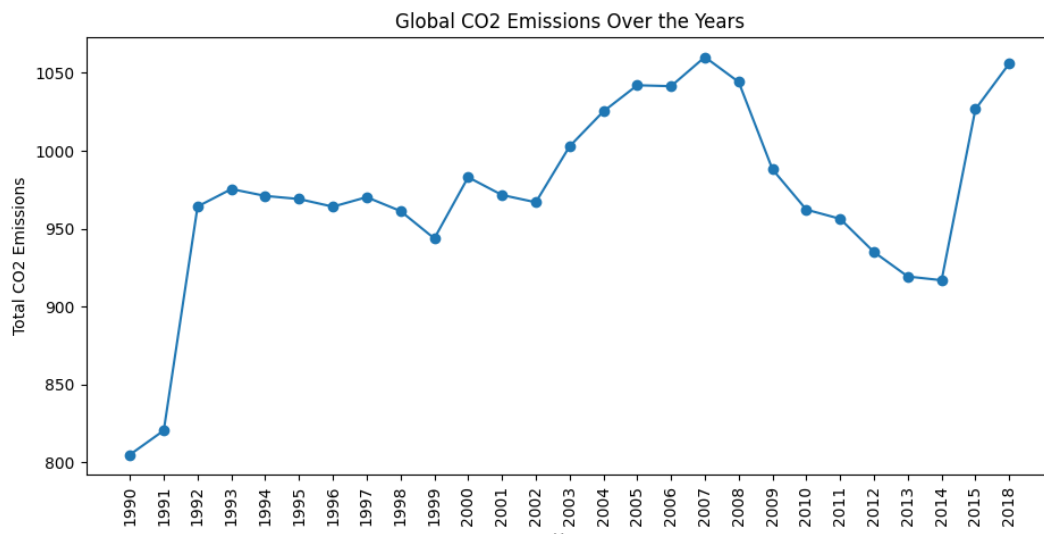


Project on CO2 Emission

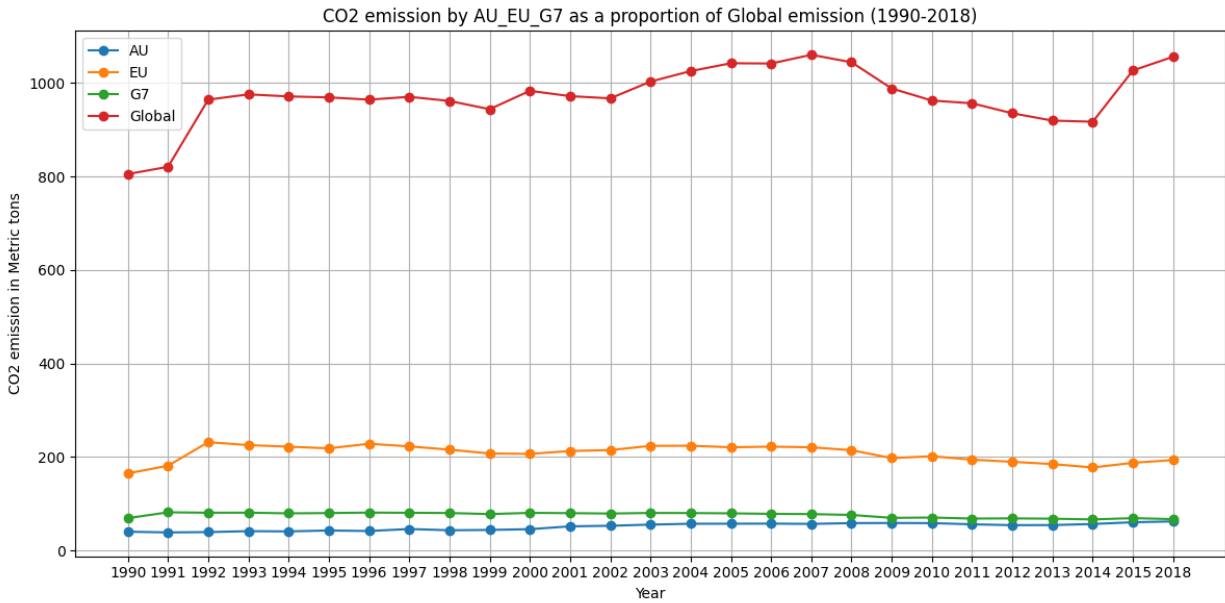
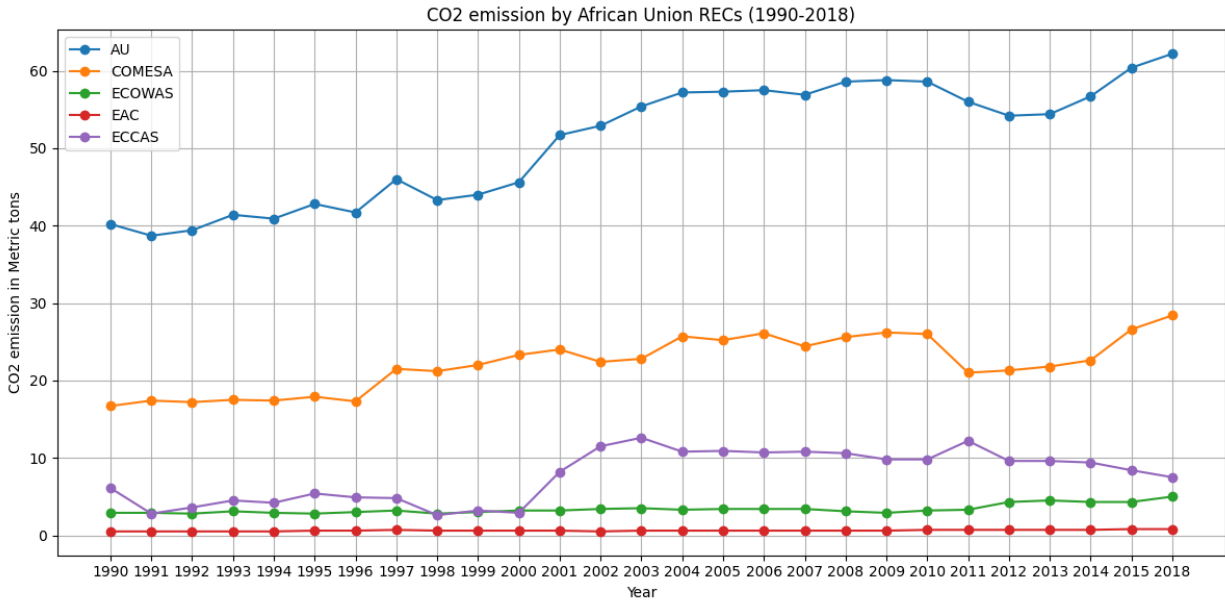
This project examines the rate of CO2 emission across countries and regional blocs across the world from 1995 to 2015 using data from kaggle dataset. The following are the important keys used to define the data for analysis.

