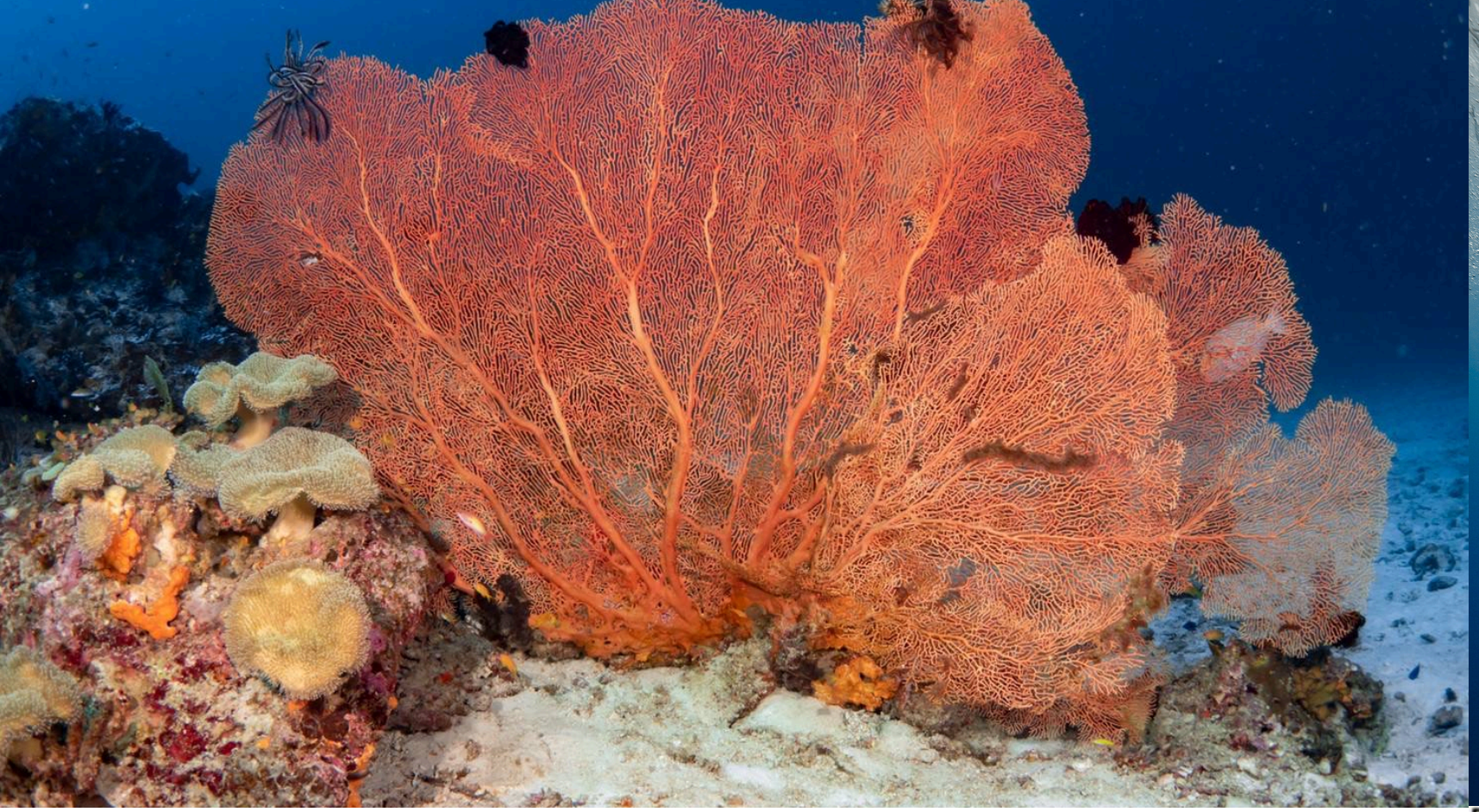
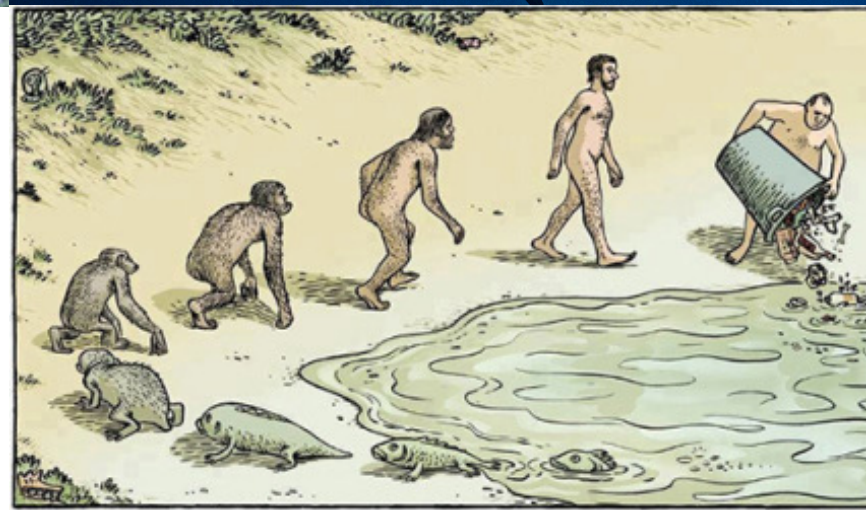
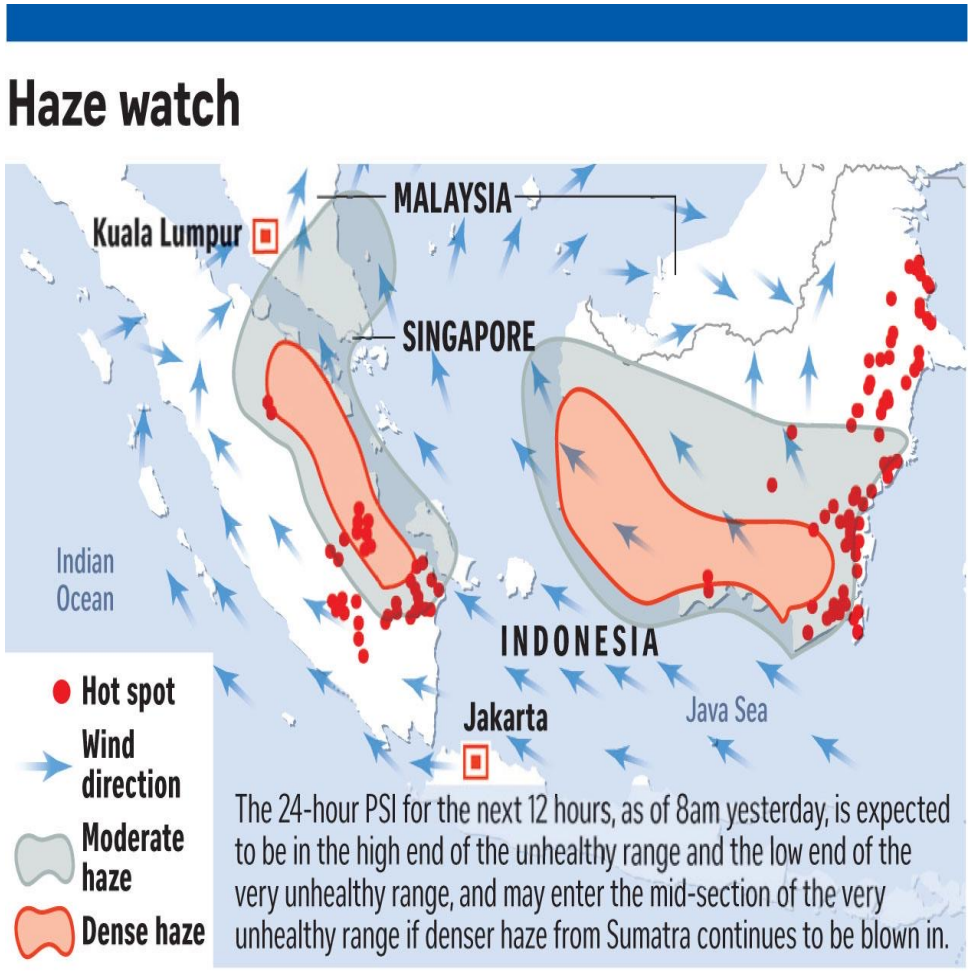


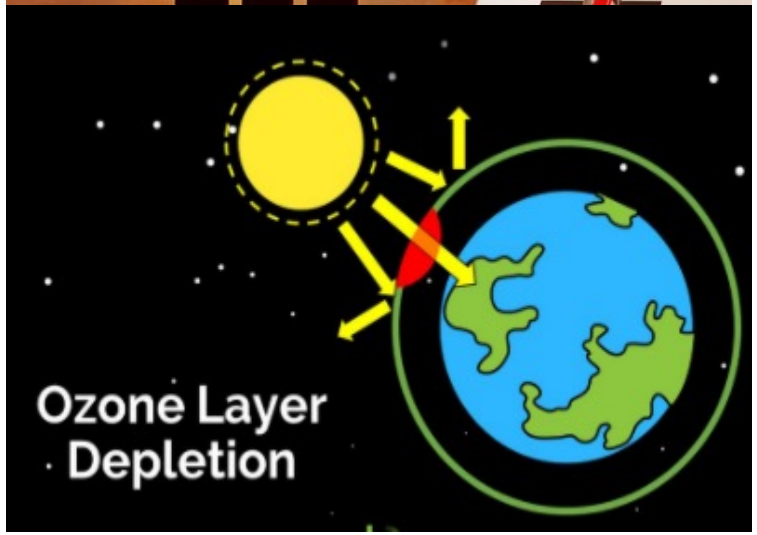
Economics of Climate Change



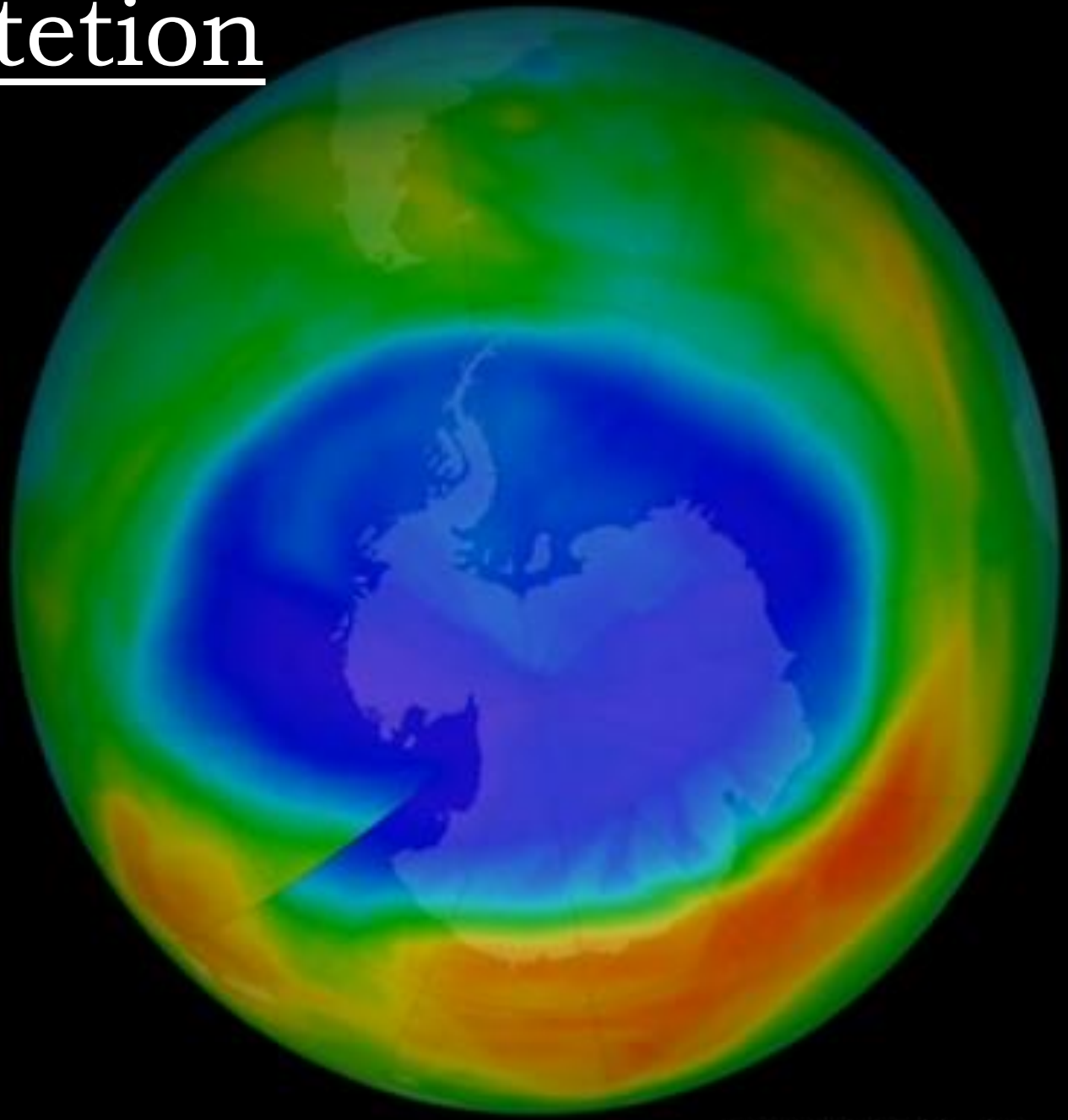
Types of Pollutants

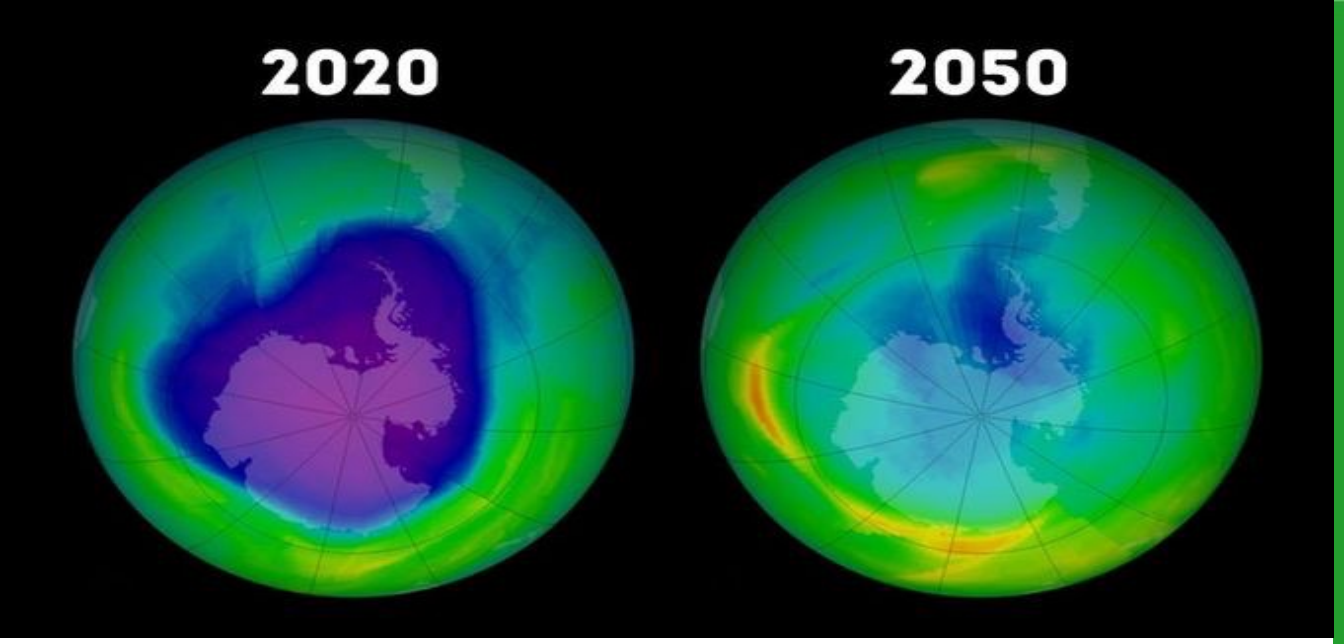
- Local, Regional and Global Pollutants

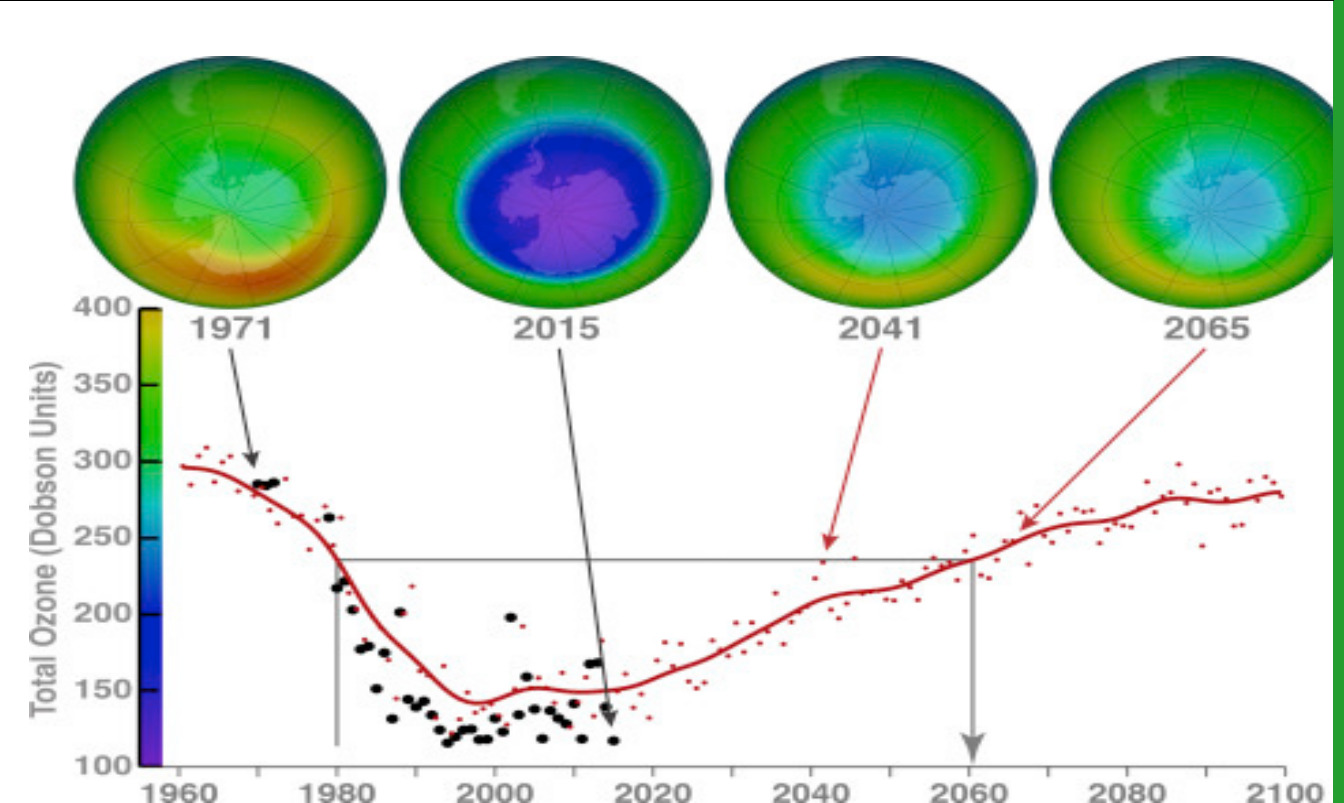




Ozone Depletetion

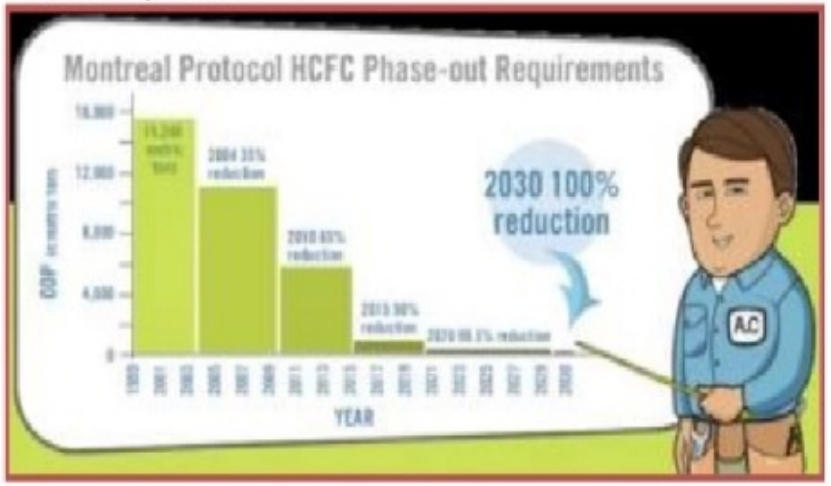




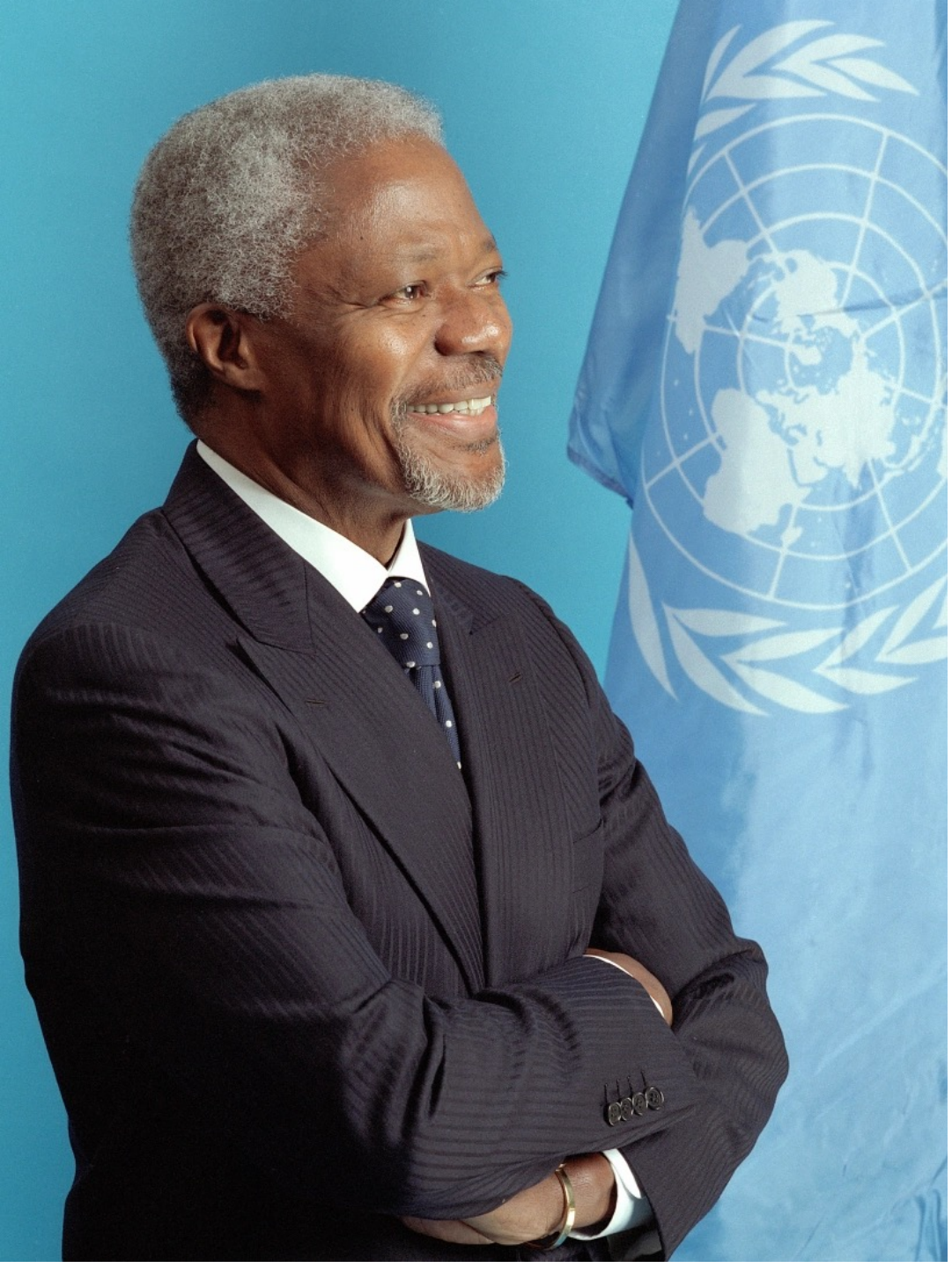


MONTREAL PROTOCOL 1989

- The Montreal Protocol on Substances that Deplete the Ozone Layer is an International Treaty designed to protect the ozone layer by Phasing out the production of numerous substances (ODS) believed to be responsible for Ozone depletion.
- The Treaty was opened for signature on September 16, 1987 and entered into force on January 1, 1989, followed by first meeting in Helsinki, May 1989. Since then, it has undergone seven revisions.
- Current status - ratified by all 197 UN members.
- The Montreal Protocol says that the production and consumption of compounds that deplete ozone in the stratosphere--chloroflourocarbons (CFCs), halons, carbon tetrachloride, and methyl chloroform-- are to be phased out by 2030.



