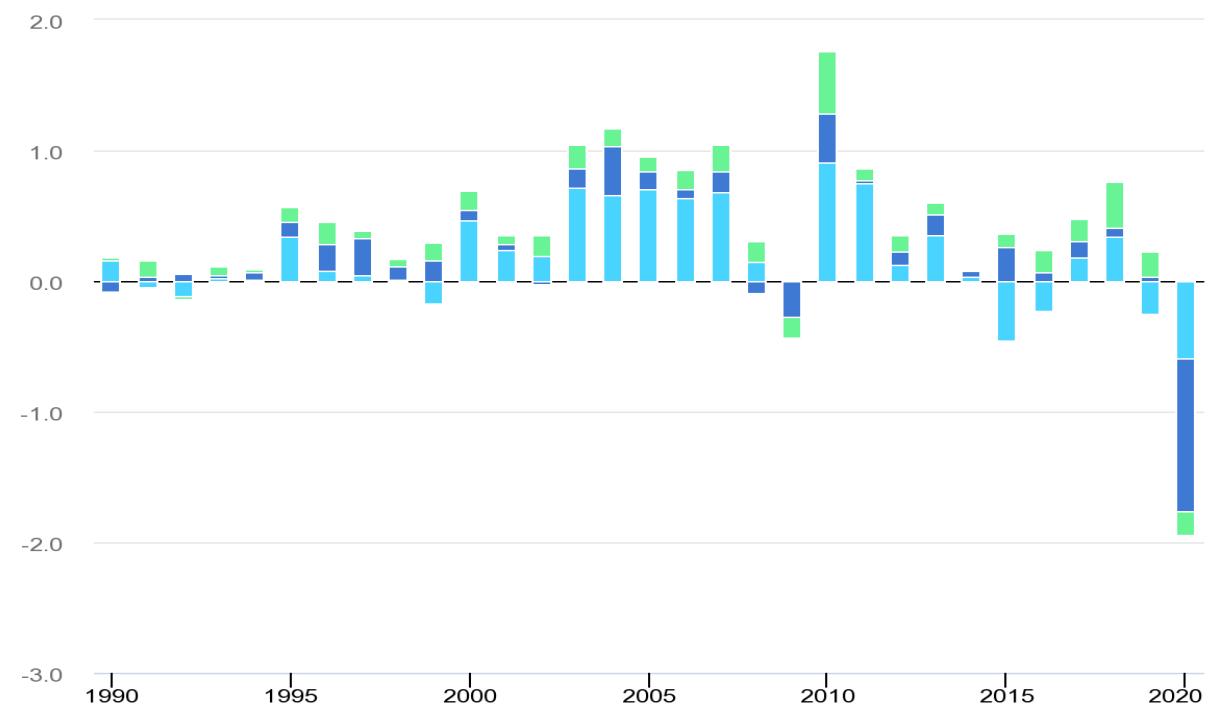
The Covid-19 pandemic and resulting economic crisis had an impact on almost every aspect of how energy is produced, supplied, and consumed around the world. The pandemic defined energy and emissions trends in 2020 – it drove down fossil fuel consumption for much of the year, whereas renewables and electric vehicles, two of the main building blocks of clean energy transitions, were largely immune.

As primary energy demand dropped nearly 4% in 2020, global energy-related CO<sub>2</sub> emissions fell by 5.8% according to the latest statistical data, the largest annual percentage decline since World War II. In absolute terms, the decline in emissions of almost 2000 million tonnes of CO<sub>2</sub> is without precedent in human history – broadly speaking, this is the equivalent of removing all of the European Union's emissions from the global total. Demand for fossil fuels was hardest hit in 2020 – especially oil, which plunged 8.6%, and coal, which dropped by 4%. Oil's annual decline was its largest ever, accounting for more than half of the drop in global emissions. Global emissions from oil use plummeted by well over 1100 Mt CO<sub>2</sub>, down from around 11400 Mt in 2019. The drop in road transport activity accounted for 50% of the decline in global oil demand, and the slump in the aviation sector for around 35%. Meanwhile, low-carbon fuels and technologies, in particular, solar PV and wind, reached their highest ever annual share of the global energy mix, increasing it by more than one percentage point to over 20%.

#### Global energy-related CO<sub>2</sub> emissions, 1990-2020 :



## Change in CO<sub>2</sub> emissions by fuel, 1990-2020 :



- Global Energy Review: CO<sub>2</sub> Emissions in 2021 By IEA :

**Energy-related CO<sub>2</sub> emissions grew to 36.3 Gt in 2021, a record high**

Global CO<sub>2</sub> emissions from energy combustion and industrial processes<sup>1</sup> rebounded in 2021 to reach their highest ever annual level. A 6% increase from 2020 pushed emissions to 36.3 gigatonnes (Gt), an estimate based on the IEA's detailed region-by-region and fuel-by-fuel analysis, drawing on the latest official national data and publicly available energy, economic and weather data.

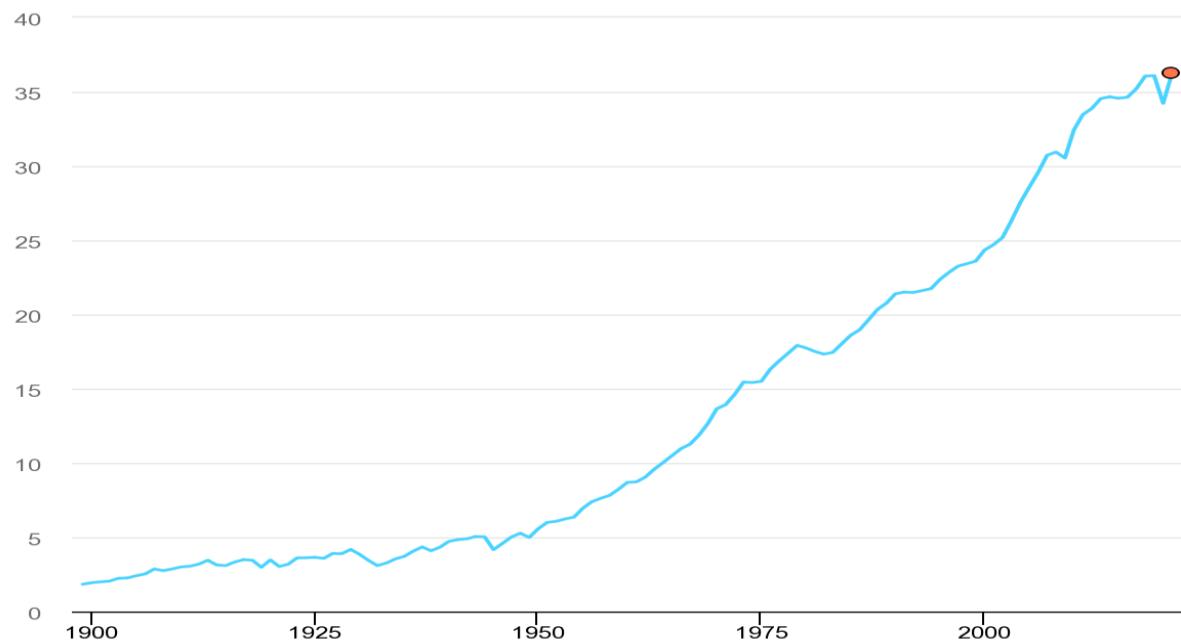
The Covid-19 pandemic had far-reaching impacts on energy demand in 2020, reducing global CO<sub>2</sub> emissions by 5.2%. However, the world has experienced an extremely rapid economic recovery since then, driven by unprecedented fiscal and monetary stimulus and a fast –

although uneven – roll-out of vaccines. The recovery of energy demand in 2021 was compounded by adverse weather and energy market conditions, which led to more coal being burnt despite renewable power generation registering its largest ever annual growth.

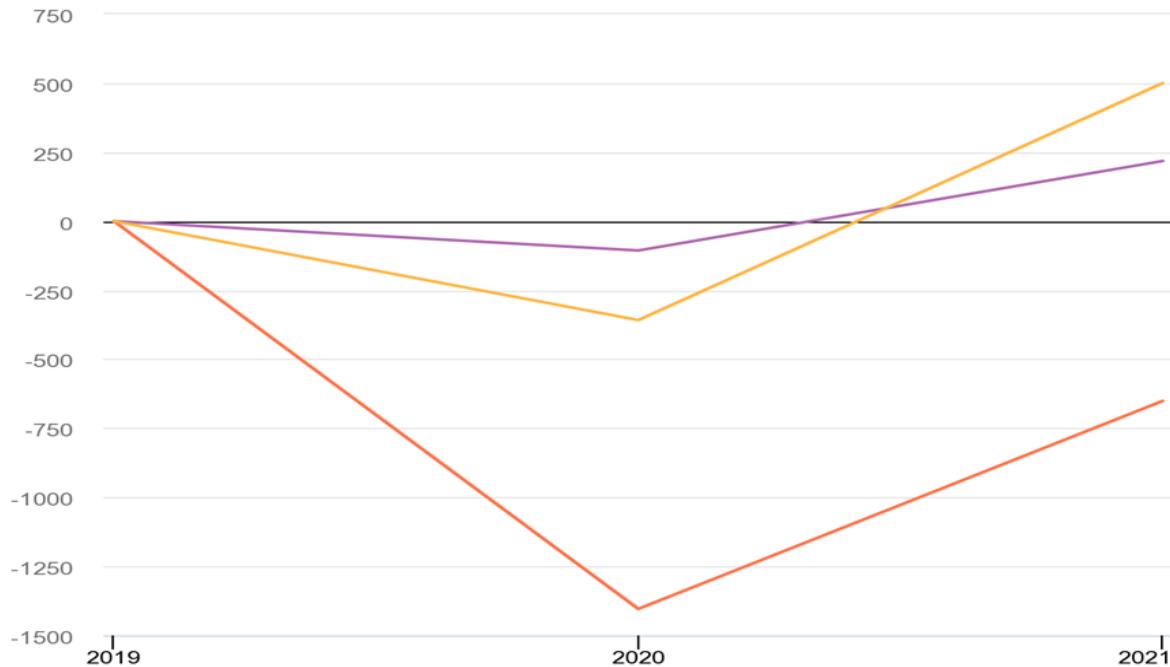
Emissions increased by almost 2.1 Gt from 2020 levels. This puts 2021 above 2010 as the largest ever year-on-year increase in energy-related CO<sub>2</sub> emissions in absolute terms. The rebound in 2021 more than reversed the pandemic-induced decline in emissions of 1.9 Gt experienced in 2020. CO<sub>2</sub> emissions in 2021 rose to around 180 megatonnes (Mt) above the pre-pandemic level of 2019.

The 6% increase in CO<sub>2</sub> emissions in 2021 was in line with the jump in global economic output of 5.9%. This marks the strongest coupling of CO<sub>2</sub> emissions with Gross domestic product (GDP) growth since 2010, when global emissions rebounded by 6.1% while economic output grew by 5.1% as the world emerged from the Global Financial Crisis.

### CO<sub>2</sub> emissions from energy combustion and industrial processes, 1900-2021:



## Change in CO<sub>2</sub> emissions by fossil fuel, relative to 2019 levels, 2019-2021:



### • CO<sub>2</sub> Emissions in 2022 By IEA :

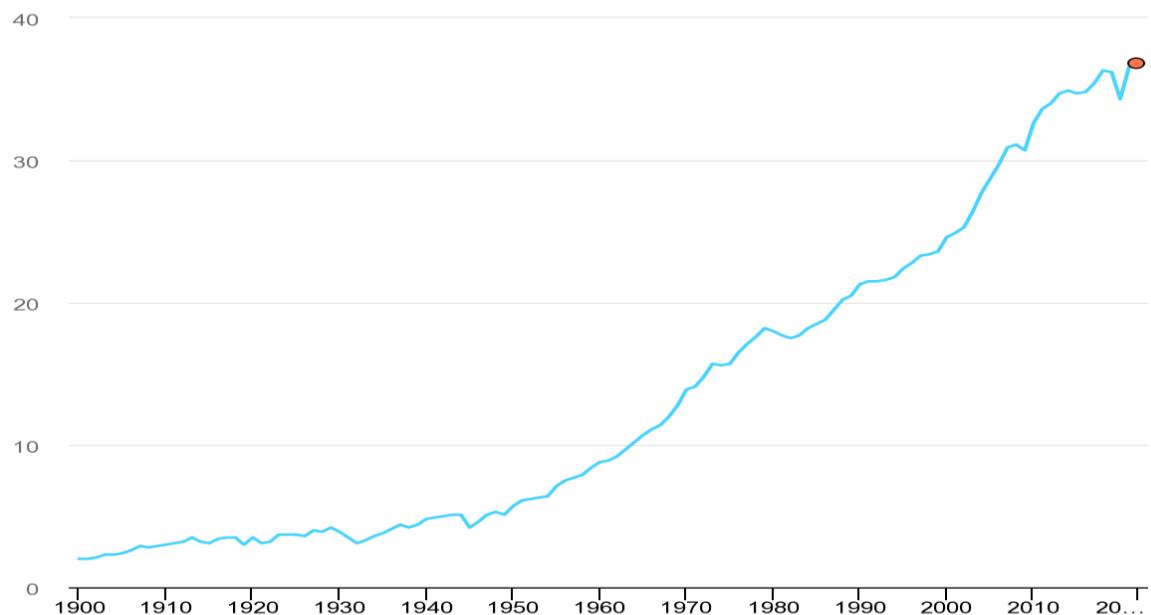
- Global energy-related CO<sub>2</sub> emissions grew by 0.9% or 321 Mt in 2022, reaching a new high of over 36.8 Gt. Following two years of exceptional oscillations in energy use and emissions, caused in part by the Covid-19 pandemic, last year's growth was much slower than 2021's rebound of more than 6%. Emissions from energy combustion increased by 423 Mt, while emissions from industrial processes decreased by 102 Mt.
- In a year marked by energy price shocks, rising inflation, and disruptions to traditional fuel trade flows, global growth in emissions was lower than feared, despite gas-to-coal switching in many countries. Increased deployment of clean energy technologies such as renewables, electric vehicles, and heat pumps helped prevent an additional 550 Mt in CO<sub>2</sub> emissions.

Industrial production curtailment, particularly in China and Europe, also averted additional emissions.

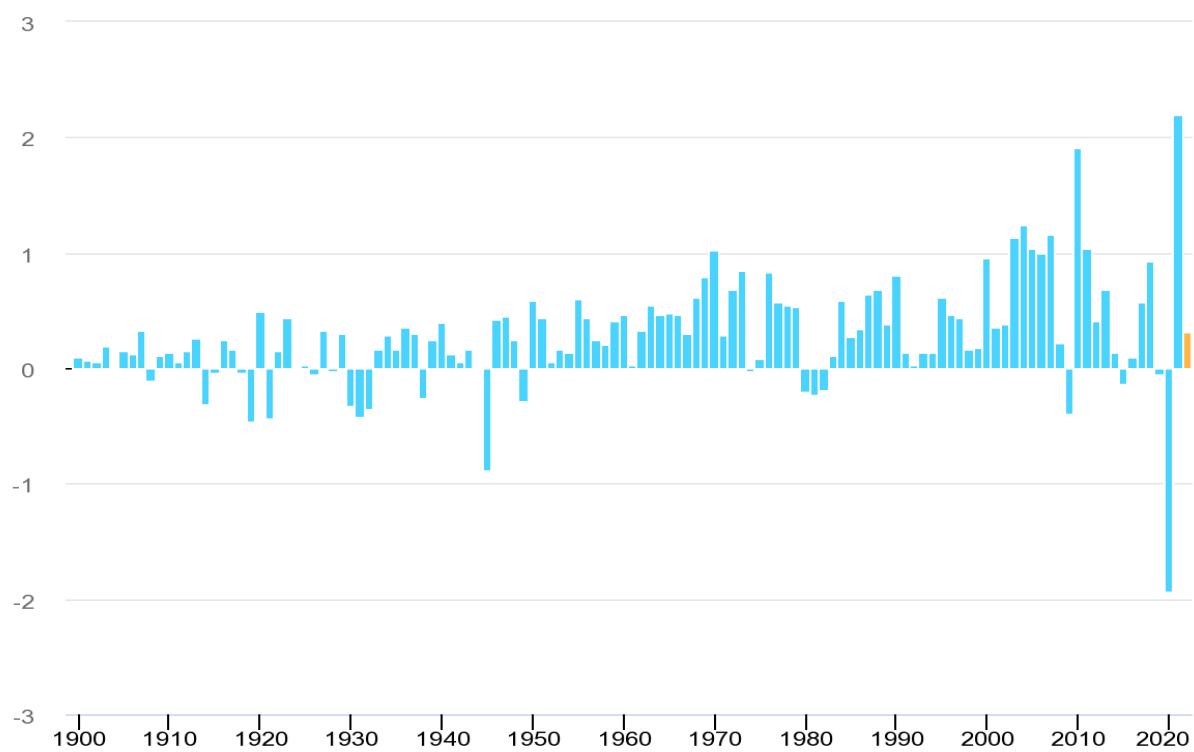
- **Specific challenges in 2022 contributed to the growth in emissions.** Of the 321 Mt CO<sub>2</sub> increase, 60 Mt CO<sub>2</sub> can be attributed to cooling and heating demand in extreme weather and another 55 Mt CO<sub>2</sub> to nuclear power plants being offline.
- **CO<sub>2</sub> growth in 2022 was well below global GDP growth of 3.2%,** reverting to a decade-long trend of decoupling emissions and economic growth that was broken by 2021's sharp rebound in emissions. Improvements in the CO<sub>2</sub> intensity of energy use were slightly slower than the past decade's average.
- **Emissions from natural gas fell by 1.6% or 118 Mt,** following continued tightening of supply exacerbated by Russia's invasion of Ukraine. Reductions in emissions from gas were particularly pronounced in Europe (-13.5%). The Asia Pacific region also saw unprecedented reductions (-1.8%).
- **Increased emissions from coal more than offset reductions from natural gas.** Amid a wave of gas-to-coal switching during the global energy crisis, CO<sub>2</sub> emissions from coal grew by 1.6% or 243 Mt, far exceeding the last decade's average growth rate, and reaching a new all-time high of almost 15.5 Gt.
- **Emissions from oil grew even more than emissions from coal, rising by 2.5% or 268 Mt to 11.2 Gt.** Around half of the increase came from aviation, as air travel continued to rebound from pandemic lows, nearing 80% of 2019 levels. Tempering this increase, electric vehicles continued to gain momentum in 2022, with over 10 million cars sold, exceeding 14% of global car sales.
- **The biggest sectoral increase in emissions in 2022 came from electricity and heat generation,** whose emissions were up by 1.8% or 261 Mt. In particular, global emissions from coal-fired electricity and heat generation grew by 224 Mt or 2.1%, led by emerging economies in Asia.
- **A strong expansion of renewables limited the rebound in coal power emissions.** Renewables met 90% of last year's global growth in electricity generation. Solar PV and wind generation each increased by around 275 TWh, a new annual record.
- **Emissions from industry declined by 1.7% to 9.2 Gt last year.** While several regions saw manufacturing curtailments, the global decline was largely driven by a 161 Mt CO<sub>2</sub> decrease in China's industry emissions, reflecting a 10% decline in cement production and a 2% decline in steel making.

- China's emissions were relatively flat in 2022, declining by 23 Mt or 0.2%. Growing emissions from combustion were offset by declines from industrial processes. Weaker economic growth, declining construction activity, and strict Covid-19 measures led to reductions in industrial and transport emissions. Power sector emissions growth slowed compared with the average of the past decade but still reached 2.6%.
- The European Union saw a 2.5% or 70 Mt reduction in CO<sub>2</sub> emissions despite oil and gas market disruptions, hydro shortfalls due to drought, and numerous nuclear plants going offline. Buildings sector emissions fell markedly, helped by a mild winter. Although power sector emissions increased by 3.4%, coal use was not as high as anticipated. For the first time, electricity generation from wind and solar PV combined exceeded that of gas or nuclear.
- US emissions grew by 0.8% or 36 Mt. The buildings sector saw the highest emissions growth, driven by extreme temperatures. The main emissions reductions came from electricity and heat generation, thanks to unprecedented increases in solar PV and wind, as well as coal-to-gas switching. While many other countries reduced their natural gas use, the United States saw an increase of 89 Mt in CO<sub>2</sub> emissions from gas, as it was called upon to meet peak electricity demand during summer heat waves.
- Emissions from Asia's emerging market and developing economies, excluding China, grew more than those from any other region in 2022, increasing by 4.2% or 206 Mt CO<sub>2</sub>. Over half of the region's increase in emissions came from coal-fired power generation.

Global CO<sub>2</sub> emissions from energy combustion and industrial processes, 1900-2022 :



Annual change in global CO<sub>2</sub> emissions from energy combustion and industrial processes, 1900-2022 :



## **Activity 4: Social or Business Impact.**

### **Social impact :**

Carbon dioxide emissions are the primary driver of global climate change. It's widely recognised that to avoid the worst impacts of climate change, the world needs to urgently reduce emissions. As the impacts of climate change mount, millions of vulnerable people face disproportionate challenges in terms of extreme events, health effects, food, water, and livelihood security, migration and forced displacement, loss of cultural identity, and other related risks.

