

Continued,
enhanced ocean altimetry
and climate monitoring
from space

31 October > 4 November 2022

OSTST meeting
IDS workshop



In partnership with:



Venice - Italy

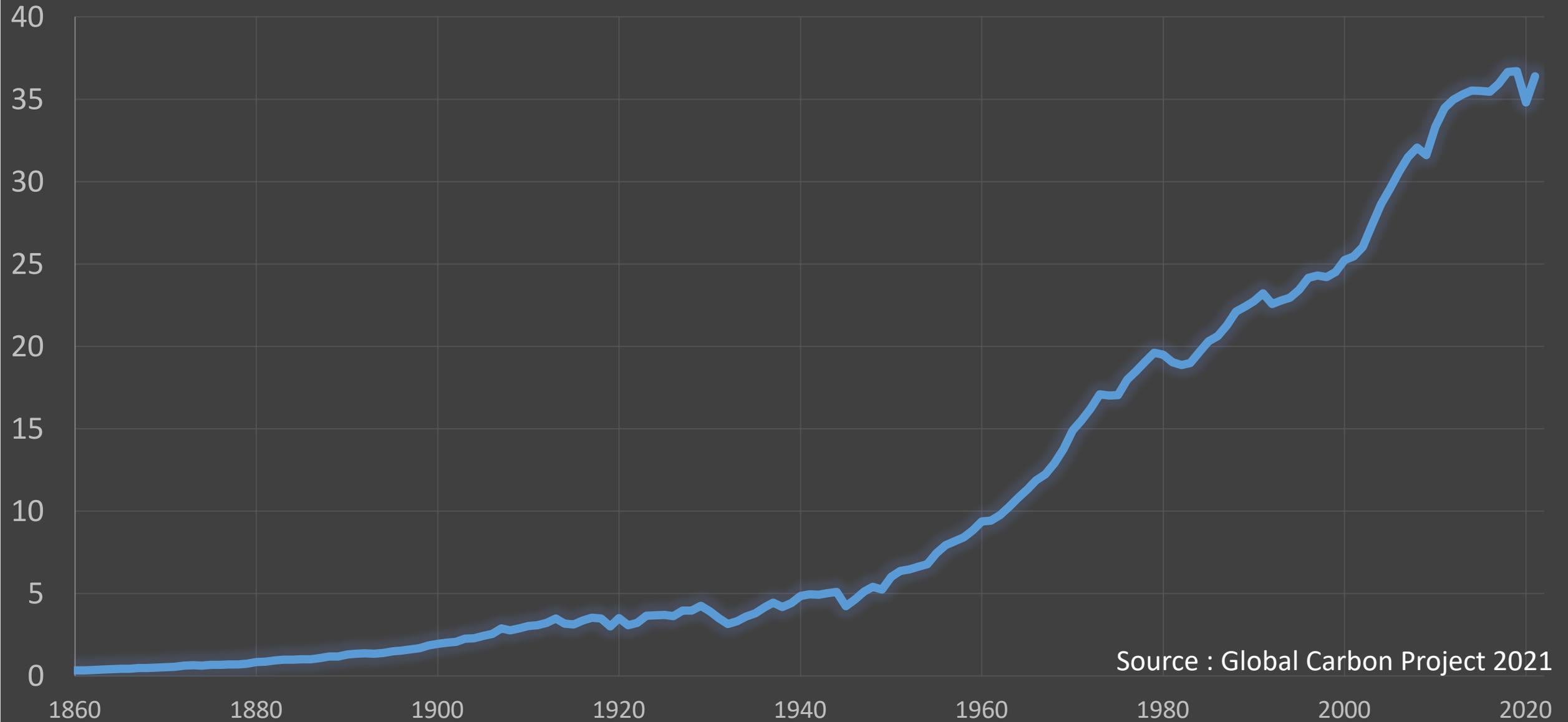


<https://ostst-altimetry-2022.com/>

