

Geography of greenhouse gas emissions

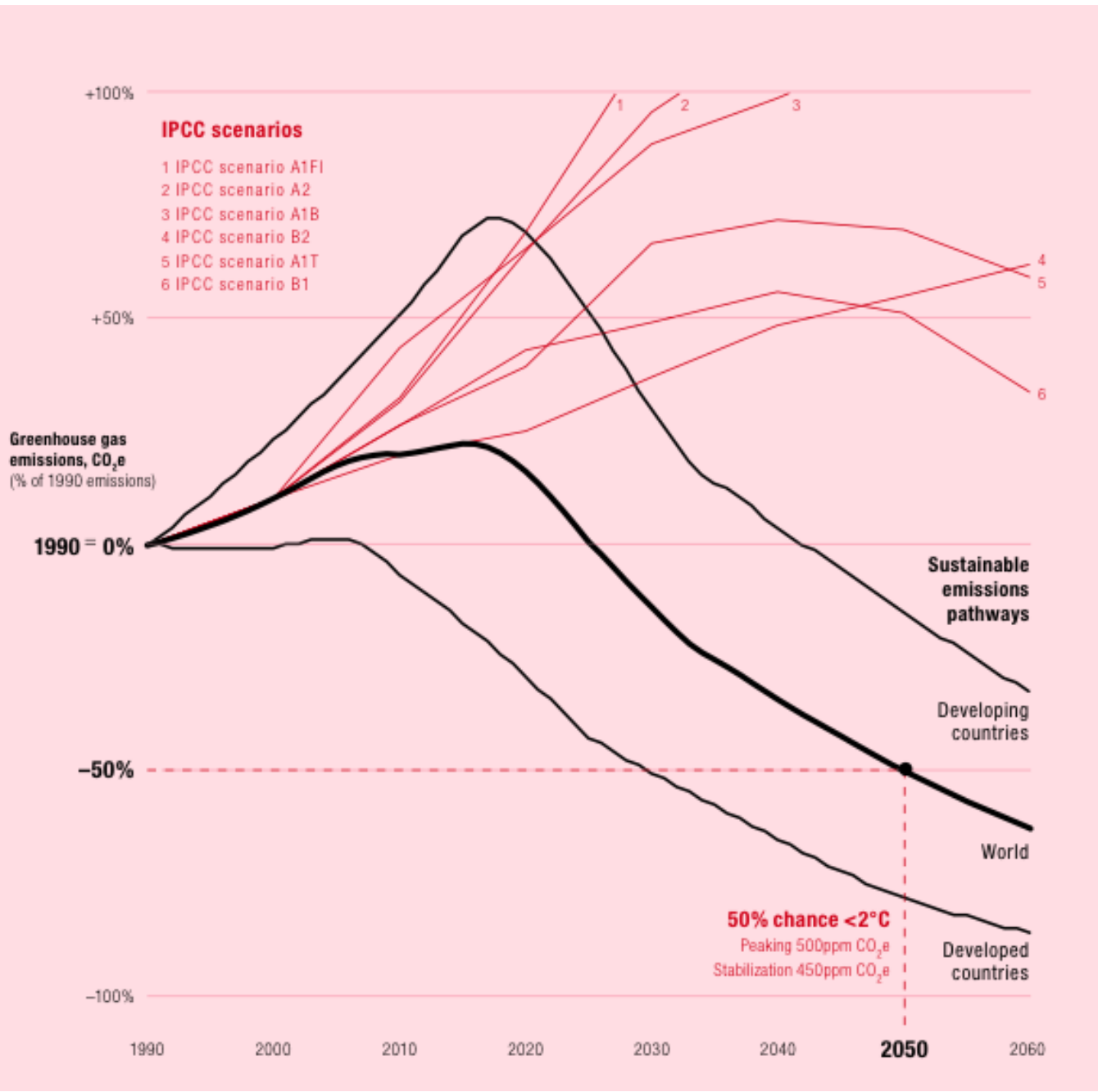
Session 2

Introduction:

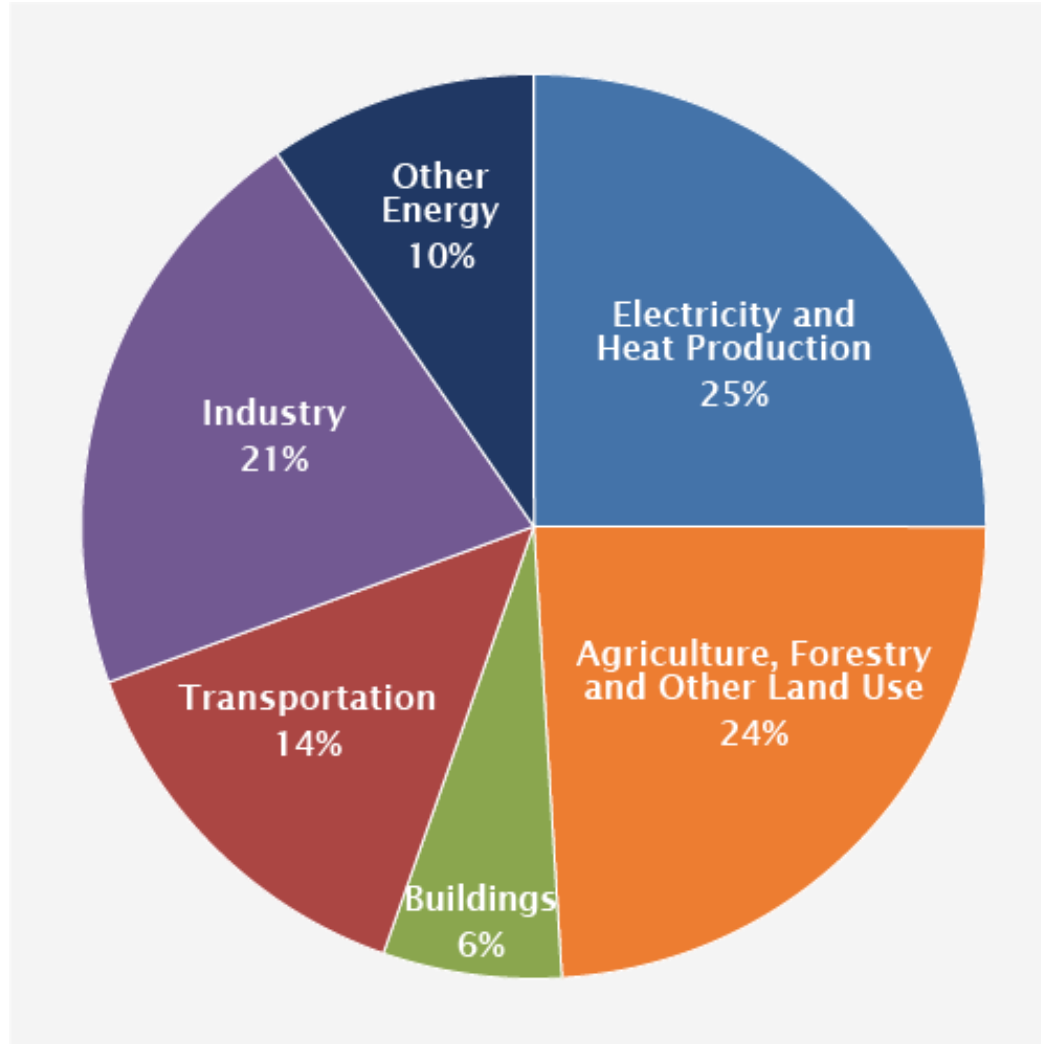
A continuous rise in emissions

- ▶ Over the last century, the average temperature on Earth has risen of about $0.7 - 0.8^{\circ} \text{C}$.
- ▶ This rise is the direct result of the increase in GHG concentrations since pre-industrial times.
- ▶ Until 1750, this concentration used to be constant, at 280 ppm. It is now over 400 ppm.
- ▶ The limit for a temperature rise of 2°C is 450 ppm.
- ▶ The annual rate of increase is about 2-3%.





Where do emissions come from?



Why do some countries pollute more than others?