Year_to_exclude (2016, 2017, 2019, and 2020) represent years in which there are missing CO2 data for at least two countries hence it is excluded. Moreover, countries were grouped into the following blocs; EU, AU, ECOWAS_excluding_gambia, ECCAS_members_excluding_Congo, EAC_members_excluding_Dr_Congo, COMESA_members_excluding_DRC_Burundi_Kenya_Rwanda_Uganda, USA_CHINA_JAPAN_GERMANY_INDIA (Top_five_economies).

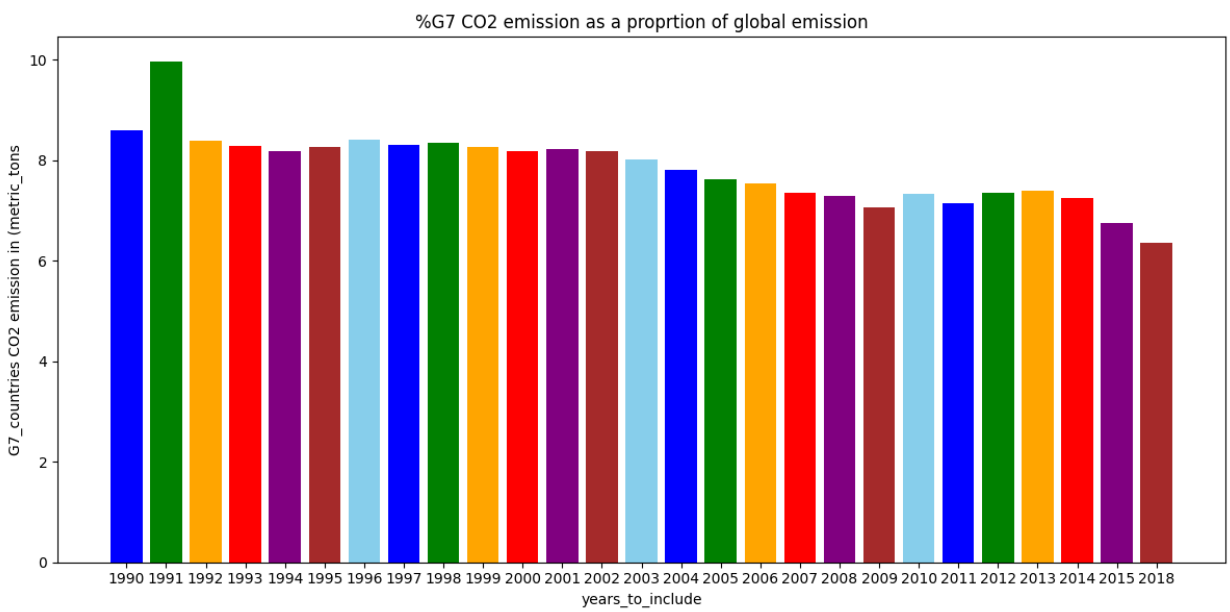
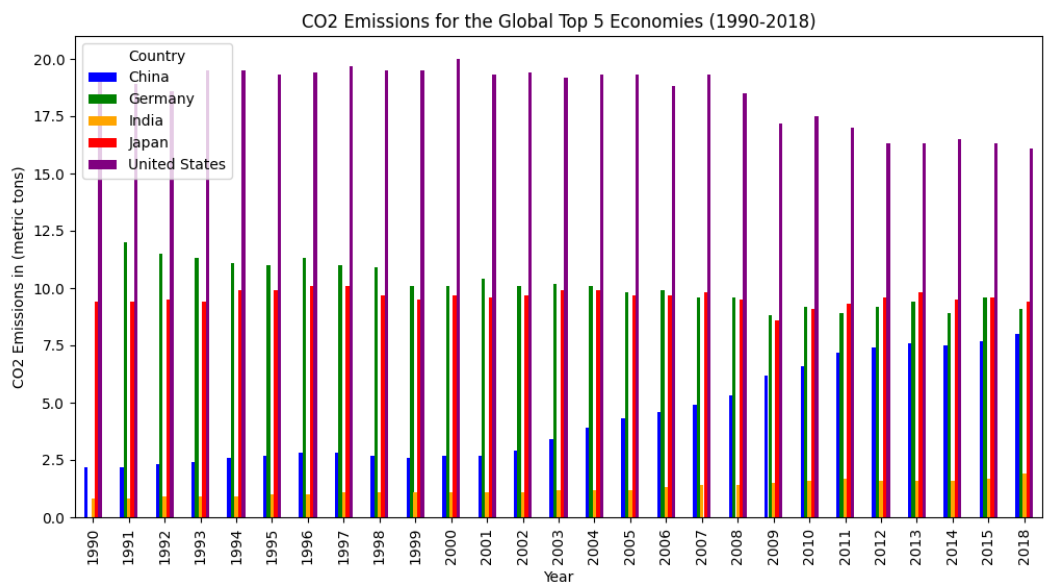
After categorizing the data based on the keys or parameters indicated above, statistical analysis was carried to determine average and percentage of CO2 emission rate across the blocs, sub regions and countries.