### **Business Model/Impact :**

By conducting an analysis the countries can identify areas for improvement and take steps to reduce factors that are responsible for Co2 Emission for environmental sustainability by improving the efficiency and transitioning to low carbon alternatives. **Higher carbon footprint is indicative of greater energy costs.** Expenditure on energy bills could be channeled to other areas of the business that require more attention.

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

Data collection is the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluate outcomes and generate insights from the data

### Activity 1: Collect the dataset:

The data is collected from the given datasheet in the project manual.

A screenshot of a Microsoft Excel spreadsheet titled "Co2 New - Excel". The spreadsheet contains data for 26 countries from 1975 to 2020. The columns represent various metrics such as CO2 emissions per capita, cumulative CO2, cement production, oil consumption, and population. The data is presented in a grid format with rows for each country and columns for each year. The Excel ribbon is visible at the top, and the status bar at the bottom shows the date as 10-03-2023 and the time as 18:29.

| country    | year | co2   | co2_grow | co2_per | cumulativ | coal_co2 | cement_c | flaring_co | gas_co2 | oil_co2 | other_ind | cement_c | coal_co2 | flaring_co | gas_co2 | oil_co2_p | other_co2 | trade_co2 | population |
|------------|------|-------|----------|---------|-----------|----------|----------|------------|---------|---------|-----------|----------|----------|------------|---------|-----------|-----------|-----------|------------|
| Afghanist. | 1975 | 2.121 | 10.88    | 0.167   | 21.287    | 0.399    | 0.069    | 0.304      | 0.476   | 0.874   | 0         | 0.006    | 0.031    | 0.024      | 0.038   | 0.069     | 0         | 0         | 1.3E+07    |
| Afghanist. | 1976 | 1.981 | -6.62    | 0.153   | 23.267    | 0.425    | 0.079    | 0.293      | 0.3     | 0.883   | 0         | 0.006    | 0.033    | 0.023      | 0.023   | 0.068     | 0         | 0         | 1.3E+07    |
| Afghanist. | 1977 | 2.384 | 20.36    | 0.181   | 25.652    | 0.451    | 0.065    | 0.381      | 0.513   | 0.975   | 0         | 0.005    | 0.034    | 0.029      | 0.039   | 0.074     | 0         | 0         | 1.3E+07    |
| Afghanist. | 1978 | 2.153 | -9.68    | 0.161   | 27.805    | 0.576    | 0.058    | 0.283      | 0.301   | 0.936   | 0         | 0.004    | 0.043    | 0.021      | 0.023   | 0.07      | 0         | 0         | 1.3E+07    |
| Afghanist. | 1979 | 2.233 | 3.69     | 0.166   | 30.038    | 0.352    | 0.064    | 0.267      | 0.385   | 1.165   | 0         | 0.005    | 0.026    | 0.02       | 0.029   | 0.087     | 0         | 0         | 1.3E+07    |
| Afghanist. | 1980 | 1.756 | -21.34   | 0.132   | 31.794    | 0.316    | 0.023    | 0.305      | 0.187   | 0.925   | 0         | 0.002    | 0.024    | 0.023      | 0.014   | 0.069     | 0         | 0         | 1.3E+07    |
| Afghanist. | 1981 | 1.978 | 12.65    | 0.15    | 33.772    | 0.333    | 0.033    | 0.293      | 0.304   | 1.015   | 0         | 0.002    | 0.025    | 0.022      | 0.023   | 0.077     | 0         | 0         | 1.3E+07    |
| Afghanist. | 1982 | 2.095 | 5.87     | 0.163   | 35.867    | 0.385    | 0.039    | 0.282      | 0.396   | 0.993   | 0         | 0.003    | 0.03     | 0.022      | 0.031   | 0.077     | 0         | 0         | 1.3E+07    |
| Afghanist. | 1983 | 2.52  | 20.31    | 0.201   | 38.387    | 0.385    | 0.006    | 0.293      | 0.616   | 1.22    | 0         | 0        | 0.031    | 0.023      | 0.049   | 0.097     | 0         | 0         | 1.3E+07    |
| Afghanist. | 1984 | 2.822 | 11.97    | 0.231   | 41.209    | 0.393    | 0.046    | 0.316      | 0.932   | 1.134   | 0         | 0.004    | 0.032    | 0.026      | 0.076   | 0.093     | 0         | 0         | 1.2E+07    |
| Afghanist. | 1985 | 3.501 | 24.1     | 0.293   | 44.71     | 0.4      | 0.032    | 0.33       | 1.192   | 1.548   | 0         | 0.003    | 0.034    | 0.028      | 0.1     | 0.13      | 0         | 0         | 1.2E+07    |
| Afghanist. | 1986 | 3.134 | -10.5    | 0.267   | 47.844    | 0.425    | 0.038    | 0.33       | 1.202   | 1.14    | 0         | 0.003    | 0.036    | 0.028      | 0.102   | 0.097     | 0         | 0         | 1.2E+07    |
| Afghanist. | 1987 | 3.114 | -0.63    | 0.268   | 50.957    | 0.443    | 0.043    | 0.223      | 0.392   | 2.013   | 0         | 0.004    | 0.038    | 0.019      | 0.034   | 0.174     | 0         | 0         | 1.2E+07    |
| Afghanist. | 1988 | 2.857 | -8.25    | 0.246   | 53.814    | 0.366    | 0.043    | 0.187      | 0.44    | 1.821   | 0         | 0.004    | 0.032    | 0.016      | 0.038   | 0.157     | 0         | 0         | 1.2E+07    |
| Afghanist. | 1989 | 2.765 | -3.22    | 0.233   | 56.579    | 0.337    | 0.043    | 0.04       | 0.48    | 1.865   | 0         | 0.004    | 0.028    | 0.003      | 0.04    | 0.157     | 0         | 0         | 1.2E+07    |
| Afghanist. | 1990 | 2.603 | -5.85    | 0.21    | 59.182    | 0.278    | 0.046    | 0.026      | 0.403   | 1.85    | 0         | 0.004    | 0.022    | 0.002      | 0.032   | 0.149     | 0         | 0         | 1.2E+07    |
| Afghanist. | 1991 | 2.427 | -6.76    | 0.182   | 61.61     | 0.249    | 0.046    | 0.026      | 0.384   | 1.718   | 0         | 0.003    | 0.019    | 0.002      | 0.029   | 0.129     | 0         | 0         | 1.3E+07    |
| Afghanist. | 1992 | 1.379 | -43.17   | 0.095   | 62.989    | 0.022    | 0.046    | 0.022      | 0.363   | 0.927   | 0         | 0.003    | 0.002    | 0.002      | 0.025   | 0.064     | 0         | 0         | 1.4E+07    |
| Afghanist. | 1993 | 1.333 | -3.36    | 0.084   | 64.322    | 0.018    | 0.047    | 0.022      | 0.352   | 0.894   | 0         | 0.003    | 0.001    | 0.001      | 0.022   | 0.056     | 0         | 0         | 1.6E+07    |
| Afghanist. | 1994 | 1.282 | -3.86    | 0.075   | 65.604    | 0.015    | 0.047    | 0.022      | 0.338   | 0.86    | 0         | 0.003    | 0.001    | 0.001      | 0.02    | 0.05      | 0         | 0         | 1.7E+07    |
| Afghanist. | 1995 | 1.23  | -3.99    | 0.068   | 66.834    | 0.015    | 0.047    | 0.022      | 0.322   | 0.824   | 0         | 0.003    | 0.001    | 0.001      | 0.018   | 0.046     | 0         | 0         | 1.8E+07    |
| Afghanist. | 1996 | 1.165 | -5.33    | 0.062   | 67.999    | 0.007    | 0.047    | 0.022      | 0.308   | 0.78    | 0         | 0.002    | 0        | 0.001      | 0.016   | 0.041     | 0         | 0         | 1.9E+07    |
| Afghanist. | 1997 | 1.084 | -6.94    | 0.056   | 69.083    | 0.004    | 0.047    | 0.022      | 0.283   | 0.728   | 0         | 0.002    | 0        | 0.001      | 0.015   | 0.038     | 0         | 0         | 1.9E+07    |
| Afghanist. | 1998 | 1.029 | -5.07    | 0.052   | 70.113    | 0.004    | 0.047    | 0.022      | 0.265   | 0.691   | 0         | 0.002    | 0        | 0.001      | 0.013   | 0.035     | 0         | 0         | 2E+07      |
| Afghanist. | 1999 | 0.881 | -21.34   | 0.04    | 70.922    | 0.004    | 0.047    | 0.022      | 0.242   | 0.495   | 0         | 0.002    | 0        | 0.001      | 0.012   | 0.024     | 0         | 0         | 2E+07      |
| Afghanist. | 2000 | 0.758 | -6.4     | 0.036   | 71.60     | 0.004    | 0.041    | 0.023      | 0.224   | 0.409   | 0         | 0        | 0        | 0.002*     | 0.011*  | 0.024*    | 0         | 0         | 2.5E+07    |

### Activity 1.1: Understand the data:

Dataset consists CO2 emissions in metric ton per capita of every country around the world. The data is collected from 1975 to 2020. In this dataset Countries and regions are included. Data is initially pre-processed using excel.

The dataset contains ,

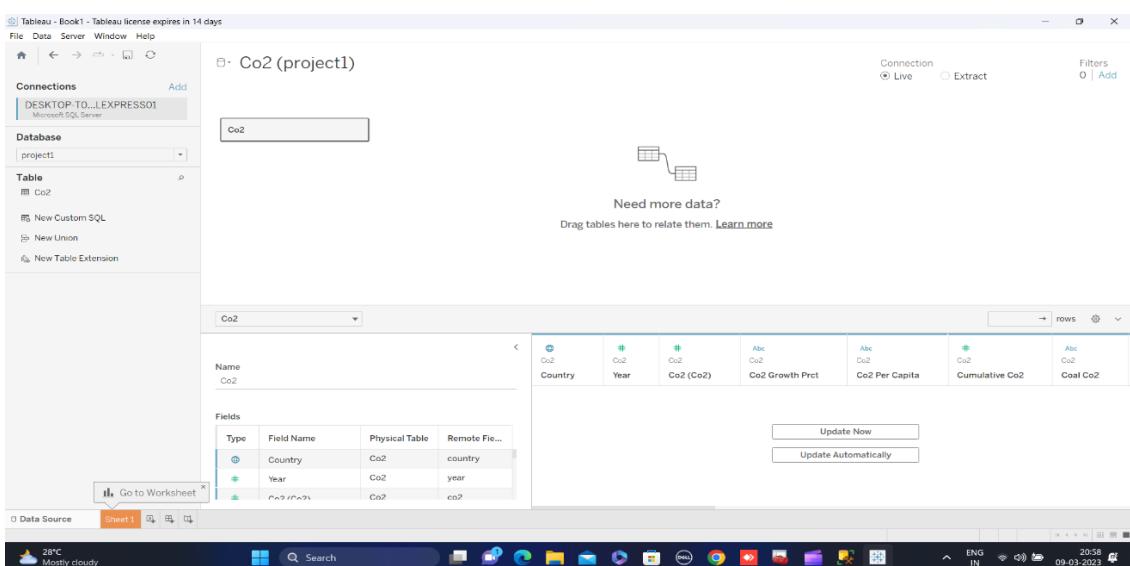
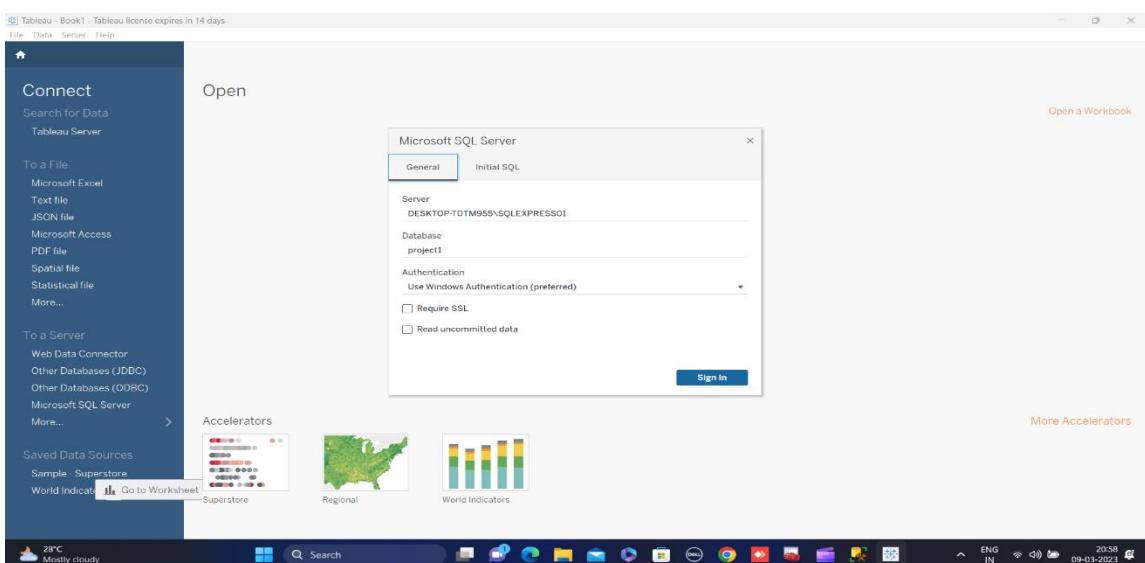
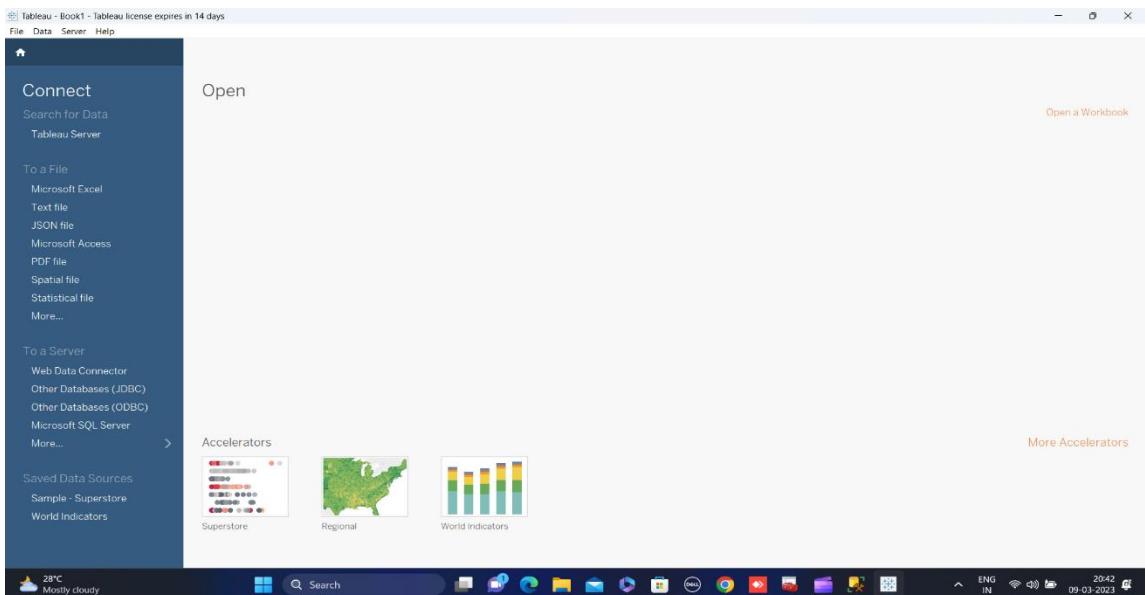
- Country- Country for which Co2 is Recorded
- Year- Year the data was recorded
- Co2 Emission (In Million Metric Tons )
- Co2 Growth per Capita
- Co2 Per Capita
- Cumulative Co2
- Several Fossil Fuels rate of Emission

## Activity 2: Storing Data in DB & Connect DB with Tableau :

The database is stored and connected in Tableau.

The screenshot shows the Microsoft SQL Server Management Studio interface. The Object Explorer on the left shows a database named 'project1' containing a table 'dbo.Co2'. The main window displays a query results grid for a SELECT statement. The grid has 15 rows of data, each representing a year from 1975 to 1989. The columns include 'country', 'year', 'co2', 'co2\_growth\_pct', 'co2\_per\_capita', 'cumulative\_co2', 'coal\_co2', 'cement\_co2', 'flaring\_co2', 'gas\_co2', 'oil\_co2', 'other\_industry\_co2', 'cement\_co2\_per\_capita', 'coal\_co2\_per\_capita', 'flaring\_co2\_per\_capita', 'gas\_co2\_per\_capita', and 'oi'. The data shows a general upward trend in cumulative CO2 over time, with values ranging from 2.121 in 1975 to 5.87 in 1989. A status bar at the bottom indicates the query was executed successfully and shows 10,918 rows.

| country     | year | co2   | co2_growth_pct | co2_per_capita | cumulative_co2 | coal_co2 | cement_co2 | flaring_co2 | gas_co2 | oil_co2 | other_industry_co2 | cement_co2_per_capita | coal_co2_per_capita | flaring_co2_per_capita | gas_co2_per_capita | oi |
|-------------|------|-------|----------------|----------------|----------------|----------|------------|-------------|---------|---------|--------------------|-----------------------|---------------------|------------------------|--------------------|----|
| Afghanistan | 1975 | 2.121 | 10.88          | 0.167          | 21.287         | 0.399    | 0.069      | 0.304       | 0.476   | 0.874   | 0                  | 0.006                 | 0.031               | 0.024                  | 0.038              | 0  |
| Afghanistan | 1976 | 1.981 | -6.62          | 0.153          | 23.267         | 0.425    | 0.079      | 0.293       | 0.3     | 0.883   | 0                  | 0.006                 | 0.033               | 0.023                  | 0.023              | 0  |
| Afghanistan | 1977 | 2.384 | 20.36          | 0.181          | 25.652         | 0.451    | 0.065      | 0.381       | 0.513   | 0.975   | 0                  | 0.005                 | 0.034               | 0.029                  | 0.039              | 0  |
| Afghanistan | 1978 | 2.153 | -9.68          | 0.161          | 27.805         | 0.576    | 0.058      | 0.283       | 0.301   | 0.936   | 0                  | 0.004                 | 0.043               | 0.021                  | 0.023              | 0  |
| Afghanistan | 1979 | 2.233 | 3.69           | 0.166          | 30.038         | 0.352    | 0.064      | 0.267       | 0.385   | 1.165   | 0                  | 0.005                 | 0.026               | 0.02                   | 0.029              | 0  |
| Afghanistan | 1980 | 1.756 | -21.34         | 0.132          | 31.794         | 0.316    | 0.023      | 0.305       | 0.187   | 0.925   | 0                  | 0.002                 | 0.024               | 0.023                  | 0.014              | 0  |
| Afghanistan | 1981 | 1.976 | 12.65          | 0.15           | 33.772         | 0.333    | 0.033      | 0.293       | 0.304   | 1.015   | 0                  | 0.002                 | 0.025               | 0.022                  | 0.023              | 0  |
| Afghanistan | 1982 | 2.095 | 5.87           | 0.163          | 35.857         | 0.385    | 0.039      | 0.282       | 0.396   | 0.993   | 0                  | 0.003                 | 0.03                | 0.022                  | 0.031              | 0  |
| Afghanistan | 1983 | 2.52  | 20.31          | 0.201          | 38.387         | 0.385    | 0.006      | 0.293       | 0.616   | 1.22    | 0                  | 0                     | 0.031               | 0.023                  | 0.049              | 0  |
| Afghanistan | 1984 | 2.822 | 11.97          | 0.231          | 41.209         | 0.393    | 0.048      | 0.316       | 0.932   | 1.134   | 0                  | 0.004                 | 0.032               | 0.026                  | 0.076              | 0  |
| Afghanistan | 1985 | 3.501 | 24.1           | 0.293          | 44.71          | 0.4      | 0.032      | 0.33        | 1.192   | 1.548   | 0                  | 0.003                 | 0.034               | 0.028                  | 0.1                | 0  |
| Afghanistan | 1986 | 3.134 | -10.5          | 0.267          | 47.844         | 0.425    | 0.038      | 0.33        | 1.202   | 1.14    | 0                  | 0.003                 | 0.036               | 0.028                  | 0.102              | 0  |
| Afghanistan | 1987 | 3.114 | -0.63          | 0.268          | 50.957         | 0.443    | 0.043      | 0.223       | 0.392   | 2.013   | 0                  | 0.004                 | 0.038               | 0.019                  | 0.034              | 0  |
| Afghanistan | 1988 | 2.857 | -8.25          | 0.24           | 53.614         | 0.366    | 0.043      | 0.187       | 0.44    | 1.821   | 0                  | 0.004                 | 0.032               | 0.016                  | 0.038              | 0  |
| Afghanistan | 1989 | 2.768 | -3.22          | 0.233          | 56.579         | 0.337    | 0.043      | 0.04        | 0.48    | 1.865   | 0                  | 0.004                 | 0.028               | 0.003                  | 0.04               | 0  |



## **Milestone 3: Data Preparation :**

### **Activity: Prepare the Data for Visualization :**

Preparing the data for visualization involves cleaning the data to remove irrelevant or missing data, transforming the data into a format that can be easily visualized, exploring the data to identify patterns and trends, filtering the data to focus on specific subsets of data, preparing the data for visualization software, and ensuring the data is accurate and complete. Since the Data is initially pre-processed we can skip this step. Basically this process helps to make the data easily understandable and ready for creating visualizations to gain insights into the performance and efficiency.