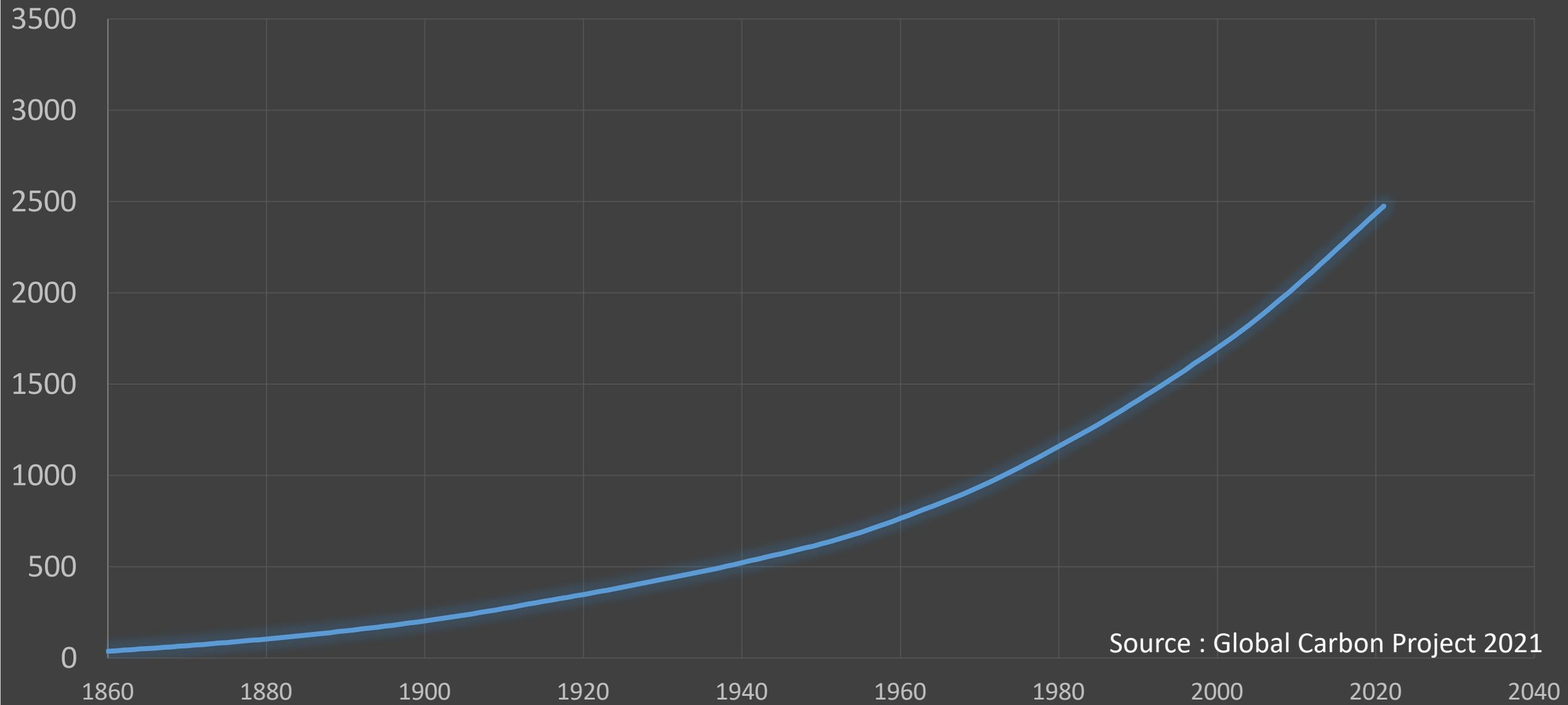
WHAT DO WE REALLY MEAN BY EMERGENCY?

OSTST AND IPCC DATA AND RESULTS ABOUT THE GLOBAL WARMING.

Annual global fossil CO2 emissions (Gt)

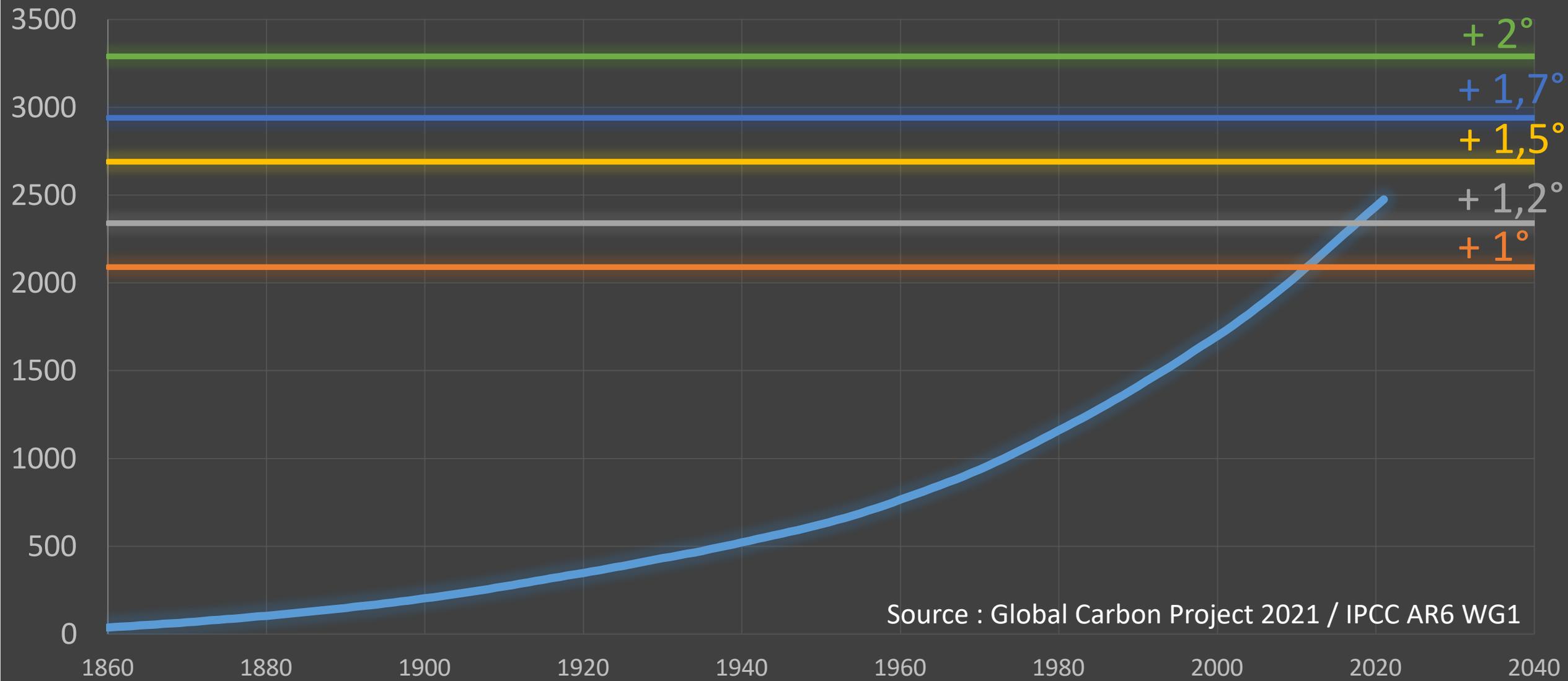


Cumulative global CO2 emissions Fossil and Land-Use change (Gt)