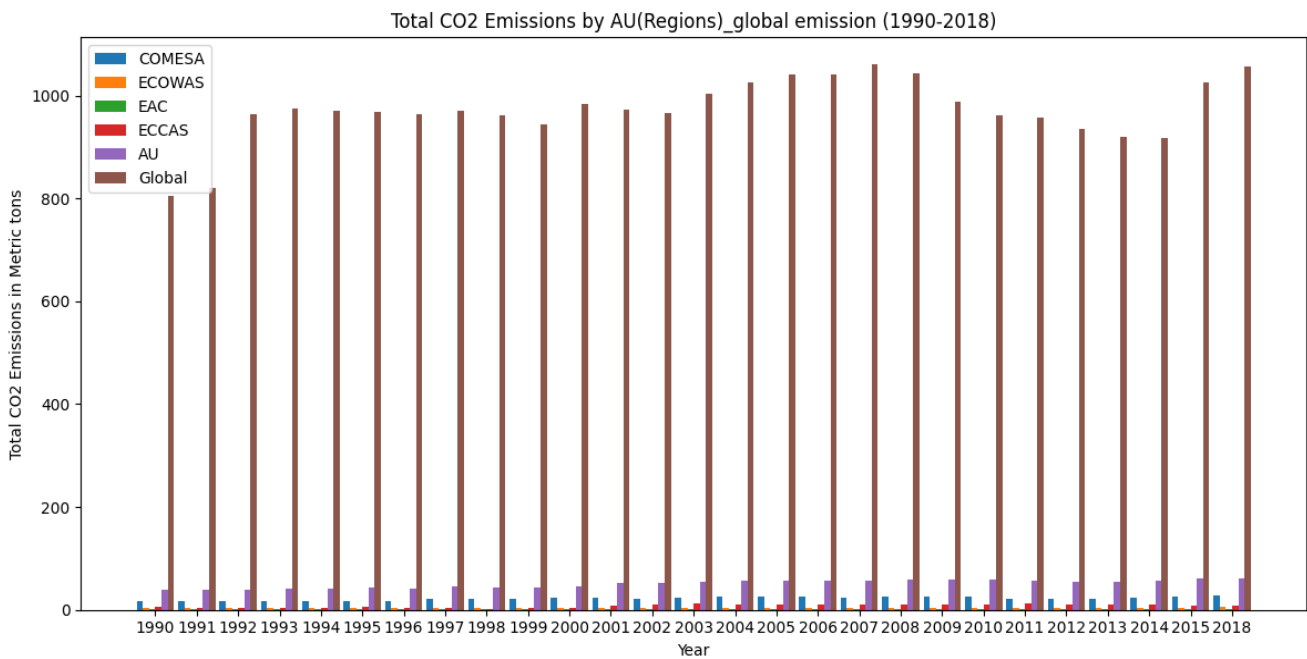
Project on CO2 Emission



Project on CO2 Emission



Project on CO2 Emission



Project on CO2 Emission

File	Edit	View	
	Year	Total CO2 Emission by AU (metric tons)	% of AU CO2 Emission
0	1990	40.2	4.99317
1	1991	38.7	4.71606
2	1992	39.4	4.08587
3	1993	41.4	4.24398
4	1994	40.9	4.21172
5	1995	42.8	4.41647
6	1996	41.7	4.32483
7	1997	46	4.7408
8	1998	43.3	4.50385
9	1999	44	4.662
10	2000	45.6	4.63839
11	2001	51.7	5.32057
12	2002	52.9	5.47053
13	2003	55.4	5.52398
14	2004	57.2	5.57885
15	2005	57.3	5.49851
16	2006	57.5	5.52088
17	2007	56.9	5.36691
18	2008	58.6	5.61195
19	2009	58.8	5.95081
20	2010	58.6	6.08958
21	2011	56	5.85529

Project on CO2 Emission

COMESA_RESULTS_table			
File Edit View			
	Year	Total CO2 Emission by COMESA (metric tons)	% of COMESA Emission of AU
0	1990	16.7	41.5423
1	1991	17.4	44.9612
2	1992	17.2	43.6548
3	1993	17.5	42.2705
4	1994	17.4	42.5428
5	1995	17.9	41.8224
6	1996	17.3	41.4868
7	1997	21.5	46.7391
8	1998	21.2	48.9607
9	1999	22	50
10	2000	23.3	51.0965
11	2001	24	46.4217
12	2002	22.4	42.344
13	2003	22.8	41.1552
14	2004	25.7	44.9301
15	2005	25.2	43.9791
16	2006	26.1	45.3913
17	2007	24.4	42.8822
18	2008	25.6	43.686
19	2009	26.2	44.5578
20	2010	26	44.3686
21	2011	21	37.5

EAC_RESULTS_table			
File Edit View			
	Year	Total CO2 Emission by EAC (metric tons)	% of EAC Emissions of AU
0	1990	0.5	1.24378
1	1991	0.5	1.29199
2	1992	0.5	1.26904
3	1993	0.5	1.20773
4	1994	0.5	1.22249
5	1995	0.6	1.40187
6	1996	0.6	1.43885
7	1997	0.7	1.52174
8	1998	0.6	1.38568
9	1999	0.6	1.36364
10	2000	0.6	1.31579
11	2001	0.6	1.16054
12	2002	0.5	0.94518
13	2003	0.6	1.08303
14	2004	0.6	1.04895
15	2005	0.6	1.04712
16	2006	0.6	1.04348
17	2007	0.6	1.05448
18	2008	0.6	1.02389
19	2009	0.6	1.02041
20	2010	0.7	1.19454
21	2011	0.7	1.25

Project on CO2 Emission

	Year	Total CO2 Emission by ECCAS (metric tons)	% of ECCAS Emission OF AU
0	1990	6.1	15.1741
1	1991	2.8	7.23514
2	1992	3.6	9.13706
3	1993	4.5	10.8696
4	1994	4.2	10.2689
5	1995	5.4	12.6168
6	1996	4.9	11.7506
7	1997	4.8	10.4348
8	1998	2.6	6.00462
9	1999	3.2	7.27273
10	2000	2.9	6.35965
11	2001	8.2	15.8607
12	2002	11.5	21.7391
13	2003	12.6	22.7437
14	2004	10.8	18.8811
15	2005	10.9	19.0227
16	2006	10.7	18.6087
17	2007	10.8	18.9807
18	2008	10.6	18.0887
19	2009	9.8	16.6667
20	2010	9.8	16.7235
21	2011	12.2	21.7857

Project on CO2 Emission

	Year	Total CO2 Emission by ECOWAS (metric tons)	% ECOWAS Emission of AU Emission
0	1990	2.9	7.21393
1	1991	2.9	7.49354
2	1992	2.8	7.1066
3	1993	3.1	7.48792
4	1994	2.9	7.09046
5	1995	2.8	6.54206
6	1996	3	7.19424
7	1997	3.2	6.95652
8	1998	2.8	6.46651
9	1999	3	6.81818
10	2000	3.2	7.01754
11	2001	3.2	6.18956
12	2002	3.4	6.42722
13	2003	3.5	6.31769
14	2004	3.3	5.76923
15	2005	3.4	5.93368
16	2006	3.4	5.91304
17	2007	3.4	5.9754
18	2008	3.1	5.2901
19	2009	2.9	4.93197
20	2010	3.2	5.46075
21	2011	3.3	5.89286