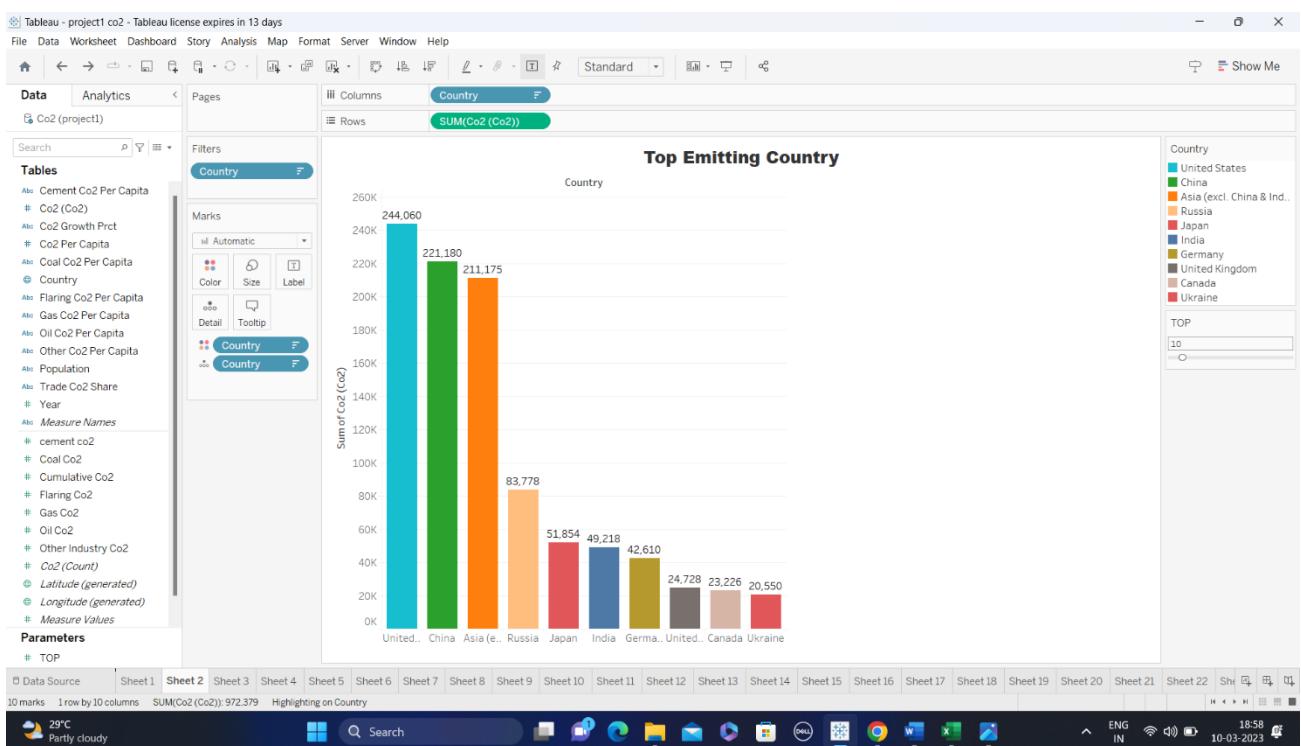
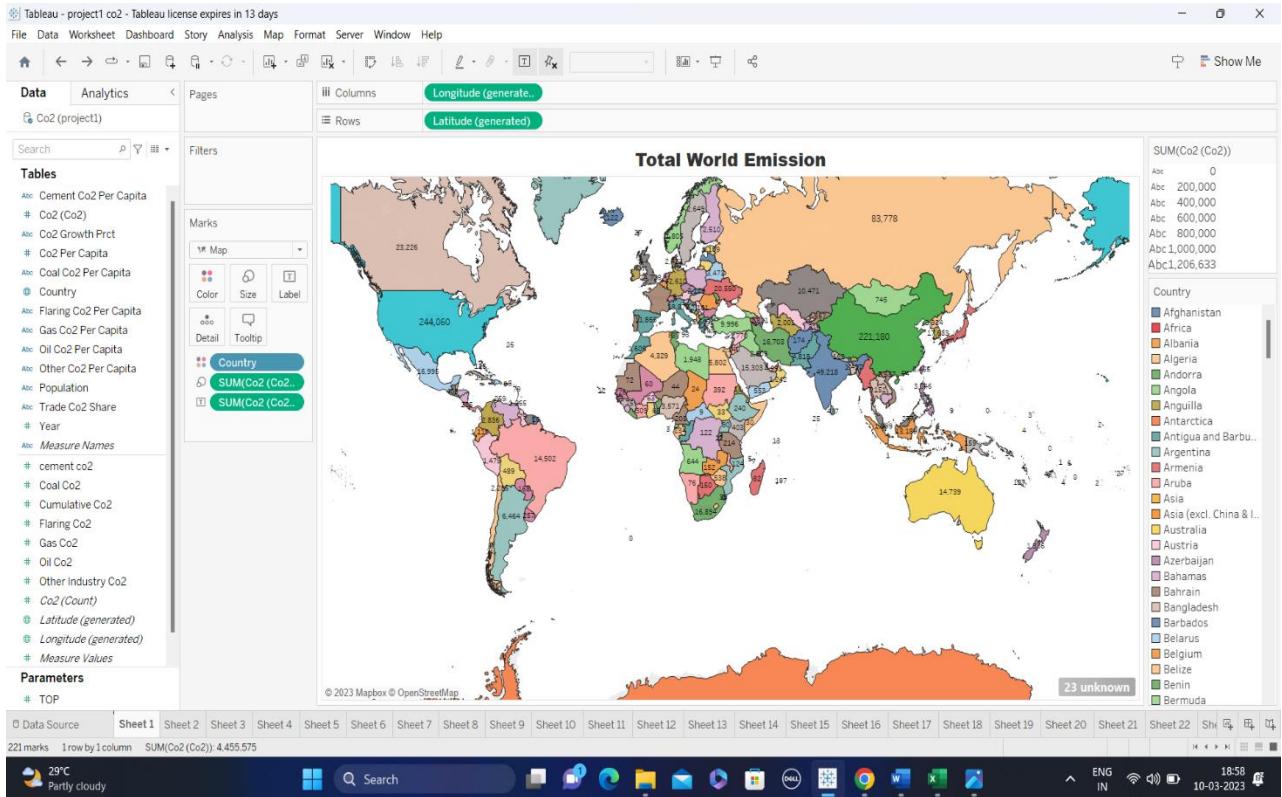
## **Milestone 4: Data Visualization :**

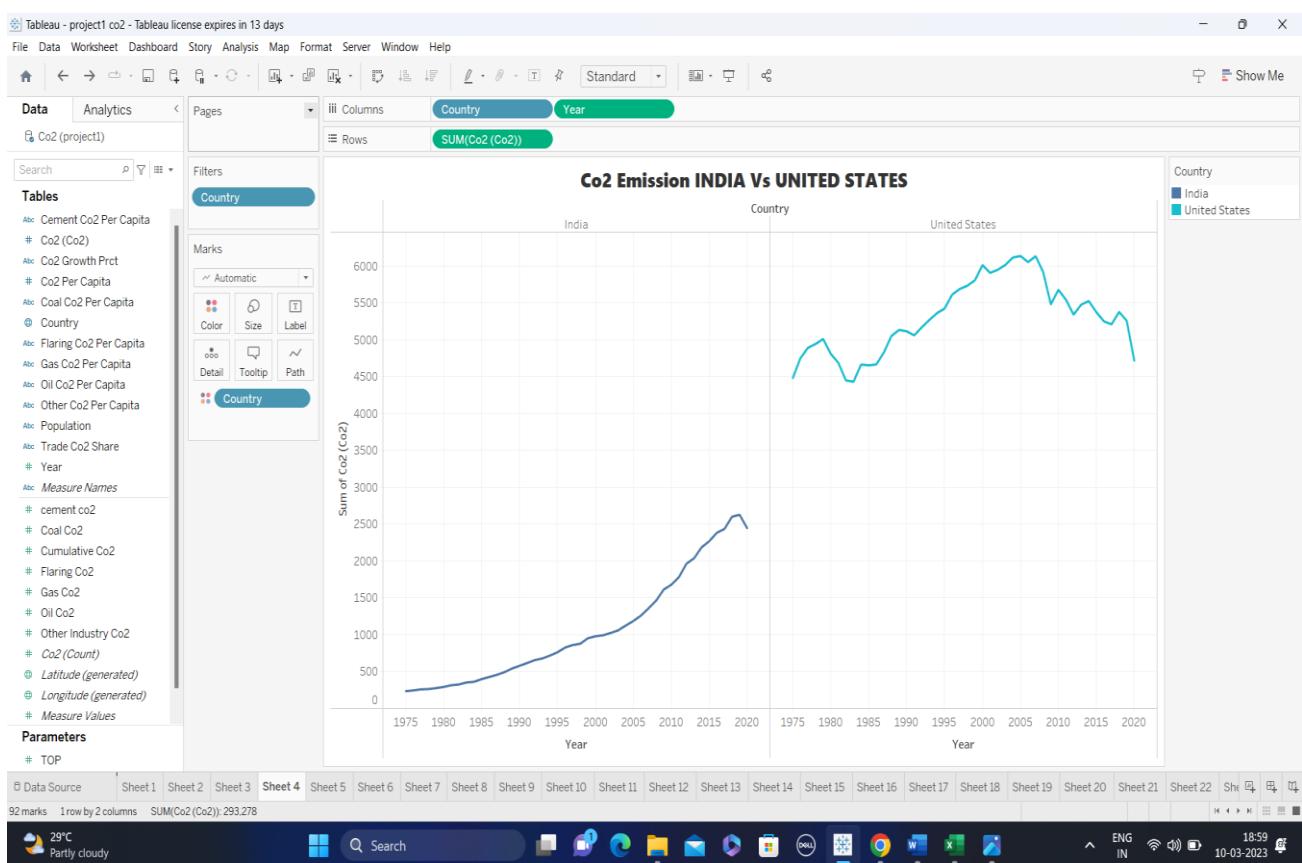
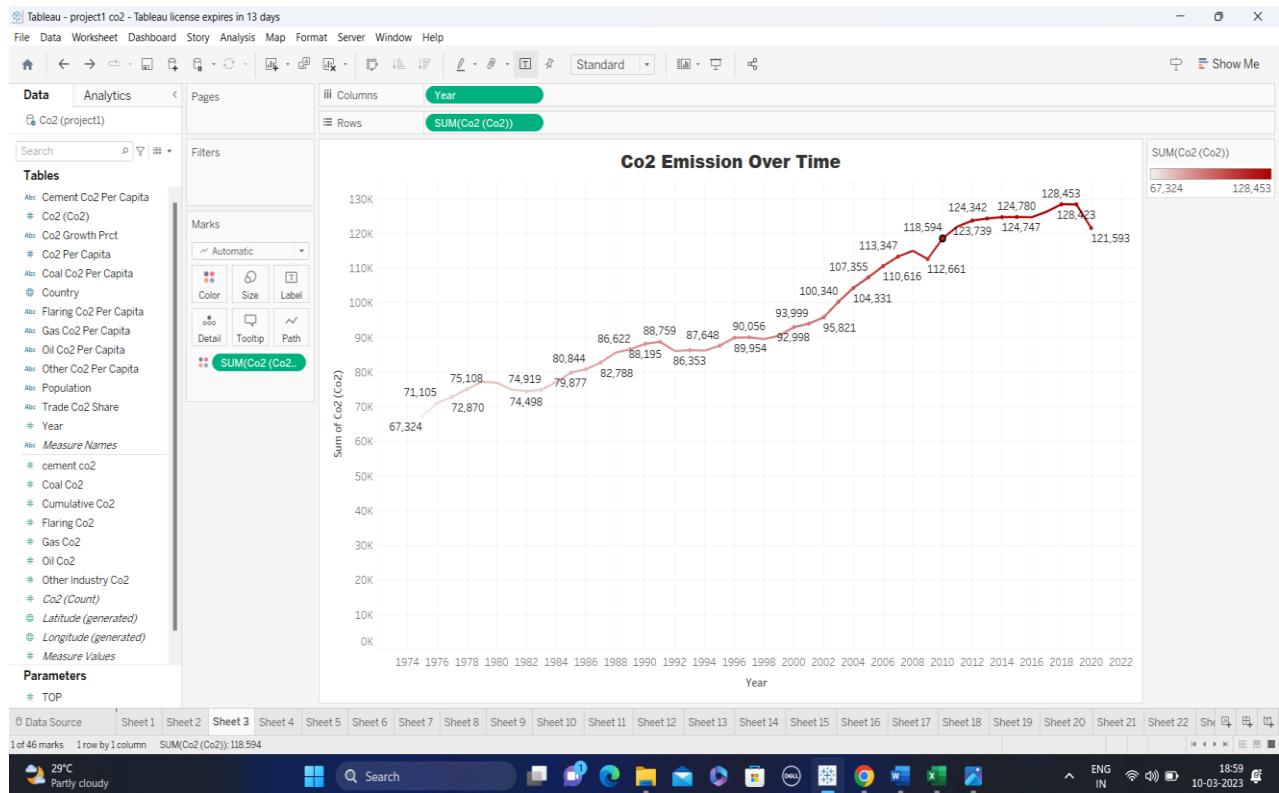
Data visualization is the process of creating graphical representations of data in order to help people understand and explore the information. The goal of data visualization is to make complex data sets more accessible, intuitive, and easier to interpret. By using visual elements such as charts, graphs, and maps, data visualizations can help people quickly identify patterns, trends, and outliers in the data. Activity 1: No of Unique Visualizations

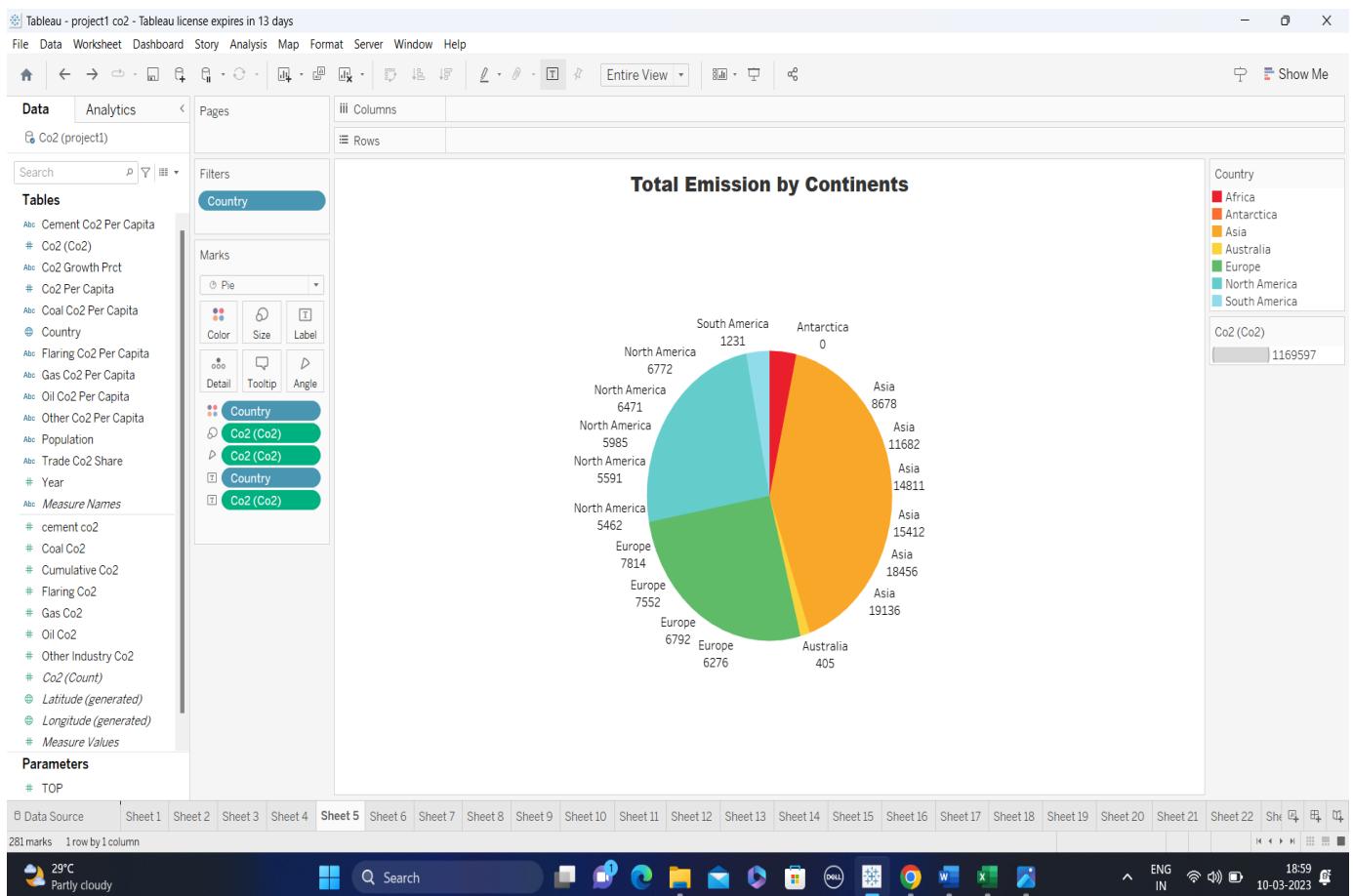
### **Activity 1: No of Unique Visualizations :**

The number of unique visualizations that can be created with a given dataset. Some common types of visualizations that can be used to analyze the Co2 Emission include bar charts, line charts, Tree Map, scatter plots, pie charts, Maps etc. These visualizations can be used to compare performance, track changes over time, show Emission, and relationships between variables, breakdown of factors and emission by countries and continents.