R410A ECO-FRIENDLY

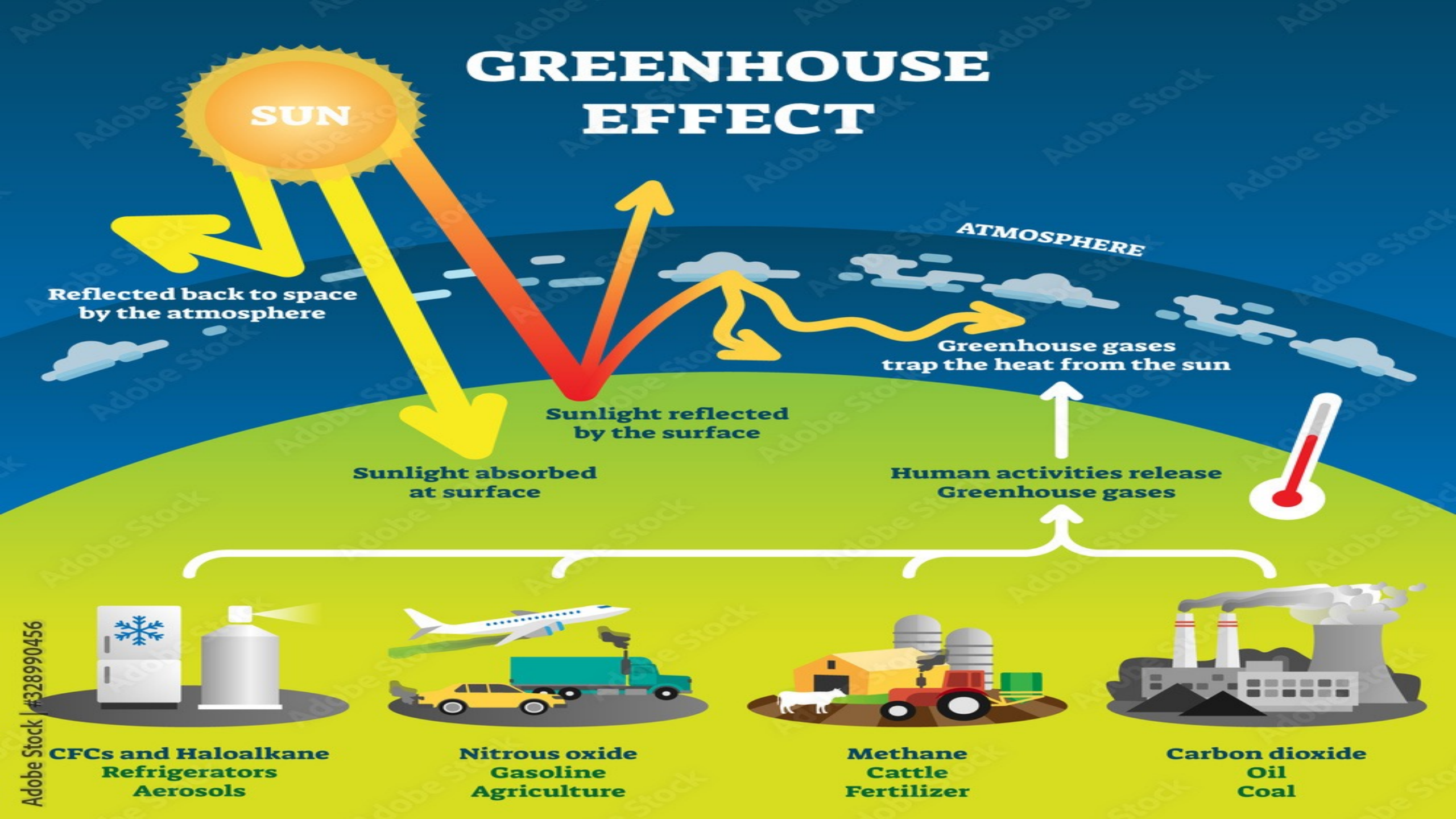


“Perhaps the single most successful international environmental agreement to date has been the Montreal Protocol, in which states accepted the need to phase out the use of ozone-depleting substances.”

-Kofi Annan

Climate Change

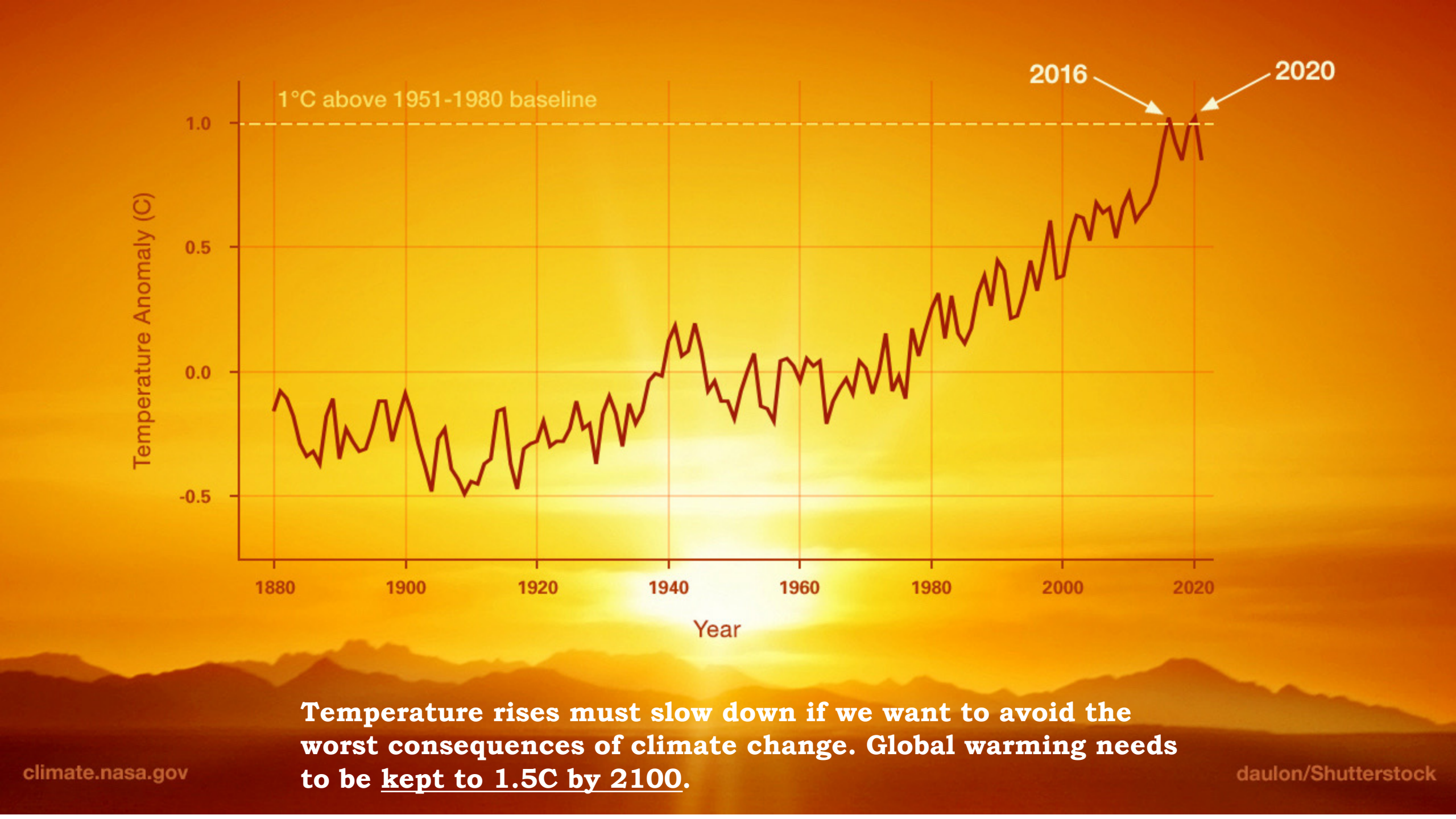
GREENHOUSE EFFECT



Definition

- Climate change refers to a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity.

- Climate change refers to a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods.



Temperature rises must slow down if we want to avoid the worst consequences of climate change. Global warming needs to be kept to 1.5C by 2100.

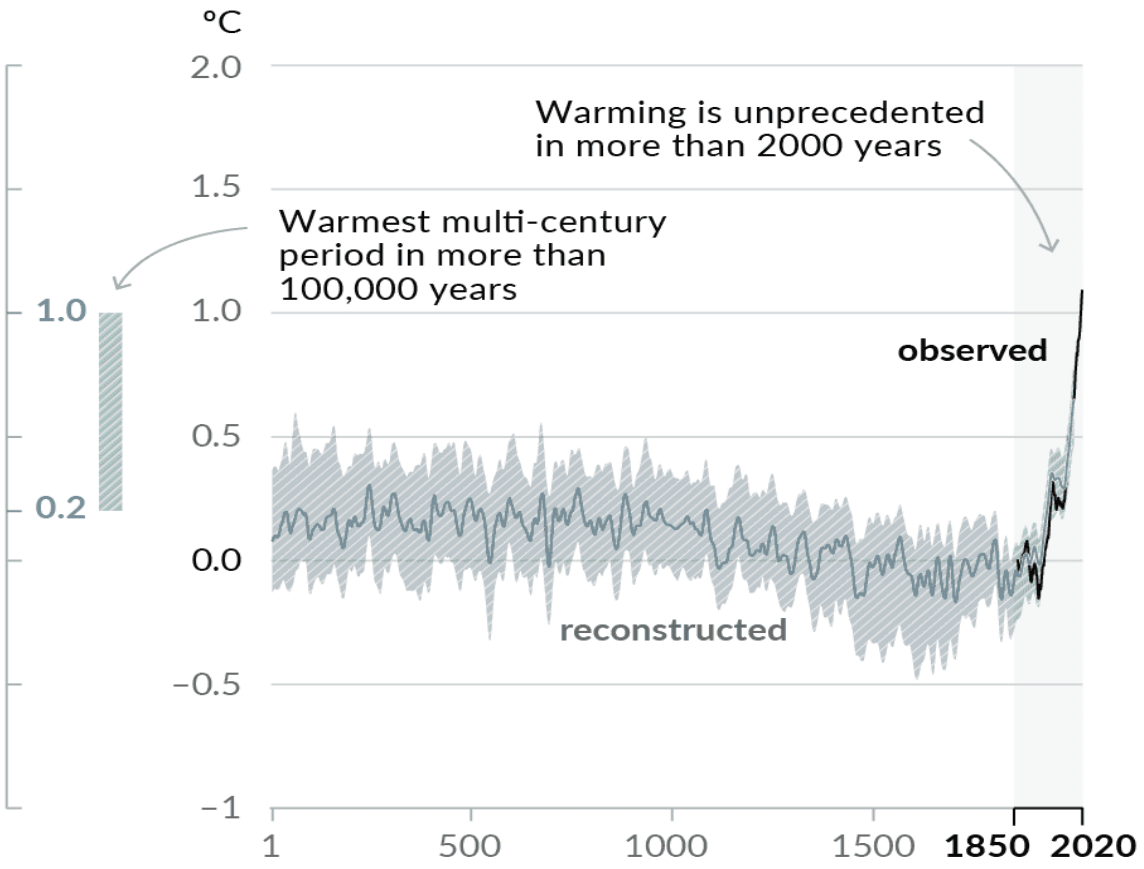
climate.nasa.gov

daulon/Shutterstock

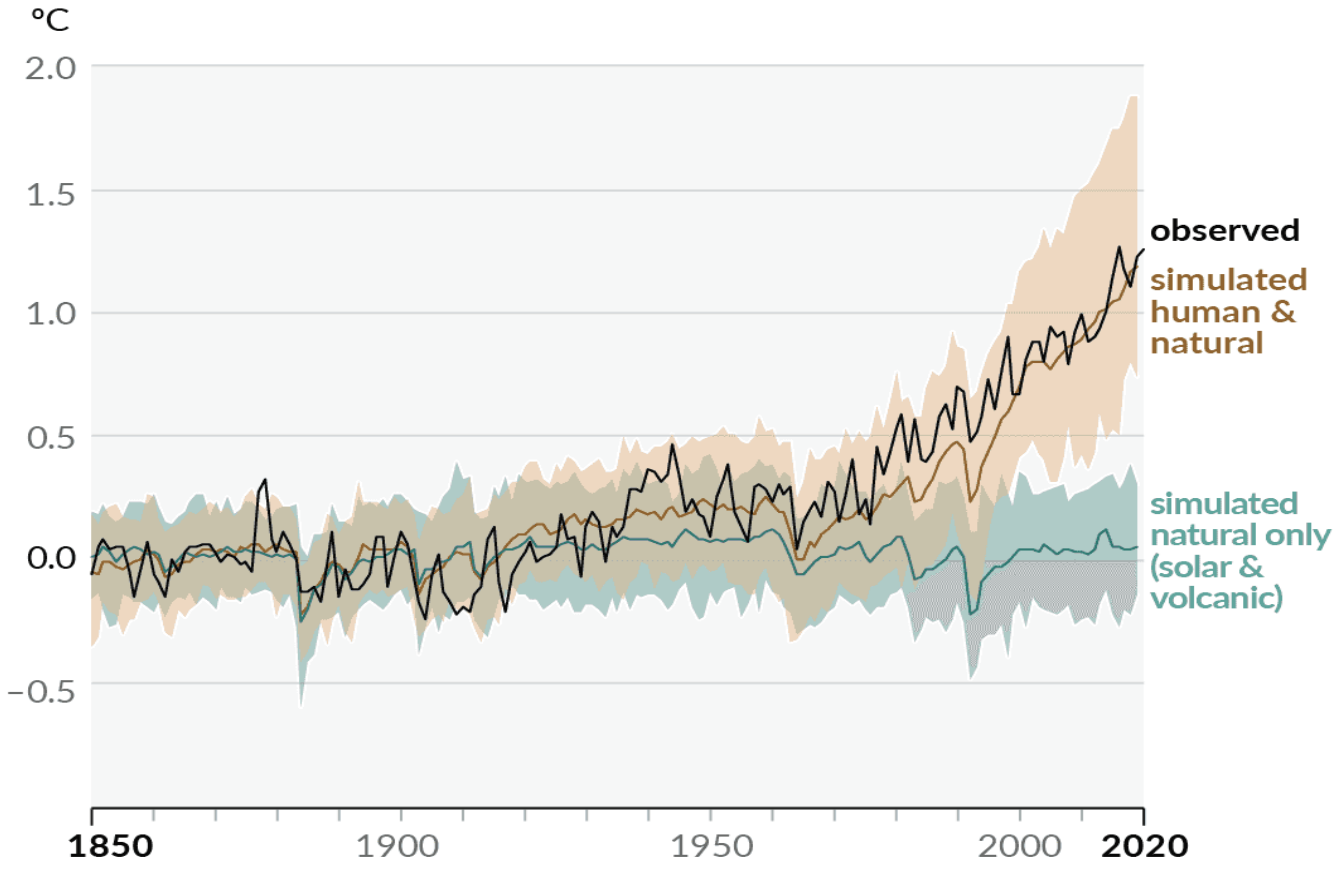
Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years

Changes in global surface temperature relative to 1850–1900

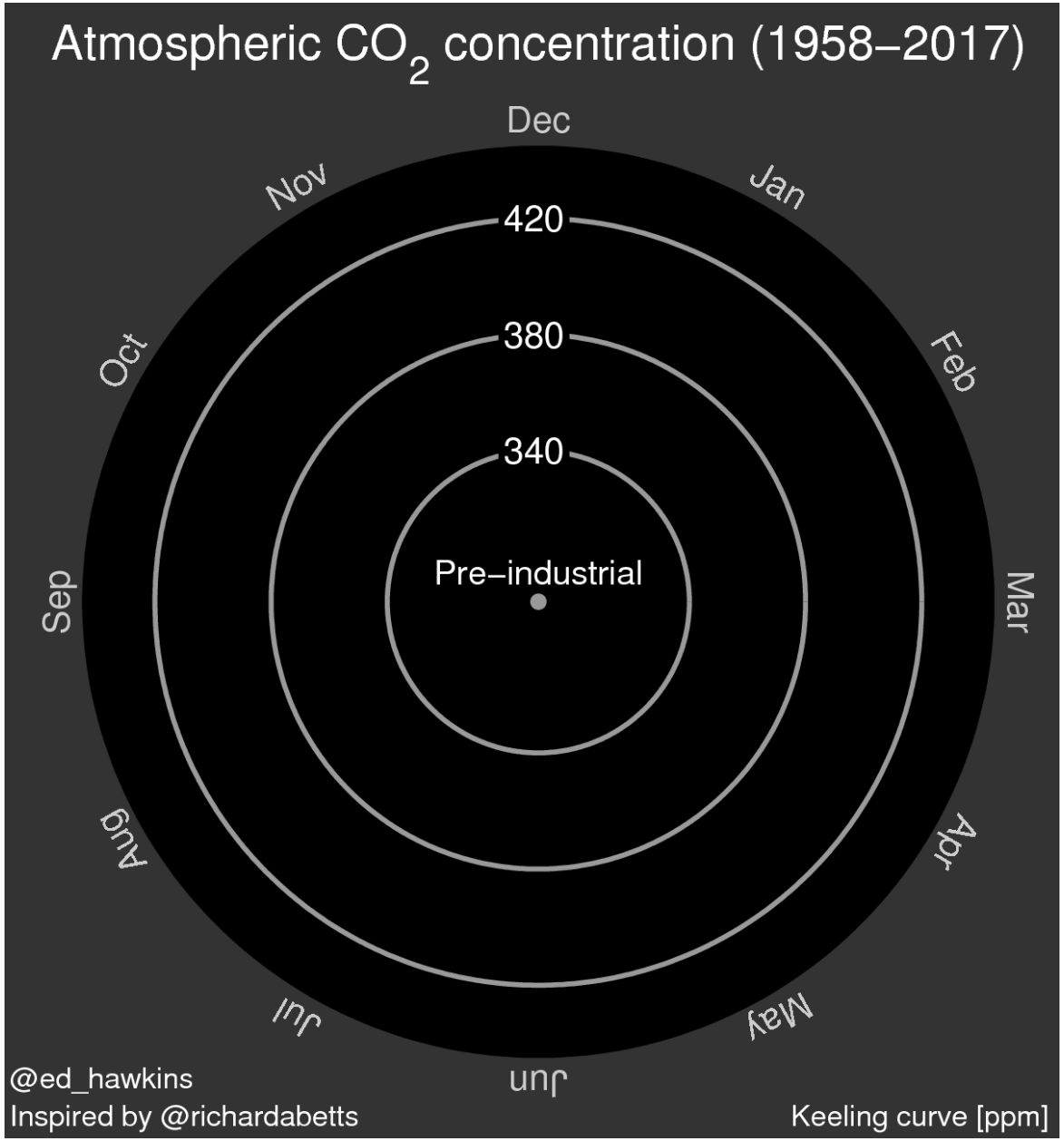
(a) Change in global surface temperature (decadal average) as reconstructed (1–2000) and **observed** (1850–2020)

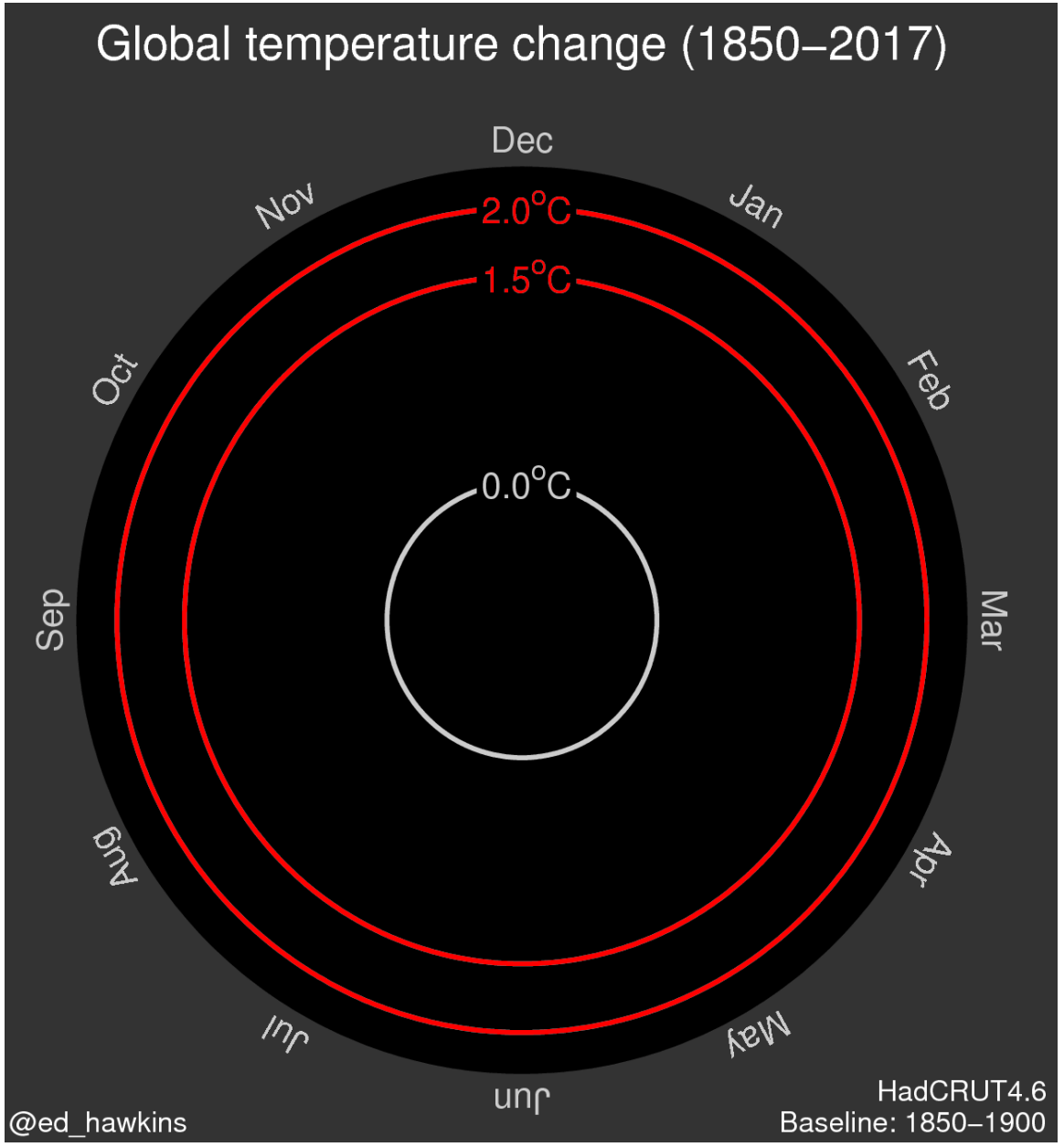


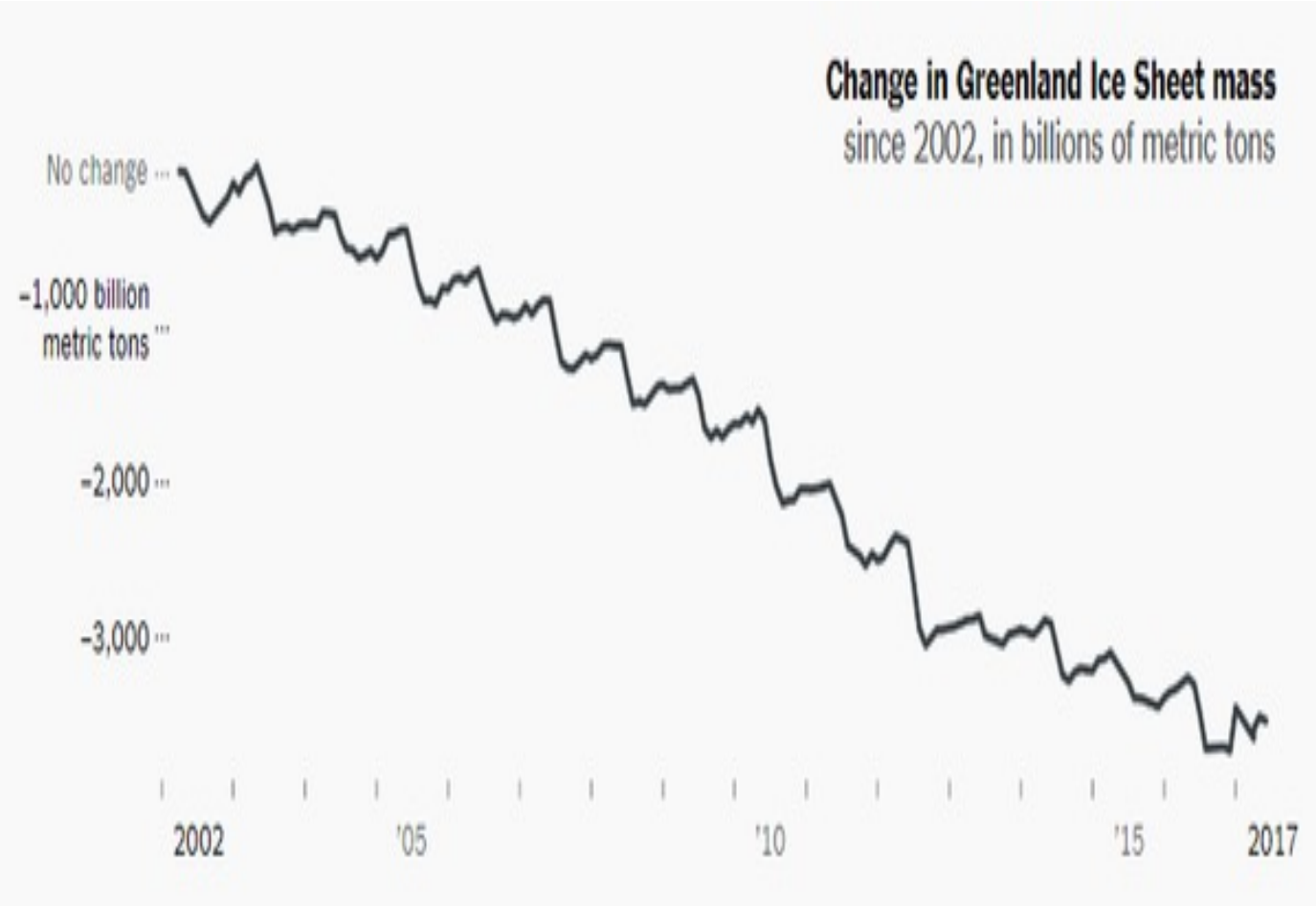
(b) Change in global surface temperature (annual average) as **observed** and simulated using human & natural and only natural factors (both 1850–2020)

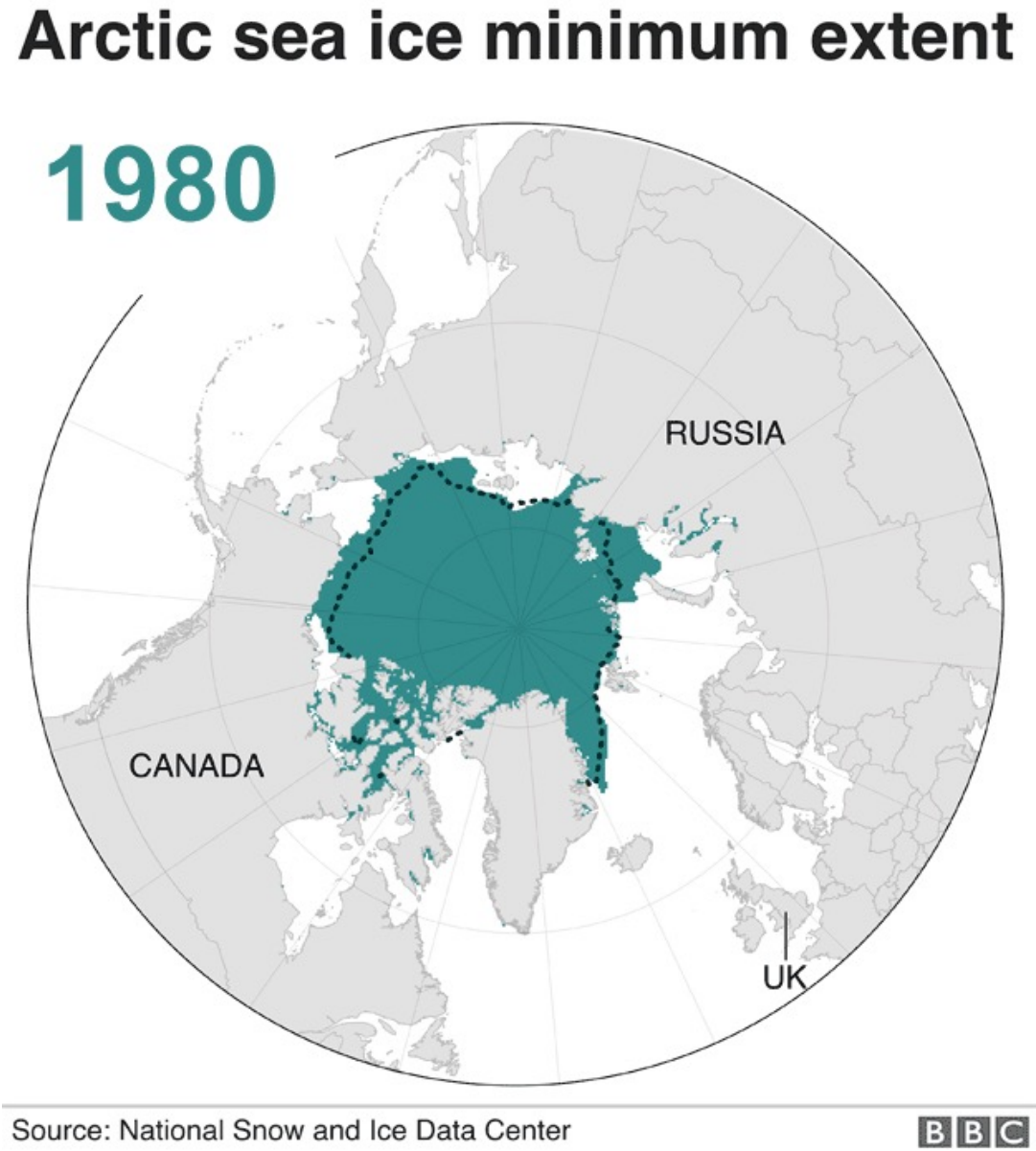


IPCC 6th assessment


Atmospheric CO_2 concentration (1958–2017)
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
420
380
340
Pre–industrial
@ed_hawkins
Inspired by @richardabetts
Keeling curve [ppm]