Project on CO2 Emission

	Year	Total CO2 Emission by EU (metric tons)	% of EU CO2 Emission
0	1990	164.9	20.4819
1	1991	181.4	22.1058
2	1992	231.7	24.0278
3	1993	225.4	23.1061
4	1994	222	22.8607
5	1995	218.6	22.557
6	1996	228.3	23.6777
7	1997	222.7	22.9517
8	1998	215.7	22.436
9	1999	207.5	21.9856
10	2000	206.6	21.0152
11	2001	212.8	21.8998
12	2002	214.8	22.213
13	2003	223.8	22.3153
14	2004	224.1	21.857
15	2005	220.8	21.188
16	2006	222.1	21.325
17	2007	220.8	20.8263
18	2008	214.5	20.542
19	2009	197.6	19.998
20	2010	201.6	20.9498
21	2011	194.3	20.3158

Project on CO2 Emission

	Year	Total CO2 Emission by G7 (metric tons)	% of G7 Emission of Global
0	1990	69.2	8.59521
1	1991	81.7	9.95613
2	1992	80.8	8.37914
3	1993	80.9	8.29318
4	1994	79.5	8.18659
5	1995	80.1	8.2654
6	1996	81.1	8.41112
7	1997	80.6	8.30671
8	1998	80.2	8.342
9	1999	77.9	8.25387
10	2000	80.5	8.18838
11	2001	79.9	8.2227
12	2002	79.1	8.17994
13	2003	80.3	8.00678
14	2004	80.1	7.81235
15	2005	79.5	7.62883
16	2006	78.4	7.5276
17	2007	77.9	7.34767
18	2008	76.1	7.28788
19	2009	69.8	7.06406
20	2010	70.5	7.3262
21	2011	68.3	7.14136

Project on CO2 Emission

	Year	Total global emission per year (metric tons)	mean of global_CO2
0	1990	805.1	4.06616
1	1991	820.6	4.12362
2	1992	964.3	4.84573
3	1993	975.5	4.90201
4	1994	971.1	4.8799
5	1995	969.1	4.86985
6	1996	964.2	4.84523
7	1997	970.3	4.87588
8	1998	961.4	4.83116
9	1999	943.8	4.74271
10	2000	983.1	4.9402
11	2001	971.7	4.88291
12	2002	967	4.8593
13	2003	1002.9	5.0397
14	2004	1025.3	5.15226
15	2005	1042.1	5.23668
16	2006	1041.5	5.23367
17	2007	1060.2	5.32764
18	2008	1044.2	5.24724
19	2009	988.1	4.96533
20	2010	962.3	4.83568
21	2011	956.4	4.80603

Project on CO2 Emission

```
import pandas as pd
import numpy as np
import seaborn as sns
from scipy.stats import ttest_ind
import matplotlib.pyplot as plt
import matplotlib as mpl
from reportlab.pdfgen import canvas
from reportlab.lib.pagesizes import letter
from tabulate import tabulate

df = pd.read_csv(r"C:\Users\isrea\OneDrive\Desktop\python
regression\CSV's\CO2_emission_csv2_Final_use.csv")

# Converting the '1990' column to numeric
df['1990'] = pd.to_numeric(df['1990'], errors='coerce')
# Exclude the years 2016, 2017, 2019, 2021 and 2020

years_to_exclude = ['2016', '2017', '2019', '2020']
years_to_include = [str(year) for year in range(1990, 2021) if str(year) not in
years_to_exclude]

# Printing the counts
print(df['Country'].value_counts())

All_countries_emission= df['Country']

# Global emissions for all years for all countries
sum_All_countries_emission = df[years_to_include].sum().sum()

##### Creating a line graph
sum_emissions_by_year = df[years_to_include].sum()

# Creating a line plot
plt.figure(figsize=(11, 5))
plt.plot(years_to_include, sum_emissions_by_year, marker='o', linestyle='--')
plt.xticks(rotation=90)
plt.title('Global CO2 Emissions Over the Years')
plt.xlabel('Year')
plt.ylabel('Total CO2 Emissions')
plt.show()

# Printing the result
```

Project on CO2 Emission

```
print(f"Total CO2 emissions by all countries from 1990_2015:
{sum_All_countries_emission:.2f} metric tons")

# Calculating the mean CO2 emissions for each year
mean_emissions_by_year = df[years_to_include].mean()

# Printing the mean emissions for each year
for year, mean_emission in mean_emissions_by_year.items():
    print(f"Mean CO2 emissions in {year}: {mean_emission:.2f} metric_tons")

# Calculating the standard deviation CO2 emissions for each year
STD_emissions_by_year = df[years_to_include].std()

# Printing the mean emissions for each year
for year, STD_emission in STD_emissions_by_year.items():
    print(f"Standard Deviation CO2 emissions in {year}: {STD_emission:.2f}
metric_tons")

## TOTAL_EMISSION_OF_ALL_COUNTRIES_BY_YEAR
total_emissions_all_countries_1990_only = df['1990'].sum()

print(f"sum_of_global_CO2_emission_1990:          {
total_emissions_all_countries_1990_only:.2f}metric_tons")

total_emissions_by_year_all_countries = df[years_to_include].sum()

# Printing the results
for year in years_to_include:

    print(f" Global_emission
{year}:                                {total_emissions_by_year_all_countries[year]:
.2f}")

# Prepare data for tabulation
table_data = {
    'Year': years_to_include,
    'Total global emission per year (metric tons)':
total_emissions_by_year_all_countries.values,
    'mean of global_CO2': mean_emissions_by_year.values
}
```

