Environmental Analysis on African Subcontinent

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Data and Methodology

We are Fetching **Real Time Data** From UN Website and **IEA** and collaborating them in our website :-

UN Data : One of our primary data sources is the United Nations data repository, accessible at https://data.un.org/default.aspx.

From this source and various other sources, we extracted valuable economic environmental factors such as GDP and essential social factors like population and population density.

https://www.esa.int/ESA_Multimedia/Images/2017/10/African_land_cover

https://data.world/datasets/africa

https://dataportal.opendataforafrica.org/data#menu=topic

https://www.nber.org/research/data/portal-public-use-datasets-sub-saharan-africa

https://opendatabarometer.org/3rdedition/regional-report/africa/

https://databank.worldbank.org/databases/africa

https://data.worldbank.org/country/ZG

What are we doing ?

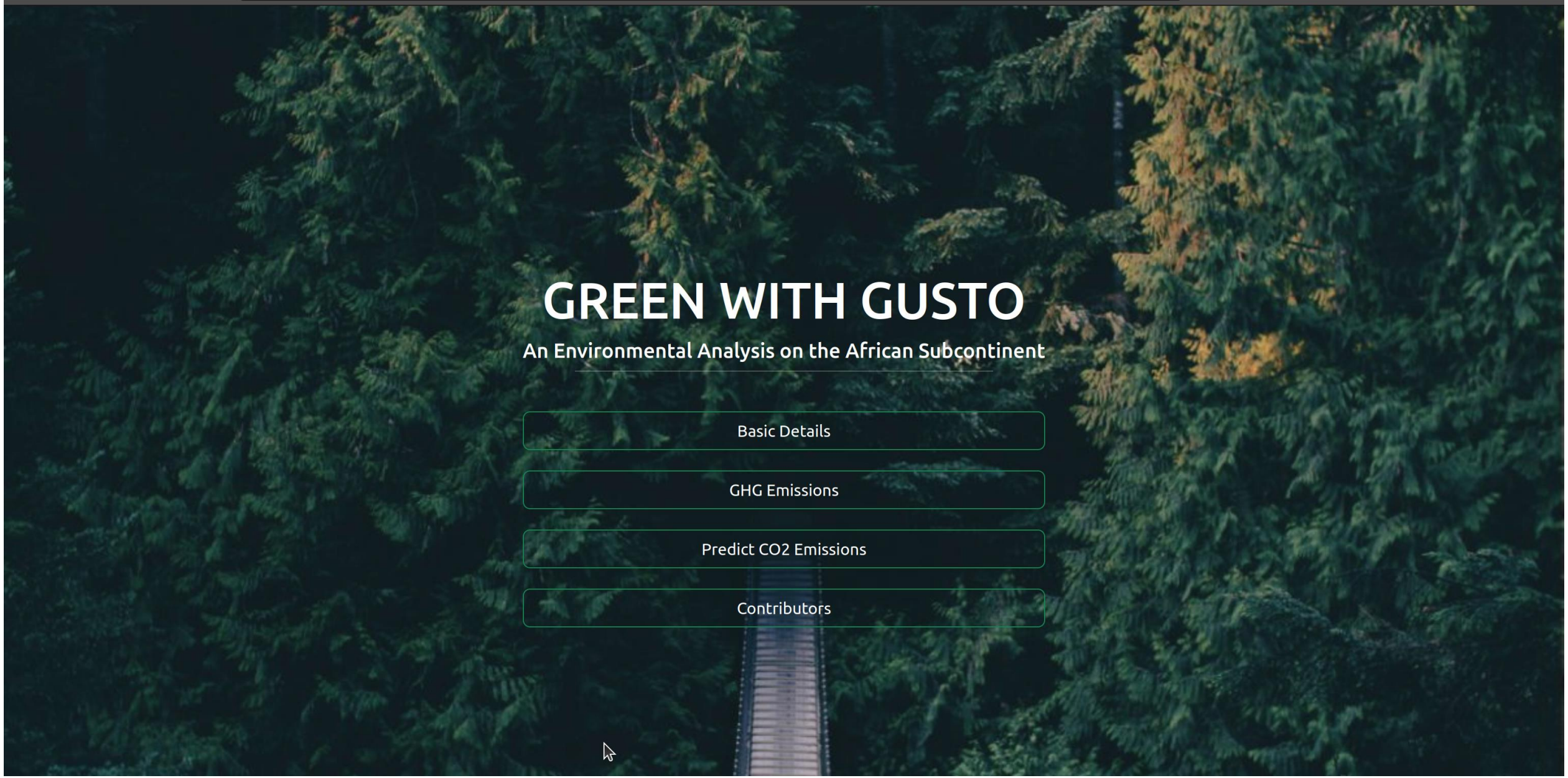
- **Objective**: Our main goal is to gain statistical insights into the factors and attributes influencing the African continent.

- **Data Visualization**: We are employing data visualization techniques to present the analyzed data in visually compelling ways, aiding in better understanding and interpretation.

- **Correlation Discovery**: Our primary focus is on identifying correlations among these diverse attributes to understand the complex interplay between them.

- **Predictive Analytics**: We are utilizing these correlations to make predictions about environmental factors that contribute to the degradation and deterioration of Africa's natural environment.

- **Interactive Website**: To achieve this, we are developing an interactive website that will serve as a platform to showcase and explore these insights.


New Tab
WhatsApp
Green with Gusto (1).ppt
React App
localhost:3000
GREEN WITH GUSTO
An Environmental Analysis on the African Subcontinent
Basic Details
GHG Emissions
Predict CO2 Emissions
Contributors

Country: Cameroon

Basic Details for Cameroon

Population (000, 2021)	99
Pop. density (per km2, 2021)	224.4
Capital city	Saint John's
UN membership date	11-Nov-81
Surface area (km2)	442
Sex ratio (m per 100 f)	93.4
National currency	E. Caribbean Dollar (XCD)
Exchange rate (per US$)	2.7
GDP: Gross domestic product (million current US$)	1662
GDP growth rate (annual %, const. 2015 prices)	3.4
GDP per capita (current US$)	17112.8
Population growth rate (average annual %)	0.9
Urban population (% of total population)	24.5
Fertility rate, total (live births per woman)	2
Life expectancy at birth (females/males, years)	77.9/75.7
Infant mortality rate (per 1 000 live births)	5.2