Global temperature change (1850–2017)
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
2.0°C
1.5°C
0.0°C
@ed_hawkins
HadCRUT4.6
Baseline: 1850–1900


Change in Greenland Ice Sheet mass
since 2002, in billions of metric tons
No change
-1,000 billion metric tons
-2,000
-3,000
2002
'05
'10
'15
2017

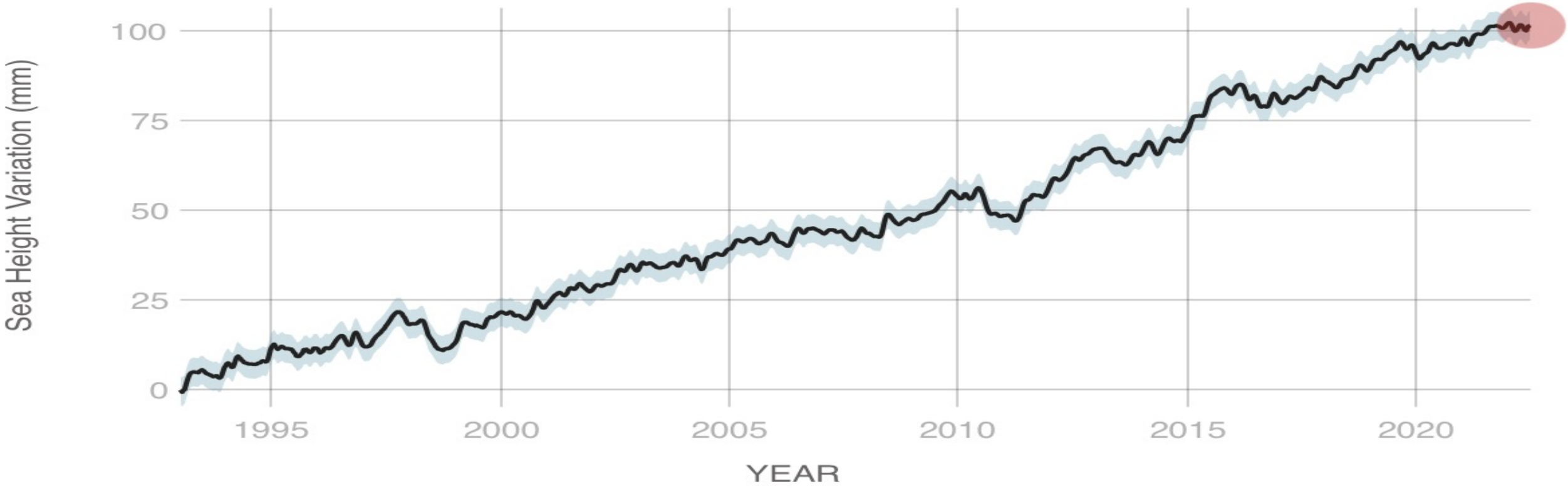

Arctic sea ice minimum extent
1980
RUSSIA
CANADA
UK
Source: National Snow and Ice Data Center
BBC

SATELLITE DATA: 1993-PRESENT

Data source: Satellite sea level observations.
Credit: NASA's Goddard Space Flight Center

RISE SINCE 1993

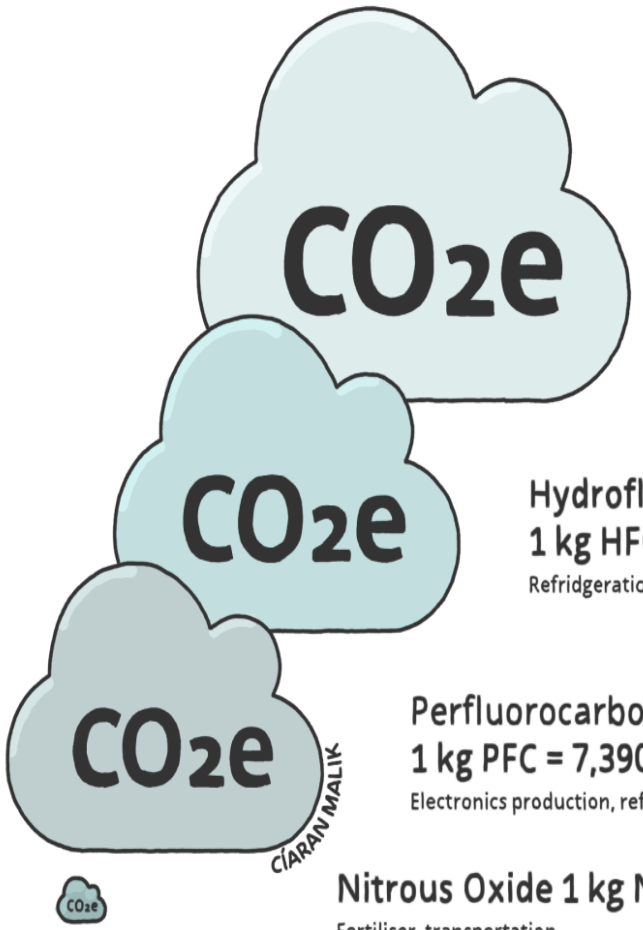
↑ 101.4 millimeters



https://climate.nasa.gov/vital-signs/sea-level/

Equivalent Global Warming Potential

Some greenhouse gasses can be more damaging than Carbon Dioxide. We compare them by converting them to their carbon dioxide equivalent (CO_2e) global warming potential over 100 years.



Sulfur Hexafluoride
1 kg SF_6 = 22,800 $kgCO_2e$
Aluminium production, circuitry

Hydrofluorocarbon
1 kg HFC = 124 to 14,800 $kgCO_2e$
Refridgeration, plastic foam production, aerosols

Perfluorocarbon
1 kg PFC = 7,390 to 12,200 $kgCO_2e$
Electronics production, refridgerant

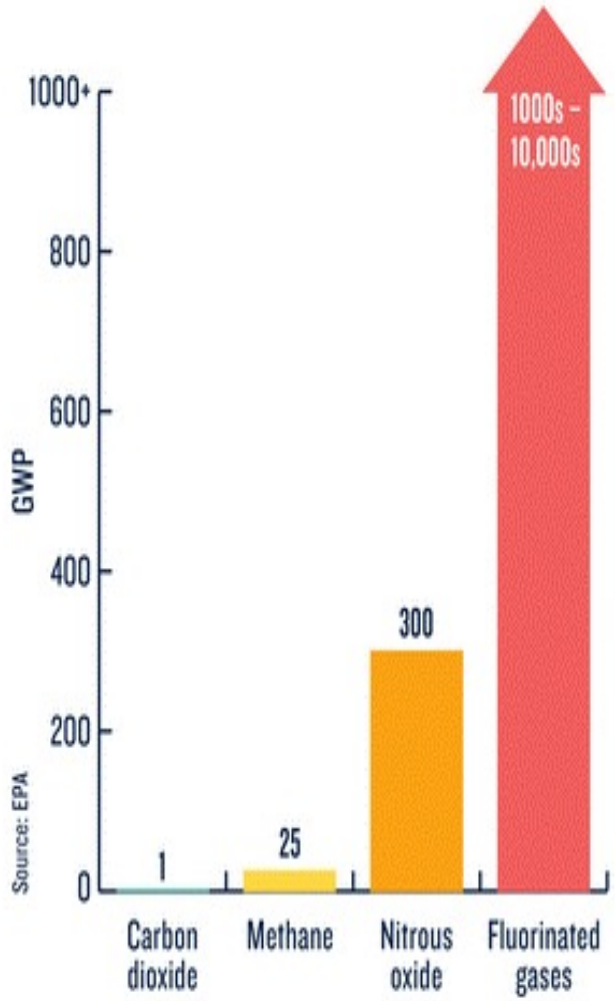
Nitrous Oxide 1 kg N_2O = 298 $kgCO_2e$
Fertiliser, transportation

Methane 1 kg CH_4 = 25 $kgCO_2e$
Landfill, livestock, coal mining, gas production

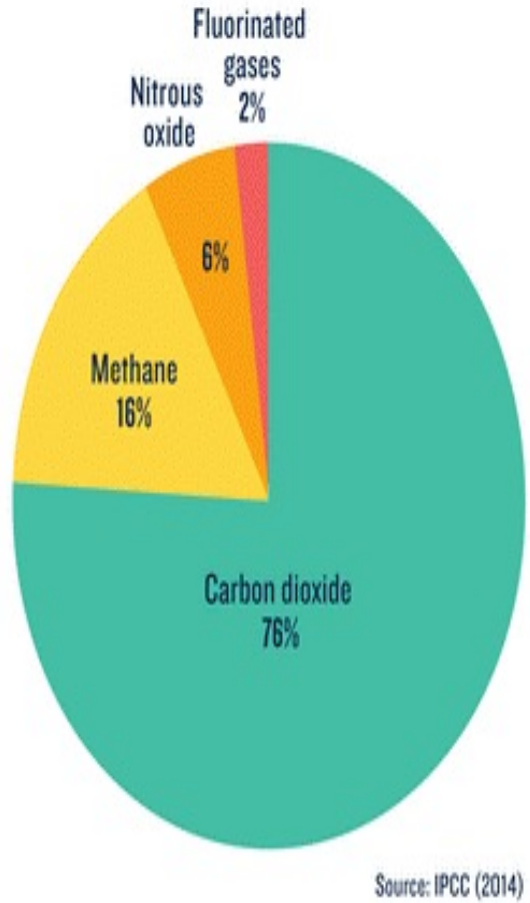
Carbon Dioxide 1 $kgCO_2e$ = 1 $kgCO_2e$
Power generation, transportation

Source: UK Emissions of Air Pollutants 1970 to 2000 (DEFRA), IPPC 2018 Report

HOW GREENHOUSE GASES WARM OUR PLANET



The global warming potential (GWP) of human-generated greenhouse gases is a measure of how much heat each gas traps in the atmosphere, relative to carbon dioxide.



How much each human-caused greenhouse gas contributes to total emissions around the globe.

Greenhouse gases (GHG) and their sources

transportation

Carbon dioxide

CO_2

fossil fuel combustion

coal and crude oil

agriculture

natural gas systems

Methane

CH_4

landfills

cars

Nitrous oxide

N_2O

manufacturing

agricultural soil management

hydrofluorocarbons

substitute of ODS

HFCs

semiconductor manufacturing

PFCs

perfluorocarbons

aluminium production

electrical transmission

SF_6

sulfur hexafluoride

magnesium prod

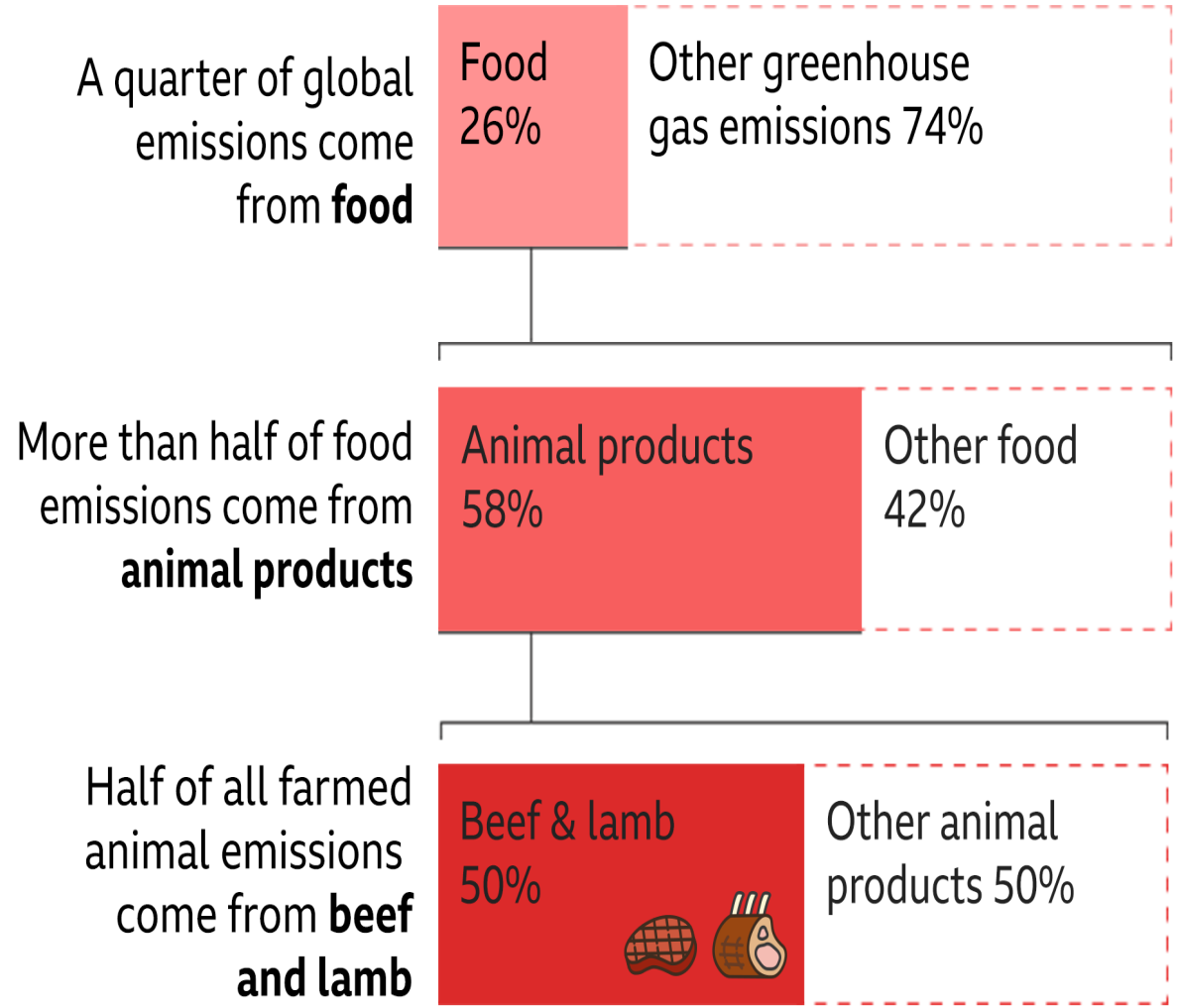
The global warming potential (GWP) of each GHG is measured using the equation 'Tg CO_2Eq'
Each gas's GWP is measured against the reference gas, CO_2.
CO_2 is measured in 1million metric tons.
1 metric ton is 1000 kilograms = average weight of a female giraffe.

GHGs emission data

- https://ourworldindata.org/co2-emissions

How much impact does food have?

Proportion of total greenhouse gas emissions from food

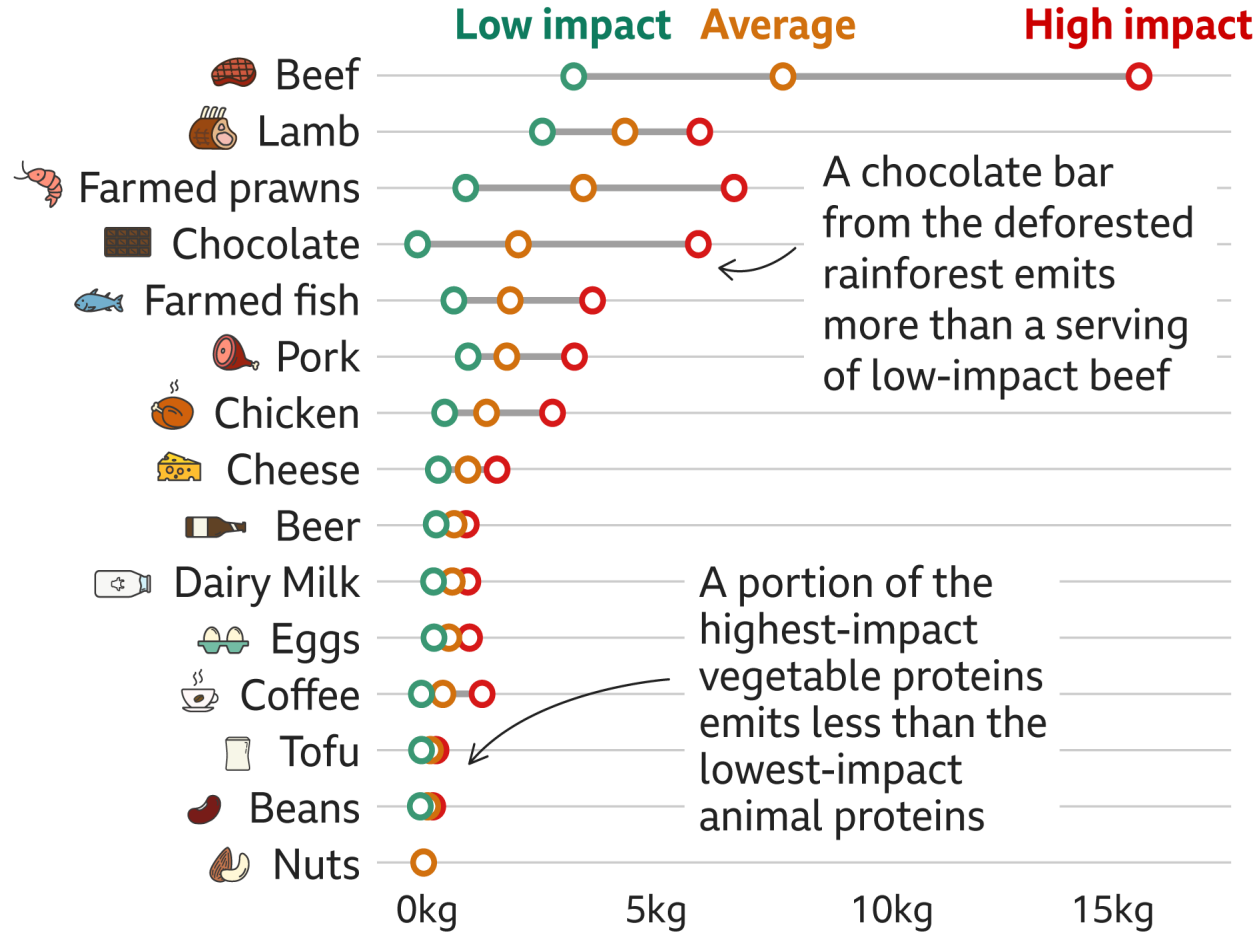


Source: Poore & Nemecek (2018), Science

BBC

Beef has the biggest carbon footprint – but the same food can have a range of impacts

Kilograms of greenhouse gas emissions per serving

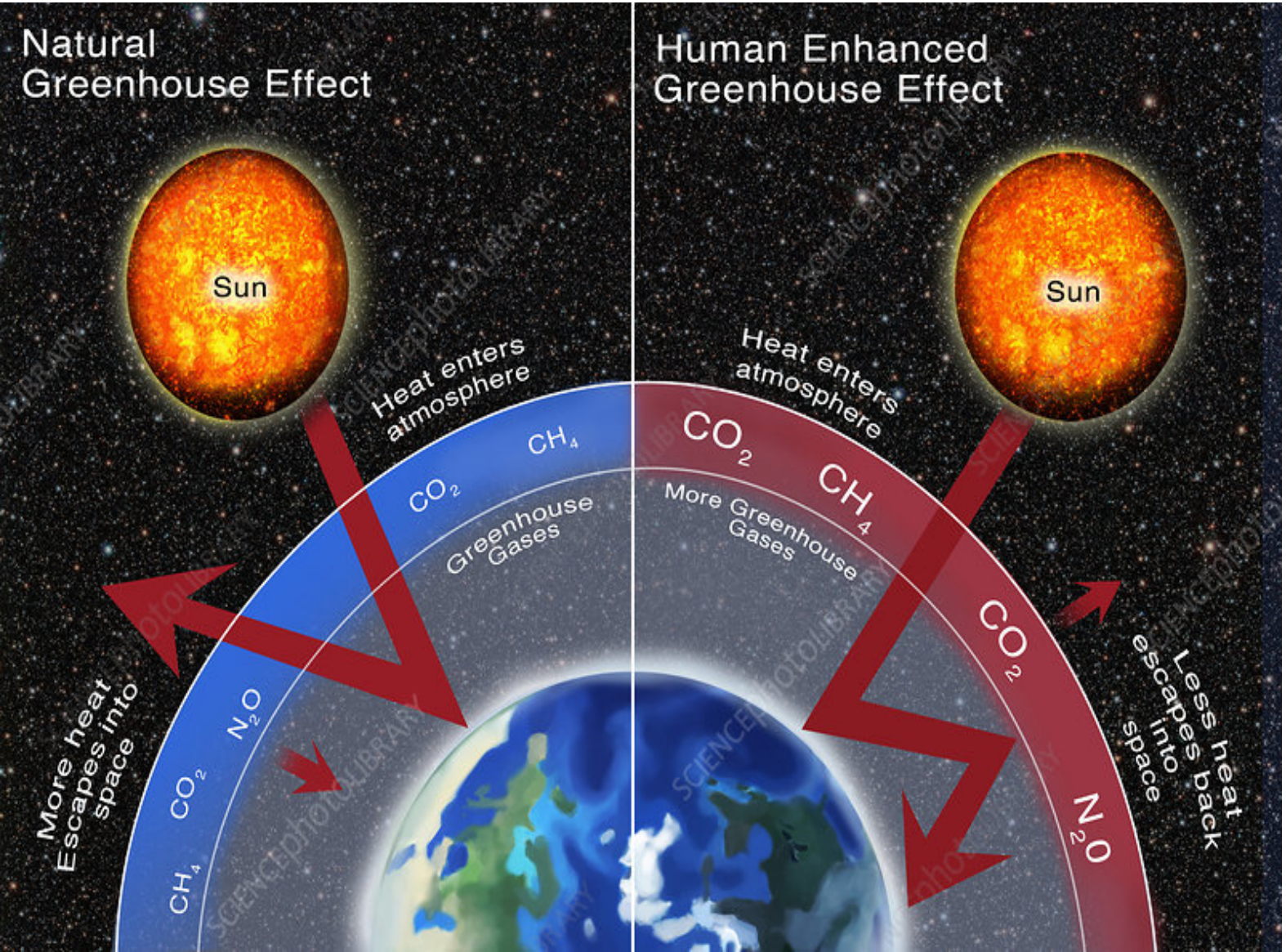


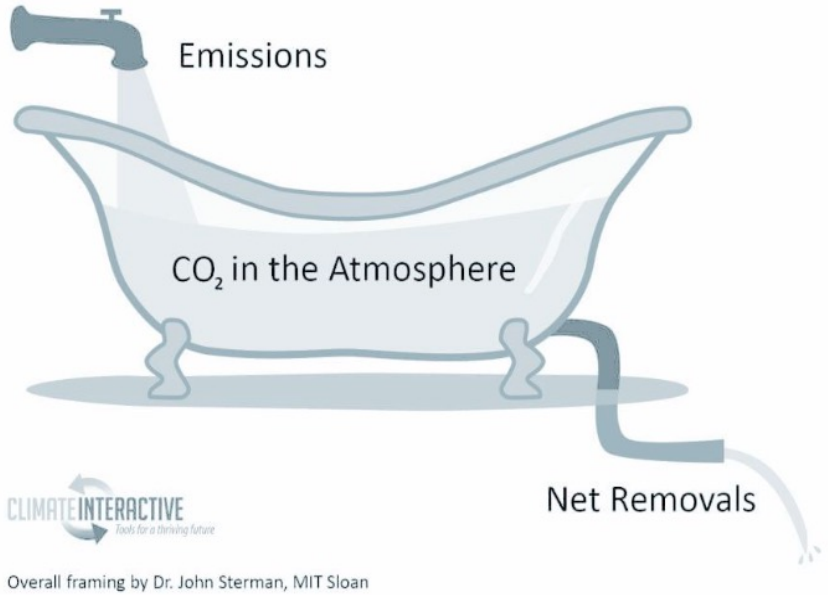
Note: The figures for each food are based on calculations from 119 countries. Serving sizes are from the British Dietetic Association (BDA) and Bupa.