Project on CO2 Emission

```
# Tabulation DataFrame for Global
Global_CO2_df = pd.DataFrame(table_data)

# Print the tabulate
table_str = tabulate(Global_CO2_df, headers='keys', tablefmt='grid')

# Print the result table
print(table_str)

# Optionally, (save tabulated result as text file)
with open('Global_co2_emission_mean_table.txt', 'w') as f:
    f.write(table_str)

# List of EU member countries
eu_member_countries = [
    'Austria', 'Belgium', 'Bulgaria', 'Croatia', 'Republic Cyprus', 'Czech
    Republic',
    'Denmark', 'Estonia', 'Finland', 'France', 'Germany', 'Greece', 'Hungary',
    'Ireland', 'Italy', 'Latvia', 'Lithuania', 'Luxembourg', 'Malta',
    'Netherlands',
    'Poland', 'Portugal', 'Romania', 'Slovakia', 'Slovenia', 'Spain', 'Sweden'
]

# rows where 'Country' is in the list of EU member countries
eu_countries_df = df[df['Country'].isin(eu_member_countries)]

# Calculating the sum of CO2 emissions for all EU countries combined
total_CO2_emissions_all_eu_countries =
eu_countries_df[years_to_include].sum().sum()

# Printing the result
print(f"Total_CO2 emissions_EU countries_1990_2021:
{total_CO2_emissions_all_eu_countries:.2f} metric tons")

# Calculating the total CO2 emissions for 1990 for EU member countries
total_emissions_EU_member_countries_1990 = eu_countries_df['1990'].sum()

# Filtering rows where 'Country' is in the list of EU member countries
eu_countries_df = df[df['Country'].isin(eu_member_countries)]

# Excluded years 2016, 2017, 2019, and 2020
years_to_exclude = ['2016', '2017', '2019', '2020']
years_to_include = [str(year) for year in range(1990, 2021) if str(year) not in
years_to_exclude]
```

Project on CO2 Emission

```
# Calculating the total (Global) CO2 emissions for all countries in each year
total_emissions_by_year_all_countries = df[years_to_include].sum()

# Calculate the total CO2 emissions for EU countries in each year
total_emissions_by_year_eu_countries = eu_countries_df[years_to_include].sum()

# Calculating the percentage of CO2 emissions for EU countries in each year
percentage_emissions_by_EU_year = (total_emissions_by_year_eu_countries /
total_emissions_by_year_all_countries) * 100

# Printing the results
for year in years_to_include:

    print(f" Global_emission
{year}:                                {total_emissions_by_year_all_countries[year]:
.2f}")

    print(f" EU_emission_in
{year}:                                {total_emissions_by_year_eu_countries[year]
:.2f}")

    # %of CO2 emissions for EU countries in each year
percentage_emissions_by_EU_year = (total_emissions_by_year_eu_countries /
total_emissions_by_year_all_countries) * 100
    # Print the results
for year in years_to_include:

    print(f"%EU_emission_in
{year}:                                {percentage_emissions_by_EU_year[year]:.2f}
%")

print(f"sum of
EU_Members_States_CO2_emission_1990:    {total_emissions_EU_member_countries_
1990:.2f}")

##### Tabulation for EU MEMBERS

# Prepare data for tabulation
table_data = {
    'Year': years_to_include,
    'Total CO2 Emission by EU (metric tons)':
total_emissions_by_year_eu_countries.values,
    '% of EU CO2 Emission': percentage_emissions_by_EU_year.values
```

Project on CO2 Emission

```
}

# Tabulation DataFrame for EU
EU_countries_result_df = pd.DataFrame(table_data)

# Print the tabulate
table_str = tabulate(EU_countries_result_df, headers='keys', tablefmt='grid')

# Print the result table
print(table_str)

# Optionally, (save tabulated result as text file)
with open('EU_RESULTS_table.txt', 'w') as f:
    f.write(table_str)
# Computing total emissions by AU member states

AU_countries=['Algeria', 'Angola', 'Benin', 'Botswana', 'Burkina Faso',
'Burundi', 'Cameroon', 'Cape Verde', 'Central African', 'Republic', 'Chad',
               'Comoros', 'Democratic Republic of Congo', 'Ivory Coast',
'Djibouti', 'Egypt', 'Equatorial Guinea', 'Eritrea',
               'Ethiopia', 'Gabon', 'Guinea', 'Guinea-Bissau', 'Kenya',
'Liberia', 'Libya', 'Madagascar', 'Malawi', 'Mali', 'Mauritania',
               'Mauritius', 'Mozambique', 'Namibia', 'Niger', 'Nigeria',
               'Rwanda', 'Morocco', 'São Tomé and Príncipe', 'Senegal',
'Seychelles', 'Sierra Leone', 'Somalia', 'South Africa', 'Sudan',
               'Swaziland', 'Tanzania', 'Togo', 'Tunisia', 'Uganda',
'Zambia', 'Zimbabwe']

# Filtering rows where 'Country' is in the list of AU member countries
AU_Member_States_df = df[df['Country'].isin(AU_countries)]

#sum all emission by AU_Members from 190_2018
Sum_total_CO2_emission_AU_countries_1990_2018_df =
df[df['Country'].isin(AU_countries)][years_to_include].sum().sum()

Sum_total_CO2_emission_AU_countries_1990_2018_df_one =
df[df['Country'].isin(AU_countries)][years_to_include].sum()
# Calculating the total CO2 emissions for 1990 for AU member countries
total_emissions_AU_member_countries_1990 = AU_Member_States_df['1990'].sum()
total_emissions_all_countries_1990 = df['1990'].sum()

# Calculating the percentage of emissions for EU member countries
percentage_AU_members_emission_1990 = (total_emissions_AU_member_countries_1990 /
total_emissions_all_countries_1990) * 100
```


Project on CO2 Emission

```
print(f"sum_of_global_CO2_emission_1990:           {
total_emissions_all_countries_1990:.2f}metric_tons")
print(f"sum_total_CO2_emission_AU_countries_1990_2018:           {Sum_total_CO2_emis
sion_AU_countries_1990_2018_df:.2f}")
print(f"sum of
AU_Members_States_CO2_emission:           {total_emissions_AU_member_countries_1990:
.2f}")
print(f"%_of_AU_Members_States_CO2_emission_1990(excluding;
Congo_Gambia_Lesotho_Western
Sahara):           {percentage_AU_members_emission_1990:.2f}%")

# Filtering rows where 'Country' is in the list of EU member countries
AU_Member_States_df = df[df['Country'].isin(AU_countries)]

# Calculating the total CO2 emissions for all countries in each year
total_emissions_by_year_all_countries = df[years_to_include].sum()

# Calculating the total CO2 emissions for AU countries in each year
total_emissions_by_year_AU_countries =
AU_Member_States_df[years_to_include].sum()

# Print the results
for year in years_to_include:

    print(f"
Global_emission           {year}:           {total_emissions_by_
year_all_countries[year]:.2f}")

    print(f"AU_emission_in           {year}:           {total_em
issions_by_year_AU_countries[year]:.2f}")

    # %of CO2 emissions for AU countries in each year
percentage_emissions_by_AU_year = (total_emissions_by_year_AU_countries /
total_emissions_by_year_all_countries) * 100
    # Print the results
    for year in years_to_include:

        print(f"%AU_emission_in           {year}:           {percen
tage_emissions_by_AU_year[year]:.2f}%")

    ##### Tabulation for AU MEMBERS

# Prepare data for tabulation
table_data = {
    'Year': years_to_include,
```

