QUANTIFYING THE CARBON FOOTPRINT: AN ANALYSIS OF CO_2 EMISSIONS ACROSS DOMESTIC DEMAND

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Master of Science in Data Science

Methods of Advanced Data Engineering

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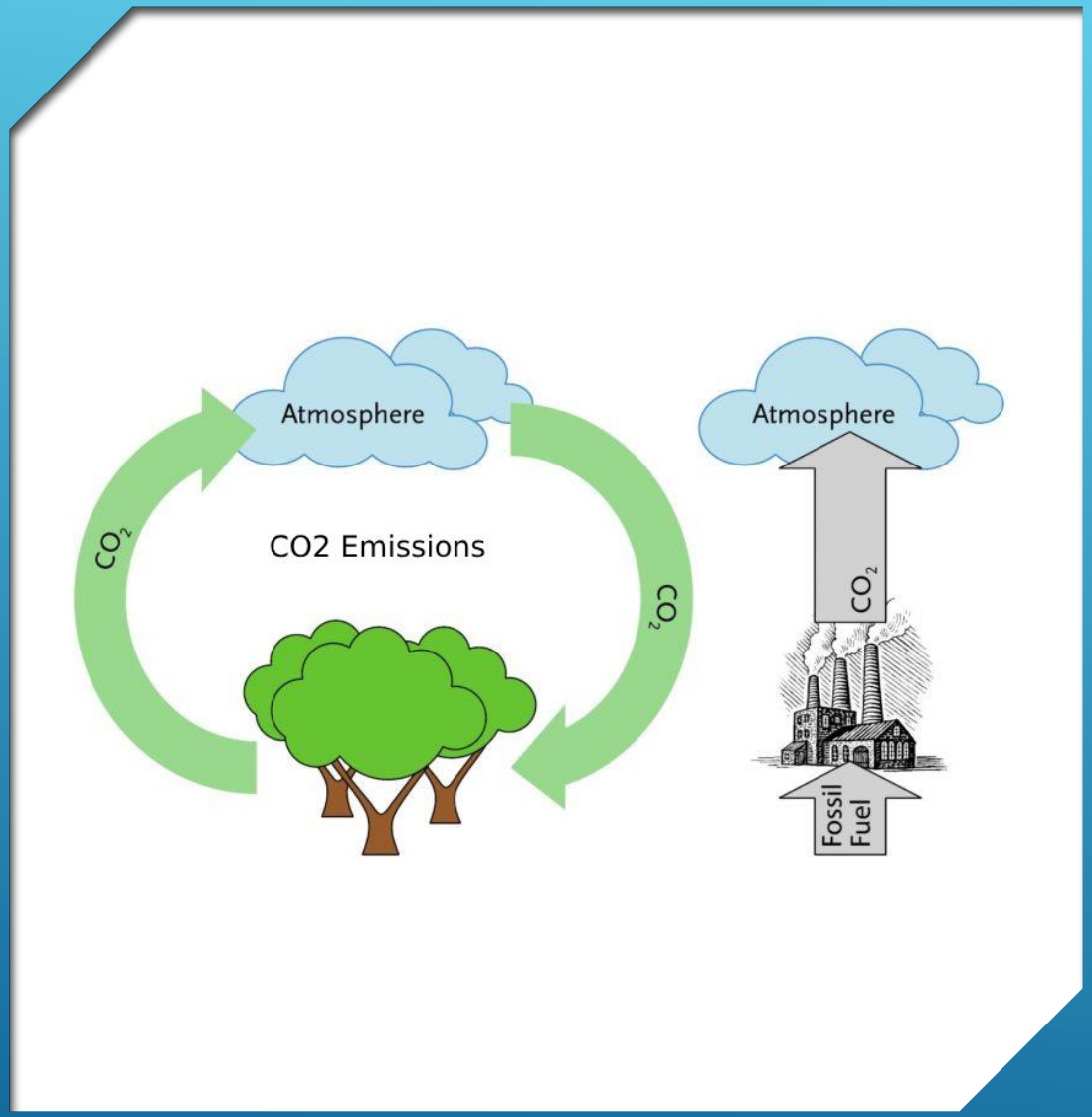
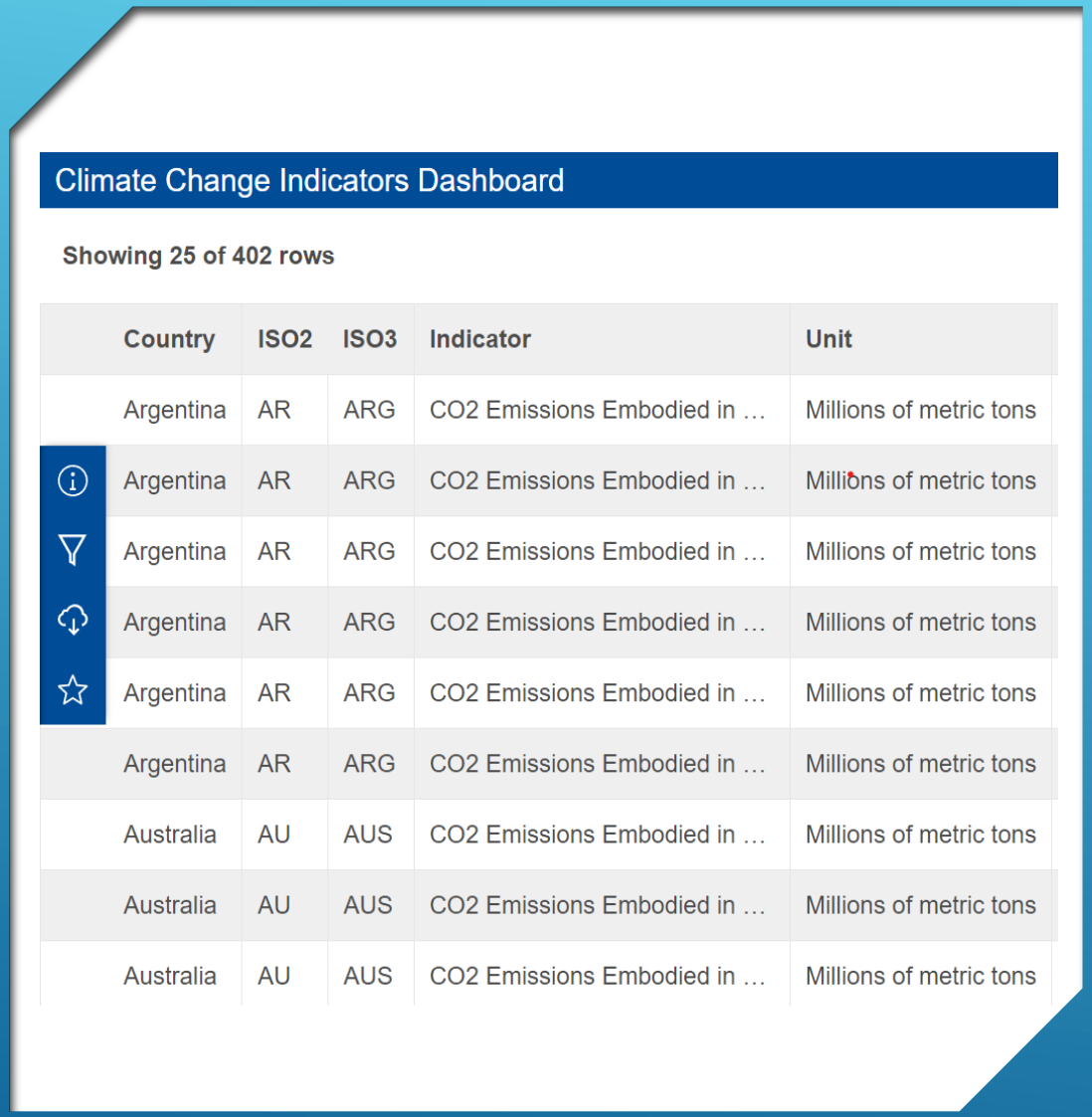