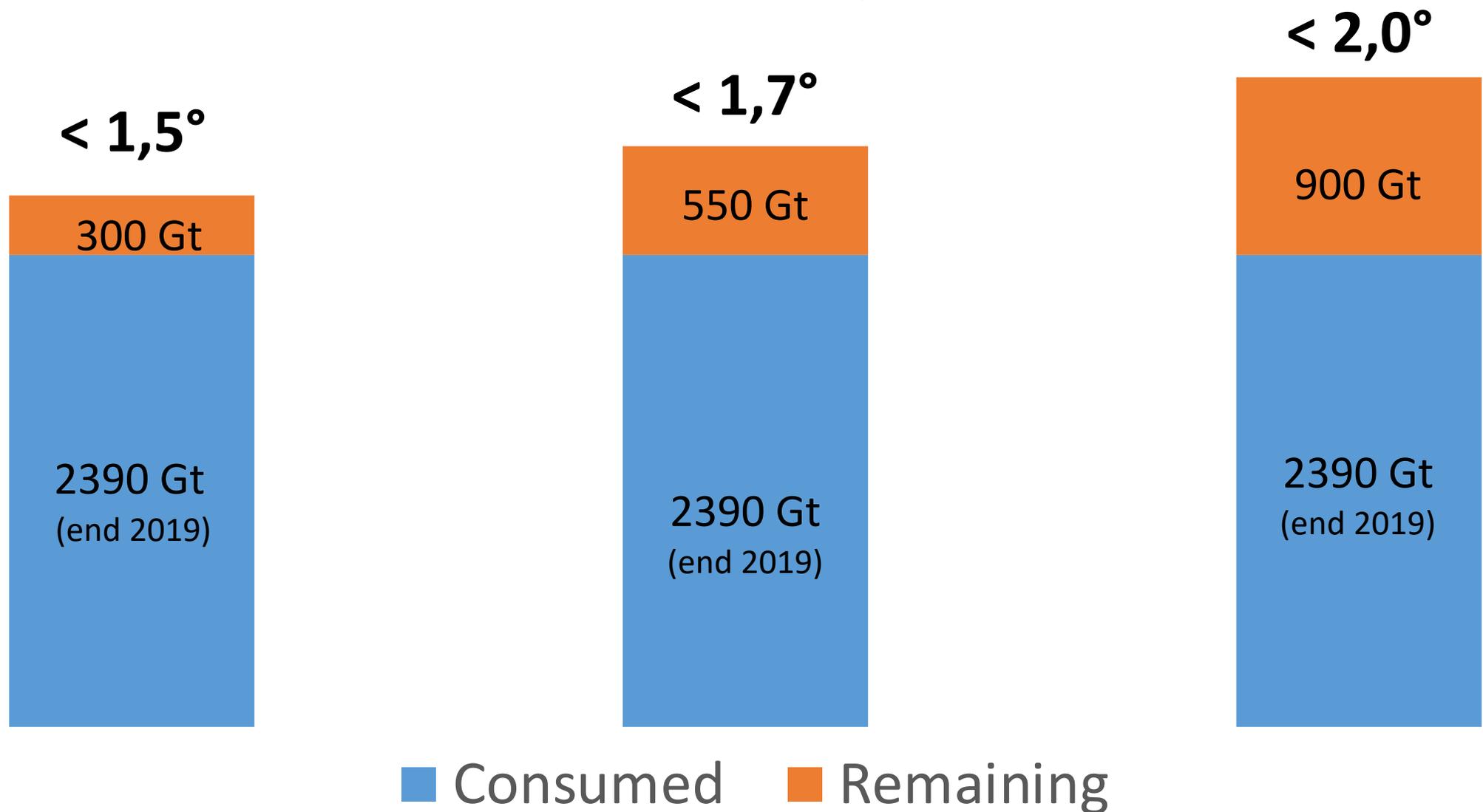
Source : Global Carbon Project 2021

Cumulative global CO2 emissions Fossil and Land-Use Change (Gt)