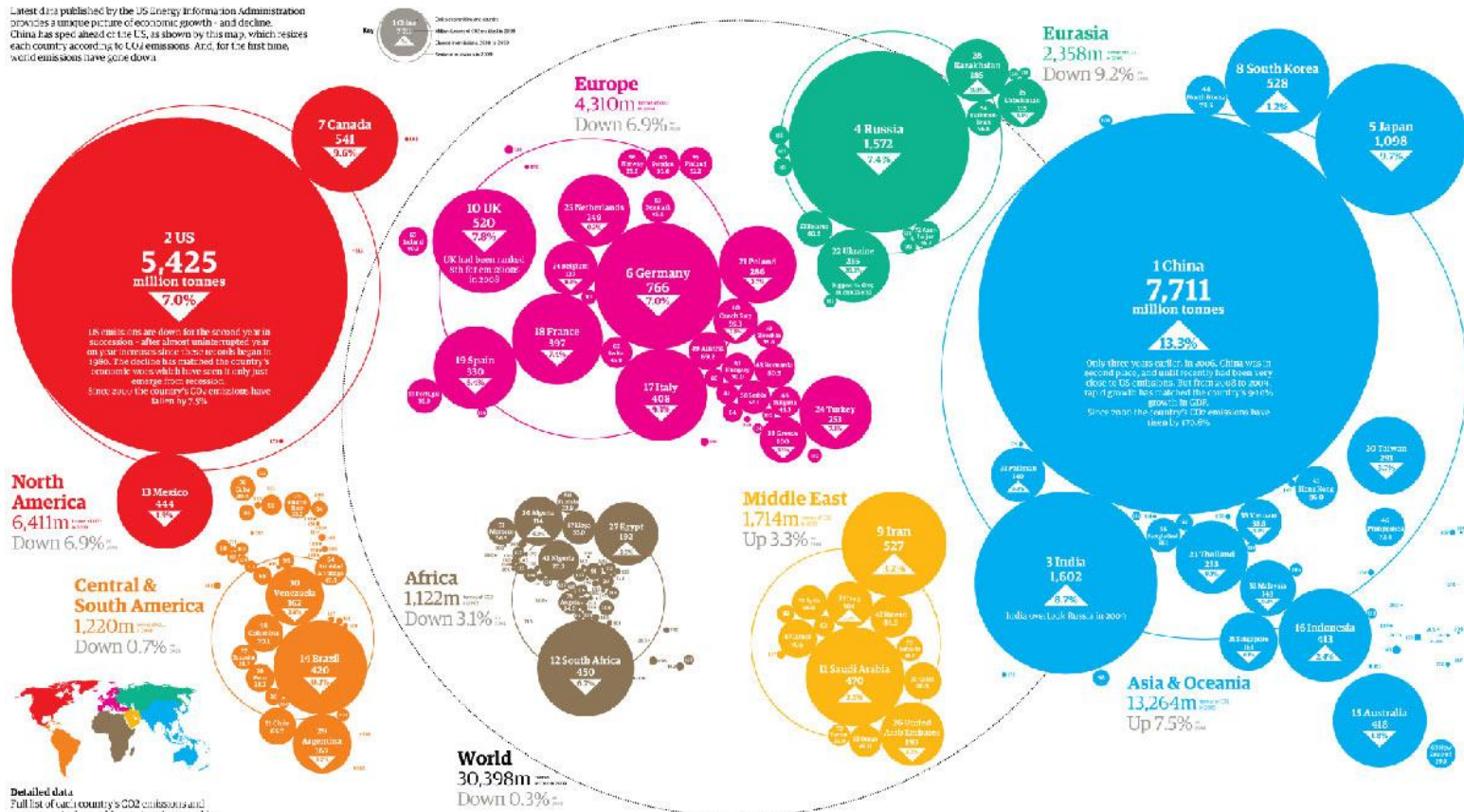
- ▶ GHG emissions have always been linked to economic growth.
 - ▶ *Dilemma: development or climate?*
- ▶ Demography
 - ▶ *In 2050, only 12% of the world's population will be in OECD countries.*
 - ▶ *But one billion people emit 70% of the world's emissions*
- ▶ Geography
 - ▶ *Local climate*
 - ▶ *Distance between main cities*
 - ▶ *Availability of natural resources*
- ▶ Public policies
 - ▶ *Energy policy*
 - ▶ *Carbon tax*
- ▶ Historical events



