



# CO<sub>2</sub> Emissions Intensity of Economies

A Team

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# Welcome to Clean Energy Now!

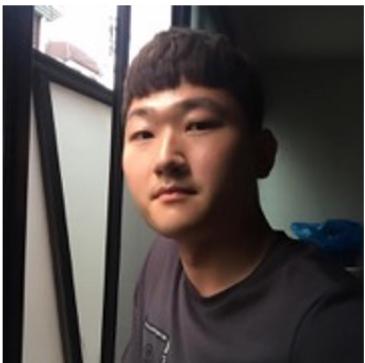
An exploration of energy use, pollution, and GDP

[Read More](#)

# Group 2



Jenny Gong



Henry Kang



Seren Shi



Arthur Cao

01

## Aim of project





# Sustainable Development Goal 13



Target

**13.1**

Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Indicators ▾



Target

**13.2**

Integrate climate change measures into national policies, strategies and planning

Indicators ▾

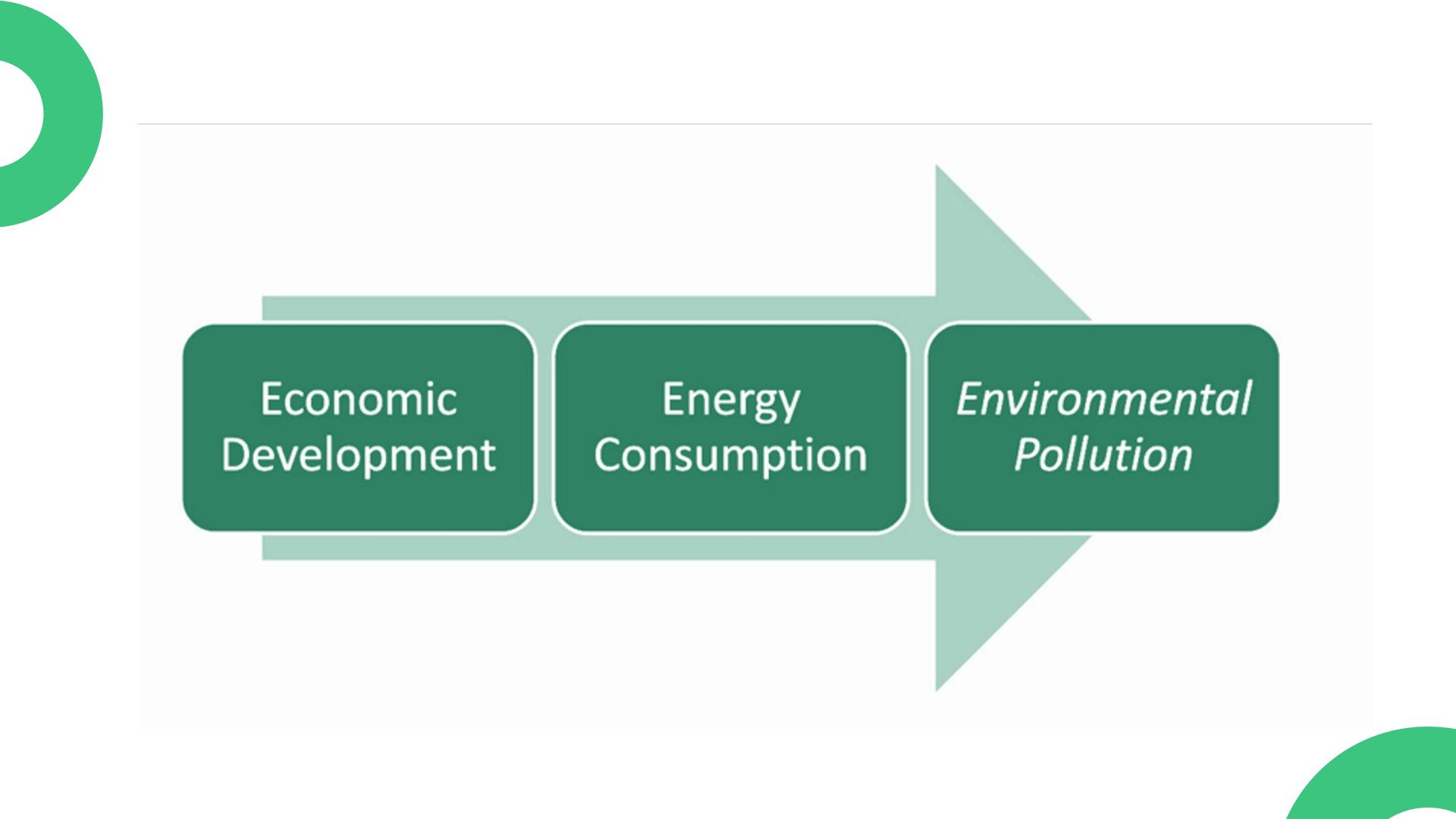


Target

**13.3**

Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

Indicators ▾



Economic  
Development

Energy  
Consumption

*Environmental  
Pollution*



02

## Datasets



# 1. Different types of energy



**Coal**



**Gas**



**Oil**



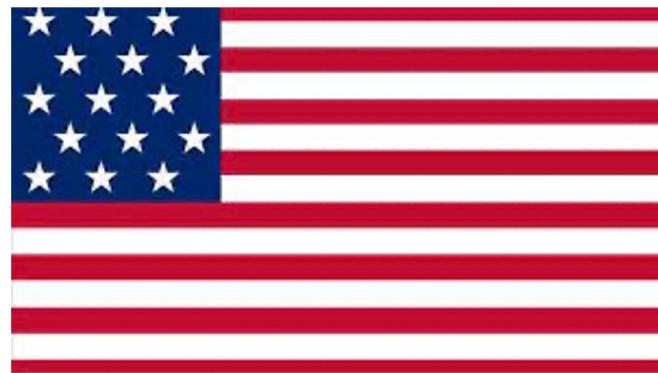
**Low Carbon Sources**

## 2. GDP Data

| All Countries and Economies |                  |                              |
|-----------------------------|------------------|------------------------------|
| Country                     | Most Recent Year | Most Recent Value (millions) |
| Afghanistan                 | 2020             | 26,116.14 ↘                  |
| Albania                     | 2020             | 14,887.63 ↗                  |
| Algeria                     | 2020             | 145,006.18 ↗                 |
| American Samoa              | 2020             | 759.00 ↗                     |
| Andorra                     | 2019             | 3,155.07 ↗                   |
| Angola                      | 2020             | 16,375.08 ↗                  |
| Antigua and Barbuda         | 2020             | 1,270.28 ↗                   |
| Argentina                   | 2020             | 389,286.06 ↗                 |
| Armenia                     | 2020             | 12,047.21 ↗                  |

## 3. Carbon Emission Data



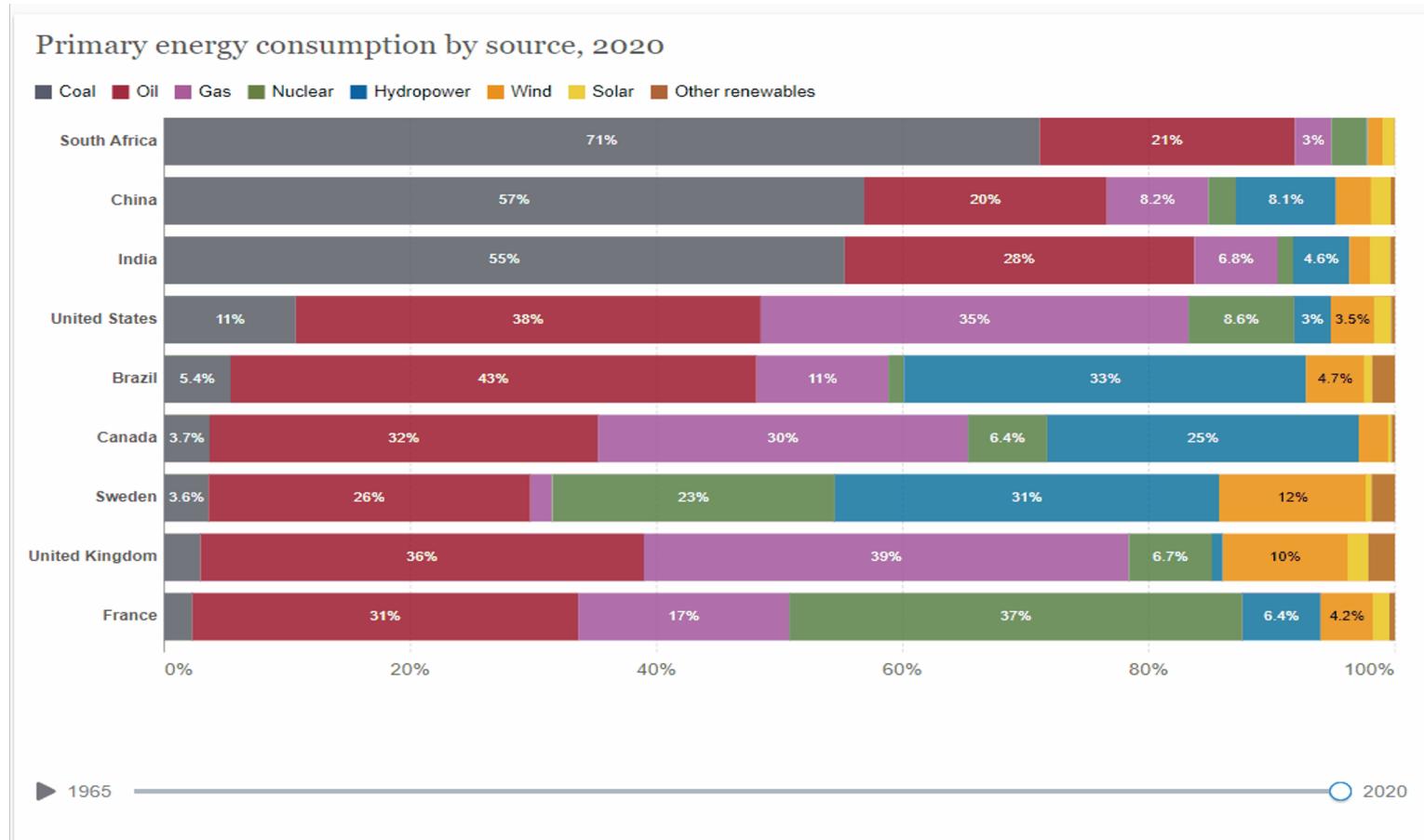


03

## Visualisation Projects

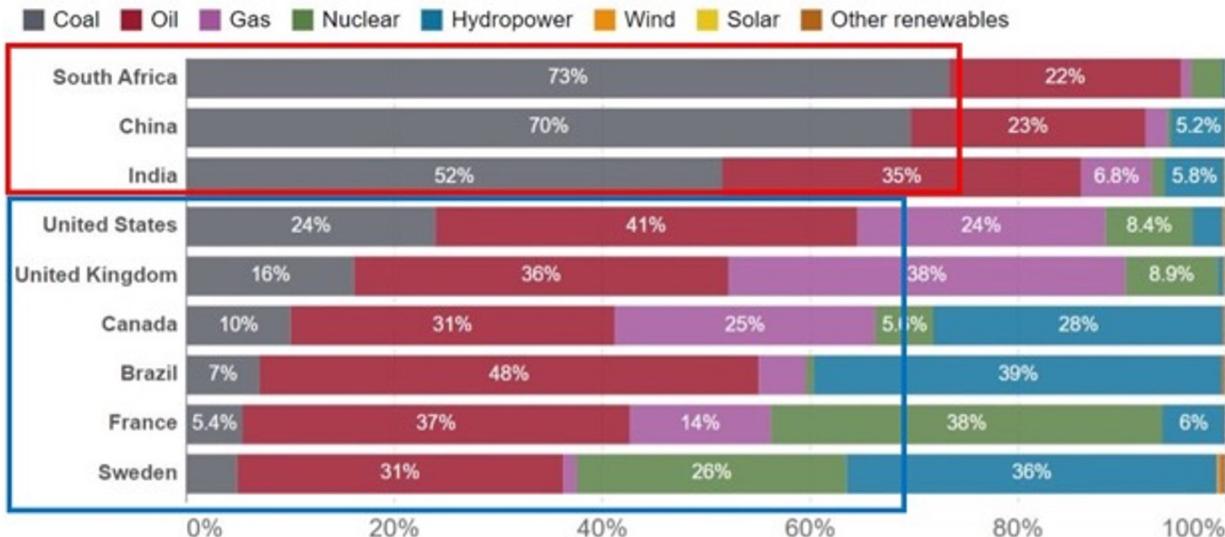
Global  
Part

# Visualisations: Percentage change of consumption (Global)



# Finding 1: Major Energy Source

Primary energy consumption by source, 2000



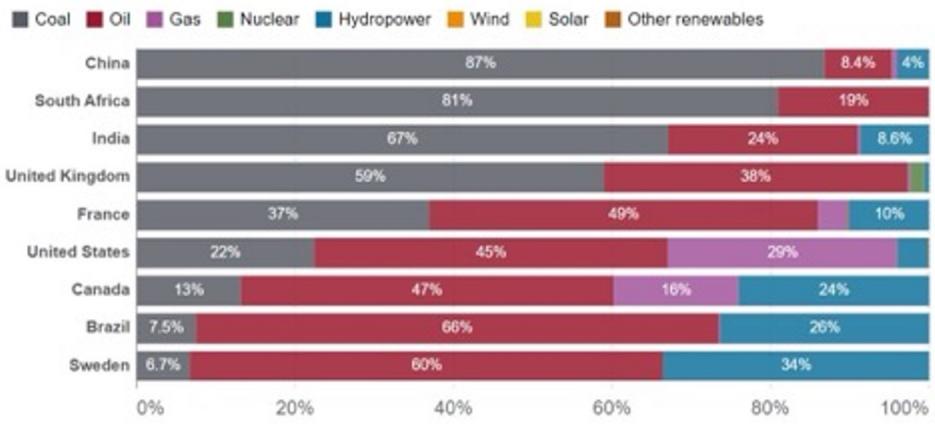
► 1965

○

2020

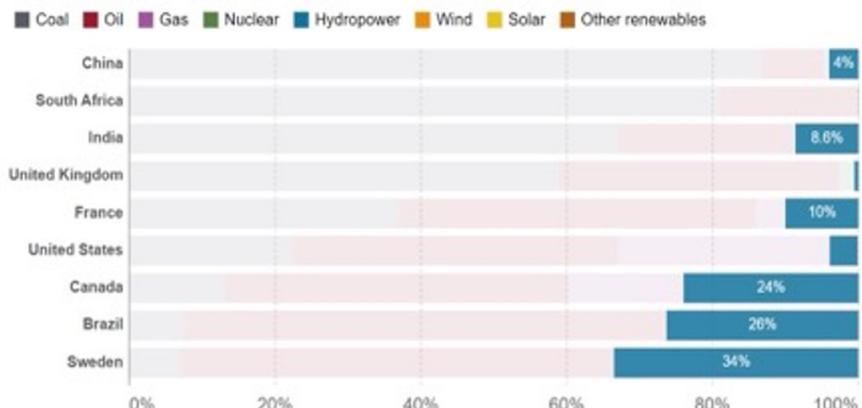
# Finding 2: Change in Low-Carbon Energy Consumption