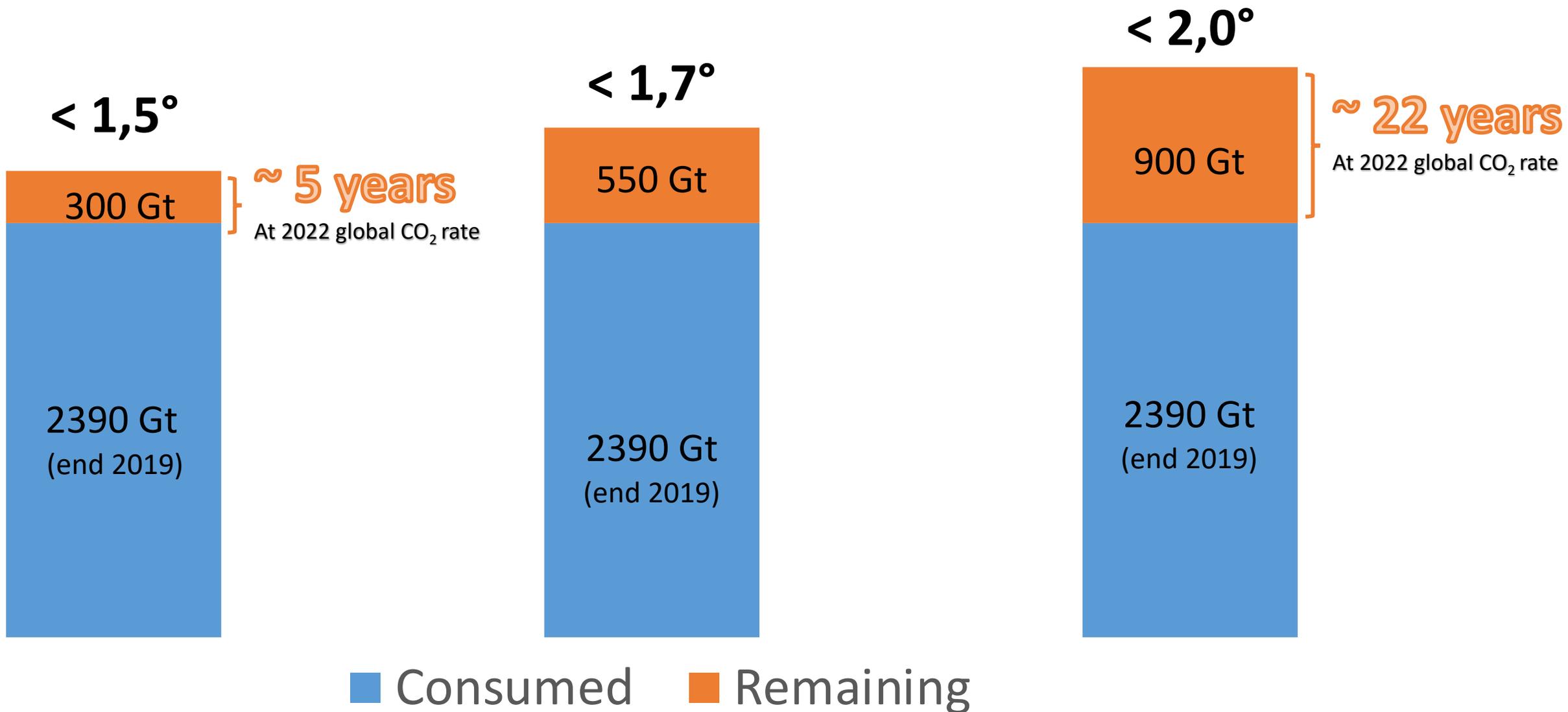
Remaining Carbon Budget

For 83% likelihood (~ 4 years / 5)



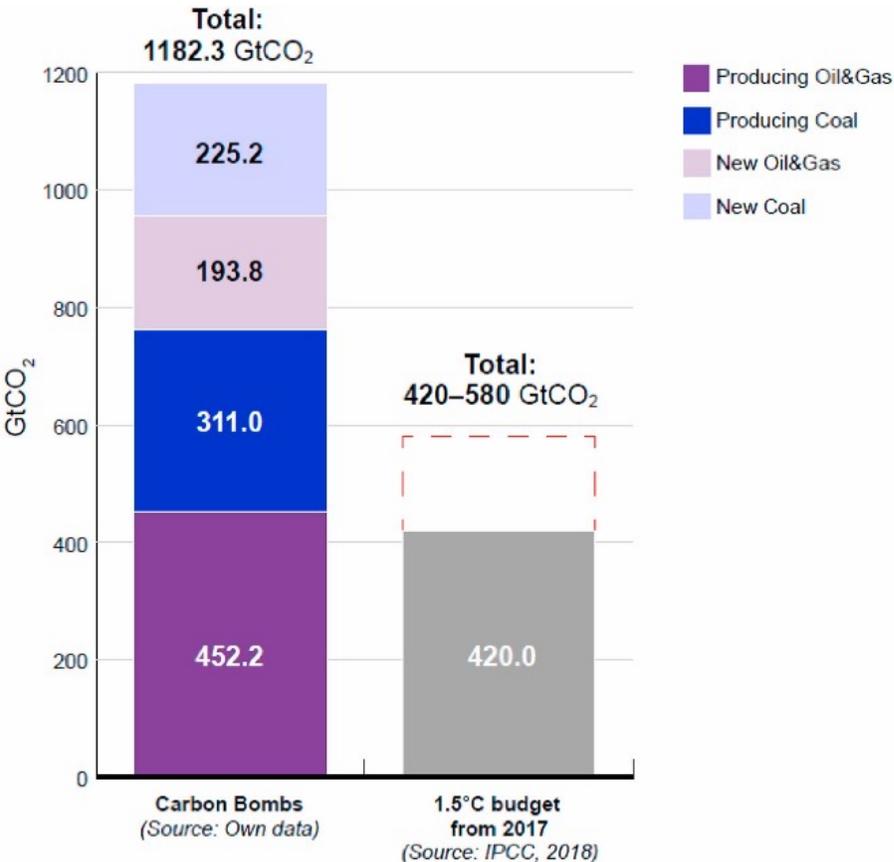
Remaining Carbon Budget

For 83% likelihood (~ 4 years / 5)



