THE ECONOMICS OF CLIMATE CHANGE

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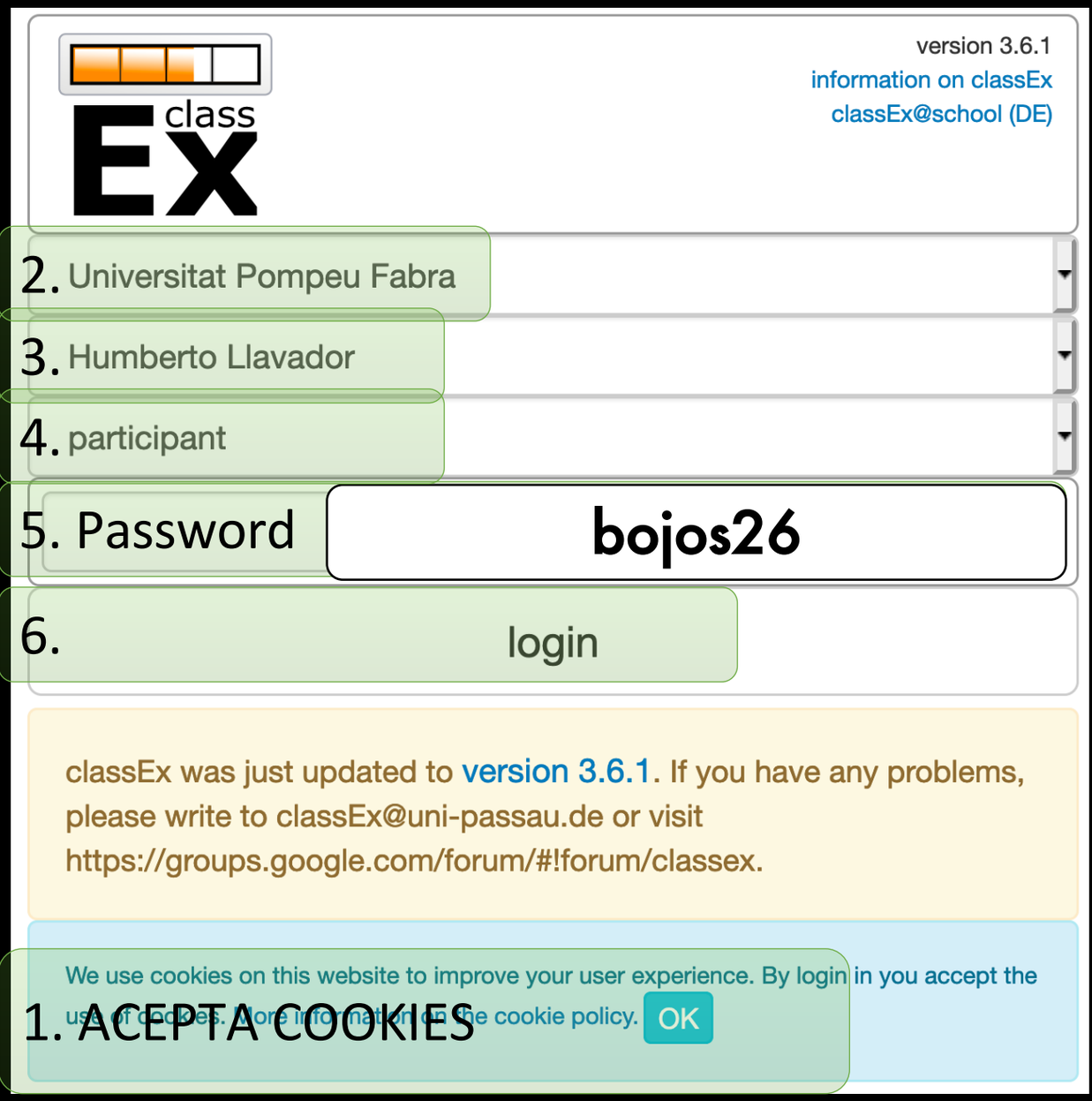

https://classex.uni-passau.de/

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Pescando en el lago y la tragedia de los comunes

El experimento es un ejemplo de la tragedia de los bienes comunes

- Elementos:
  - El lago es un bien común: no se puede excluir a nadie
  - Las capturas generan una externalidad negativa que las y los pescadores no tienen en cuenta.

Problemas de coordinación en la explotación

Nadie se hace cargo

Soberexplotación

Si asignamos la propiedad, problemas de distribución y asignación del uso

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Pescando en el lago y el Cambio climático

El experimento es un ejemplo de la tragedia de los bienes comunes

- Semejanzas entre el experimento y el cambio climático
- Diferencias entre el experimento y el cambio climático

  - ✓ Las emisiones de gases invernadero generan una externalidad negativa → Soberexplotación
  - ✓ La atmósfera es un bien común → Problemas de coordinación en la explotación. Nadie se hace cargo

  - ✖ En el cambio climático tratamos con un bien global
  - ✖ Los efectos tienen efectos a muy largo plazo

Las generaciones futuras no están presentes para expresar su opinión, y las presentes son las que han de tomar las decisiones

Necesidad de instituciones mundiales

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Cambio climático y la Economía

Un cambio en la temperatura media global causado por las emisiones antropogénicas.

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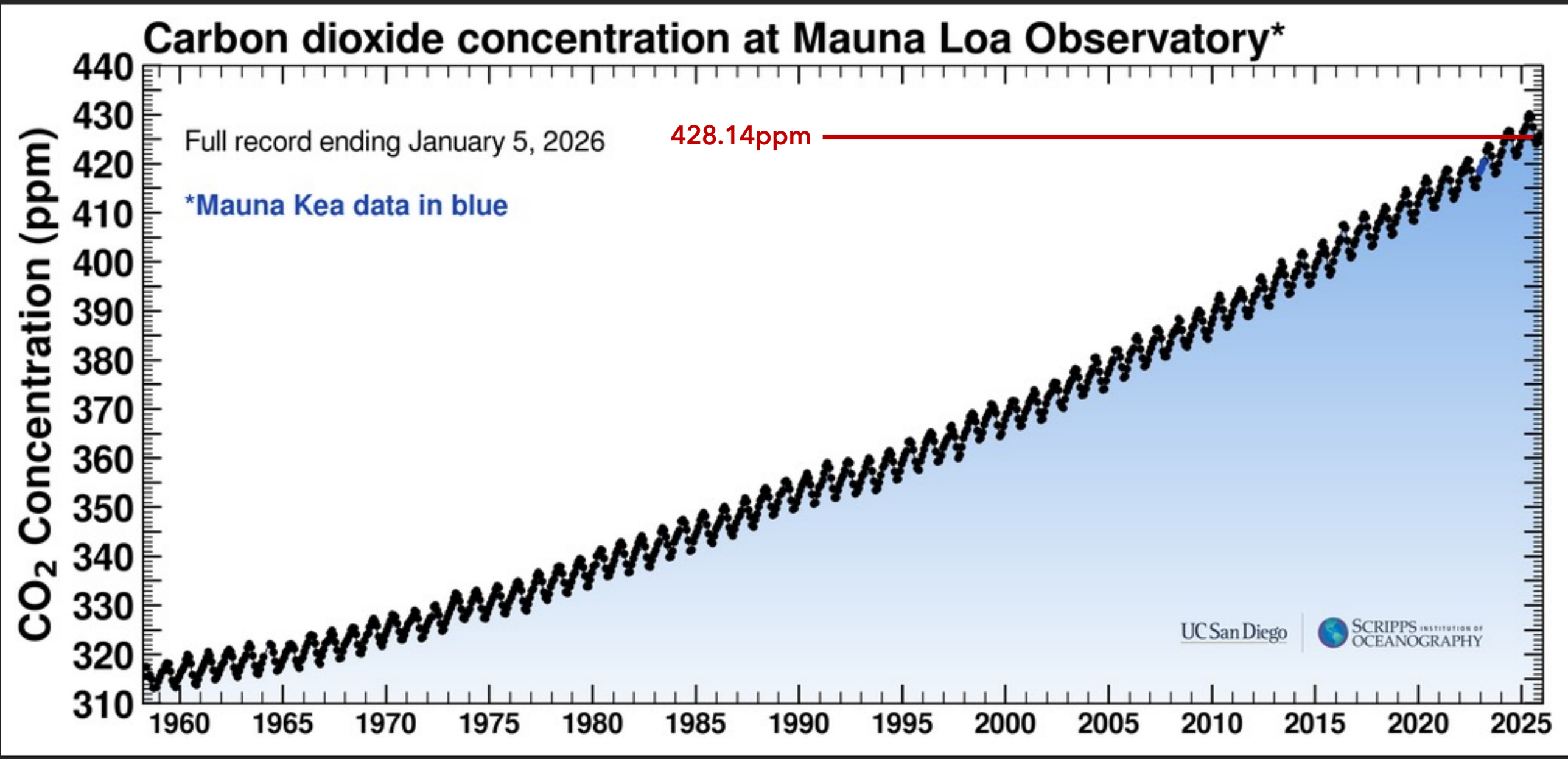
CONCENTRACIÓN DE CO2 EN LA ATMÓSFERA

THE (CHARLES DAVID) KEELING CURVE – UC-SAN DIEGO



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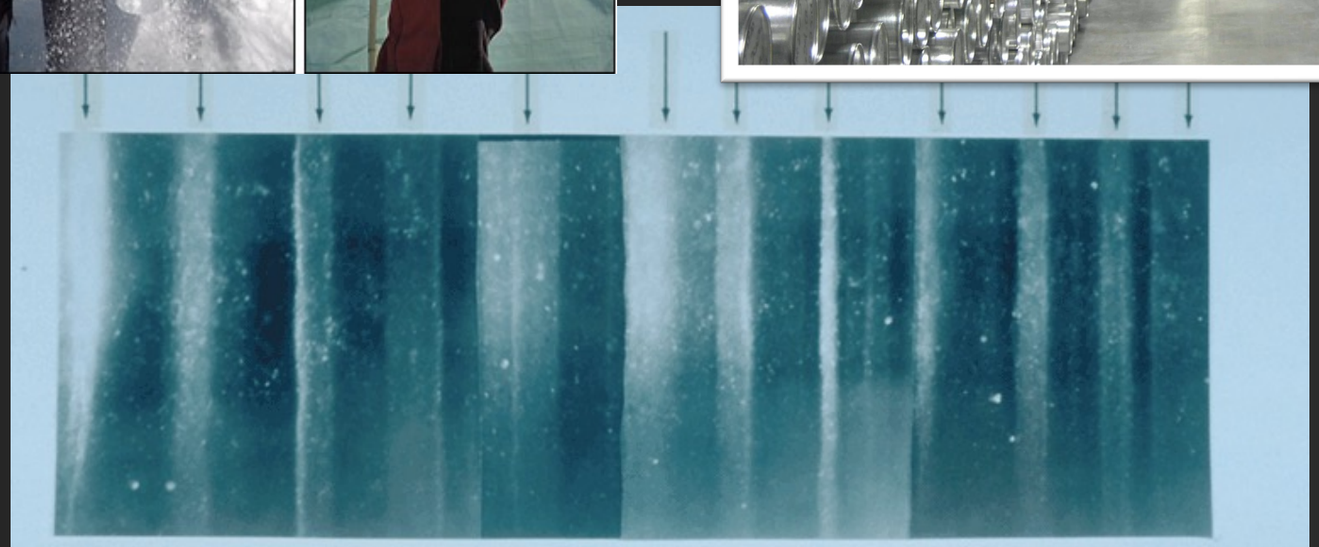
Medición de la temperatura y de la concentración de CO2 con núcleos de hielo (ice-cores)



19 cm long section of GISP 2 ice core from 1855 m showing annual layer structure illuminated from below by a fiber optic source. Section contains 11 annual layers with summer layers (arrowed) sandwiched between darker winter layers.