Primary energy consumption by source, 1965



► 1965 ○ 2020

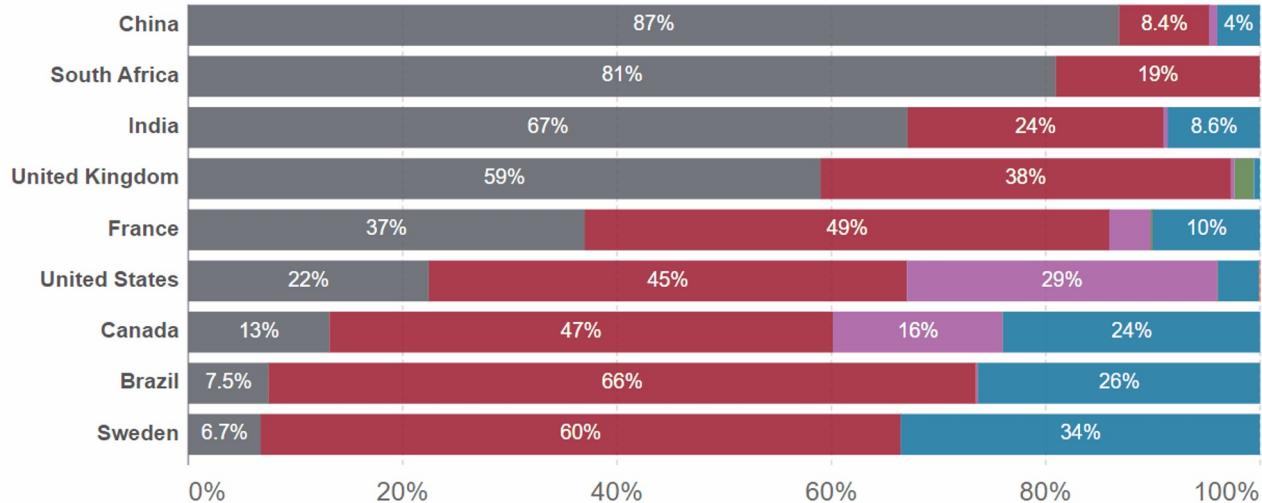
Primary energy consumption by source, 1965



► 1965 ○ 2020

## Primary energy consumption by source, 1965

Coal Oil Gas Nuclear Hydropower Wind Solar Other renewables

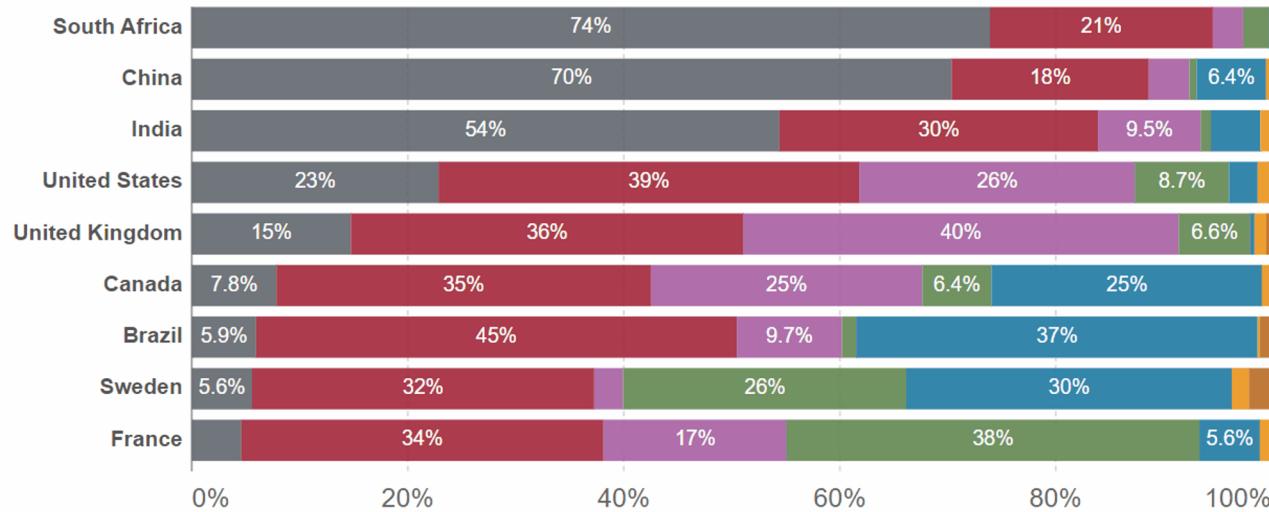


► 1965

2020

## Primary energy consumption by source, 2010

■ Coal ■ Oil ■ Gas ■ Nuclear ■ Hydropower ■ Wind ■ Solar ■ Other renewables

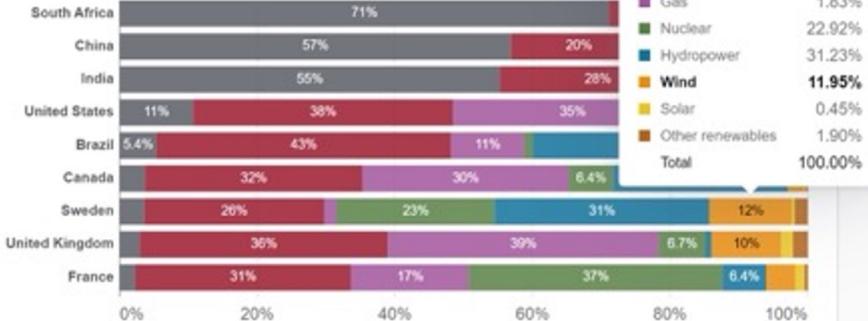


► 1965

2020

### Primary energy consumption by source, 2020

■ Coal ■ Oil ■ Gas ■ Nuclear ■ Hydropower ■ Wind ■ Solar ■ Other renewables



► 1965

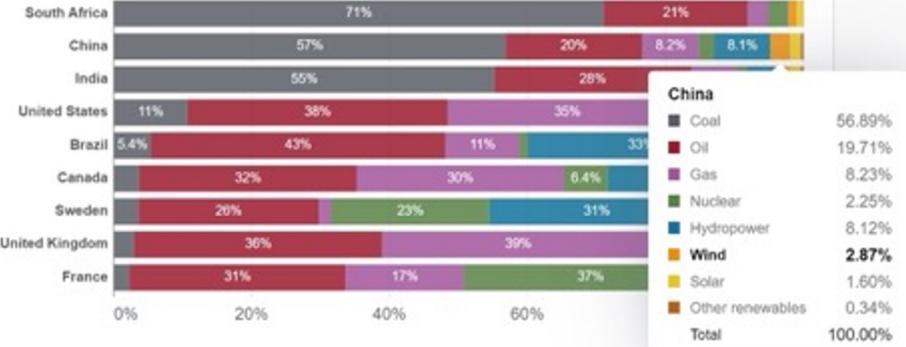
— 2020

### Sweden

|                  |               |
|------------------|---------------|
| Coal             | 3.59%         |
| Oil              | 26.13%        |
| Gas              | 1.83%         |
| Nuclear          | 22.92%        |
| Hydropower       | 31.23%        |
| Wind             | <b>11.95%</b> |
| Solar            | 0.45%         |
| Other renewables | 1.90%         |
| Total            | 100.00%       |

### Primary energy consumption by source, 2020

■ Coal ■ Oil ■ Gas ■ Nuclear ■ Hydropower ■ Wind ■ Solar ■ Other renewables



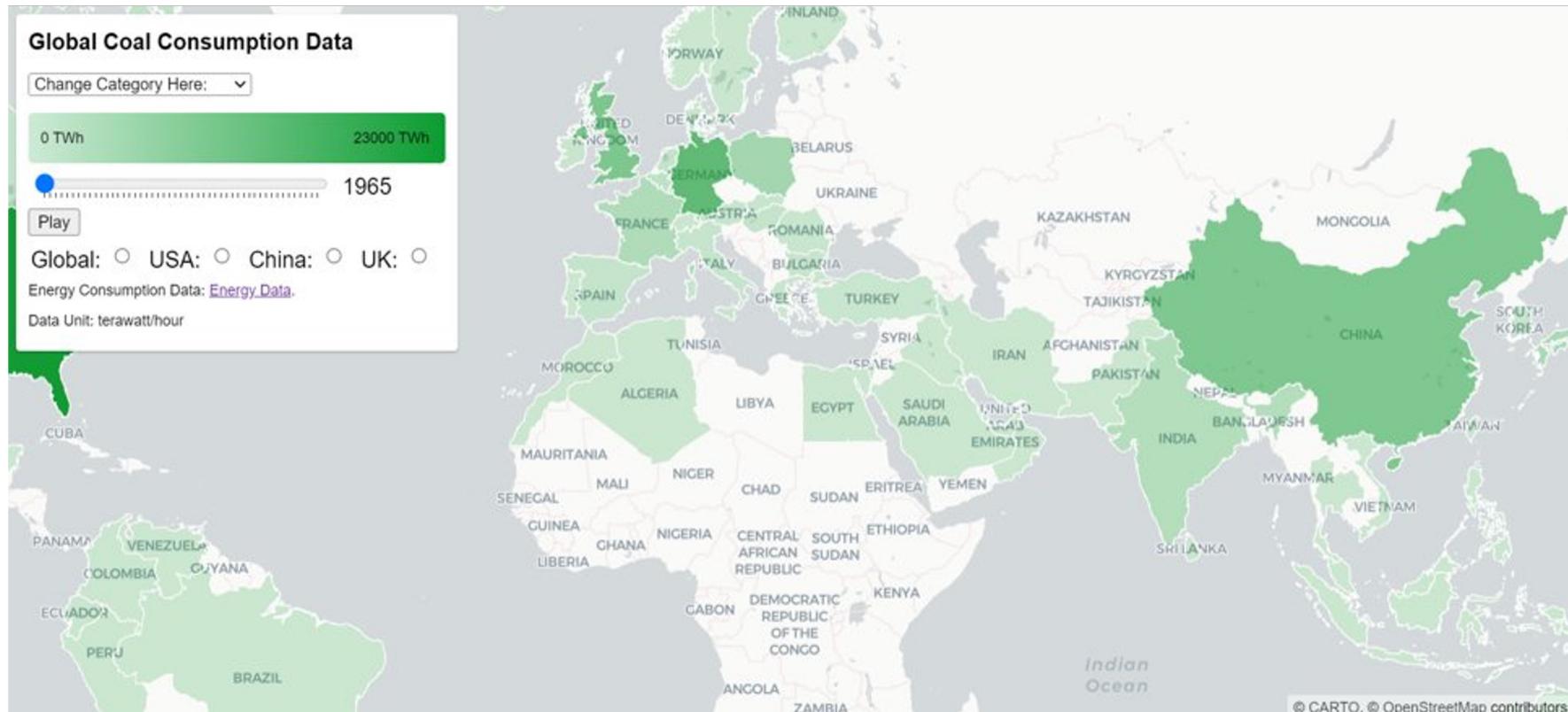
### China

|                  |              |
|------------------|--------------|
| Coal             | 56.89%       |
| Oil              | 19.71%       |
| Gas              | 8.23%        |
| Nuclear          | 2.25%        |
| Hydropower       | 8.12%        |
| Wind             | <b>2.87%</b> |
| Solar            | 1.60%        |
| Other renewables | 0.34%        |
| Total            | 100.00%      |

► 1965

— 2020

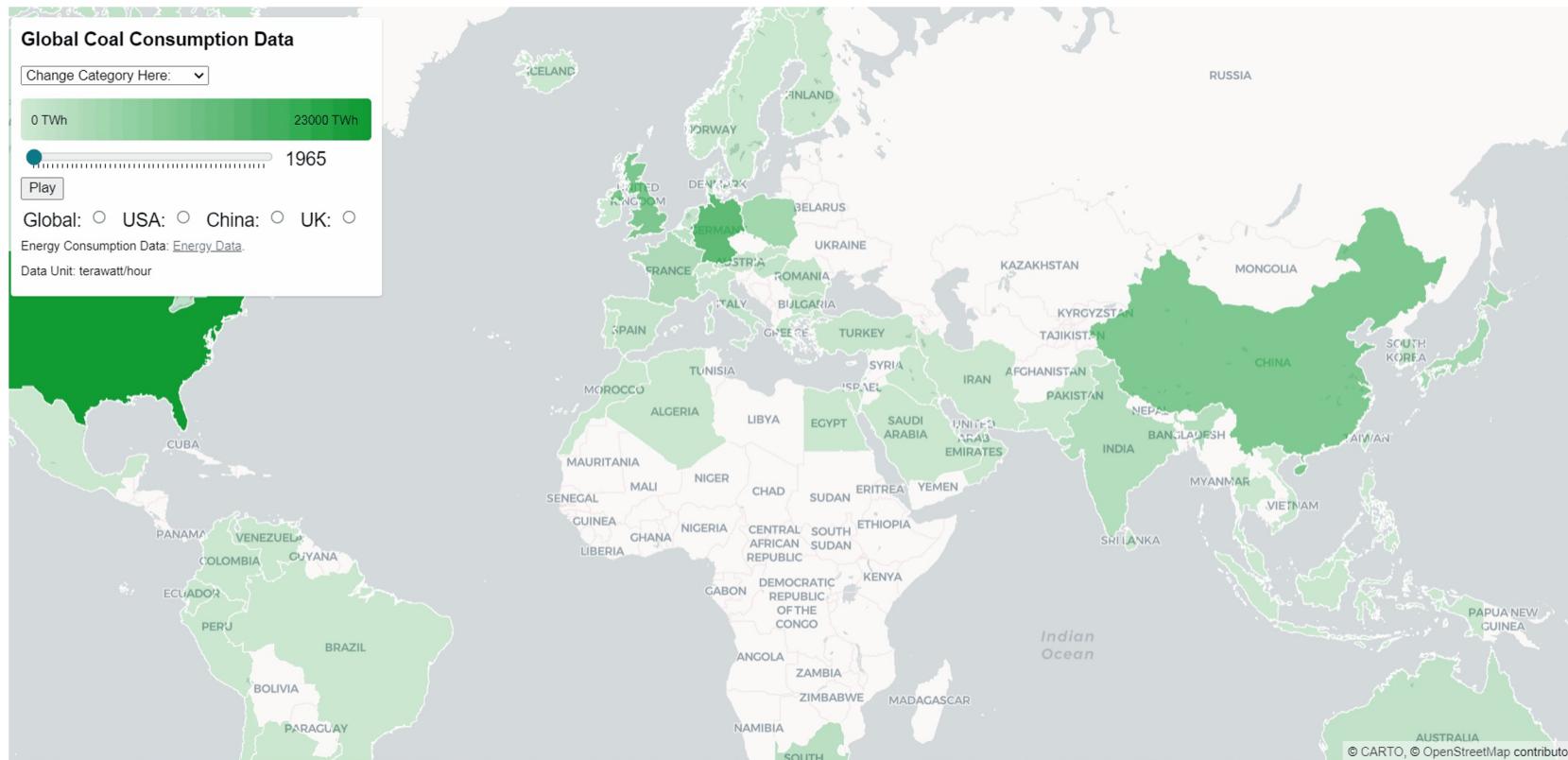
# Visualisations: Global Energy Consumption Map



