



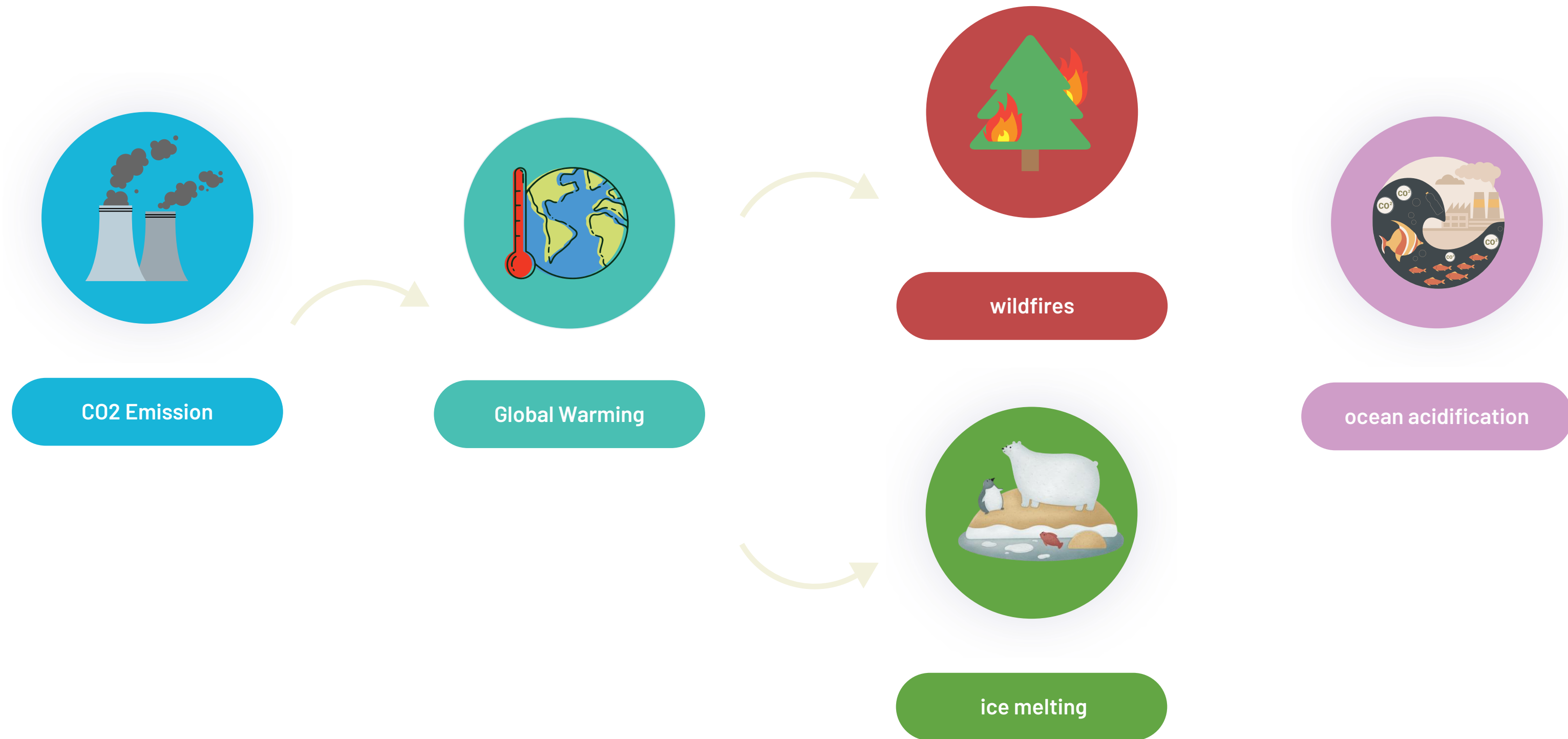
# 2024 SPE Datathon

## Analyzing Incentives for CCUS Projects Toward a Net Zero World

Presented by Titan Group

September-October 2024

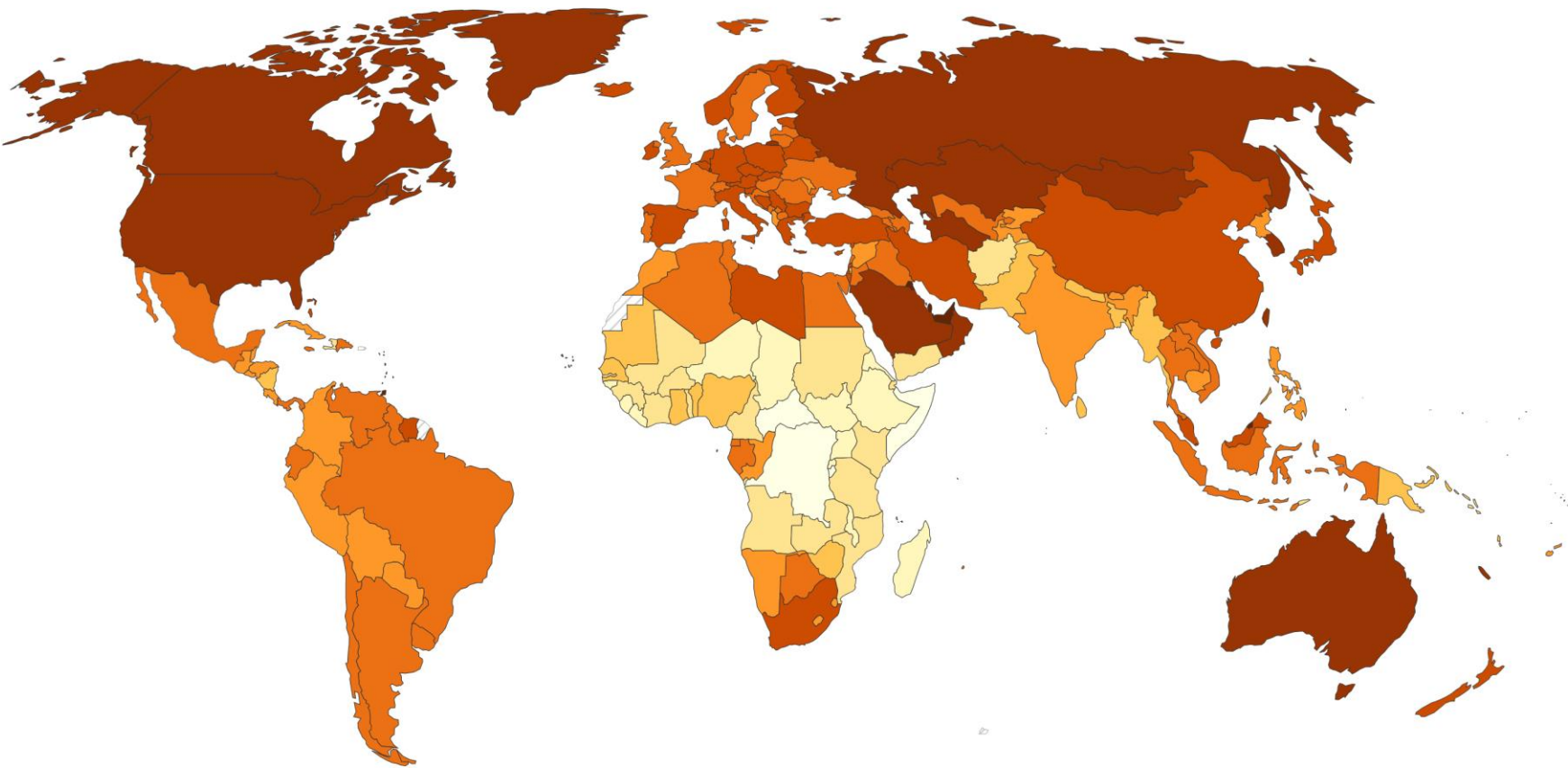
# Problem Statement



# Global CO2 Emission Heat Map

## Per capita CO<sub>2</sub> emissions, 2022

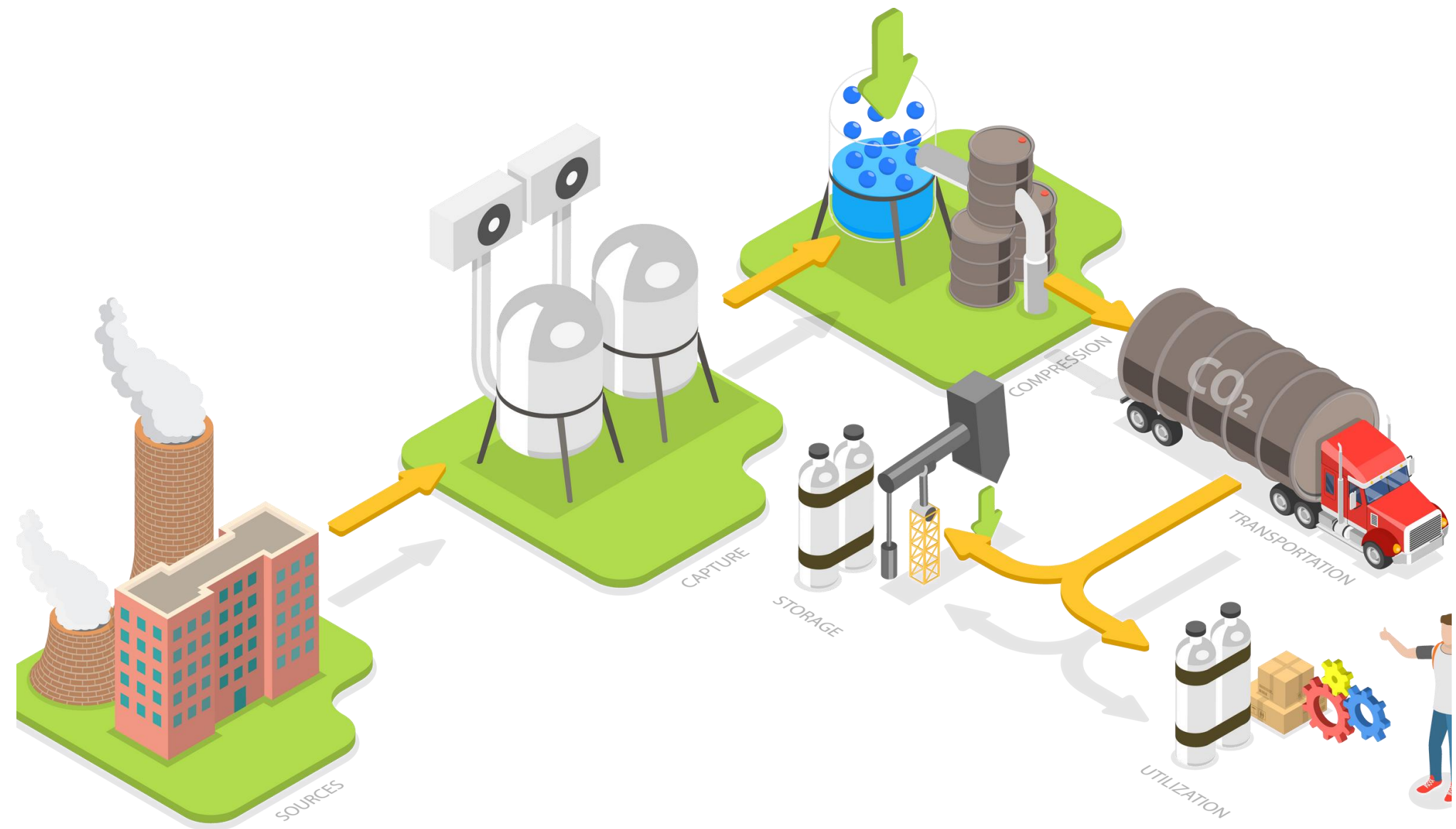
Carbon dioxide (CO<sub>2</sub>) emissions from fossil fuels and industry<sup>1</sup>. Land-use change is not included.



Data source: Global Carbon Budget (2023); Population based on various sources (2023)  
OurWorldinData.org/co2-and-greenhouse-gas-emissions | CC BY

# Project Aim

- Analyze the factors influencing the growth and success of CCUS projects
- Energy Demand by 2050 and feasibility of CCUS projects in the future



# Project Progress

## Data Collection

- Used 10 datasets from SPE dataset list
- Added Renewable Energy and CO2 Emission datasets

## Data Analysis

- CO2 Emission
- Carbon Markets and Credits
- Renewable Energy and CCUS project globally