Source: Poore & Nemecek (2018), Science

BBC

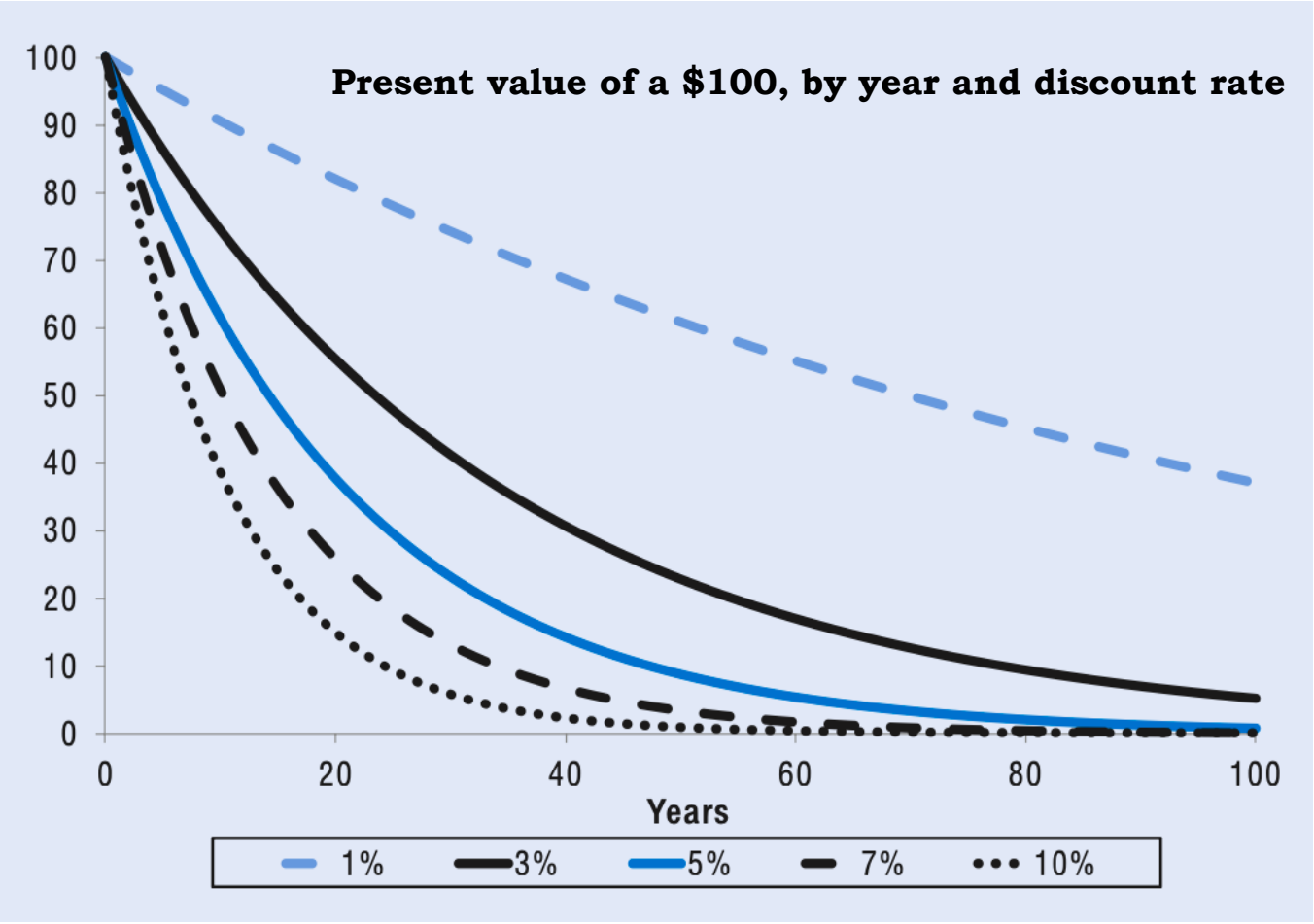
Climate change, Stock of GHGs and intergeneration problem





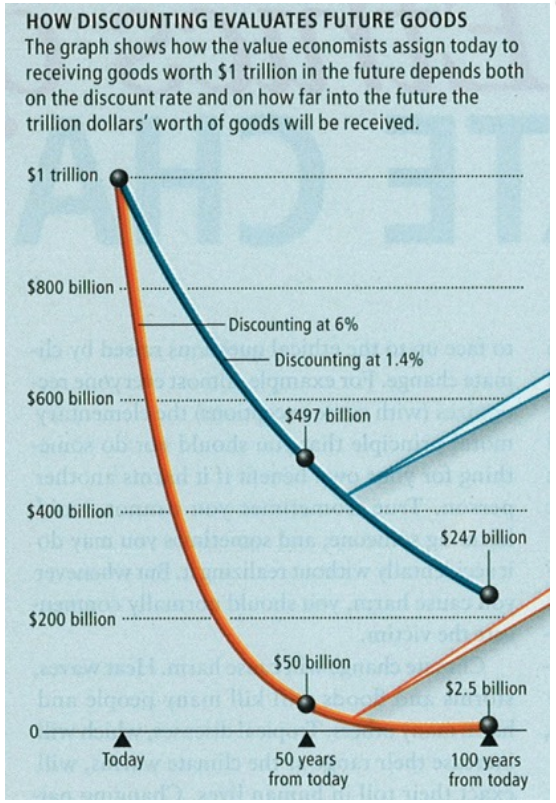
Overall framing by Dr. John Sterman, MIT Sloan

BALANCING THE PRESENT AND FUTURE: THE DISCOUNT RATE



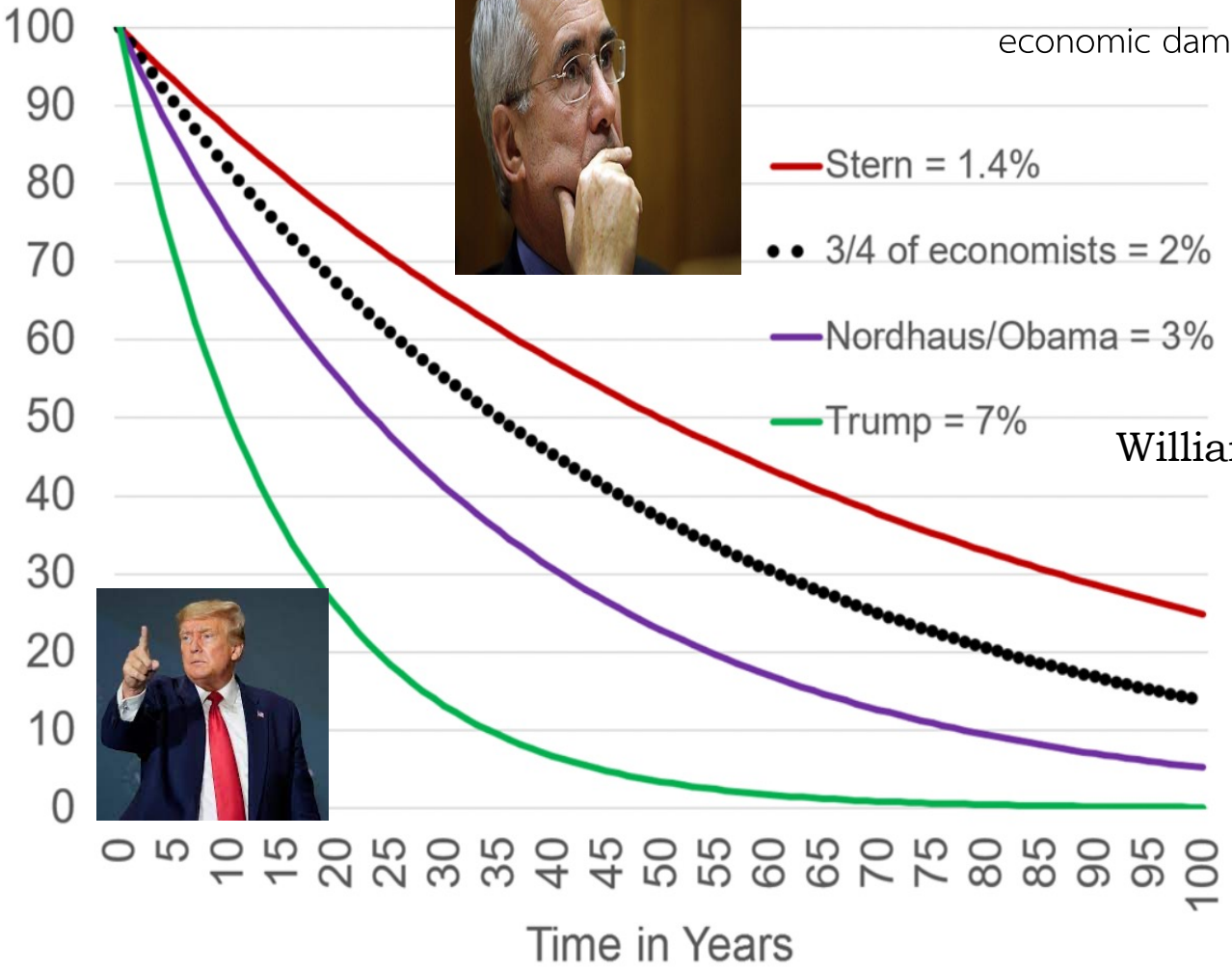
- A high discount rate will highly favor the present over the future, while a low discount rate will give more weight to future costs or benefits.
- In many environmental applications, the benefits occur in the future while the costs are paid in the short term.
- Climate change : the costs of mitigating climate change would occur in the near term while the benefits (i.e., reduced damages) would occur decades and even centuries in the future.
- Thus a low discount rate will generally support a higher degree of environmental protection.

Distance future & Discount rate



Sir Nicholas Stern of LSE

urgent action against global warming to prevent economic damage.

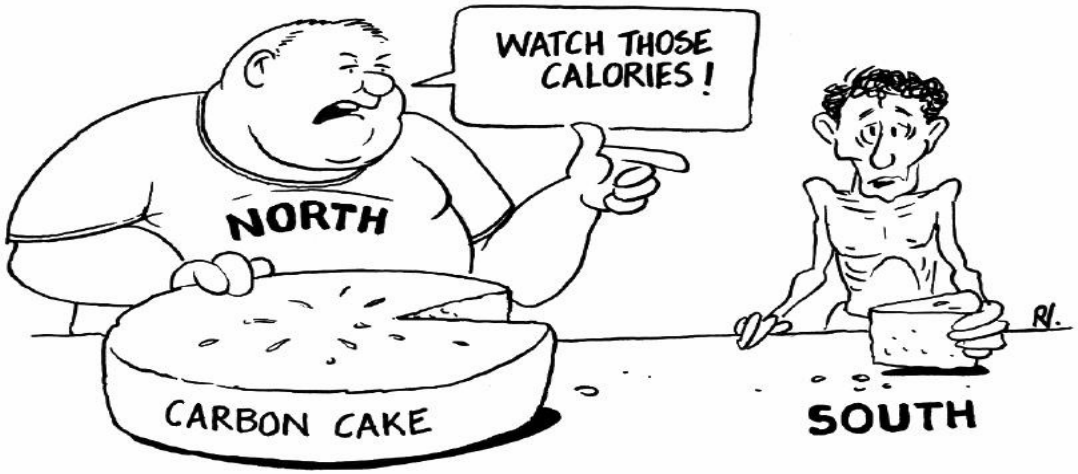


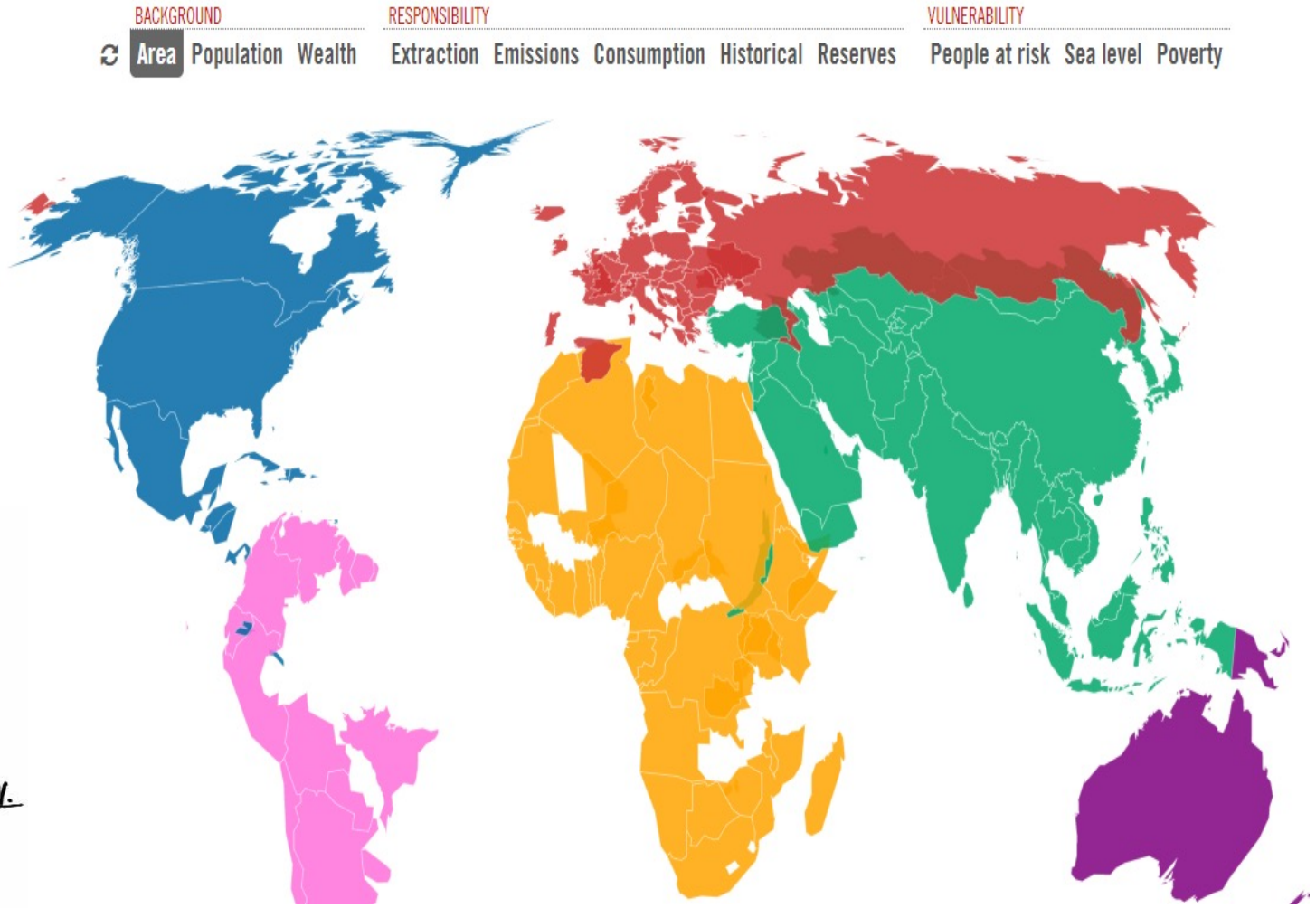
William D. Nordhaus of Yale

act slower, wait and see

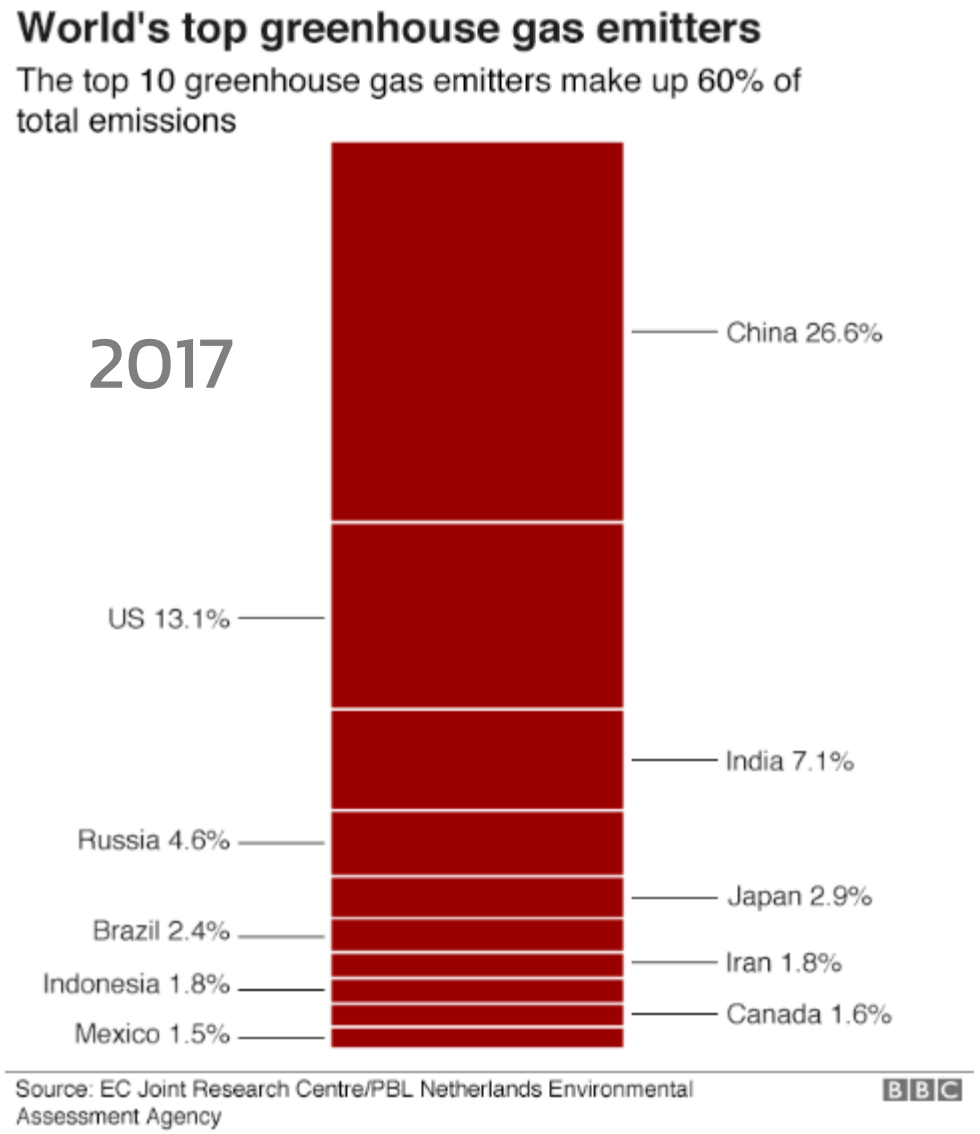
Equity

[CLICK HERE]

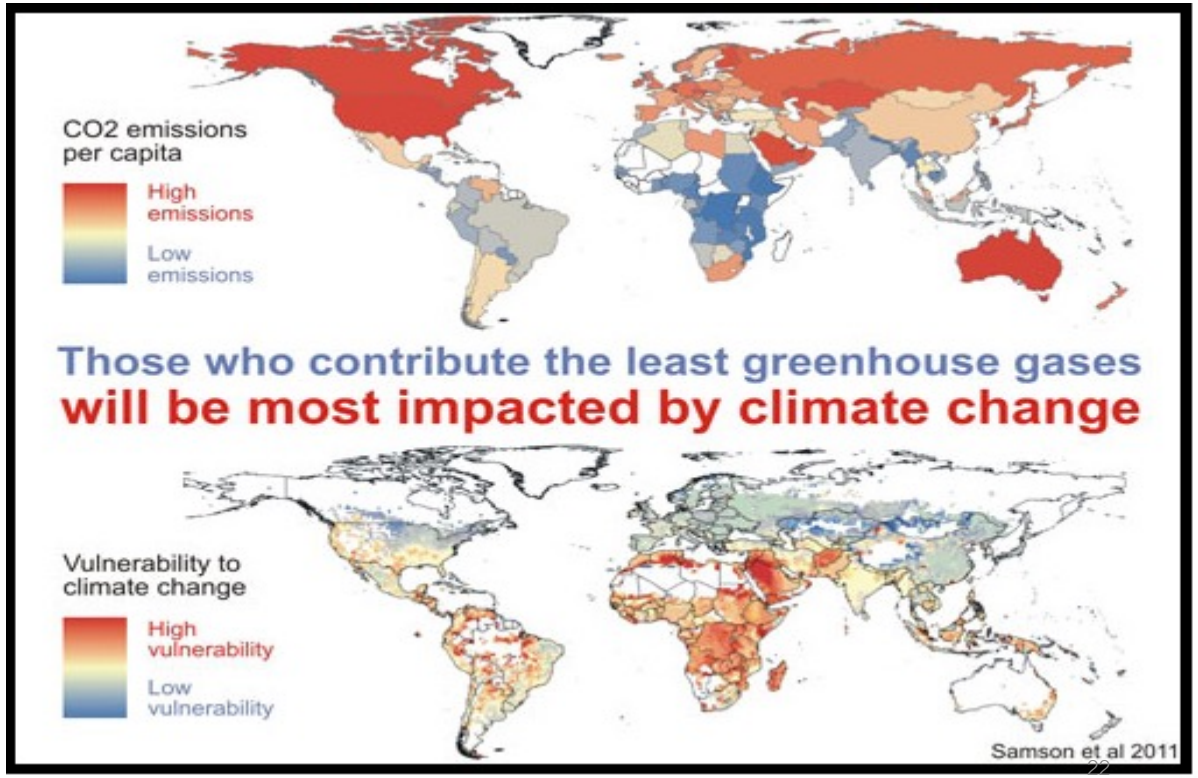




Top 10 GHG emitters make up 60% of total emissions



"In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities".
[Principle 7 of the Rio Declaration at the first Rio Earth Summit in 1992]

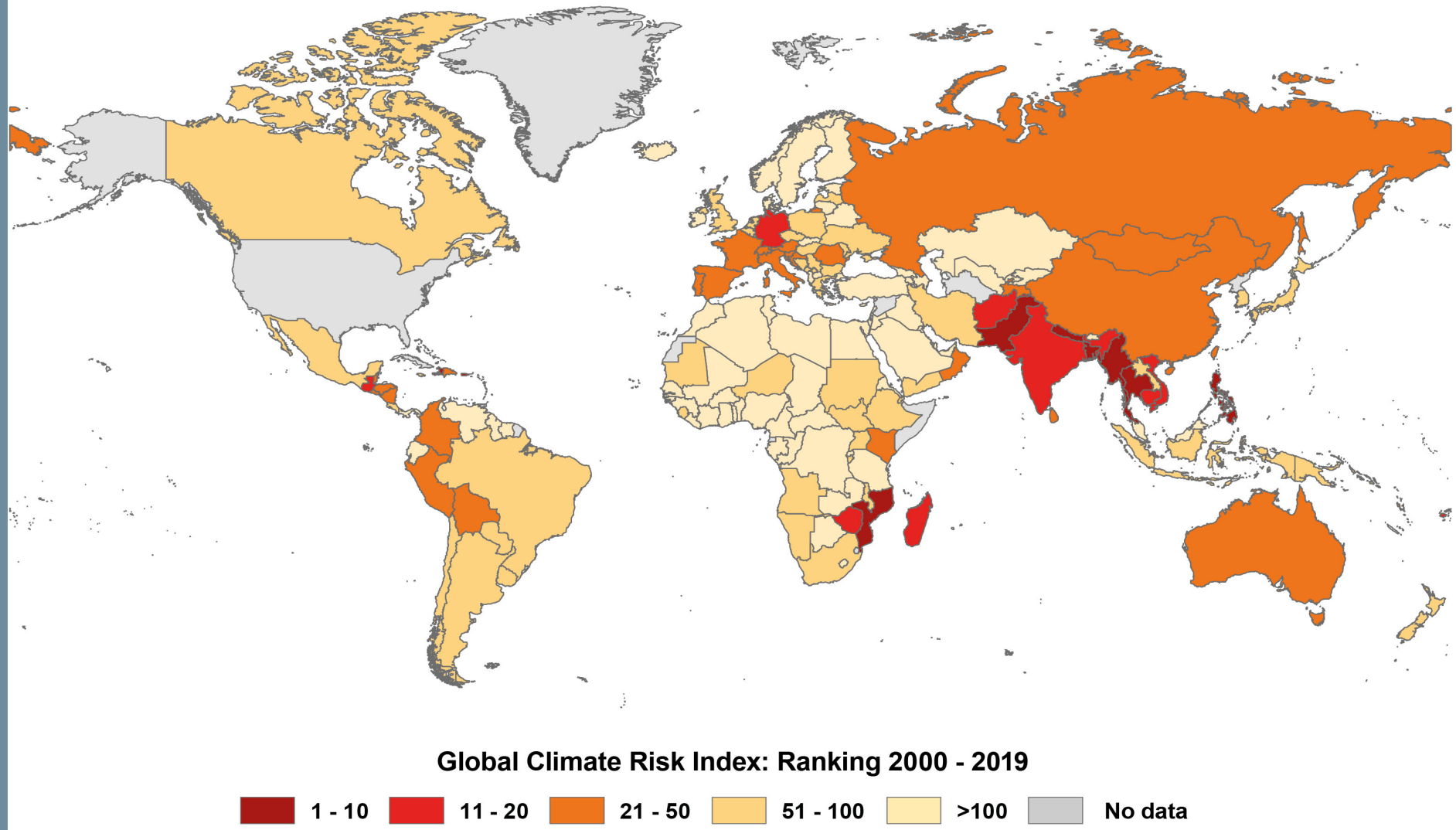


Global Climate Risk Index

GERMANWATCH

Global Climate Risk Index

www.germanwatch.org/en/cri



Global Climate Risk Index

GERMANWATCH

Global Climate Risk Index

www.germanwatch.org/en/cri

CRI 2000-2019 (1999-2018)	Country	CRI score	Fatalities	Fatalities per 100 000 inhabitants	Losses in million US$ PPP	Losses per unit GDP in %	Number of events (2000–2019)
1 (1)	Puerto Rico	7.17	149.85	4.12	4 149.98	3.66	24
2 (2)	Myanmar	10.00	7 056.45	14.35	1 512.11	0.80	57
3 (3)	Haiti	13.67	274.05	2.78	392.54	2.30	80
4 (4)	Philippines	18.17	859.35	0.93	3 179.12	0.54	317
5 (14)	Mozambique	25.83	125.40	0.52	303.03	1.33	57
6 (20)	The Bahamas	27.67	5.35	1.56	426.88	3.81	13
7 (7)	Bangladesh	28.33	572.50	0.38	1 860.04	0.41	185
8 (5)	Pakistan	29.00	502.45	0.30	3 771.91	0.52	173
9 (8)	Thailand	29.83	137.75	0.21	7 719.15	0.82	146
10 (9)	Nepal	31.33	217.15	0.82	233.06	0.39	191

The 10 countries most affected from 2000 to 2019 (annual averages)

GHGs reduction is a public good

Non-rivalry means that consumption of a good by one person does not reduce the amount available for others.