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# Visualisations: Global Energy Consumption Map

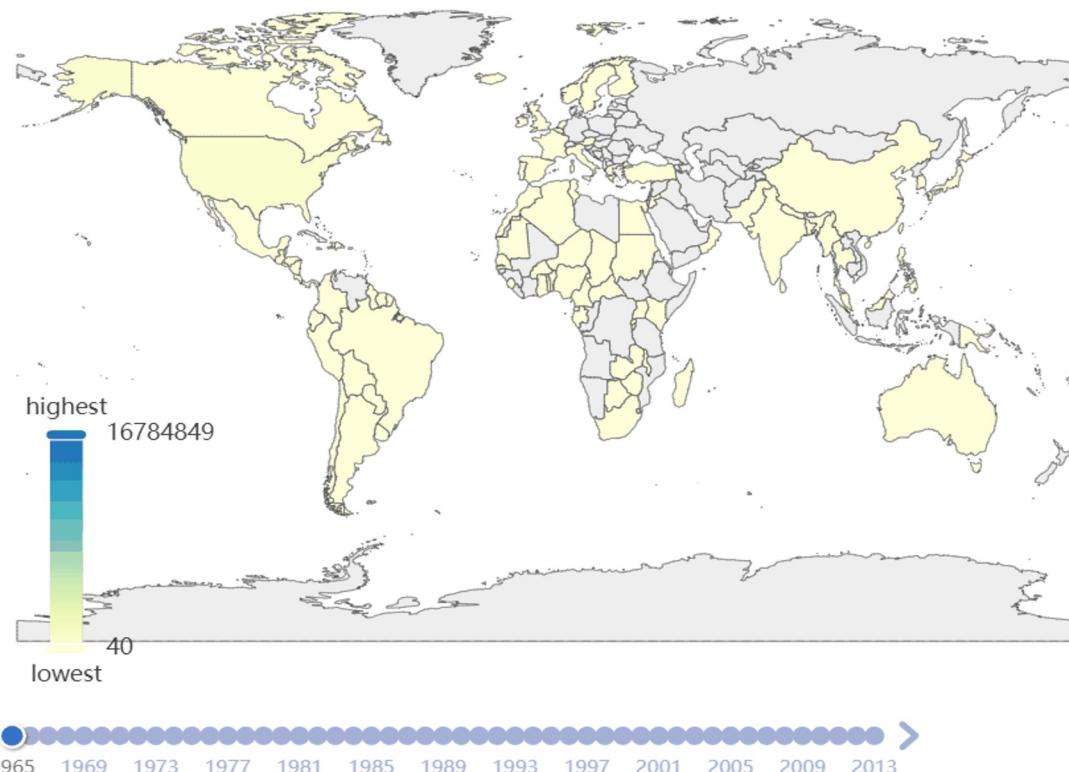


Data: The World bank

# Visualisations: GDP Global



GDP(million/\$)



## Time Slider

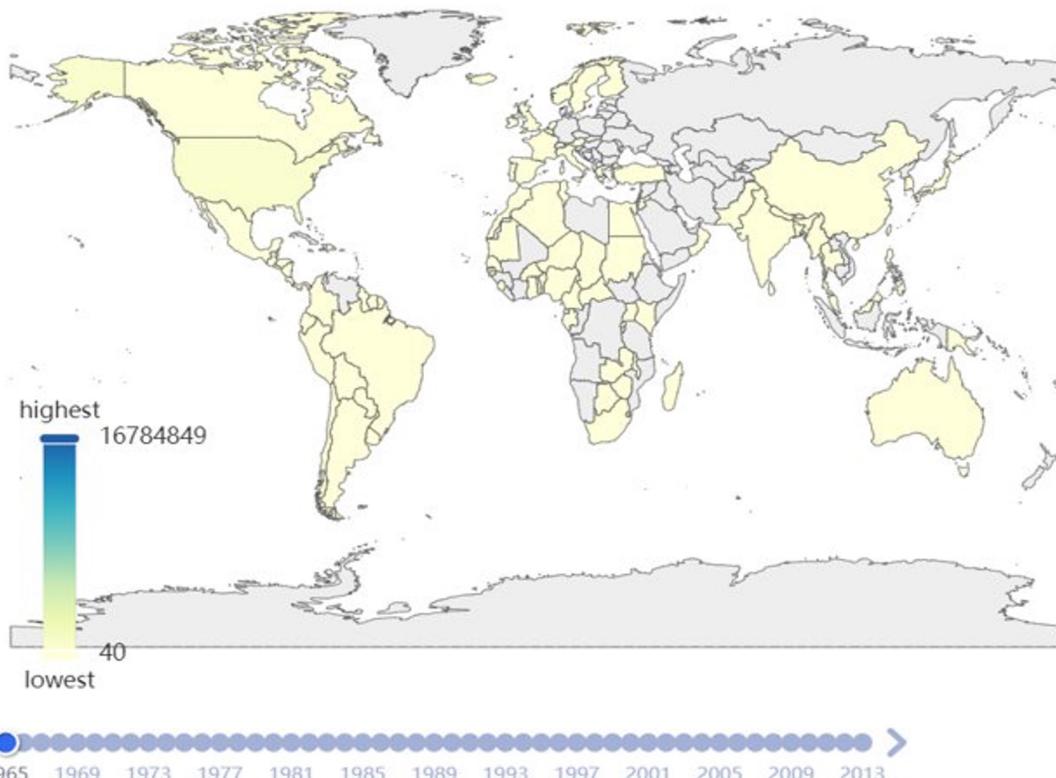
select from 1965 - 2013

## Colour

change with GDP

# Visualisations: GDP Global

GDP(million/\$)



## Time Slider

1965

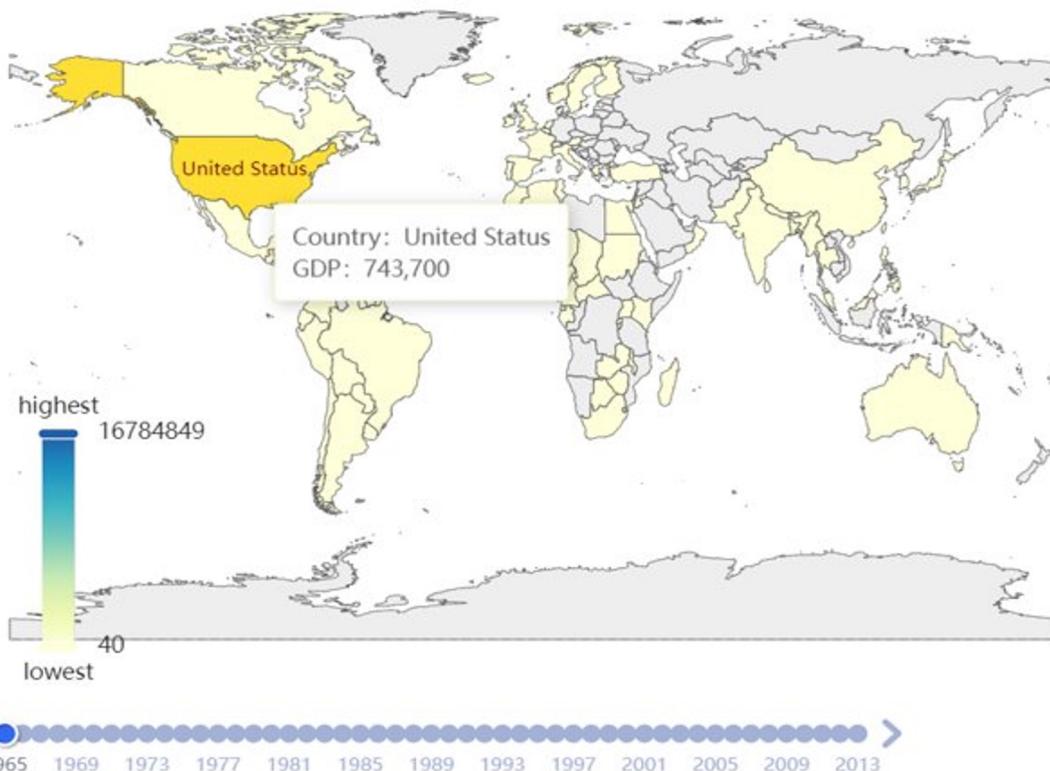
## Colour

light yellow

# Visualisations: GDP Global



GDP(million/\$)



## Time Slider

1965

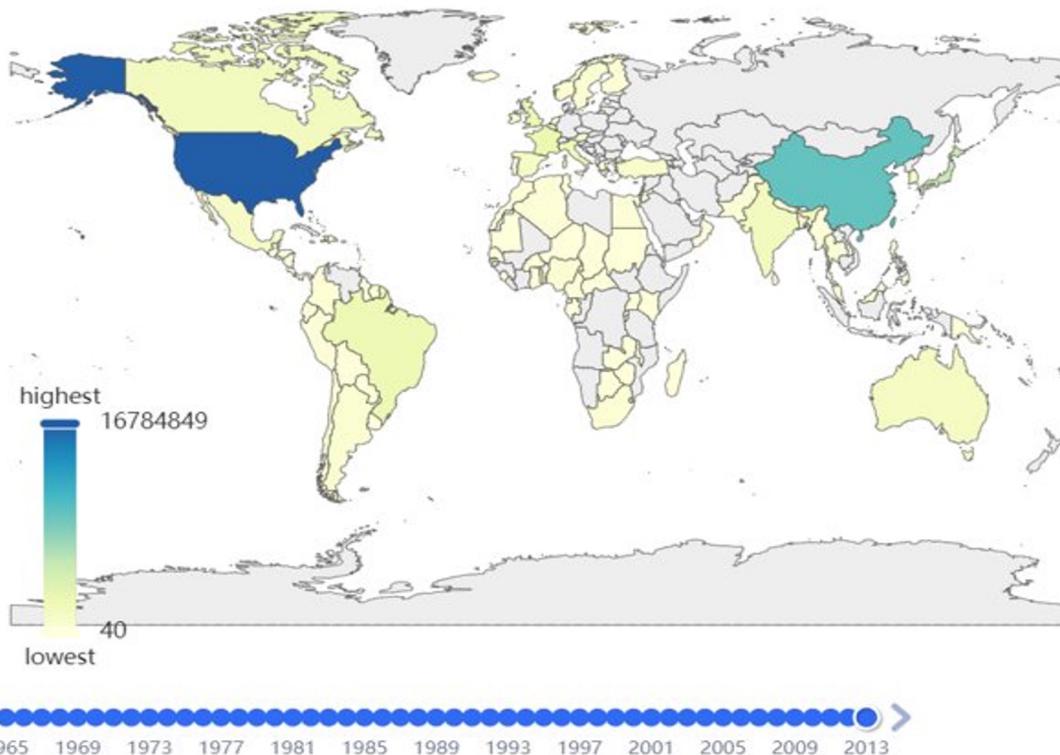
## Country

United States

# Visualisations: GDP Global



GDP(million/\$)



## Time Slider

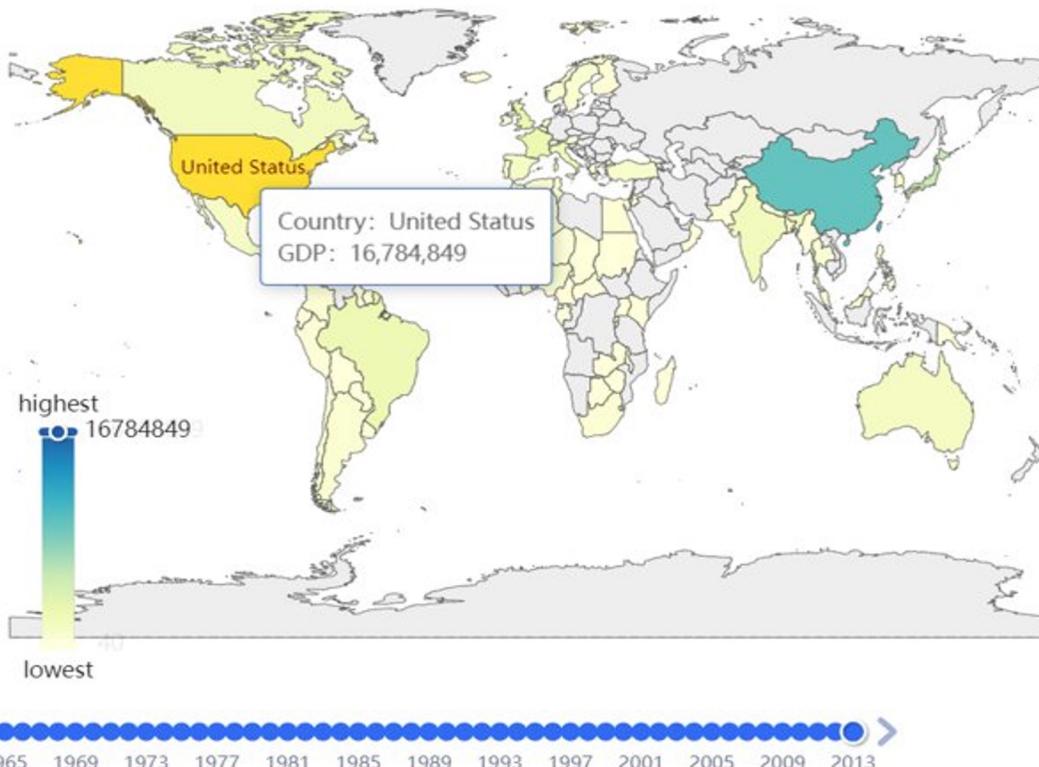
2013

## Colour

Some noticeable change

# Visualisations: GDP Global

GDP(million/\$)