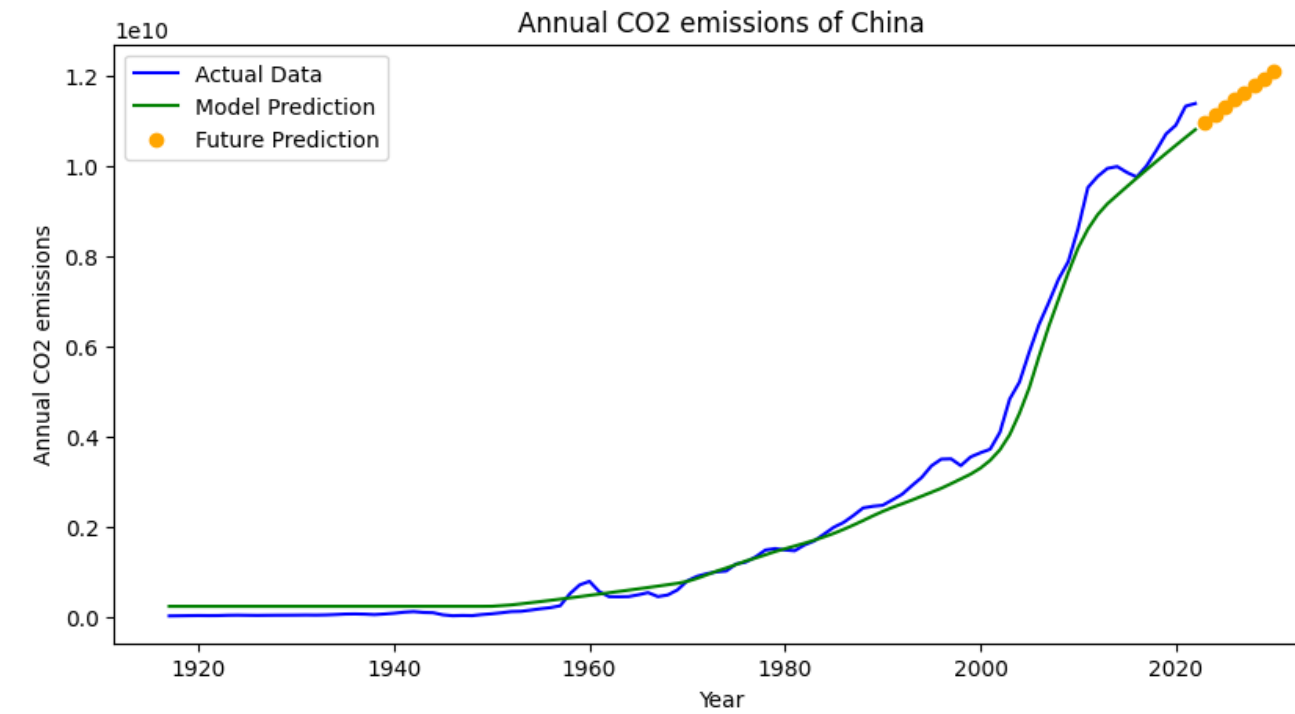
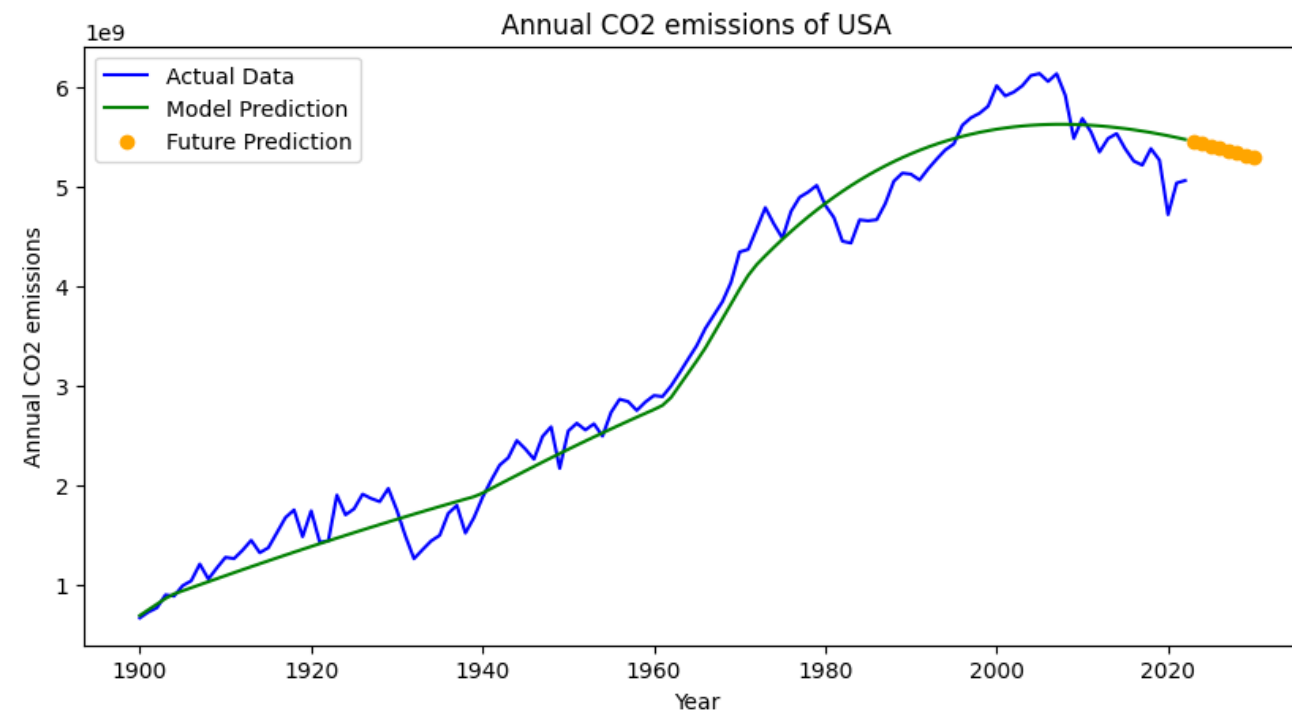
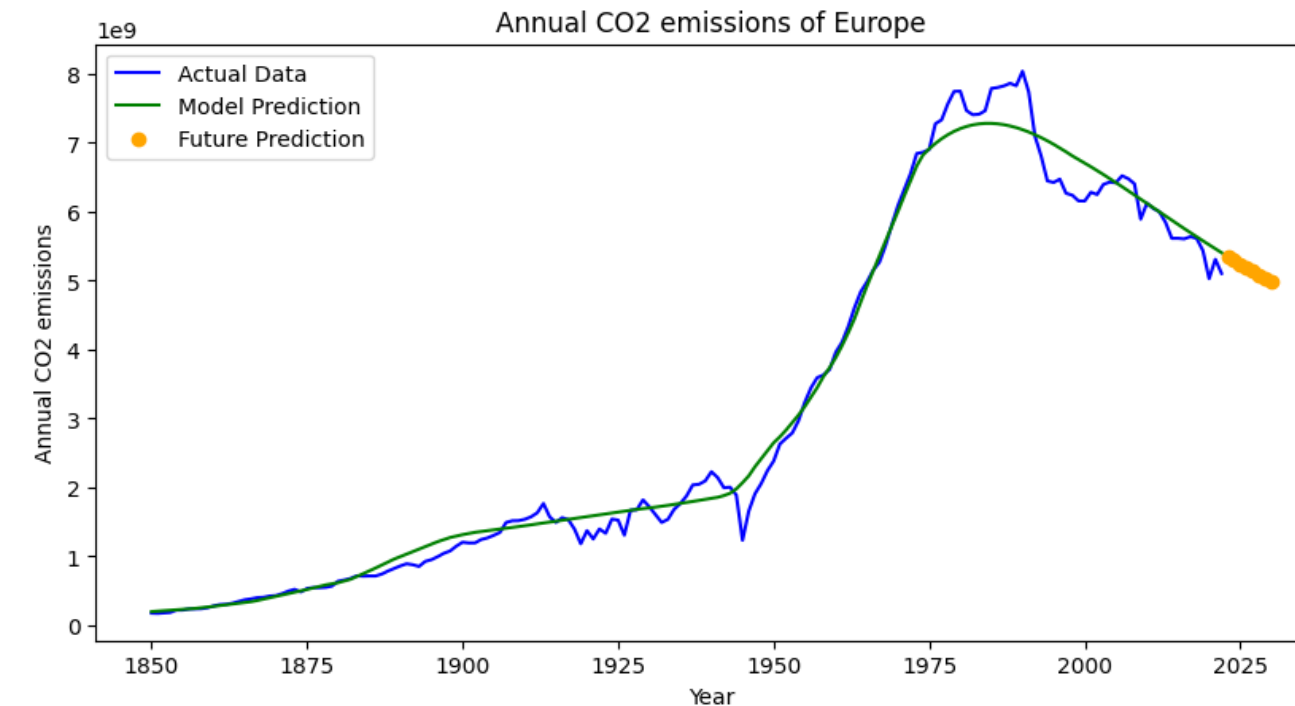
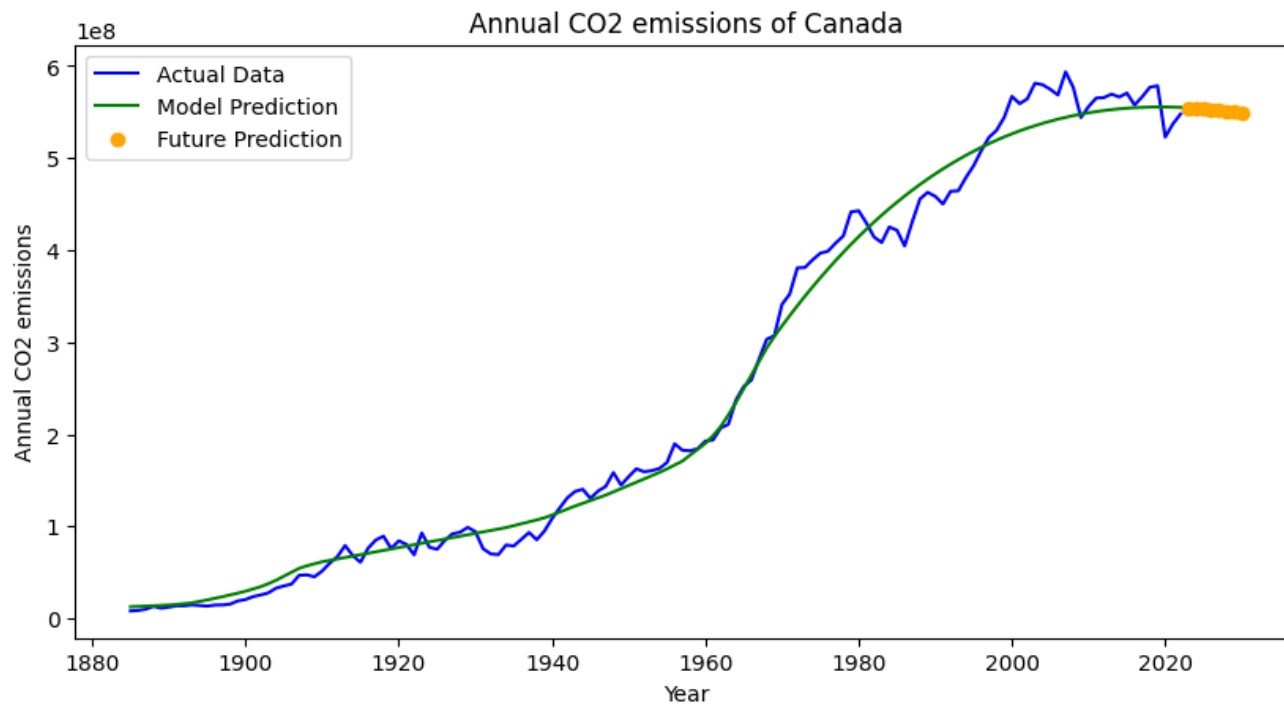
## Applying ML Models