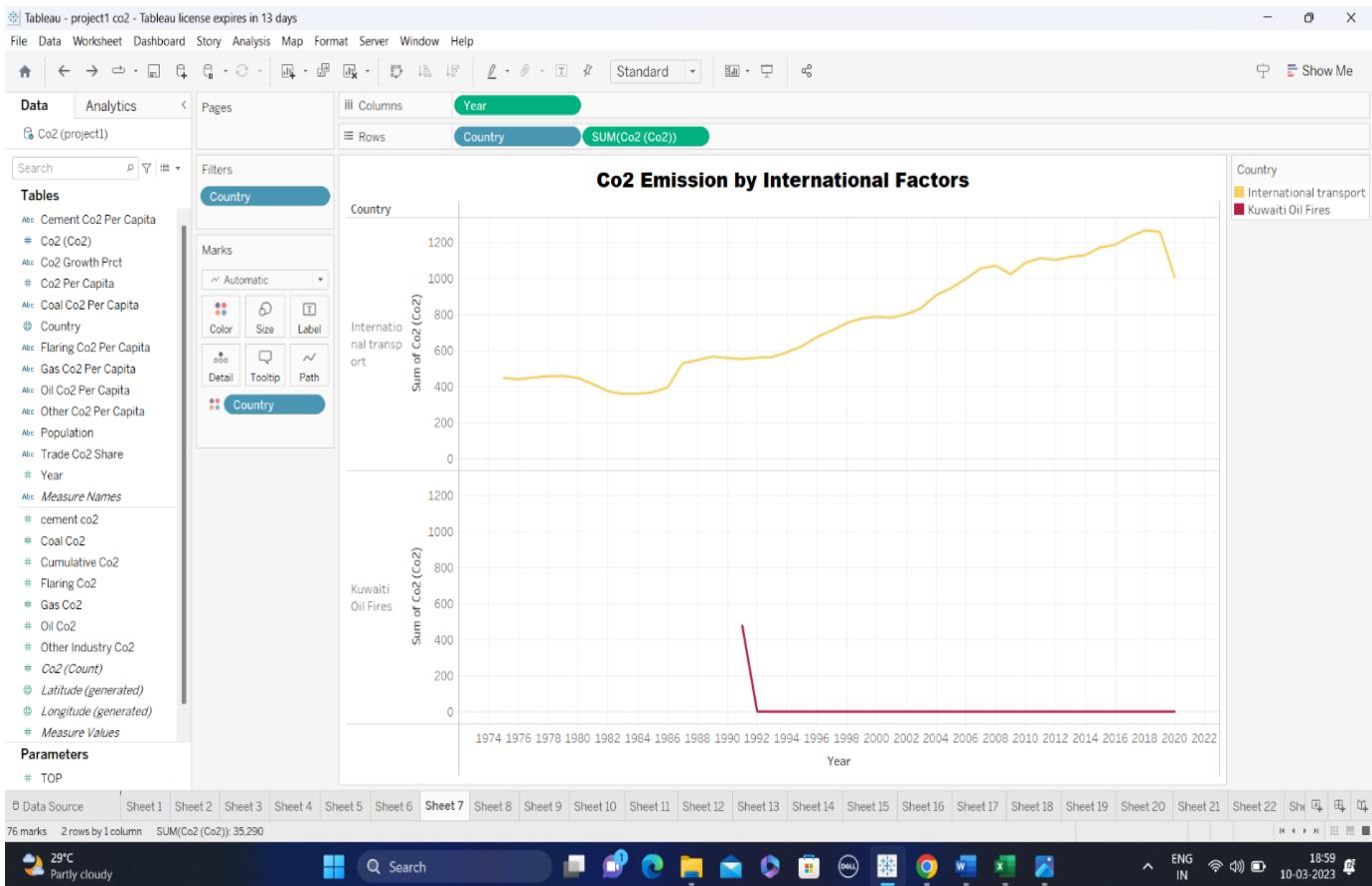
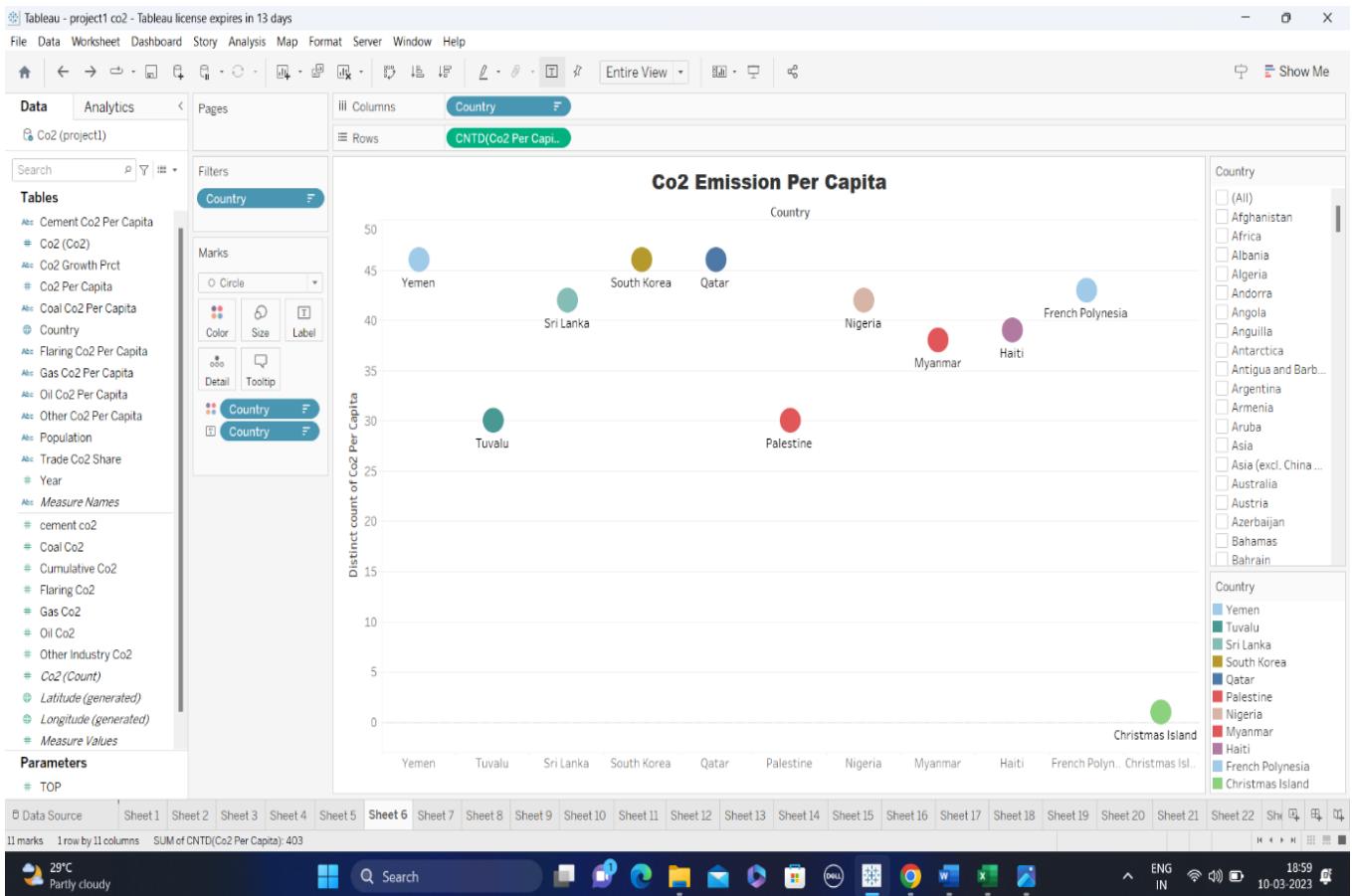
## Activity 1.1 :To Understand- Total World Emission, Co2 Emission over Time, Total Emission by Continents :

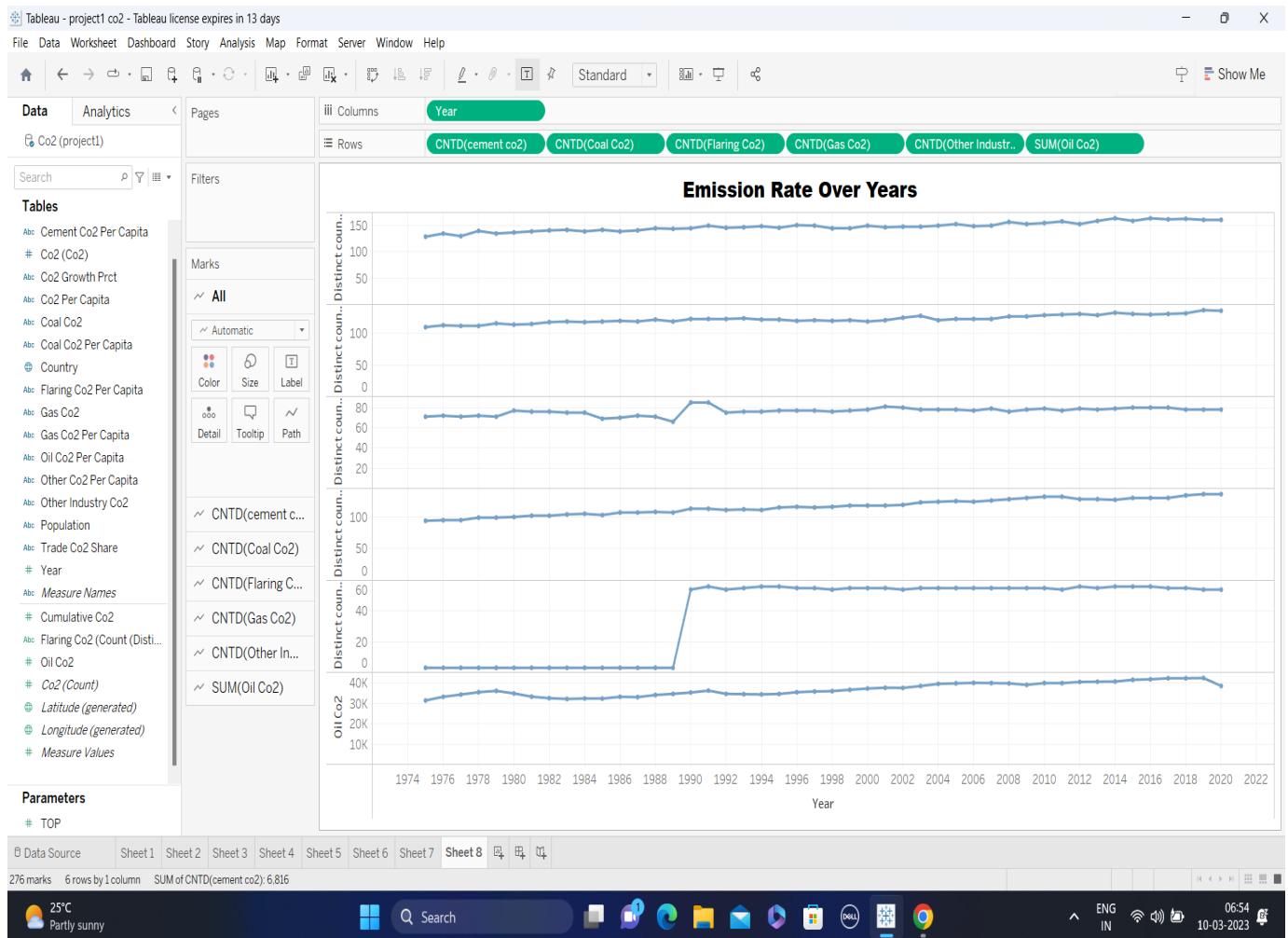




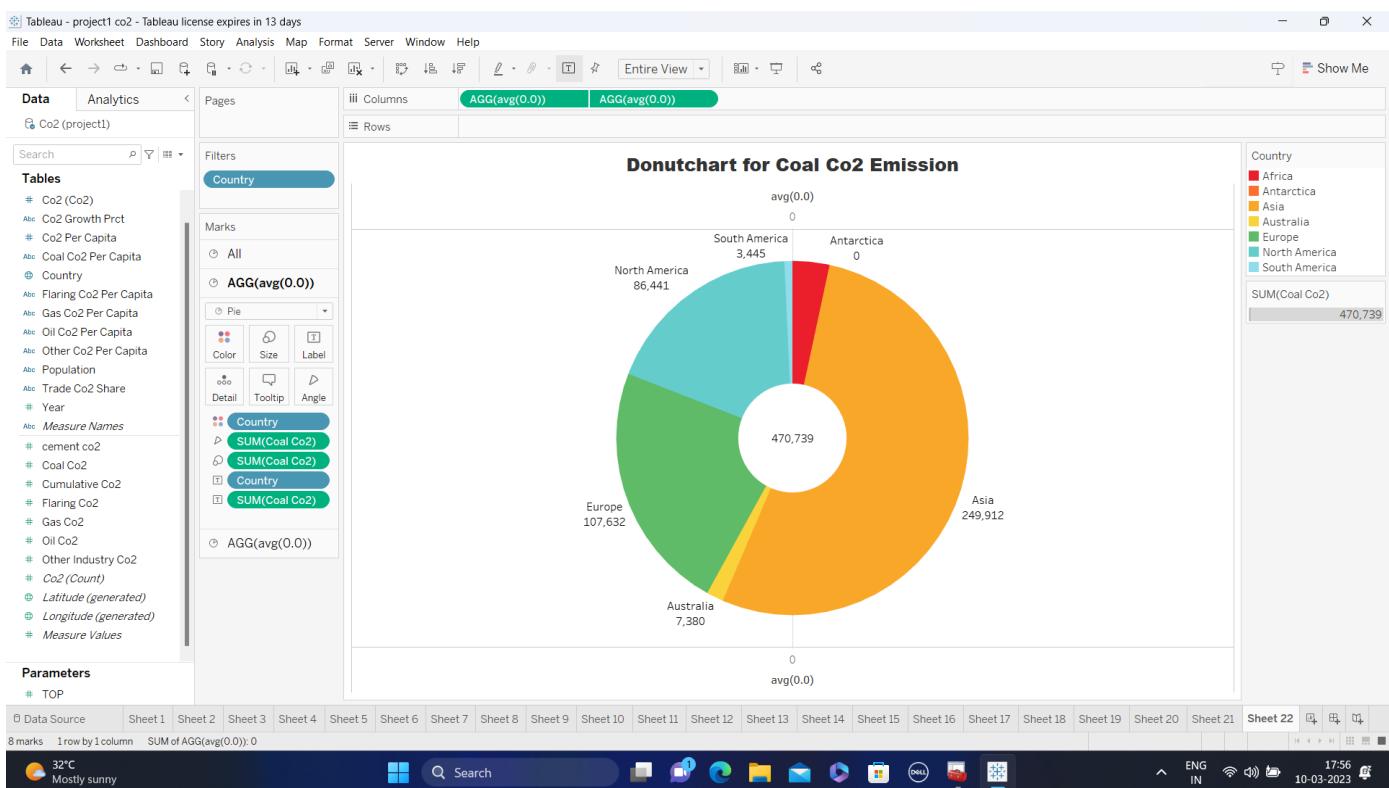
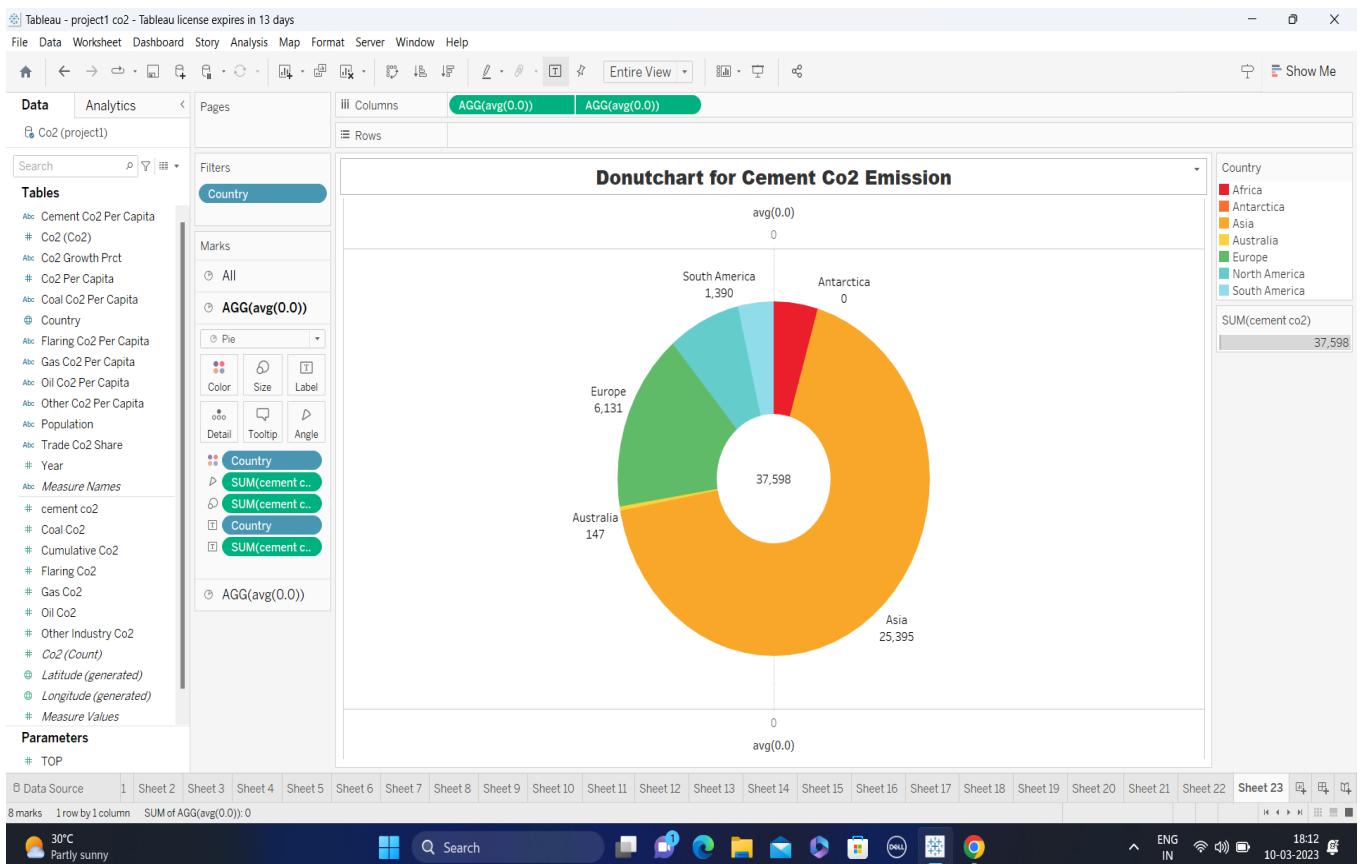


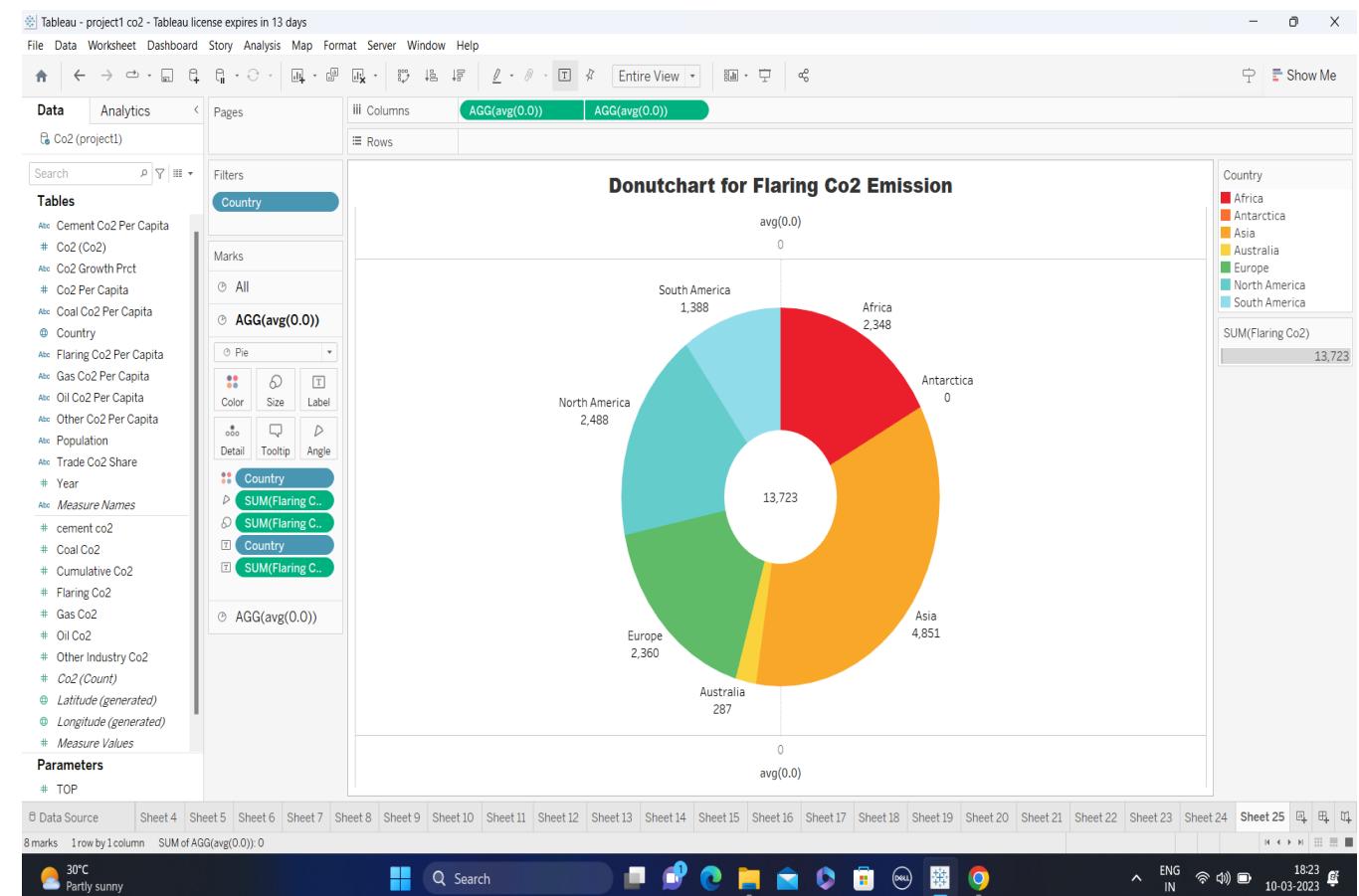
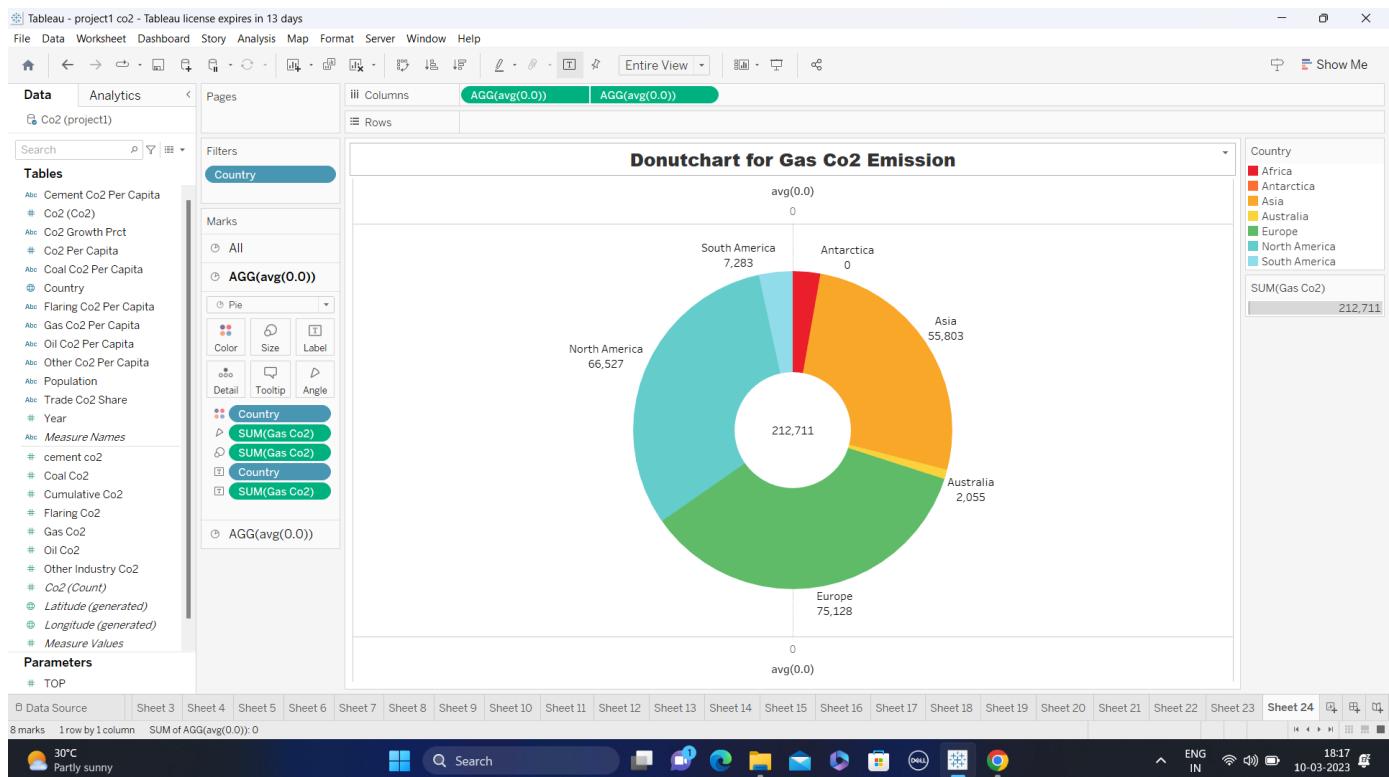
## Activity 1.2 : To Understand- Co2 Emission per Capita, Co2 Emission by International Factors, Emission Rate Over Years :