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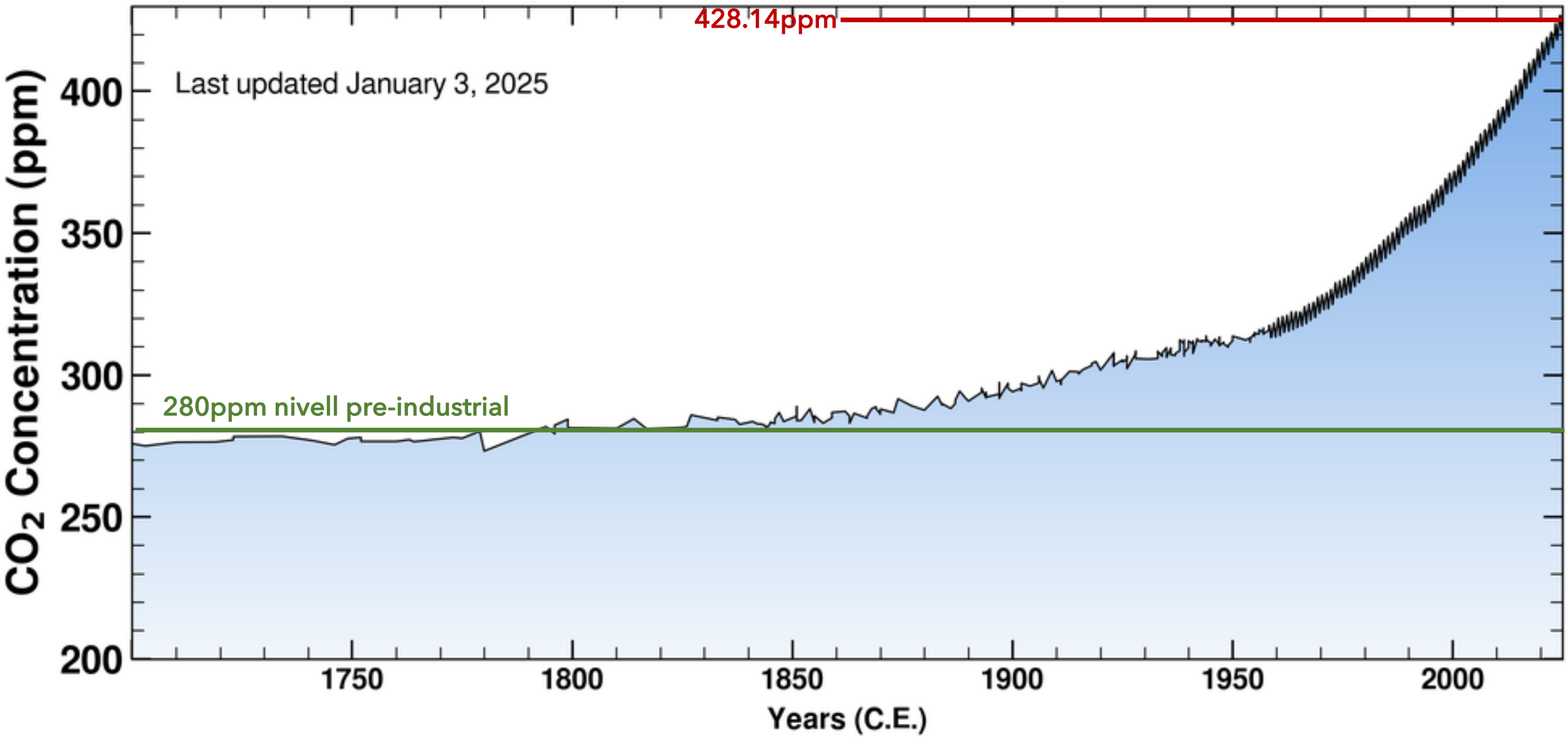
Concentración de CO_2 en la atmósfera

THE KEELING CURVE + ICE-CORES



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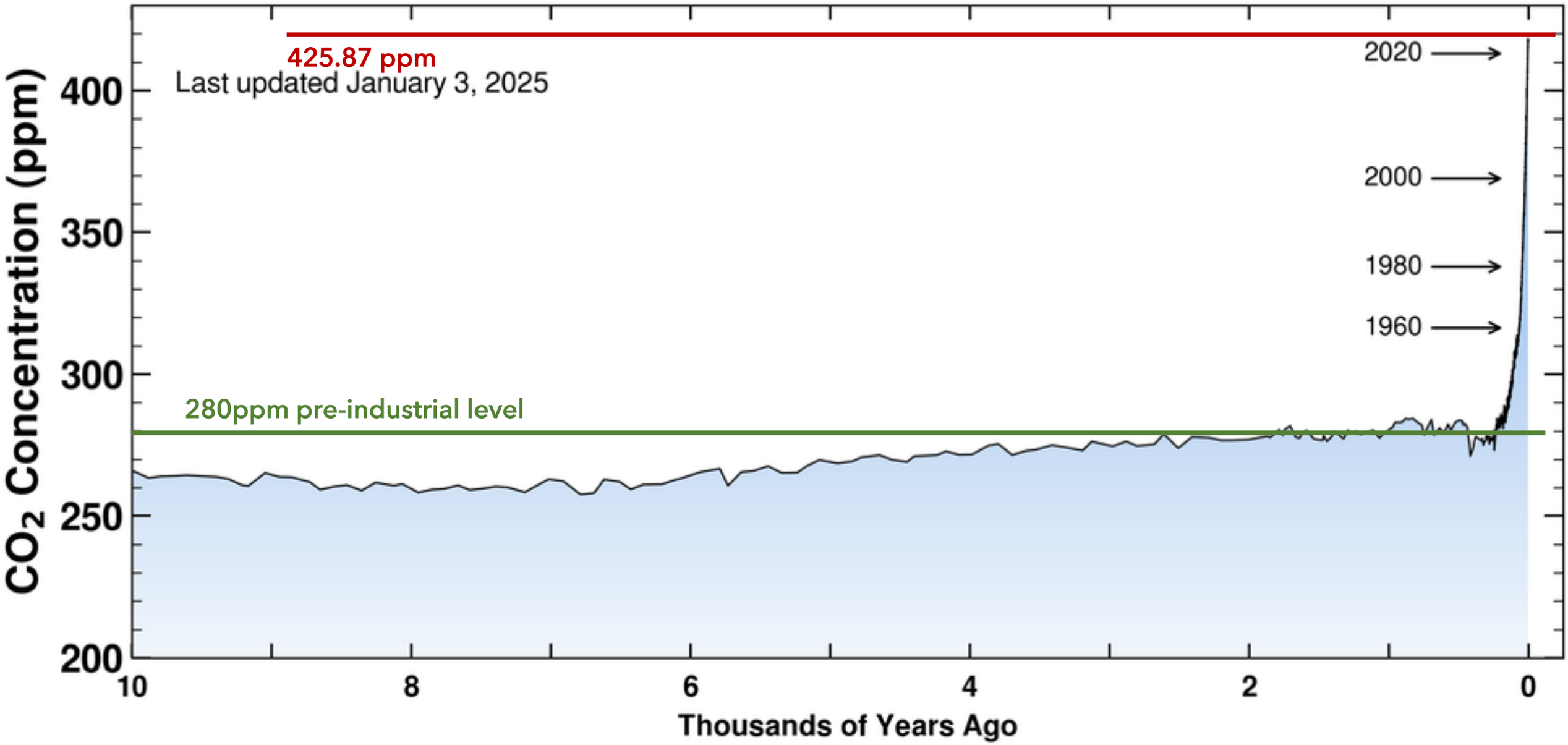
CONCENTRACIÓN DE CO_2 EN LA ATMÓSFERA

THE KEELING CURVE + ICE-CORES



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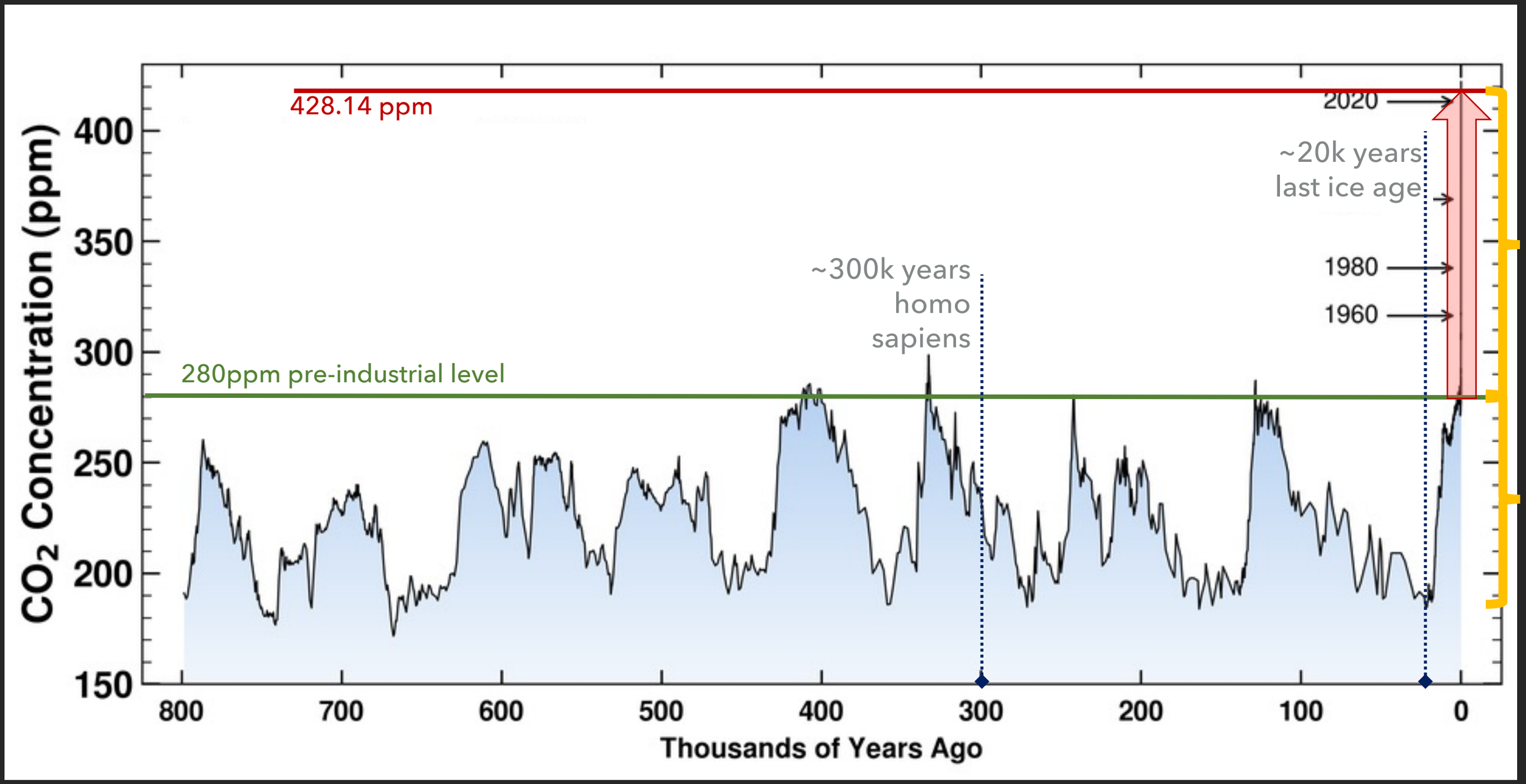
CONCENTRACIÓN DE CO_2 EN LA ATMÓSFERA