- LSTM models
- ARIMA
- Linear Regression

## Prediction Analysis

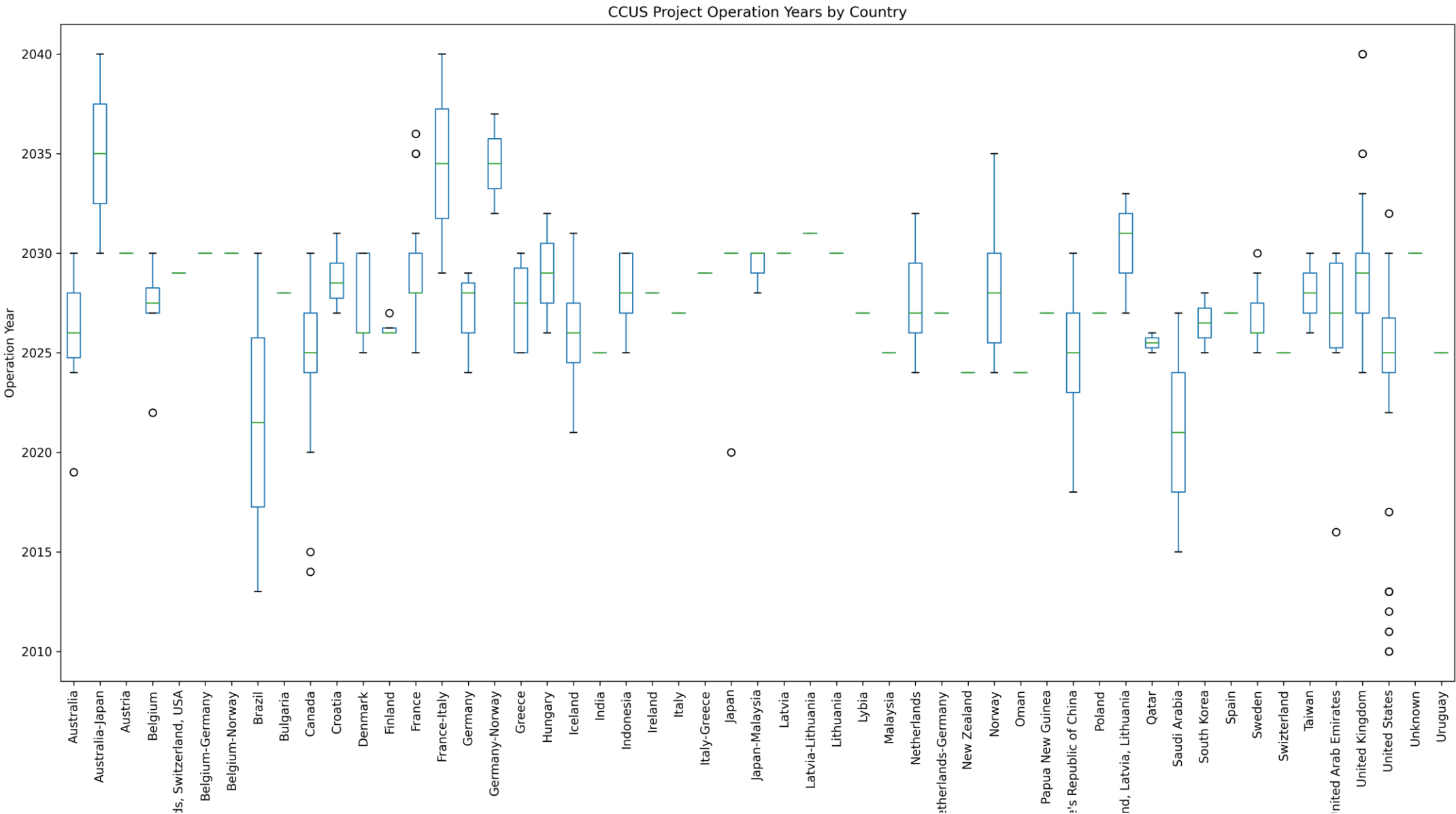
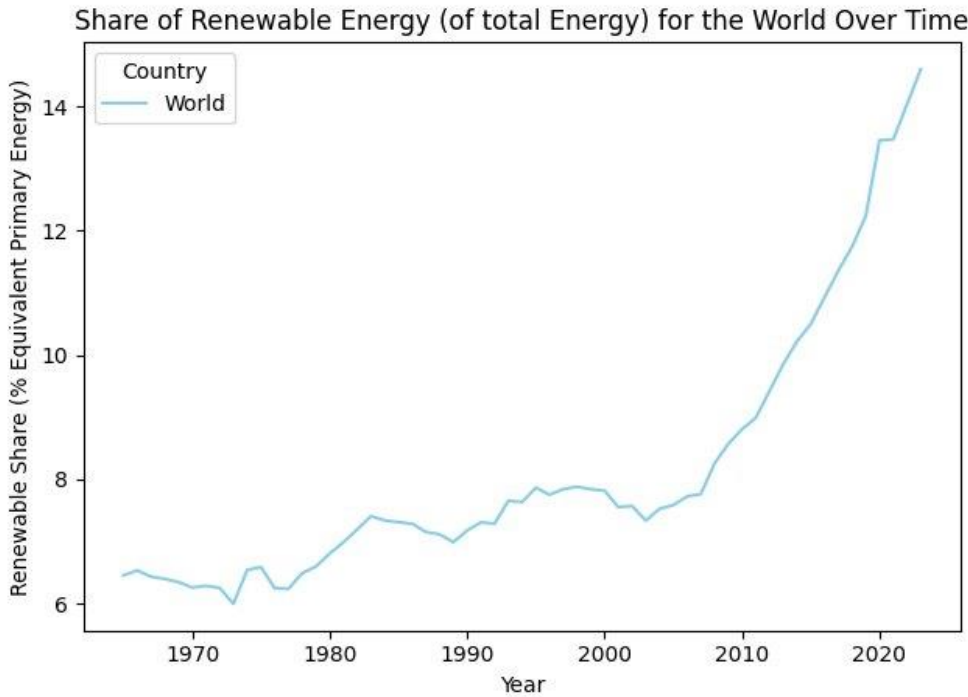
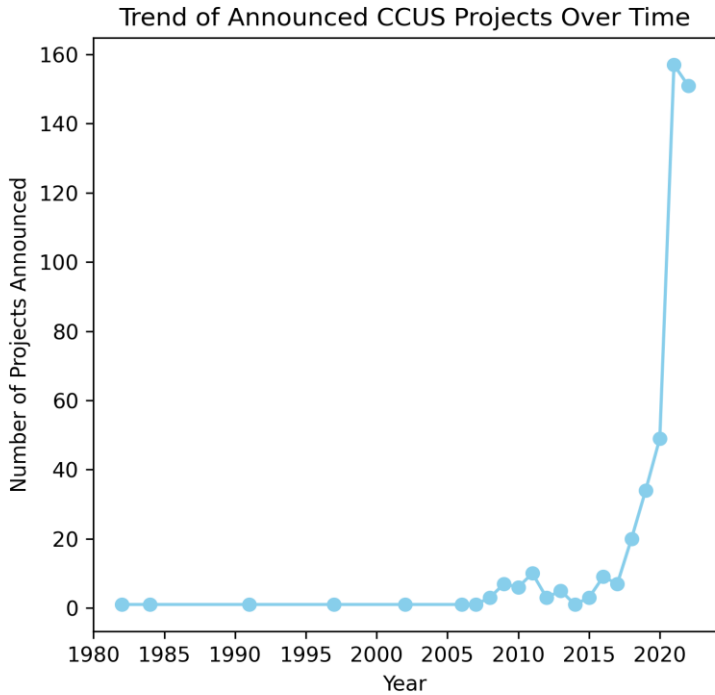
- Pearson Correlation
- Time Series prediction