Different measures of emissions: Per country

An atlas of pollution: the world in carbon dioxide emissions

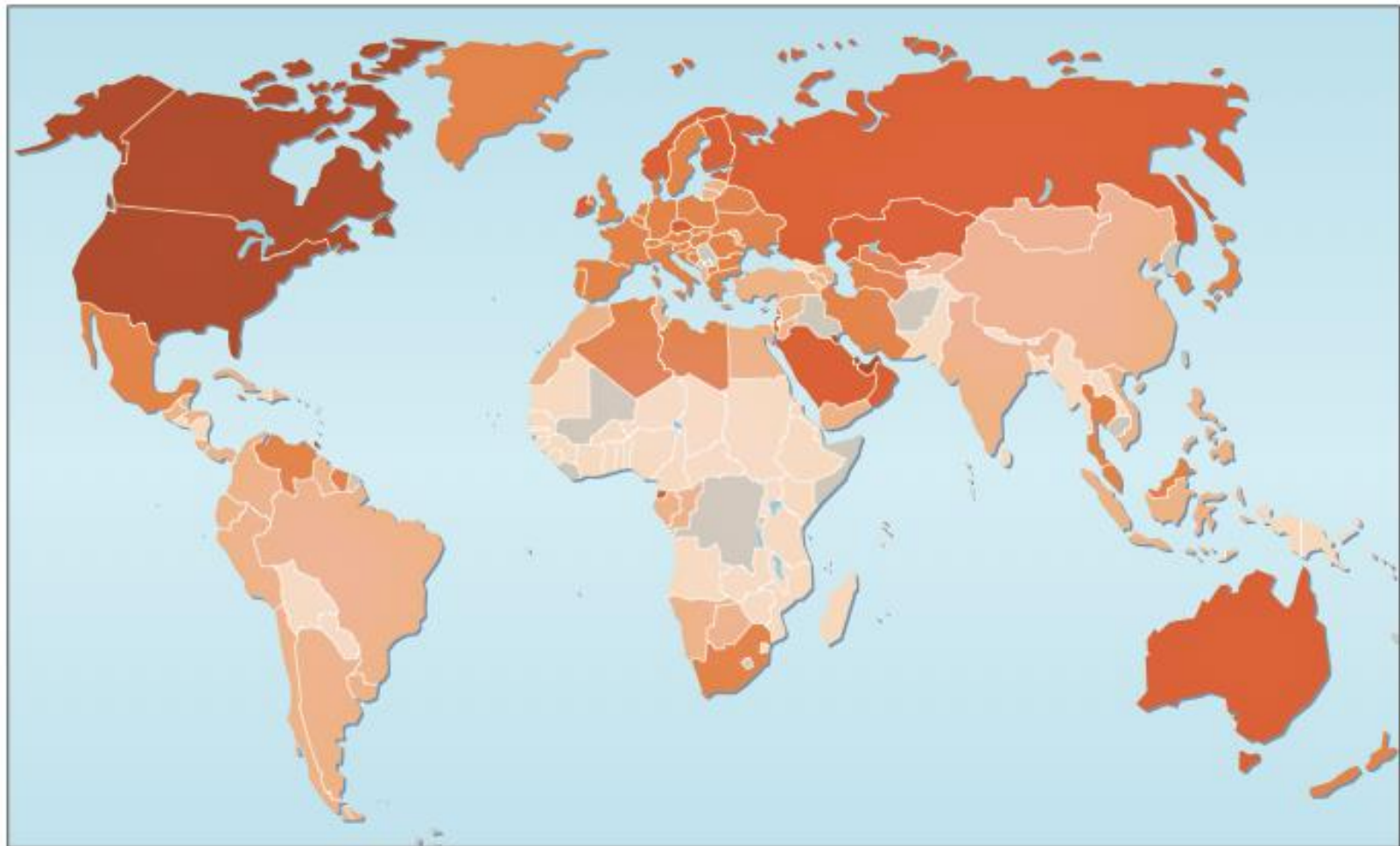
Latest data published by the US Energy Information Administration provides a unique picture of economic growth - and decline. China has speared ahead of the US, as shown by this map, which ranks each country according to CO₂ emissions. And, for the first time, world emissions have gone down.



Detailed data. Full list of each country's CO₂ emissions and movement in the world emitters league table