THE KEELING CURVE + ICE-CORES



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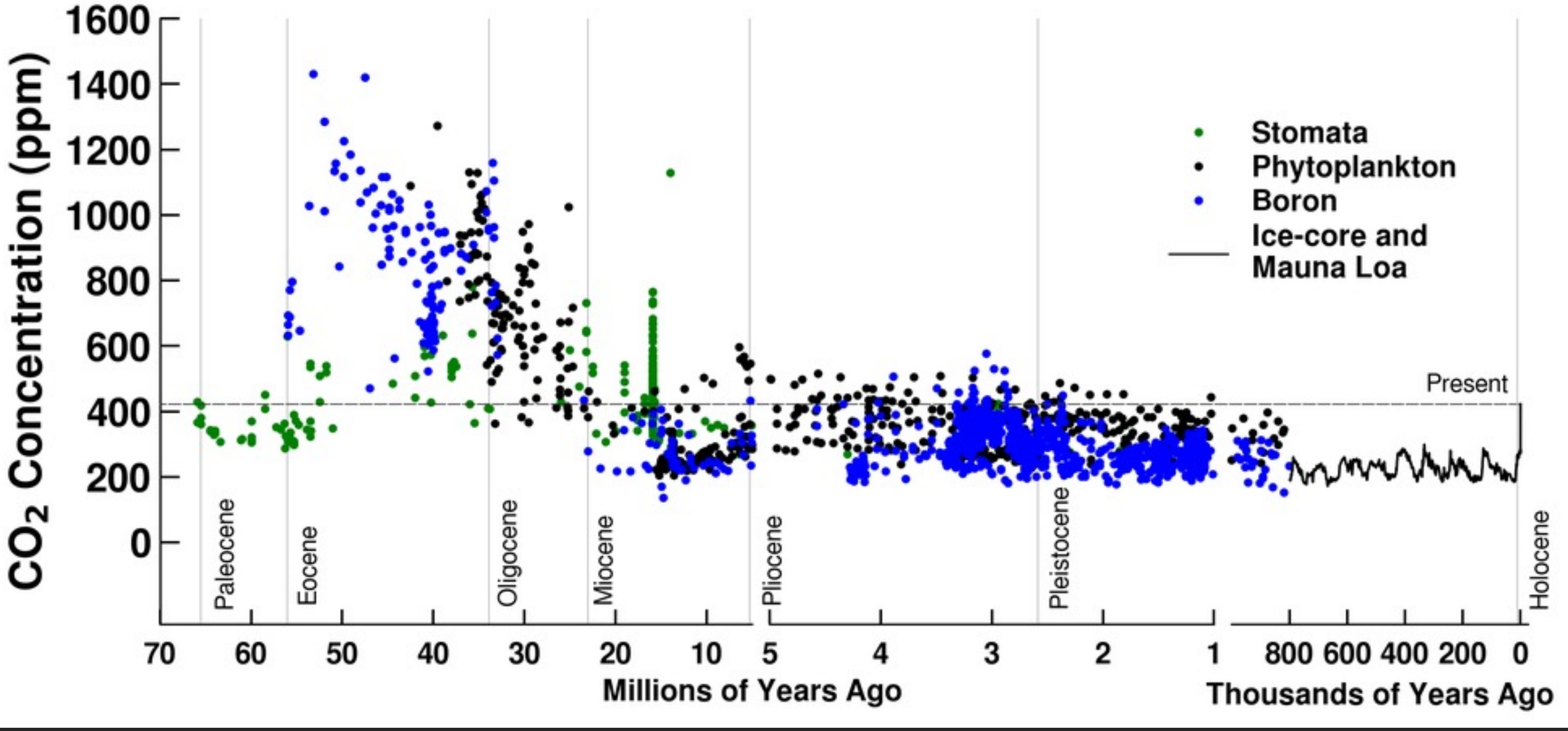
CONCENTRACIÓN DE CO_2 EN LA ATMÓSFERA



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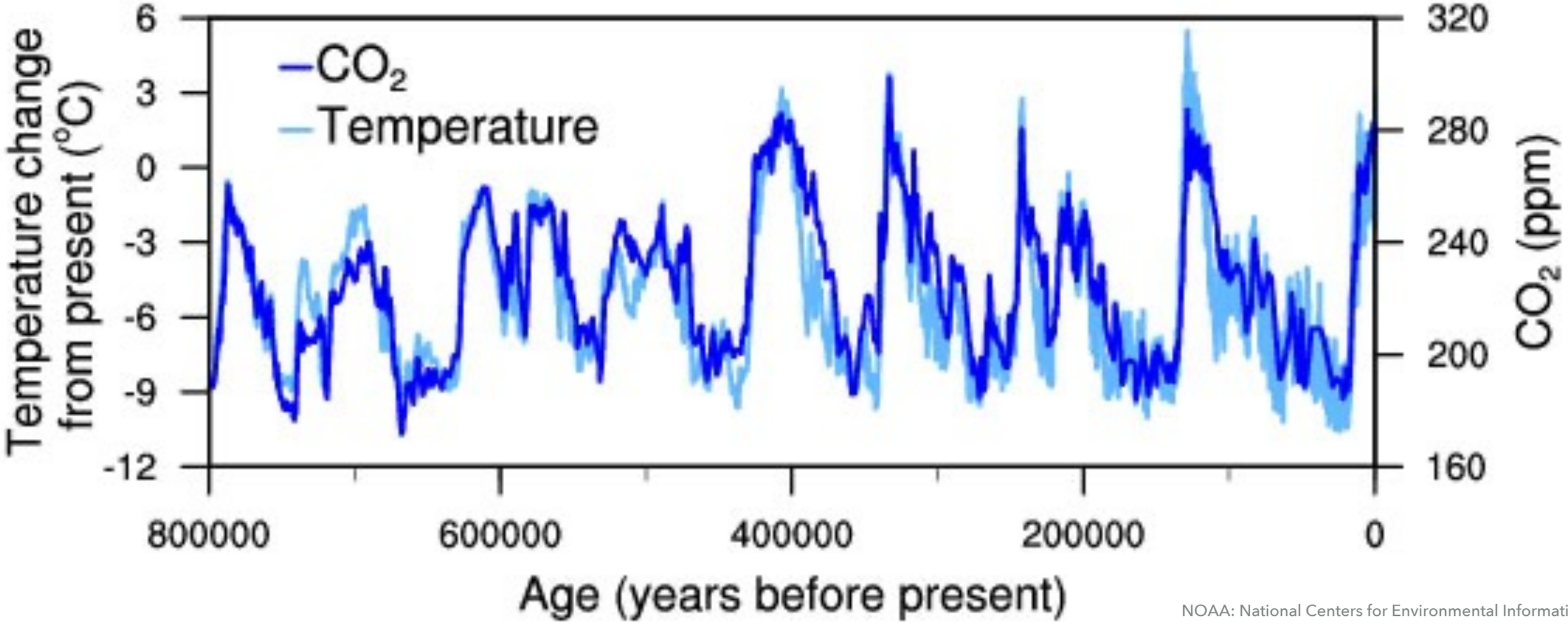

NOAA: National Centers for Environmental Information

La temperature se mueve con la concentración de CO_2 en la atmósfera

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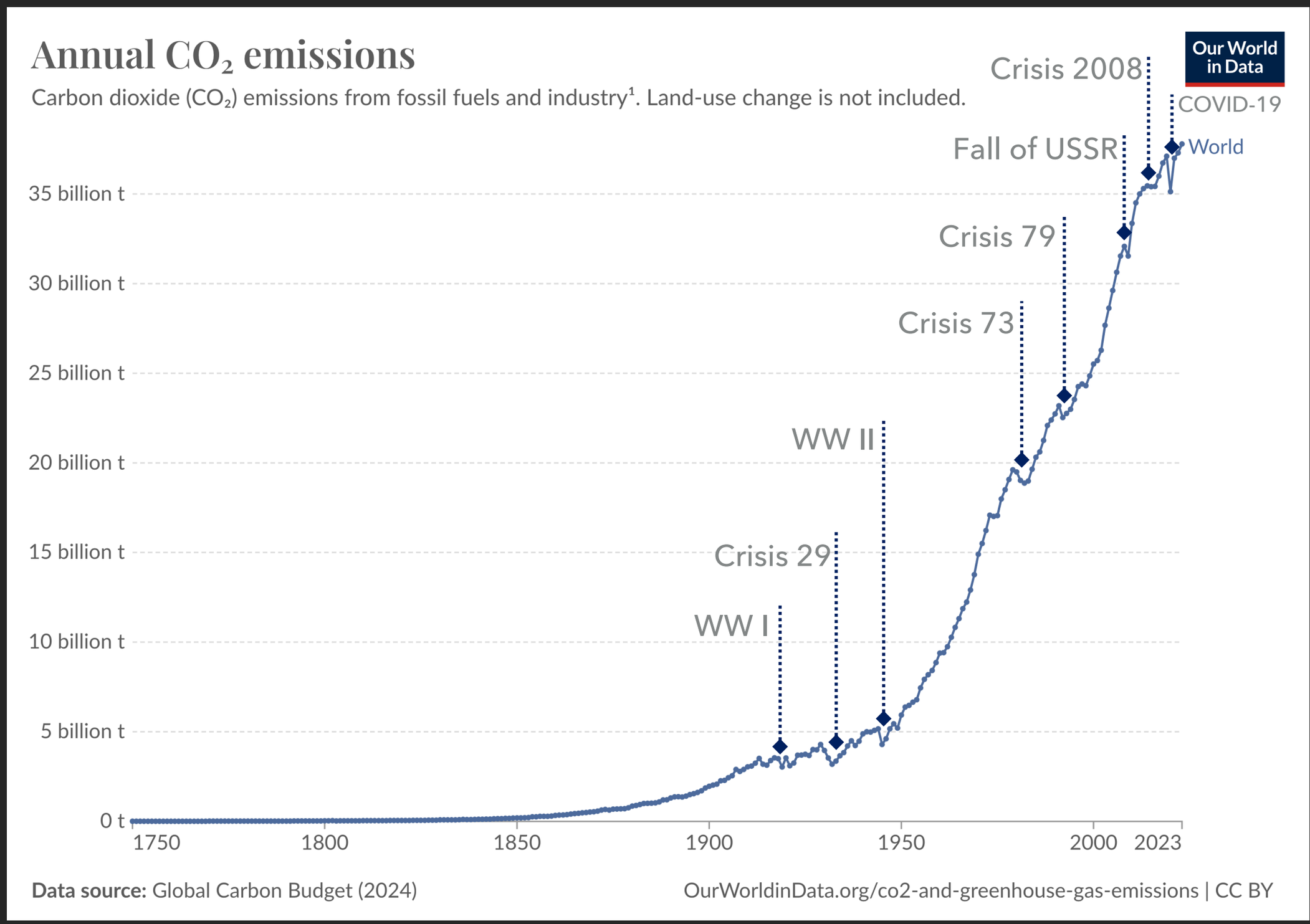
LAS EMISIONES ESTÁN ESTRECHAMENTE LIGADAS A LA ACTIVIDAD ECONÓMICA



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Es necesario reducir las emisiones y establecer una economía de cero emisiones netas

El aumento de temperatura es proporcional a las emisiones globales acumuladas

Hay un "presupuesto de carbono" asociado a cada objetivo

Existe una relación casi-lineal entre las emisiones antropogénicas de CO_2 y el aumento de la temperatura en el "corto plazo"