# Annual CO2 Emission Prediction

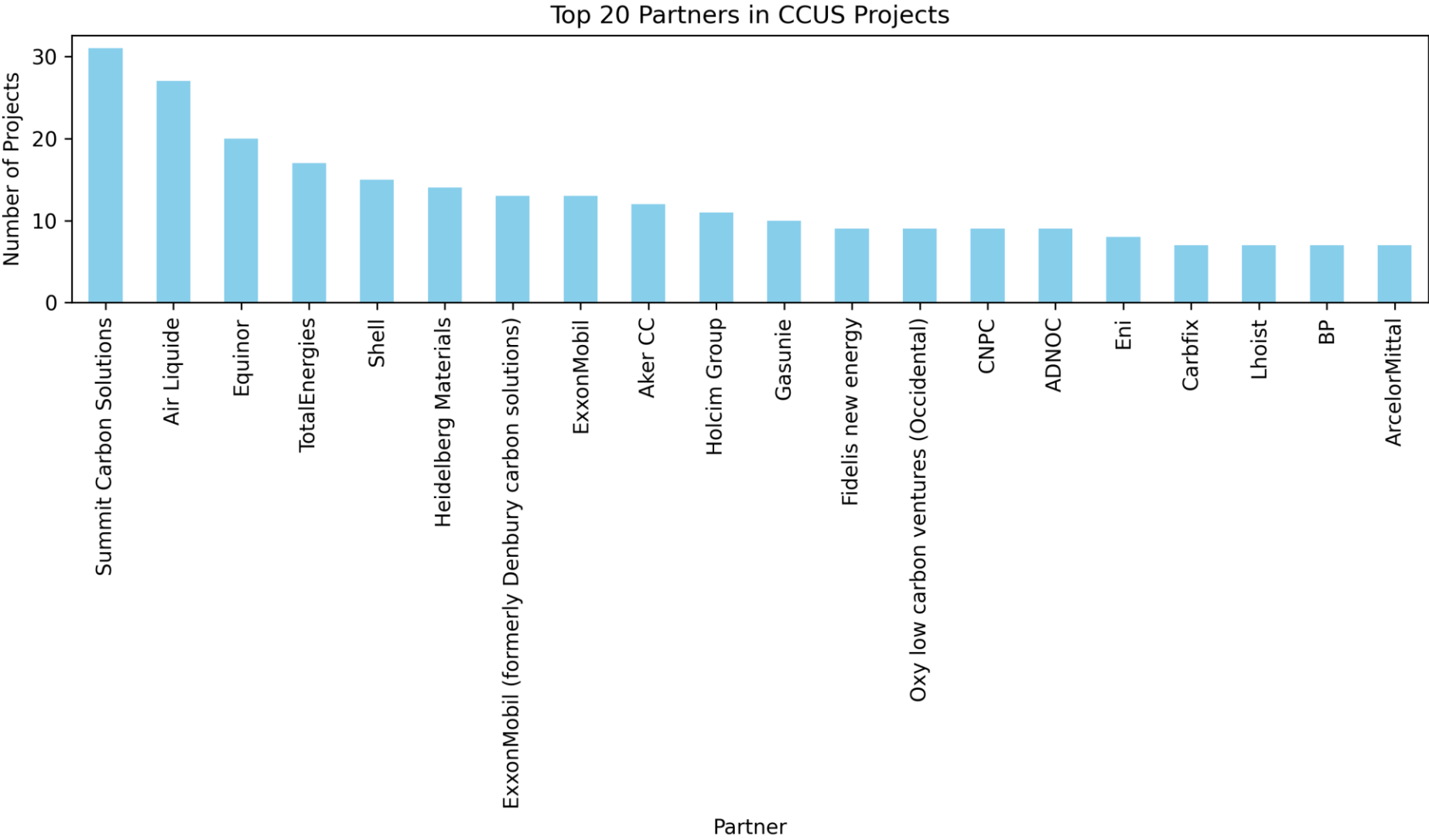
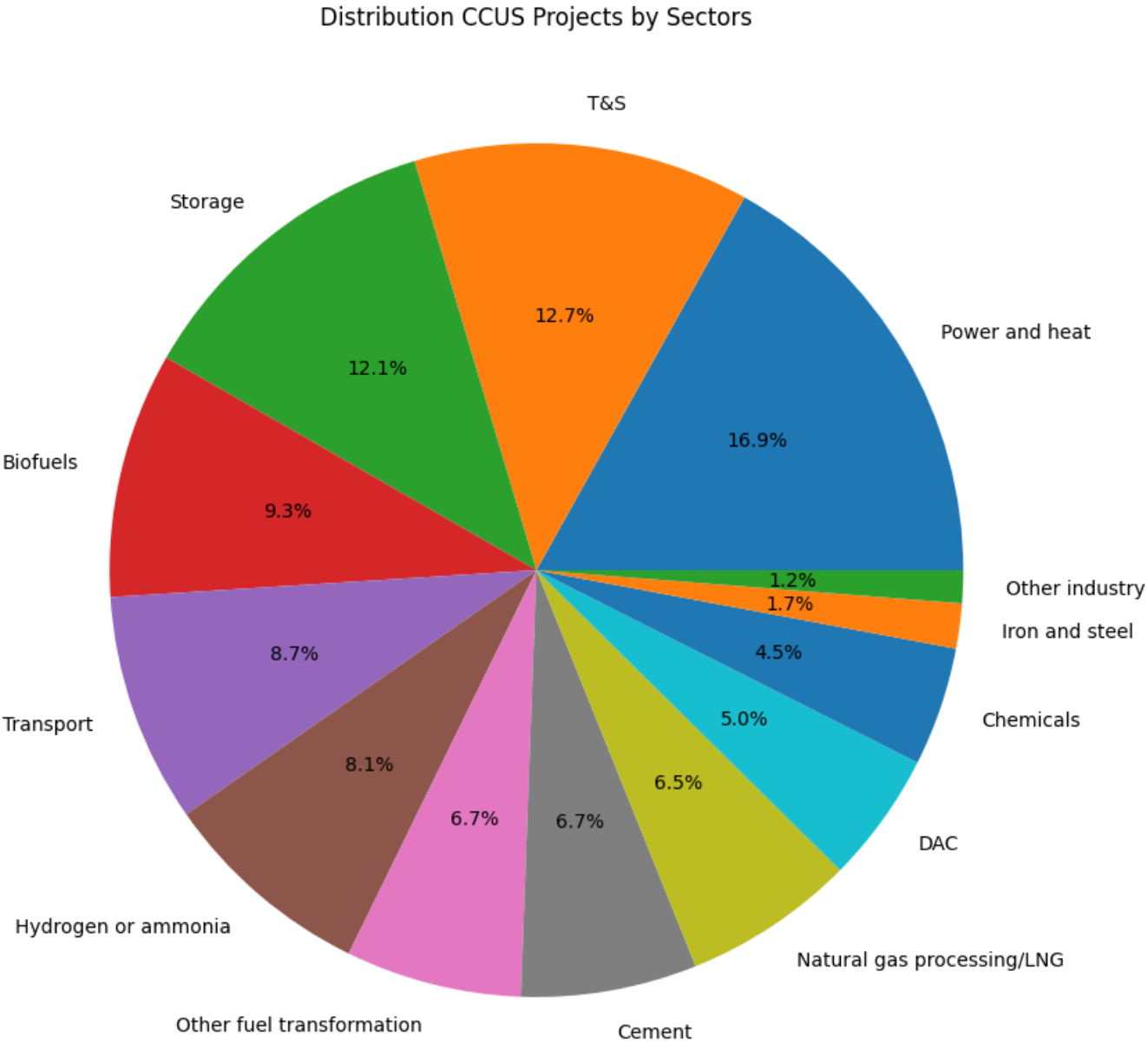