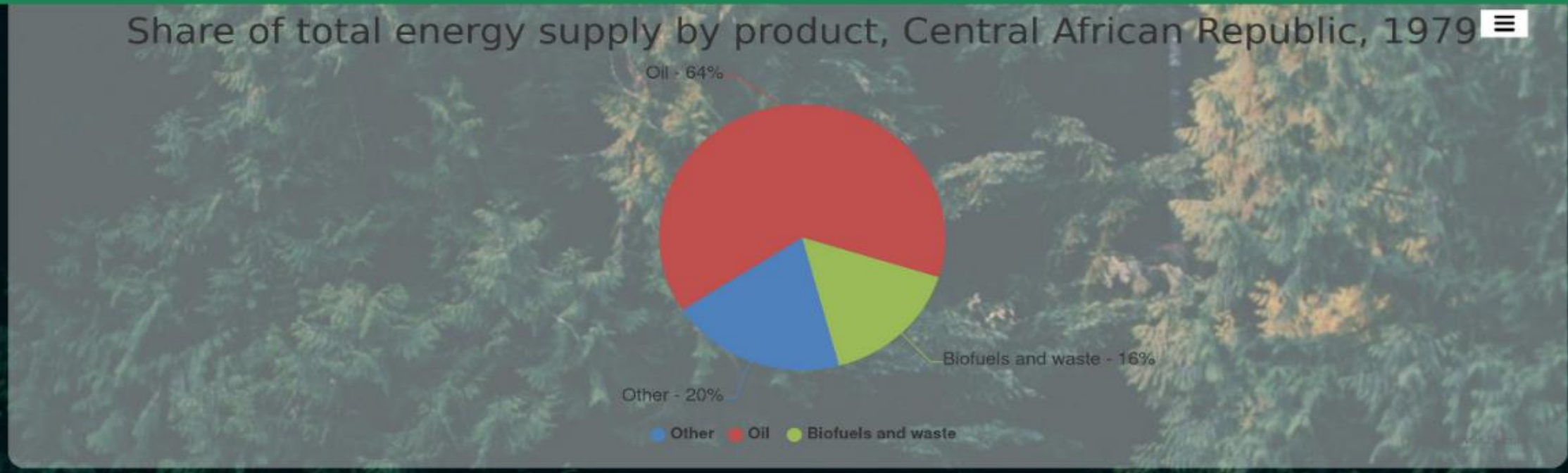
Country: Central African Republic

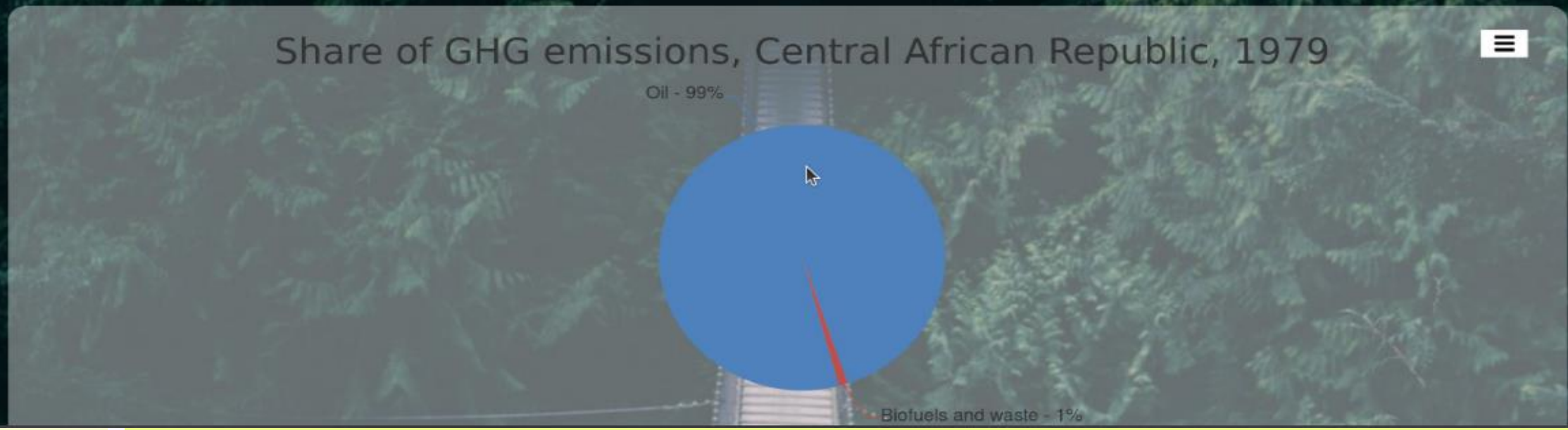
Year: 1979

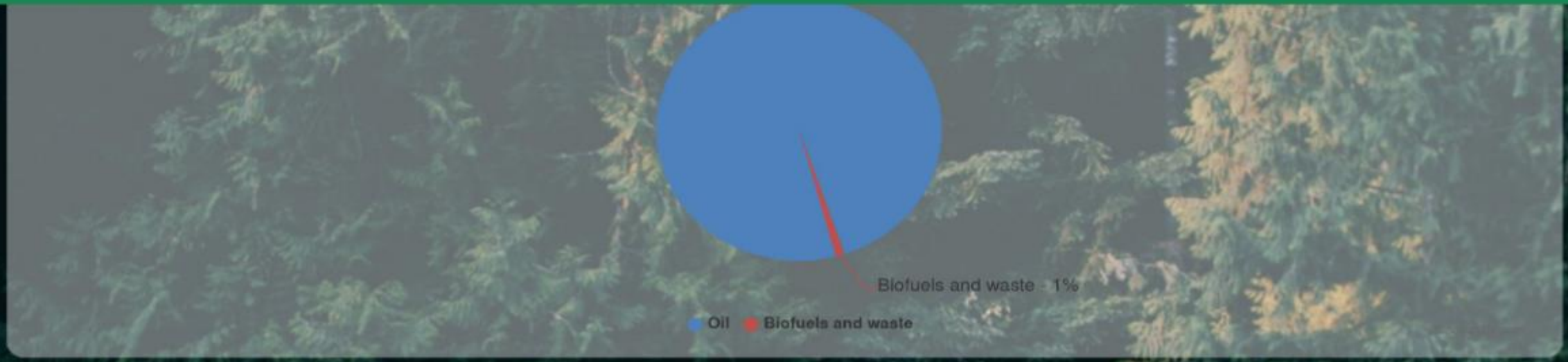
Key emissions figures for 1979, Central African Republic

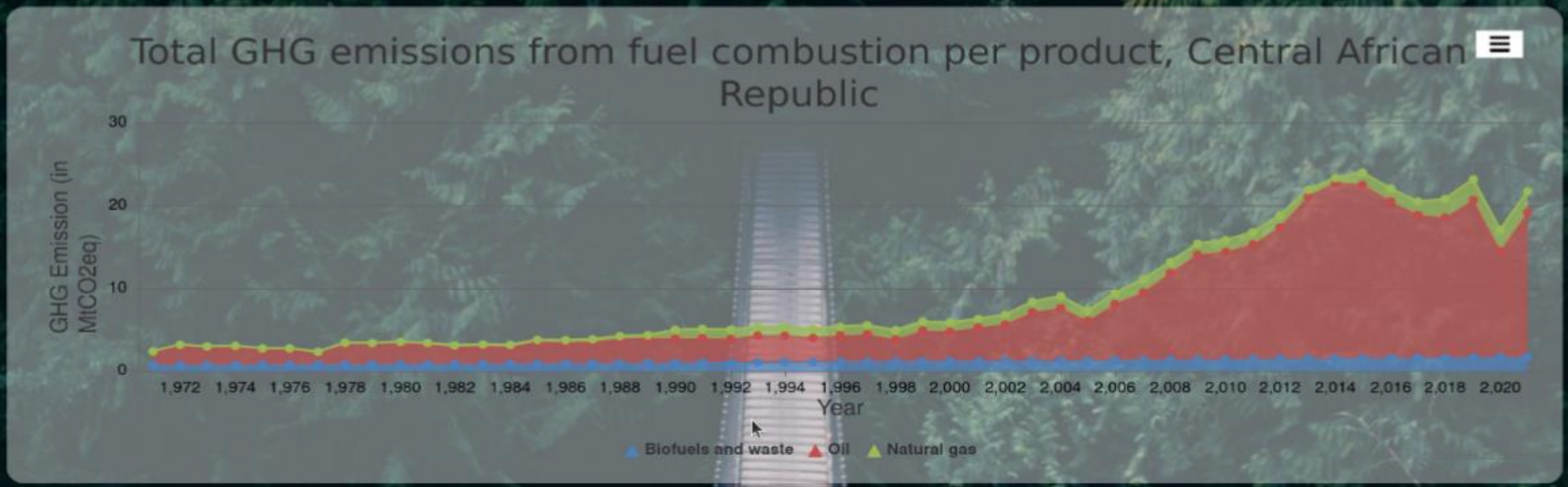
CO2 / population (tCO2 per capita)	1.618
CO2 / TES (tCO2 per TJ)	46.273
Total GHG emissions - Fuel Combustion (tCO2eq)	3.743907
CO2 / GDP PPP (kgCO2 per 2015 USD)	0.154
Total energy supply (Other)	372.9149
Total energy supply (Oil)	1203.9566
Total energy supply (Biofuels and waste)	296.2549
Total GHG emissions - Fuel Combustion (tCO2eq) (Oil)	3.687799
Total GHG emissions - Fuel Combustion (tCO2eq) (Biofuels and waste)	0.056107

Share of total energy supply by product: Central African Republic, 1979


Share of total energy supply by product, Central African Republic, 1979
Oil - 64%
Biofuels and waste - 16%
Other - 20%
Other
Oil
Biofuels and waste


Share of GHG emissions, Central African Republic, 1979
Oil - 99%
Biofuels and waste - 1%


Biofuels and waste : 1%
Oil
Biofuels and waste


Total GHG emissions from fuel combustion per product, Central African Republic
GHG Emission (in MtCO2eq)
30
20
10
0
1,972 1,974 1,976 1,978 1,980 1,982 1,984 1,986 1,988 1,990 1,992 1,994 1,996 1,998 2,000 2,002 2,004 2,006 2,008 2,010 2,012 2,014 2,016 2,018 2,020
Year
Biofuels and waste
Oil
Natural gas

Country: Select the country

Year: Select the year

Advanced

Predict

Please select the country and the year

Country: Egypt

Year: 1978

Advanced

Energy by Biofuels and Waste (tCO2/TJ): 0.5

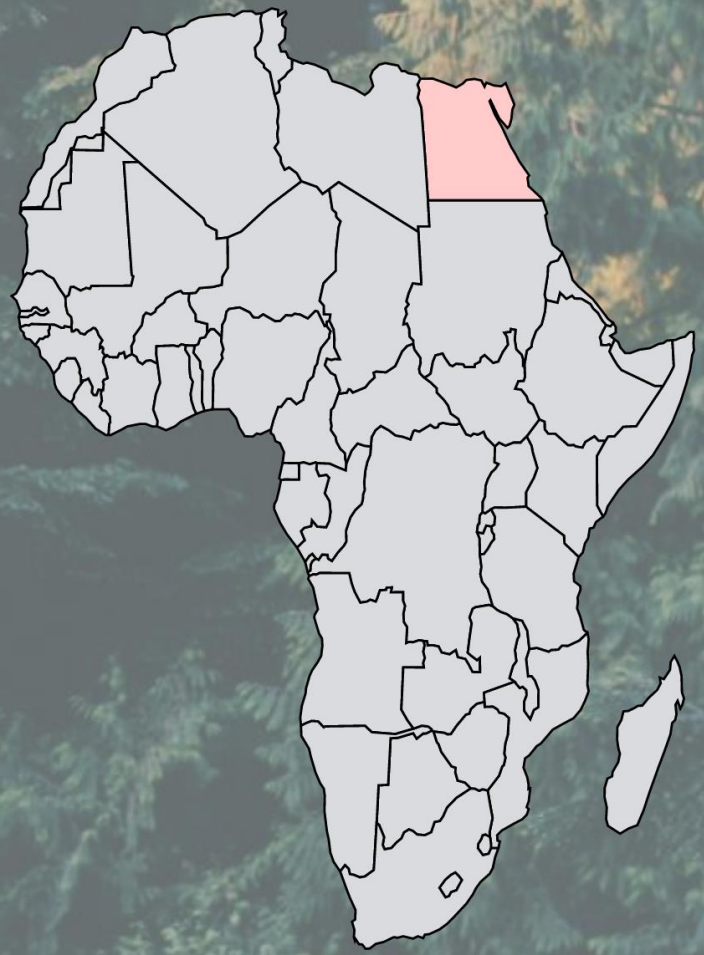
Energy by Coal, Peat and Oil Shale (tCO2/TJ): 10

Energy by Oil (tCO2/TJ): 2.650

Energy by Natural Gas (tCO2/TJ): 95.2

Predict

Predicted CO2 emission for Egypt in 1978 = 6.96 tCO2 per TJ (low threat)



Environmental News for Algeria

Algeria - Vulnerability | Climate Change Knowledge Portal

Historical Hazards ; Drought Drought ; Earthquake Earthquake ; Epidemic Epidemic ; Extreme temperature Extreme temperature ; Flood Flood ...

by World Bank

Algeria Environment and fight against climate change - CoR

The national authorities have launched several initiatives to combat desertification, including the green dam - a green belt to halt the advance of ...