Cada 1000 $GtCO_2$ la temperature aumenta ~0.45°C

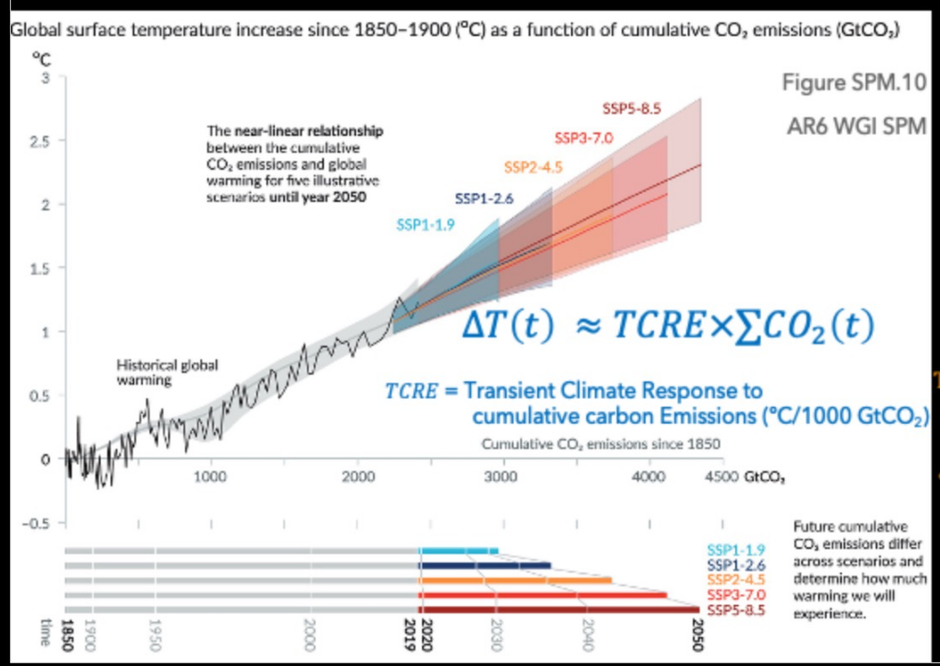


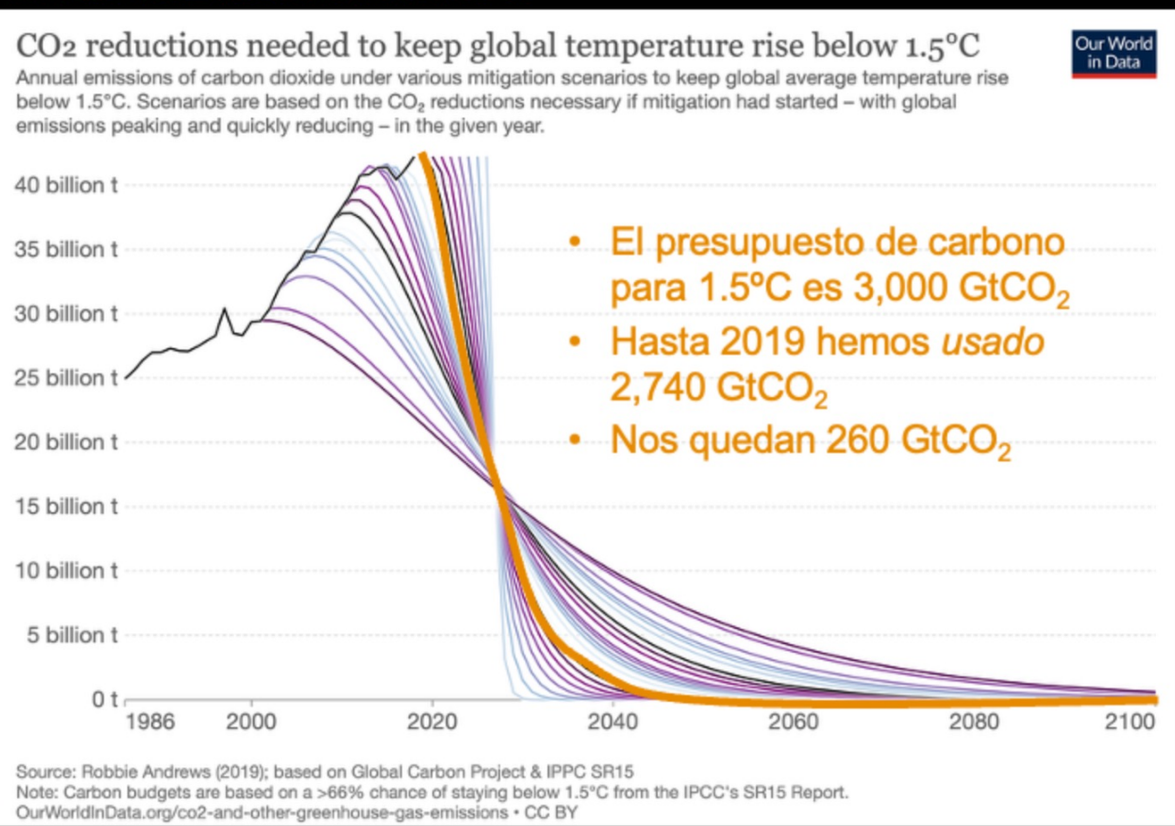
Figure SPM.10

AR6 WGI SPM

$TCRE \in [0.27, 0.62]$

Best estimate 0.45 °C/1000 $GtCO_2$

Sendas de Emisiones para 1.5°C



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Existe una relación casi–lineal entre las emisiones antropogénicas de CO_2 y el aumento de la temperatura en el "corto plazo"

Cada 1000 $GtCO_2$ la temperature aumenta ~0.45ºC

Global surface temperature increase since 1850–1900 (°C) as a function of cumulative CO_2 emissions ($GtCO_2$)

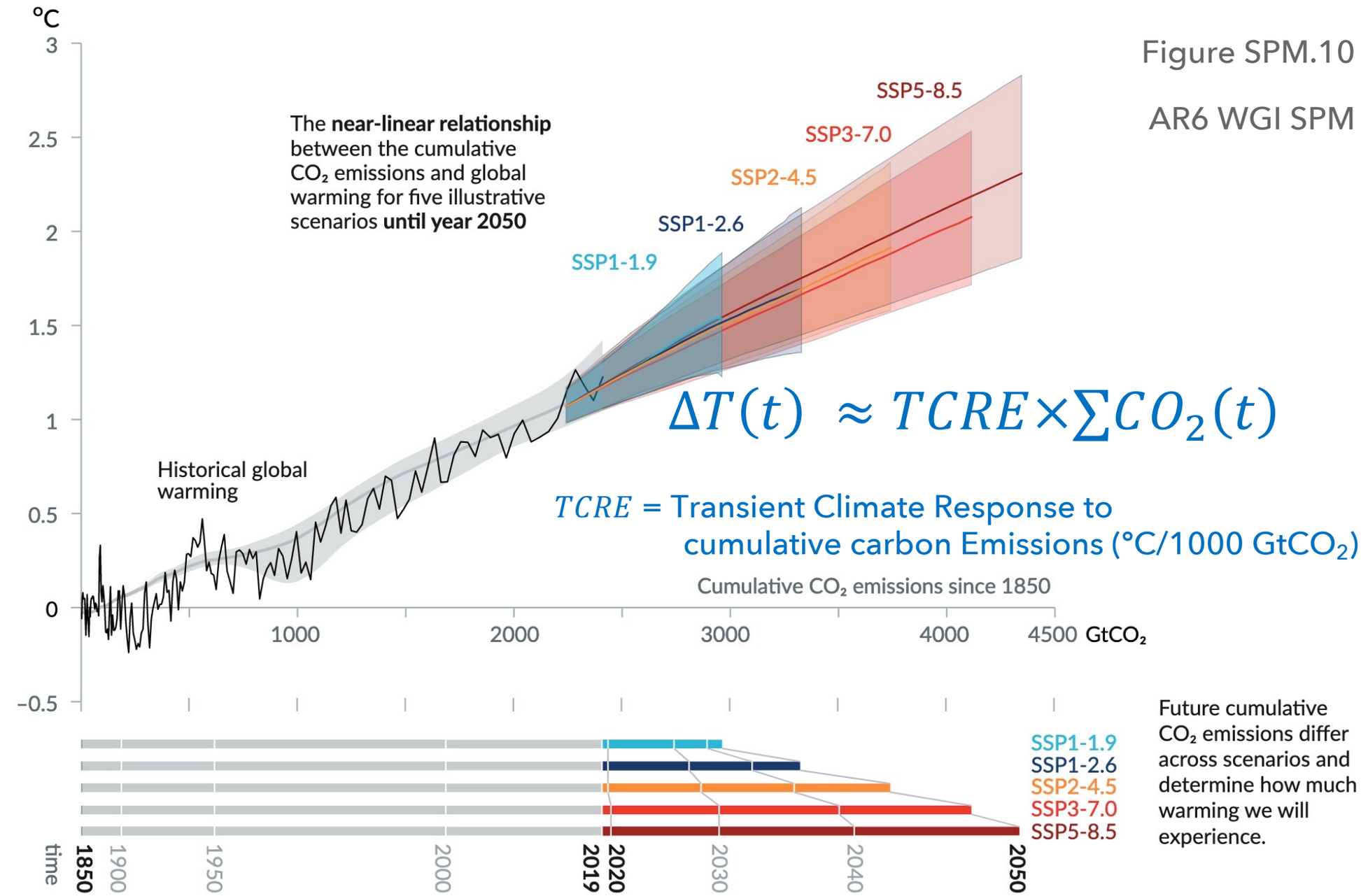


Figure SPM.10

AR6 WGI SPM

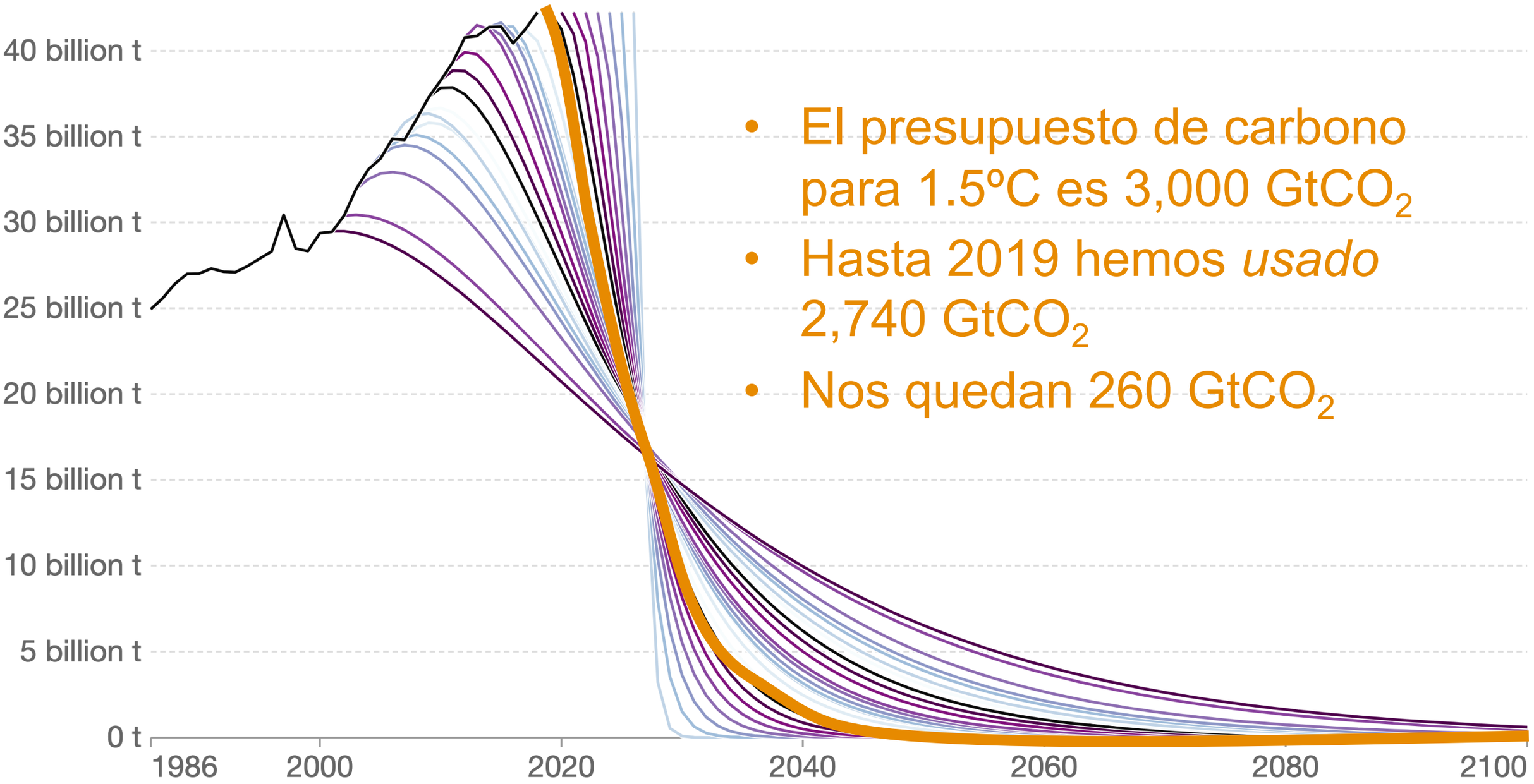
$\mathrm{TCRE} \in [0.27, 0.62]$

Best estimate
0.45
°C/1000 $GtCO_2$

Sendas de Emisiones para 1.5ºC

CO_2 reductions needed to keep global temperature rise below 1.5°C

Annual emissions of carbon dioxide under various mitigation scenarios to keep global average temperature rise below 1.5°C. Scenarios are based on the CO_2 reductions necessary if mitigation had started – with global emissions peaking and quickly reducing – in the given year.