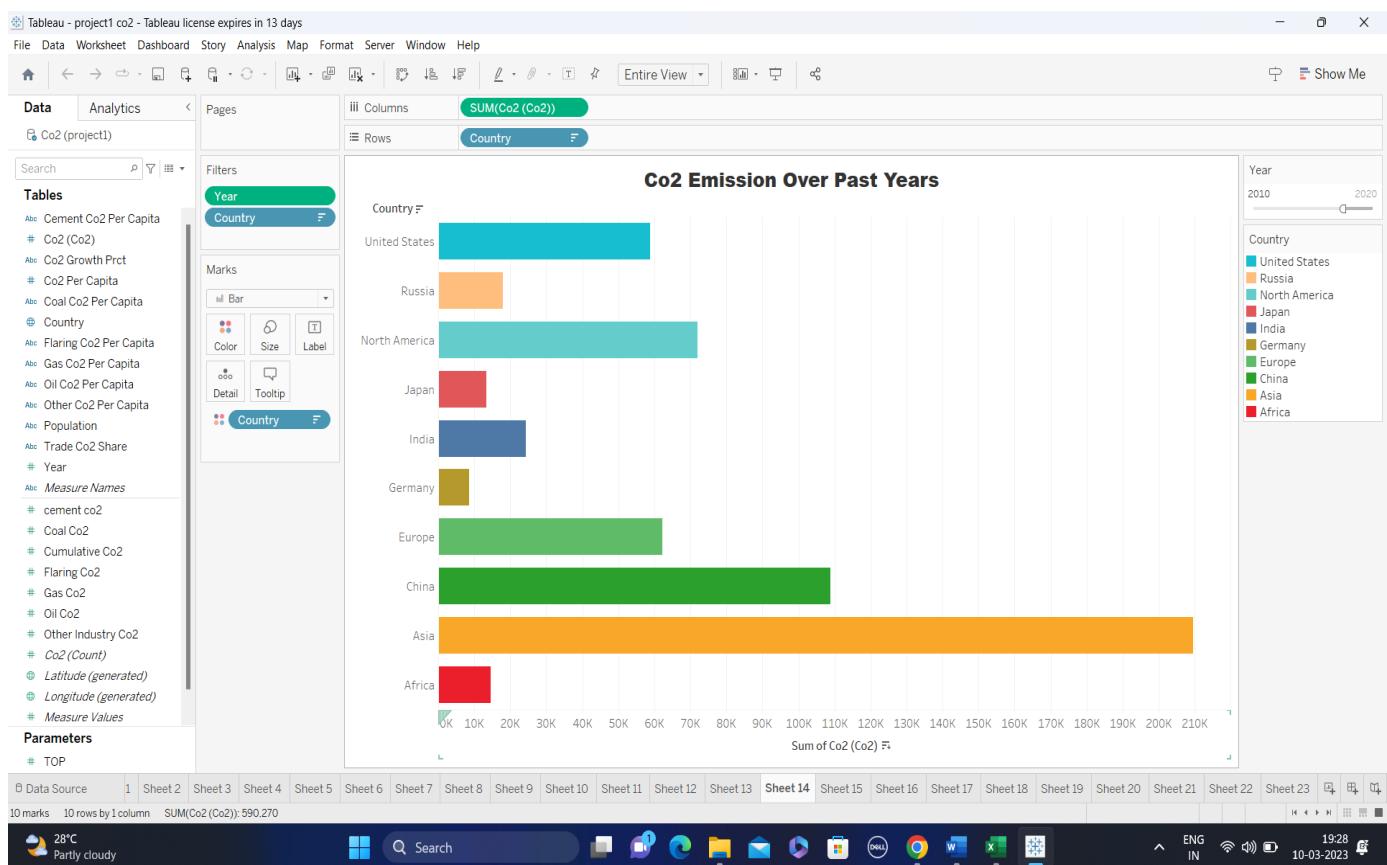
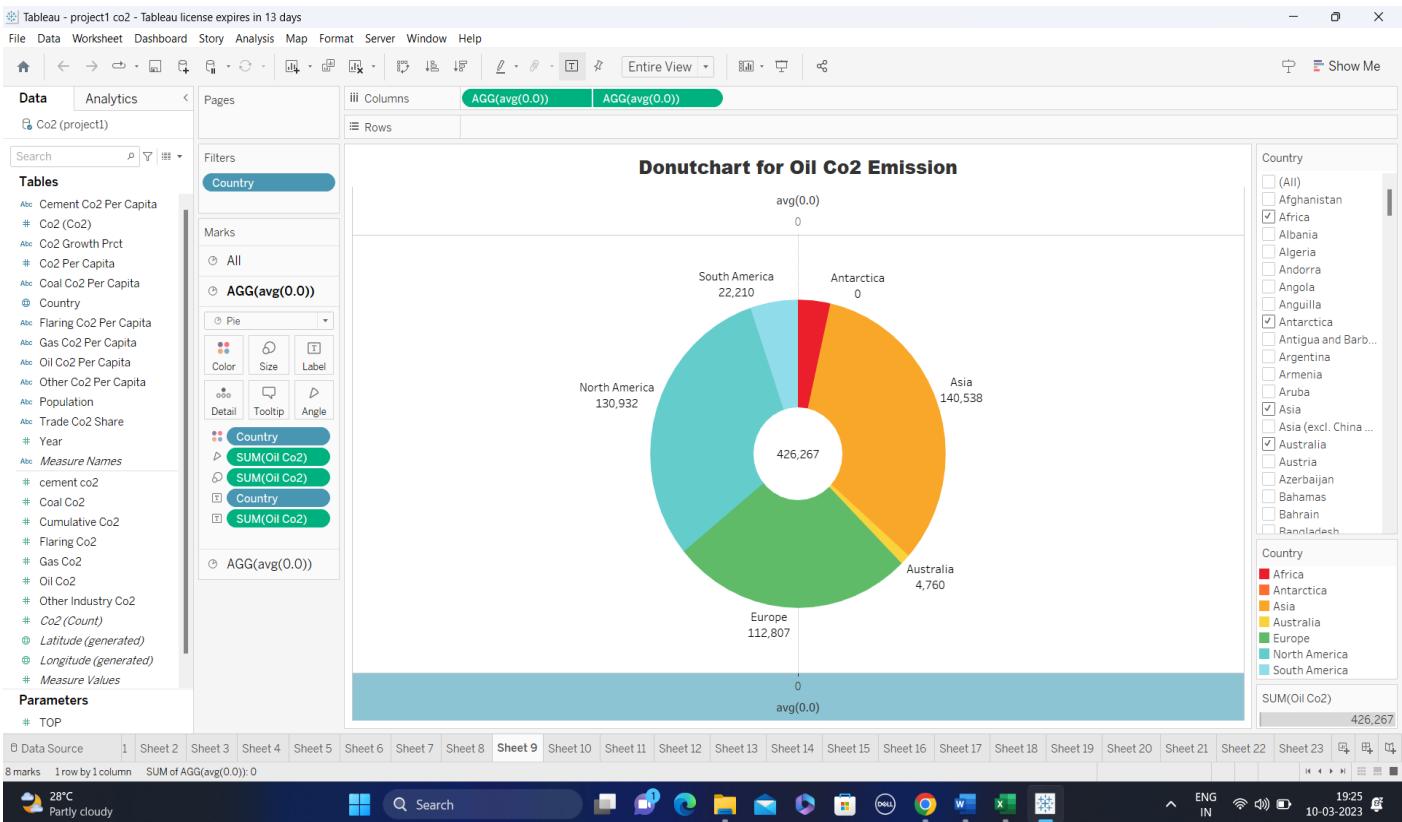


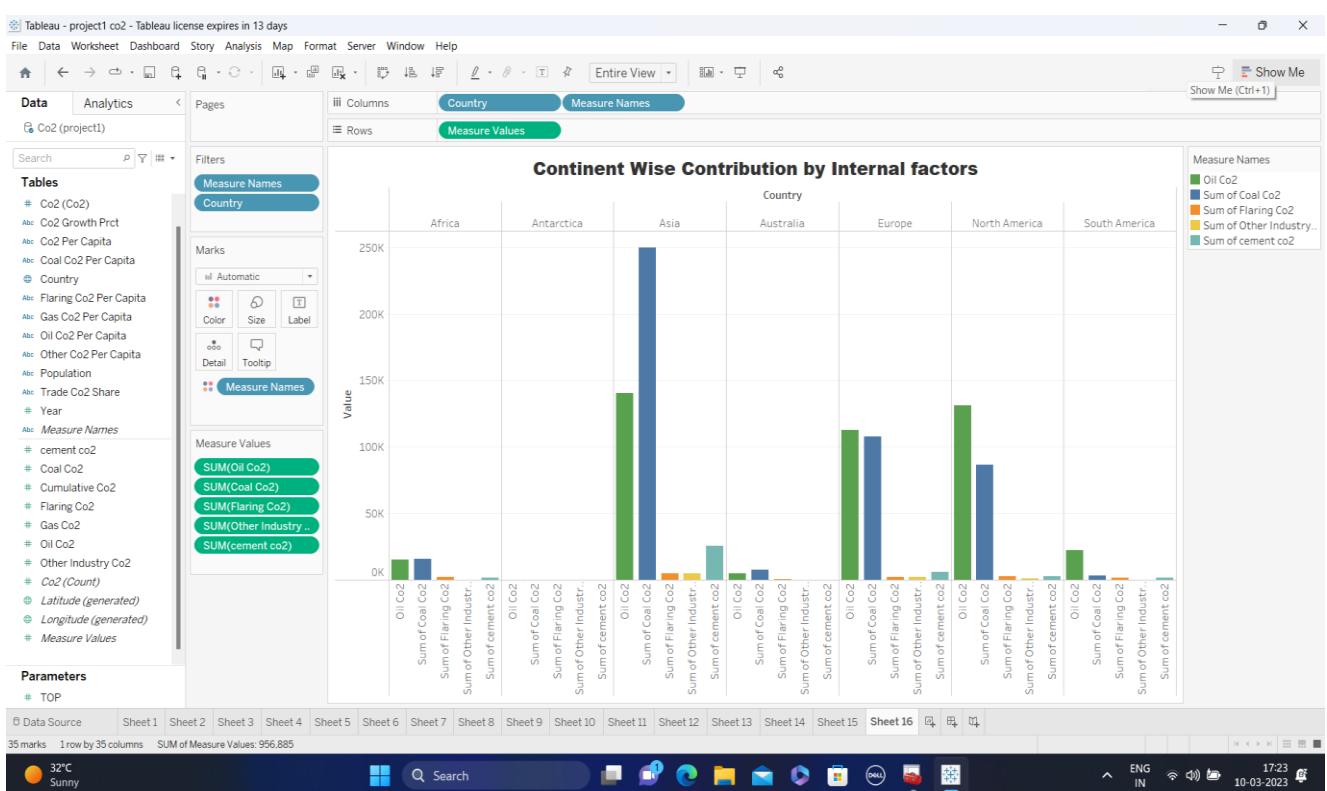
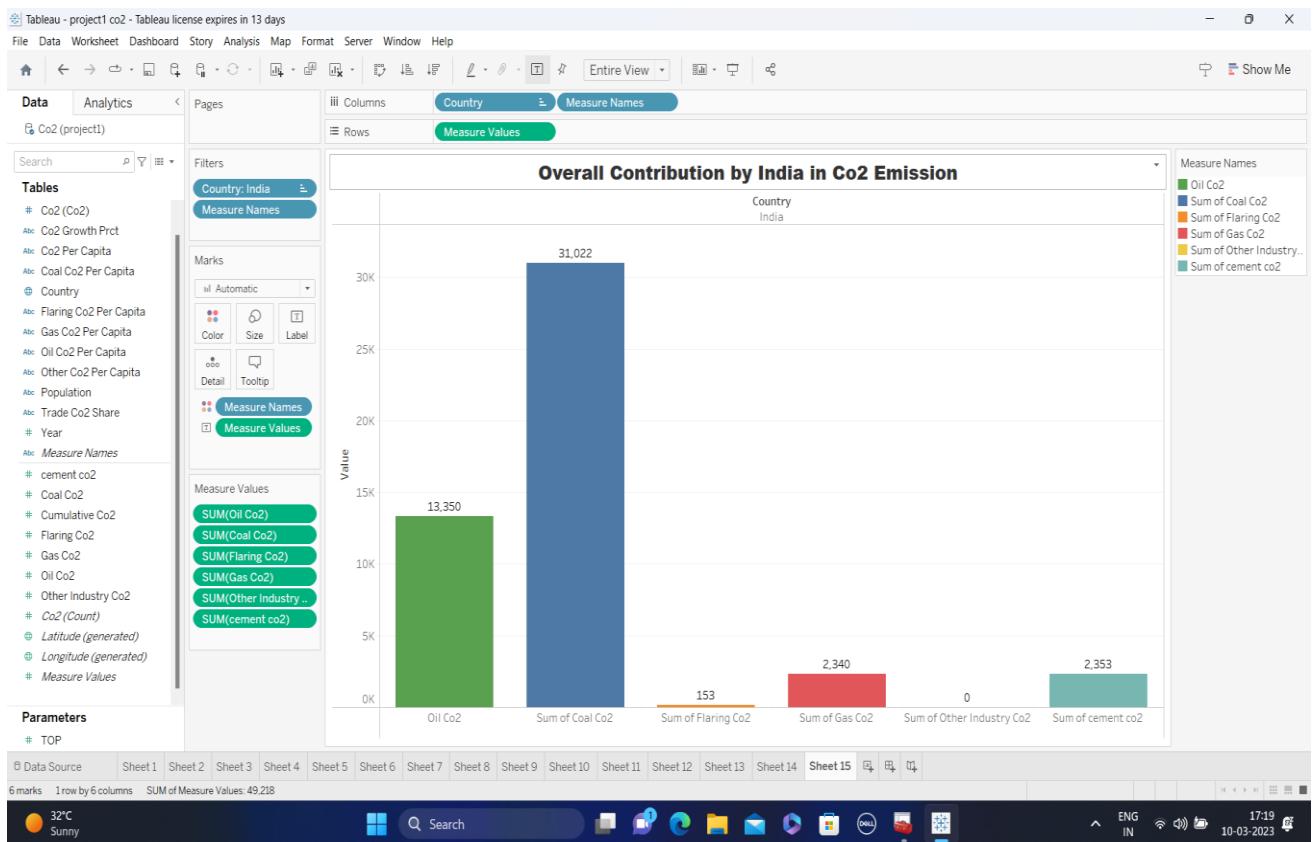


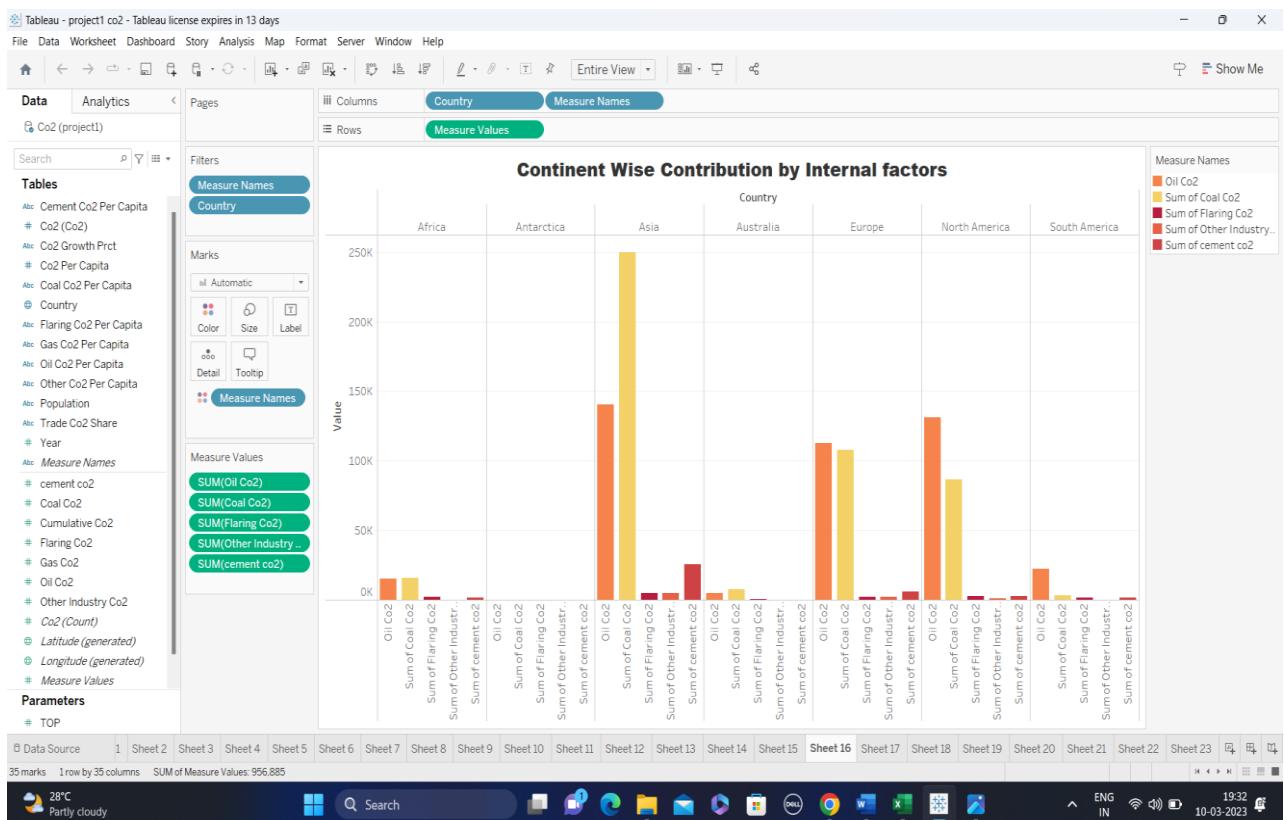
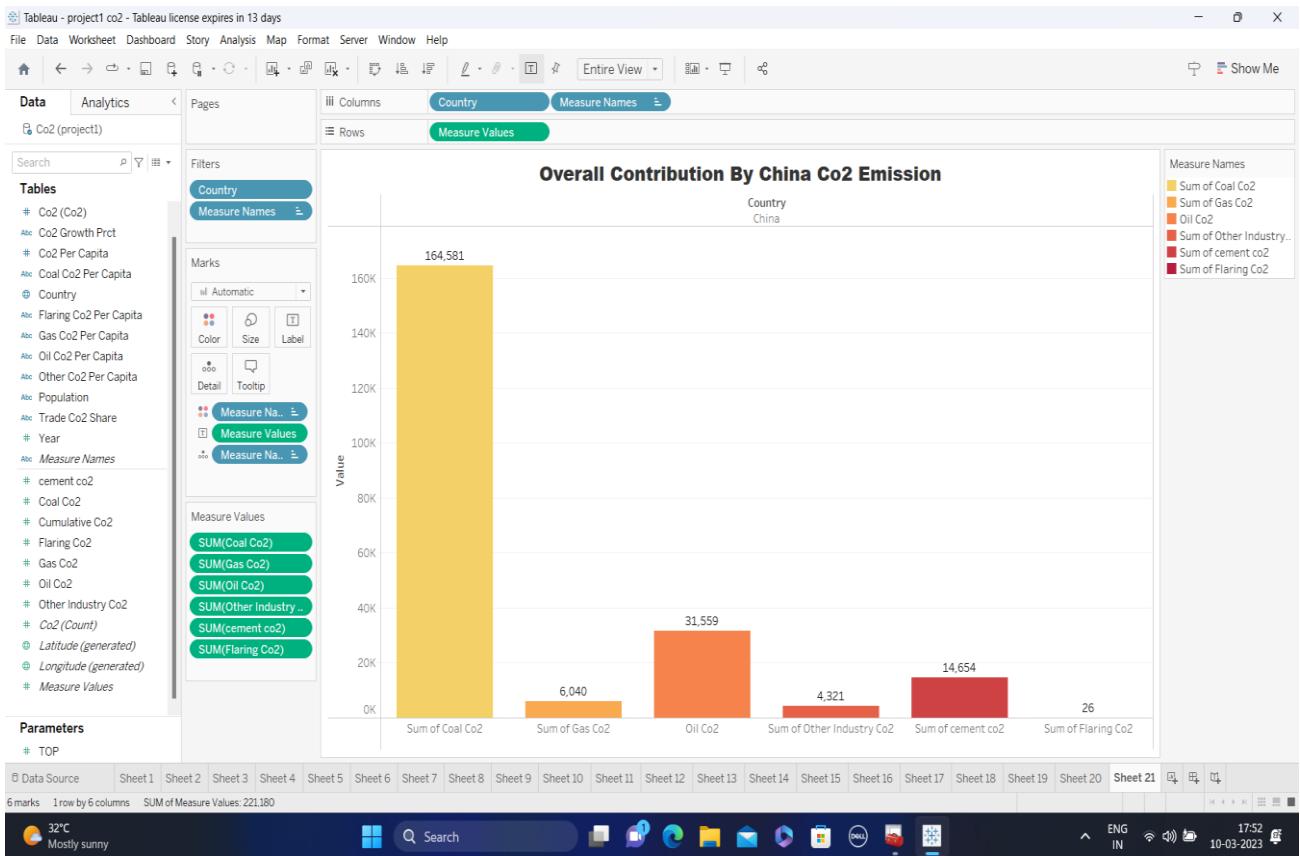
**Activity 1.3 : To Understand- Co2 contribution by different fossil fuels, Co2 Emission over past 10 Years, Change in Co2 Emission and Co2 Emission in 2020 :**