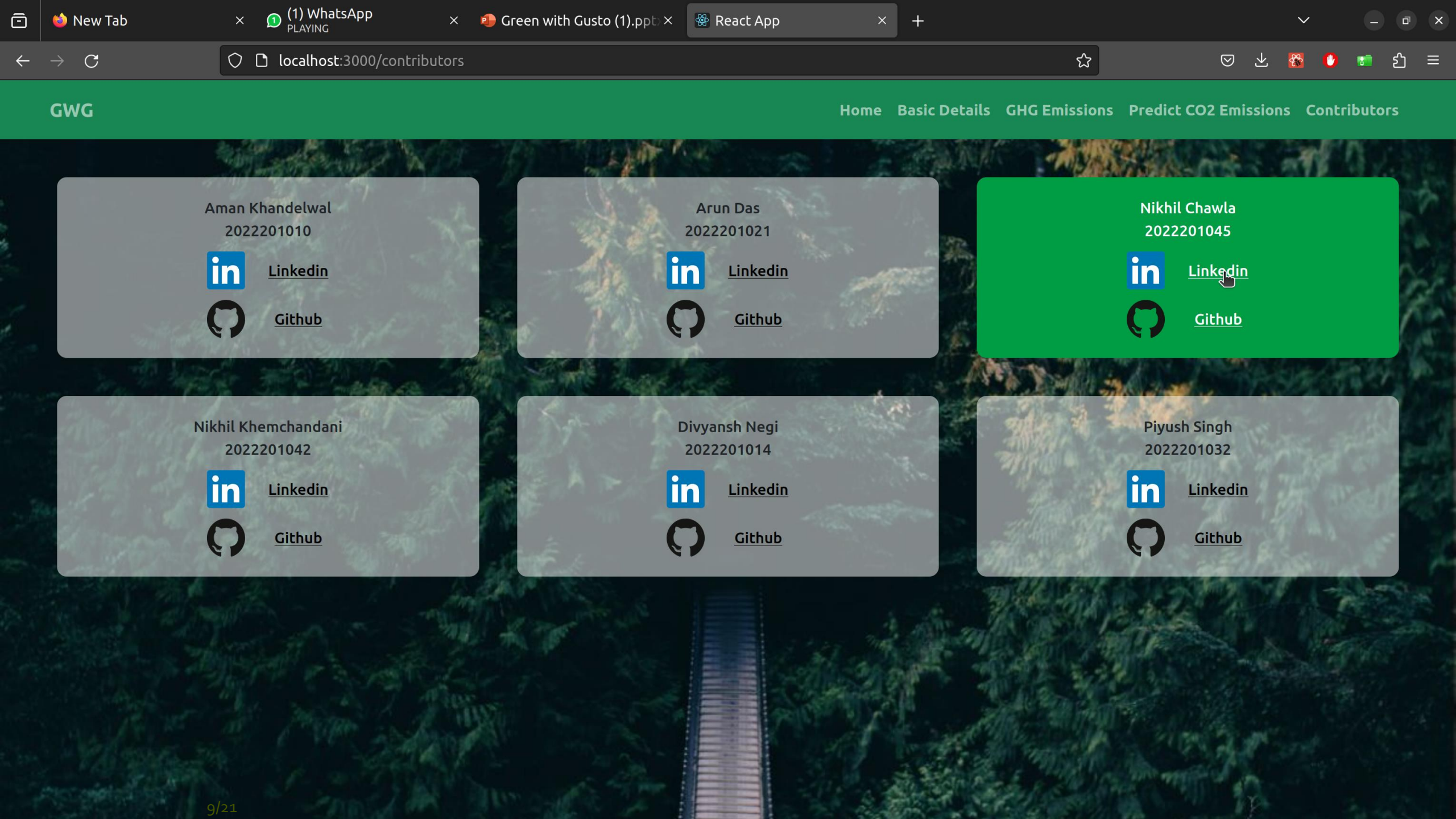
by europa.eu

European Union mobilises to protect the environment in Algeria

The main environmental challenges in Algeria concern air quality, management and quality of water resources, waste management, nature ...

by European Commission

Algeria Pollution: Serious Environmental & Health Risks ...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Linkedin
Github
Divyansh Negi
2022201014
Linkedin
Github
Piyush Singh
2022201032
Linkedin
Github
9/21

Previously Done Analysis

Data and Methodology

- **Data Scraping:**
  - Open environmental datasets for Africa and its countries were collected.
  - Data included statistics on carbon emissions, energy consumption, and threatened species over several years.
- **Data Cleaning and Processing:**
  - Addressed missing values by interpolating or replacing them with means.
  - Dealt with outliers, removing those resulting from errors or erroneous sensor readings.
  - Transformed data for suitability in machine learning models and visualizations.
- **Exploratory Data Analysis (EDA):**
  - Utilized visual tools like bar charts and plots to uncover correlations between different dataset parameters.
  - Refined the machine learning model based on identified correlations, assigning more weight to parameters strongly correlated with the target variable.

How the Data Looked Before Pre-Processing

	T27	CO2 emission estimates	Unnamed: 2	Unnamed: 3	Unnamed: 4	Unnamed: 5	Unnamed: 6
0	Region/Country/Area	NaN	Year	Series	Value	Footnotes	Source
1	8	Albania	1975	Emissions (thousand metric tons of carbon diox...	4,524	NaN	International Energy Agency, IEA World Energy ...
2	8	Albania	1985	Emissions (thousand metric tons of carbon diox...	7,145	NaN	International Energy Agency, IEA World Energy ...
3	8	Albania	2005	Emissions (thousand metric tons of carbon diox...	3,981	NaN	International Energy Agency, IEA World Energy ...
4	8	Albania	2010	Emissions (thousand metric tons of carbon diox...	4,074	NaN	International Energy Agency, IEA World Energy ...

	T26	Threatened species	Unnamed: 2	Unnamed: 3	Unnamed: 4	Unnamed: 5	Unnamed: 6
0	Region/Country/Area	NaN	Year	Series	Value	Footnotes	Source
1	4	Afghanistan	2004	Threatened Species: Vertebrates (number)	31	NaN	World Conservation Union (IUCN), Gland and Cam...
2	4	Afghanistan	2010	Threatened Species: Vertebrates (number)	31	NaN	World Conservation Union (IUCN), Gland and Cam...
3	4	Afghanistan	2015	Threatened Species: Vertebrates (number)	31	NaN	World Conservation Union (IUCN), Gland and Cam...
4	4	Afghanistan	2019	Threatened Species: Vertebrates (number)	33	NaN	World Conservation Union (IUCN), Gland and Cam...

	T02	Population, density and surface area	Unnamed: 2	Unnamed: 3	Unnamed: 4	Unnamed: 5	Unnamed: 6
0	Region/Country/Area	NaN	Year	Series	Value	Footnotes	Source
1	1	Total, all countries or areas	2010	Population mid-year estimates (millions)	6,985.60	NaN	United Nations Population Division, New York, ...
2	1	Total, all countries or areas	2010	Population mid-year estimates for males (milli...	3,514.41	NaN	United Nations Population Division, New York, ...
3	1	Total, all countries or areas	2010	Population mid-year estimates for females (mil...	3,471.20	NaN	United Nations Population Division, New York, ...
4	1	Total, all countries or areas	2010	Sex ratio (males per 100 females)	101.2	NaN	United Nations Population Division, New York, ...

	T24	Production, trade and supply of energy	Unnamed: 2	Unnamed: 3	Unnamed: 4	Unnamed: 5	Unnamed: 6
0	Region/Country/Area	NaN	Year	Series	Value	Footnotes	Source
1	1	Total, all countries or areas	1995	Primary energy production (petajoules)	381,677	NaN	United Nations Statistics Division, New York, ...
2	1	Total, all countries or areas	2000	Primary energy production (petajoules)	412,291	NaN	United Nations Statistics Division, New York, ...
3	1	Total, all countries or areas	2005	Primary energy production (petajoules)	476,693	NaN	United Nations Statistics Division, New York, ...
4	1	Total, all countries or areas	2010	Primary energy production (petajoules)	530,014	NaN	United Nations Statistics Division, New York, ...