- El presupuesto de carbono para 1.5ºC es 3,000 $GtCO_2$
- Hasta 2019 hemos *usado* 2,740 $GtCO_2$
- Nos quedan 260 $GtCO_2$

Source: Robbie Andrews (2019); based on Global Carbon Project & IPPC SR15
Note: Carbon budgets are based on a >66% chance of staying below 1.5°C from the IPCC's SR15 Report.
OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

¿Cómo Podemos Reducir las Emisiones?

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What determines total CO_2 emissions?

The 'Kaya Identity' breaks down total emissions into the key elements driving them.

Our World in Data

Total CO_2 emissions = **Population** x **CO_2 emissions per person**

Income
Goods and services per person (measured in $)

x

Technology
CO_2 emissions per $

Energy intensity
Energy consumed per $

x

Carbon intensity
CO_2 emitted per unit of energy consumed.

$$\textit{Total } CO_2 \textit{ emissions} = \textit{Population} \times \frac{\textit{GDP}}{\textit{Population}} \times \frac{\textit{Energy}}{\textit{GDP}} \times \frac{CO_2}{\textit{Energy}}$$

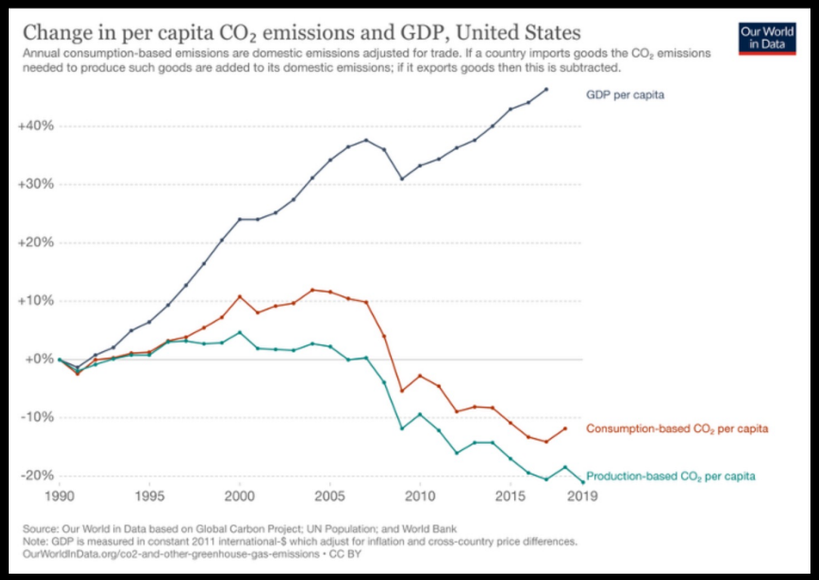
↓ energy intensity by:

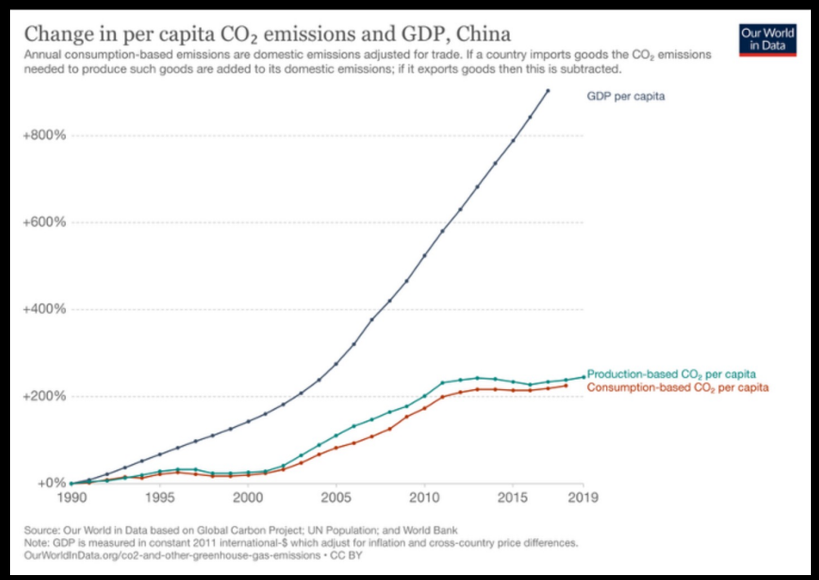
- Improving energy efficiency
- Switching to less intensive industries

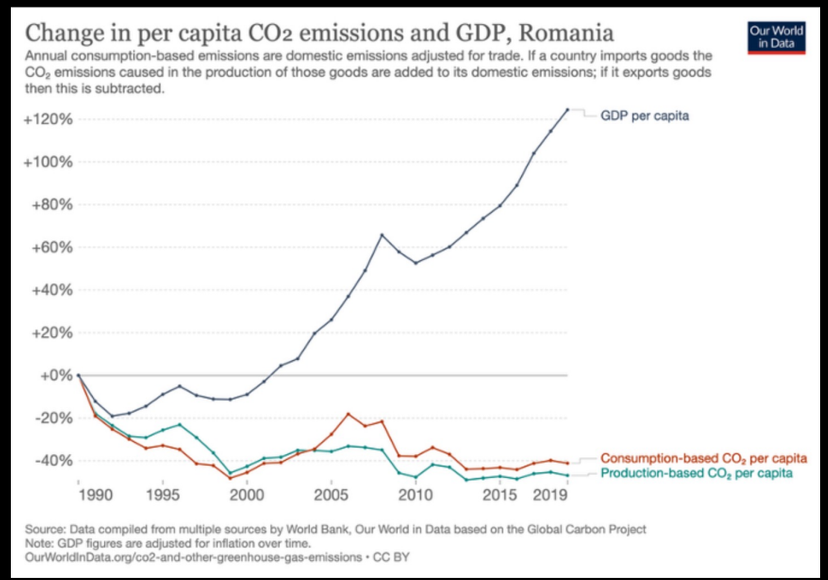
↓ carbon intensity by:

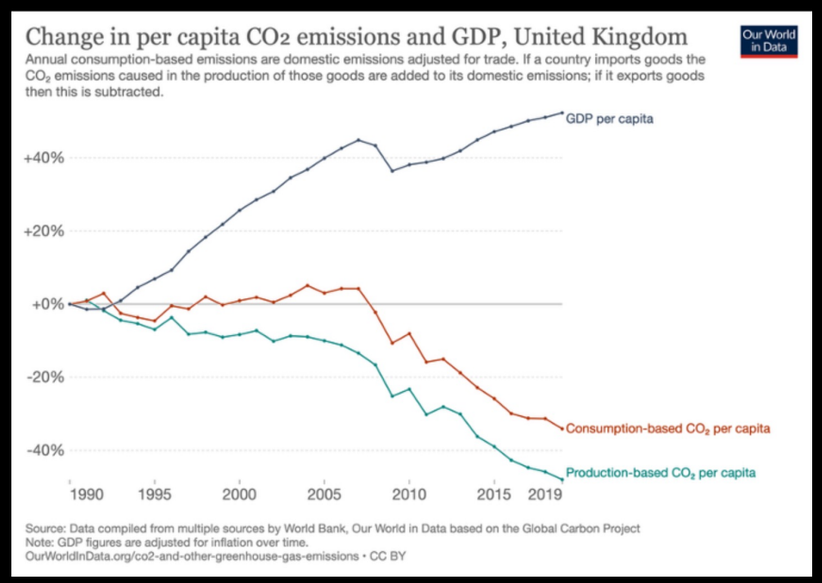
- Switching to renewable energy
- Switching to nuclear energy
- Substituting gas for coal (partial)
- Capturing & storing fossil CO_2 (CCS)

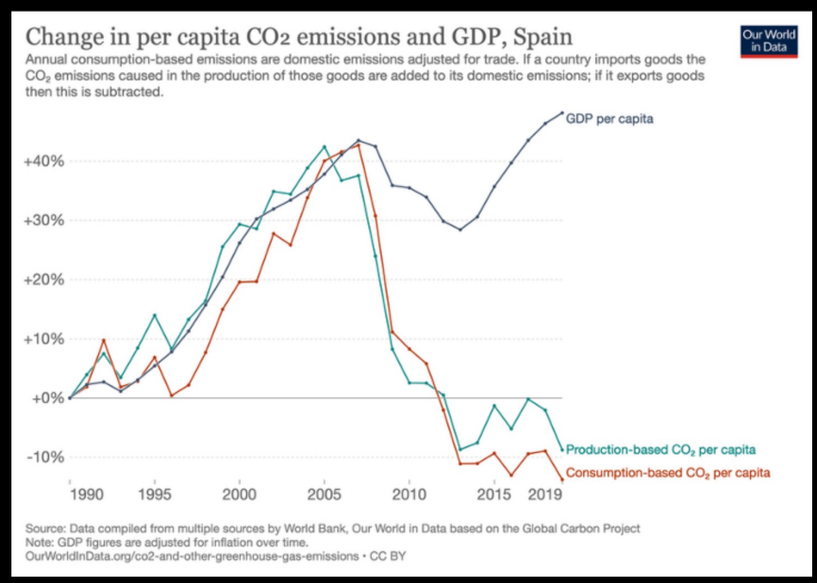
¿SE PUEDE DISOCIAR EL CRECIMIENTO ECONÓMICO DE LAS EMISIONES DE CO_2, SIN TRASLADAR LA PRODUCCIÓN (OFFSHORING) A PARAÍSOS DE EMISIONES?