# Trend of CCUS and Renewable Projects Globally

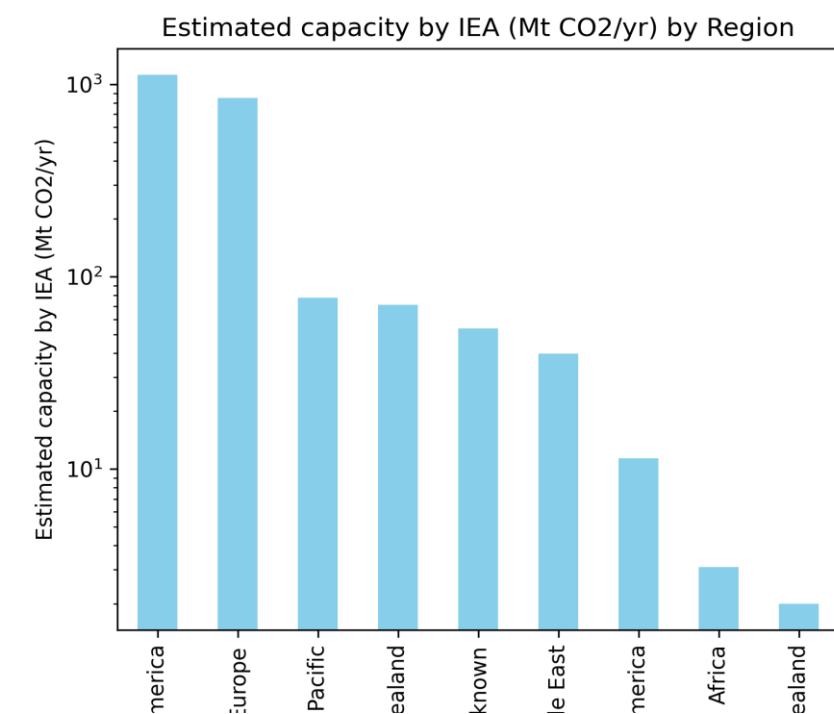
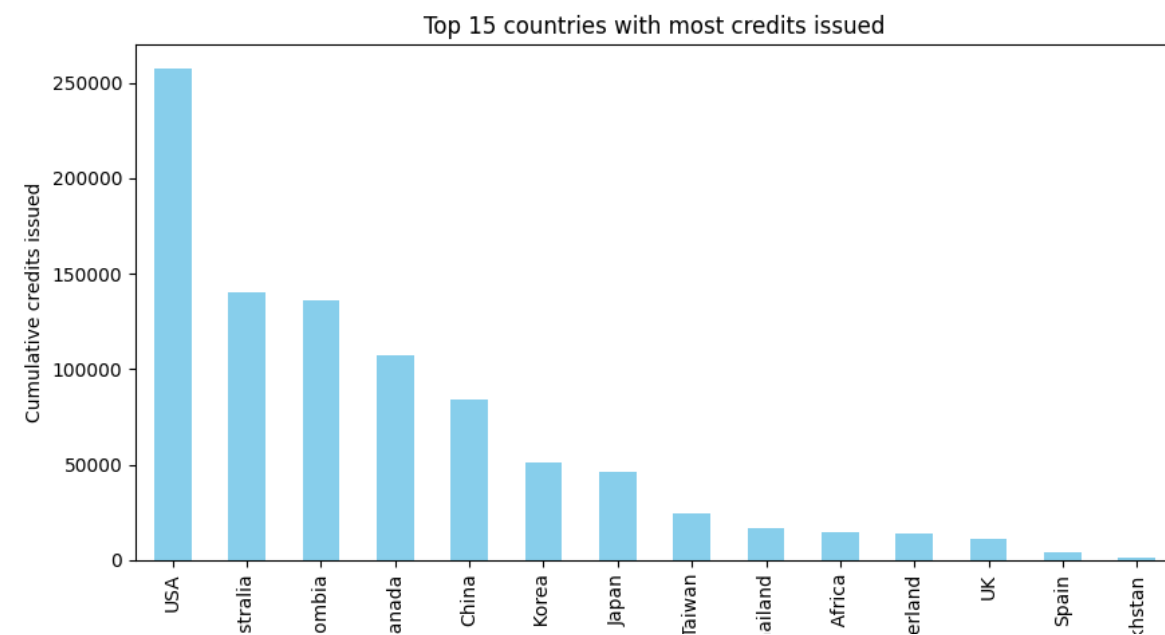
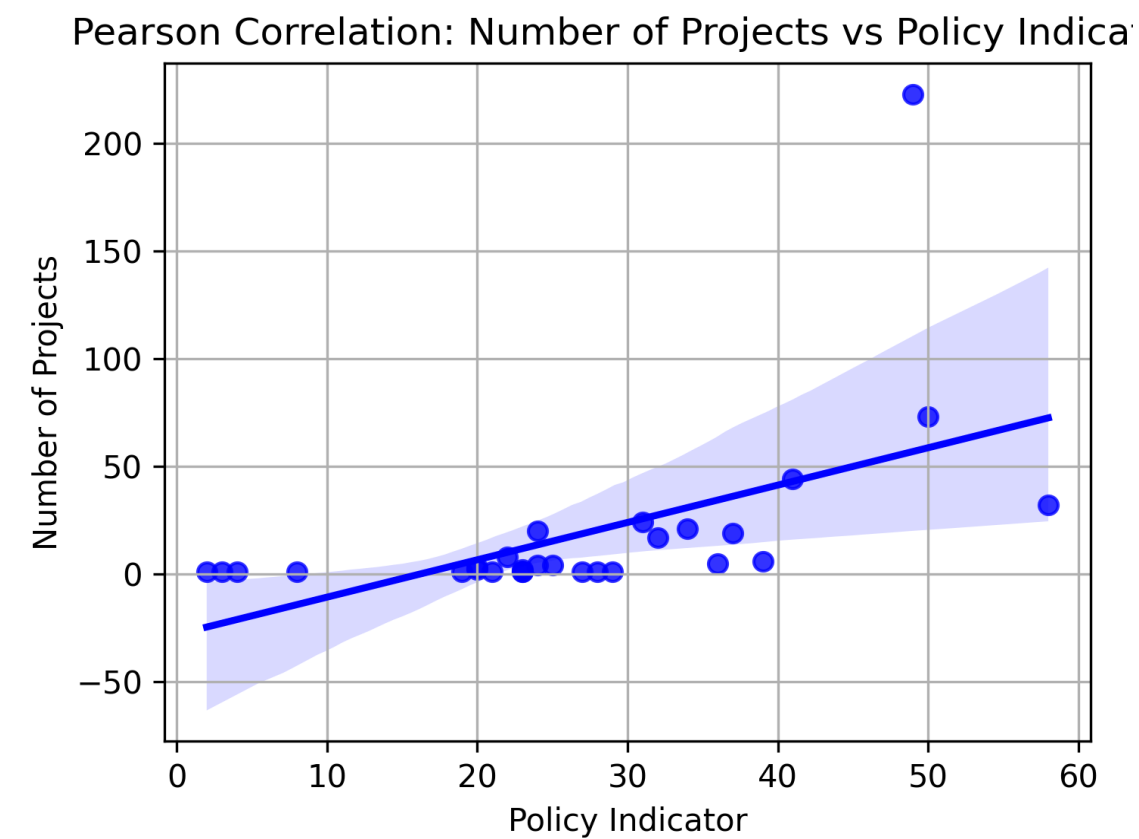
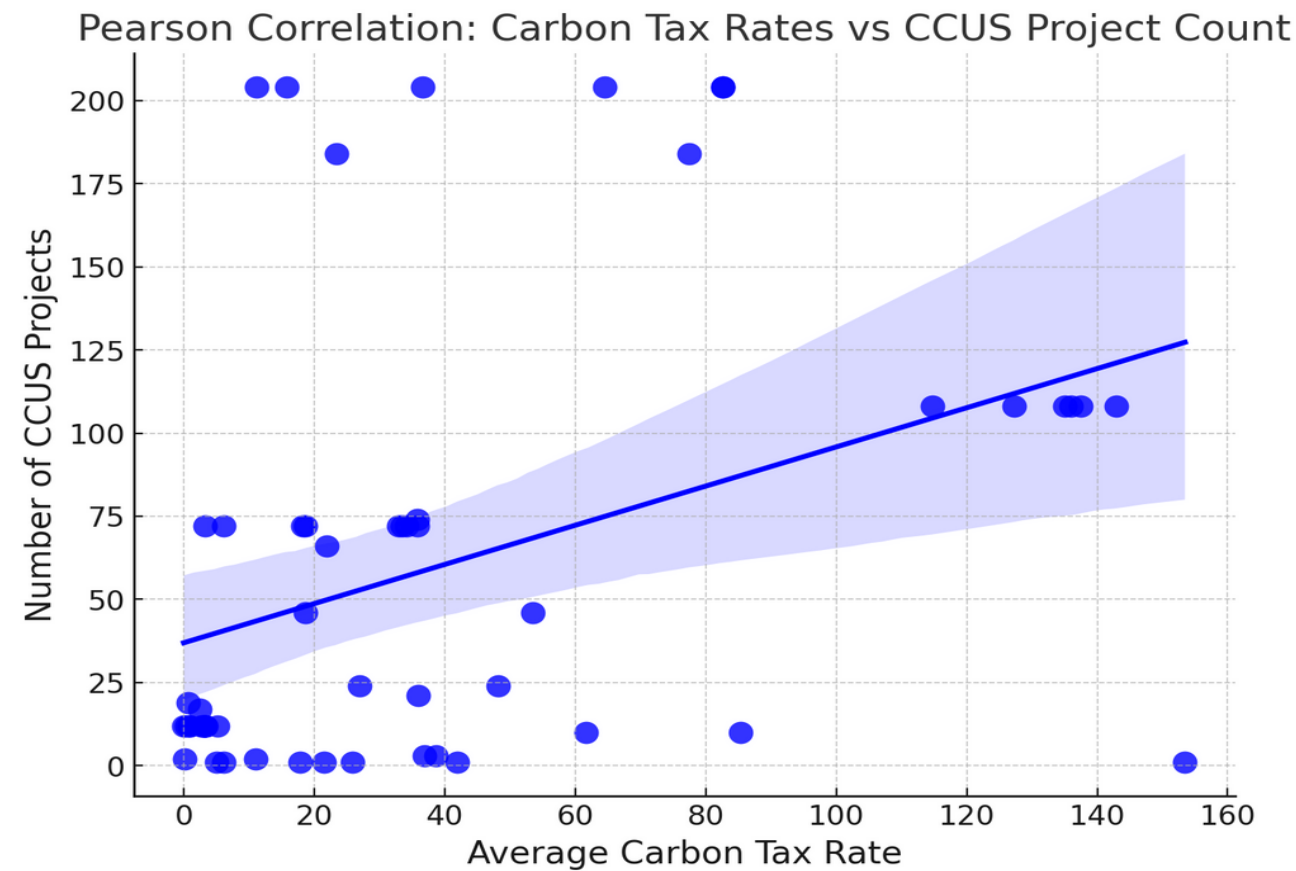