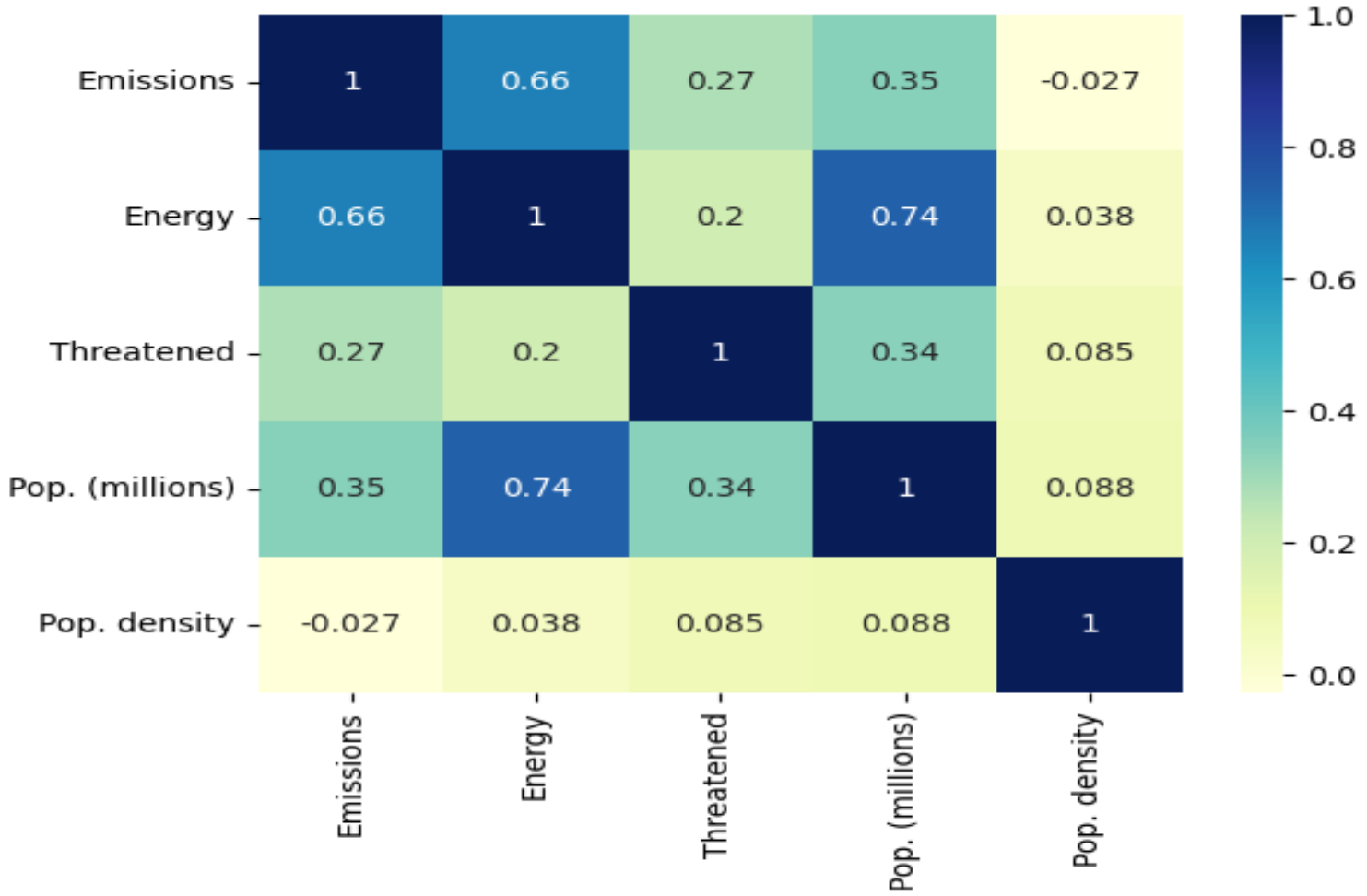
Data after Pre-Processing

	Region/Country/Area	Year	Population mid-year estimates (millions)	Population density	Threatened Species: Total (number)
0	Algeria	2010	35.86	15.1	105
1	Algeria	2015	39.54	16.6	114
2	Algeria	2020	43.45	18.2	155
3	Algeria	2022	44.90	18.9	180
4	Angola	2010	23.36	18.7	117

	Region/Country/Area	Year	Emissions (thousand metric tons of carbon dioxide)	Threatened Species: Total (number)
0	Algeria	2005	78045	50
1	Algeria	2010	96452	105
2	Algeria	2015	131690	114
3	Algeria	2019	143586	145
4	Angola	2005	7510	76

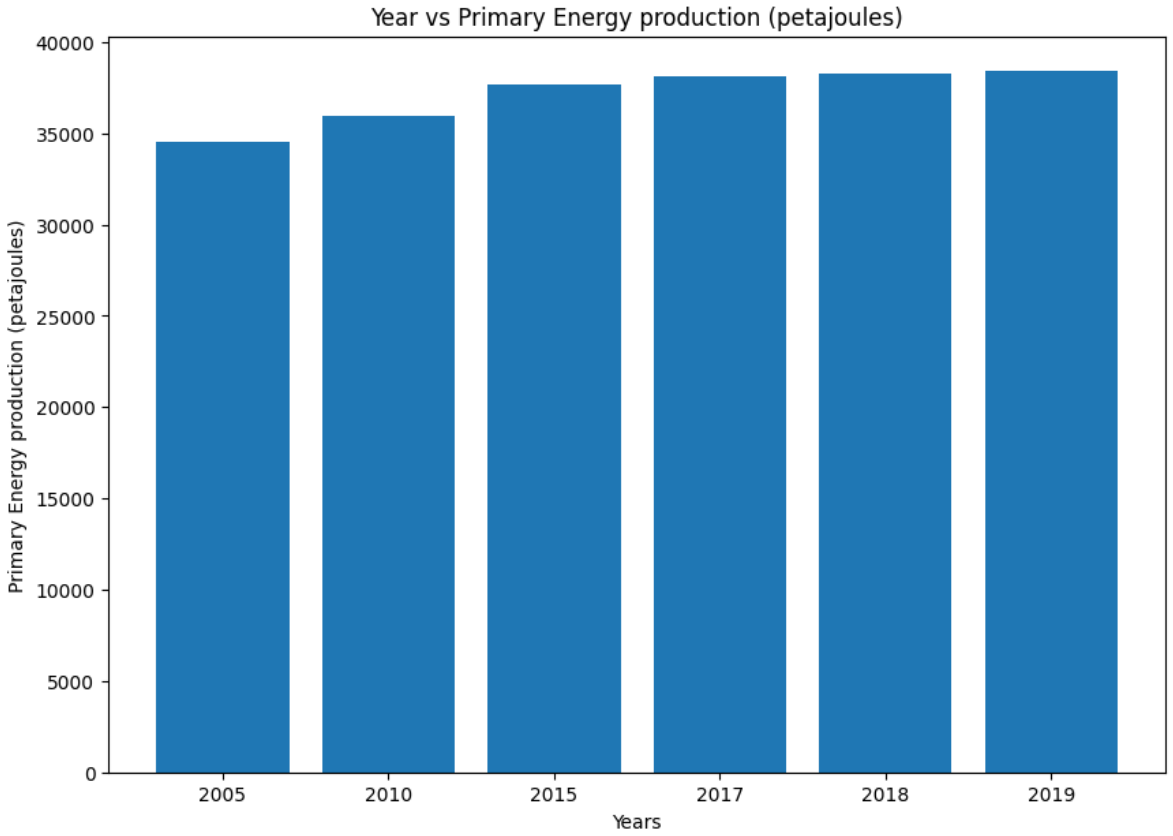
	Region/Country/Area	Year	Emissions (thousand metric tons of carbon dioxide)	Threatened Species: Total (number)
113	Zambia	2019	7566	98
114	Zimbabwe	2005	12551	43
115	Zimbabwe	2010	11753	55
116	Zimbabwe	2015	14514	60
117	Zimbabwe	2019	13882	103