## Time Slider

2013

## Country

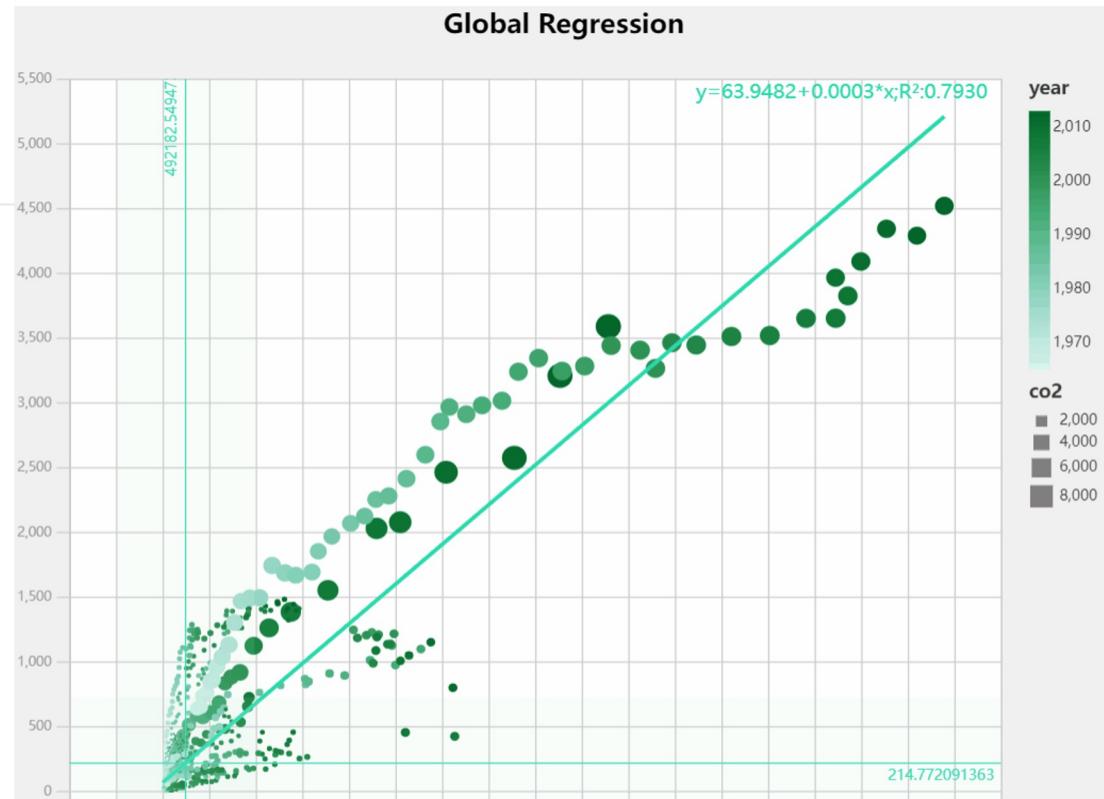
United States

# Visualisations: Global Regression

XY axis indicator X Axis GDP\_million

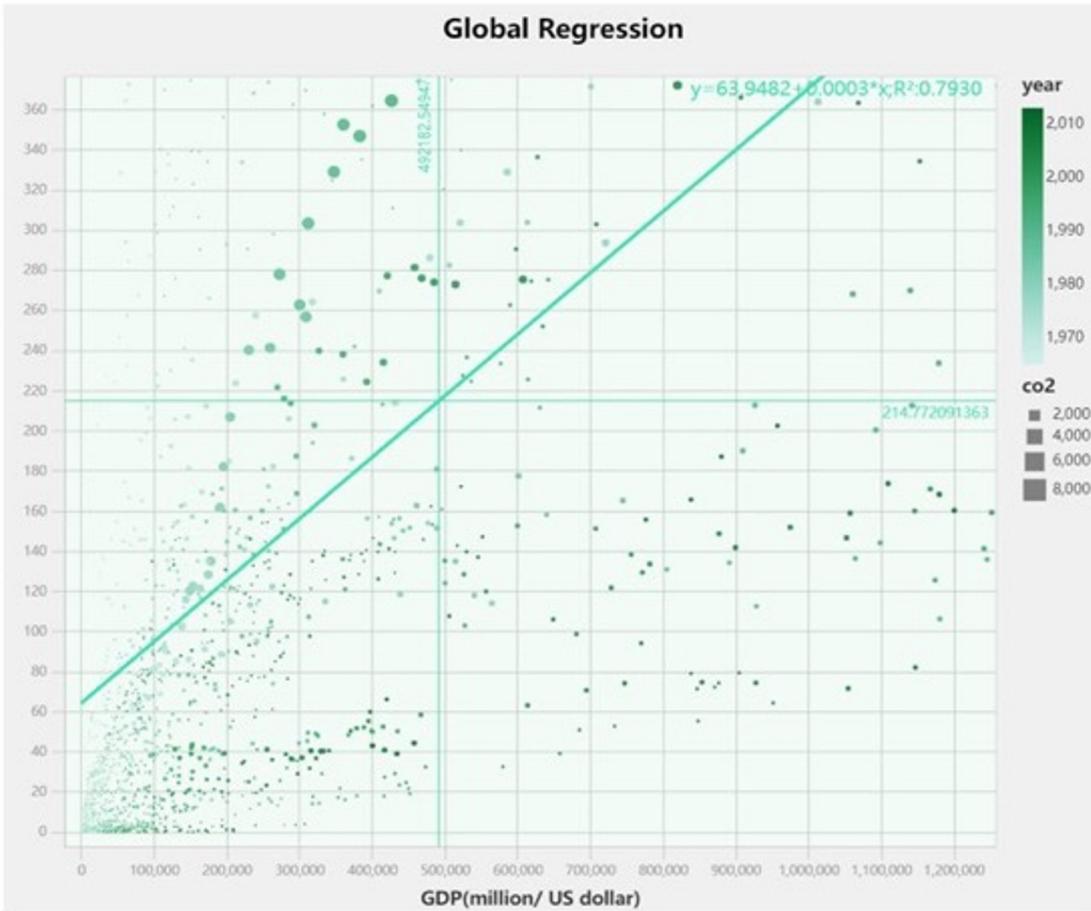
Bubble indicator co2

Y Axis lowcarbon\_consumption



| Dep. Variable:        | GDP_million      | R-squared:          | 0.807     |       |           |           |
|-----------------------|------------------|---------------------|-----------|-------|-----------|-----------|
| Model:                | OLS              | Adj. R-squared:     | 0.807     |       |           |           |
| Method:               | Least Squares    | F-statistic:        | 2095.     |       |           |           |
| Date:                 | Wed, 11 May 2022 | Prob (F-statistic): | 0.00      |       |           |           |
| Time:                 | 16:51:17         | Log-Likelihood:     | -29646.   |       |           |           |
| No. Observations:     | 2003             | AIC:                | 5.930e+04 |       |           |           |
| Df Residuals:         | 1998             | BIC:                | 5.933e+04 |       |           |           |
| Df Model:             | 4                |                     |           |       |           |           |
| Covariance Type:      | nonrobust        |                     |           |       |           |           |
|                       | coef             | std err             | t         | P> t  | [0.025    | 0.975]    |
| Intercept             | -4.972e+04       | 1.64e+04            | -3.031    | 0.002 | -8.19e+04 | -1.76e+04 |
| lowcarbon_consumption | 2083.0245        | 55.924              | 37.247    | 0.000 | 1973.348  | 2192.701  |
| oil_consumption       | -42.2934         | 39.998              | -1.057    | 0.290 | -120.735  | 36.149    |
| coal_consumption      | 37.6906          | 12.295              | 3.066     | 0.002 | 13.579    | 61.802    |
| gas_consumption       | 387.6572         | 59.356              | 6.531     | 0.000 | 271.251   | 504.064   |
| Omnibus:              | 850.413          | Durbin-Watson:      | 0.069     |       |           |           |
| Prob(Omnibus):        | 0.000            | Jarque-Bera (JB):   | 25255.851 |       |           |           |
| Skew:                 | 1.380            | Prob(JB):           | 0.00      |       |           |           |
| Kurtosis:             | 20.175           | Cond. No.           | 2.70e+03  |       |           |           |