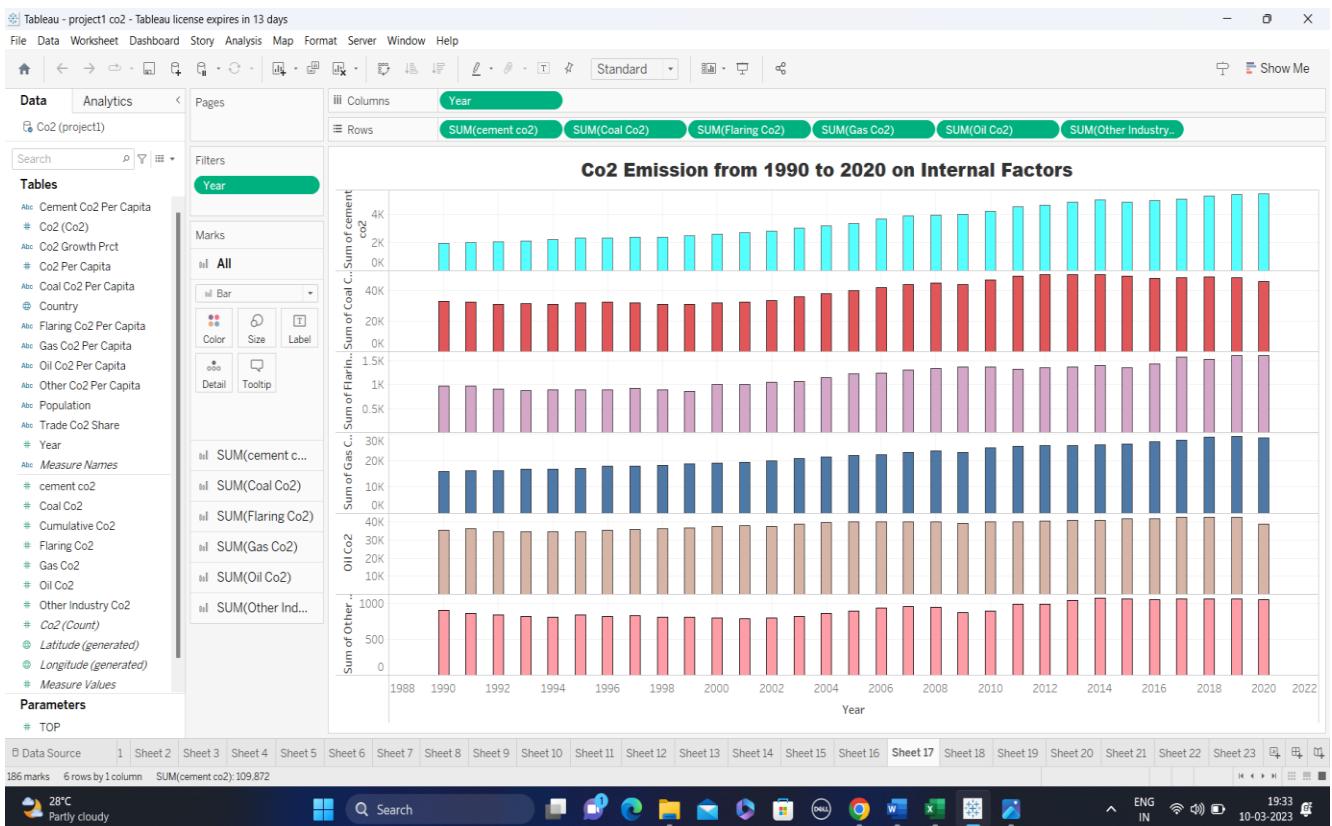




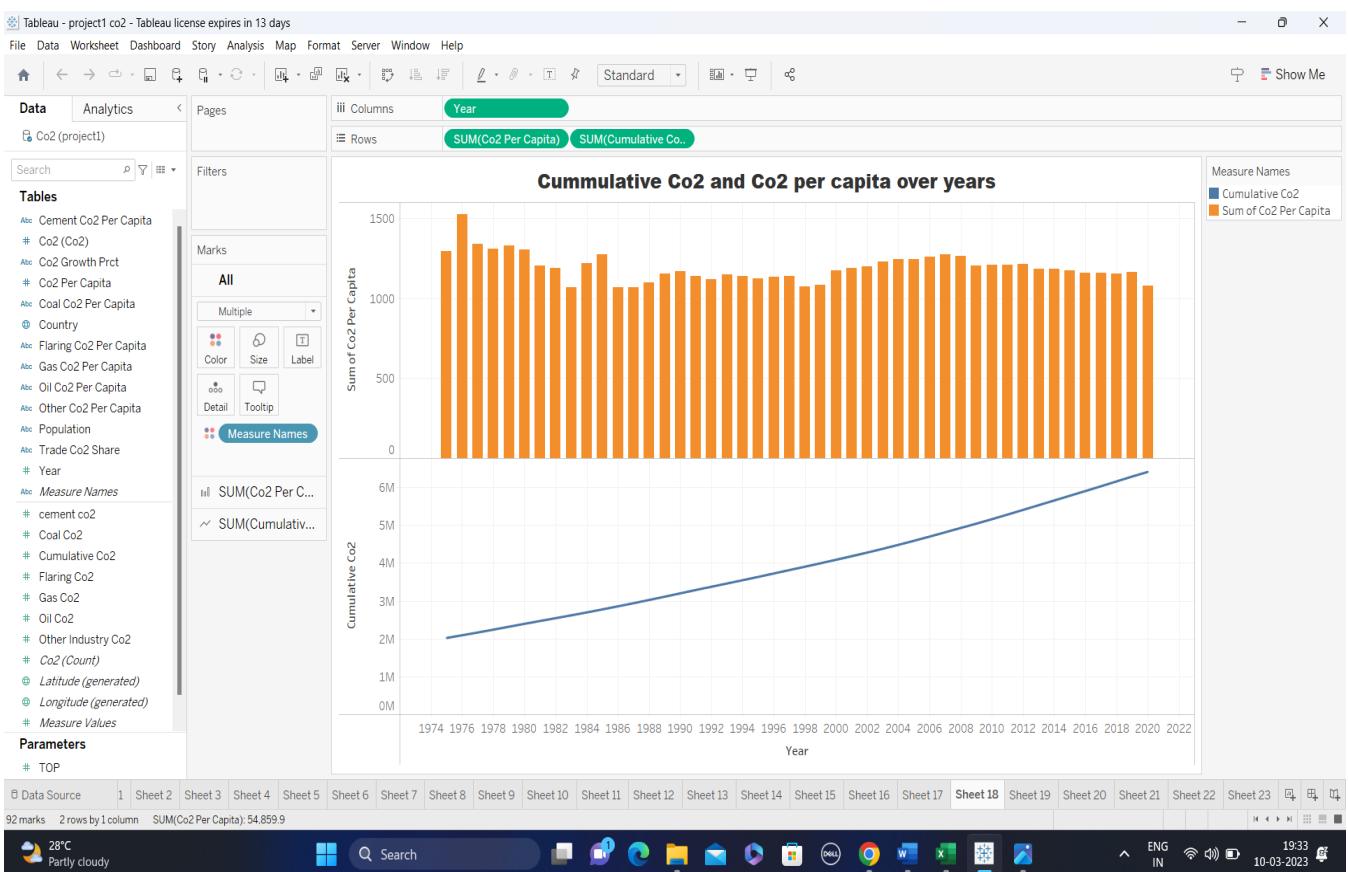


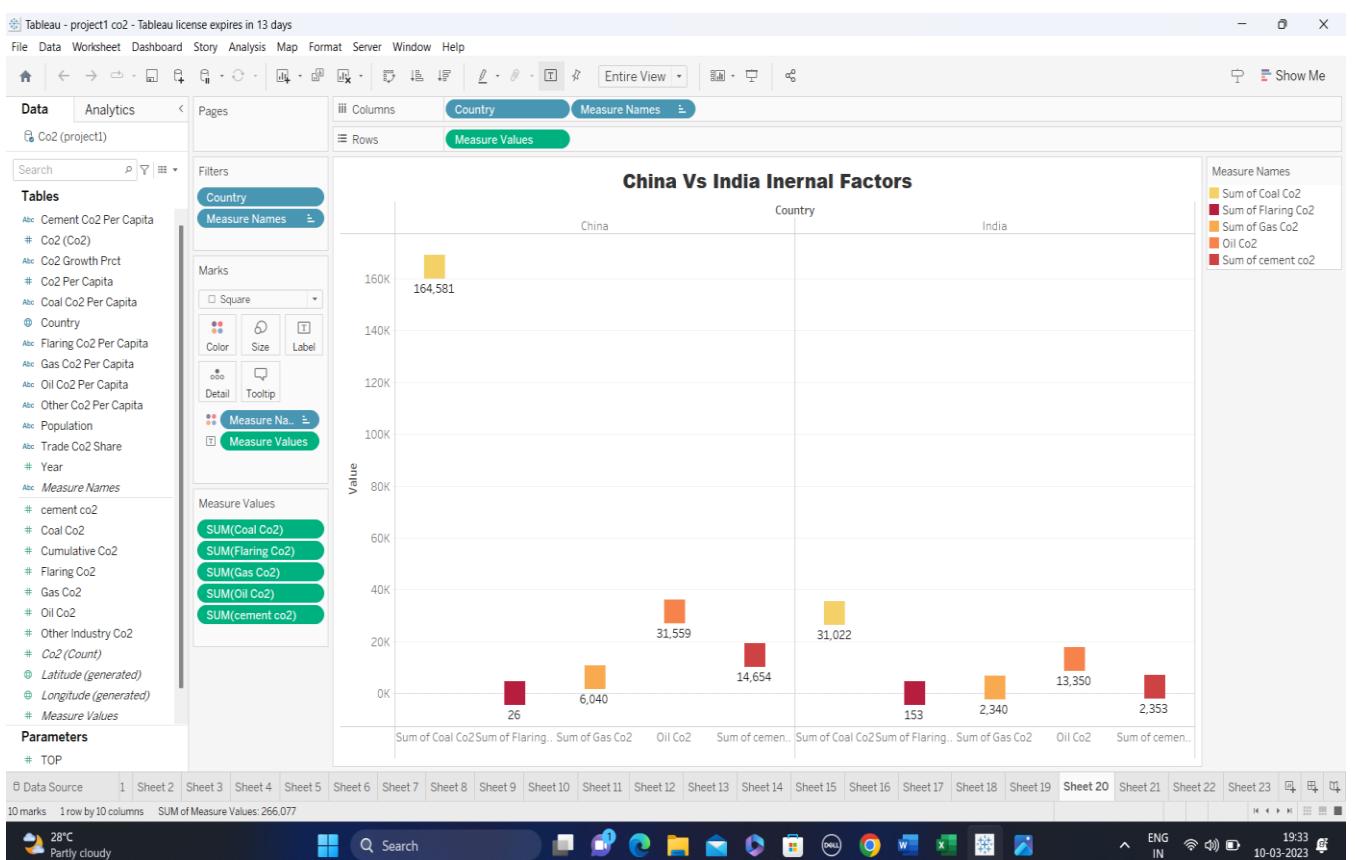
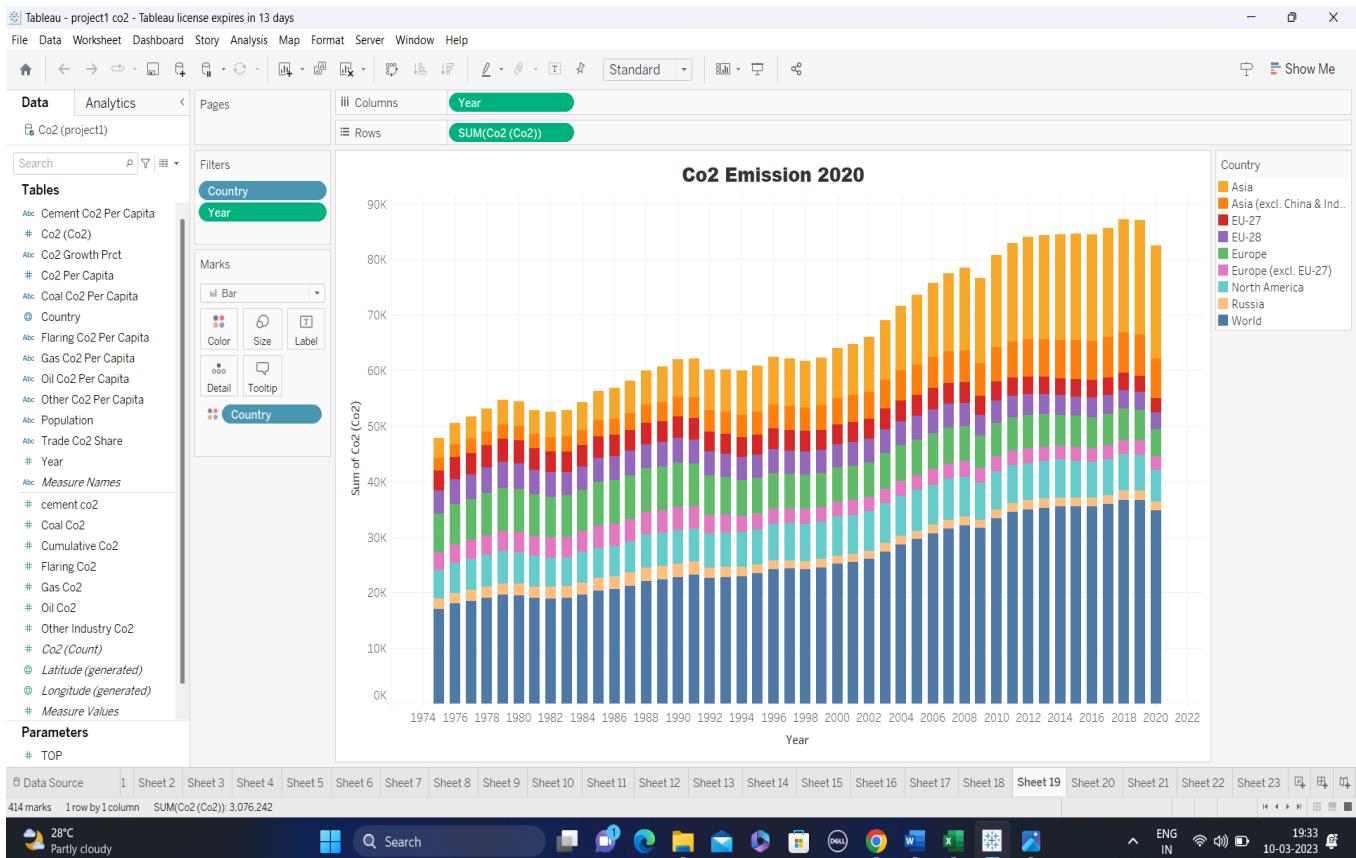


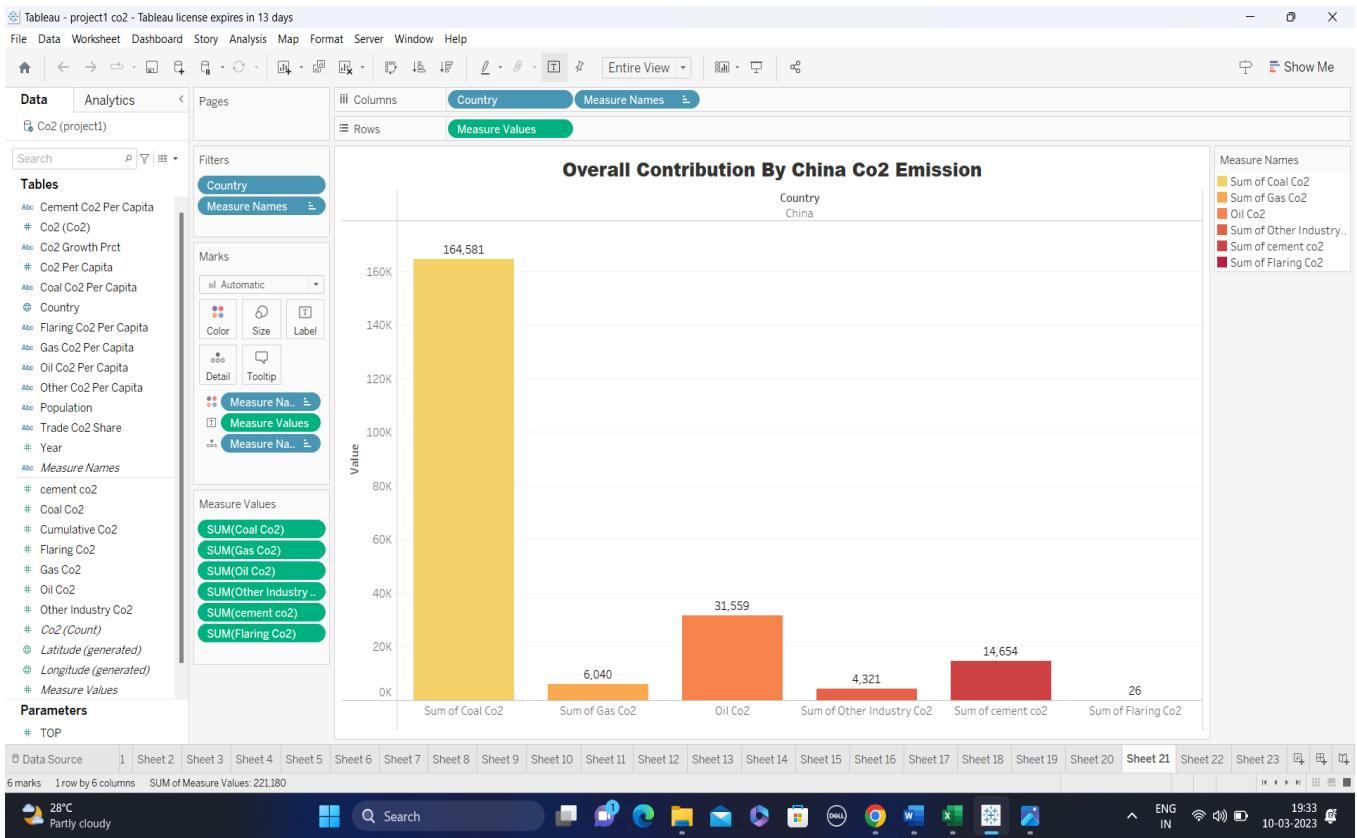




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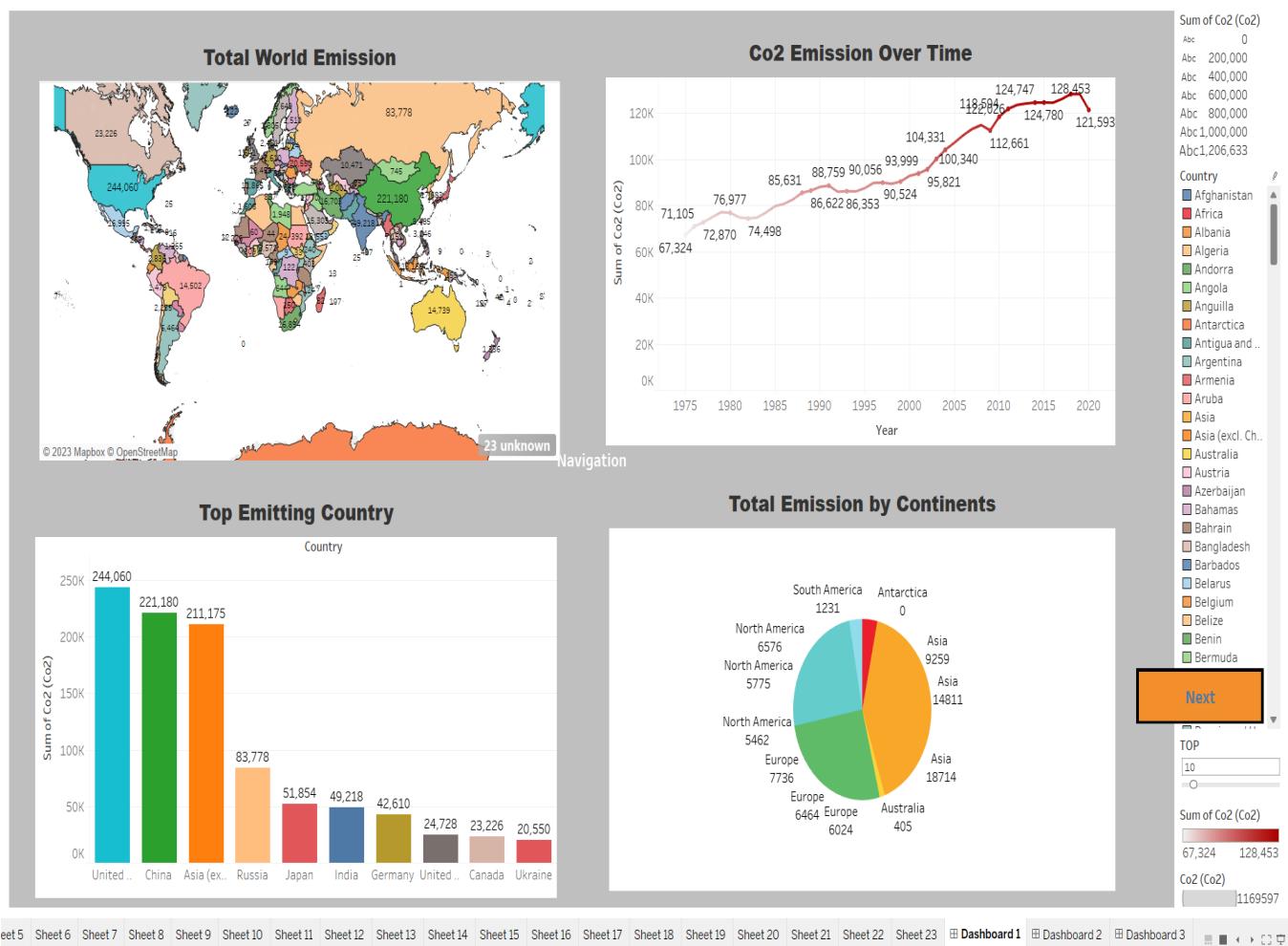