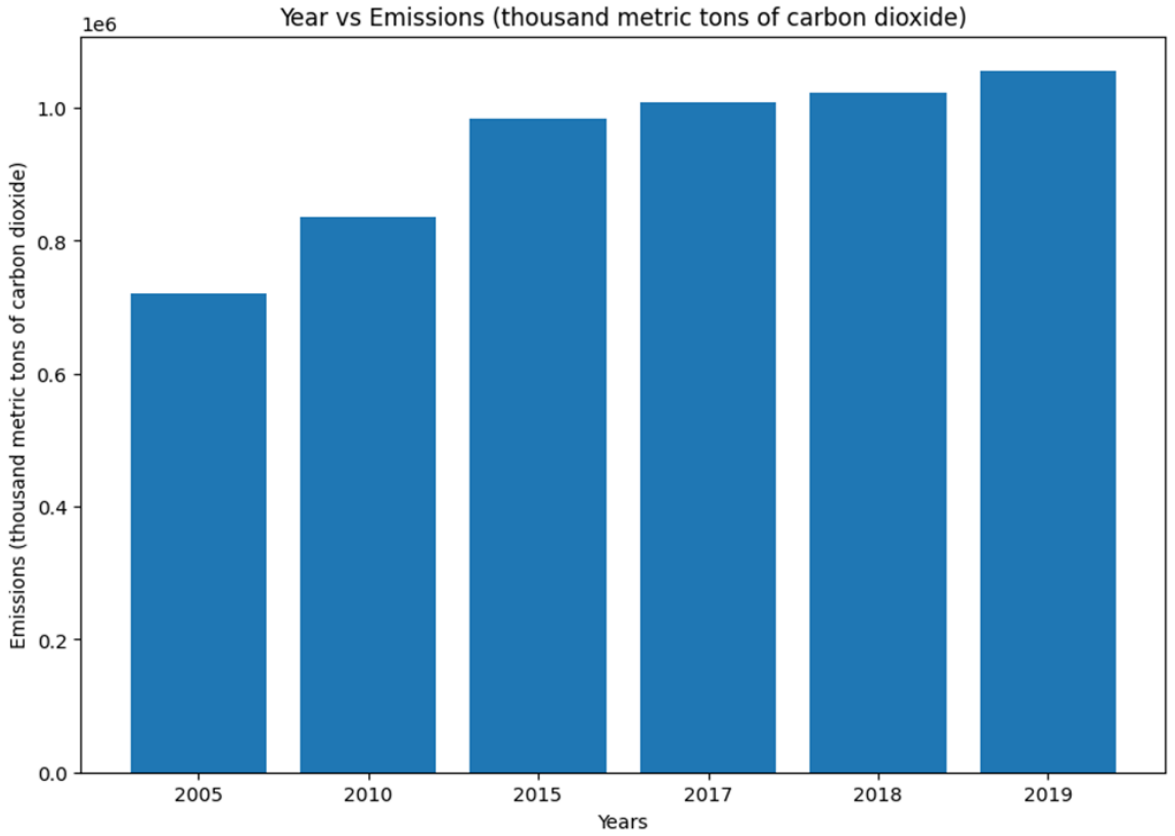
Correlation Among Different Attributes



This **Heat Map** is used by us to decide on the attributes that are affecting each other , and can be crucial in modelling and Predicting each other

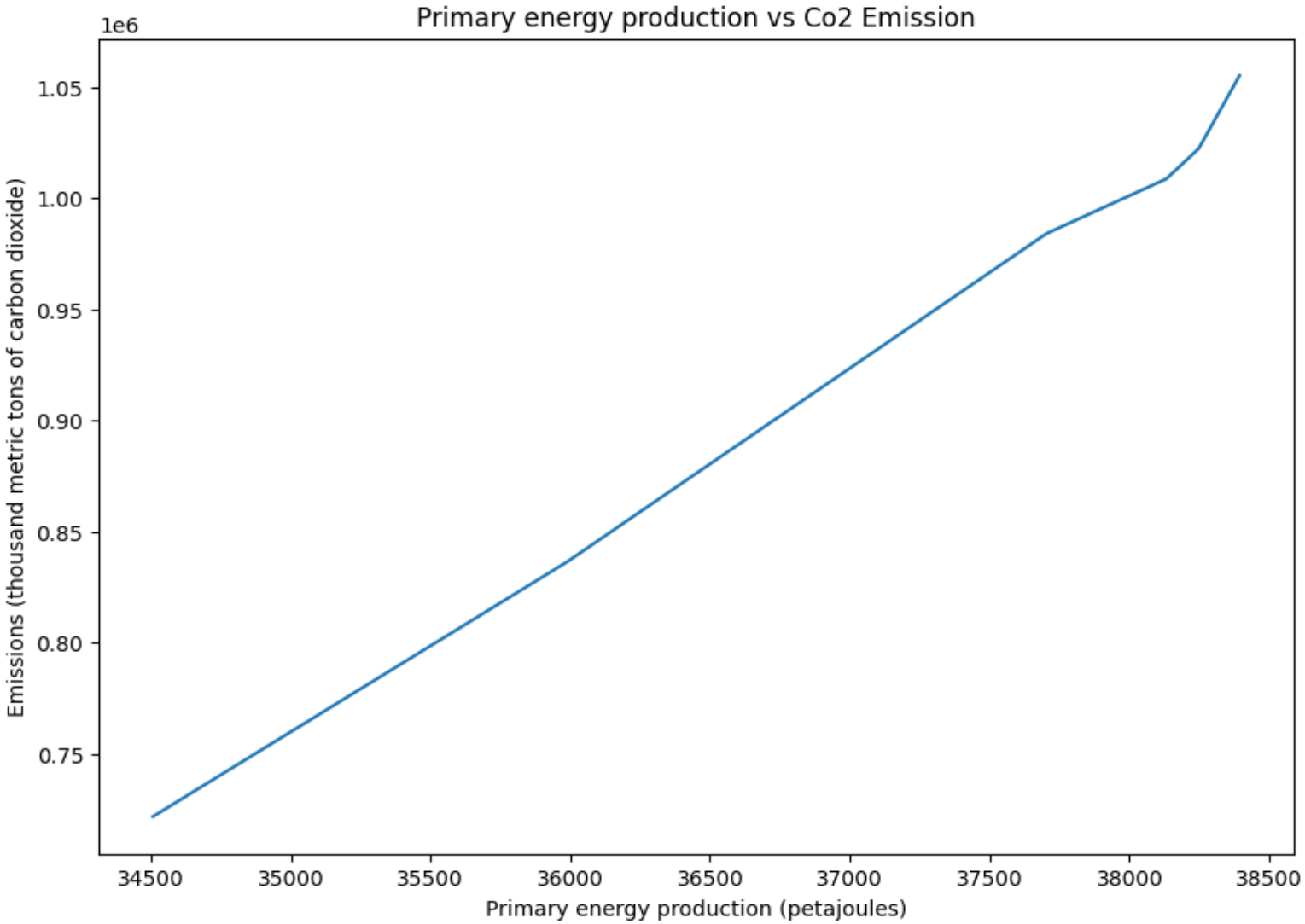
Insights





Inference : The Increase in **Production of Energy** is Linearly Increasing **CO2 Emission** in the Continent.

Graph Representing the Relation



New Analysis

How the Data Looked Before Pre-Processing

	Biofuels and waste	Coal, peat and oil shale	Oil	Natural gas	CO2TES(tCO2 per TJ)	country	year
0	0.002251	0.384980	5.920485	2.383026	59.253	Algeria	1971
1	0.002329	0.372553	6.312181	3.058608	57.281	Algeria	1972
2	0.002381	0.414828	7.169531	3.524308	54.459	Algeria	1973
3	0.002390	0.282616	7.702091	4.081844	54.996	Algeria	1974
4	0.002433	0.326198	8.708710	4.654142	58.629	Algeria	1975

	Biofuels and waste	Coal, peat and oil shale	Oil	Natural gas	CO2TES(tCO2 per TJ)	year
count	1489.000000	736.000000	1489.000000	572.000000	1489.000000	2805.000000
mean	1.879437	19.303543	9.998516	9.437294	26.801398	1996.000000
std	4.602290	66.231015	17.556829	18.986965	21.968185	14.722226
min	0.000419	0.002157	0.041632	0.000303	0.329000	1971.000000
25%	0.190572	0.250003	1.188374	0.150986	9.316000	1983.000000
50%	0.689007	0.886346	2.446164	1.580009	15.614000	1996.000000
75%	1.590454	2.972576	9.636897	7.955379	47.346000	2009.000000
max	39.618539	374.369663	121.475662	107.638041	90.853000	2021.000000

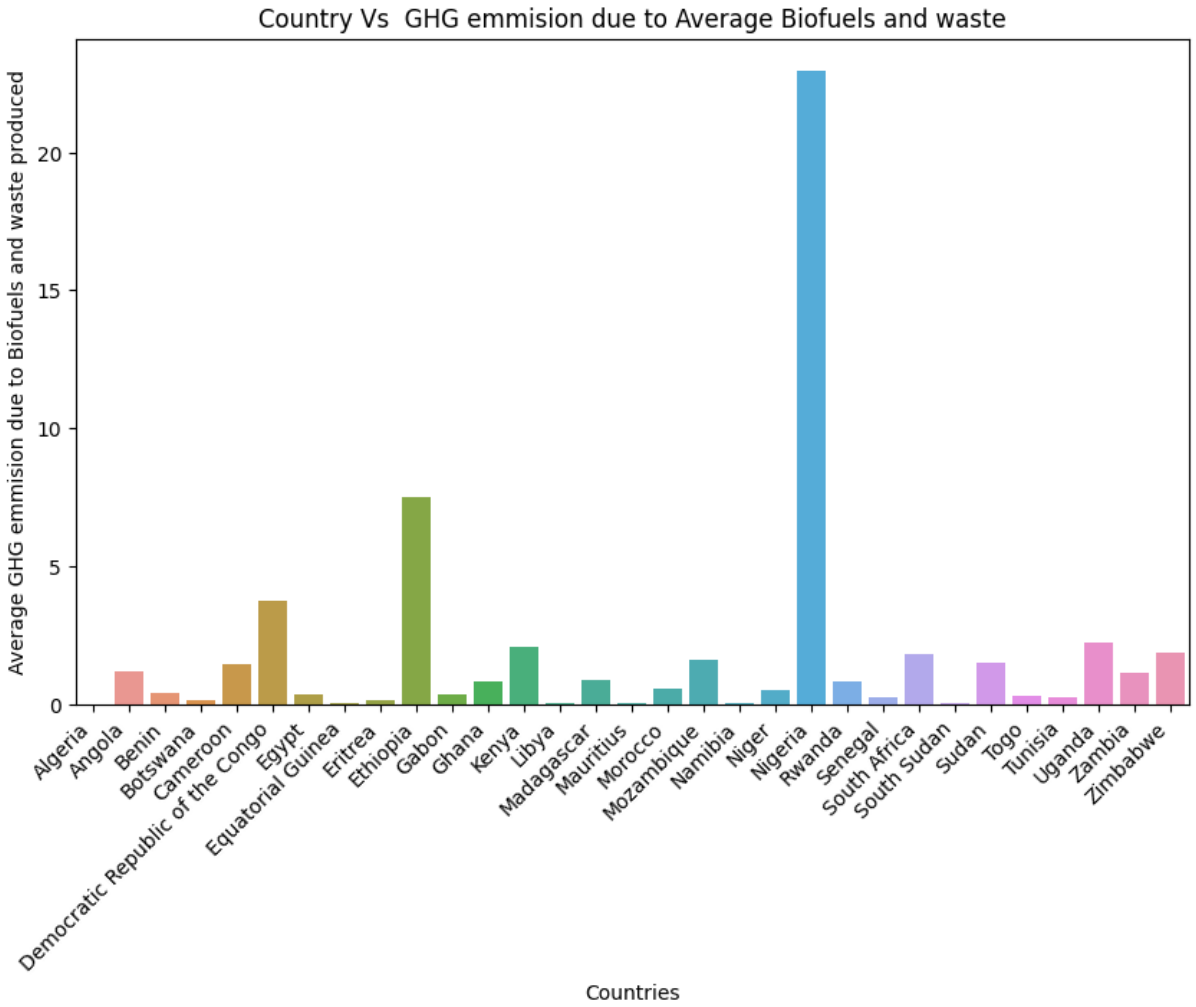
How the Data Looked After Pre-Processing