425 “Carbon Bombs”- Mapping Key Fossil Fuel Projects

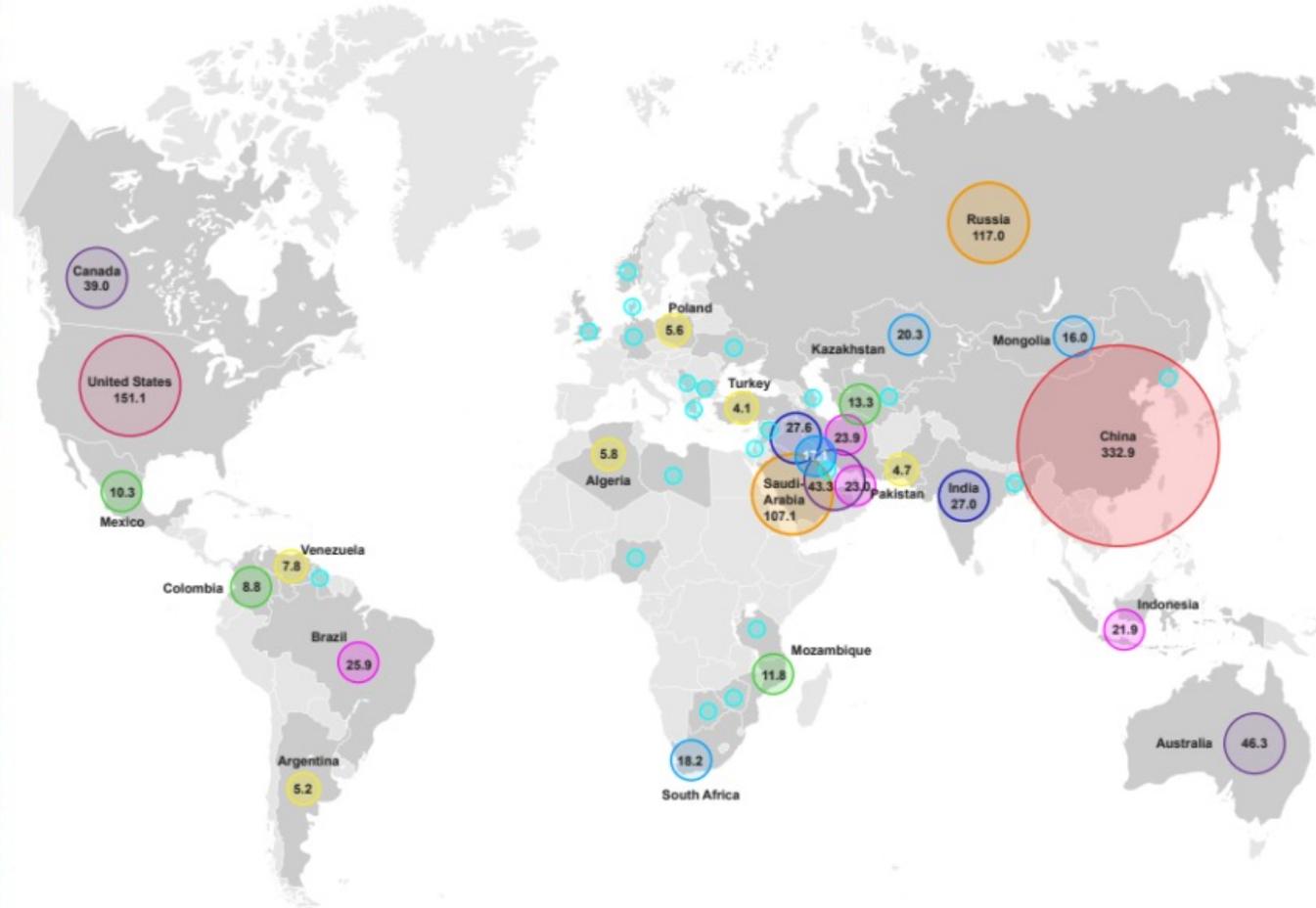
Kühne, 2022



Potential CO₂-Emissions

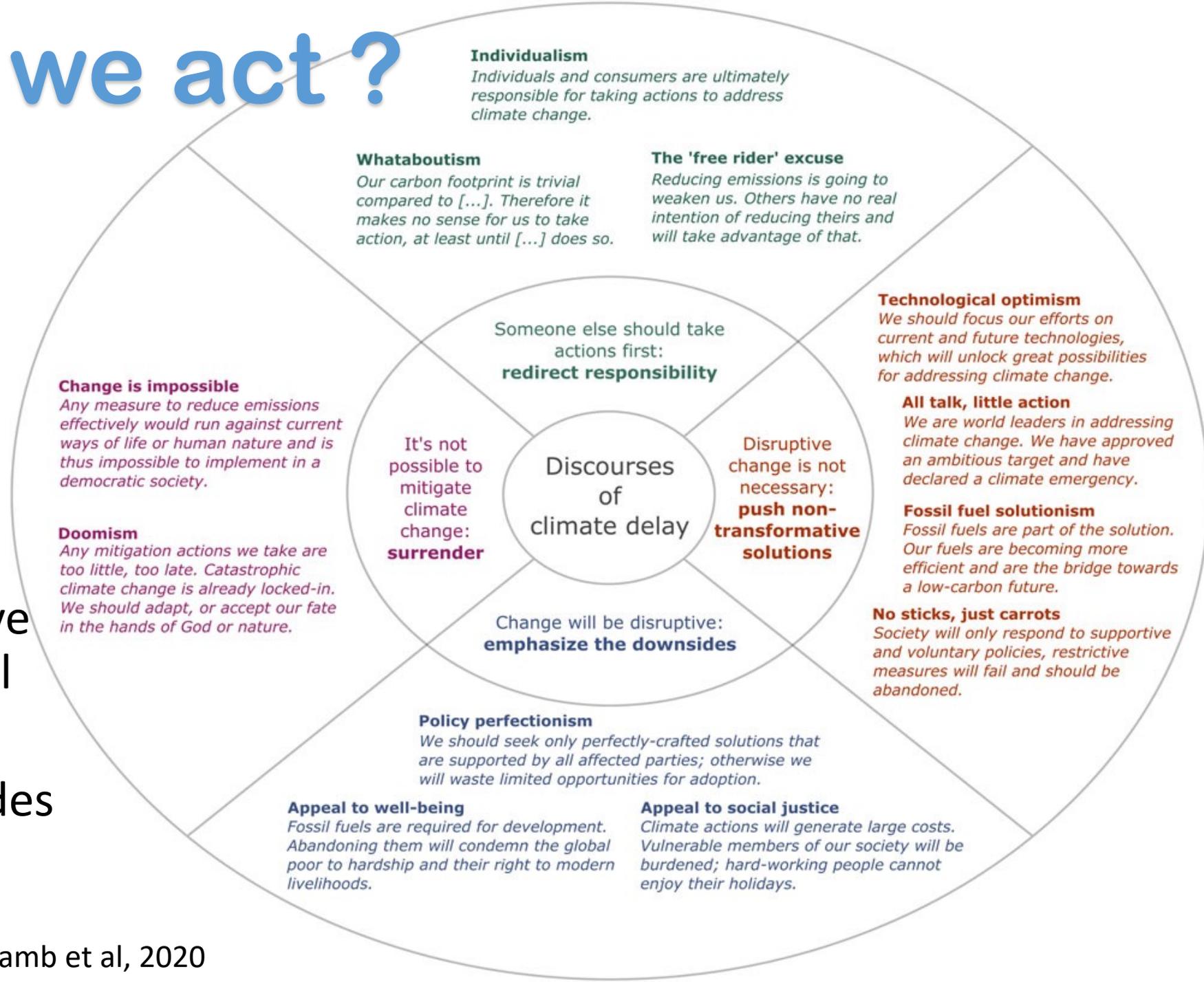
Country	Potential Emissions
China	332.9
United States	151.1
Russian Federation	117.0
Saudi-Arabia	107.1
Australia	46.3
Qatar	43.3
Canada	39.0
Iraq	27.6
India	27.0
Brazil	25.9
Iran	23.9
United Arab Emirates	23.0
Indonesia	21.9
Kazakhstan	20.3
South Africa	18.2
Kuwait	17.1
Mongolia	16.0
Turkmenistan	13.3
Mozambique	11.8
Mexico	10.3
Colombia	8.8