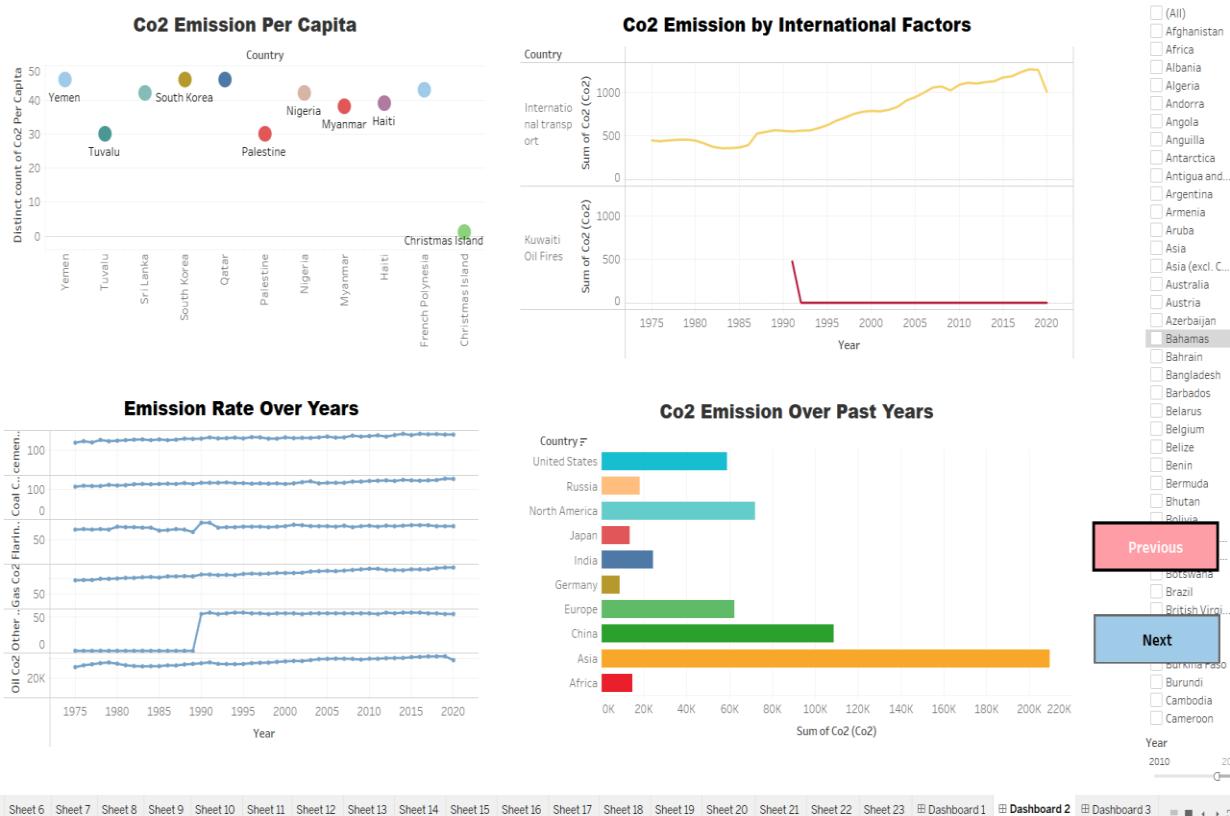
## Milestone 5: Dashboard :

A dashboard is a graphical user interface (GUI) that displays information and data in an organized, easy-to-read format. Dashboards are often used to provide real-time monitoring and analysis of data, and are typically designed for a specific purpose or use case. Dashboards can be used in a variety of settings, such as business, finance, manufacturing, healthcare, and many other industries. They can be used to track key performance indicators (KPIs), monitor performance metrics, and display data in the form of charts, graphs, and tables.

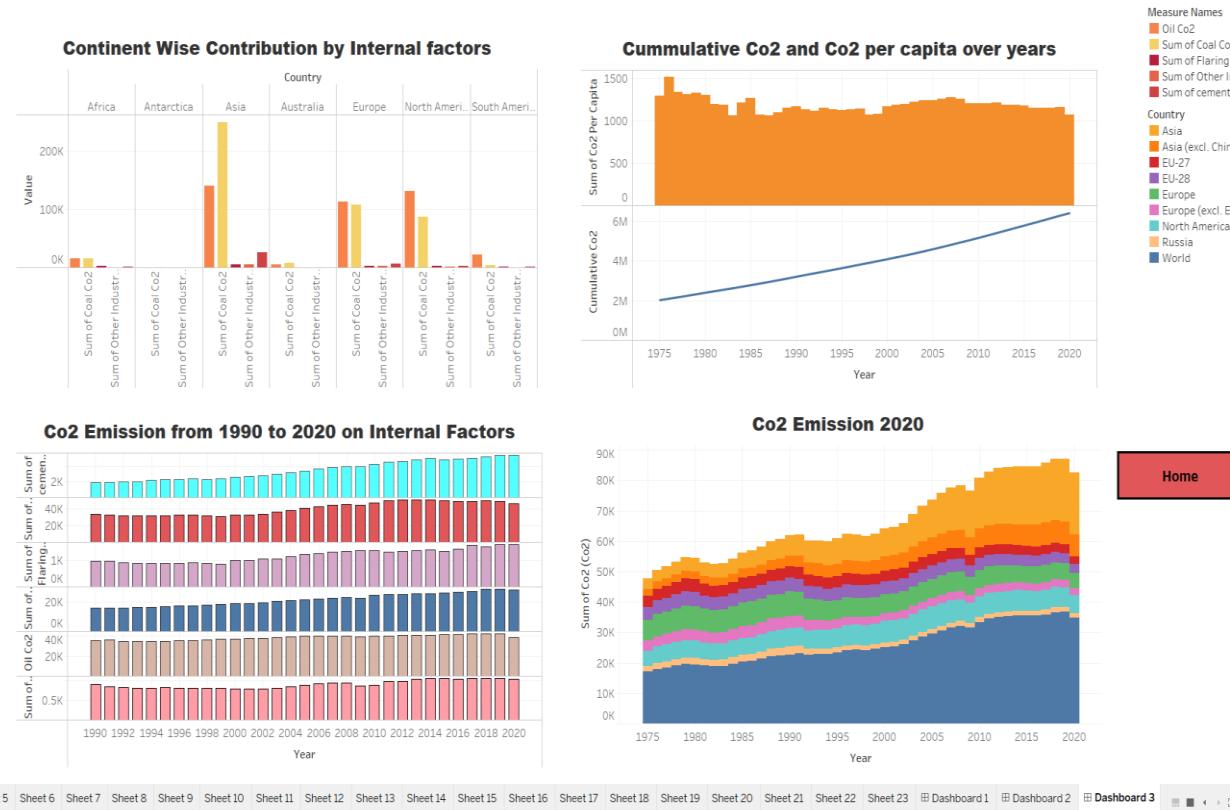
## Activity :1- Responsive and Design of Dashboard

The responsiveness and design of a dashboard for analyzing the globally Co2 Emission. It is crucial to ensure that the information is easily understandable and actionable. Key considerations for designing a responsive and effective dashboard include user-centred design, clear and concise information, interactivity, data-driven approach, accessibility, customization. Once you have created views on different sheets in Tableau, you can pull them into a dashboard.





Sheet 5 Sheet 6 Sheet 7 Sheet 8 Sheet 9 Sheet 10 Sheet 11 Sheet 12 Sheet 13 Sheet 14 Sheet 15 Sheet 16 Sheet 17 Sheet 18 Sheet 19 Sheet 20 Sheet 21 Sheet 22 Sheet 23 Dashboard 1 Dashboard 2 Dashboard 3



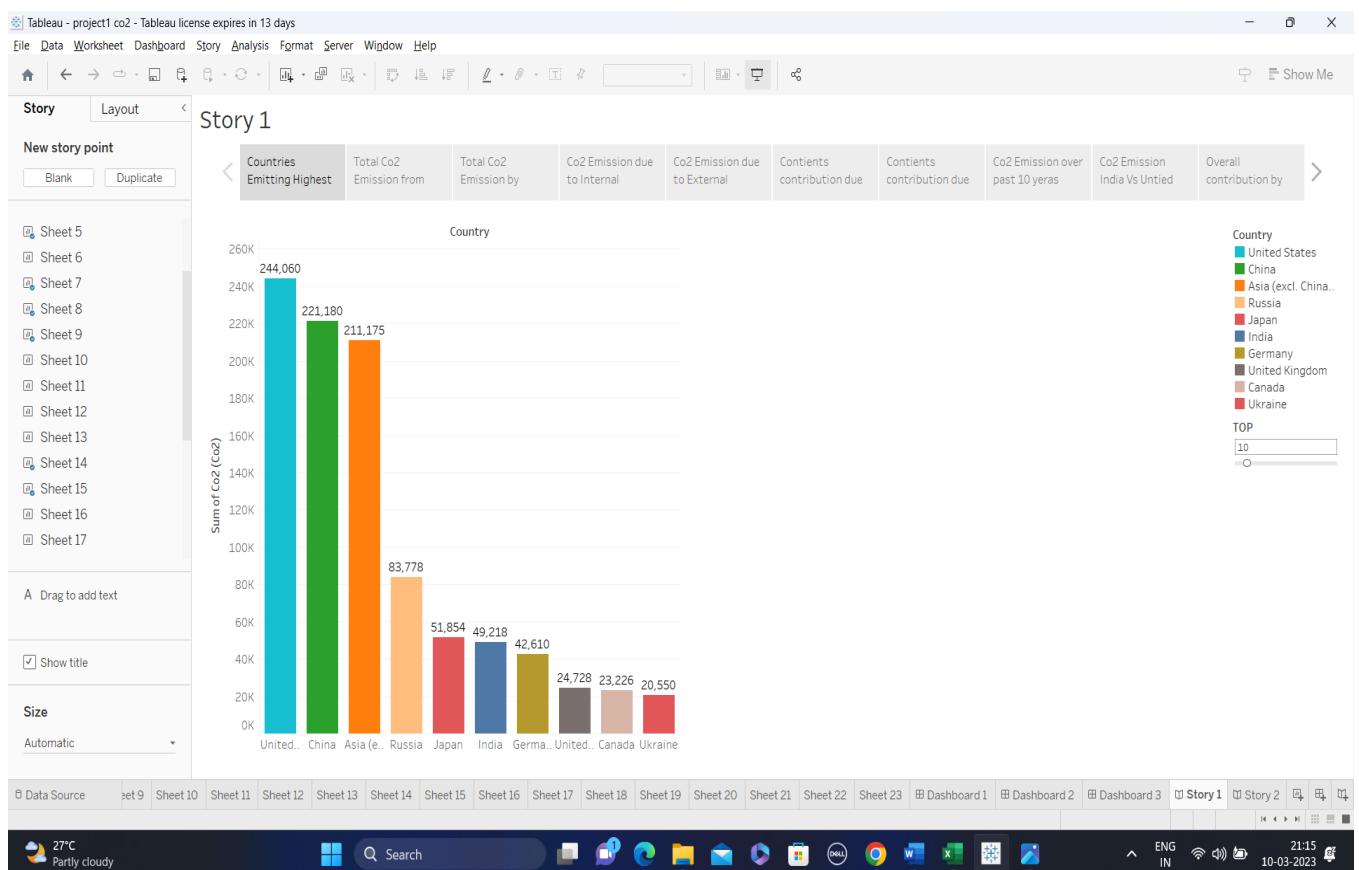
Sheet 5 Sheet 6 Sheet 7 Sheet 8 Sheet 9 Sheet 10 Sheet 11 Sheet 12 Sheet 13 Sheet 14 Sheet 15 Sheet 16 Sheet 17 Sheet 18 Sheet 19 Sheet 20 Sheet 21 Sheet 22 Sheet 23 Dashboard 1 Dashboard 2 Dashboard 3

## Milestone 6: Story :

A data story is a way of presenting data and analysis in a narrative format, with the goal of making the information more engaging and easier to understand. A data story typically includes a clear introduction that sets the stage and explains the context for the data, a body that presents the data and analysis in a logical and systematic way, and a conclusion that summarizes the key findings and highlights their implications. Data stories can be told using a variety of mediums, such as reports, presentations, interactive visualizations, and videos.

### Activity: 1- No of Scenes of Story :

The number of scenes in a storyboard for a data visualization analysis of the Co2 Emission will depend on the complexity of the analysis and the specific insights that are trying to be conveyed. A storyboard is a visual representation of the data analysis process and it breaks down the analysis into a series of steps or scenes.



## Milestone 7: Performance Testing:

### Activity 1: Amount of Data Rendered to DB:

- The amount of data that is rendered to a database depends on the size of the dataset and the capacity of the database to store and retrieve data.
- Open the SQL Server Management Studio, go to the database then click to expand the tables, select the table and Right click and select Properties

The screenshot shows the Microsoft SQL Server Management Studio interface. The Object Explorer on the left lists the database structure, including databases, tables, and other objects. A results grid on the right displays the structure and data of a table named 'Co2'.

| Name | Owner | Type       | Created_datetime        |
|------|-------|------------|-------------------------|
| Co2  | dbo   | user table | 2023-03-09 20:35:31.497 |

| Column_name     | Type     | Computed | Length | Prec | Scale | Nullable | TrimTrailingBlanks | FixedLenNullSource | Collation                |
|-----------------|----------|----------|--------|------|-------|----------|--------------------|--------------------|--------------------------|
| cumulative_co2  | float    | no       | 8      | 53   | NULL  | no       | (n/a)              | (n/a)              | NULL                     |
| coal_co2        | nvarchar | no       | 100    |      |       | no       | (n/a)              | (n/a)              | SQL_Latin1_General_CI_AS |
| cement_co2      | nvarchar | no       | 100    |      |       | no       | (n/a)              | (n/a)              | SQL_Latin1_General_CI_AS |
| flaring_co2     | nvarchar | no       | 100    |      |       | no       | (n/a)              | (n/a)              | SQL_Latin1_General_CI_AS |
| gas_co2         | nvarchar | no       | 100    |      |       | no       | (n/a)              | (n/a)              | SQL_Latin1_General_CI_AS |
| oil_co2         | float    | no       | 8      | 53   | NULL  | no       | (n/a)              | (n/a)              | NULL                     |
| other_industry_ | nvarchar | no       | 100    |      |       | no       | (n/a)              | (n/a)              | SQL_Latin1_General_CI_AS |
| cement_co2_p_   | nvarchar | no       | 100    |      |       | no       | (n/a)              | (n/a)              | SQL_Latin1_General_CI_AS |

| Identity                    | Seed | Increment | NotForReplication |
|-----------------------------|------|-----------|-------------------|
| No identity column defined. | NULL | NULL      | NULL              |

| RowGuidCol                    |
|-------------------------------|
| No rowguidcol column defined. |

| Data_located_on_filegroup |
|---------------------------|
| PRIMARY                   |

Query executed successfully.

SQLQuery2.sql - DESKTOP-TOTM955\SQLEXPRESS01.project1 (DESKTOP-TOTM955\drsja (54))\* - Microsoft SQL Server Management Studio

File Edit View Query Project Tools Window Help

Connect to... New Query Execute

project1

Object Explorer

SQLQuery2.sql - DE...TOTM955\drsja (54)\* x SQLQuery1.sql - DE...TOTM955\drsja (62)\*

USE project1 SELECT \* FROM INFORMATION\_SCHEMA.COLUMNS

| TABLE_CATALOG | TABLE_SCHEMA | TABLE_NAME | COLUMN_NAME            | ORDINAL_POSITION | COLUMN_DEFAULT | IS_NULLABLE | DATA_TYPE | CHARACTER_MAXIMUM_LENGTH | CHARACTER_OCTET_LENGTH | NUMERIC_PRECISION | NUMERIC_SCALE |
|---------------|--------------|------------|------------------------|------------------|----------------|-------------|-----------|--------------------------|------------------------|-------------------|---------------|
| project1      | dbo          | Co2        | country                | 1                | NULL           | NO          | nvarchar  | 50                       | 100                    | NULL              | NULL          |
| project1      | dbo          | Co2        | year                   | 2                | NULL           | NO          | int       | NULL                     | 10                     | 10                | 10            |
| project1      | dbo          | Co2        | co2                    | 3                | NULL           | NO          | float     | NULL                     | NULL                   | 53                | 2             |
| project1      | dbo          | Co2        | co2_growth_pct         | 4                | NULL           | NO          | nvarchar  | 50                       | 100                    | NULL              | NULL          |
| project1      | dbo          | Co2        | co2_per_capita         | 5                | NULL           | NO          | nvarchar  | 50                       | 100                    | NULL              | NULL          |
| project1      | dbo          | Co2        | cumulative_co2         | 6                | NULL           | NO          | float     | NULL                     | NULL                   | 53                | 2             |
| project1      | dbo          | Co2        | coal_co2               | 7                | NULL           | NO          | nvarchar  | 50                       | 100                    | NULL              | NULL          |
| project1      | dbo          | Co2        | cement_co2             | 8                | NULL           | NO          | nvarchar  | 50                       | 100                    | NULL              | NULL          |
| project1      | dbo          | Co2        | flaring_co2            | 9                | NULL           | NO          | nvarchar  | 50                       | 100                    | NULL              | NULL          |
| project1      | dbo          | Co2        | gas_co2                | 10               | NULL           | NO          | nvarchar  | 50                       | 100                    | NULL              | NULL          |
| project1      | dbo          | Co2        | oil_co2                | 11               | NULL           | NO          | float     | NULL                     | NULL                   | 53                | 2             |
| project1      | dbo          | Co2        | other_industry_co2     | 12               | NULL           | NO          | nvarchar  | 50                       | 100                    | NULL              | NULL          |
| project1      | dbo          | Co2        | cement_co2_per_capita  | 13               | NULL           | NO          | nvarchar  | 50                       | 100                    | NULL              | NULL          |
| project1      | dbo          | Co2        | coal_co2_per_capita    | 14               | NULL           | NO          | nvarchar  | 50                       | 100                    | NULL              | NULL          |
| project1      | dbo          | Co2        | flaring_co2_per_capita | 15               | NULL           | NO          | nvarchar  | 50                       | 100                    | NULL              | NULL          |
| project1      | dbo          | Co2        | gas_co2_per_capita     | 16               | NULL           | NO          | nvarchar  | 50                       | 100                    | NULL              | NULL          |
| project1      | dbo          | Co2        | oil_co2_per_capita     | 17               | NULL           | NO          | nvarchar  | 50                       | 100                    | NULL              | NULL          |
| project1      | dbo          | Co2        | other_co2_per_capita   | 18               | NULL           | NO          | nvarchar  | 50                       | 100                    | NULL              | NULL          |
| project1      | dbo          | Co2        | trade_co2_share        | 19               | NULL           | NO          | nvarchar  | 50                       | 100                    | NULL              | NULL          |
| project1      | dbo          | Co2        | population             | 20               | NULL           | NO          | nvarchar  | 50                       | 100                    | NULL              | NULL          |

Query executed successfully.