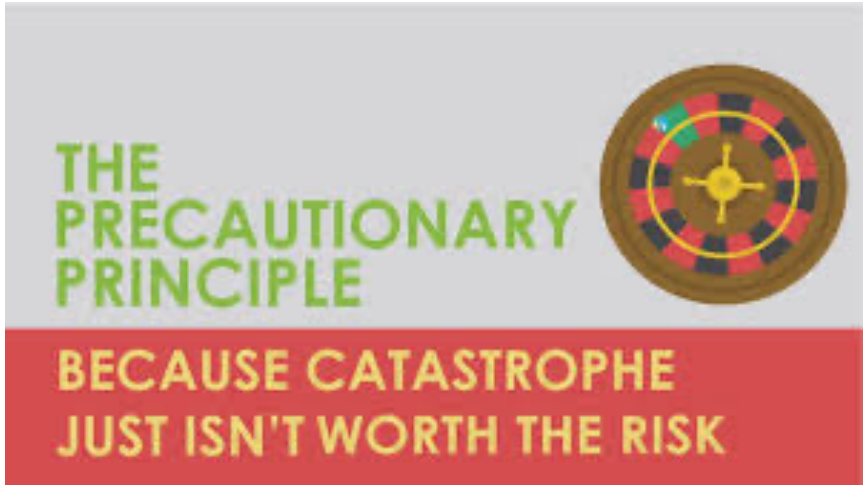
Non-exclusion means that it is costly or impossible for one user to exclude others from using a good

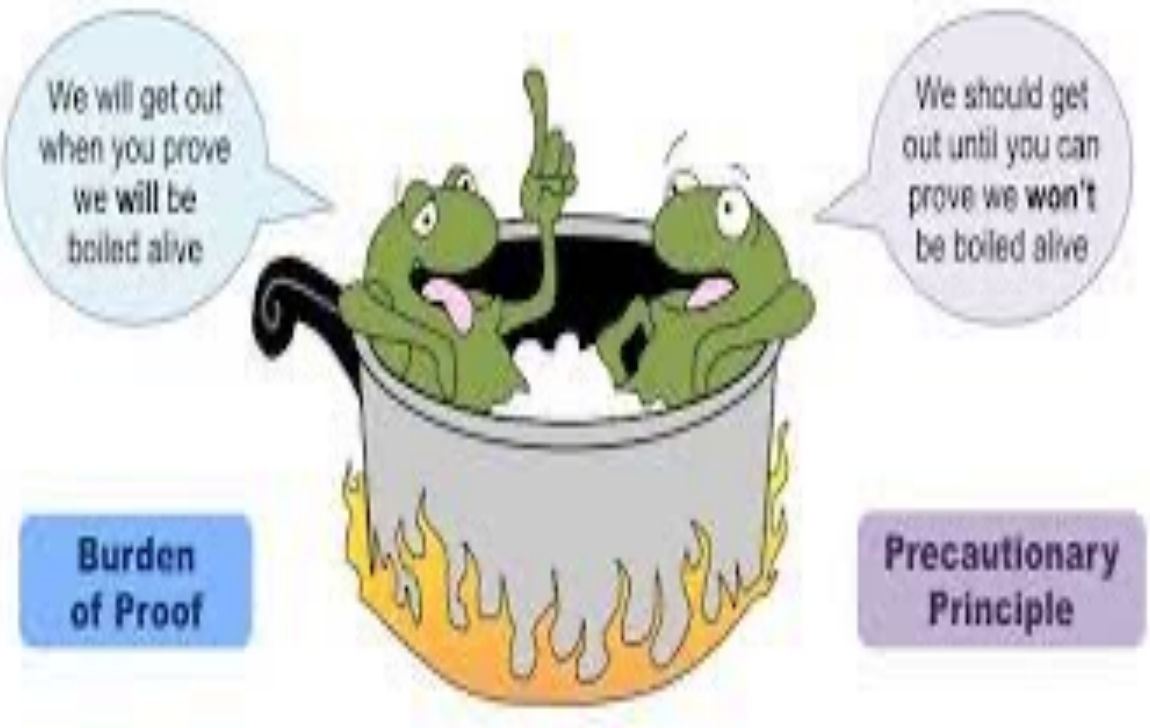
	RIVALRY	NON-RIVALRY	
EXCLUSION	**PRIVATE GOOD** Motor vehicles Computers Smartphones Hair cut Essentially, only one person can own it or use it at the same time. 'Sharing it' means loss of utility. No free rider problem! Easy for sellers to set a price.	**'CLUB' GOOD** Subscription TV Hotel 'wi-fi' Password protected website Golf club More than one person (a club) can use it at the same time, without reducing utility to others. Ability to exclude means ability to charge - usually a fixed access charge. Small 'clubs' can become congested.	EXCLUSION
NON EXCLUSION	**'COMMON RESOURCE'** [AKA COMMON PROPERTY] Fish stocks Rivers, oceans The environment People cannot be excluded from use, but using the resource reduces availability/has impact on others. Resources may be depleted by free access, leading to over-use.	**PUBLIC GOOD** Defense Streetlighting Tsunami/earthquake warning system More than one person can use it at the same time. Free to one means free to all - the free rider problem! Sellers/providers cannot charge at point of use!	NON EXCLUSION
	RIVALRY	NON-RIVALRY	

Precautionary principle

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.
[Principle 15 of the 1992 Rio Declaration]

Article 3 of the United Nations Framework Convention on Climate Change (UNFCCC) establishes that “parties should take precautionary measures to anticipate, prevent, or minimize the causes of climate change and mitigate its adverse effects.”





TIMELINE OF CLIMATE CHANGE

1896 Svante Arrhenius constructs the first climate model of the influence of atmospheric carbon dioxide (CO_2).

1920–25 Era of large-scale petroleum development begins with the opening of Texas and Persian Gulf oil fields.

1930s Milutin Milankovitch publishes "Mathematical Climatology and the Astronomical Theory of Climatic Changes" to explain the causes of Earth's ice ages.

1957 Roger Revelle and Hans E. Suess write that "human beings are now carrying out a large scale geophysical experiment" in a paper examining CO_2 uptake by the oceans.

1960 Curve developed by American climate scientist Charles David Keeling begins to track atmospheric CO_2 concentrations. CO_2 concentration in 1960 ≈ 315 parts per million (ppm).

1973 First oil shock

1974 First evidence of chlorine chemicals being involved in ozone depletion is published.

1979 Second oil shock

1980 Keeling Curve: CO_2 concentration in 1980 ≈ 337 ppm.

1990 First Intergovernmental Panel on Climate Change (IPCC) report notes pattern of past warming while signaling that future warming is likely.

1992 United Nations conference in Rio de Janeiro creates the UN Framework Convention on Climate Change.

1997 Kyoto Protocol is created with the intent to limit greenhouse gas (GHG) emissions from industrialized countries. The U.S., the largest GHG emitter at the time, does not sign on.

2000 Keeling Curve: CO_2 concentration in 2000 ≈ 367 ppm.

2001 Third IPCC report notes that warming resulting from GHG emissions has become very likely.

2005 Kyoto Protocol goes into effect. All major industrialized countries sign on except the U.S.

2006 China becomes the world's largest GHG emitter.

2007 Fourth IPCC report notes that effects of global warming are occurring.

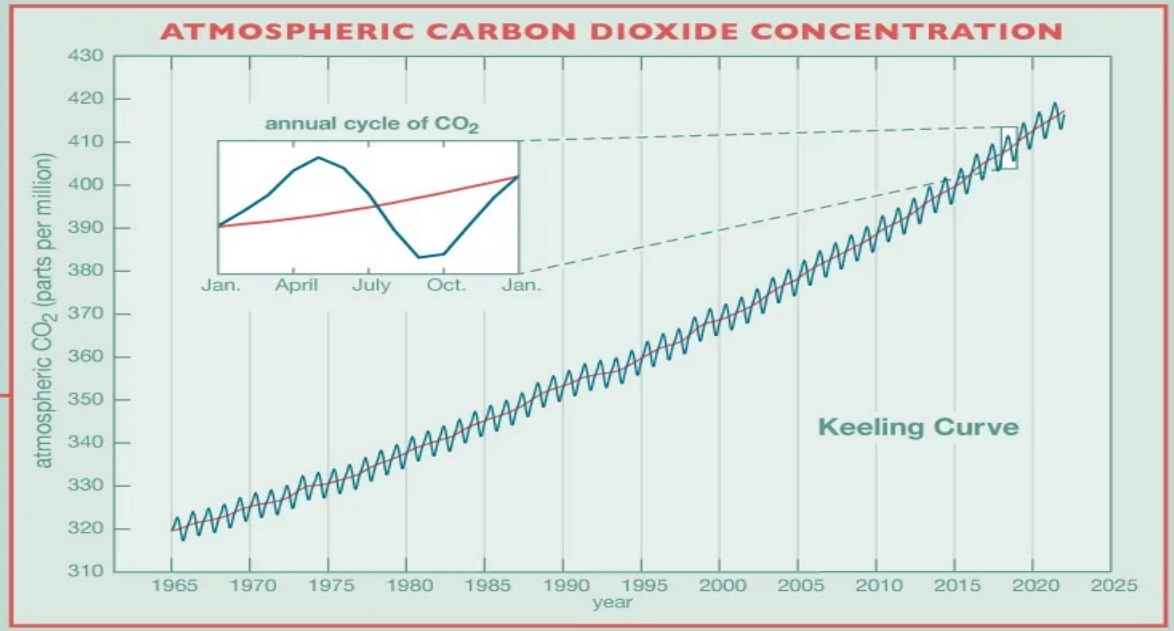
2011 Canada withdraws from the Kyoto Protocol.

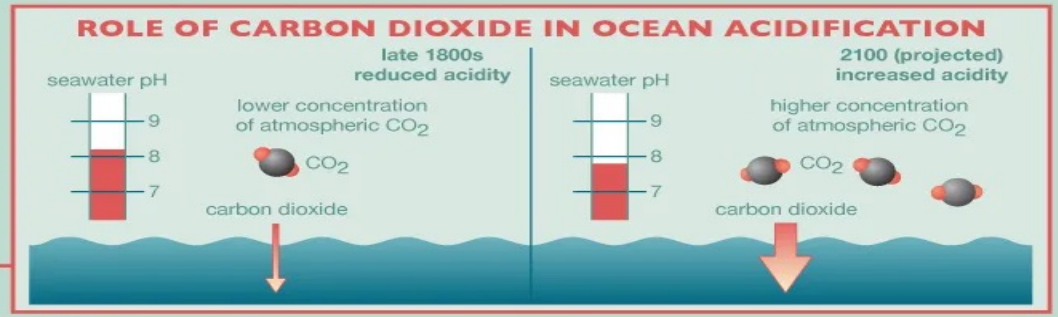
2013 Keeling Curve: CO_2 concentration in 2013 ≈ 400 ppm.

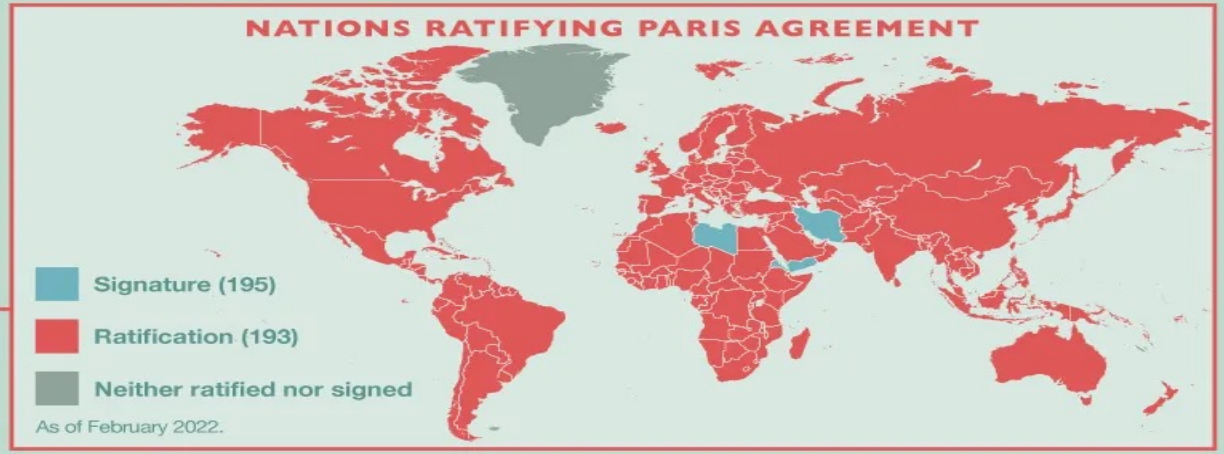
2015 Paris Agreement (which replaces the Kyoto Protocol) is adopted by nearly 200 countries, including the U.S.

2016 Paris Agreement goes into effect.

2021 Sixth IPCC report notes unequivocally that human activity has brought widespread and rapid changes to the atmosphere, hydrosphere, and biosphere.





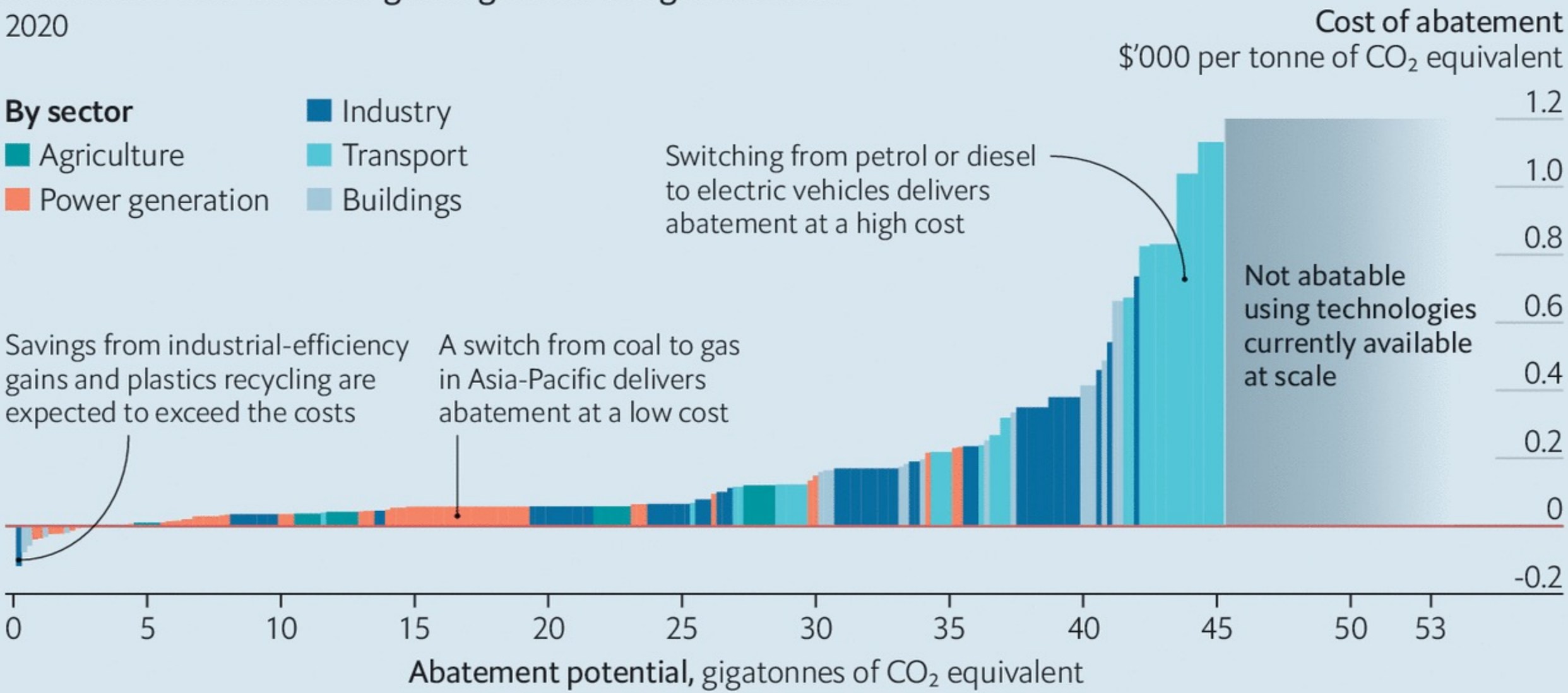


The great abatement debate

1

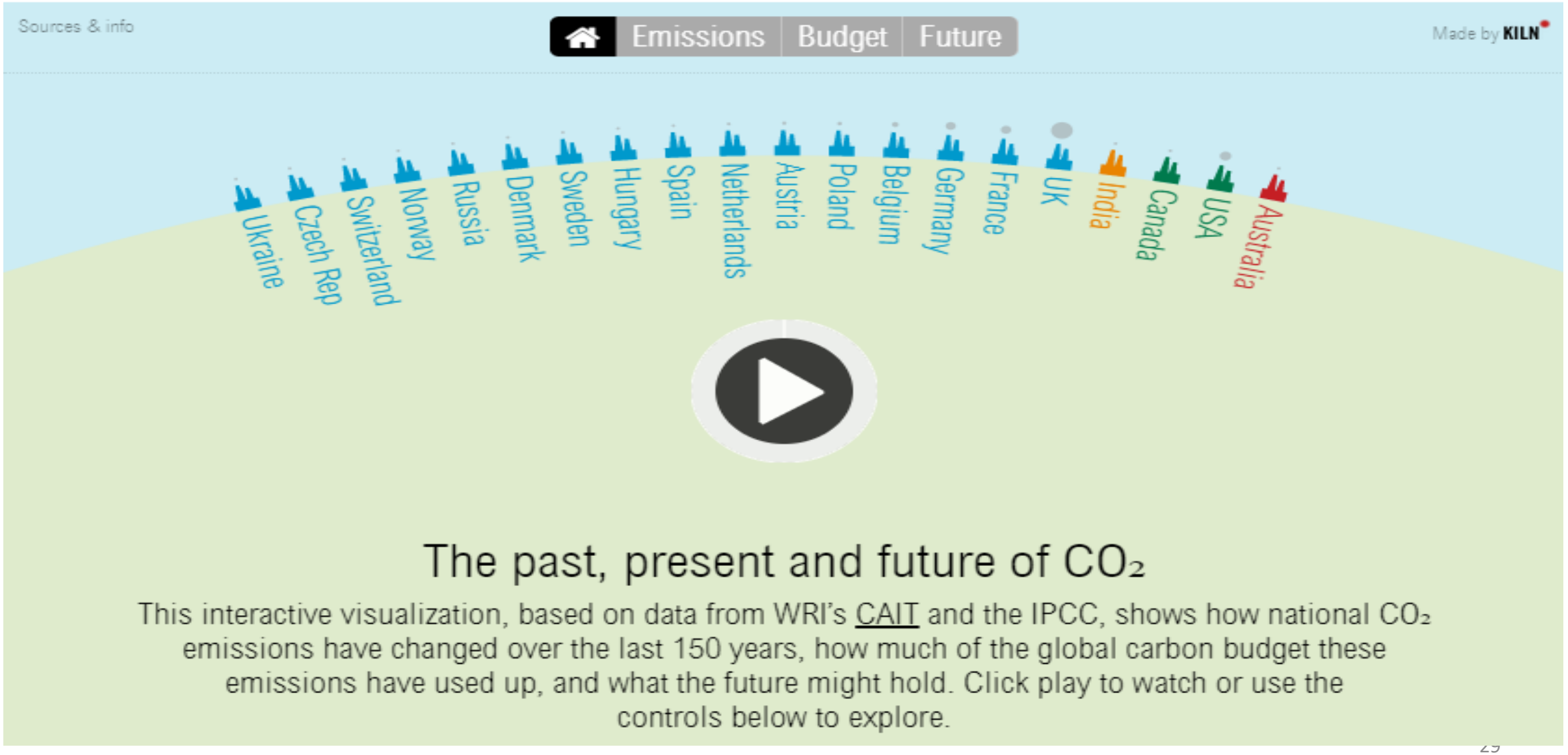
Abatement-cost curve for global greenhouse-gas emissions

2020



Source: Goldman Sachs

CLICK HERE


Sources & info
Emissions
Budget
Future
Made by KILN
Ukraine
Czech Rep
Switzerland
Norway
Russia
Denmark
Sweden
Hungary
Spain
Netherlands
Austria
Poland
Belgium
Germany
France
UK
India
Canada
USA
Australia
The past, present and future of CO_2
This interactive visualization, based on data from WRI's CAIT and the IPCC, shows how national CO_2 emissions have changed over the last 150 years, how much of the global carbon budget these emissions have used up, and what the future might hold. Click play to watch or use the controls below to explore.

TODAY IN CHEMISTRY HISTORY

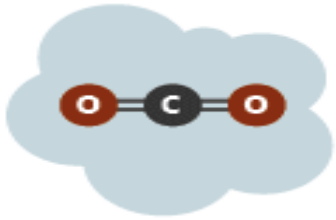
16TH FEBRUARY – THE KYOTO PROTOCOL (2005)

192 COUNTRIES

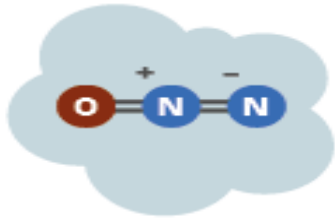
- signed and ratified
- ratified but withdrawn
- signed but not ratified

TARGET
↓5.2%
by 2012 relative to 1990

METHANE



CARBON DIOXIDE



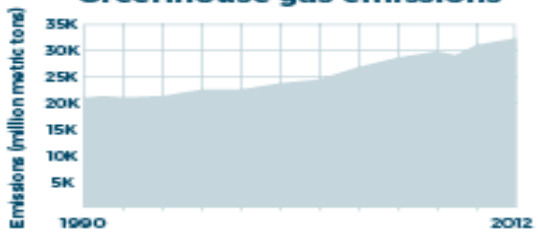
NITROUS OXIDE

GREENHOUSE GASES

- HYDROFLUOROCARBONS
- PERFLUOROCARBONS
- SULFUR HEXAFLUORIDE

The Kyoto Protocol is an international treaty to reduce the emission of six greenhouse gases. 192 countries are party to the protocol, but only 38 had binding targets for the first period (2008–2012). These 38 countries met their target collectively – but an absence of binding targets for developing nations such as China and India meant that worldwide greenhouse gas emissions continued to rise.

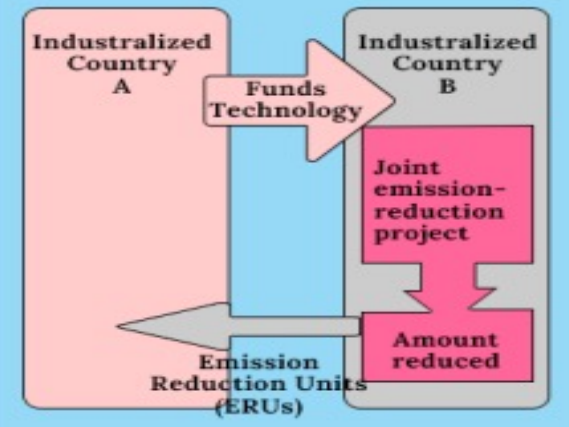
Greenhouse gas emissions



The Kyoto Protocol's flexible mechanism for fulfillingemission reductions commitments

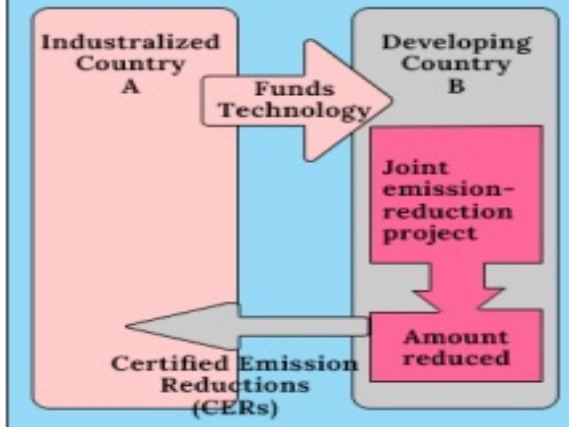
Joint Implementation
(Kyoto Protocol,Article 6)

When an industrialized country Invests in an emission reduction project in another Industralized country, the amount reduced counts toward the investor's emissionreduction total



Clean Development Mechanism
(Kyoto Protocol, Article 12)

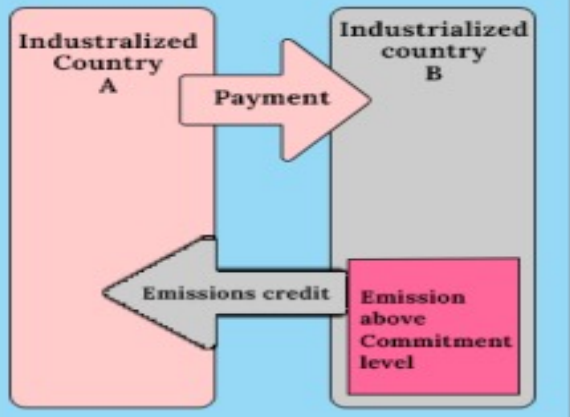
When an Industriallized country Invests in an emision reduction project in a developing country, the amount reduced counts toward the Investor's emission reduction total.



Creadits issued for emissions reduced in 2000 and onward

(International) Emission Tradin
(Kyoto Protocol, Article 17)

Industrialized countries may buy and sell emission credits.