How do domestic consumption patterns and final demand across different countries contribute to the overall carbon footprint, and which sectors or industries drive the highest levels of embodied CO_2 emissions?

QUESTION



Climate Change Indicators Dashboard

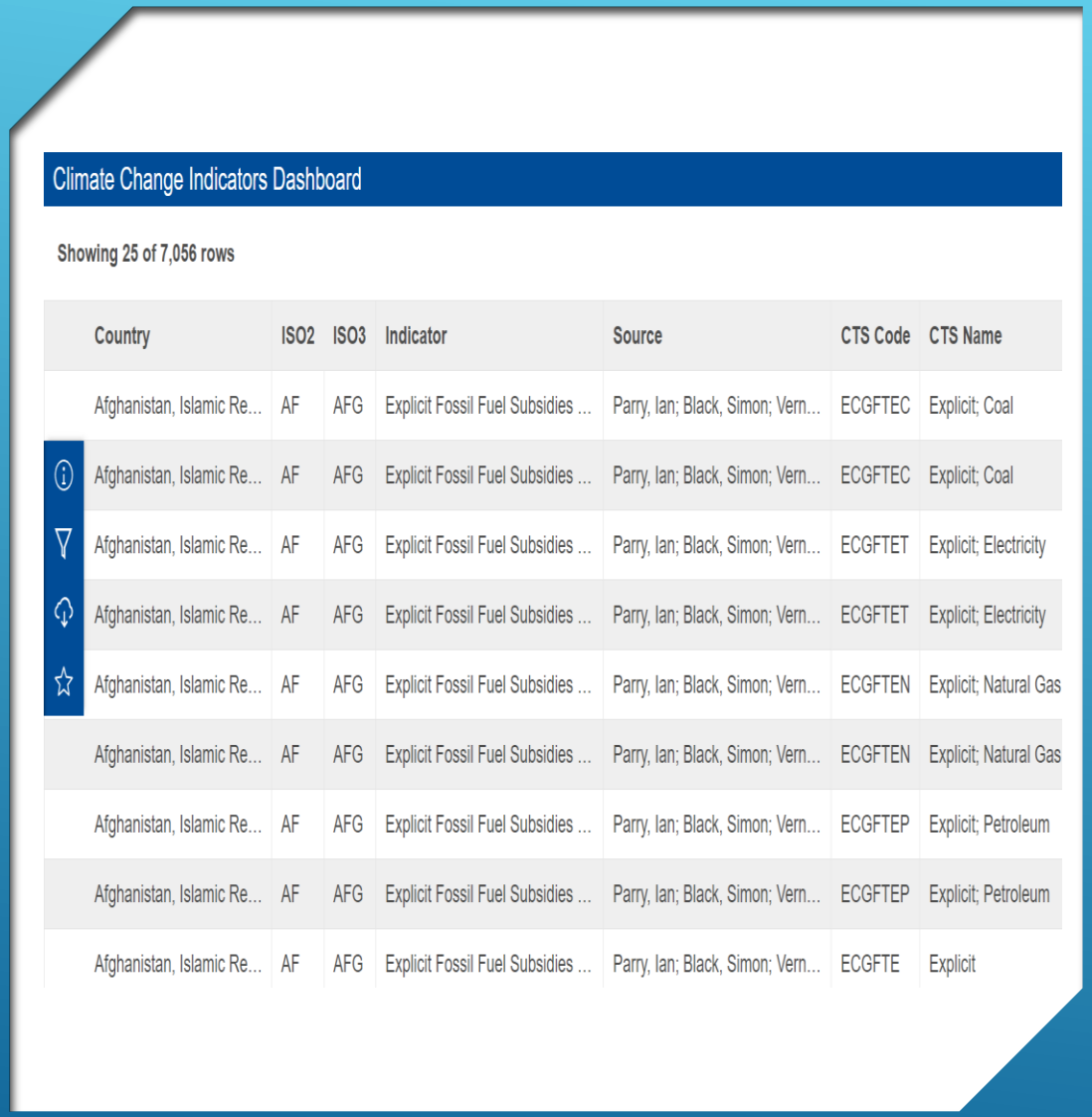
Showing 25 of 402 rows

	Country	ISO2	ISO3	Indicator	Unit
	Argentina	AR	ARG	CO2 Emissions Embodied in …	Millions of metric tons
	Argentina	AR	ARG	CO2 Emissions Embodied in …	Millions of metric tons
	Argentina	AR	ARG	CO2 Emissions Embodied in …	Millions of metric tons
	Argentina	AR	ARG	CO2 Emissions Embodied in …	Millions of metric tons
	Argentina	AR	ARG	CO2 Emissions Embodied in …	Millions of metric tons
	Argentina	AR	ARG	CO2 Emissions Embodied in …	Millions of metric tons
	Australia	AU	AUS	CO2 Emissions Embodied in …	Millions of metric tons
	Australia	AU	AUS	CO2 Emissions Embodied in …	Millions of metric tons
	Australia	AU	AUS	CO2 Emissions Embodied in …	Millions of metric tons