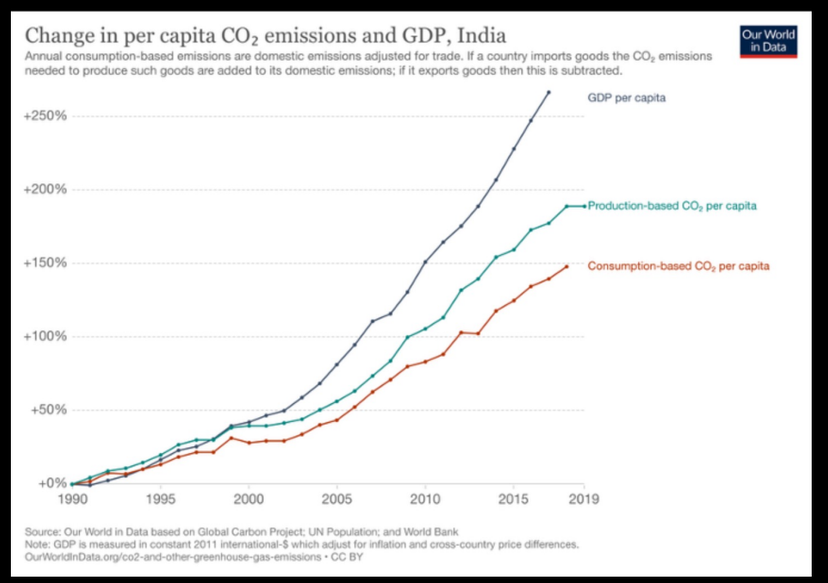












https://ourworldindata.org/grapher/co2-emissions-and-gdp-per-capita?time=1990..2019

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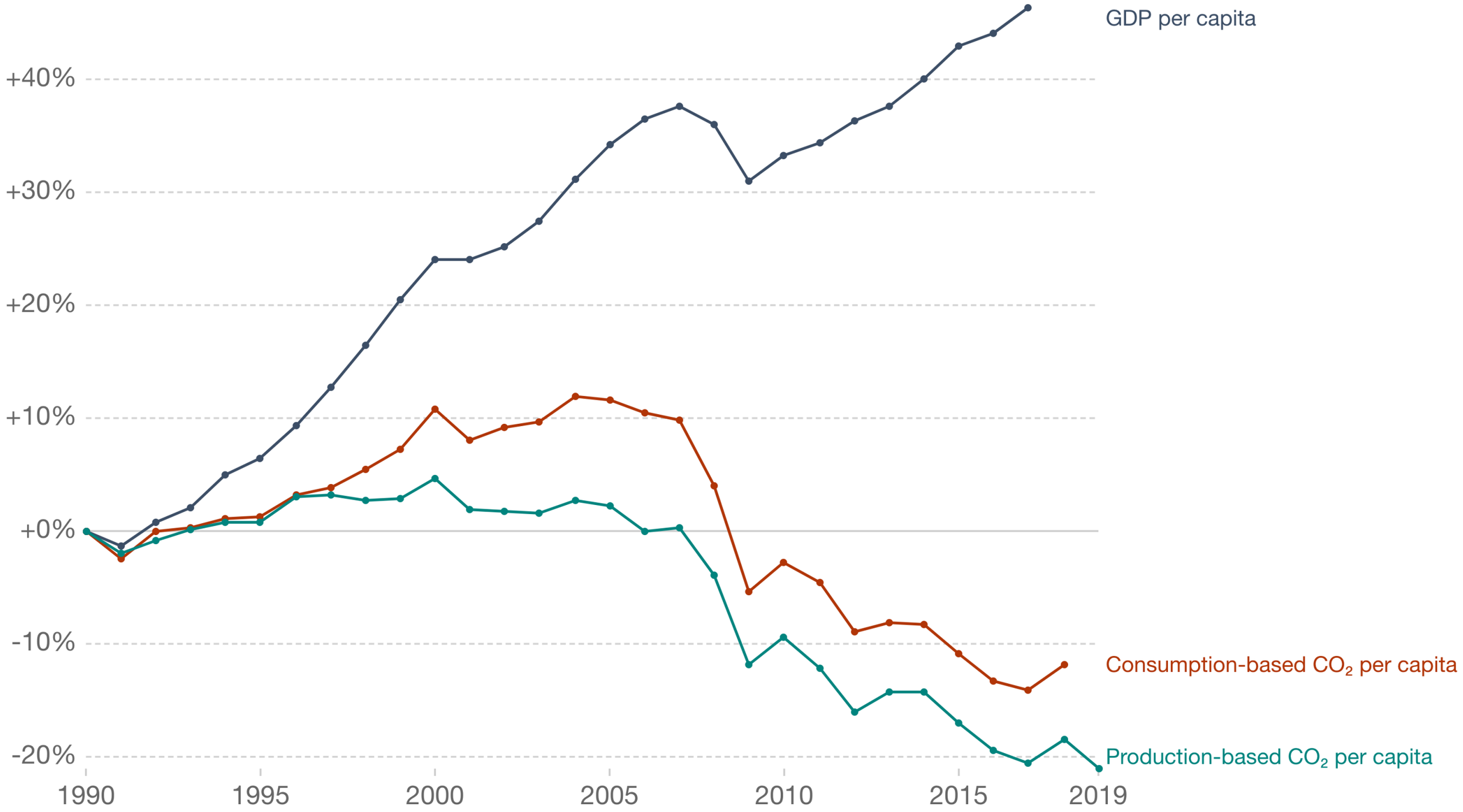
Change in per capita CO_2 emissions and GDP, United States

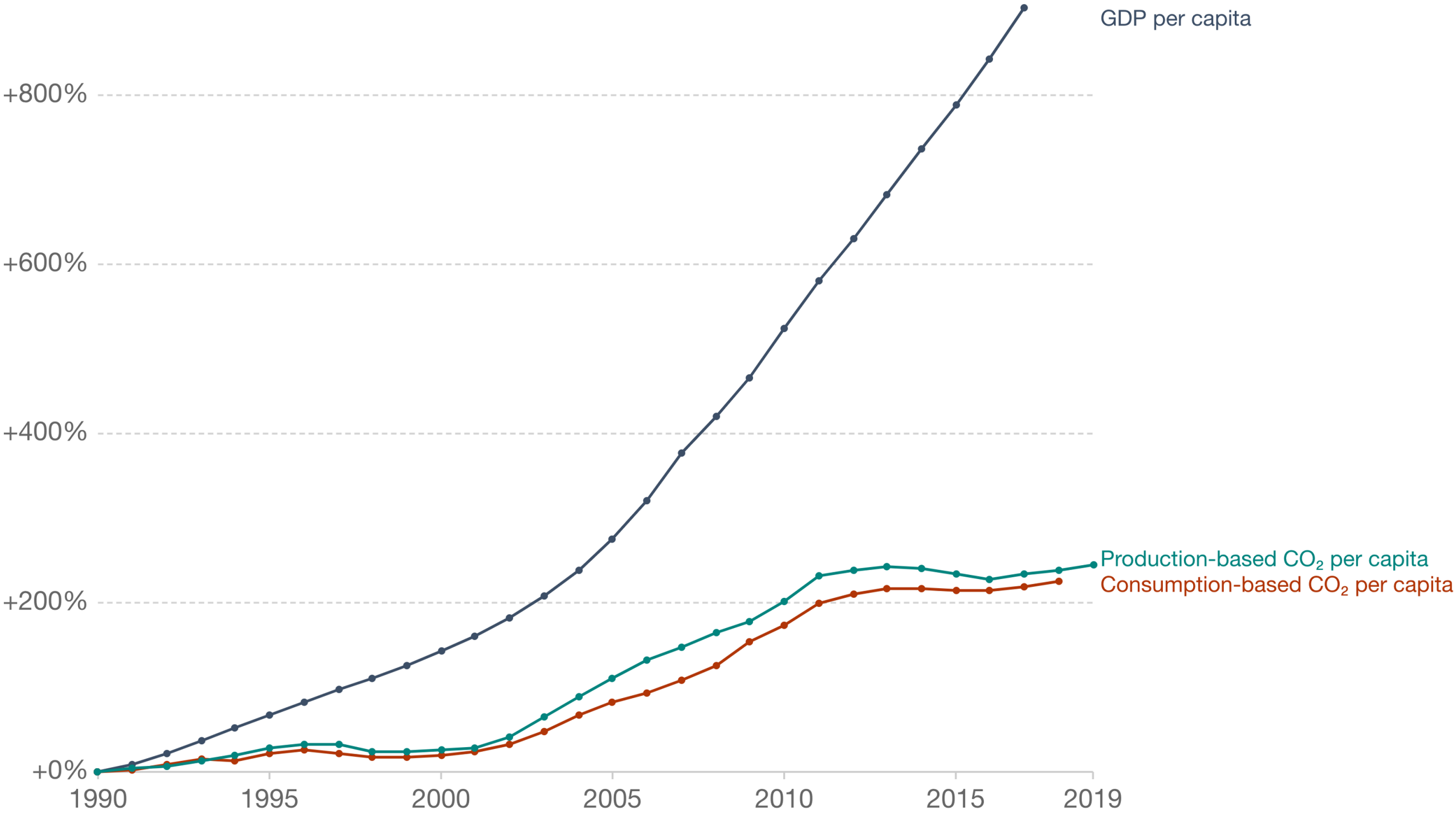
Annual consumption-based emissions are domestic emissions adjusted for trade. If a country imports goods the CO_2 emissions needed to produce such goods are added to its domestic emissions; if it exports goods then this is subtracted.



Source: Our World in Data based on Global Carbon Project; UN Population; and World Bank
Note: GDP is measured in constant 2011 international-$ which adjust for inflation and cross-country price differences.
OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

Change in per capita CO_2 emissions and GDP, China

Annual consumption-based emissions are domestic emissions adjusted for trade. If a country imports goods the CO_2 emissions needed to produce such goods are added to its domestic emissions; if it exports goods then this is subtracted.



Source: Our World in Data based on Global Carbon Project; UN Population; and World Bank
Note: GDP is measured in constant 2011 international-$ which adjust for inflation and cross-country price differences.
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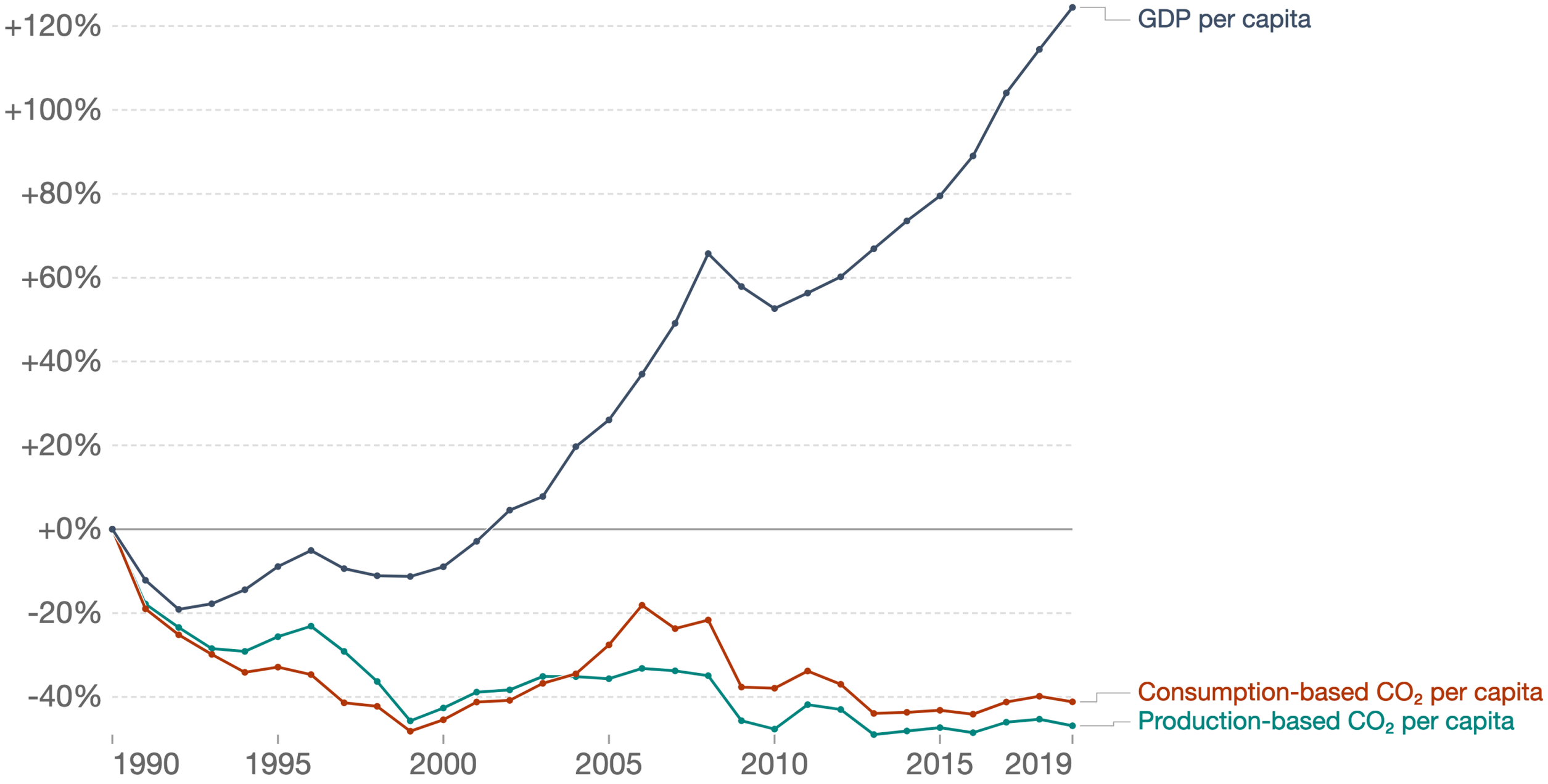
Change in per capita CO_2 emissions and GDP, Romania

Our World in Data

Annual consumption-based emissions are domestic emissions adjusted for trade. If a country imports goods the CO_2 emissions caused in the production of those goods are added to its domestic emissions; if it exports goods then this is subtracted.