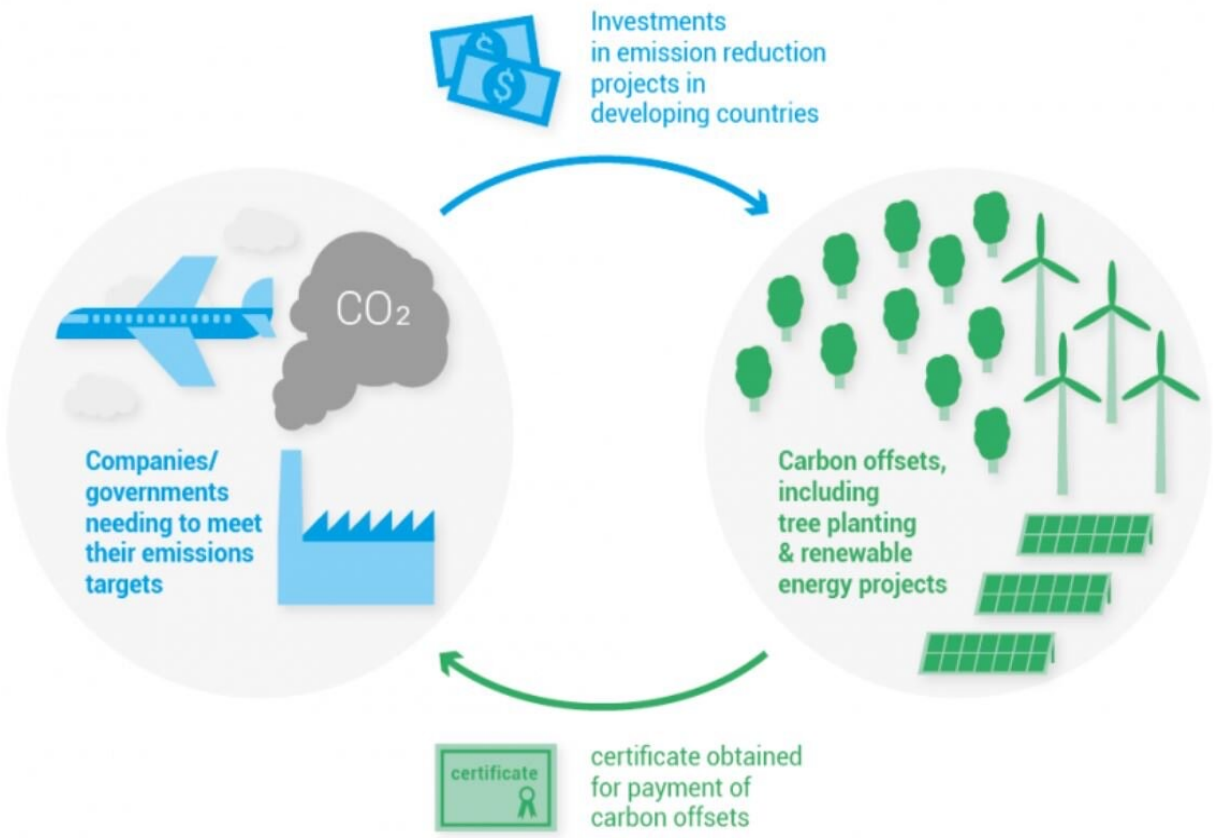
More Widely practiced startin in 2008

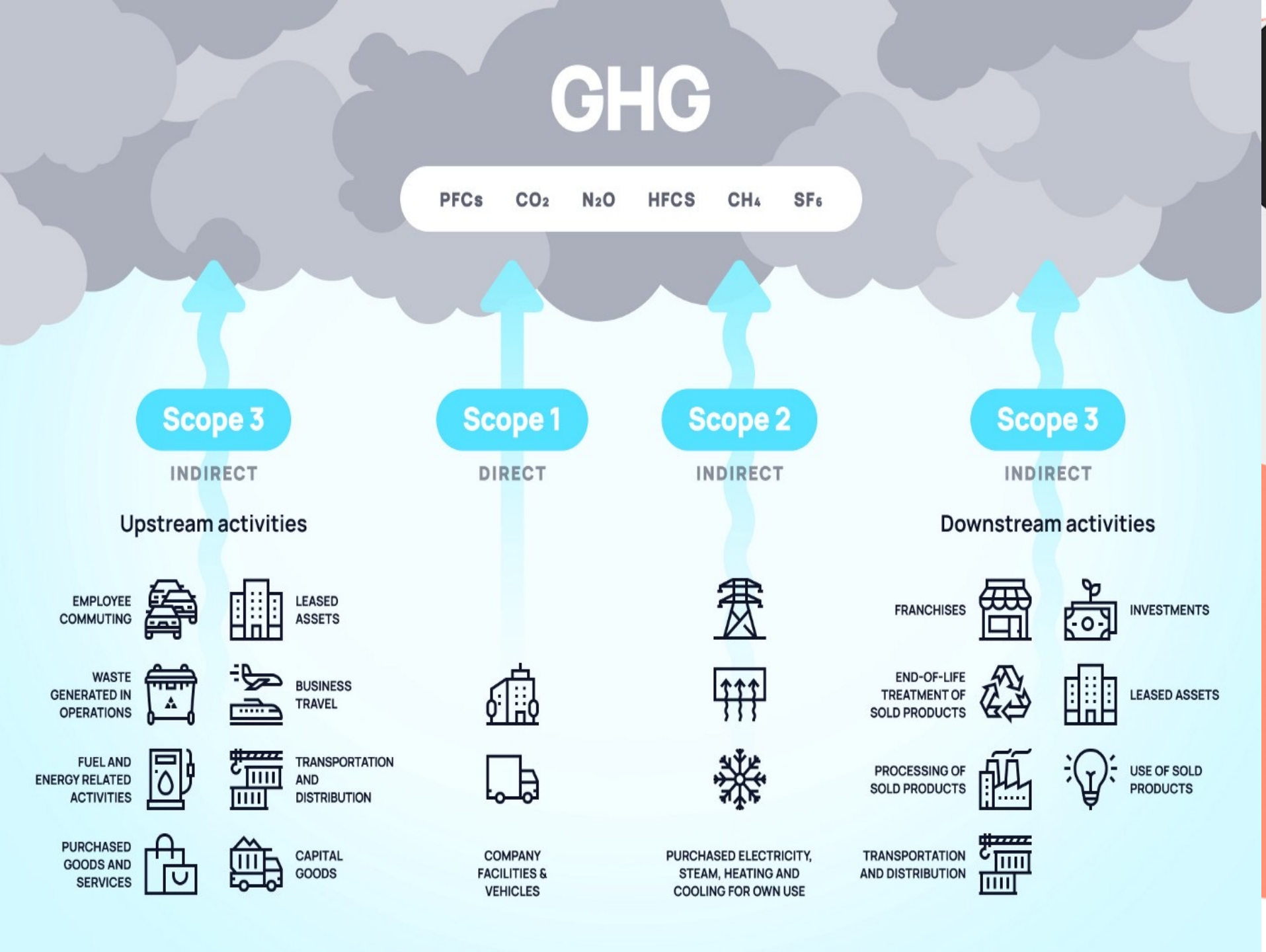
Source: Japan's Ministry of Environment

[Emission trading]

HOW DO ORGANISATIONS OFFSET THEIR EMISSIONS VOLUNTARILY?

- Currently, offsetting generally consists of an organization purchasing an amount of carbon credits that corresponds to the quantity of GHG they wish to offset and whose type enter either in scope 1, scope 2 and/or scope 3:
- The money these organizations pay to purchase carbon credits contributes directly or indirectly to the funding of a specific carbon emissions reduction project.
- installation of renewable energy infrastructure, planting trees that remove and store carbon from the atmosphere.





Scope 1

Direct emissions resulting from vehicles, fuel use, and/or chemical leakage

Scope 2

Indirect emissions resulting from bought electricity, cooling, heat and/or steam

Scope 3

Other indirect emissions that occur in the value chain of a company and are not already included within scope 2 (such as emissions resulting from purchased goods and services, transport, or business travel)

PARIS CLIMATE AGREEMENT

Historical document that legally binds the whole World to participate in climate change fight.

196 countries
Adopted the Agreement
officially recognizing human influence on climate

Finance
Rich countries will provide minimum of **$100 billion** to developing ones for climate change adaptation by 2020

2020
Will come into force by 2020
If signed by **55 countries** covering **55%** of global emissions

Goal
Holding the increase in the global average temperature well below
2°C
Pursue efforts to limit the temperature increase to
1.5°C

5 years
Ambitious
Every 5 years countries shall revise their emissions reduction targets and measures

Climate neutrality 2050
The balance between emissions and sinks should be reached in the second half of XXI century

Climate damage
For the first time ever the Agreement defines climate loss and damage terms **but** liability and compensation are not mentioned

Clean technologies
The Agreement urges to speed up clean tech development and international technology transfer

Role of forests
The Agreement binds saving and increasing forest area in order to capture GHGs from the atmosphere

@CLIMATERUSSIA CLIMATERUSSIA.RU

Kyoto Protocol VS Paris Agreement

Feature	Kyoto protocol	Paris Agreement
Goal	Reduce greenhouse gas emissions to 5.2% below 1990 levels	Stop the global average temperature from rising more than 2 degrees Celsius above pre-industrial levels through cutting greenhouse gas emissions
Countries under obligation	Countries considered to be industrialized in 1997	All countries
Greenhouse gases targeted	Targeted gases include carbon dioxide, nitrous oxide, methane, HFCs, PFCs, and sulfur hexafluoride.	All anthropogenic greenhouse gases
Timeframe	First phase ended in 2012	Most goals to be achieved by 2025-2030

DB Difference Between.net

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

Two Degree Targets

Paris Agreement: Temperature Targets

Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit th temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change

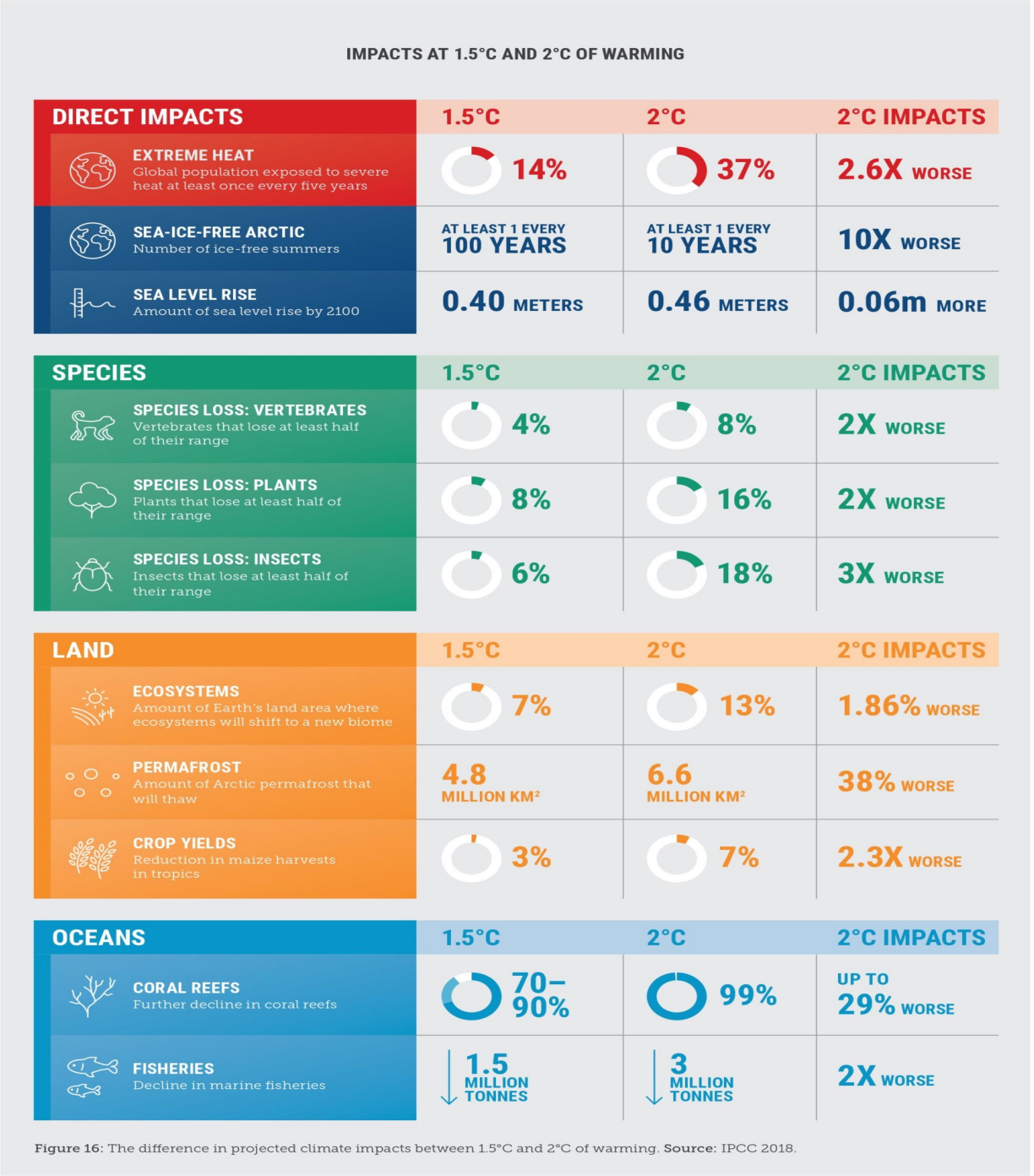


Figure 16: The difference in projected climate impacts between 1.5°C and 2°C of warming. **Source:** IPCC 2018.

WHY DOES LIMITING TEMPERATURE RISE TO 1.5 DEGREES MATTER?

At 2 degrees of global warming, there would be widespread and severe impacts on people and nature. A third of the world's population would be regularly exposed to severe heat, leading to health problems and more heat-related deaths.

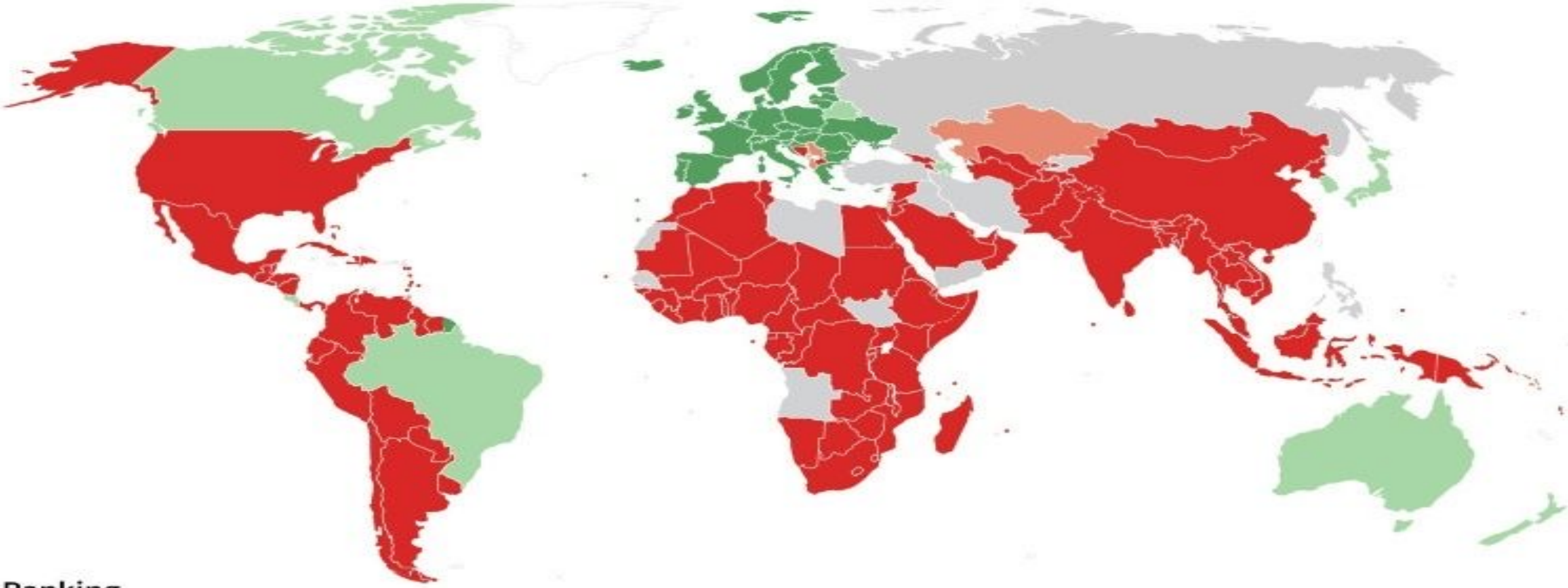
Almost all warm water coral reefs would be destroyed, and the Arctic sea ice would melt entirely at least one summer per decade, with devastating impacts on the wildlife and communities they support. We cannot rule out the possibility that irreversible loss of ice sheets in Greenland and the Antarctic could be triggered, leading to several metres of sea level rise over centuries to come.

At 1.5°C, the impacts would be serious, but less severe. There would be lower risks of food and water shortages, lower risks to economic growth and fewer species at risk of extinction. Threats to human health from air pollution, disease, malnutrition and exposure to extreme heat would also be lower. That is why every fraction of a degree of warming matters, and why we are dedicated to keeping the prospect of holding temperature rises to 1.5 degrees alive.

Paris climate accord pledges

National emissions reduction commitments against the goal to keep global warming below 1.5°C

Requires 50% reduction of greenhouse gas emissions (GHG) by 2030



Ranking

- **Insufficient** — *Intensity target or none at all, +50 conditional**
- **Partially insufficient** — *< 20% emission reductions, up to 50% conditional**
- **Partially sufficient** — *20-40% emission reductions*
- **Sufficient** — *> 40% emission reductions*
- **No pledge**

**emissions cuts conditional on international financial support*

Source: Universal Ecological Fund

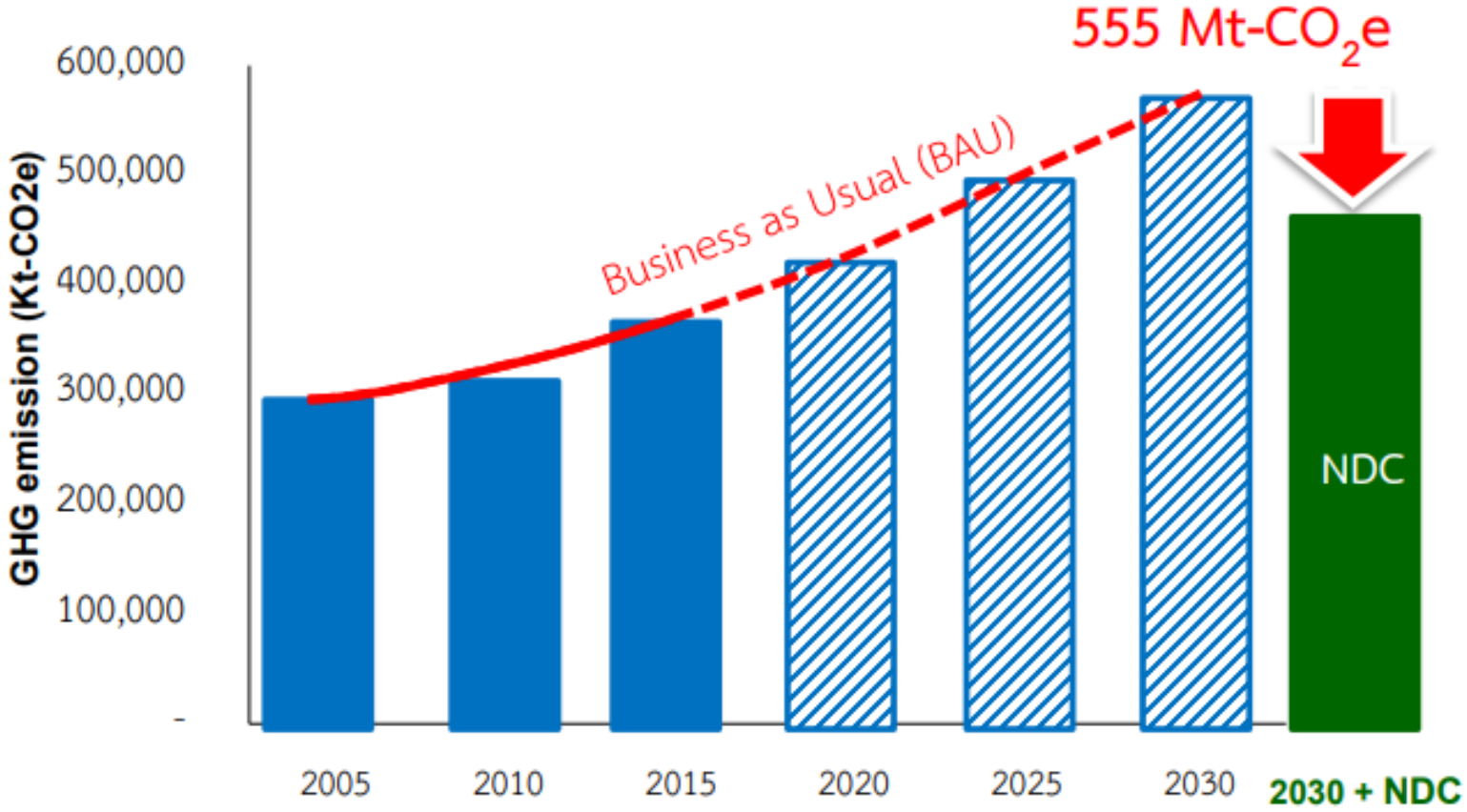
Thailand's NDC

Statement by H.E. General Prayut Chan-o-cha (Ret.), Prime Minister of the Kingdom of Thailand at the General Debate of the 70th Session of the United Nations General Assembly
New York, 29 September 2015

"THAILAND INTENDS TO REDUCE GREENHOUSE GAS EMISSIONS BY 20% FROM BAU LEVEL BY 2030"

The level of contribution could increase up to 25% subject to adequate and enhanced access to technology development and transfer, financial resources and capacity building support through a balanced and ambitious global agreement under the UNFCCC

Thailand's NDC



20% Reduction from BAU by 2030 (111 Mt-CO_2e)

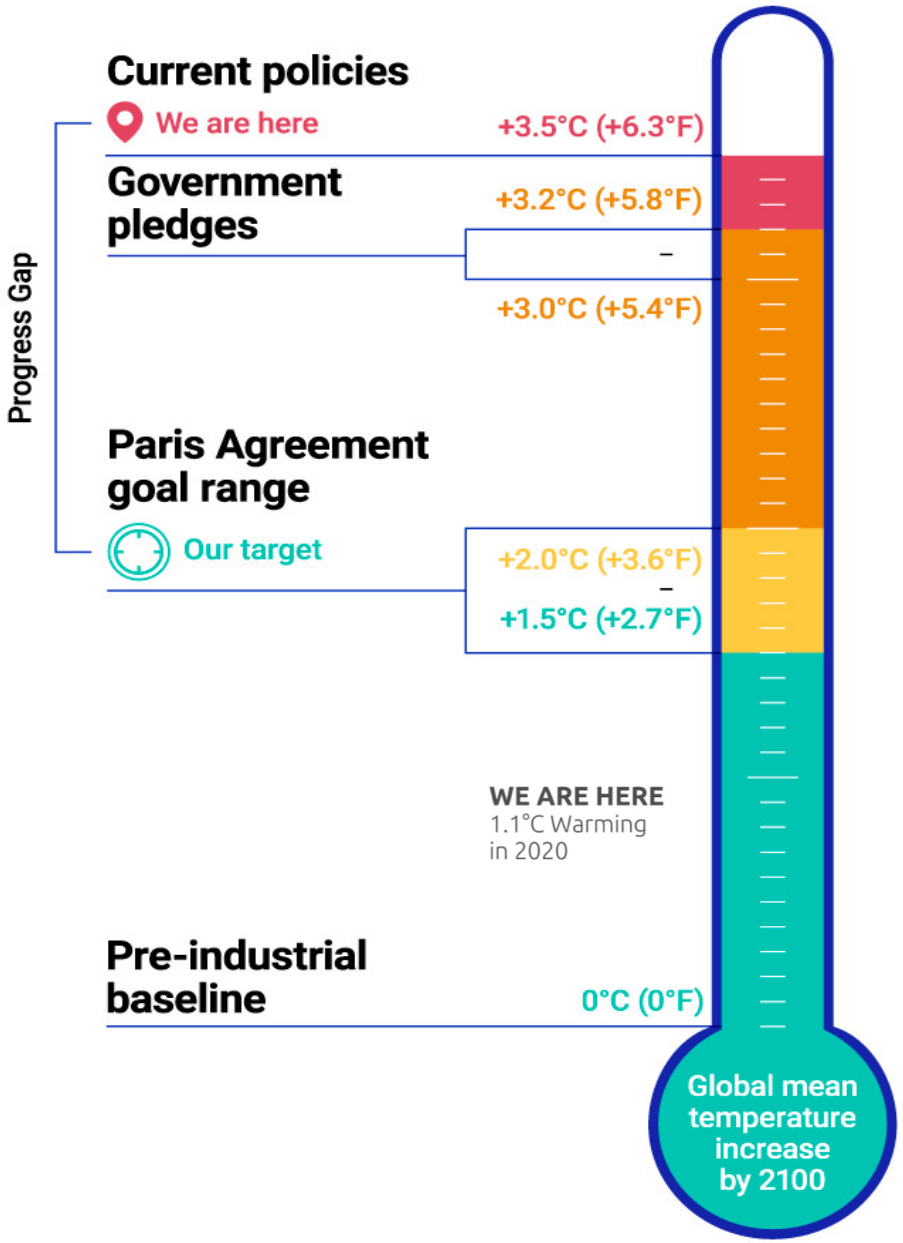
Priority Sectors:

- Energy and Transport
- Waste
- IPPU

(Industrial Processes and Product Use)

The Paris Agreement gave the world a collective mission: limit global warming to 1.5˚C–2˚C (2.7˚F–3.6˚F) above pre-industrial levels.

Unfortunately, we aren't close to hitting the goal we set five years ago.



What happens if we fail to reach our goals?

Low-lying areas become uninhabitable

Species extinctions increase

30%

of plant and animal species could be extinct by 2070.

Source: PNAS (2020)

Food and water become more scarce

Mortality rates increase ■ = 1,000 deaths

250,000 additional deaths per year could occur between 2030 and 2050.

Source: World Health Organization (2018)

Equatorial regions become uninhabitable

Economic losses increase

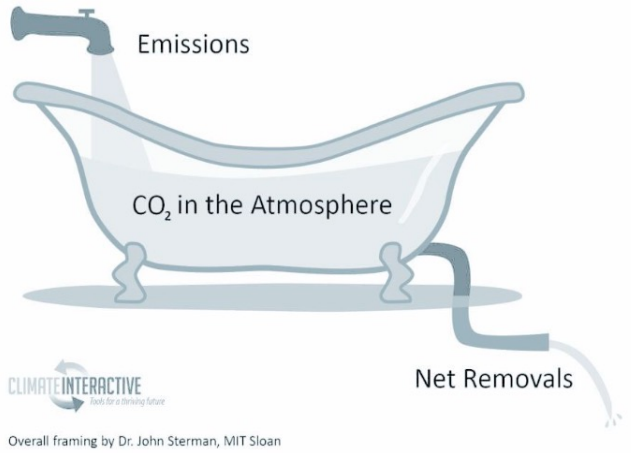
2% of U.S. GDP (over $400B) could be lost with a 4°C rise in temperature.

Source: Brookings (2019)

Source: 2021

Net zero is defined by the IPCC

"when anthropogenic CO2 emissions are balanced globally by anthropogenic CO2 removals over a specified period."



Getting it right – Net Zero WHAT?

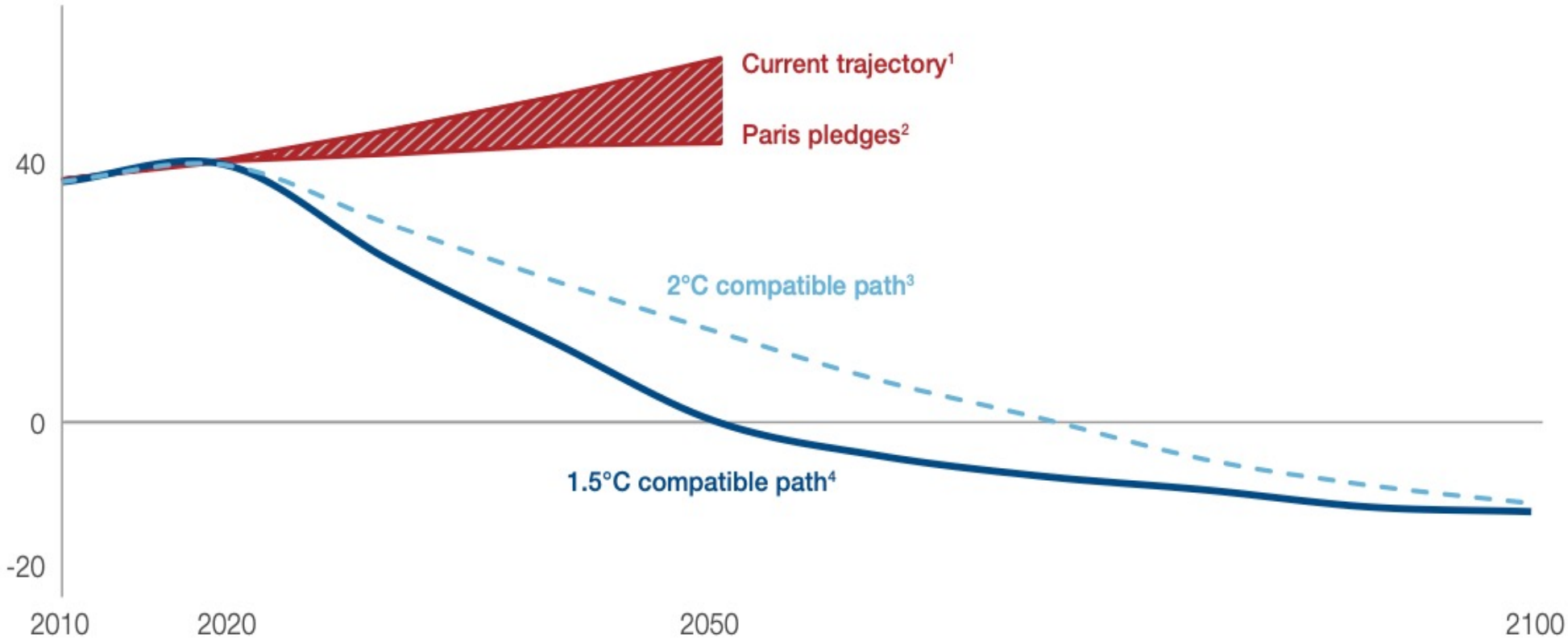
What we say		What it means	Context/Example
Net Zero Carbon Net Zero CO2 Carbon Neutral	=	CO2 only Balancing the emissions and removals of CO2	China will be carbon neutral before 2060. This means it might achieve Net Zero Emissions some time between 2070-2080.
Net Zero Emissions Net Zero GHG Climate Neutral	=	ALL greenhouse gases Balancing the emissions and removals of all GHGs	Paris Agreement goal — balancing sources and sinks of all GHG emissions. The EU will be climate neutral by 2050. This means it will be carbon neutral around 2040.