# Visualisations: Global Regression

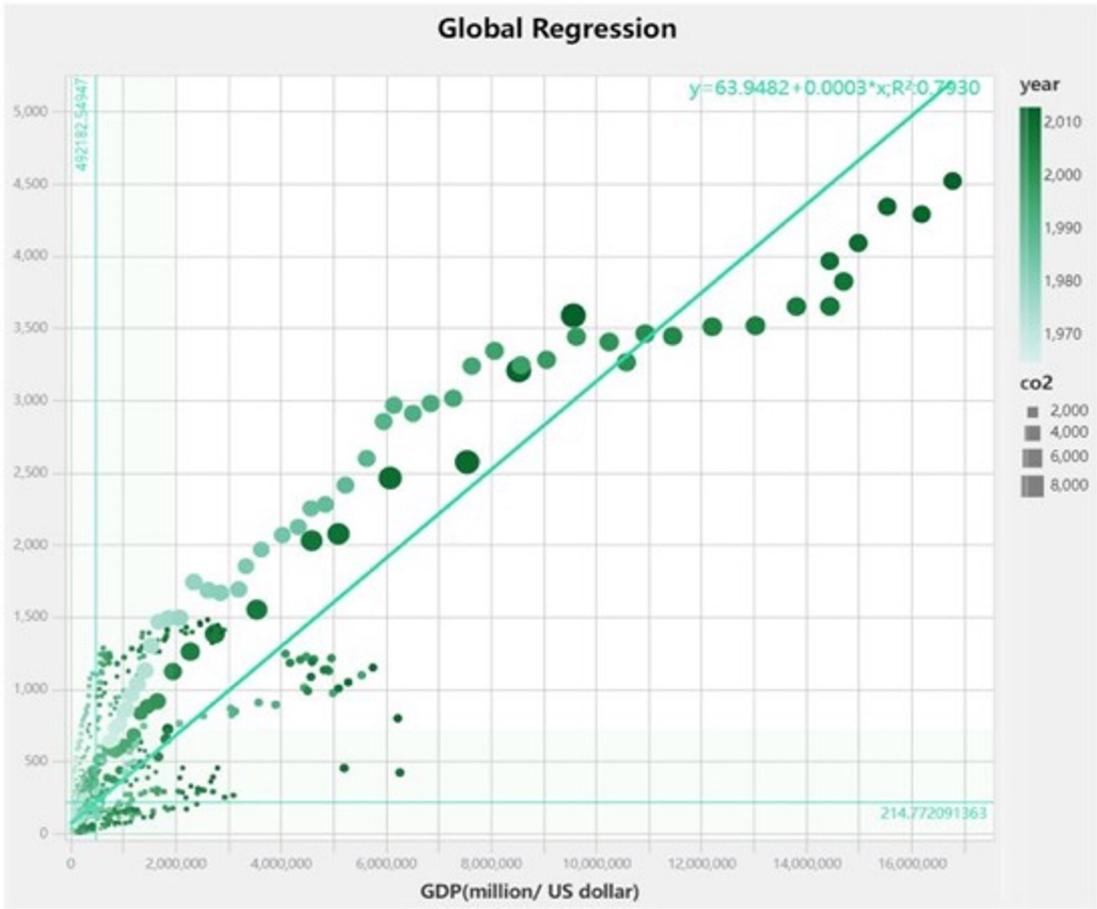


Time

mainly before 2000

Zoom in

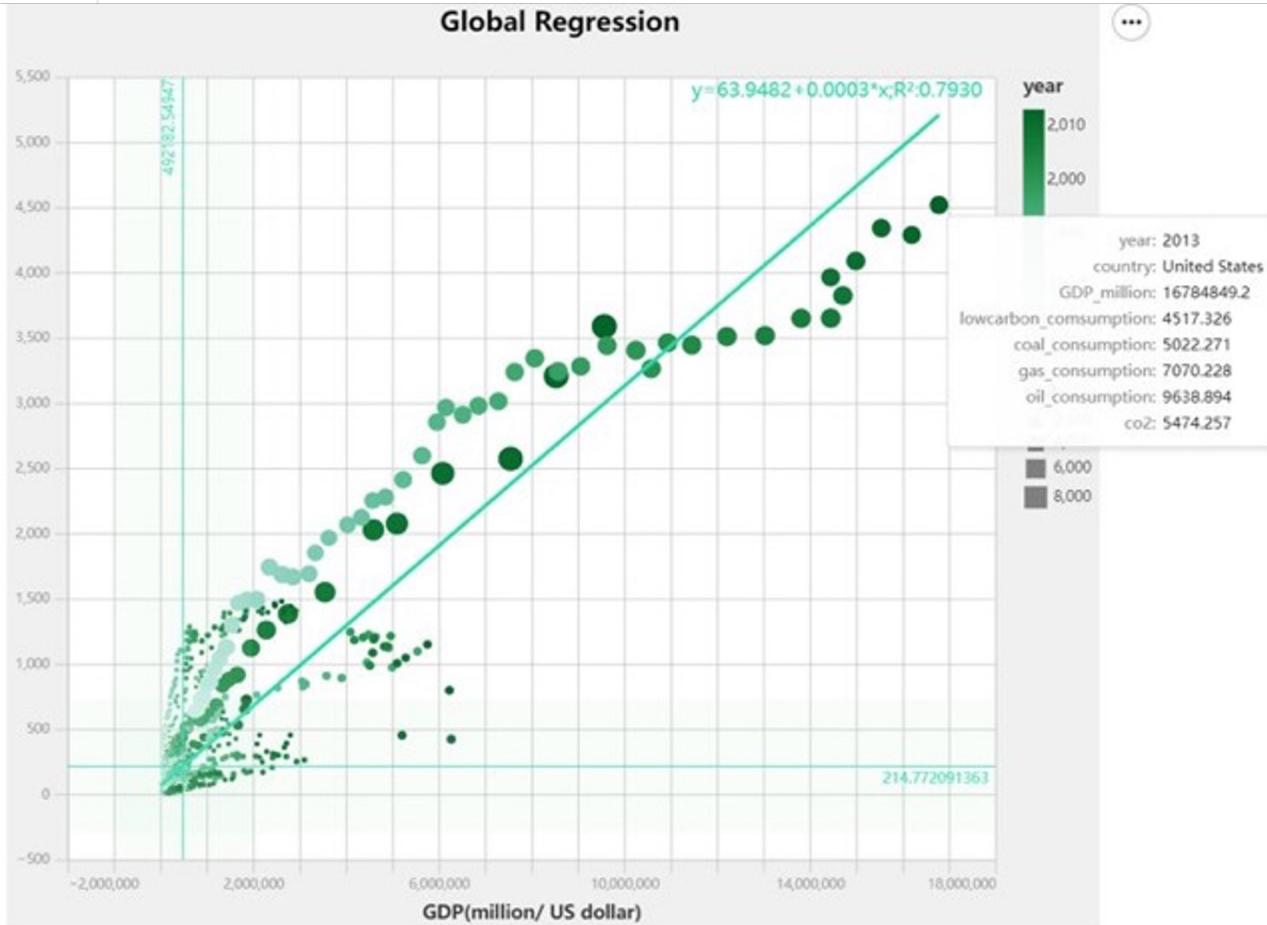
# Visualisations: Global Regression



Trends and  
relation

Zoom out

# Visualisations: Global Regression

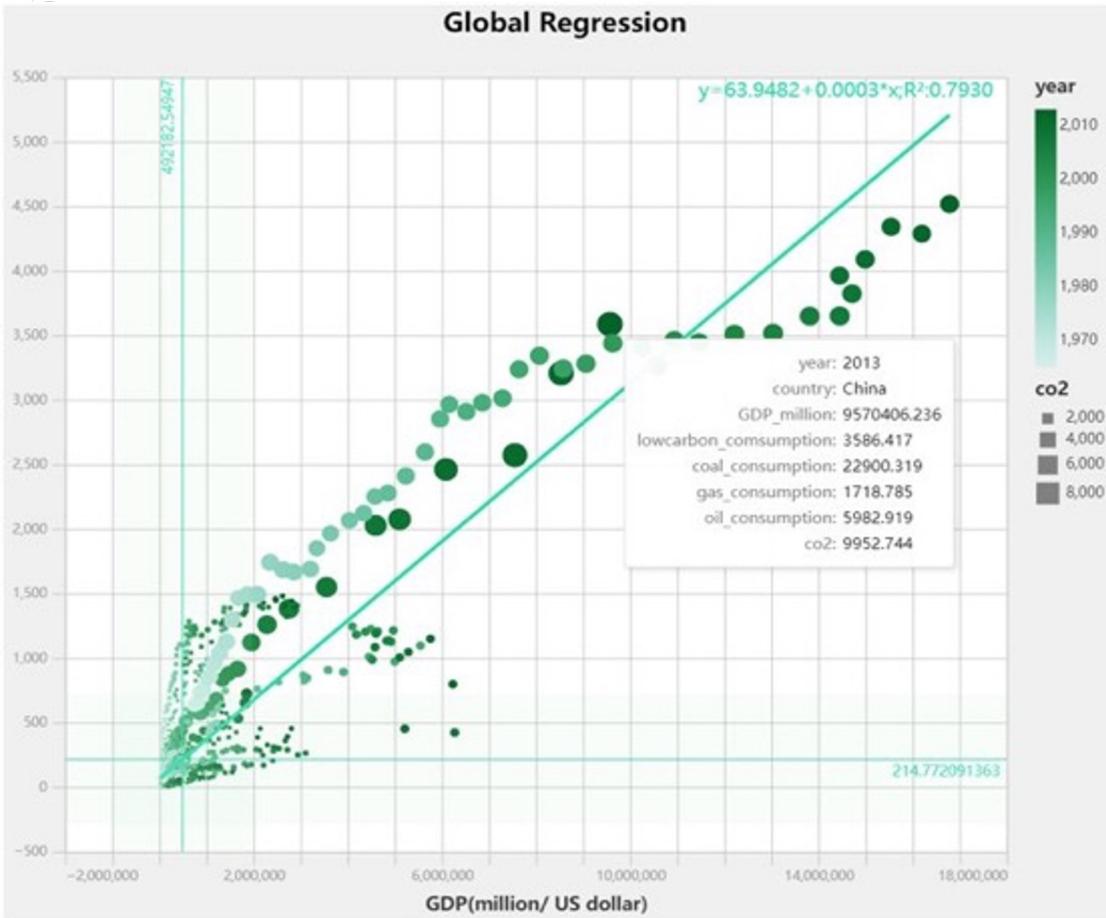


Some important bubbles

Zoom out

13 United States

# Visualisations: Global Regression



Some  
important  
bubble

Zoom out

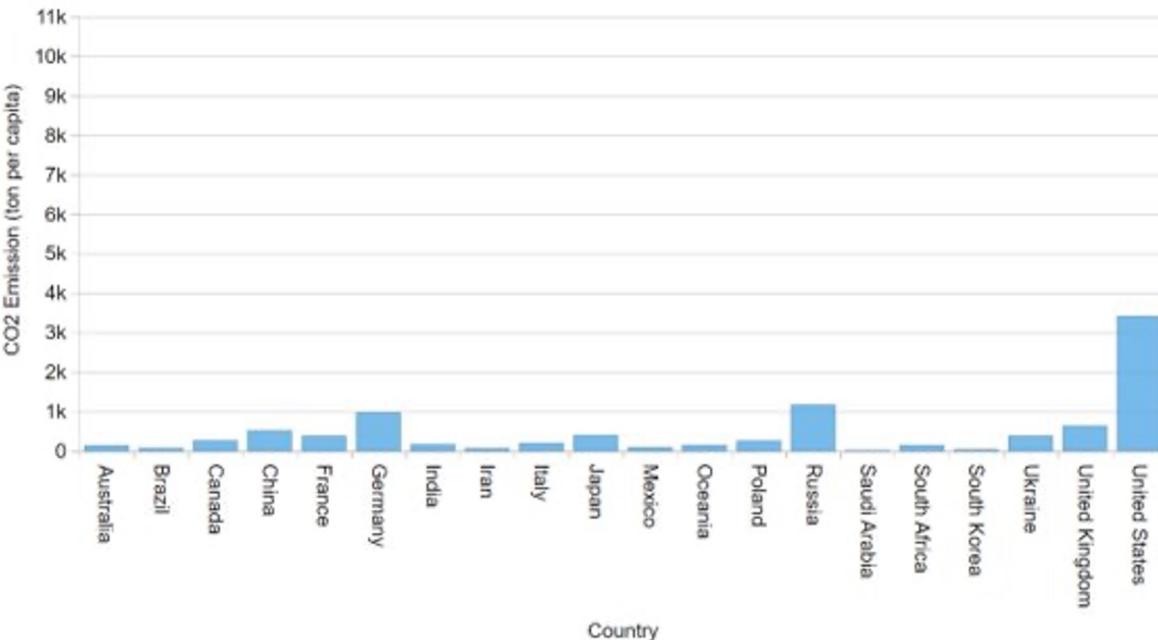
2013 China

# Visualisations: CO2 Emission Bar Chart

## World 20 Largest CO2 Emission 1965

CO2 Emission Data: [CO2 Data](#).

Data Unit: ton per capita



Year: 1965

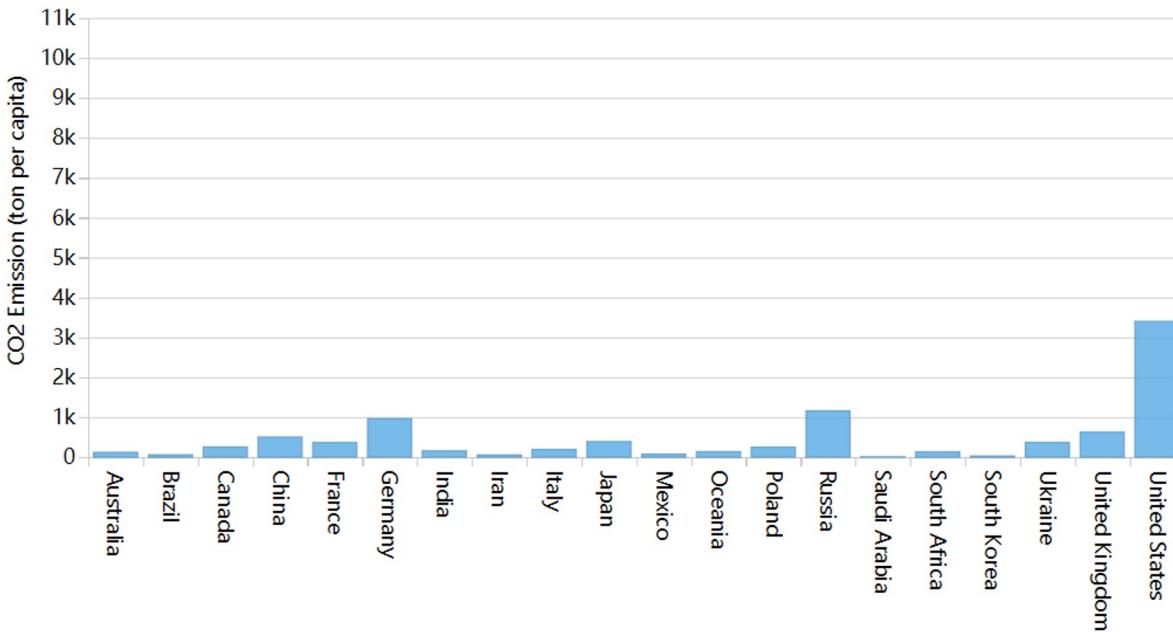
Play

# Visualisations: CO2 Emission Bar Chart

## World 20 Largest CO2 Emission 2010

CO2 Emission Data: [CO2 Data](#).