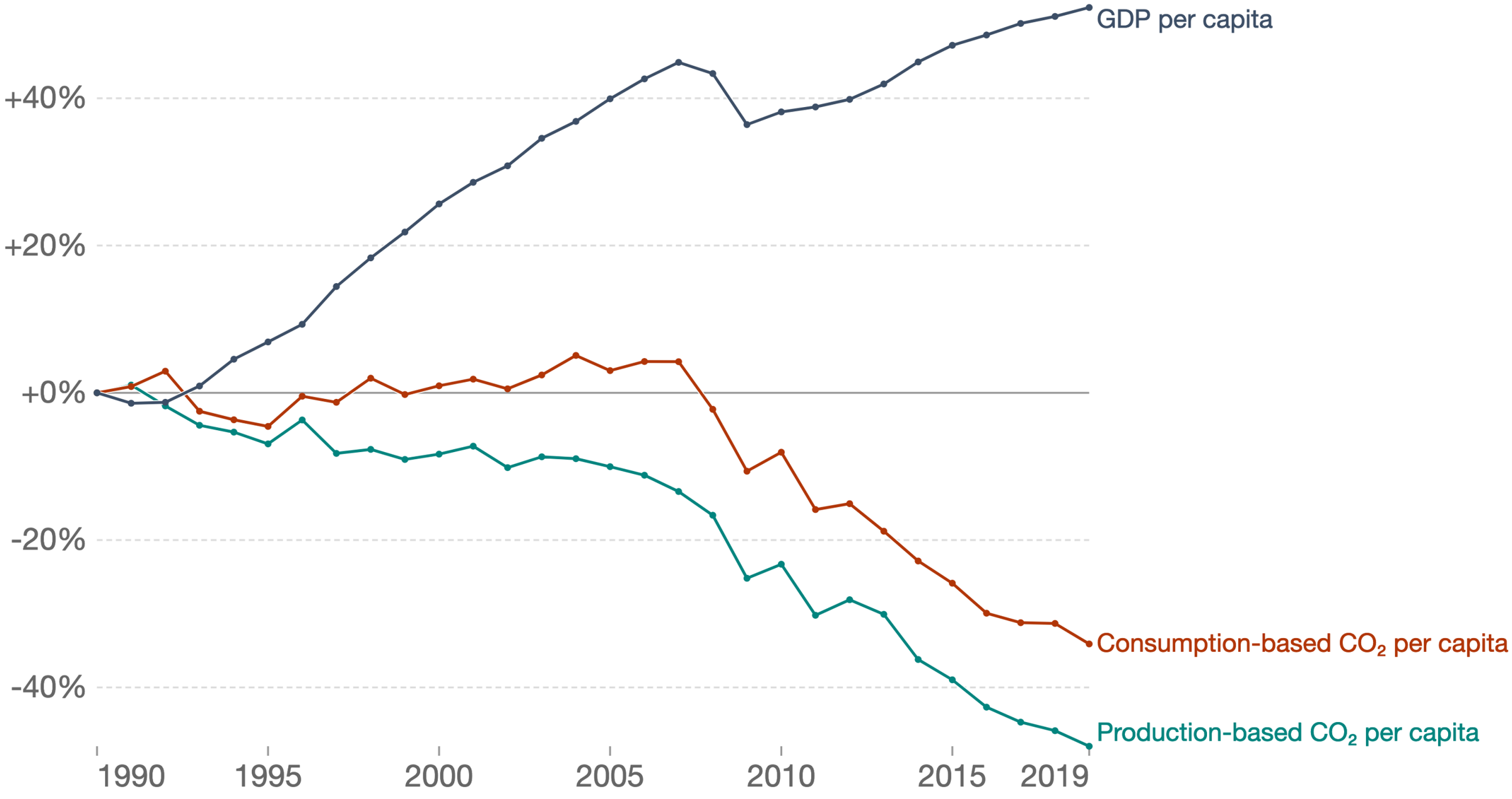


Source: Data compiled from multiple sources by World Bank, Our World in Data based on the Global Carbon Project
Note: GDP figures are adjusted for inflation over time.

Change in per capita CO_2 emissions and GDP, United Kingdom

Our World in Data

Annual consumption-based emissions are domestic emissions adjusted for trade. If a country imports goods the CO_2 emissions caused in the production of those goods are added to its domestic emissions; if it exports goods then this is subtracted.

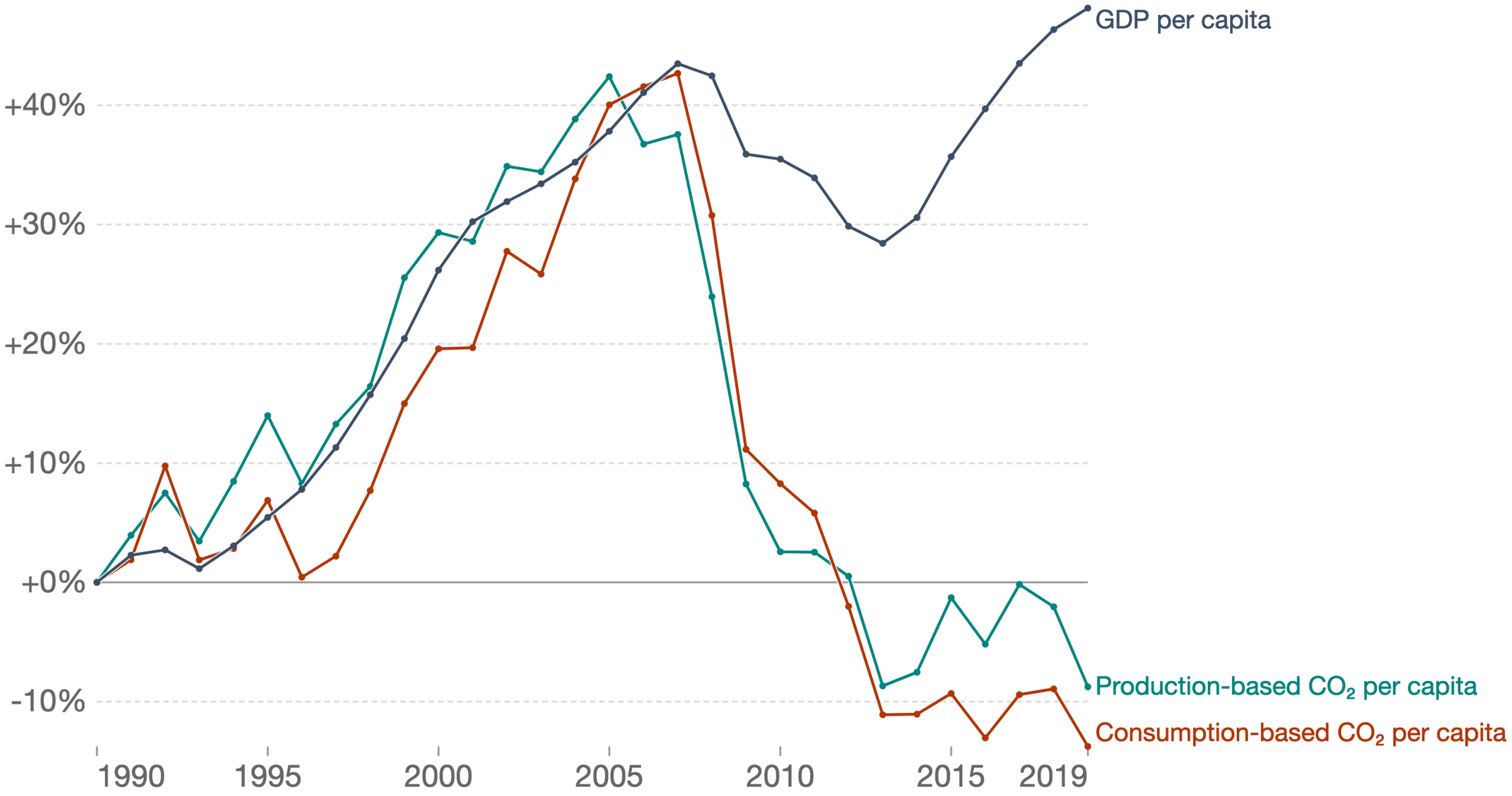


Source: Data compiled from multiple sources by World Bank, Our World in Data based on the Global Carbon Project
Note: GDP figures are adjusted for inflation over time.