- **Carbon neutrality** Carbon-neutral means purchasing carbon reduction credits equivalent to emissions released, without the need for emissions reductions to have taken place.
- **Net zero**, There is a focus on carbon removal and carbon capture, with offsetting used only for residual emissions.

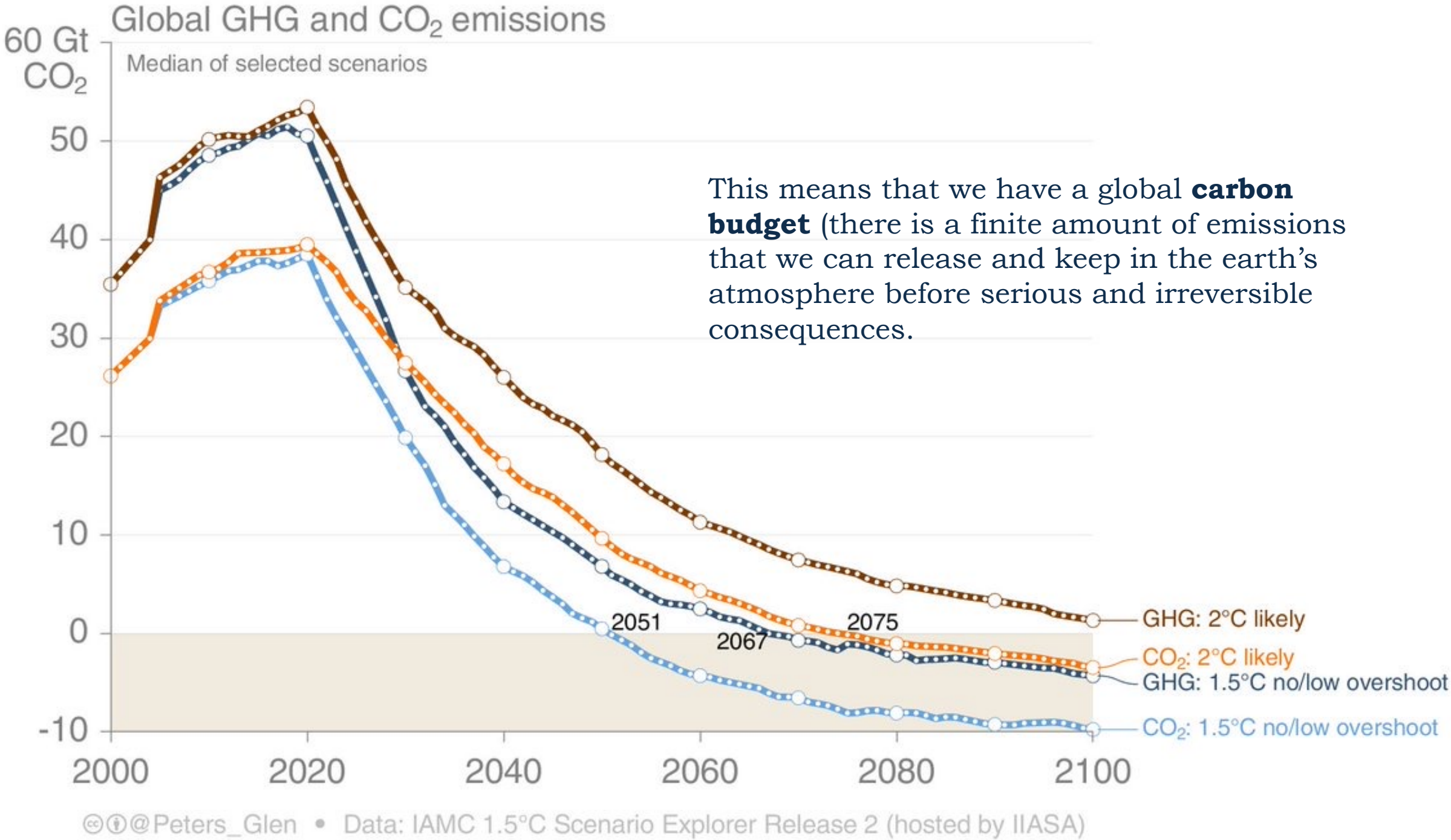
Figure 1: The world needs to move to "net zero", 2010-2100

Global net CO_2 emissions pathways

Gt per year



- According to IPCC, limiting global warming to 1.5°C requires net human- caused carbon dioxide (CO2) emissions to fall by 45% by 2030 and to reach net zero by 2050. Even limiting the temperature rise to 2°C will require CO2 emissions to fall by 25% by 2030, requiring a turnaround of the present trend.

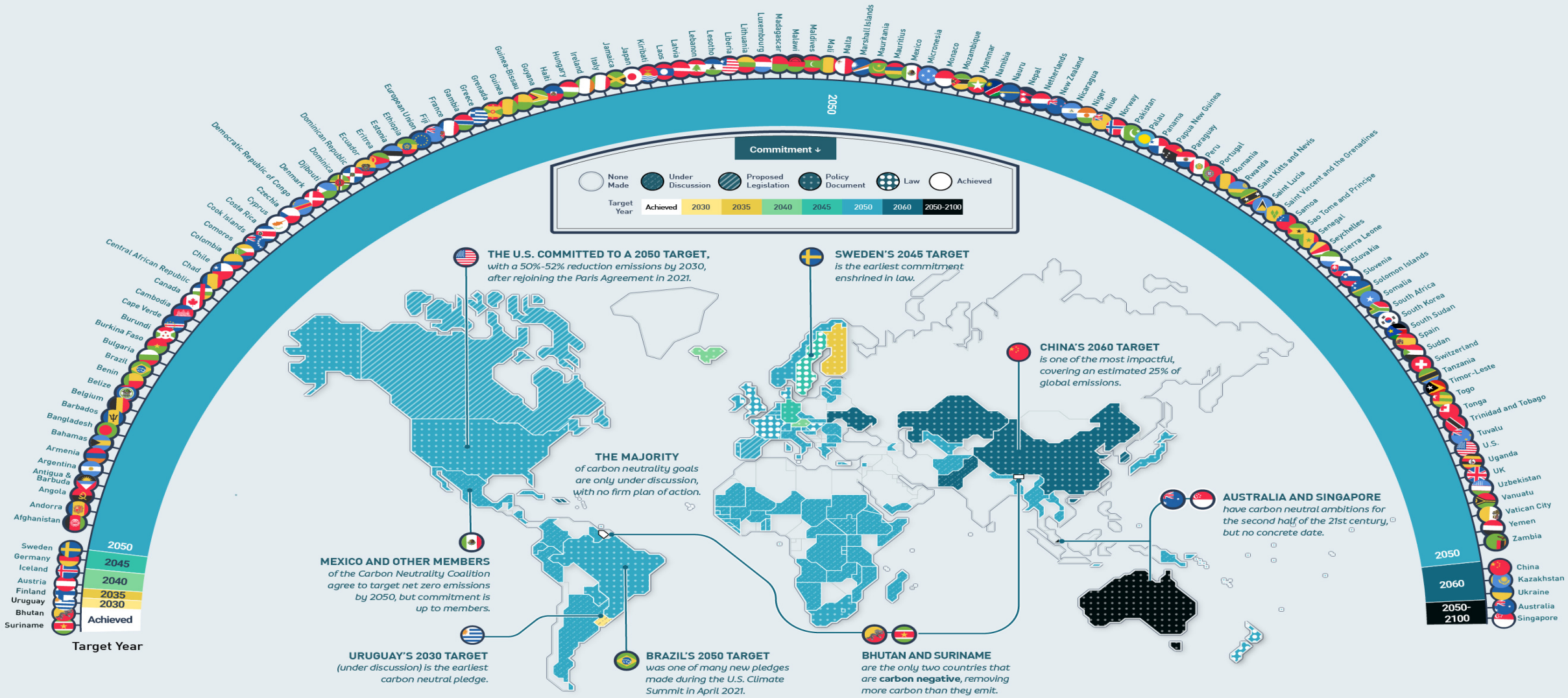


This means that we have a global **carbon budget** (there is a finite amount of emissions that we can release and keep in the earth's atmosphere before serious and irreversible consequences.

RACE TO NET ZERO

CARBON NEUTRAL GOALS BY COUNTRY

Which countries have made a carbon neutral pledge?
This map breaks down pledges by target year and level of commitment.



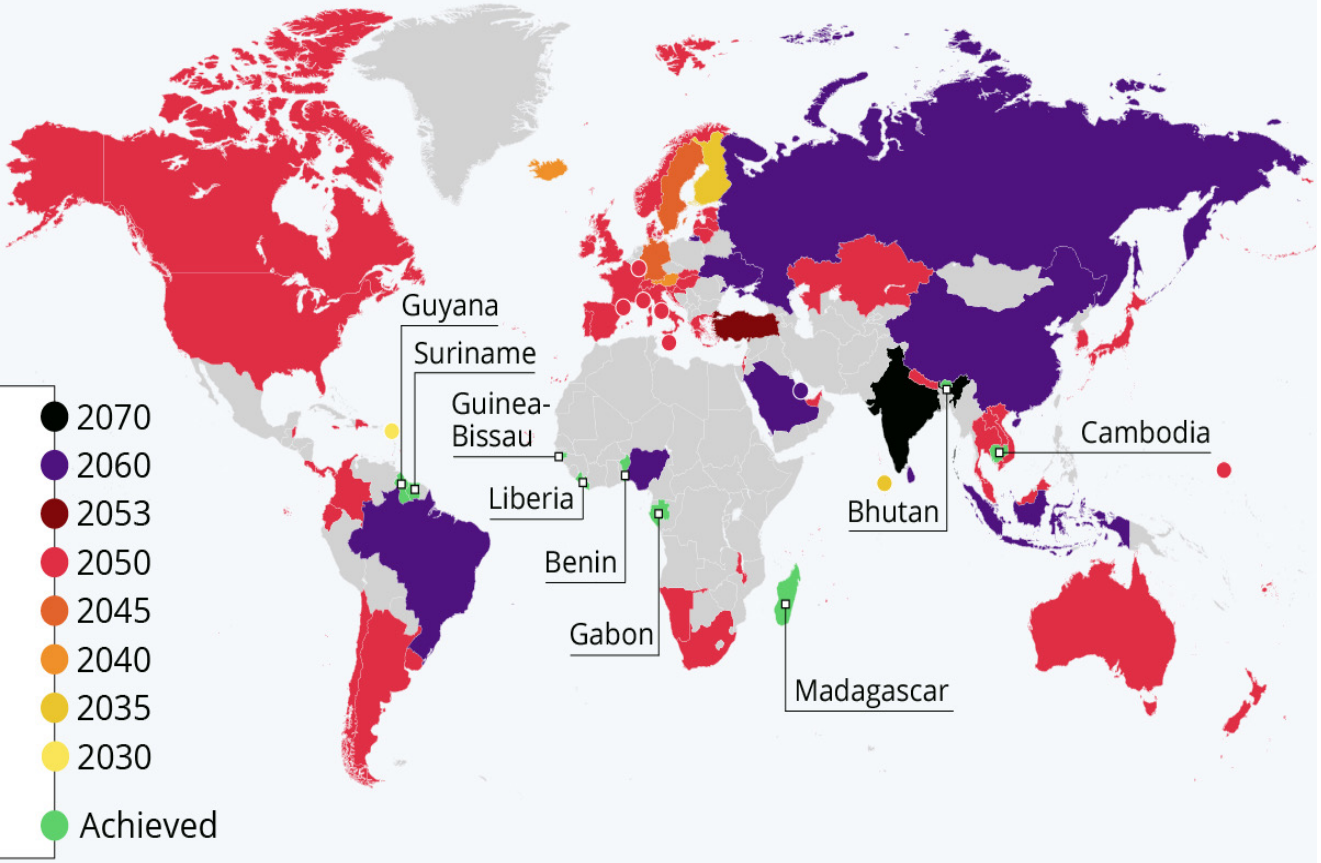
VISUAL CAPITALIST

/visualcapitalist @visualcap visualcapitalist.com

SOURCES: *Energy and Climate Intelligence Unit, Carbon Neutrality Coalition, Climate Action Tracker*

The Road to Net Zero

Countries with laws, policy documents or concrete timed pledges for carbon neutrality by target year

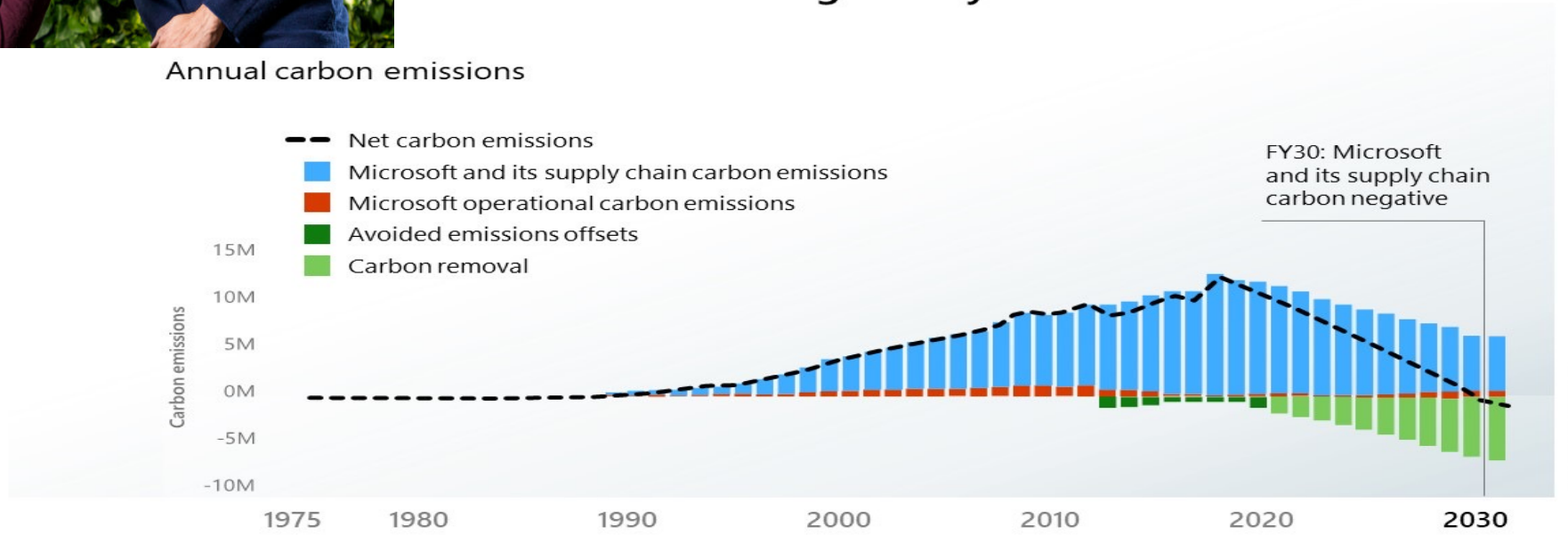


Source: Energy & Climate Intelligence Unit

Country	Target Status
Bhutan	Achieved
Suriname	Achieved
Denmark	Law
France	Law
Hungary	Law
New Zealand	Law
Sweden	Law
United Kingdom	Law

Microsoft

Microsoft's pathway to carbon negative by 2030



Environmental Kuznets Curve (EKC)

- Early stages of industrialization are linked to relatively high pollution levels when growth is a priority environmental controls are lenient or nonexistent ➔ pollution heaven and race to the bottom.
- More advanced economic development ➔ greater concern for environmental quality and a strengthening of environmental regulation

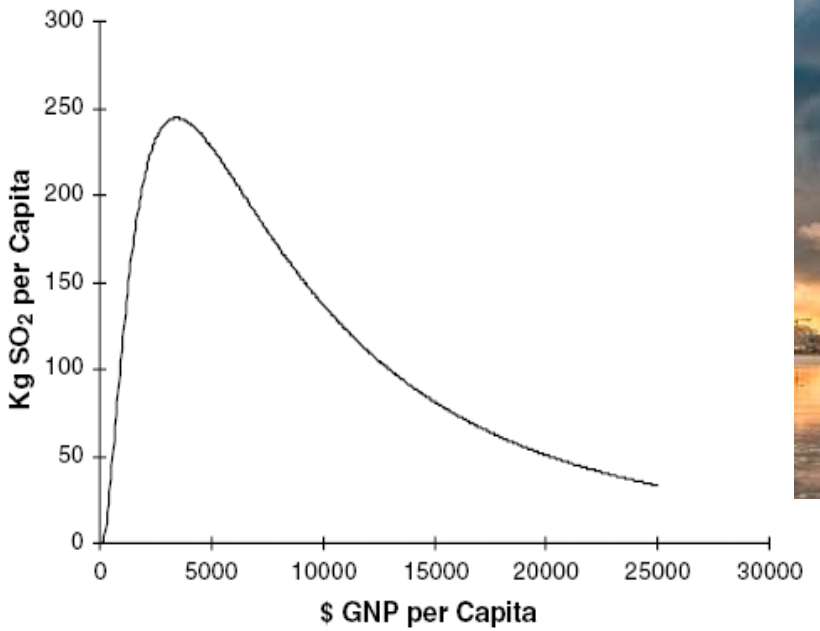
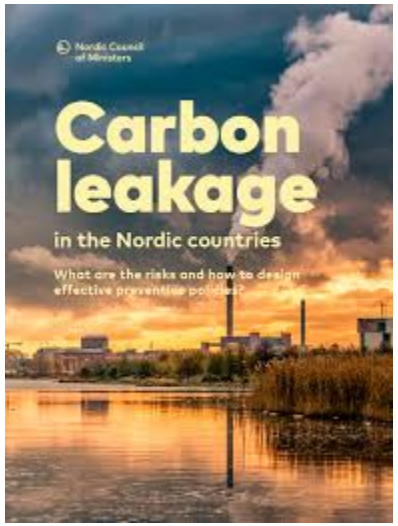
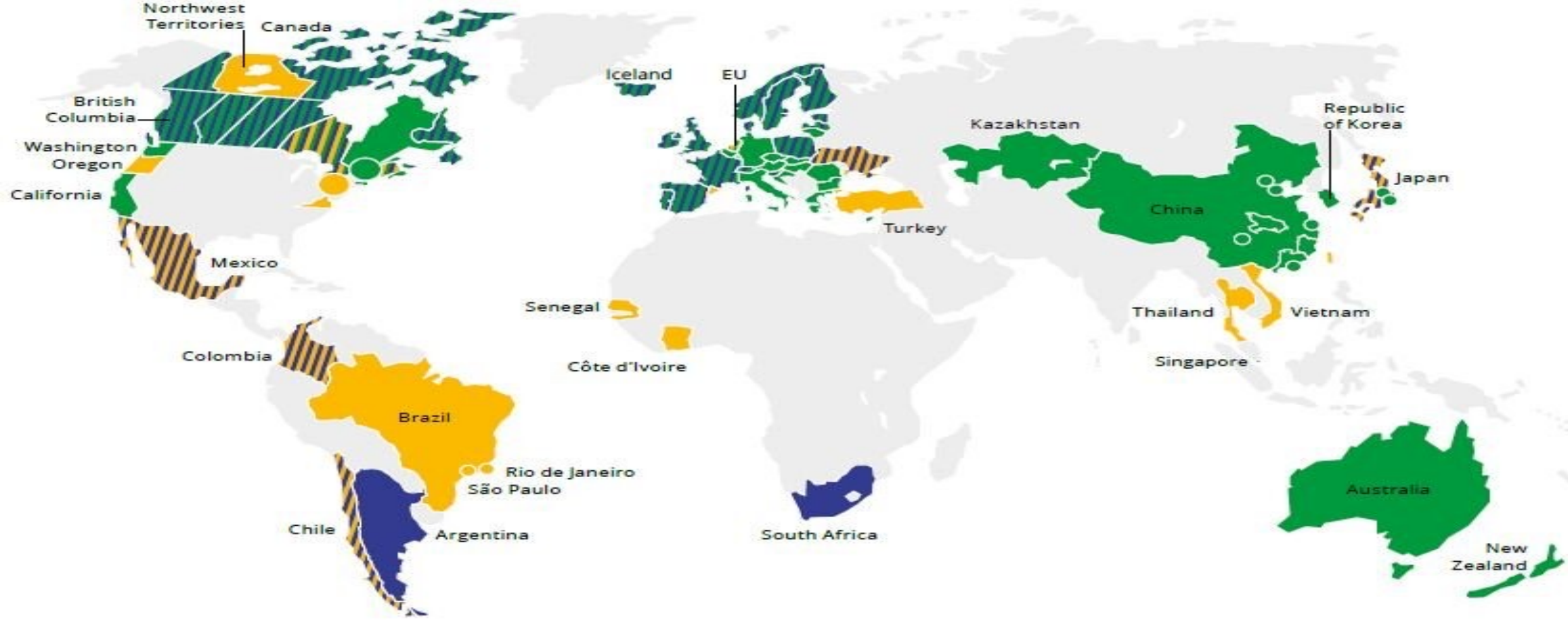
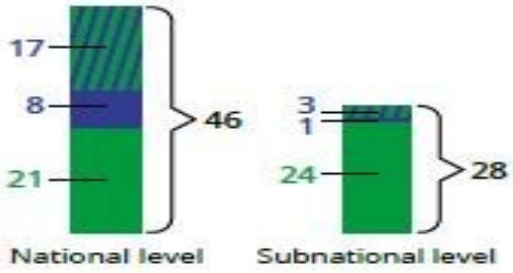


Figure 1. *Environmental Kuznets curve for sulfur emissions. Source: Panayotou (1993) and Stern, Common, and Barbier (1996).*





Tally of carbon pricing initiatives implemented or scheduled for implementation



- ETS implemented or scheduled for implementation
- Carbon tax implemented or scheduled for implementation
- ETS or carbon tax under consideration
- ETS and carbon tax implemented or scheduled
- Carbon tax implemented or scheduled, ETS under consideration
- ETS implemented or scheduled, carbon tax under consideration
- ETS and carbon tax implemented or scheduled, ETS or carbon tax under consideration

The large circles represent cooperation initiatives on carbon pricing between subnational jurisdictions. The small circles represent carbon pricing initiatives in cities.

Note: Carbon pricing initiatives are considered "scheduled for implementation" once they have been formally adopted through legislation and have an official, planned start date. Carbon pricing initiatives are considered "under consideration" if the government has announced its intention to work towards the implementation of a carbon pricing initiative and this has been formally confirmed by official government sources. The carbon pricing initiatives have been classified in ETSs and carbon taxes according to how they operate technically. ETS not only refers to cap-and-trade systems, but also baseline-and-credit systems as seen in British Columbia and baseline-and-offset systems as seen in Australia. The authors recognize that other classifications are possible.