# CCUS Partners and Project Types





# CCUS Projects Incentives

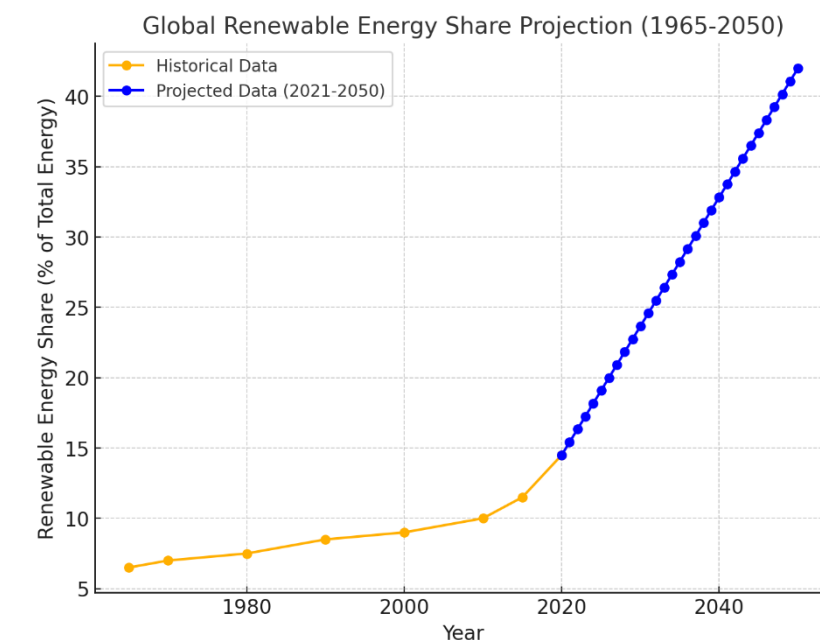
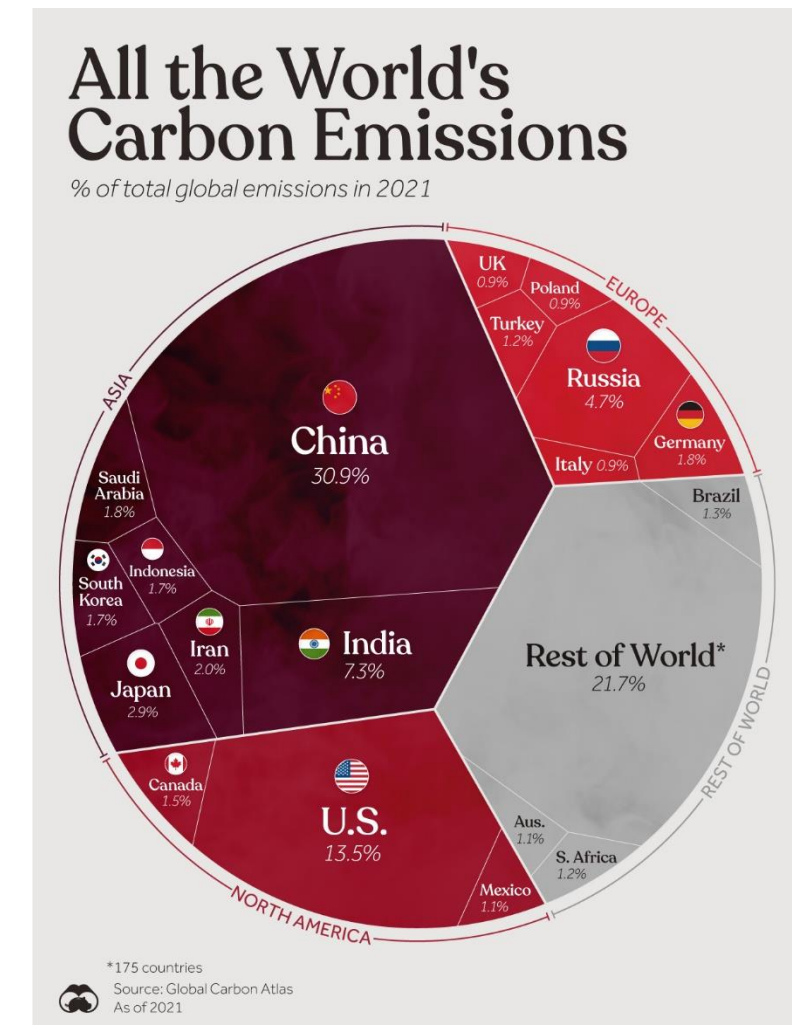


# The Rise of CCUS Projects (2019–2021)

- Global net-zero commitments gained significant momentum around 2020, as many nations aimed to align with the Paris Agreement to limit global warming. The European Union adopted the European Green Deal in 2020, targeting climate neutrality by 2050, with a focus on decarbonizing sectors like energy and industry. Similarly, the UK launched its \*Net Zero Strategy\* in 2021, which builds on previous policies such as the \*Ten Point Plan\* for a green industrial revolution. The strategy includes substantial investments in green technology and aims to create thousands of jobs while cutting emissions across various sectors.
- In the U.S., President Biden's administration spurred investments in carbon capture, utilization, and storage (CCUS) through expansions of the 45Q tax credit. Biden also proposed a \$2 trillion clean energy plan, focusing on boosting industries like electric vehicles and sustainable energy. Meanwhile, Canada took a legal approach, passing the \*Net-Zero Emissions Accountability Act\* in June 2021, which binds the country to specific climate goals. Norway, taking a more aggressive approach, set a target to achieve net-zero emissions by 2030.
- Technologically, advancements in renewable energy, battery storage, and CCUS have been critical, though no single breakthrough around 2020 radically changed the trajectory. Instead, it has been the cumulative effect of policy support, technological improvement, and financial incentives driving the transition.

# Recommendation

- Carbon Tax is not enough toward Net Zero World
- Importance of Regulations, especially Global Regulations
- Individual Country Regulations vs Global Regulations
- Renewable Energy in combination with CCUS projects
- Better Carbon Credit Systems



# References

- IEA CCUS Projects Database
- World Bank - State and Trends of Carbon Pricing Dashboard
- Our World in Data: Per capita CO<sub>2</sub> emissions
- Data on CO<sub>2</sub> and greenhouse gas emissions by Our World in Data
- Renewable Energy World Wide : 1965~2022: [link](#)
- World Carbon Pricing Database
- Public profit and emission database
- Global CCS Institute Facilities Report
- CO<sub>2</sub> emissions dataset (from Our World in Data): [link](#)
- UK The 2021 Net Zero Strategy targeted a net-zero by 2050  
<https://www.gov.uk/government/publications/net-zero-strategy>
- Canada The Canadian Net-Zero Emissions Accountability Act, which became law in June 2021  
<https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/net-zero-emissions-2050.html>
- European Green Deal is approved in 2020  
[https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal\\_en](https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en)



# Team Member



Sina Ziaee



Mahtab Kowsari



Ehsan Daneshgar



Marjan Saedi



Aref Motamedi



Zohreh Sadeghifard



Jin Meng

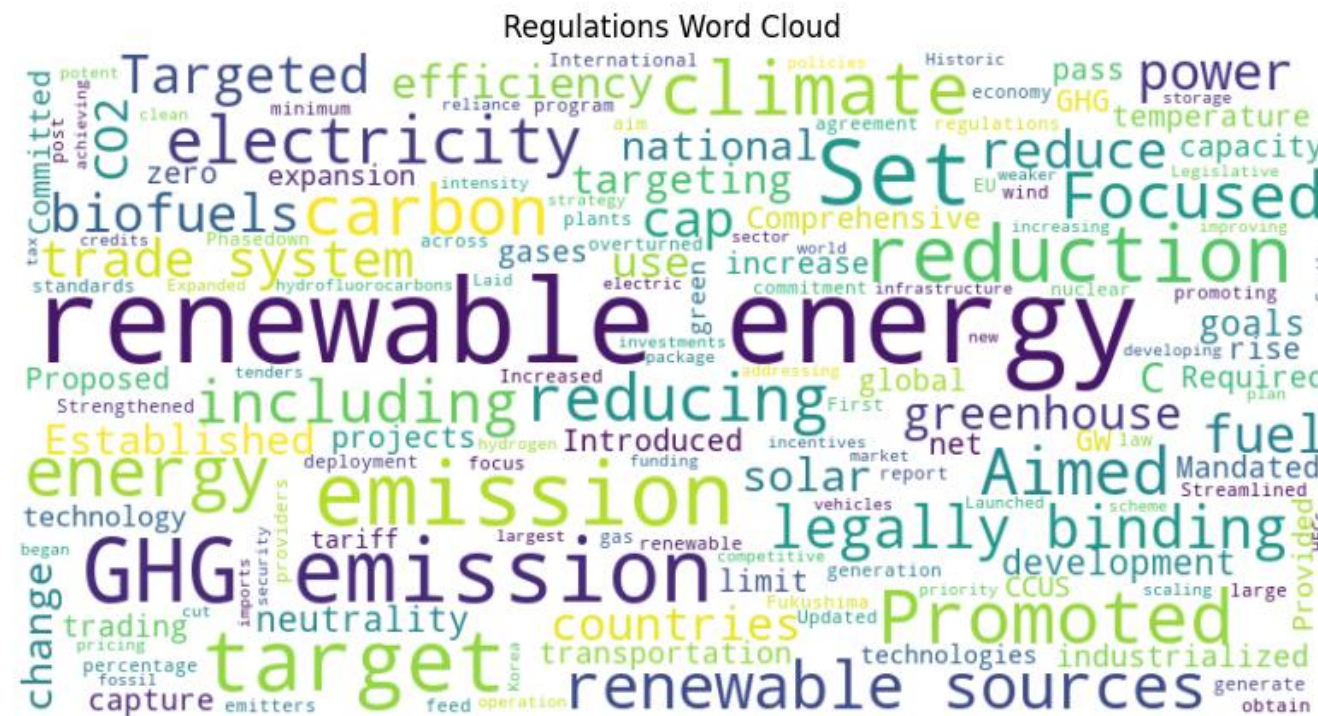
CO2 Emissions (MtCO2/day)