Data Unit: ton per capita



Year: 1965

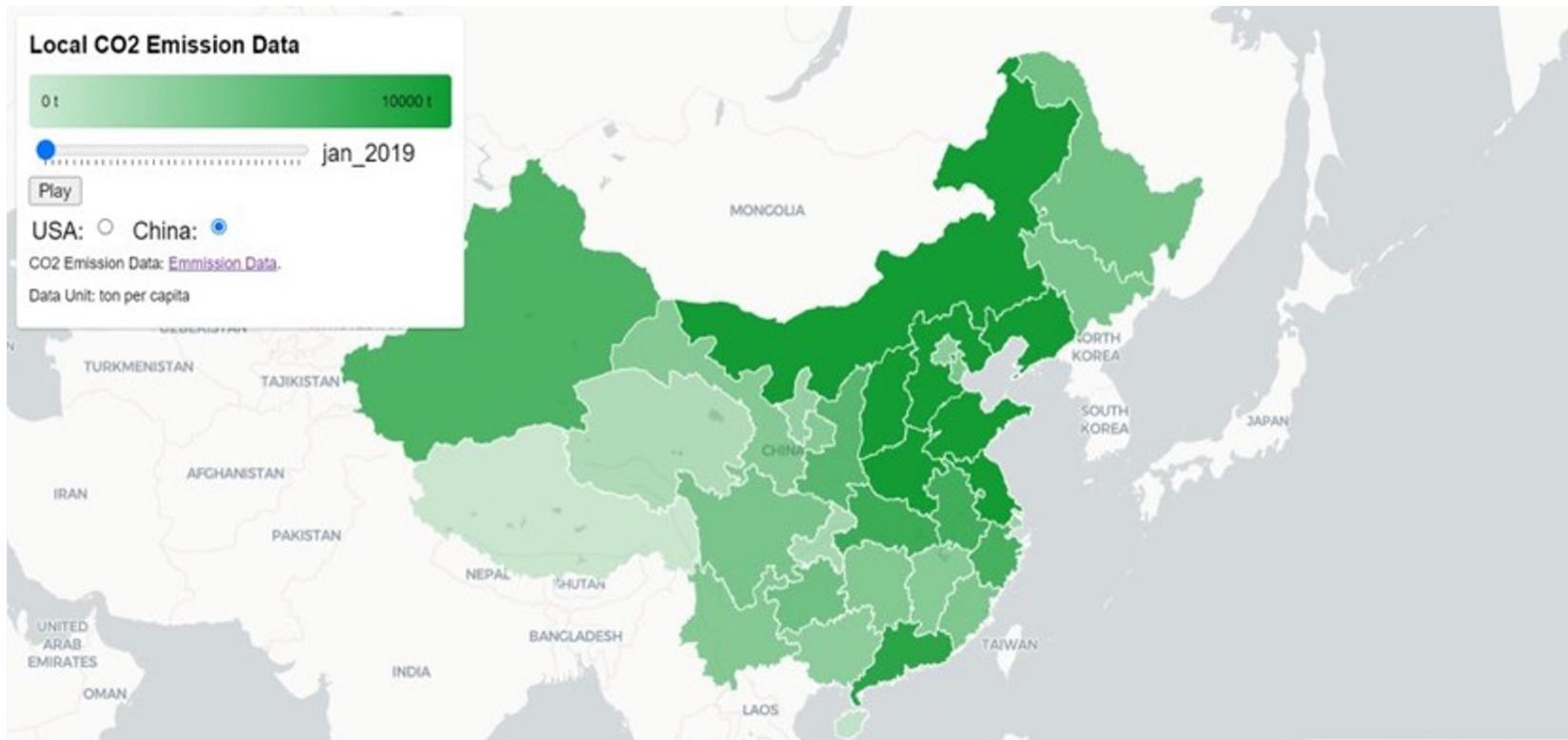
Play

03

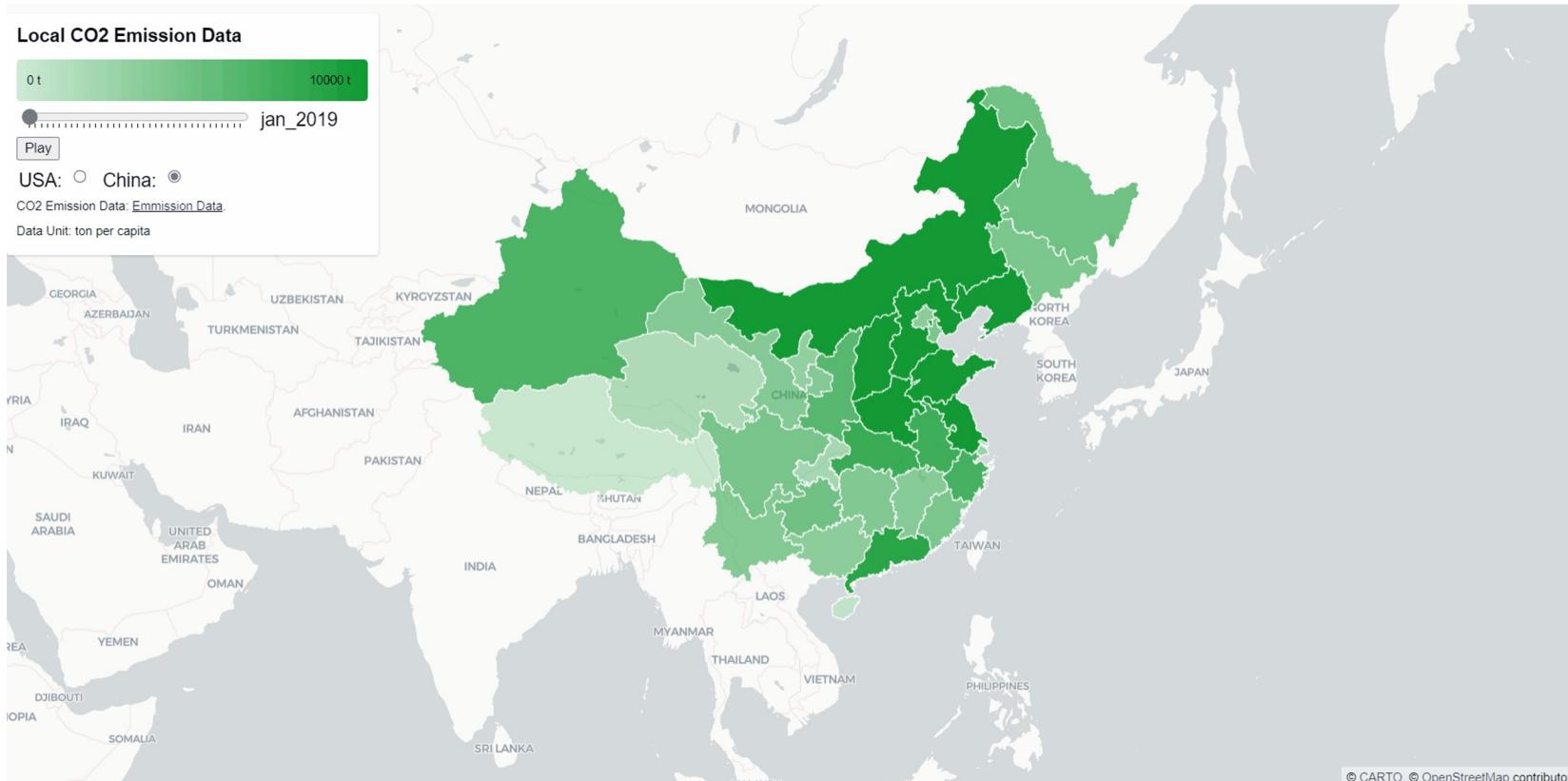
## Visualisation Projects

Local  
Part

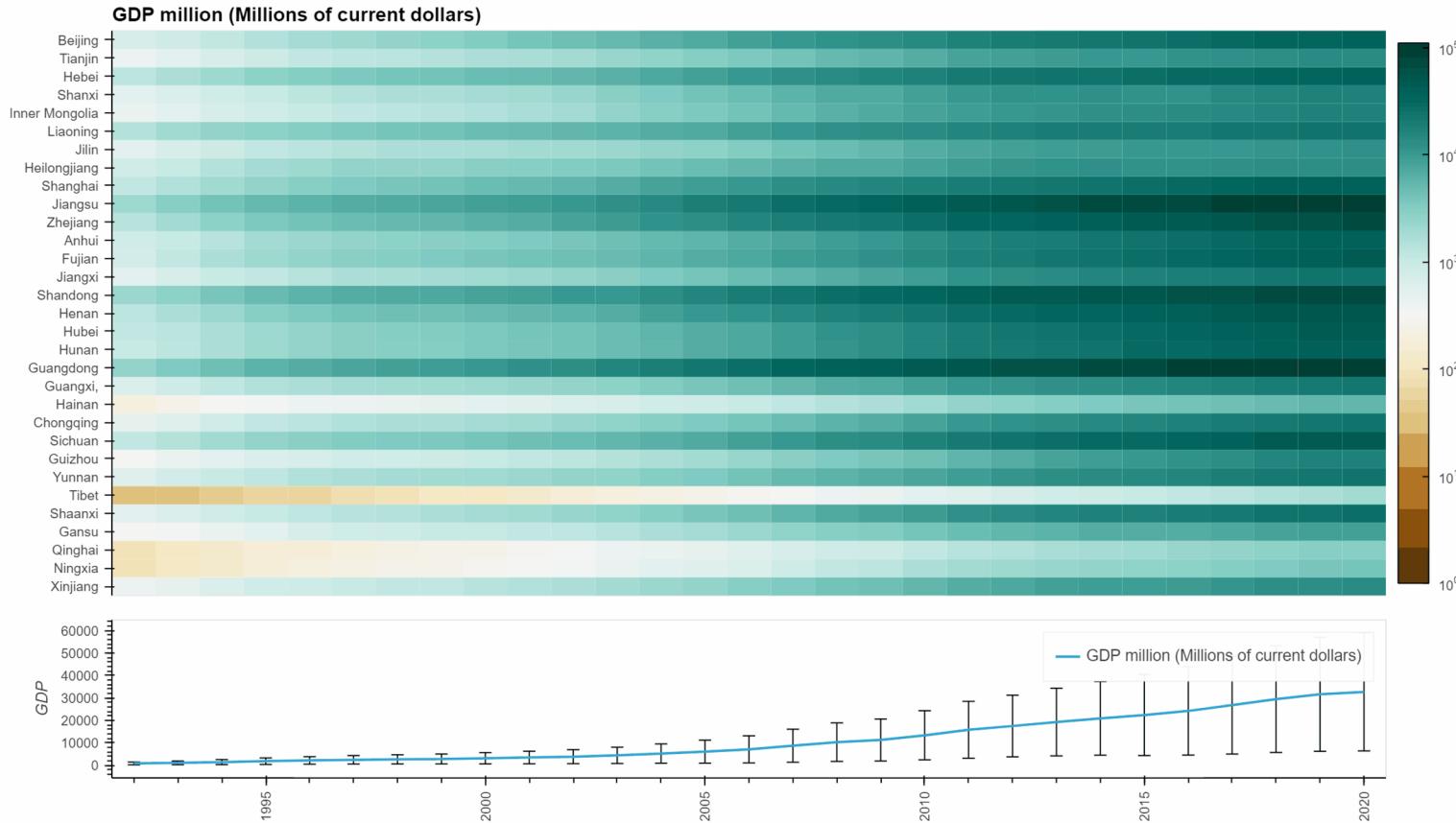
# Visualisations: CO2 Emission Local Map



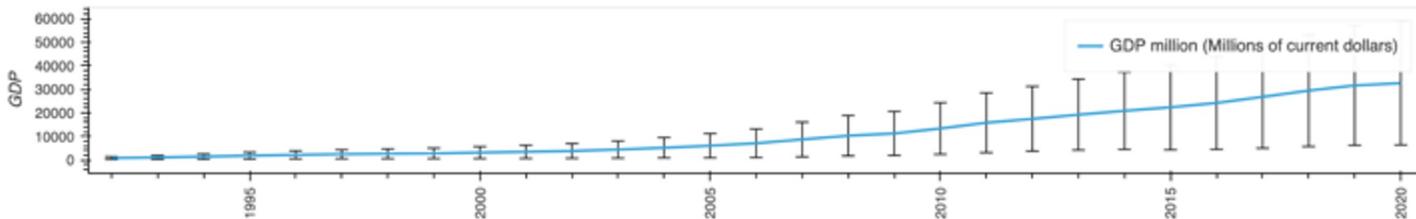
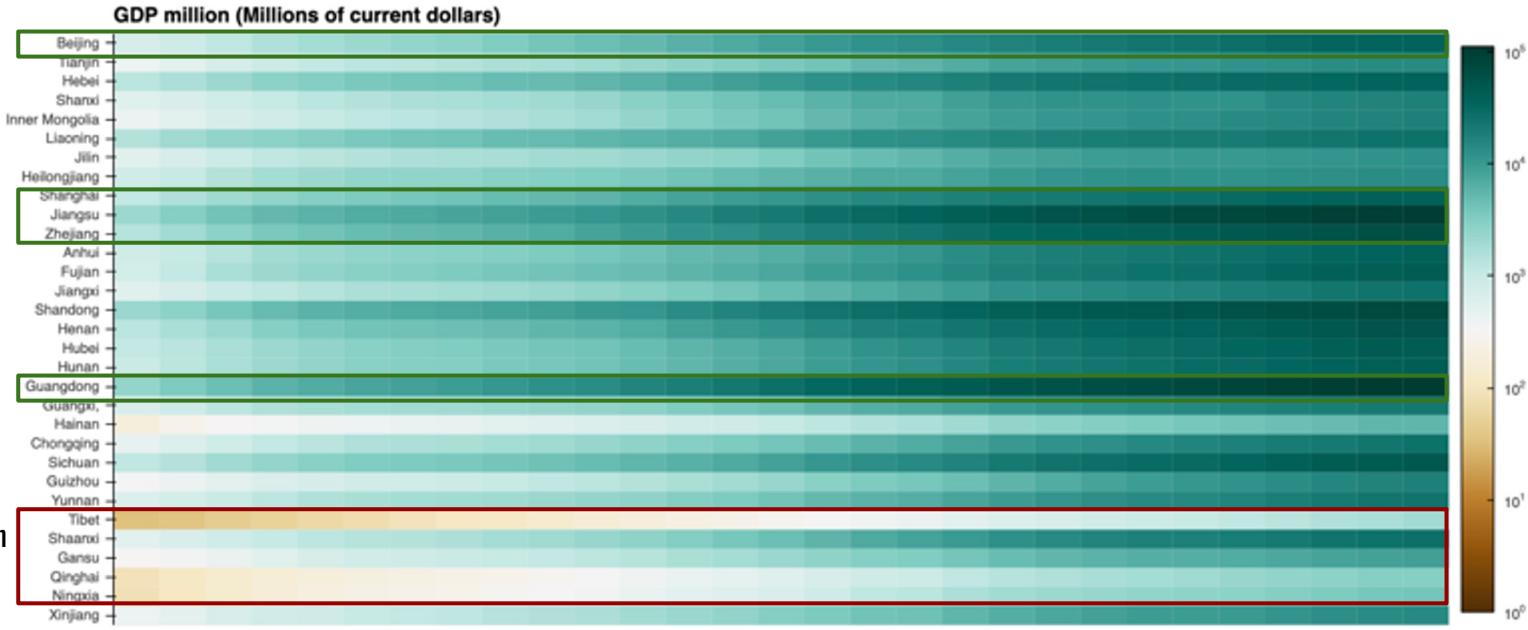
# Visualisations: CO2 Emission Local Map



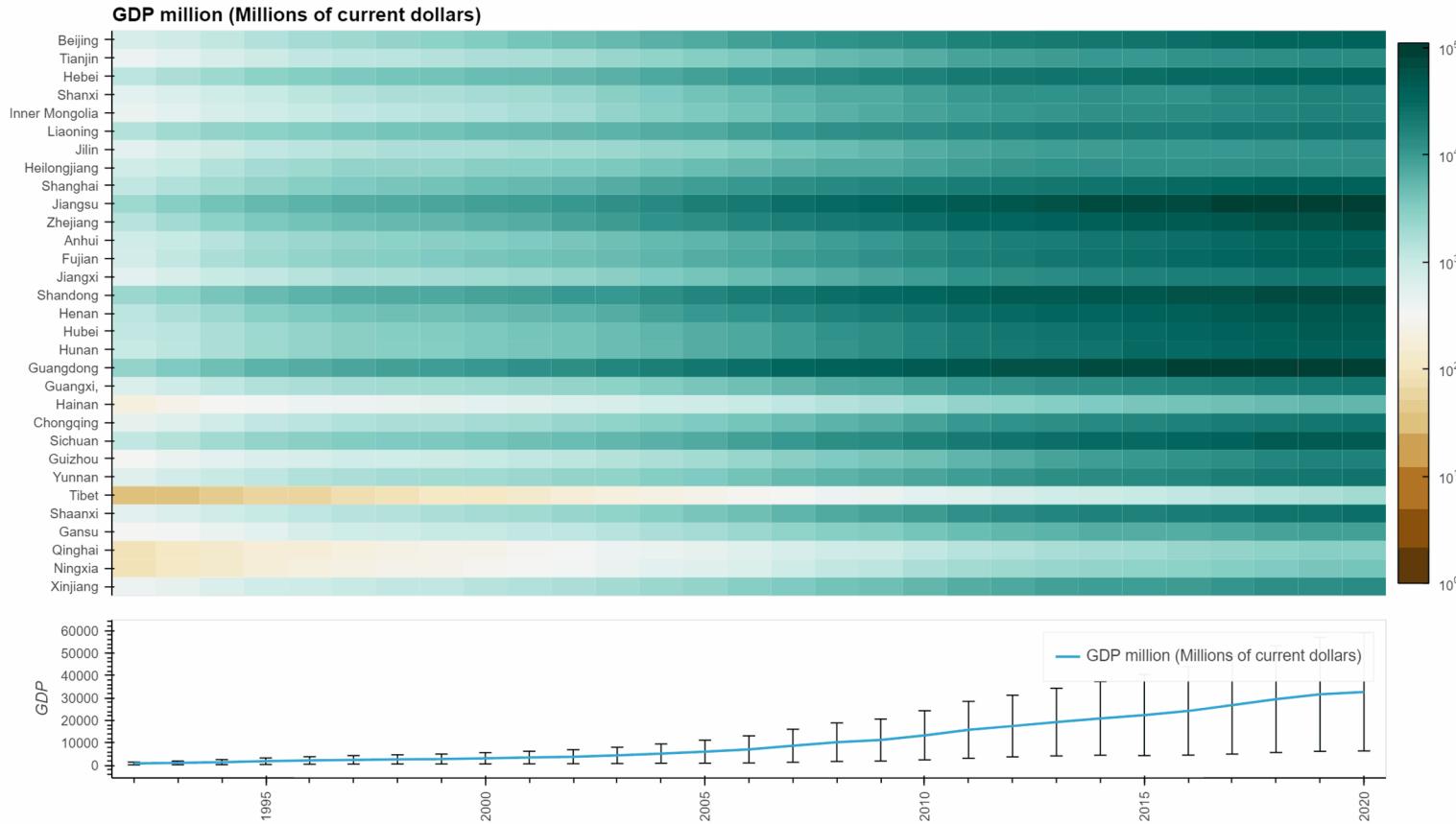
# Visualisations: GDP China



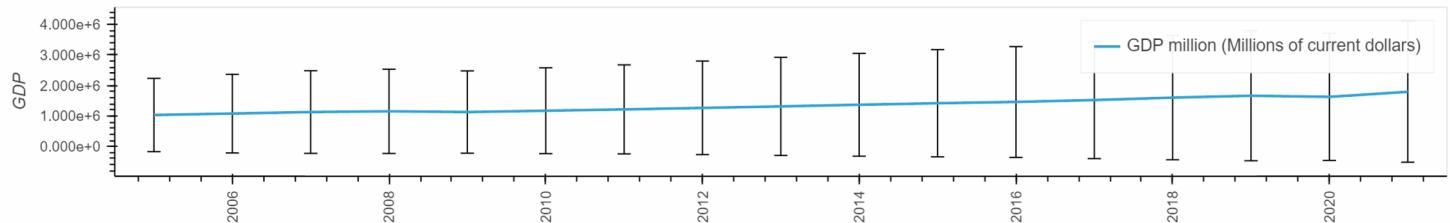
# Visualisations: GDP China



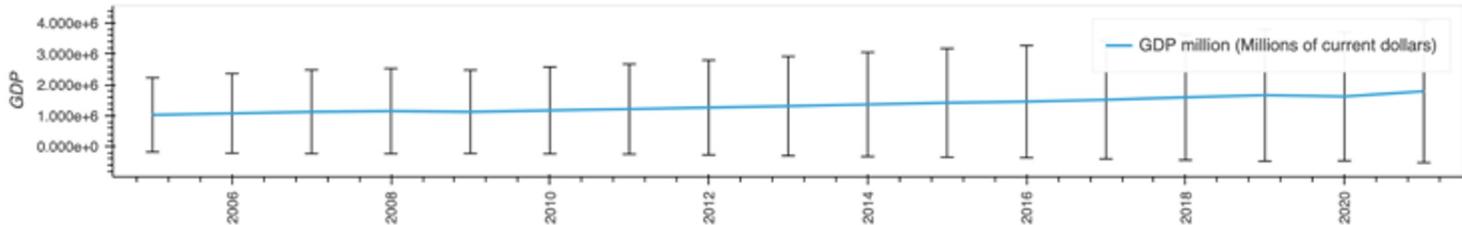
# Visualisations: GDP China



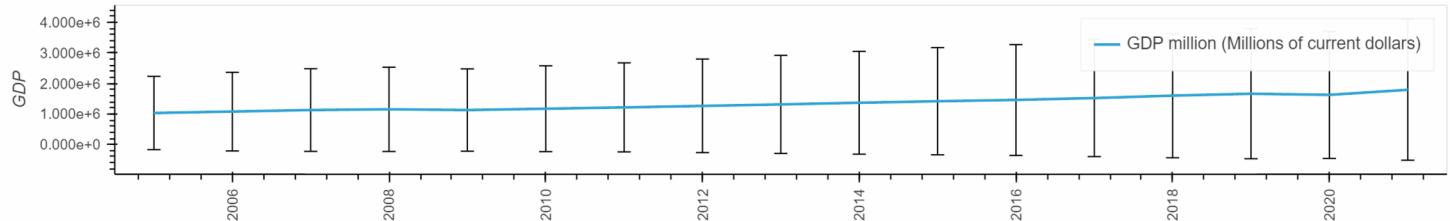
# Visualisations: GDP the U.S.