CO2 Emissions Embodied in Trade

- Metadata URL: https://climatedata.imf.org/datasets/7ba962035bb548bb9893add2b5491896_0/explore
- Data URL: https://opendata.arcgis.com/datasets/7ba962035bb548bb9893add2b5491896_0.csv
- Data Type: CSV
- Description: This dataset contains annual estimates of CO2 emissions embodied in a country's gross exports from 2015-2021.
- Data Structure: Semi-structured Data
- License: Custom License

USED DATA



Climate Change Indicators Dashboard

Showing 25 of 7,056 rows

Country	ISO2	ISO3	Indicator	Source	CTS Code	CTS Name
Afghanistan, Islamic Re...	AF	AFG	Explicit Fossil Fuel Subsidies ...	Parry, Ian; Black, Simon; Vern...	ECGFTEC	Explicit; Coal
Afghanistan, Islamic Re...	AF	AFG	Explicit Fossil Fuel Subsidies ...	Parry, Ian; Black, Simon; Vern...	ECGFTEC	Explicit; Coal
Afghanistan, Islamic Re...	AF	AFG	Explicit Fossil Fuel Subsidies ...	Parry, Ian; Black, Simon; Vern...	ECGFTET	Explicit; Electricity
Afghanistan, Islamic Re...	AF	AFG	Explicit Fossil Fuel Subsidies ...	Parry, Ian; Black, Simon; Vern...	ECGFTET	Explicit; Electricity
Afghanistan, Islamic Re...	AF	AFG	Explicit Fossil Fuel Subsidies ...	Parry, Ian; Black, Simon; Vern...	ECGFTEN	Explicit; Natural Gas
Afghanistan, Islamic Re...	AF	AFG	Explicit Fossil Fuel Subsidies ...	Parry, Ian; Black, Simon; Vern...	ECGFTEN	Explicit; Natural Gas
Afghanistan, Islamic Re...	AF	AFG	Explicit Fossil Fuel Subsidies ...	Parry, Ian; Black, Simon; Vern...	ECGFTEP	Explicit; Petroleum
Afghanistan, Islamic Re...	AF	AFG	Explicit Fossil Fuel Subsidies ...	Parry, Ian; Black, Simon; Vern...	ECGFTEP	Explicit; Petroleum
Afghanistan, Islamic Re...	AF	AFG	Explicit Fossil Fuel Subsidies ...	Parry, Ian; Black, Simon; Vern...	ECGFTE	Explicit

Fossil Fuel Subsidies

- Metadata URL: https://climatedata.imf.org/datasets/d48cfd2124954fb0900cef95f2db2724_0/explore
- Data URL: https://opendata.arcgis.com/datasets/d48cfd2124954fb0900cef95f2db2724_0.csv
- Data Type: CSV
- Description: This dataset shows the value of fossil fuel subsidies, both explicit and implicit, for various countries from 2015-2021.
- Data Structure: Semi-structured Data
- License: Custom License

USED DATA

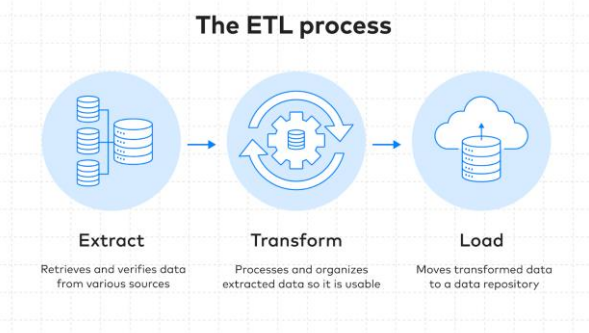
LICENSE

This project contains two open datasets from the International Monetary Fund (IMF) repository. These datasets provide crucial information for our research and are free to use for study purposes, subject to the IMF terms of use. The following link contains more information about the terms of uses.