Venezuela	7.8
Algeria	5.8
Poland	5.6
Argentina	5.2
Pakistan	4.7
Turkey	4.1
North Korea	3.2
Germany	3.0
Norway	2.8
Libya	2.7
Serbia	2.5
Bulgaria	2.5
Uzbekistan	2.4
Denmark	2.2
Botswana	2.2
Greece	2.2
Guyana	2.1
Ukraine	1.7
Azerbaijan	1.7
United Kingdom	1.5
Bahrain	1.4
Bangladesh	1.4
Syria	1.4
Israel	1.1
Nigeria	1.0
Tanzania	1.0
Zimbabwe	1.0

Carbon Bombs World Map



Source: Kjell Kühne, currently under submission; don't cite without author's permission

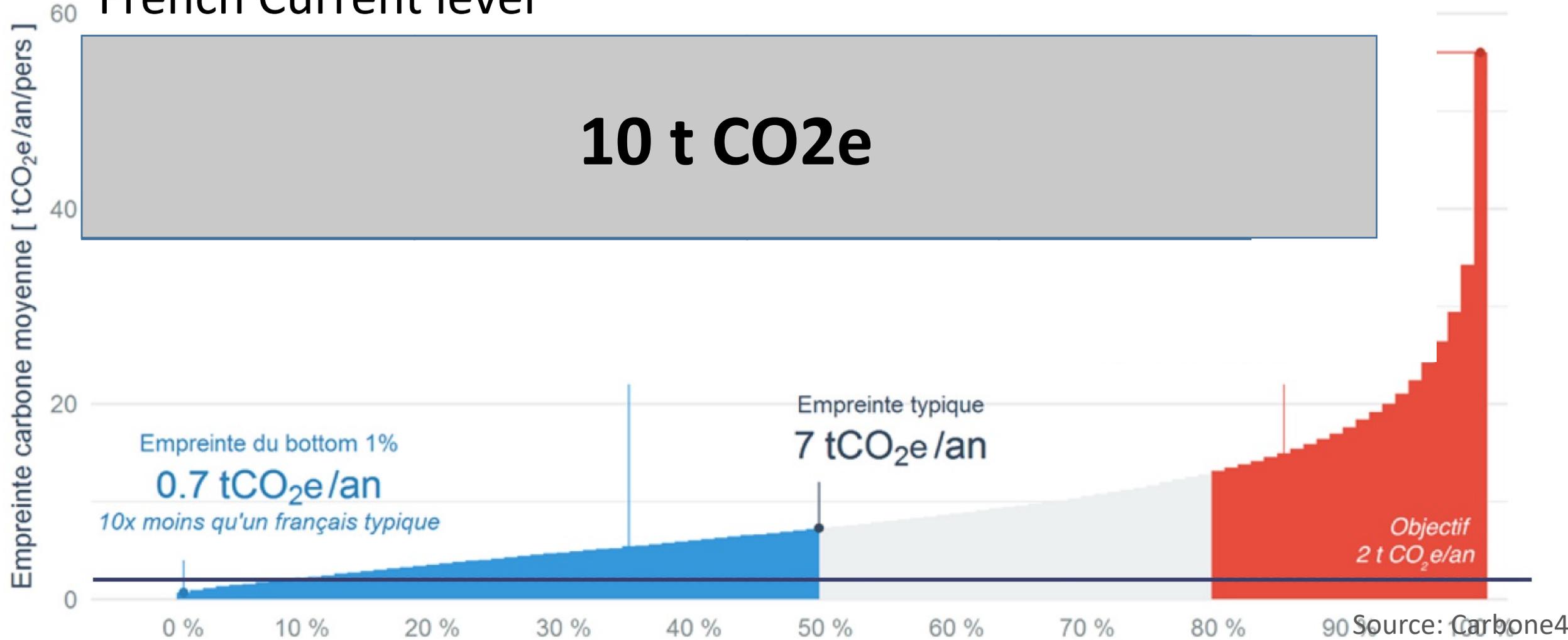
Why don't we act ?