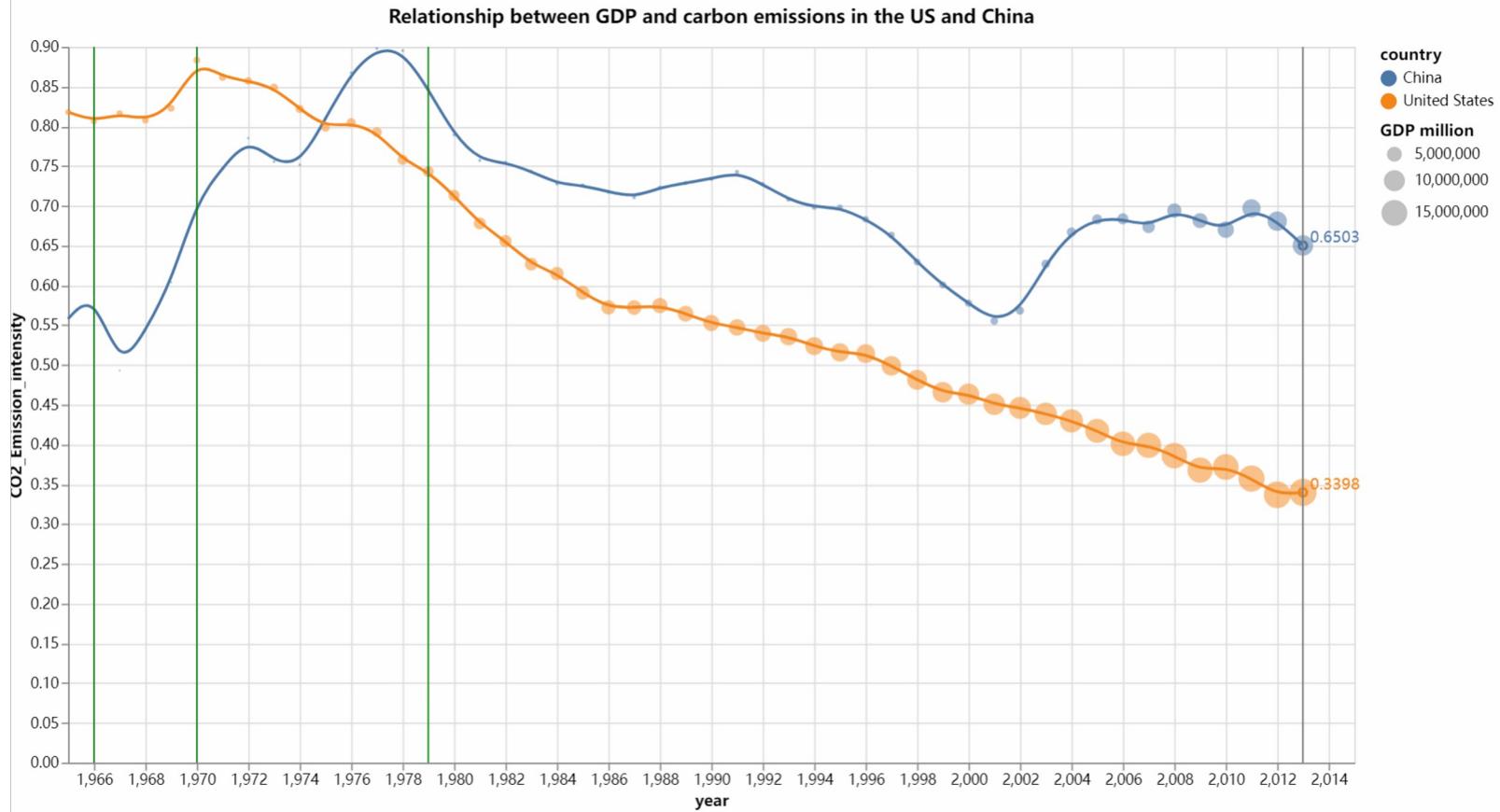
# Visualisations: GDP the U.S.