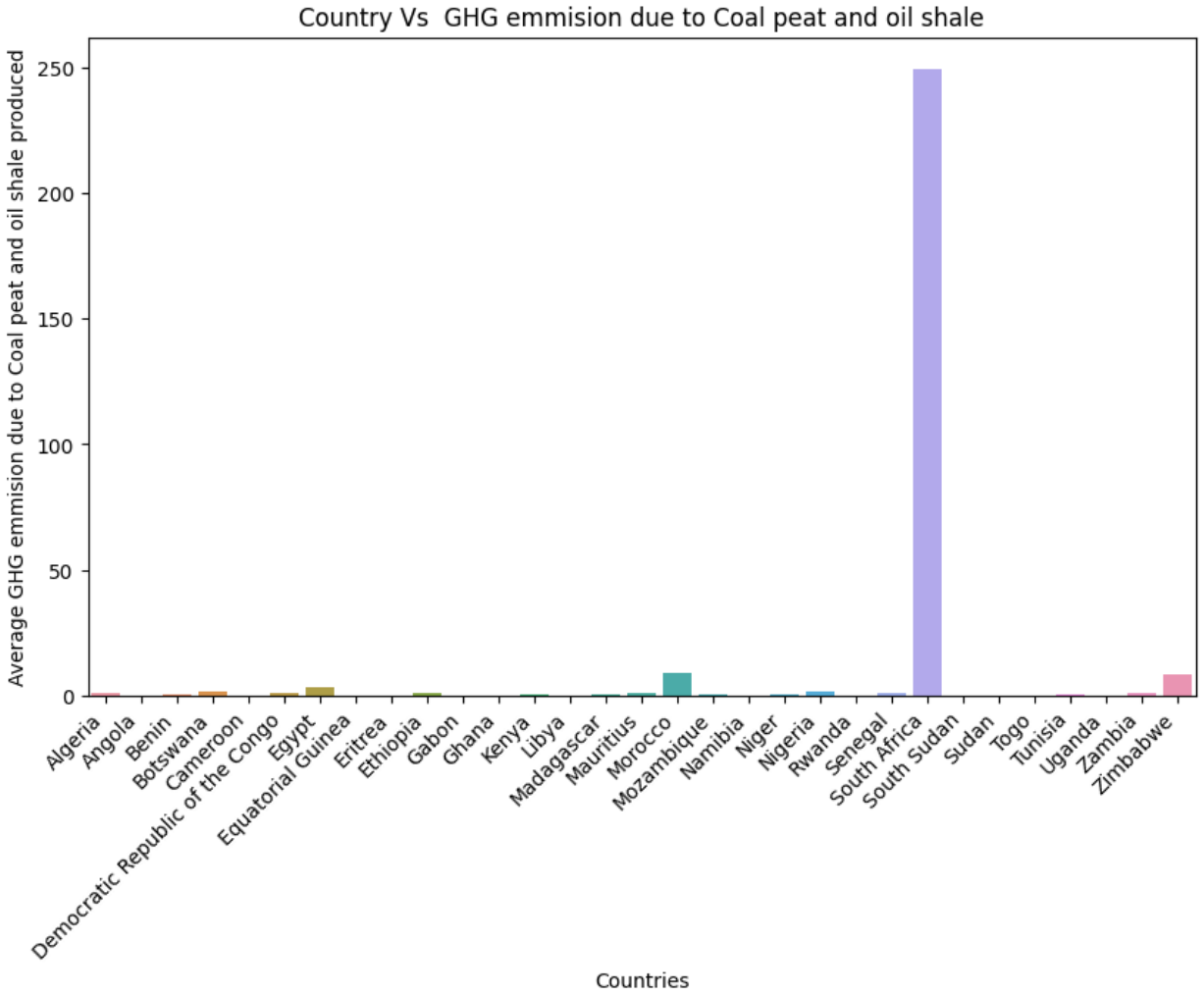
	Top_1	Top_2	Top_3	Top_4	Top_5
Biofuels and waste	(Nigeria, 22.968368549019605)	(Ethiopia, 7.526907392156864)	(Democratic Republic of the Congo, 3.720520999...	(Uganda, 2.216335137254902)	(Kenya, 2.0782648627450984)
Coal, peat and oil shale	(South Africa, 249.65953023529414)	(Morocco, 8.725409607843138)	(Zimbabwe, 8.400515078431372)	(Egypt, 3.4010538627450986)	(Botswana, 1.8103111)
Oil	(Egypt, 66.66413631372548)	(South Africa, 49.89619484313725)	(Nigeria, 31.57726980392157)	(Algeria, 28.872792078431374)	(Libya, 22.53528425490196)
Natural gas	(Egypt, 37.33882735294118)	(Algeria, 36.95884921568627)	(Nigeria, 13.618380882352941)	(Libya, 7.324936450980393)	(Tunisia, 5.649335588235294)
CO2TES(tCO2 per TJ)	(South Africa, 71.71666666666665)	(Morocco, 63.31413725490196)	(Algeria, 56.323627450980396)	(Tunisia, 56.28594117647059)	(Egypt, 55.58941176470588)

How the Data Looked After Pre-Processing

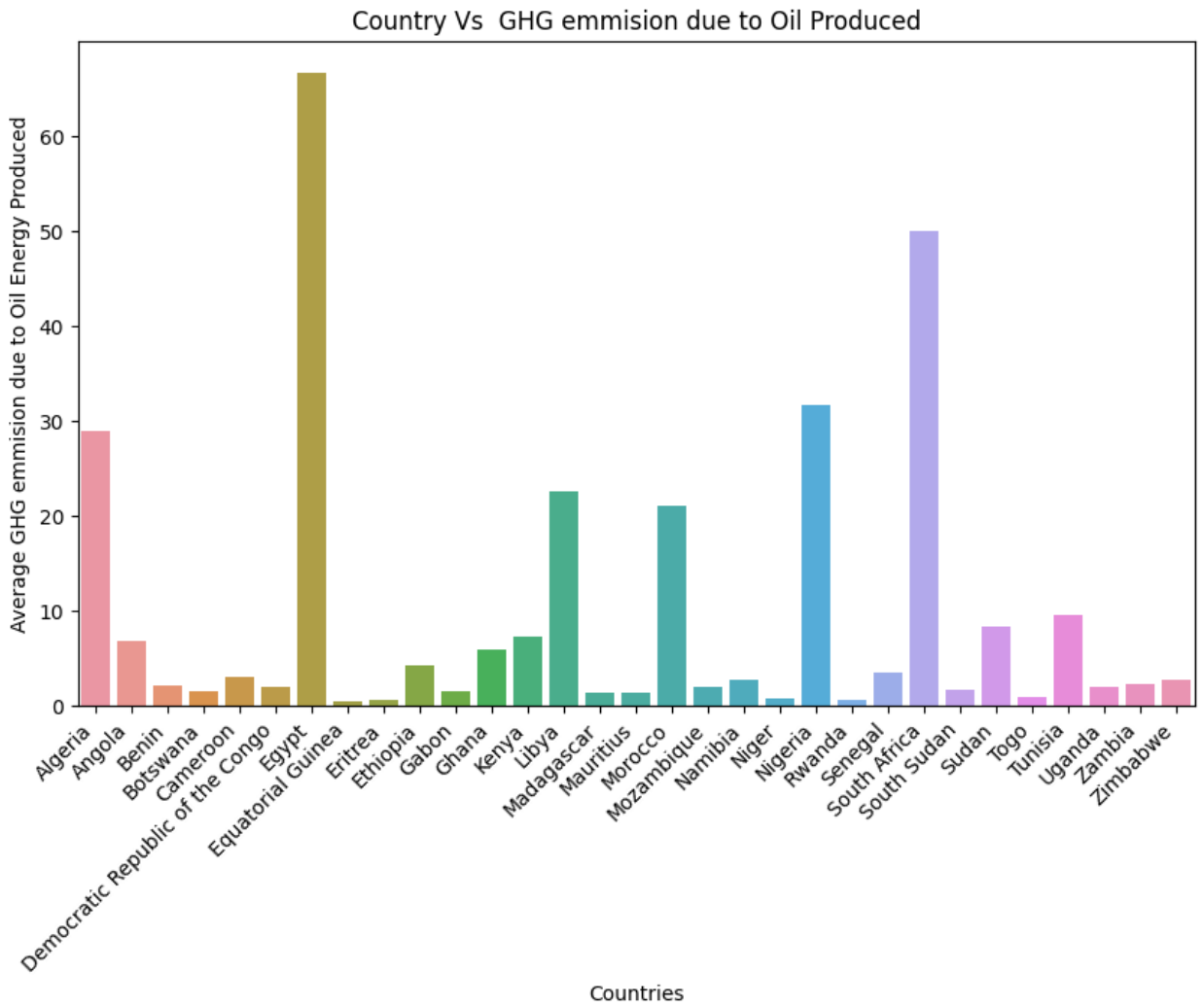
	Bottom_1	Bottom_2	Bottom_3	Bottom_4	Bottom_5
Biofuels and waste	(Algeria, 0.005031607843137255)	(Mauritius, 0.023356627450980393)	(Equatorial Guinea, 0.03541368292682926)	(Namibia, 0.057350612903225795)	(Libya, 0.05813650980392158)
Coal, peat and oil shale	(Angola, 0.0)	(Cameroon, 0.0)	(Equatorial Guinea, 0.0)	(Eritrea, 0.0)	(Gabon, 0.0)
Oil	(Equatorial Guinea, 0.4367369756097561)	(Rwanda, 0.5427257647058823)	(Eritrea, 0.5935775333333332)	(Niger, 0.7269458823529412)	(Togo, 0.8265810196078432)
Natural gas	(Botswana, 0.0)	(Eritrea, 0.0)	(Ethiopia, 0.0)	(Kenya, 0.0)	(Madagascar, 0.0)
CO2TES(tCO2 per TJ)	(Rwanda, 3.0864901960784312)	(Ethiopia, 3.688509803921569)	(Uganda, 3.8169215686274516)	(Democratic Republic of the Congo, 4.505333333...	(Mozambique, 7.342098039215687)