DESKTOP-TOTM955\SQLEXPRESS01 | DESKTOP-TOTM955\drsja ... | project1 | 00:00:00 | 20 rows

Ready

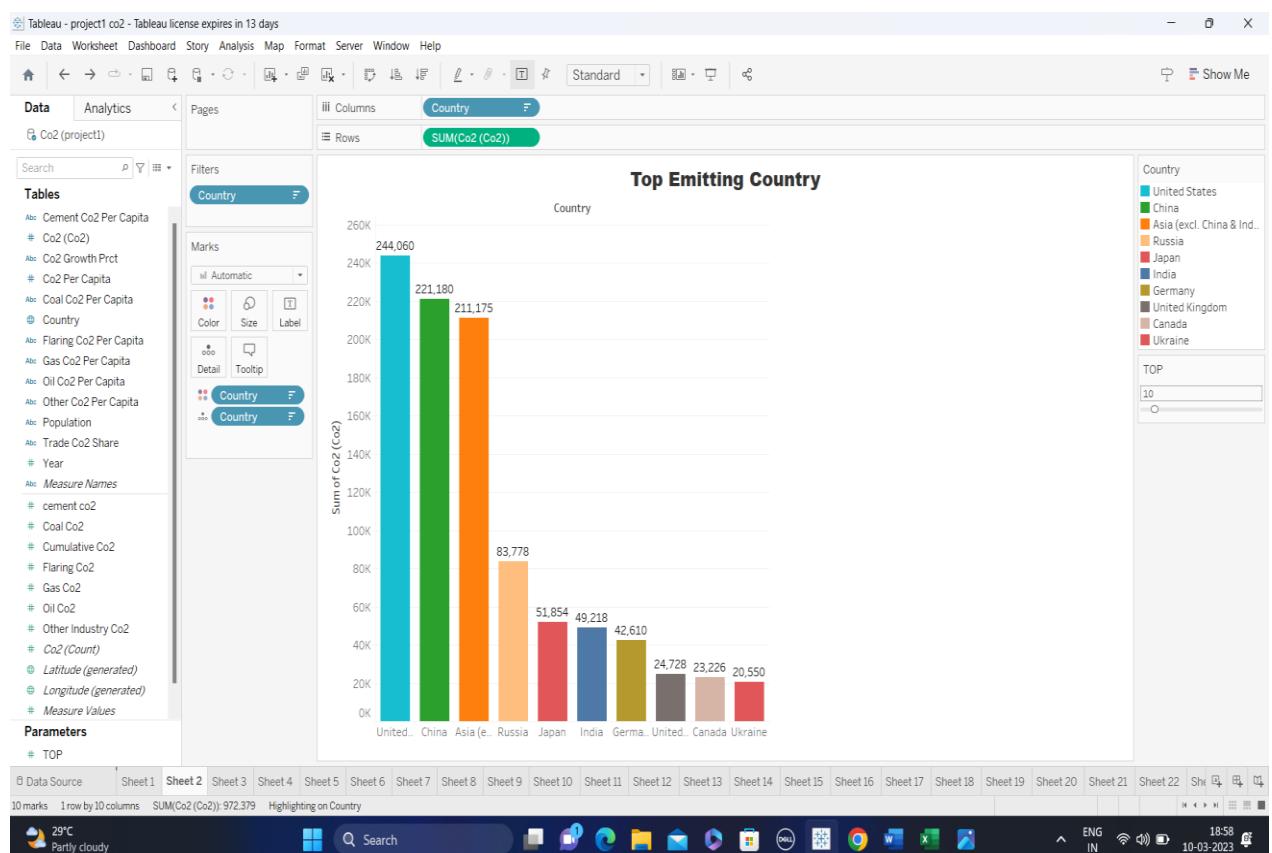
27°C Partly cloudy

Search

LN 1 Col 54 Ch 54 INS

ENG IN WiFi 21:33 10-03-2023

## Activity 2: Utilization of Data Filters:



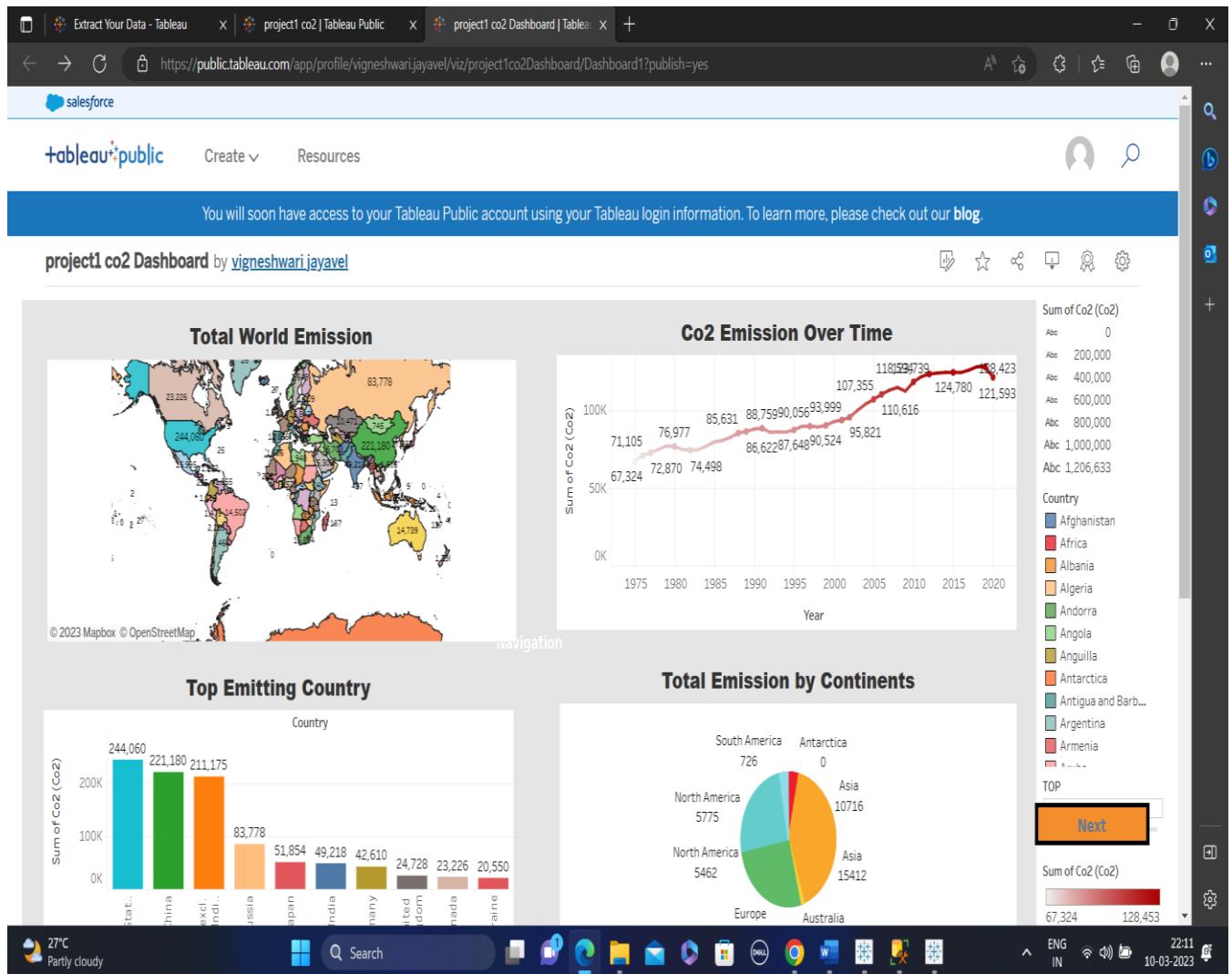
### **Activity 3: No of Visualizations/ Graphs :**

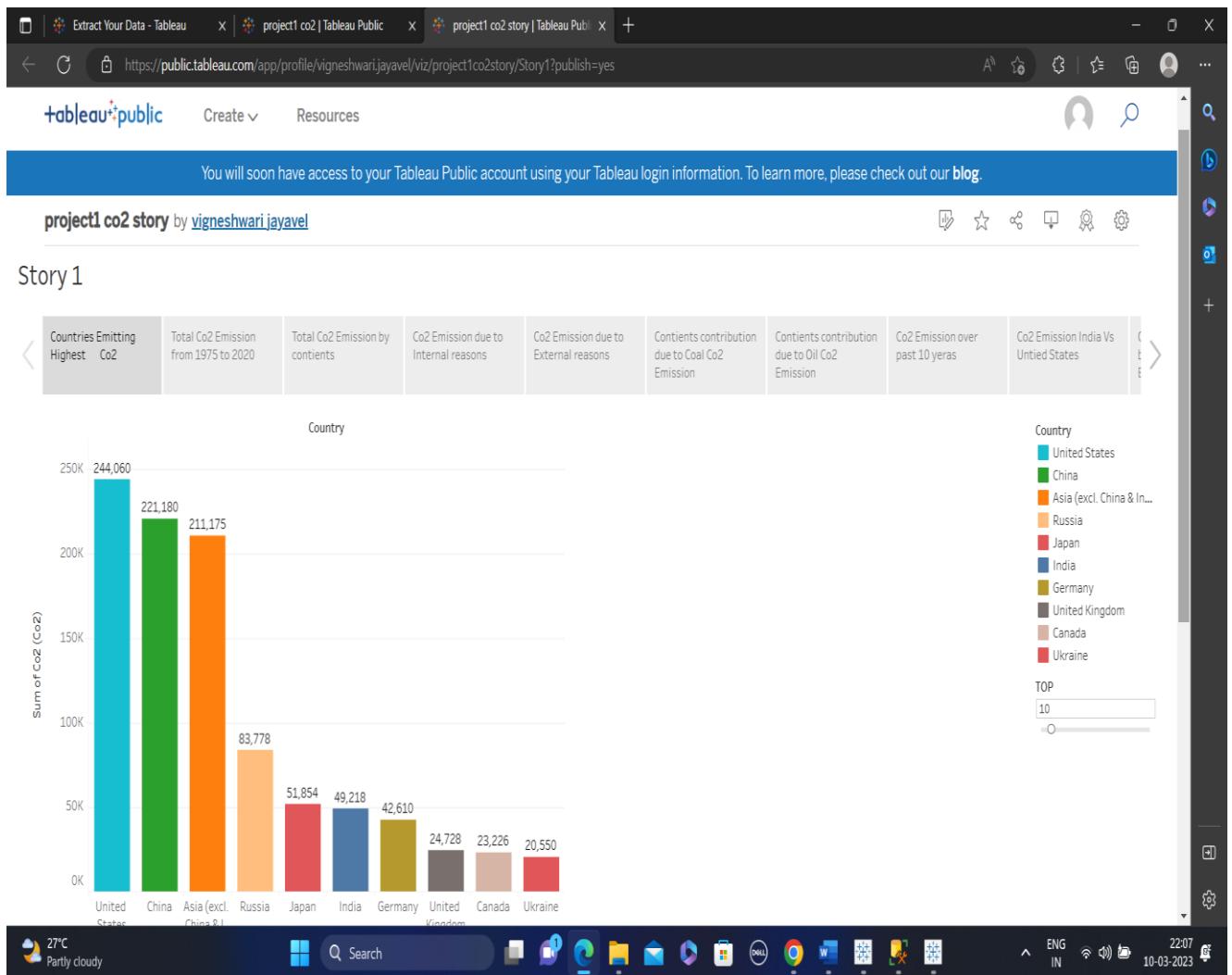
1. Top World Emission.
2. Top Emitting Countries.
3. Co2 Emission over Time.
4. Co2 Emission India vs USA.
5. Total Emission by Continents.
6. Co2 Emission per Capita.
7. Co2 Emission by International Factors.
8. Emission Rate over Years.
9. Donut Charts - Coal Co2, Cement Co2, Gas Co2, Oil Co2, Flaring Co2.
10. Co2 Emission over past 10 years.
11. Continent Contribution in Co2 Emission .
12. Cumulative Co2 and Co2 per Capita.
13. Co2 Emission in 2020.
14. China vs India Co2 emission due to internal factors.
15. Overall Contribution by China in Co2 Emission.

## Milestone 8: Web integration :

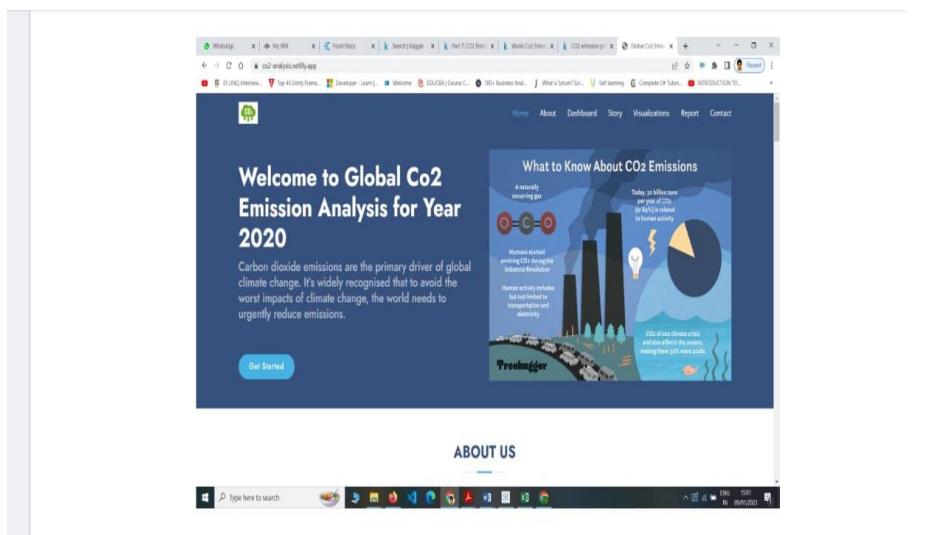
Publishing helps us to track and monitor key performance metrics, to communicate results and progress. help a publisher stay informed, make better decisions, and communicate their performance to others.

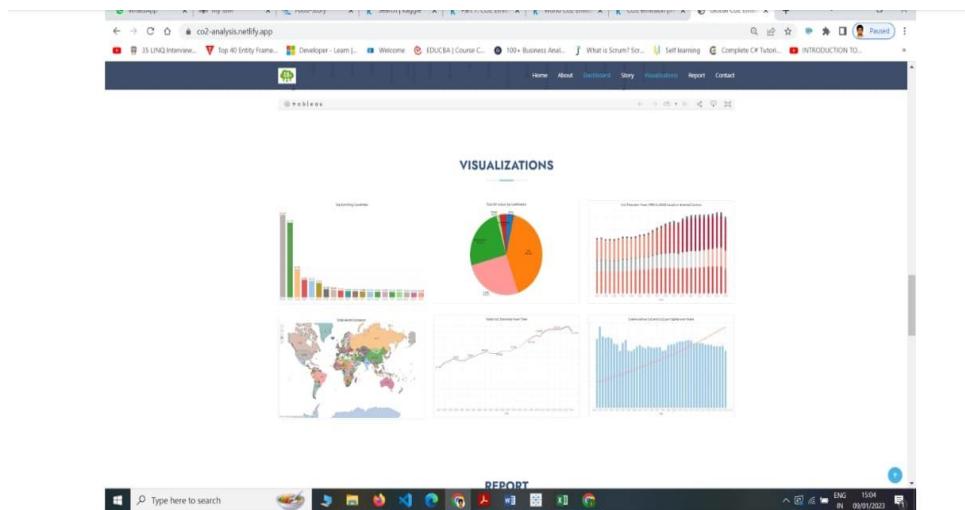
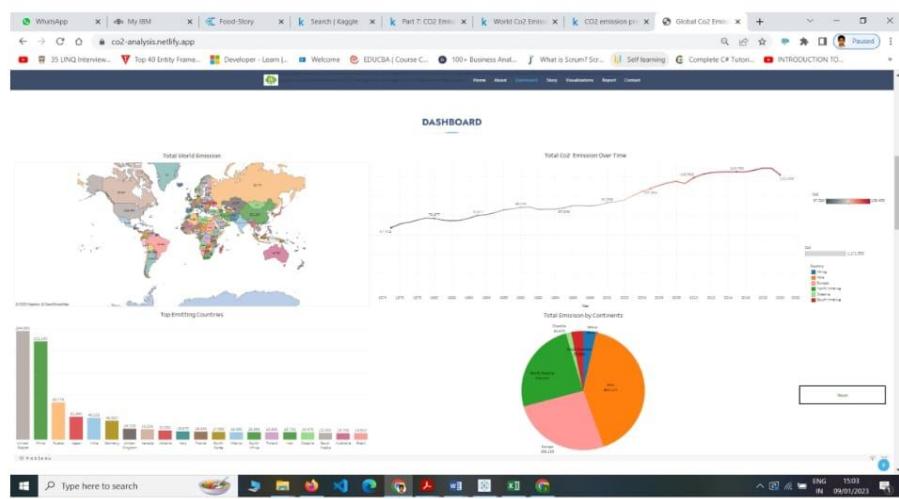
### **Publishing dashboard and reports to tableau public**

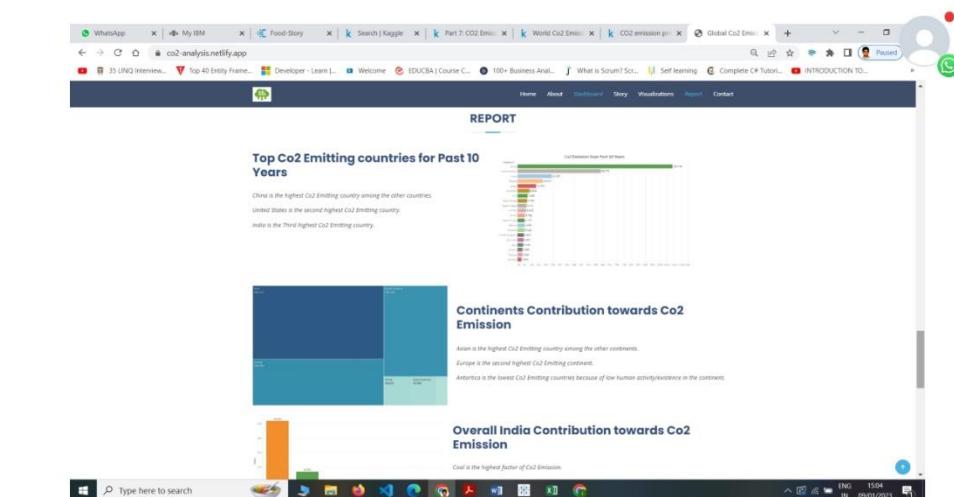
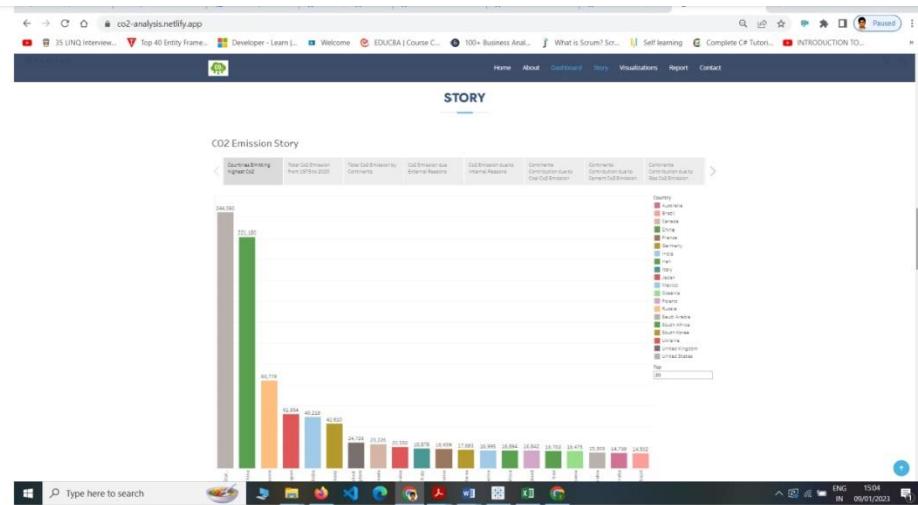




## Activity 1: Dashboard and Story embed with UI :







## Milestone 9: Project Demonstration & Documentation

### Below mentioned deliverables to be submitted along with other deliverables

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

Activity 2 :- Project Documentation-Step by step project development procedure