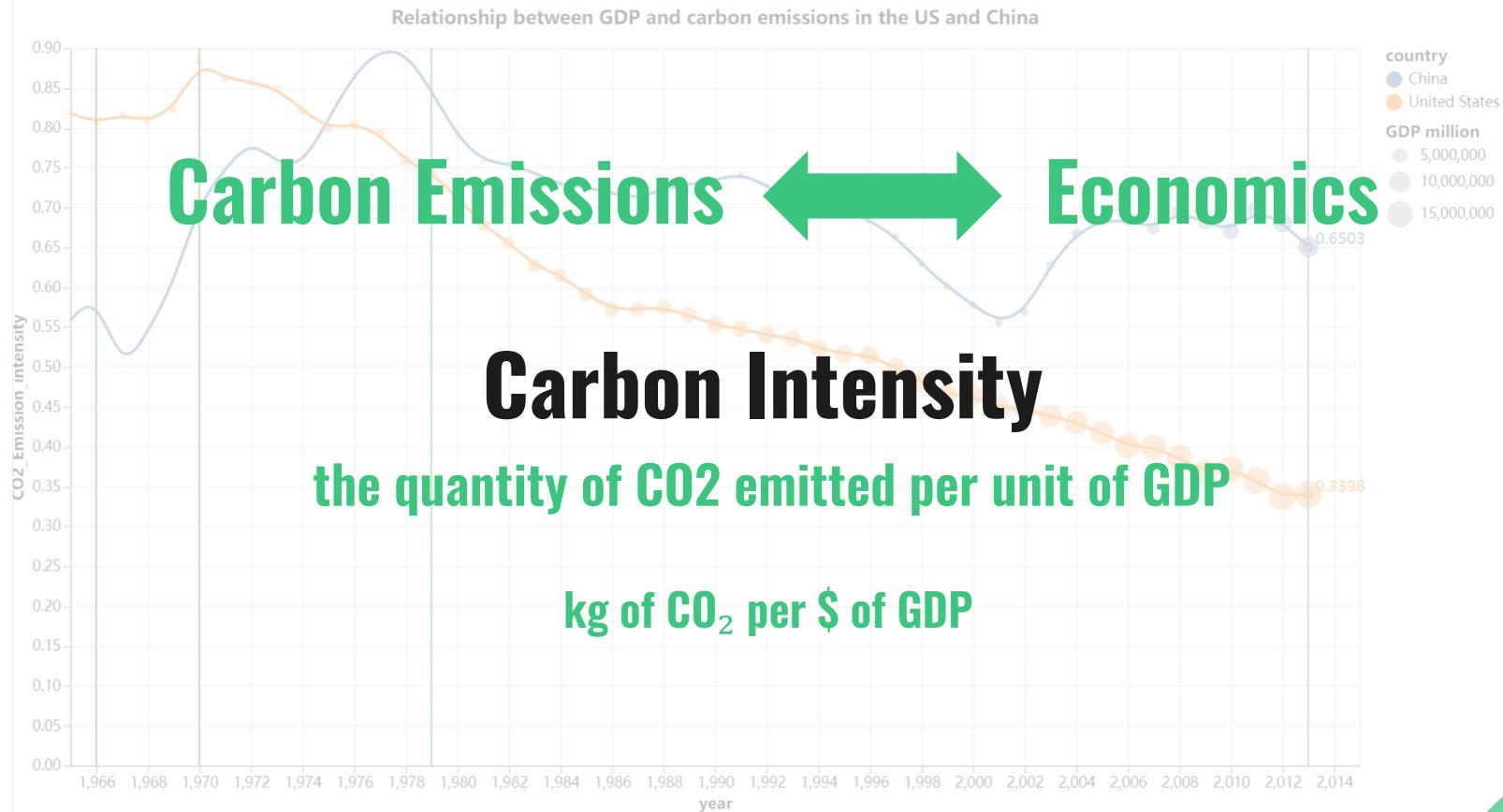


# Visualisations: GDP the U.S.

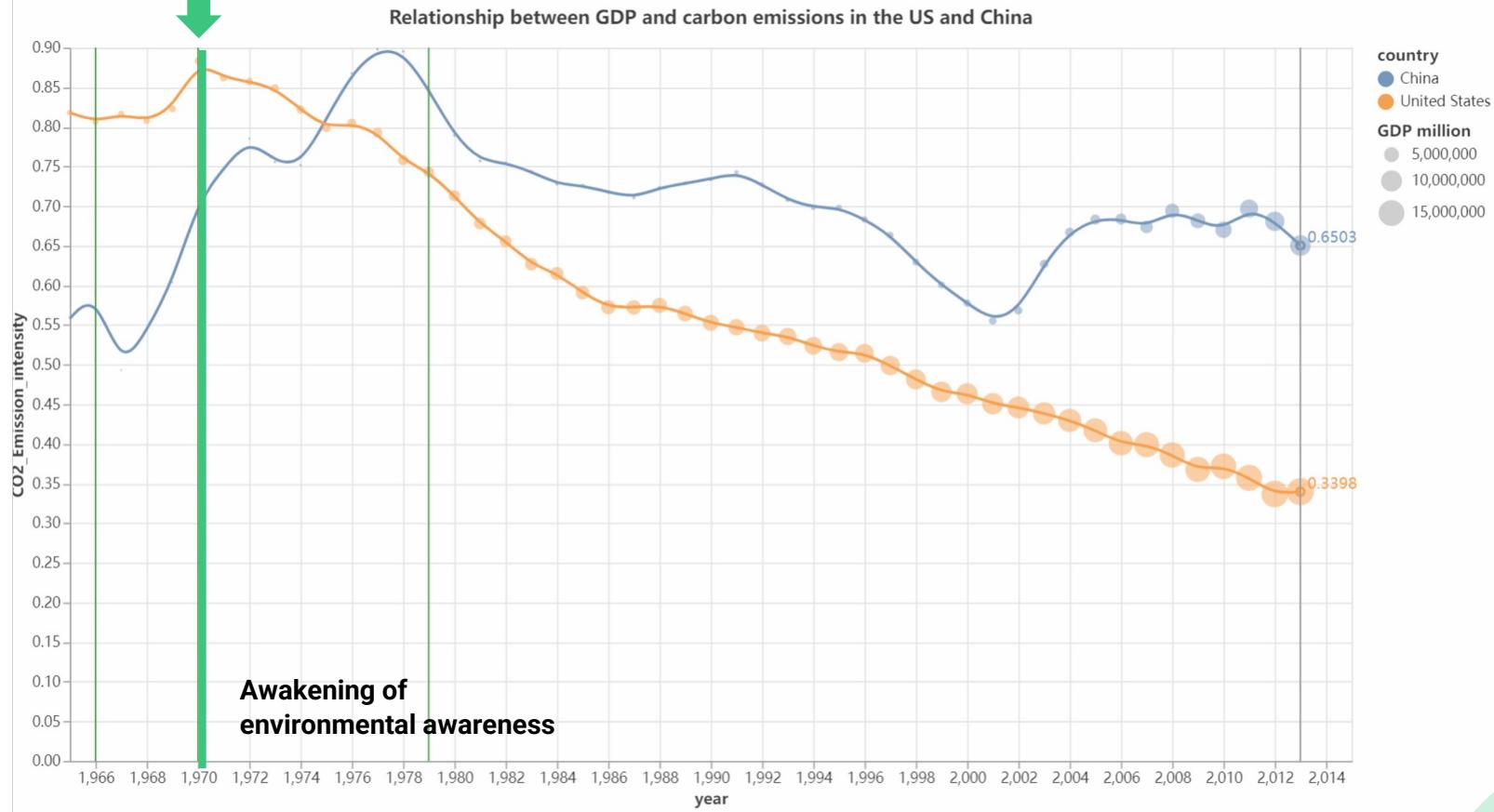


# Visualisations: Carbon Intensity

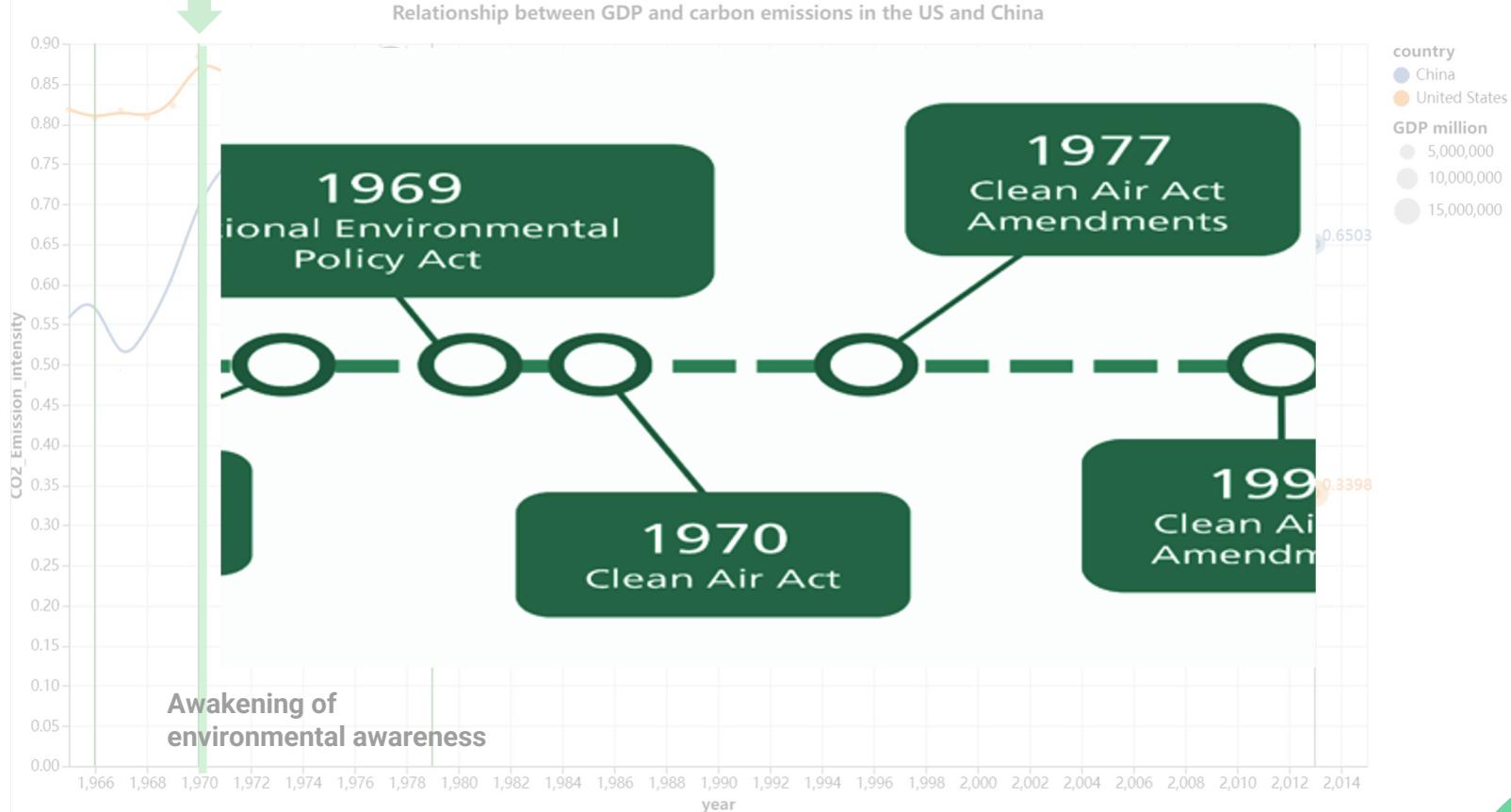




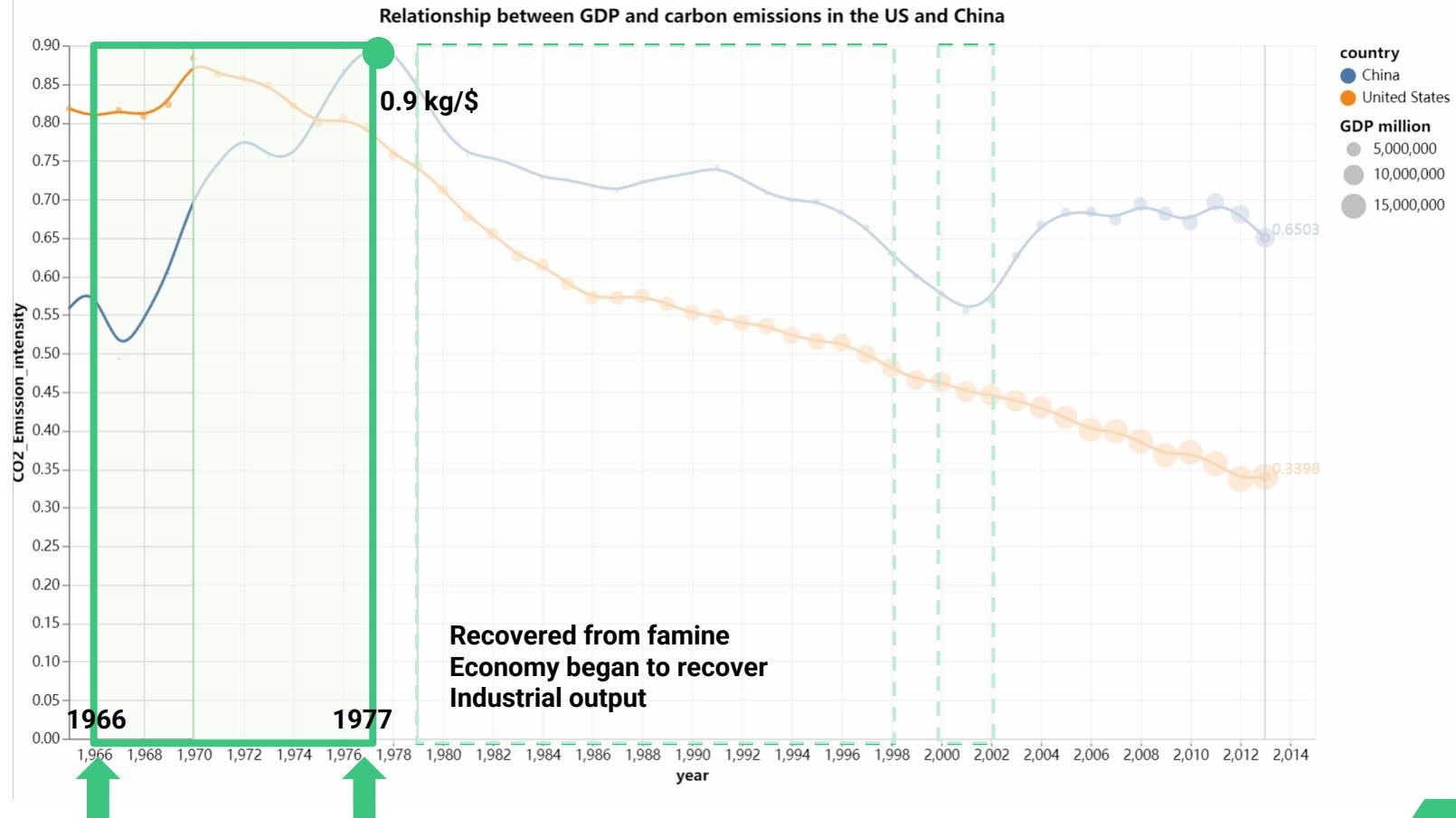
# Visualisations: Carbon Intensity



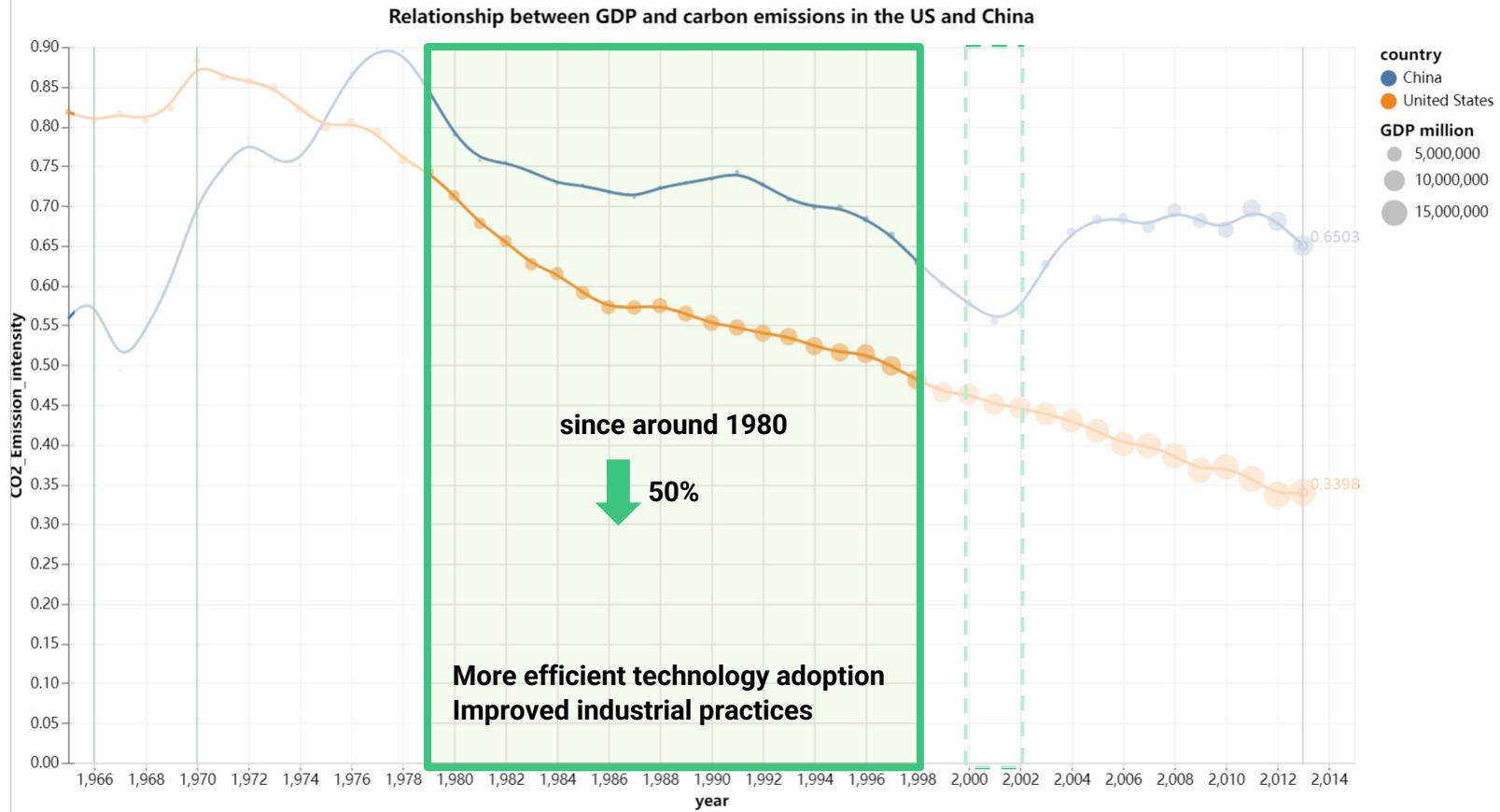
# Visualisations: Carbon Intensity



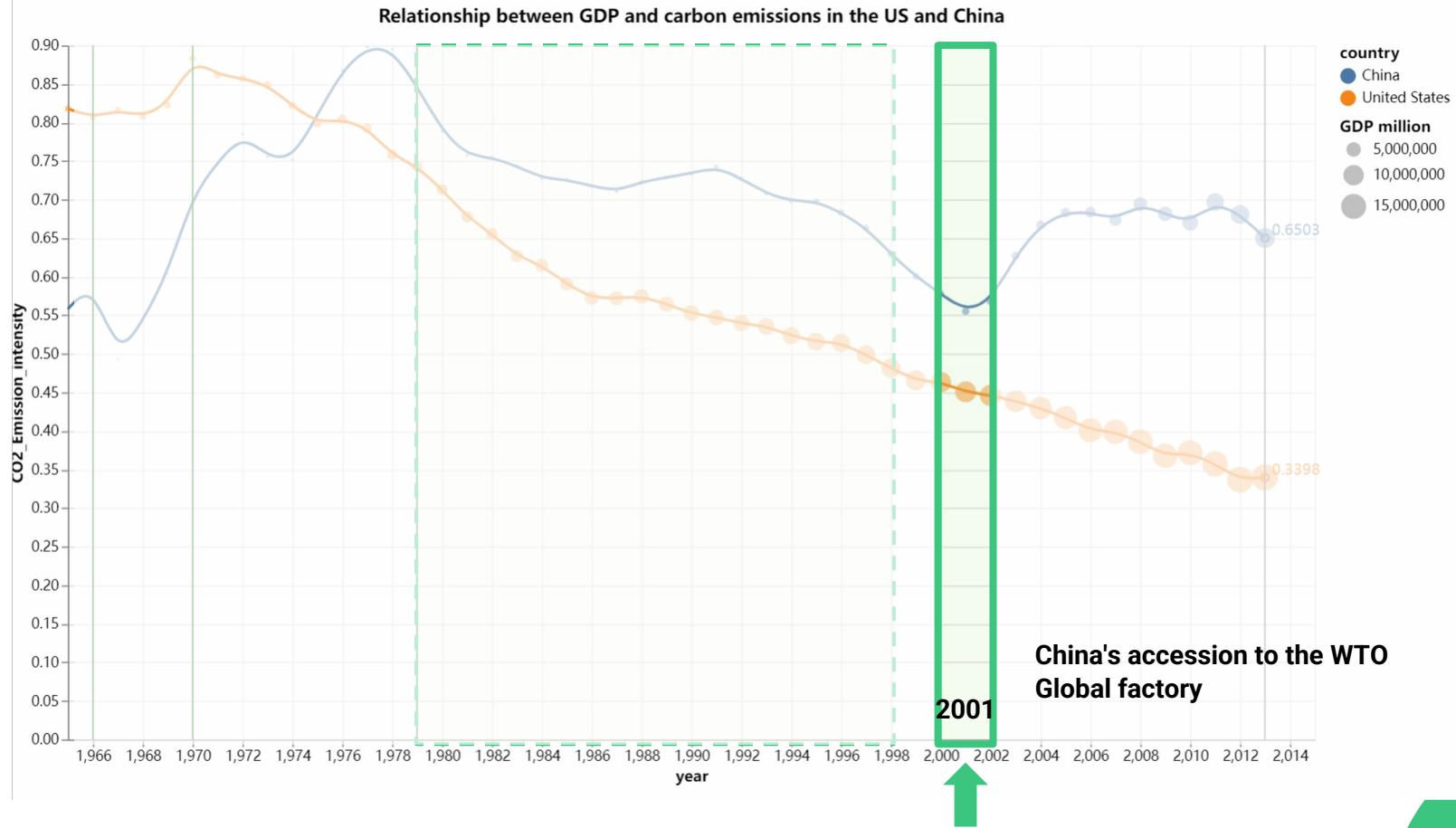
# Visualisations: Carbon Intensity



# Visualisations: Carbon Intensity



# Visualisations: Carbon Intensity



# Summarize

- From energy part:
  - The **United States** has been consuming **the largest** volumes of the energies since the year, 1965. The United States heavily depends on the **oil** as its main source of energy production.
  - The trends in the energy usage in **China** gradually increases throughout the years. The percentage of the low carbon consumption in China increased with time, but the **coal** is still the main source of energy.
- From GDP part:
  - The increment of GDP in **China** is noticeable particularly from **1990 to 2020**. And both the GDP in China and the US vary by each province (state).

# Summarize

- From the relation between economy, energy, and environment:
  - They are all **positively correlated** to each other. It shows that the country with **higher GDP** are more likely to have **better energy structure** ( use more low carbon energy). As well as the **need for economic development**, **carbon emissions** generally **increase** in line with **GDP**. However, as countries have **transformed** their **industrial and energy structures** in recent years, the **rate of growth in carbon emissions** has **declined**, and even **total carbon emissions** have begun to **fall**.
- From the relation between economy and environment:
  - **The quantity of carbon emission per unit of GDP reduction** has been driven by both **high income** and **transitioning economies**, with many countries across **Europe** and **North America** peaking prior to **1970** and **developing nations** peaking later in the **20th century**.

# Thank You



**Do you have any questions?**