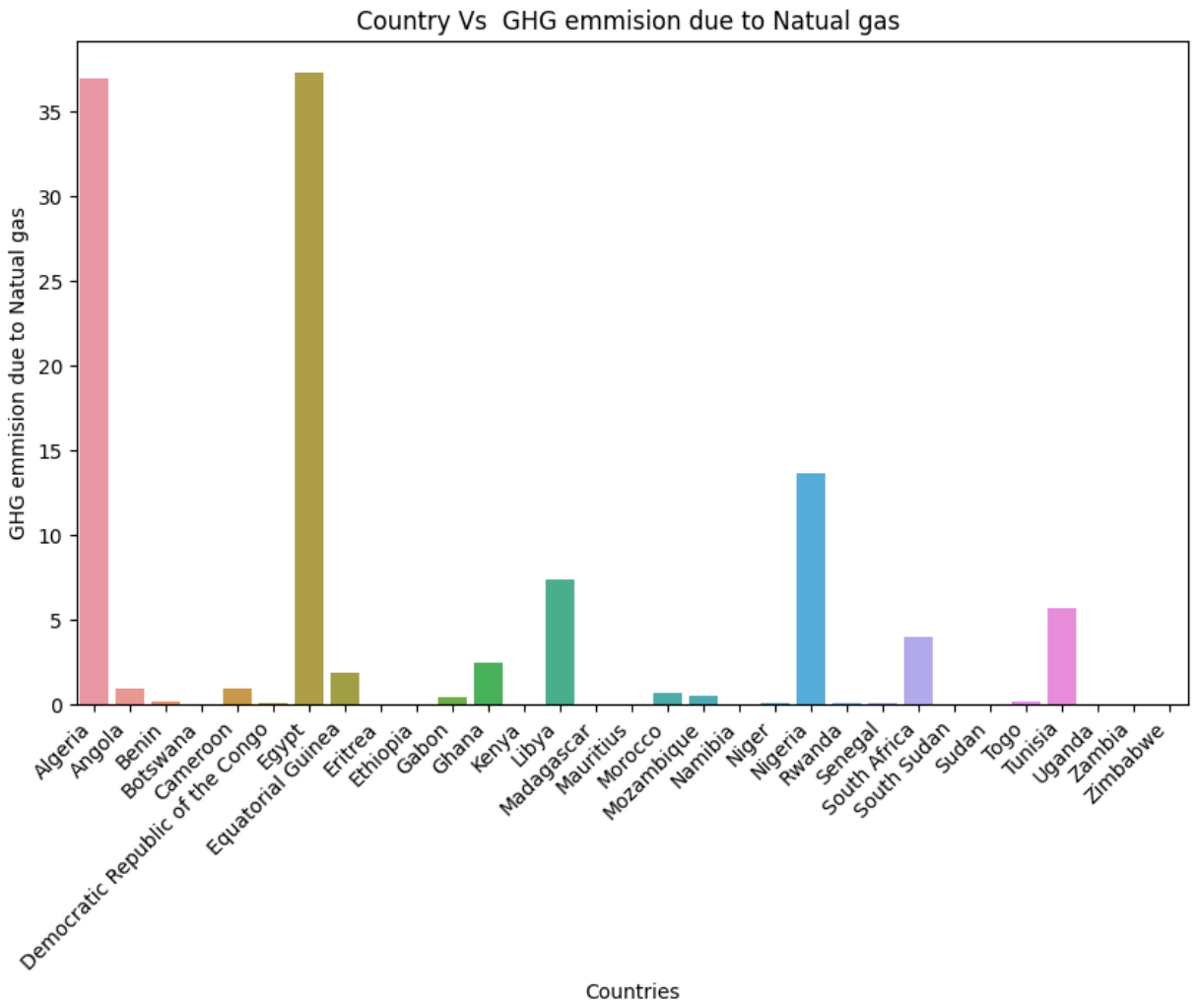
GFG Gas Emission for different Sources Averaged Across Years (1971 - 2021)



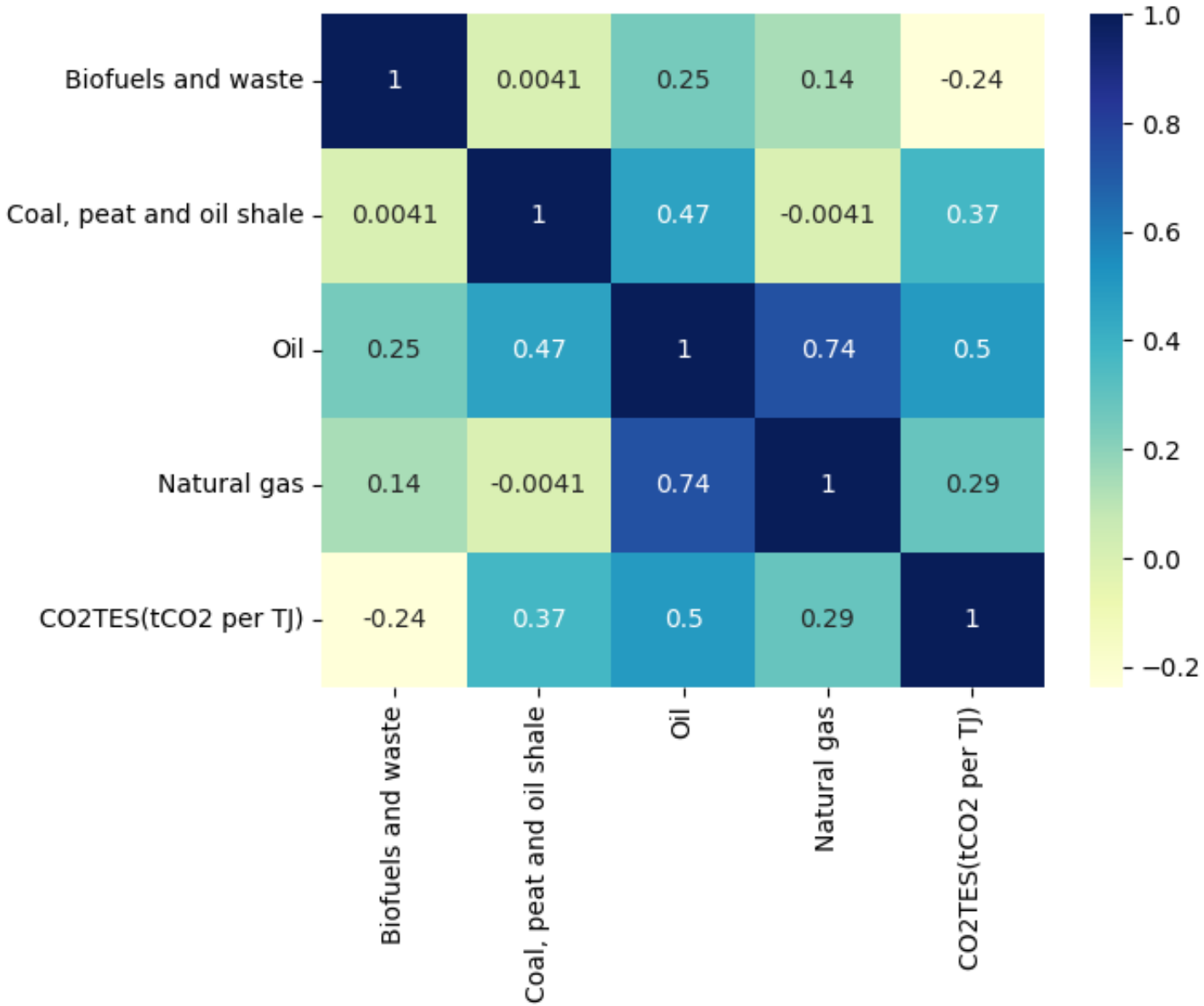


GFG Gas Emission for different Sources averaged across years (1971 - 2021)