Project on CO2 Emission

```
'Total CO2 Emission by AU (metric tons)':
total_emissions_by_year_AU_countries.values,
'% of AU CO2 Emission': percentage_emissions_by_AU_year.values
}

# Tabulation DataFrame for AU
AU_countries_result_df = pd.DataFrame(table_data)

# Print the tabulate
table_str = tabulate(AU_countries_result_df, headers='keys', tablefmt='grid')

# Print the result table
print(table_str)

# Optionally, (save tabulated result as text file)
with open('AU_RESULTS_table.txt', 'w') as f:
    f.write(table_str)

# List of ECOWAS member countries excluding Gambia
ECOWAS_Members_excluding_Gambia = ['Benin', 'Burkina Faso', 'Cabo Verde', 'Ivory
Coast', 'Ghana', 'Guinea',
                                     'Guinea-Bissau', 'Liberia', 'Mali', 'Niger',
'Nigeria', 'Senegal', 'Sierra Leone', 'Togo']

AU_countries_df=['Algeria', 'Angola', 'Benin', 'Botswana', 'Burkina Faso',
'Burundi', 'Cameroon', 'Cape Verde', 'Central African', 'Republic', 'Chad',
                 'Comoros', 'Democratic Republic of Congo', 'Ivory Coast',
'Djibouti', 'Egypt', 'Equatorial Guinea', 'Eritrea',
                 'Ethiopia', 'Gabon', 'Guinea', 'Guinea-Bissau', 'Kenya',
'Liberia', 'Libya', 'Madagascar', 'Malawi', 'Mali', 'Mauritania',
                 'Mauritius', 'Mozambique', 'Namibia', 'Niger', 'Nigeria',
                 'Rwanda', 'Morocco', 'SÃ£o TomÃ© and PrÃªncipe', 'Senegal',
'Seychelles', 'Sierra Leone', 'Somalia', 'South Africa', 'Sudan',
                 'Swaziland', 'Tanzania', 'Togo', 'Tunisia', 'Uganda',
'Zambia' 'Zimbabwe']

# Filtering rows where 'Country' is in the list of ECOWAS member countries
(excluding Gambia)
ECOWAS_countries_df = df[df['Country'].isin(ECOWAS_Members_excluding_Gambia)]

# Calculating the total CO2 emissions by ECOWAS countries (excluding Gambia) for
each year
total_CO2_emission_by_ECOWAS_1990_2018_df =
ECOWAS_countries_df[years_to_include].sum()
```

Project on CO2 Emission

```
# Calculating the total CO2 emissions by all AU countries for each year
total_CO2_emission_by_AU_countries_1990_2018_df =
df[df['Country'].isin(AU_countries_df)][years_to_include].sum()

# Calculating the percentage of emissions for ECOWAS countries (excluding Gambia)
as a proportion of AU countries for each year
percentage_ECOWAS_members_emitted_1990_2018 =
(total_CO2_emission_by_ECOWAS_1990_2018_df /
total_CO2_emission_by_AU_countries_1990_2018_df) * 100

#compute CO2 Emission_by_ECCAS_From_1990_2015
sum_CO2_emissions_by_ECOWAS_members =
ECOWAS_countries_df[years_to_include].sum().sum()

# Print the result
print(f"Total CO2 emissions by ECOWAS member states for all
years:      {sum_CO2_emissions_by_ECOWAS_members:.2f} metric tons")

# Print the Results
for year in years_to_include:
    print(f"ECOWAS_emission_in          {year}:                  {total_CO
2_emission_by_ECOWAS_1990_2018_df[year]:.2f} metric_tons")

    print(f"%ECOWAS_emission_in          {year} of AU
emissions:      {percentage_ECOWAS_members_emitted_1990_2018[year]:.2f}%")

##### Tabulation for ECOWAS MEMBERS

# Prepare data for tabulation
table_data = {
    'Year': years_to_include,
    'Total CO2 Emission by ECOWAS (metric tons)':
total_CO2_emission_by_ECOWAS_1990_2018_df.values,
    '% ECOWAS Emission of AU Emission':
percentage_ECOWAS_members_emitted_1990_2018.values
}

# Tabulation DataFrame for ECOWAS
ECOWAS_countries_result_df = pd.DataFrame(table_data)

# Print the tabulate
table_str = tabulate(ECOWAS_countries_result_df, headers='keys', tablefmt='grid')
```

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```
# Print the result table
print(table_str)

# Optionally, (save tabulated result as text file)
with open('ECOWAS_RESULTS_table.txt', 'w') as f:
    f.write(table_str)

ECCAS_Member_Excluding_Congo= ['Angola', 'Burundi', 'Cameroon', 'Central African
Republic', 'Gabon', 'Equatorial Guinea', 'Democratic Republic of Congo',
                                'Rwanda', 'SÃ£o TomÃ© and PrÃ-ncipe', 'Chad']

# list of ECCAS countries (excluding Congo)
ECCAS_countries_df = df[df['Country'].isin(ECCAS_Member_Excluding_Congo)]

# total CO2 emissions by ECCAS countries (excluding Congo) for each year
total_CO2_emission_by_ECCAS_1990_2018_df =
ECCAS_countries_df[years_to_include].sum()

# Calculating the percentage of emissions for ECCAS countries (excluding Congo)
as a proportion of AU countries for each year
percentage_ECCAS_members_emitted_1990_2018 =
(total_CO2_emission_by_ECCAS_1990_2018_df /
total_CO2_emission_by_AU_countries_1990_2018_df) * 100

#compute CO2 Emission_by_ECCAS_From_1990_2015
sum_CO2_emissions_by_ECCAS_members =
ECCAS_countries_df[years_to_include].sum().sum()