https://www.imf.org/external/terms.htm

TECHNOLOGY USED

- *Python*
- *Pandas*
- *Sqlite3*
- *Matplotlib*



	Country	ISO3	F2015_C	F2015_F	F2016_C	F2017_C
1	Argentina	ARG	-15.944	3.47844577773985	-13.312	-19.797
2	India	IND	132.19	0.0056485809118871	132.366	102.065
3	Japan	JPN	-125.796	0.115784760686885	-141.123	-139.049
4	Lithuania	LTU	-5.97	0.794726697002769	-5.304	-5.521
5	Turkey	TUR	-23.612	0.0242207787391167	-15.745	-13.741

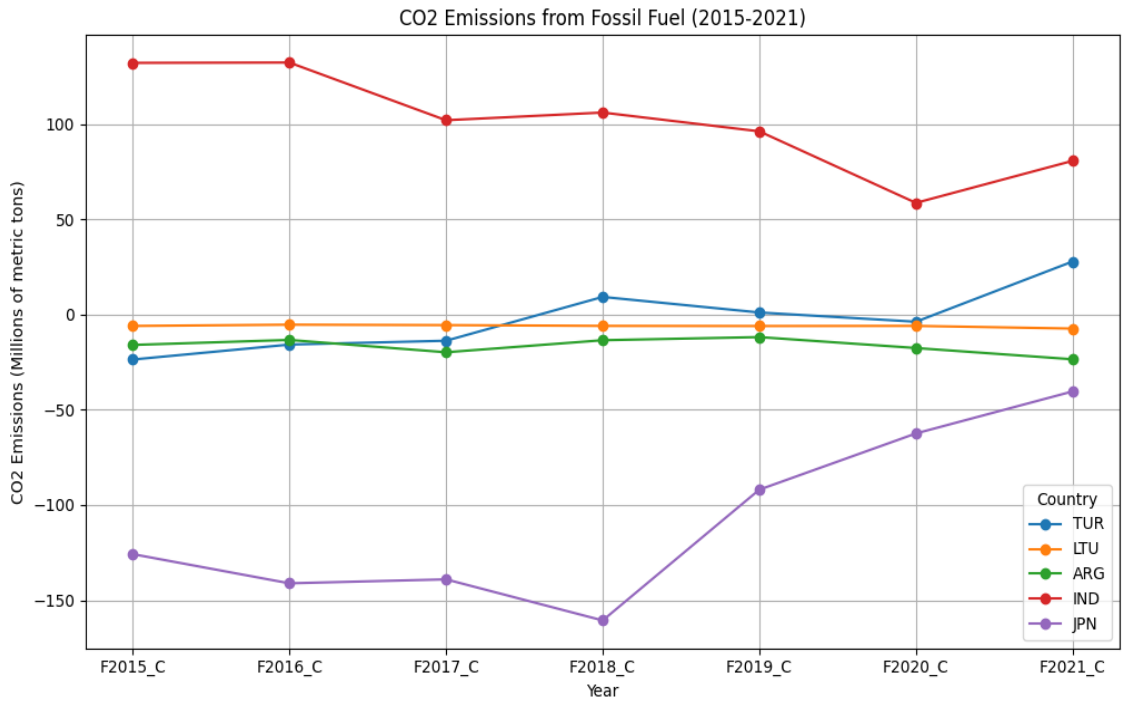
DATA PIPELINE

By using ETL process we merged our final data. The process included data extract, cleaning, transformation, and validation to ensure data flow reliability.