- Redirect Responsibility
- Push non transformative solutions (technological optimism)
- Emphasize the downsides
- Surrender

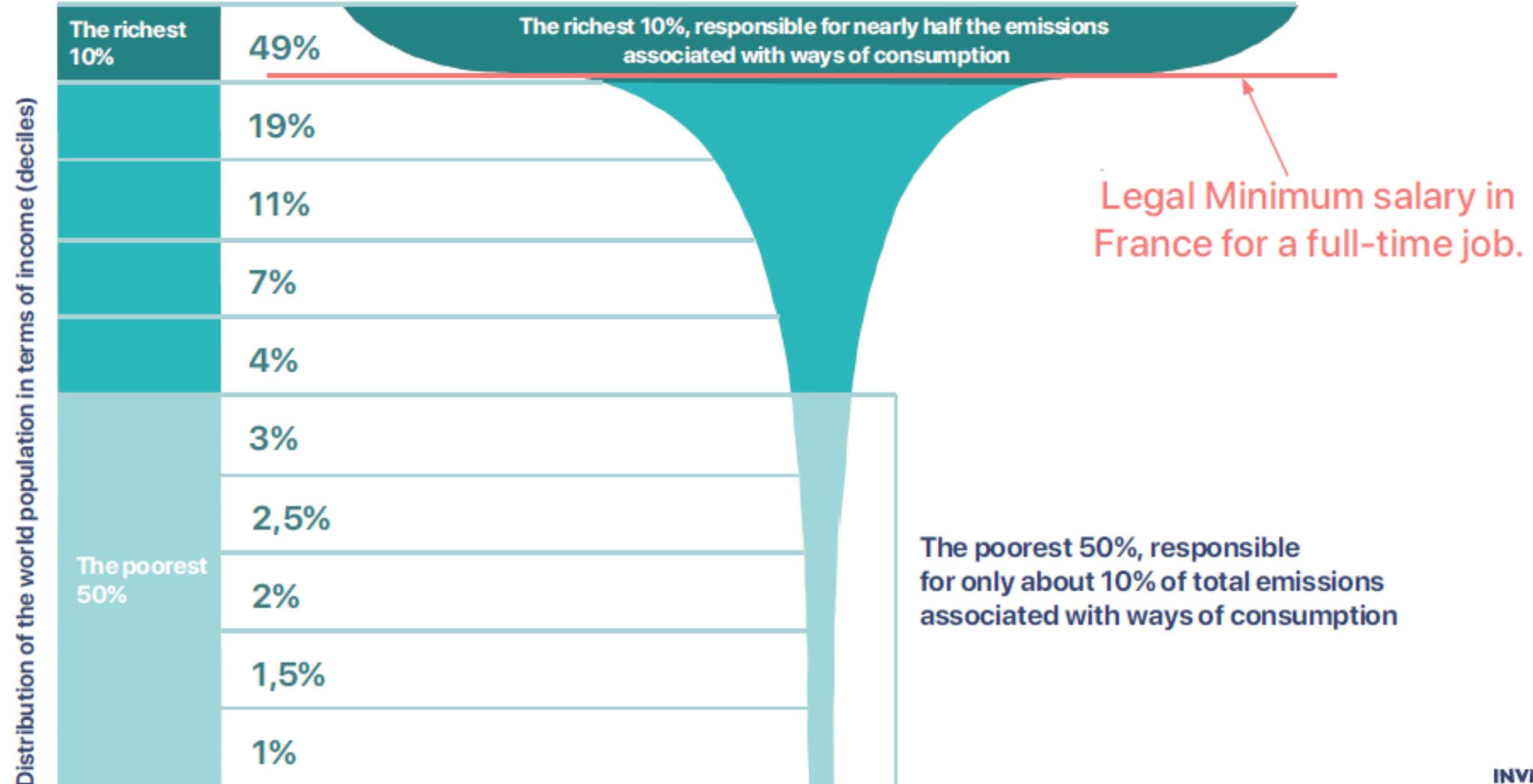
Mean carbon footprint (t CO₂e)

French Current level



Deciles of income on a worldwide scale, and emissions of the associated ways of consumption

Percentage of CO₂ emissions in the world population



Mean carbon footprint (t CO₂e)