# Print the result
print(f"Total CO2 emissions by ECCAS member states for all
years:      {sum_CO2_emissions_by_ECCAS_members:.2f} metric tons")
# Print the Results
for year in years_to_include:
    print(f"ECCAS_emission_in          {year}:                {total_CO2
_emission_by_ECCAS_1990_2018_df[year]:.2f} metric_tons")

    print(f"%ECCAS_emission_in          {year} of AU
emissions:      {percentage_ECCAS_members_emitted_1990_2018[year]:.2f}%")

##### Tabulation for ECCAS MEMBERS

# Prepared data for tabulation
table_data = {
    'Year': years_to_include,
```

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```
'Total CO2 Emission by ECCAS (metric tons)':
total_CO2_emission_by_ECCAS_1990_2018_df.values,
'% of ECCAS Emission OF AU':
percentage_ECCAS_members_emitted_1990_2018.values
}

# Tabulation DataFrame for ECCAS
ECCAS_countries_result_df = pd.DataFrame(table_data)

# Print the tabulate
table_str = tabulate(ECCAS_countries_result_df, headers='keys', tablefmt='grid')

# Print the result table
print(table_str)

# Optionally, (save tabulated result as text file)
with open('ECCAS_RESULTS_table.txt', 'w') as f:
    f.write(table_str)

EAC_Member_Excluding_DR_Congo= ['Democratic Republic of Congo', 'Burundi',
'Kenya', 'Rwanda', 'South Sudan', 'Uganda','Tanzania']

# list of EAC countries (excluding Congo)
EAC_countries_df = df[df['Country'].isin(EAC_Member_Excluding_DR_Congo)]

# total CO2 emissions by EAC countries (excluding Congo) for each year
total_CO2_emission_by_EAC_1990_2018_df = EAC_countries_df[years_to_include].sum()

# Calculating the percentage of emissions for EAC countries (excluding Congo) as
a proportion of AU countries for each year
percentage_EAC_members_emitted_1990_2018 =
(total_CO2_emission_by_EAC_1990_2018_df /
total_CO2_emission_by_AU_countries_1990_2018_df) * 100

#computing CO2 Emission_by_EAC_From_1990_2015
sum_CO2_emissions_by_EAC_members = EAC_countries_df[years_to_include].sum().sum()

# Printing the Results
for year in years_to_include:
    print(f"EAC_emission_in          {year}:                      {total_CO2_e
mission_by_EAC_1990_2018_df[year]:.2f} metric_tons")

    print(f"%EAC_emission_in          {year} of AU
emissions:          {percentage_EAC_members_emitted_1990_2018[year]:.2f}%")
```

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```
# Print the result
print(f"Total CO2 emissions by EAC member states for all
years:      {sum_CO2_emissions_by_EAC_members:.2f} metric tons")

##### Tabulation for EAC MEMBERS

# Prepare data for tabulation
table_data = {
    'Year': years_to_include,
    'Total CO2 Emission by EAC (metric tons)':
total_CO2_emission_by_EAC_1990_2018_df.values,
    '% of EAC Emissions of AU': percentage_EAC_members_emitted_1990_2018.values
}

# Tabulation DataFrame for EAC
EAC_countries_result_df = pd.DataFrame(table_data)

# Print the table using tabulate
table_str = tabulate(EAC_countries_result_df, headers='keys', tablefmt='grid')

# Print the result table
print(table_str)

# save the tabulated result to a text file
with open('EAC_RESULTS_table.txt', 'w') as f:
    f.write(table_str)

COMESA_members_excluding_DRC_Burundi_Kenya_Rwanda_Uganda= ['Comoros', 'Djibouti',
'Egypt', 'Ethiopia', 'Libya', 'Madagascar', 'Malawi', 'Mauritius',
                                                    'Seychelles', 'Sudan',
'Swaziland','Zambia', 'Zimbabwe']

# list of COMESA countries (excluding_DRC_Burundi_Kenya_Rwanda_Uganda)
COMESA_countries_df =
df[df['Country'].isin(COMESA_members_excluding_DRC_Burundi_Kenya_Rwanda_Uganda)]

# total CO2 emissions by COMESA countries
(excluding_DRC_Burundi_Kenya_Rwanda_Uganda) for each year
total_CO2_emission_by_COMESA_1990_2018_df =
COMESA_countries_df[years_to_include].sum()
```

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```
# Calculating the percentage of emissions for COMESA countries
(excluding_DRC_Burundi_Kenya_Rwanda_Uganda) as a proportion of AU countries for
each year
percentage_COMESA_members_emitted_1990_2018 =
(total_CO2_emission_by_COMESA_1990_2018_df /
total_CO2_emission_by_AU_countries_1990_2018_df) * 100

#compute CO2 Emission_by_COMESA_From_1990_2015
sum_CO2_emissions_by_COMESA_members =
COMESA_countries_df[years_to_include].sum().sum()

# Print the Results
for year in years_to_include:
    print(f"COMESA emission in {year}: {total_CO2_emission_by_COMESA_1990_2018_df[year]:.2f} metric tons")

    print(f"%COMESA emission AS a % of AU emission in {year} of COMESA
emissions: {percentage_COMESA_members_emitted_1990_2018[year]:.2f}%")

# Print the result
print(f"Total CO2 emissions by COMESA member states for all
years: {sum_CO2_emissions_by_COMESA_members:.2f} metric tons")

##### Tabulation for COMESA MEMBERS

# Prepare data for tabulation
table_data = {
    'Year': years_to_include,
    'Total CO2 Emission by COMESA (metric tons)':
total_CO2_emission_by_COMESA_1990_2018_df.values,
    '% of COMESA Emission of AU':
percentage_COMESA_members_emitted_1990_2018.values
}

# Tabulation DataFrame for COMESA
COMESA_countries_result_df = pd.DataFrame(table_data)

# Print the table using tabulate
table_str = tabulate(COMESA_countries_result_df, headers='keys', tablefmt='grid')

# Print the result table
print(table_str)

# save the tabulated result to a text file
```

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```
with open('COMESA_RESULTS_table.txt', 'w') as f:
    f.write(table_str)

#calculation of CO2 for G7 member country.
G7_members=[ 'France', 'United States', 'United Kingdom', 'Germany', 'Japan',
'Italy', 'Canada']

# list of G7 countries
G7_countries_df = df[df['Country'].isin(G7_members)]

# total CO2 emissions by G7 countries.
total_CO2_emission_by_G7_1990_2018_df = G7_countries_df[years_to_include].sum()

# Calculating the percentage of emissions for G7 countries.
percentage_G7_members_emitted_1990_2018 = (total_CO2_emission_by_G7_1990_2018_df
/ total_emissions_by_year_all_countries) * 100