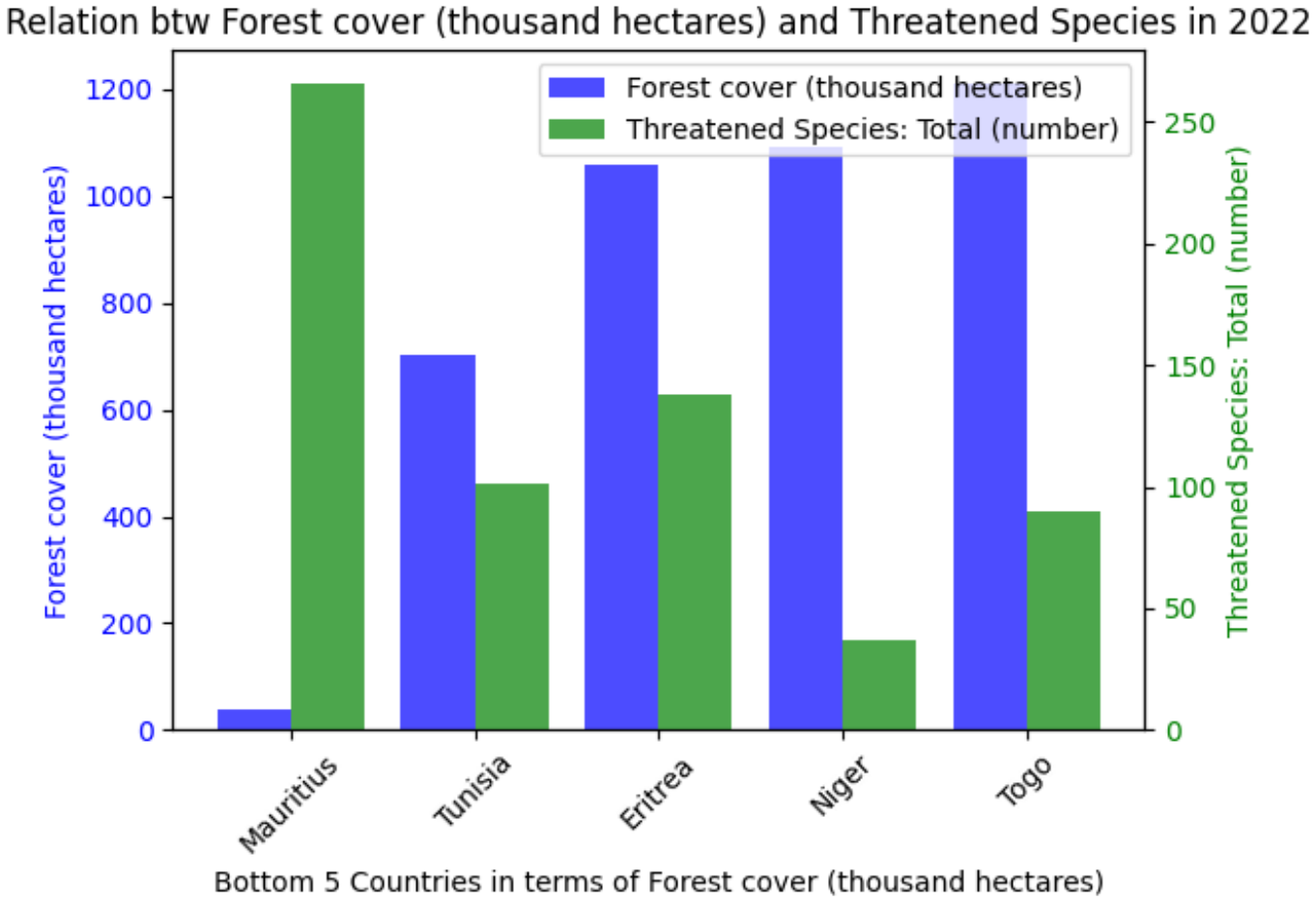




Correlation Matrix



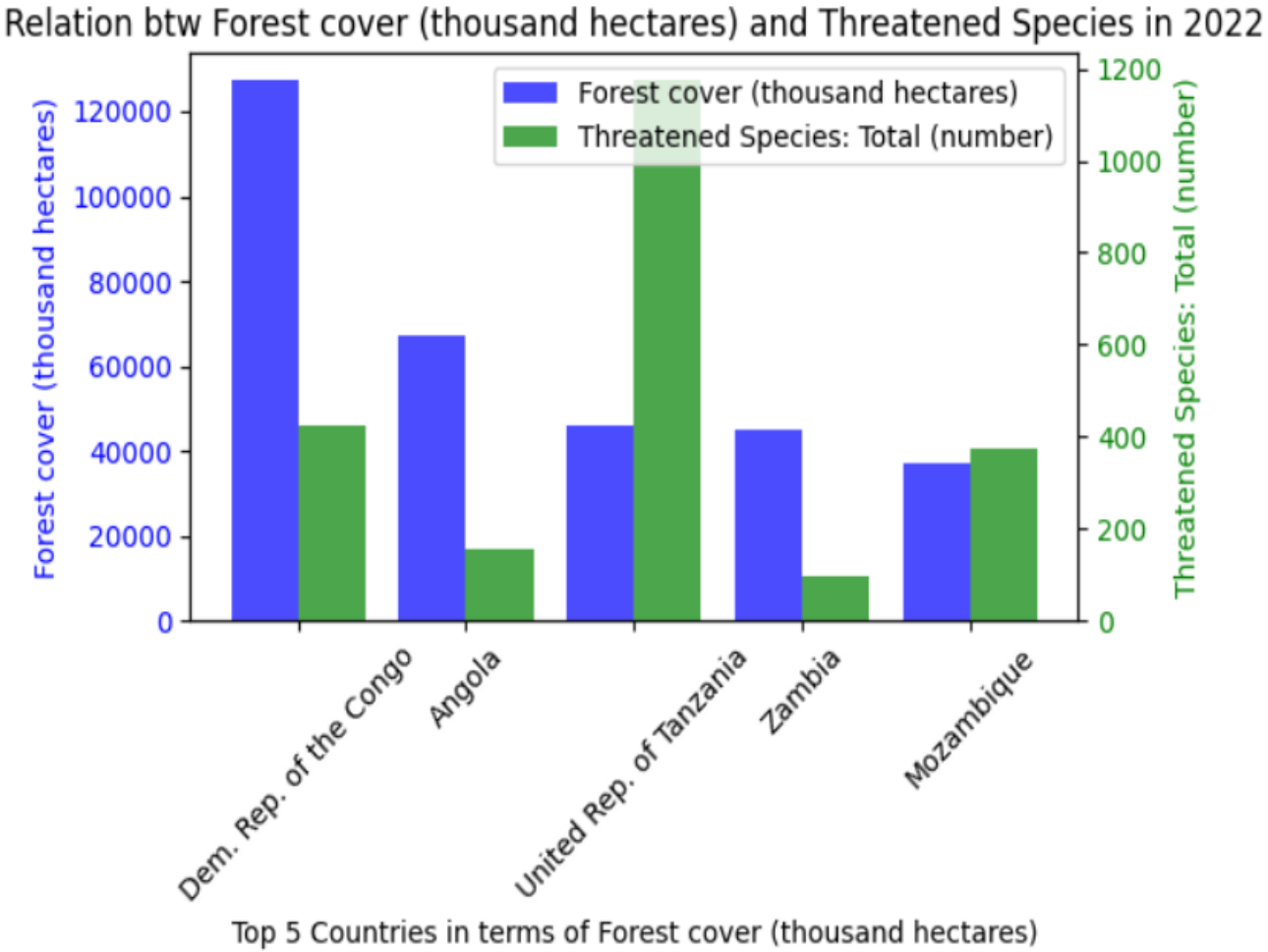
Heat Map Showing the relationships between multiple Factors contributing to GFG emission.



Threatened Species

The Threatened species Count is More

In countries where Forest Cover is less and vice versa.



Threatened Species

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Different Models and Their R2 Scores

Machine Learning Model	Accuracy
Linear Regression	90.50%
SVM with Linear Kernel	85.60%
SVM with RBF Kernel	89.39%
SVM with Polynomial Kernel	87.86%
Polynomial Regression	96.93%
Neural Network (MLP)	98.20%

Timeline

- ✓ 06/09/23 :

  Relevant Data Collection .

- ✓ 17/09/23 :

  Data Cleaning and Transformation(I).

- ✓ 30/09/23 :

  Final Refined Data ,Understanding , Feature Generation(Visualization,Insights,Co-relation) , Transformation(II).

- ✓ 17/10/23 :

  ML Modelling and Observation(I) , Visualization(II).

- ✓ 05/11/23 :

  ML Modelling and Observation(II),Visualization(II),Documentation

THANK YOU