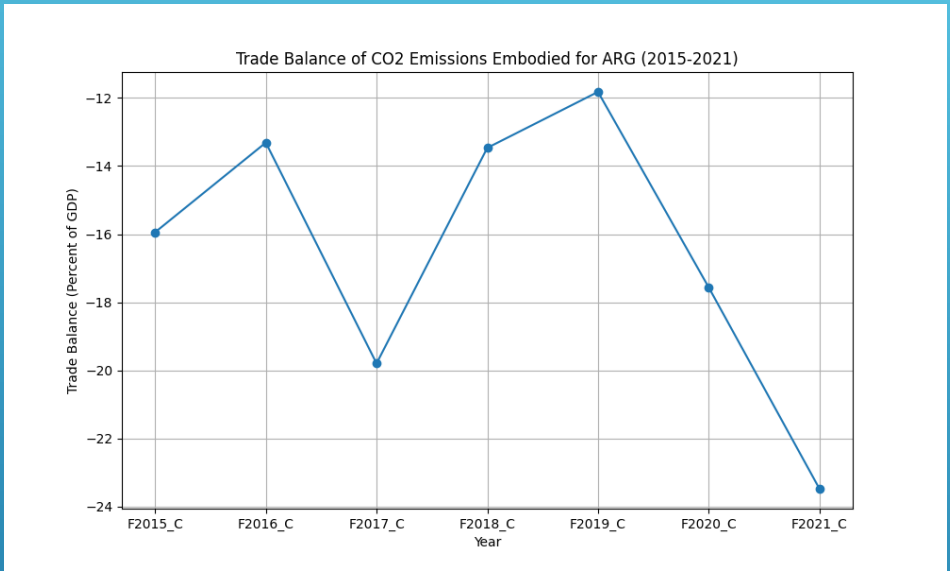
DATA PIPELINE

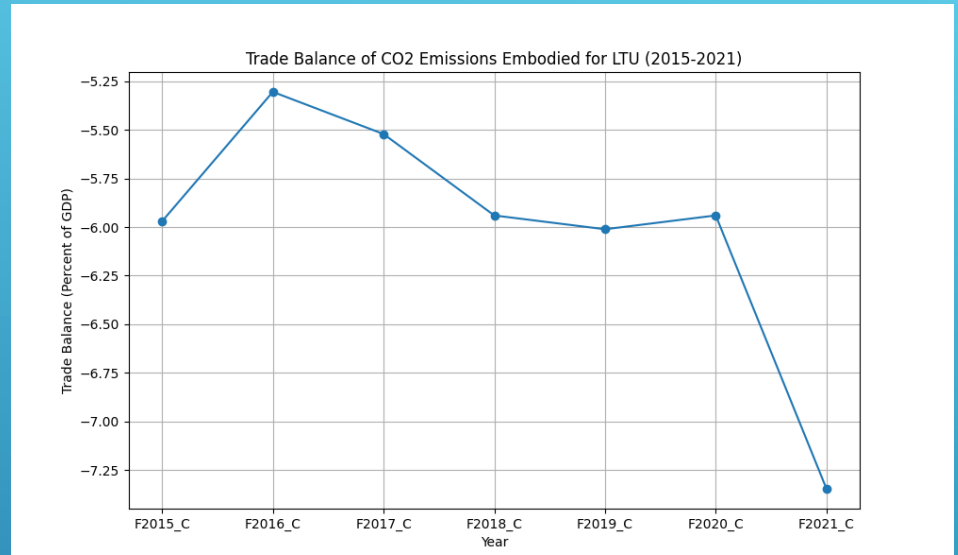
```
1
2     import pandas as pd
3     import sqlite3
4
5     def get(url):
6         data = pd.read_csv(url)
7         return pd.DataFrame(data)
8
9     def columnDel(data, delCol):
10        data.drop(delCol, inplace = True, axis = 1)
11
12        return data
13
14    def dropNull(data):
15        return data.dropna(how = "any", axis = 0)
16
17    def dataMerge(t1, t2, key, t1S, t2S):
18        return pd.merge(t1, t2, how ='left', on = key, suffixes=(t1S, t2S))
19
20    def save(data, path, file, table):
21        try:
22            conn = sqlite3.connect(path+file)
23            data.to_sql(table, conn, if_exists='replace', index=False)
24            conn.close()
25            return [path+file, table]
```