Change in per capita CO_2 emissions and GDP, Spain

Our World in Data

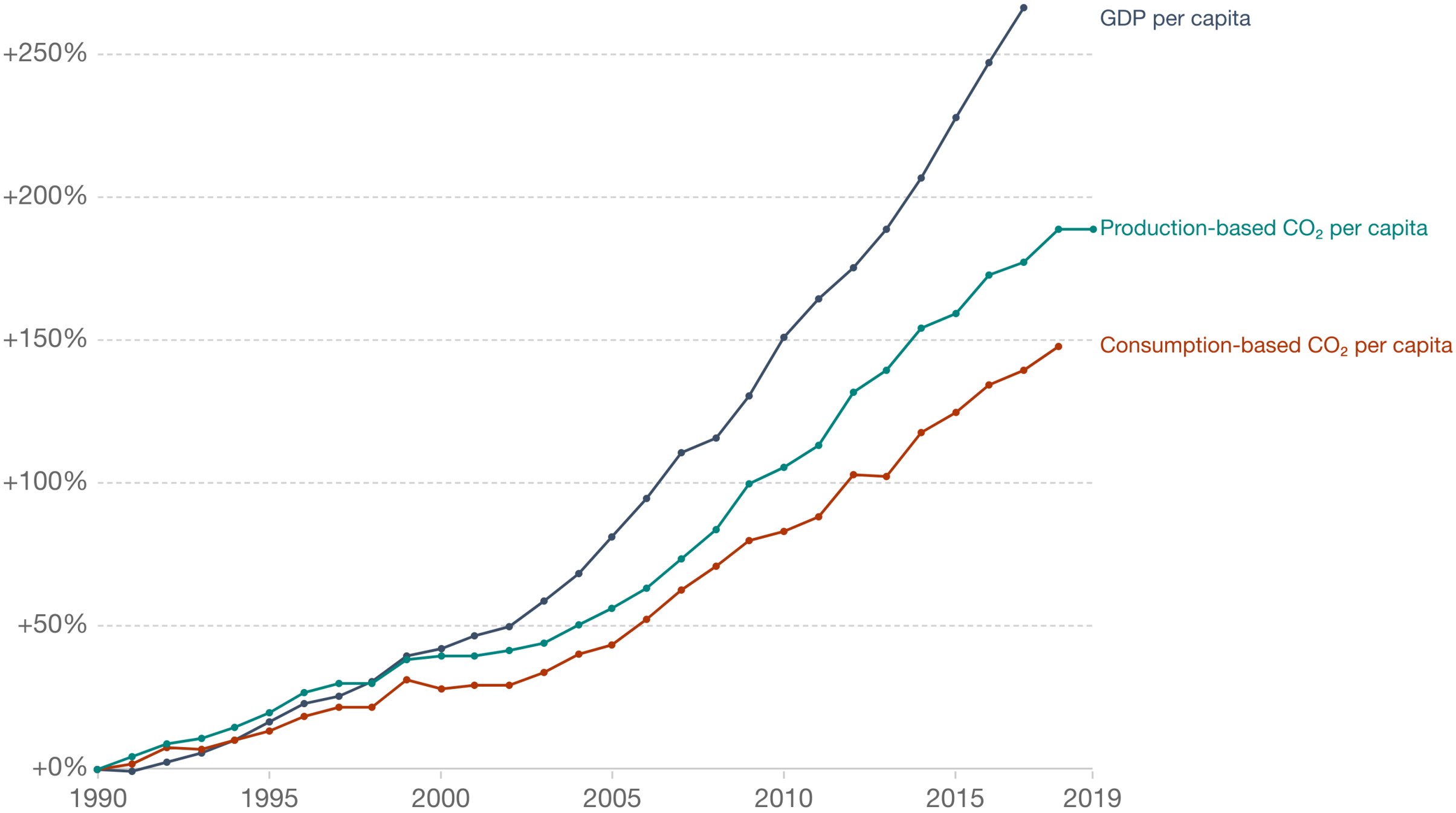
Annual consumption-based emissions are domestic emissions adjusted for trade. If a country imports goods the CO_2 emissions caused in the production of those goods are added to its domestic emissions; if it exports goods then this is subtracted.



Source: Data compiled from multiple sources by World Bank, Our World in Data based on the Global Carbon Project
Note: GDP figures are adjusted for inflation over time.

Change in per capita CO_2 emissions and GDP, India

Annual consumption-based emissions are domestic emissions adjusted for trade. If a country imports goods the CO_2 emissions needed to produce such goods are added to its domestic emissions; if it exports goods then this is subtracted.



Source: Our World in Data based on Global Carbon Project; UN Population; and World Bank
Note: GDP is measured in constant 2011 international-$ which adjust for inflation and cross-country price differences.
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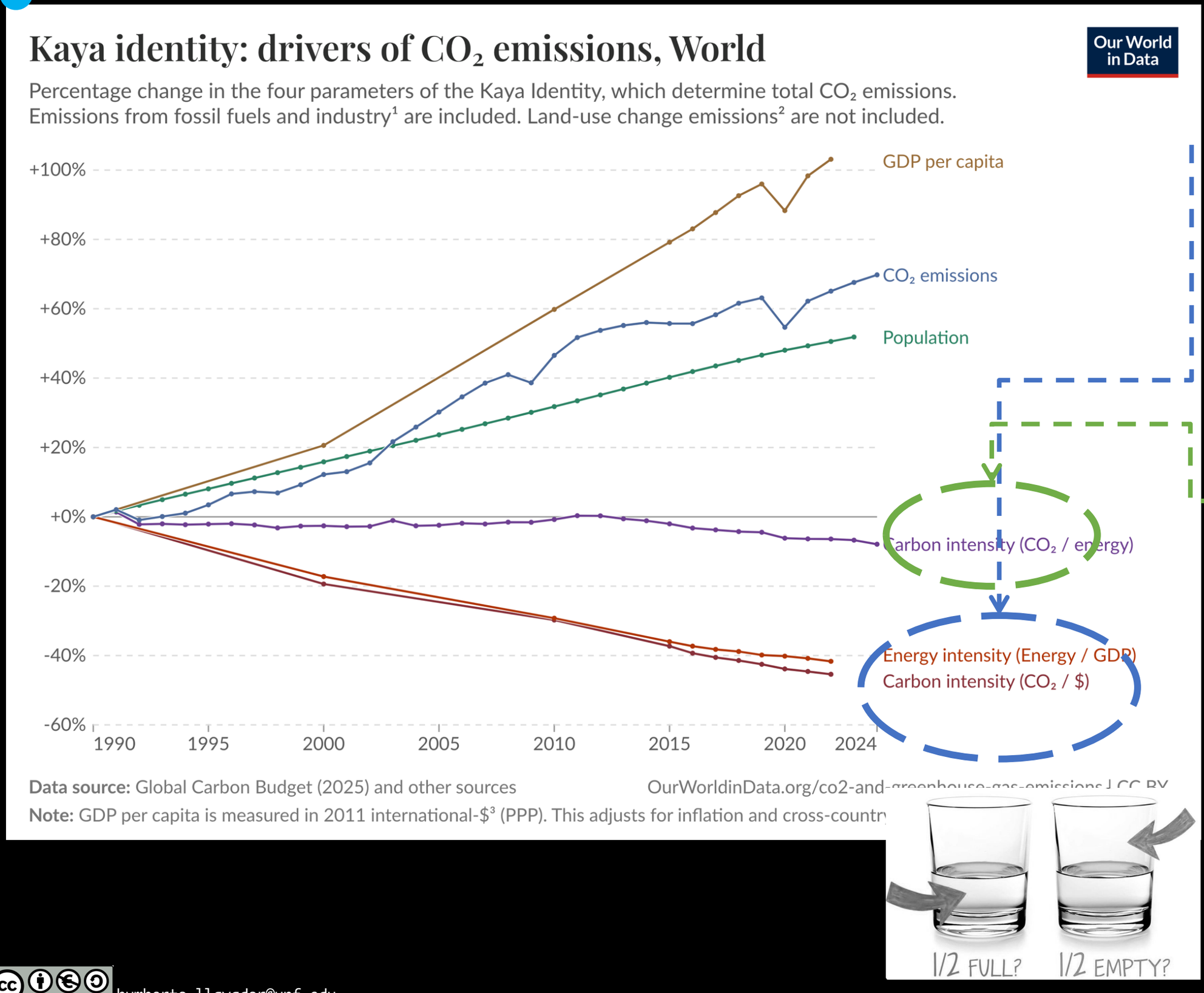
¿En qué hemos avanzado?



Los avances en la reducción de emisiones se han conseguido principalmente por eficiencia energética.

El uso de energía verde prácticamente no ha variado, excepto levemente en los últimos años y en los países de la OCDE

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¿QUÉ HEMOS CONSEGUIDO?

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Global greenhouse gas emissions and warming scenarios

Our World in Data

– Each pathway comes with uncertainty, marked by the shading from low to high emissions under each scenario.
– Warming refers to the expected global temperature rise by 2100, relative to pre-industrial temperatures.

Annual global greenhouse gas emissions
in gigatonnes of carbon dioxide-equivalents

150 Gt

100 Gt

50 Gt

0

Greenhouse gas emissions up to the present

No climate policies
4.1 – 4.8 °C
→expected emissions in a baseline scenario if countries had not implemented climate reduction policies.

Current policies
2.7 – 3.1 °C
→emissions with current climate policies in place result in warming of 2.7 to 3.1°C by 2100.

Pledges & targets (2.4 °C)
→emissions if all countries delivered on reduction pledges result in warming of 2.4°C by 2100.

2°C pathways

1.5°C pathways

1990 2000 2010 2020 2030 2040 2050 2060 2070 2080 2090 2100

Data source: Climate Action Tracker (based on national policies and pledges as of May 2021).
OurWorldinData.org – Research and data to make progress against the world's largest problems.

Last updated: July 2021.

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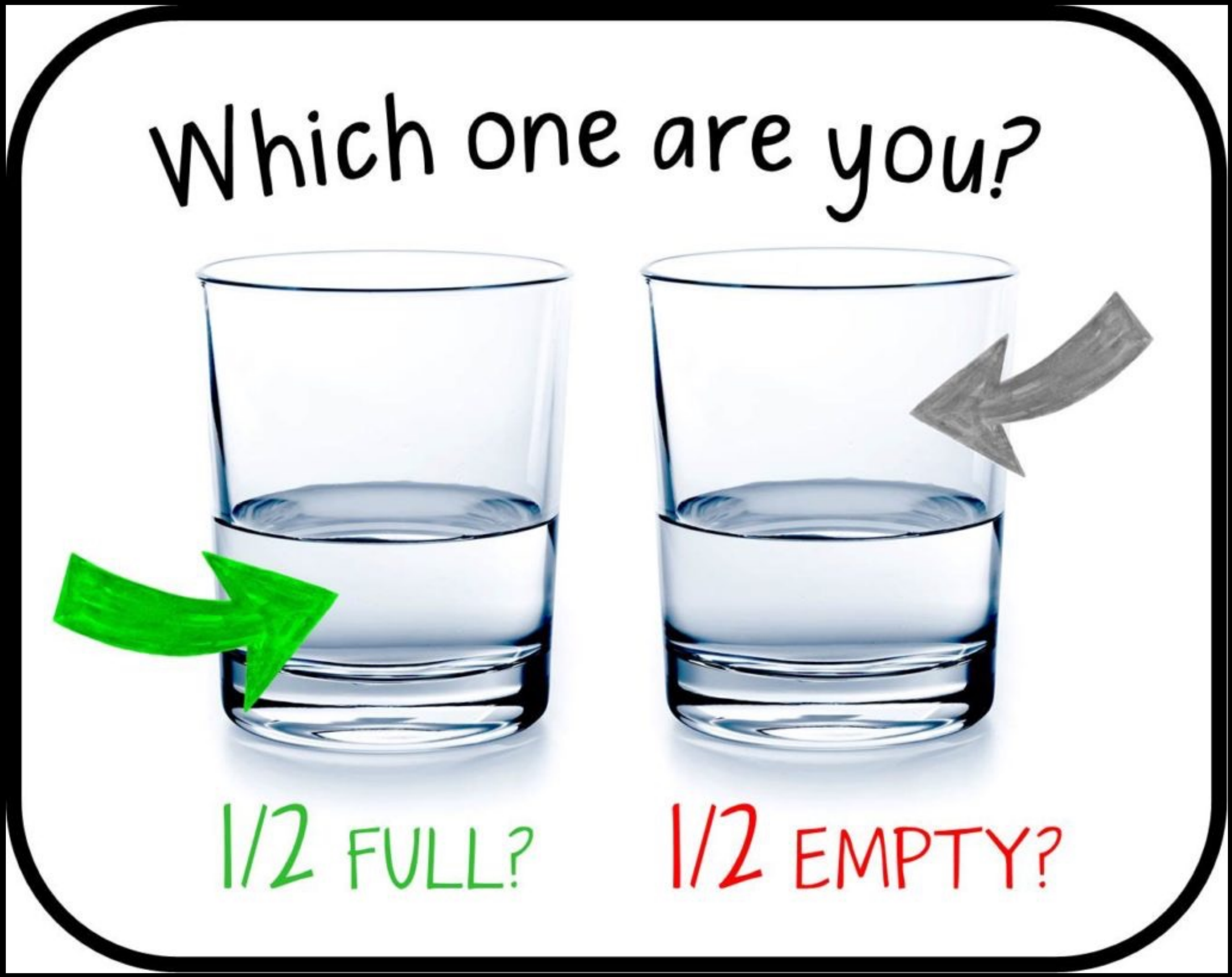

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