RANK	COUNTRY	2019 EMISSIONS (m tonnes)	2018 EMISSIONS (m tonnes)	% CHG	RANK	COUNTRY	2019 EMISSIONS (m tonnes)	2018 EMISSIONS (m tonnes)	% CHG
1	US	5,425	5,120	7.0%	1	US	5,425	5,120	7.0%
2	China	7,711	6,760	13.3%	2	China	7,711	6,760	13.3%
3	India	1,602	1,478	8.7%	3	India	1,602	1,478	8.7%
4	Russia	1,572	1,466	7.4%	4	Russia	1,572	1,466	7.4%
5	Japan	1,098	1,089	0.7%	5	Japan	1,098	1,089	0.7%
6	Germany	766	715	7.0%	6	Germany	766	715	7.0%
7	Canada	541	520	3.0%	7	Canada	541	520	3.0%
8	South Korea	528	520	1.2%	8	South Korea	528	520	1.2%
9	Iran	527	516	1.2%	9	Iran	527	516	1.2%
10	UK	520	484	7.8%	10	UK	520	484	7.8%
11	Saudi Arabia	470	457	2.2%	11	Saudi Arabia	470	457	2.2%
12	South Africa	450	449	0.2%	12	South Africa	450	449	0.2%
13	Mexico	444	438	1.1%	13	Mexico	444	438	1.1%
14	Australia	416	406	1.8%	14	Australia	416	406	1.8%
15	Indonesia	413	402	2.3%	15	Indonesia	413	402	2.3%
16	Brazil	397	358	9.7%	16	Brazil	397	358	9.7%
17	Italy	408	397	2.3%	17	Italy	408	397	2.3%
18	France	397	396	0.2%	18	France	397	396	0.2%
19	Spain	350	347	1.5%	19	Spain	350	347	1.5%
20	Algeria	320	318	0.2%	20	Algeria	320	318	0.2%
21	Thailand	286	284	0.2%	21	Thailand	286	284	0.2%
22	Ukraine	282	280	0.2%	22	Ukraine	282	280	0.2%
23	Netherlands	265	263	0.2%	23	Netherlands	265	263	0.2%
24	Egypt	192	190	0.2%	24	Egypt	192	190	0.2%
25	Turkey	253	251	0.2%	25	Turkey	253	251	0.2%
26	Argentina	187	185	0.2%	26	Argentina	187	185	0.2%
27	Pakistan	187	185	0.2%	27	Pakistan	187	185	0.2%
28	Kazakhstan	187	185	0.2%	28	Kazakhstan	187	185	0.2%
29	North Macedonia	187	185	0.2%	29	North Macedonia	187	185	0.2%
30	Taiwan	187	185	0.2%	30	Taiwan	187	185	0.2%
31	Philippines	187	185	0.2%	31	Philippines	187	185	0.2%
32	Vietnam	187	185	0.2%	32	Vietnam	187	185	0.2%
33	Myanmar	187	185	0.2%	33	Myanmar	187	185	0.2%
34	Cambodia	187	185	0.2%	34	Cambodia	187	185	0.2%
35	Laos	187	185	0.2%	35	Laos	187	185	0.2%
36	Timor-Leste	187	185	0.2%	36	Timor-Leste	187	185	0.2%
37	Brunei	187	185	0.2%	37	Brunei	187	185	0.2%
38	Maldives	187	185	0.2%	38	Maldives	187	185	0.2%
39	Bhutan	187	185	0.2%	39	Bhutan	187	185	0.2%
40	Nepal	187	185	0.2%	40	Nepal	187	185	0.2%
41	Sri Lanka	187	185	0.2%	41	Sri Lanka	187	185	0.2%
42	Bangladesh	187	185	0.2%	42	Bangladesh	187	185	0.2%
43	Nepal	187	185	0.2%	43	Nepal	187	185	0.2%
44	Bhutan	187	185	0.2%	44	Bhutan	187	185	0.2%
45	Nepal	187	185	0.2%	45	Nepal	187	185	0.2%
46	Bhutan	187	185	0.2%	46	Bhutan	187	185	0.2%
47	Nepal	187	185	0.2%	47	Nepal	187	185	0.2%
48	Bhutan	187	185	0.2%	48	Bhutan	187	185	0.2%
49	Nepal	187	185	0.2%	49	Nepal	187	185	0.2%
50	Bhutan	187	185	0.2%	50	Bhutan	187	185	0.2%

Per capita



Émissions de CO₂ par habitants en 2004
(en tonnes)



Les données n'incluent pas les émissions du secteur LULUCF (déforestation).

Source : Human Development Report, 2007-2008.

Other possible approaches

- ▶ **Energy intensity**

- ▶ A measure of emissions linked to GDP, and compatible with development.
- ▶ How much does an economy pollute to produce an additional unit of wealth?

- ▶ **Emissions on a given year or cumulative emissions? Since when? Historical responsibility.**

- ▶ **Emissions from LULUCF?**

- **Different measures of emissions lead to different definitions of responsibility.**

- **Importance of MRV**