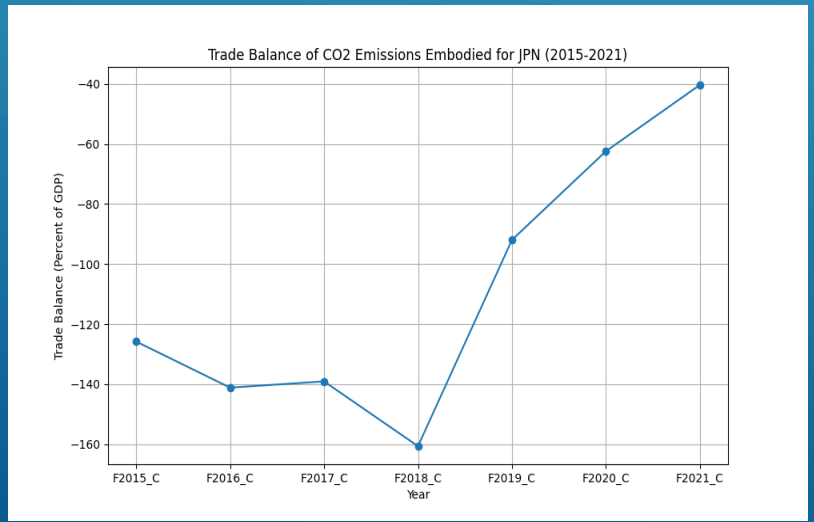
DATA ANALYSIS

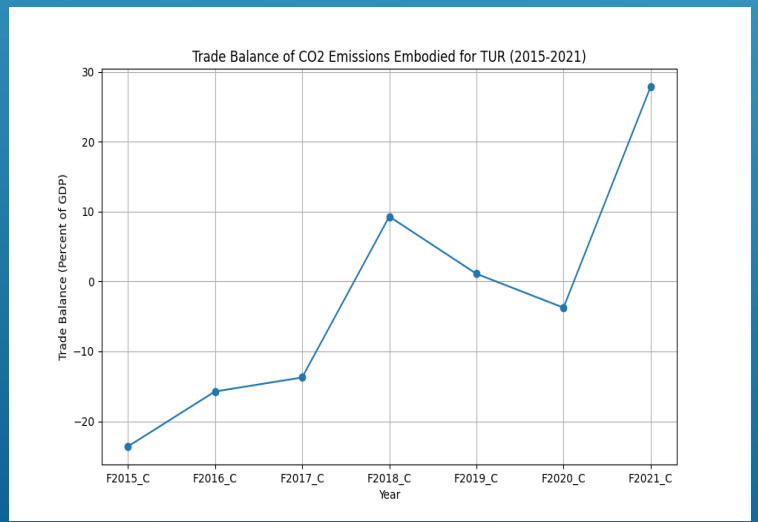


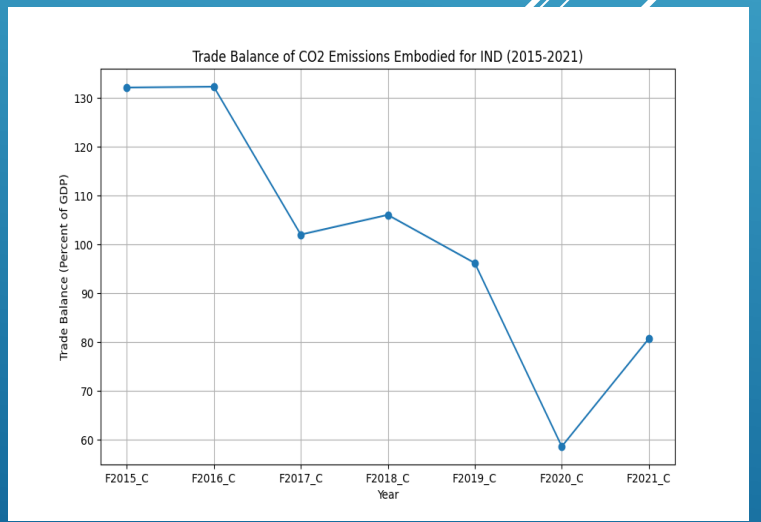
DATA ANALYSIS











SUMMARY

Depending on the economic structure and consumer behavior of a country, domestic consumption patterns and ultimate demand have a considerable impact on its carbon footprint.
A vital role is also played by agriculture, particularly livestock husbandry, and transportation in global supply networks. These elements can be seen in the trade balances of nations like India and Japan.

THANK YOU