Production-based vs consumption based

Figure 1: The origins of emissions in the production of a wooden table (for illustrative purposes)

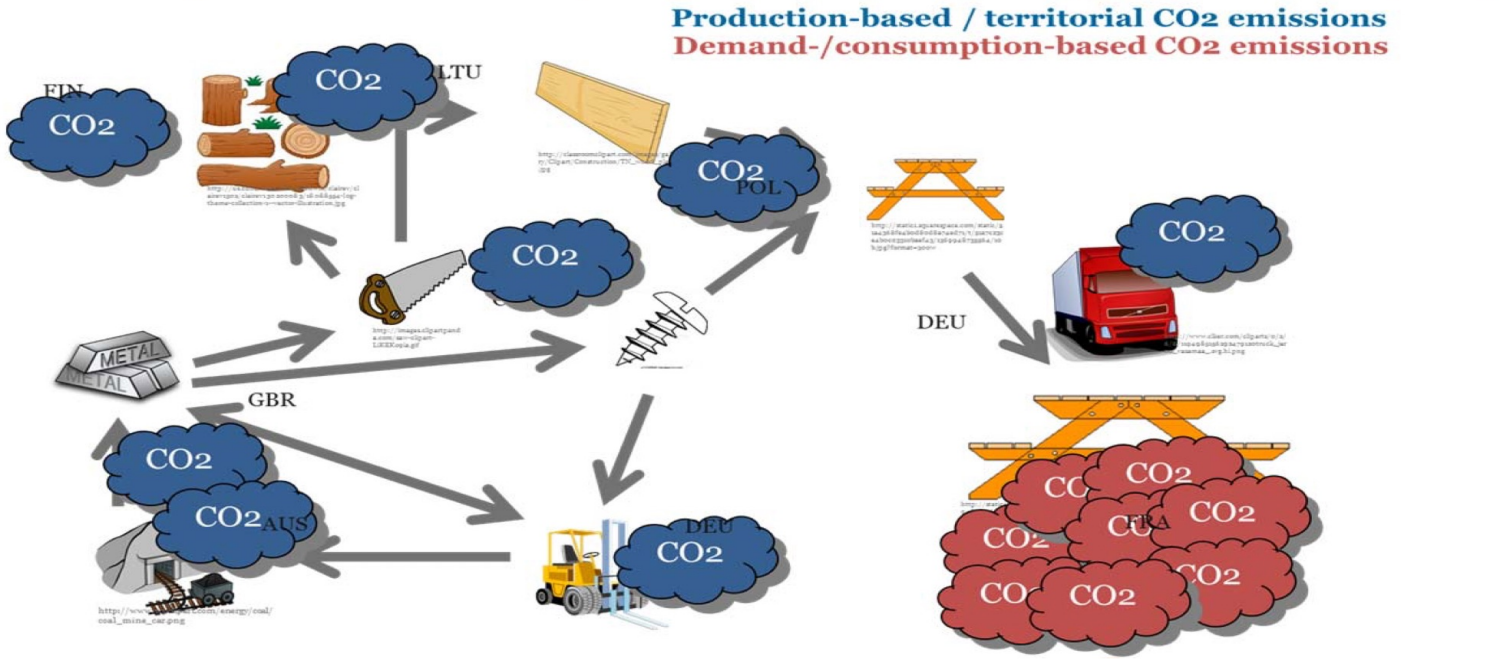
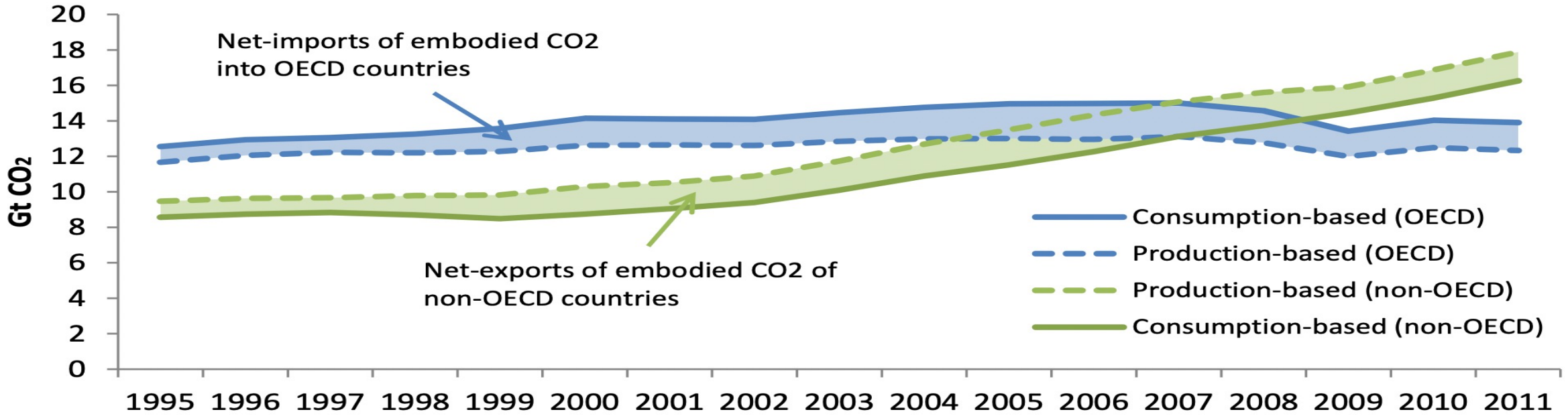


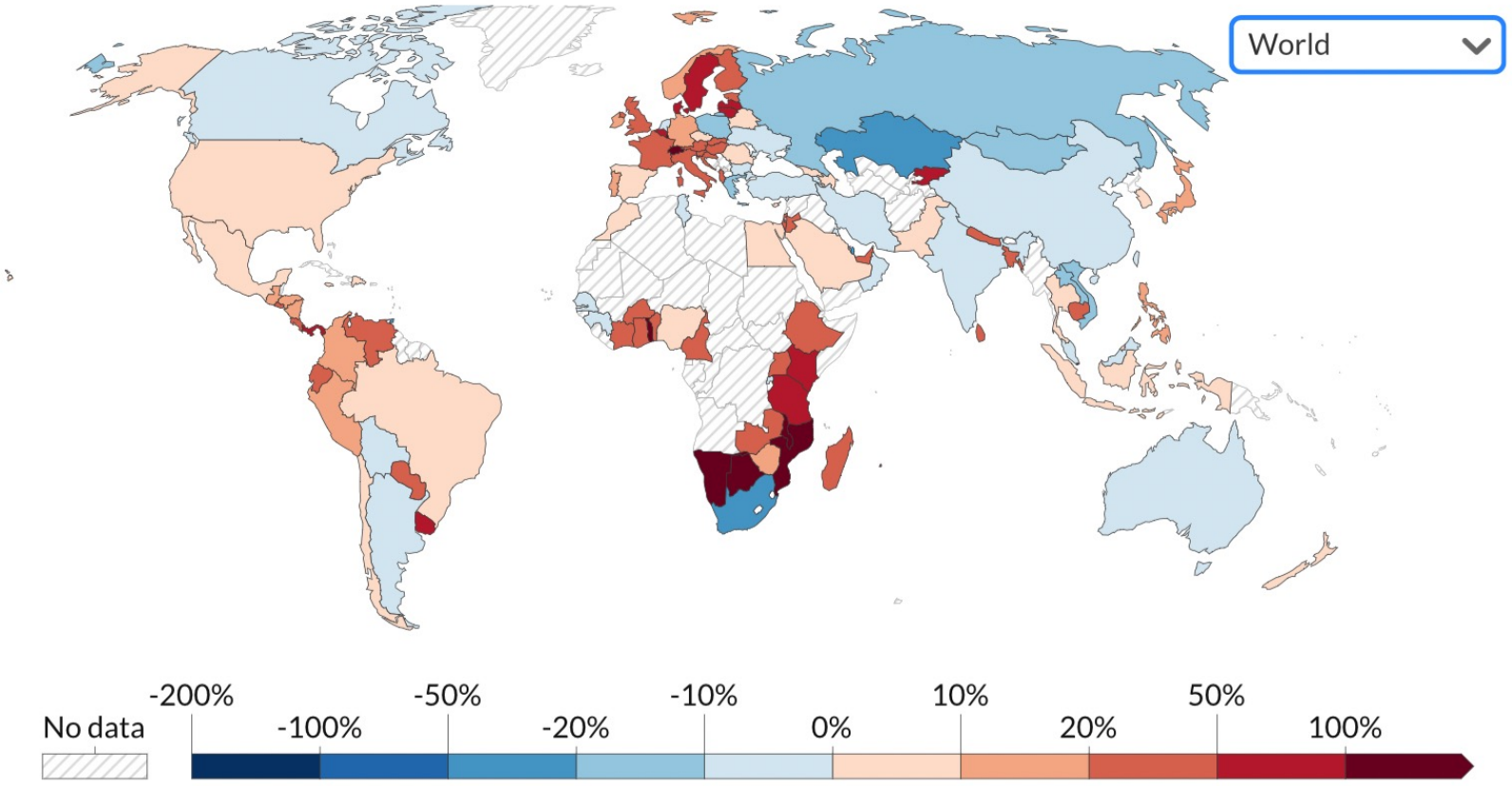
Figure 2: CO_2 emissions from fuel combustion (OECD and non-OECD countries)



CO_2 emissions embedded in trade, 2019

Share of carbon dioxide (CO_2) emissions embedded in trade, measured as emissions exported or imported as the percentage of domestic production emissions. Positive values (red) represent net importers of CO_2 (i.e. "20%" would mean a country imported emissions equivalent to 20% of its domestic emissions). Negative values (blue) represent net exporters of CO_2.

Our World in Data



Source: Our World in Data based on the Global Carbon Project
OurWorldInData.org/co2-and-other-greenhouse-gas-emissions/ • CC BY

1990 2019

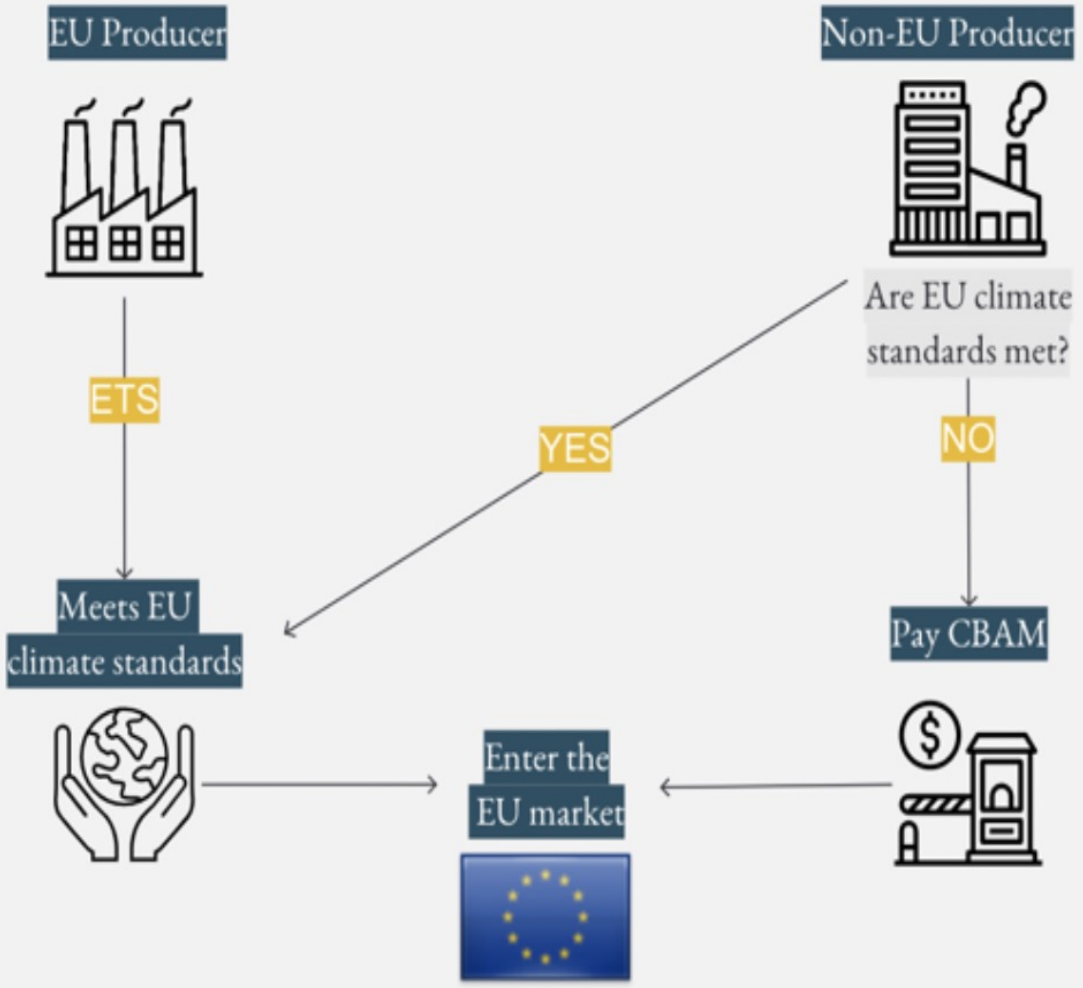
Countries shown in red are net importers of emissions – they import more CO_2 embedded in goods than they export.

For example, the USA has a value of 7.7%. This means emissions calculated on the basis of 'consumption' are 7.7% higher than their emissions based on production.

Countries shown in blue are net exporters of emissions – they export more CO_2 embedded in goods than they import.

For example, China's value of -14% . The consumption-based emissions of China are 14% lower than their production-based emissions.

CARBON BORDER ADJUSTMENT MECHANISM



- The mechanism aims to minimize the risk of leakage while also incentivizing countries outside Europe to rethink their carbon intensive production processes to continue current trading patterns.
- The CBAM will be fully adopted by the EU in 2026 after a three-year phase in period. Initially.
- the CBAM will only cover Scope 1 emissions from imports of carbon intensive goods with a high risk of leakage namely—iron and steel, cement, fertilizer, aluminum, and electricity.
- Will industries shift their production to non-EU countries with cleaner grids or will it result in a cleaner EU production grid?
- Could the exporter avoid/minimize the tax burden through purchase of renewable energy or offsets?
- Or does the country of production need to have a national carbon reduction mechanism in place to offset the CBAM?

CBAM: Gradual phase-in

Based on the purchase of **certificates** (€ / tonne of CO_2 emitted)

Price of certificates based on the **average trading price of EU ETS** allowances in the week prior to import

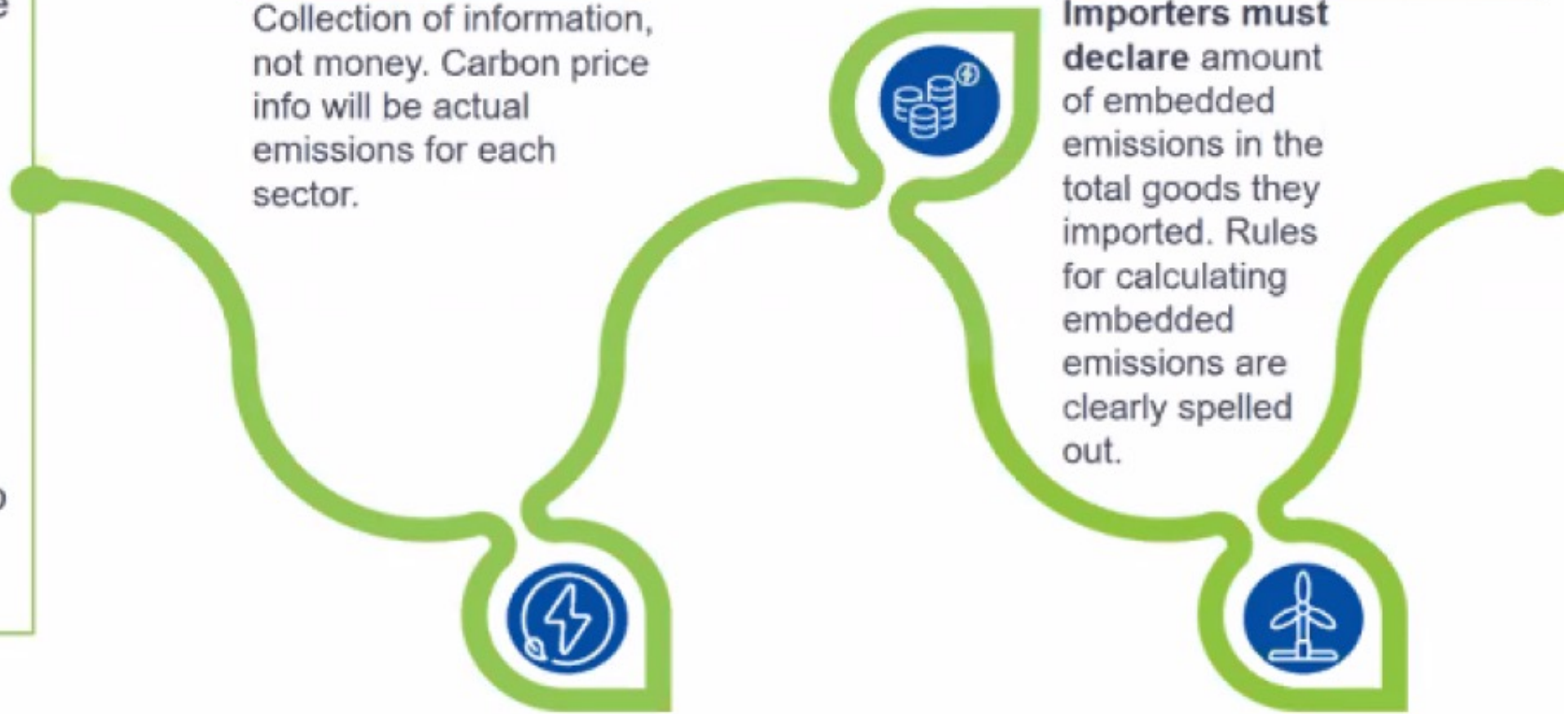
Gradual phase-in with simplified procedures, to allow businesses to adjust

Transitional phase
2023-25

Collection of information, not money. Carbon price info will be actual emissions for each sector.

After transitional phase
2026 onwards

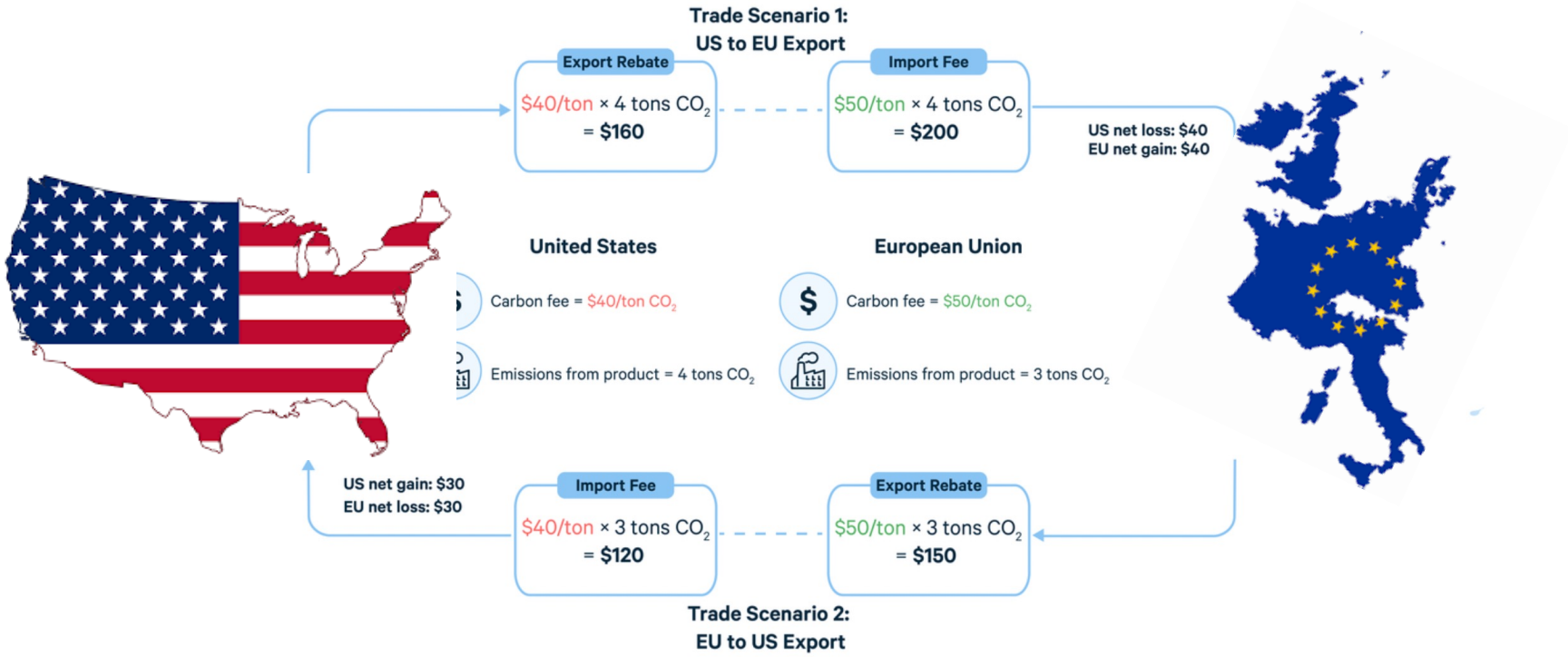
Importers must declare amount of embedded emissions in the total goods they imported. Rules for calculating embedded emissions are clearly spelled out.



European Commission

Clean Competition Act (CCA)

- The CCA proposes a domestic price on domestic emissions intensity as well as a border adjustment mechanism for importers into the United States.



Key Differences between the EU CBAM and U.S. CCA

	Europe Fit for 55 (EU Parliament approved proposal)	U.S. Clean Competition Act
Initial Sectors Covered	• Aluminum, ammonia, cement, electricity, fertilizers, hydrogen, iron and steel, organic chemicals, plastics, and complex goods that use these products as inputs	• Fossil fuels, refined petroleum products, petrochemicals, fertilizer, hydrogen, adipic acid, cement, iron and steel, aluminum, glass, pulp and paper, and ethanol
Emissions Price	• Calculated based on the weekly average of the ETS auctions (currently approximately 84 euros per ton)	• $55 per ton and increase by 5 percent above inflation each year
Structure for Calculations for Carbon Border Charge	• Requires importers of covered industries to buy CBAM certificates priced by the ETS allowances • Exporter countries would have submit a CBAM certificate per ton of embedded emissions in the goods	• Importers into the United States would pay a price on emissions per ton that is equivalent to the difference of a country's emissions intensity and the U.S. baseline for emissions intensity established by the U.S. industry average • For countries without reliable data: ratio of the level of the emissions intensity of the economy of the country of origin to the level of emissions intensity of U.S. economy • For countries with reliable data: ratio of the average emissions intensity of the industry in the country of origin to the emissions intensity of that industry in the United States

Source :https://www.csis.org/analysis/trade-tools-climate-transatlantic-carbon-border-adjustments

Key Differences between the EU CBAM and U.S. CCA

	Europe Fit for 55 (EU Parliament approved proposal)	U.S. Clean Competition Act
Implementation Period	• The CBAM would be launched in 2027 • There would be a phase out of all free ETS allowances in sectors covered by the CBAM between 2027 and December 2032	• In 2024, there would be a phase-in for goods listed above • In 2026, coverage would expand to include imported finished goods containing at least 500 pounds of covered energy-intensive primary goods • In 2028, the threshold for coverage would be lowered to 100 pounds
Revenue Use	• Revenues would be divided 75 percent to the EU budget and 25 percent to member state governments to be used for climate action • All revenue specifically raised from goods imported from least developed countries would be used for decarbonization efforts in those countries	• 75 percent of revenues would be used to fund investment in decarbonization in the effected industries • 25 percent of revenues would be used to fund investment in decarbonization in least developed countries
Least Developed Countries (LDCs)	• The EU CBAM would apply to all countries importing into the European Union	• The CCA would exempt LDCs

Are these proposals WTO compatible?

- requirement of “national treatment” equal treatment of domestic and foreign goods.
- The United States and European Union have proposed imposing equivalent fees on domestic items as they would on imported “like” goods.
- Both proposals face WTO compatibility issues, particularly for their inclusion of export rebates.
- The Agreement on Subsidies and Countervailing Duties prohibits WTO members from providing rebates that are contingent on export performance.
- One possible justification is Article XX of GATT, which allows for specific exemptions to national treatment if the trade policy is intended to protect “human, animal, or plant life or health” or the “conservation of exhaustible natural resources.” However, Article XX exemptions must be applied in a nondiscriminatory manner and with clear environmental objectives, which could be challenging to justify given the clear political nature of the export rebates.

WORLD TRADE ORGANIZATION

WTO rules and environmental policies: key GATT disciplines

- Measures taken to achieve environmental protection goals may restrict trade and thereby impact on the WTO rights of other members.
- Certain environmental measures may also violate the second key discipline of the GATT, which is contained in Article XI and provides, among other things, that restrictions on the importation or sale of products from other WTO members are prohibited.

The principle of non-discrimination

- a member shall not discriminate between “like” products from different trading partners (giving them equally “most favoured-nation” or MFN status, GATT Article I); and
- between its own and like foreign products (giving them “national treatment”, GATT Article III).

“Like” products & PPM

- Are products at issue “like” products?
- An important question in relation to environmental measures is whether products may be treated differently because of the way in which they have been produced even if the processes or production methods (PPMs) used does not leave a trace in the final product, i.e. the final product remain identical (referred to as non-product-related PPMs).
- Examples of a PPM-based restriction is the U.S. trade ban on shrimp from countries that have not been certified as having regulatory regimes in place to prevent the killing of sea turtles.
- Products that are not “like” maybe treated differently and this does not lead to violation of WTO obligations.
- Therefore, the determination of likeness assumes great significance and consequently, so does the question of the role of PPMs in determination of likeness.
- When comparing two products, different processes or production methods (PPMs) used in the manufacture of such products do not per se render these products “unlike”.

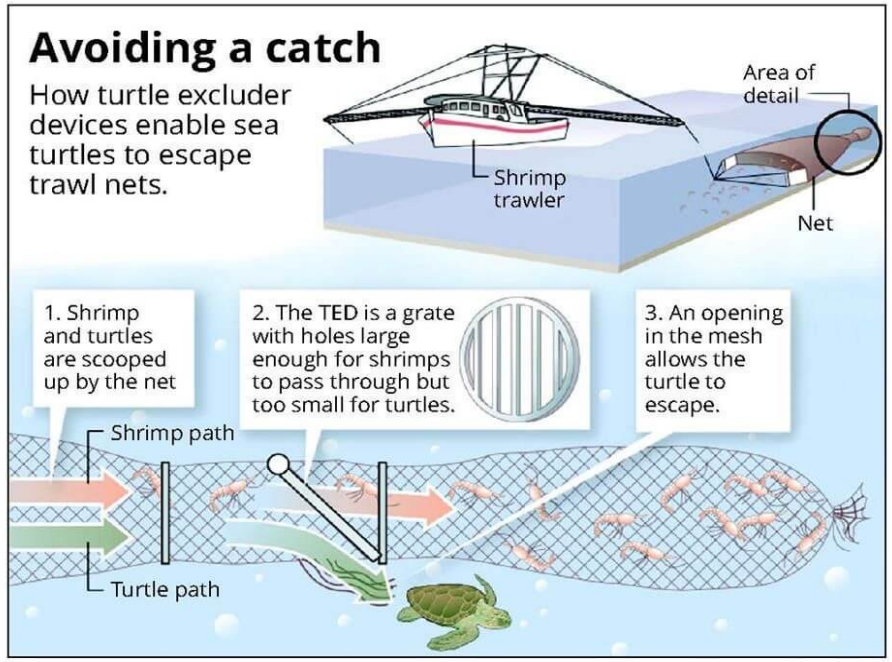
WORLD TRADE ORGANIZATION

WTO rules and environmental policies: GATT exceptions

- GATT Article XX on General Exceptions lays out specific instances in which WTO members may be exempted from GATT rules.
- Two exceptions are of particular relevance to the protection of the environment:
  - necessary to protect human, animal or plant life or health (paragraph (b)), or
  - relating to the conservation of exhaustible natural resources (paragraph (g)).
- For a GATT-inconsistent environmental measure to be justified under Article XX, a member must perform a two-tier analysis proving:
  - first, that its measure falls under at least one of the exceptions and, then,
  - that the measure satisfies the requirements of the introductory paragraph (the “chapeau” of Article XX)
    - it is not applied in a manner which would constitute “a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail”, and
    - is not “a disguised restriction on international trade”.

United States — Import Prohibition of Certain Shrimp and Shrimp Products

- Sea turtles have been adversely affected by human activity
- The US Endangered Species Act of 1973 listed as endangered or threatened the five species of sea turtles that occur in US waters, and prohibited their “take” within the US, in its territorial sea and the high seas. (“Take” means harassment, hunting, capture, killing or attempting to do any of these.)
- Under the act, the US required that US shrimp trawlers use “turtle excluder devices” (TEDs) in their nets when fishing in areas where there is a significant likelihood of encountering sea turtles.



United States — Import Prohibition of Certain Shrimp and Shrimp Products

- shrimp harvested with technology that may adversely affect certain sea turtles may not be imported into the US unless the harvesting nation was certified to have a regulatory programme
- Essentially this meant the use of TEDs at all time.

- Found that the measure did qualify for provisional justification under Article XX(g). (the phrase “exhaustible natural resources” under Article XX(g) has been interpreted broadly to include not only “mineral” or “non-living” resources but also living species which may be susceptible to depletion, such as sea turtles)
- But failed to meet the requirements of the chapeau (the introductory paragraph) of Article XX (which defines when the general exceptions can be cited).
- The US lost the case because it discriminated between WTO members. It provided countries in the Caribbean — technical and financial assistance and longer transition periods for their fishermen to start using turtle-excluder devices.
- It did not give the same advantages, however, to the four Asian countries (India, Malaysia, Pakistan and Thailand) that filed the complaint with the WTO.

The 2030 Agenda

- The UN's Largest participatory process (3 years (2012-2015) with approx. 8.5 million people participated, along with diplomatic processes).
- Transforming our world: The 2030 Agenda for Sustainable Development
- 193 UN Member States adopted the 2030 Agenda on September 25, 2015
- SDGs started in 2016 and ends at the end of 2030, with annual review at HLPF and comprehensive review of all goals every four years.
- Non-binding Agreement

Structure Of The SDGs

Structure of SDGs

17 Goals

169 Targets

248 Indicators

Transformative + Inclusive + Integrated + Universal

Source: Asst. Prof. Chol Bunnag