Country

Sector

- Domestic Aviation
- Ground Transport
- Industry
- International Aviation
- Power
- Residential

Country	Domestic Aviation	Ground Transport	Industry	International Aviation	Power	Residential
Brazil	0.1	0.5	0.5	0.1	0.2	0.2
China	0.1	3.8	18.5	0.1	21.5	3.5
EU27 & UK	0.1	3.8	2.8	0.5	3.8	2.8
France	0.1	0.5	0.2	0.1	0.2	0.2
Germany	0.1	0.5	0.5	0.1	1.0	0.5
India	0.1	1.0	3.2	0.1	5.5	0.8
Italy	0.1	0.2	0.2	0.1	0.2	0.2
Japan	0.1	0.5	1.0	0.1	2.2	0.2
ROW	0.1	9.5	15.8	0.8	15.5	4.5
Russia	0.1	0.5	1.2	0.1	4.5	0.8
Spain	0.1	0.2	0.2	0.1	0.2	0.2
UK	0.1	0.5	0.2	0.1	0.2	0.2
US	0.5	6.8	4.5	0.2	6.5	2.5

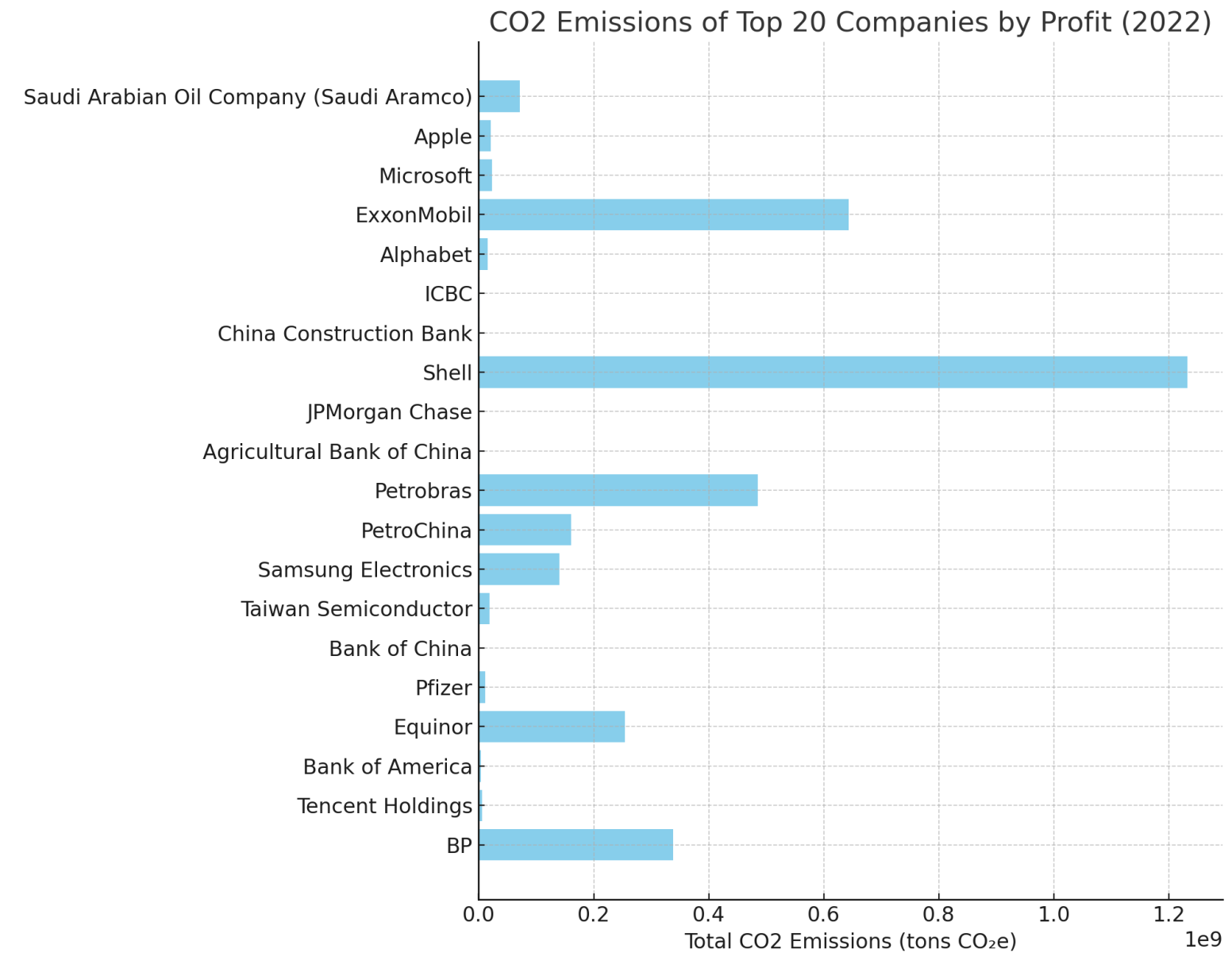
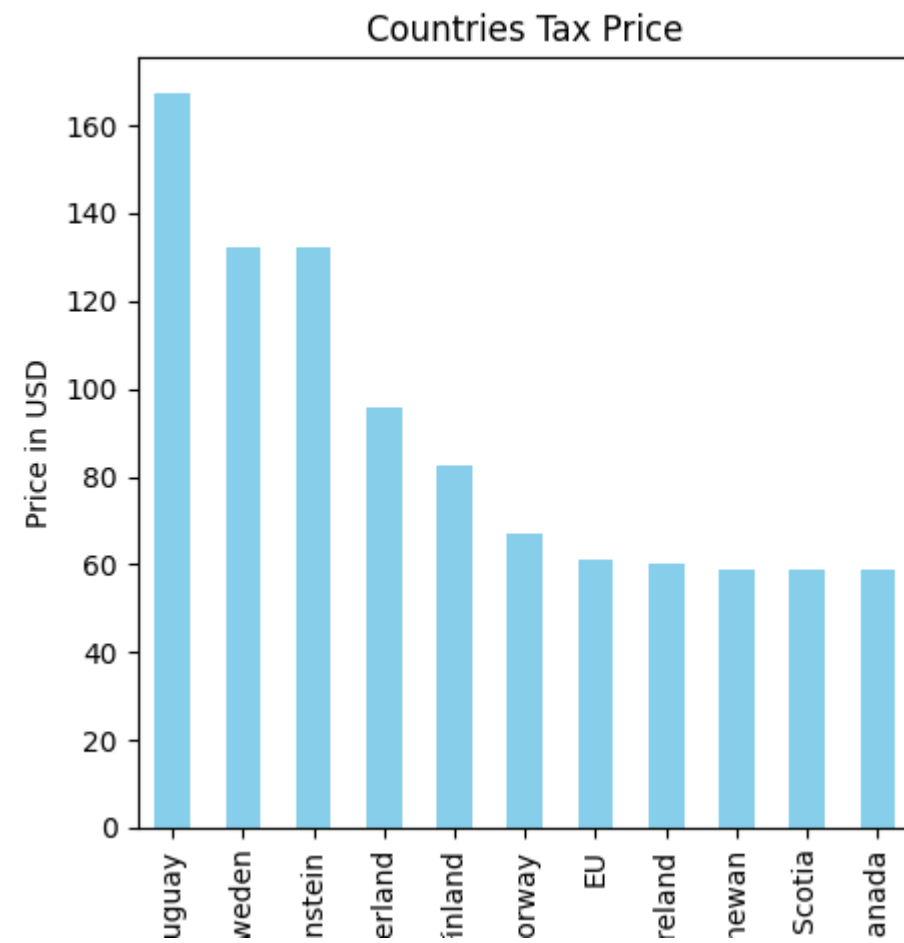


The scatter plot displays the relationship between the number of CCUS projects and CO2 emissions. The y-axis, labeled 'CO2 Emissions (MtCO2)', ranges from 0 to 40. The x-axis, labeled 'Number of CCUS Projects', ranges from 0 to 14. The data points are represented by orange 'x' marks. A dense cluster of points is visible at 0 CCUS projects, with emissions ranging from about 20 to 47 MtCO2. As the number of CCUS projects increases, the emissions generally decrease, with most points falling below 5 MtCO2. There is a notable outlier at 6 CCUS projects with an emission of approximately 1 MtCO2.

Number of CCUS Projects	CO2 Emissions (MtCO2)
0	47
0	23
0	21
0	20
0	1
1	5
1	4
1	0
2	2
2	1
2	0
3	0
4	1
4	0
5	1
5	0
6	5
6	4
6	1
6	0
8	1
8	0
9	0
10	0
10	0
14	2
14	1
14	0



# Further Analyses







**Thank You for  
Watching**