#compute CO2 Emission_by_G7_From_1990_2015
sum_CO2_emissions_by_G7_members = G7_countries_df[years_to_include].sum().sum()

# Print the Results
for year in years_to_include:
    print(f"G7_emission_in {year}: {total_CO2_emission_by_G7_1990_2018_df[year]:.2f} metric_tons")

    print(f"%G7_emission_in {year} of G7
emissions: {percentage_G7_members_emitted_1990_2018[year]:.2f}%")

# Print the result
print(f"Total CO2 emissions by G7 member states for all
years: {sum_CO2_emissions_by_G7_members:.2f} metric tons")

##### Tabulation of Result for G7

# G7 data for tabulation
table_data = {
    'Year': years_to_include,
    'Total CO2 Emission by G7 (metric tons)':
total_CO2_emission_by_G7_1990_2018_df.values,
    '% of G7 Emission of Global': percentage_G7_members_emitted_1990_2018.values
}

# Create a DataFrame
G7_countries_result_df = pd.DataFrame(table_data)
```


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```
# Print the table using tabulate
table_str = tabulate(G7_countries_result_df, headers='keys', tablefmt='grid')

# Print the result table
print(table_str)

# save the tabulated result to a text file
with open('G7_result_table.txt', 'w') as f:
    f.write(table_str)

## Graphs for the AU_REC
total_CO2_emission_by_COMESA_1990_2018_df =
COMESA_countries_df[years_to_include].sum()

COMESA= total_CO2_emission_by_COMESA_1990_2018_df
ECOWAS= total_CO2_emission_by_ECOWAS_1990_2018_df
EAC= total_CO2_emission_by_EAC_1990_2018_df
ECCAS= total_CO2_emission_by_ECCAS_1990_2018_df
AU= Sum_total_CO2_emission_AU_countries_1990_2018_df_one

# Graphs for Visualisation
# line graph for the selected AU Regional Economic Blocs
plt.figure(figsize=(12, 6))

plt.plot(years_to_include, AU, marker='o', linestyle='-', label='AU')
plt.plot(years_to_include, COMESA, marker='o', linestyle='-', label='COMESA')
plt.plot(years_to_include, ECOWAS, marker='o', linestyle='-', label='ECOWAS')
plt.plot(years_to_include, EAC, marker='o', linestyle='-', label='EAC')
plt.plot(years_to_include, ECCAS, marker='o', linestyle='-', label='ECCAS')
plt.xlabel('Year')
plt.ylabel('CO2 emission in Metric tons')
plt.title('CO2 emission by African Union RECs (1990-2018)')
plt.legend()
plt.grid(True)
plt.tight_layout()
plt.show()

# line graph for for AU, EU, G7
G7_countries=total_CO2_emission_by_G7_1990_2018_df
Global_emission=total_emissions_by_year_all_countries
EU_members_states=total_emissions_by_year_eu_countries
AU= Sum_total_CO2_emission_AU_countries_1990_2018_df_one

plt.figure(figsize=(12, 6))
```

Project on CO2 Emission

```
plt.plot(years_to_include, AU, marker='o', linestyle='-', label='AU')
plt.plot(years_to_include, EU_members_states, marker='o', linestyle='-',
label='EU')
plt.plot(years_to_include, G7_countries, marker='o', linestyle='-', label='G7')
plt.plot(years_to_include, Global_emission, marker='o', linestyle='-',
label='Global')
plt.xlabel('Year')
plt.ylabel('CO2 emission in Metric tons')
plt.title('CO2 emission by AU_EU_G7 as a proportion of Global emission (1990-
2018)')
plt.legend()
plt.grid(True)
plt.tight_layout()
plt.show()

#%G7 CO2 emission as a proprtion of global emission
colors = ['blue', 'green', 'orange', 'red', 'purple', 'brown', 'skyblue']
G7_percent= percentage_G7_members_emitted_1990_2018
plt.figure(figsize=(12,6))
plt.bar(years_to_include,G7_percent,color=colors)
plt.xlabel('years_to_include')
plt.ylabel('G7_countries CO2 emission in (metric_tons)')
plt.title('%G7 CO2 emission as a proprtion of global emission')
plt.tight_layout()
plt.show()

# Bar Graphs for Global Top 5 Economies
USA_China_Germany_Japan_India = ['Germany', 'United States', 'India', 'Japan',
'China']
Top_5_economies = df[df['Country'].isin(USA_China_Germany_Japan_India)]
Top_5_economies_df = Top_5_economies.set_index('Country')[years_to_include]

# Define colors for each country
colors = ['blue', 'green', 'orange', 'red', 'purple']

# Create a bar plot for the five countries from 1990 to 2010
ax = Top_5_economies_df.T.plot(kind='bar', color=colors, figsize=(12, 6))
plt.xlabel("Year")
plt.ylabel("CO2 Emissions in (metric tons)")
plt.title("CO2 Emissions for the Global Top 5 Economies (1990-2018)")

# Show the plot
plt.show()

###USE THE RECS
```

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```
data=[total_CO2_emission_by_COMESA_1990_2018_df,
total_CO2_emission_by_ECOWAS_1990_2018_df,
total_CO2_emission_by_EAC_1990_2018_df,
total_CO2_emission_by_ECCAS_1990_2018_df,
Sum_total_CO2_emission_AU_countries_1990_2018_df_one,
total_emissions_by_year_all_countries]

# Create a list of regions
regions = ['COMESA', 'ECOWAS', 'EAC', 'ECCAS', 'AU', 'Global']

# Number of regions and years
num_regions = len(regions)
num_years = len(years_to_include)

# Set the width of the bars
bar_width = 0.15

# Create an array of indices for the years
x = np.arange(num_years)

# Create a grouped bar chart
fig, ax = plt.subplots(figsize=(12, 6))

for i in range(num_regions):
    ax.bar(x + i * bar_width, data[i], width=bar_width, label=regions[i])

# Set the x-axis labels to be the years
ax.set_xticks(x + (bar_width * (num_regions - 1)) / 2)
ax.set_xticklabels(years_to_include)

plt.xlabel('Year')
plt.ylabel('Total CO2 Emissions in Metric tons')
plt.title('Total CO2 Emissions by AU(Regions)_global emission (1990-2018)')
plt.legend()
plt.tight_layout()
plt.show()
```