French Current level

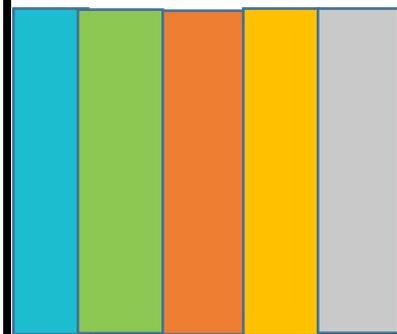


Mean carbon footprint (t CO₂e)

French Current level



Global Carbon neutrality



Reached in 5 years → + 1,5°C

2 t

Reached in 22 years → +2°C

TRANSPORTATION

around **2,5 t CO₂e**

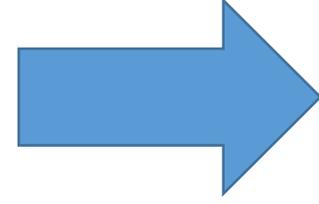
Car

Plane

Train, bus

Freight

INVENTONS
N&S VIES
BAS CARBONE



0.4
t CO₂e

**Tomorrow's
Transportation**

INVENTONS
N&S VIES
BAS CARBONE

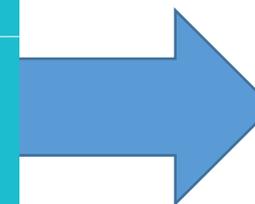
Source: INVBC / ADEME

10,000 km/year
1,400 kg SUV type
amortized over 10 years

3,1 t CO₂e
per person

Manufacturing

Use



0.4
t CO₂e

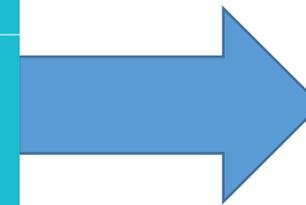
Tomorrow's
Transportation

10,000 km/year
Electric 1,400 kg SUV type
amortized over 10 years

3 t CO₂e
per person

Manufacturing

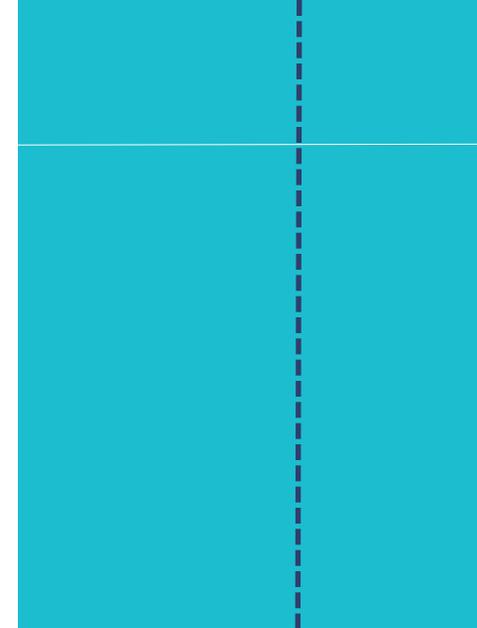
Use



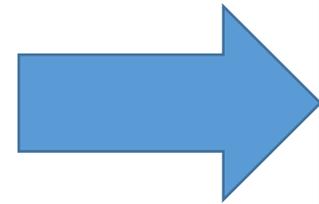
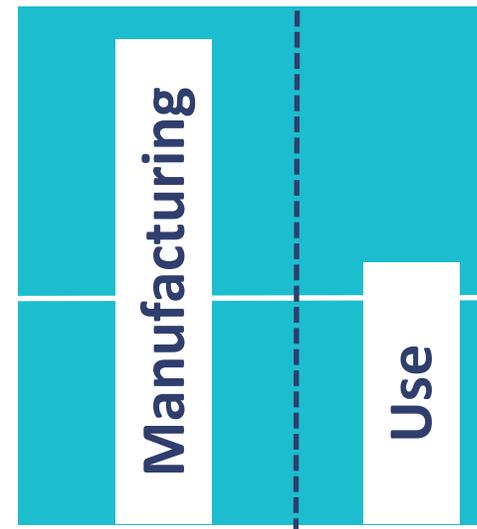
0.4
t CO₂e

**Tomorrow's
Transportation**

3,000 km/year
Electric 800 kg type
amortized over 30
years



0,5 t CO₂e
per person

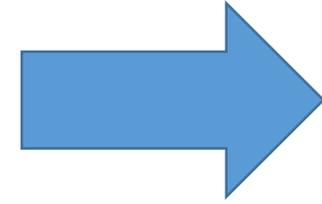


0.4
t CO₂e

Tomorrow's
Transportation

1 round trip Paris/ New York

1,8 t CO₂e
per passenger

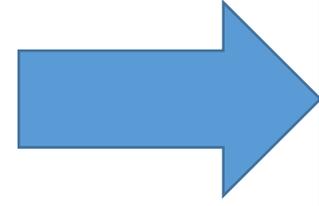


0.4
t CO₂e

**Tomorrow's
Transportation**

1 OSTST

1,3 t CO₂e
per person



0.4
t CO₂e

Tomorrow's
Transportation

FOOD

around **2,5 t CO₂e**

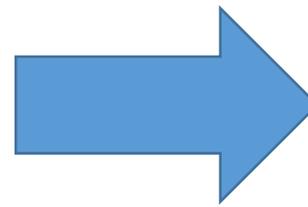
Drinks

Plants

Eggs & Dairy

**Meat
and
Fish**

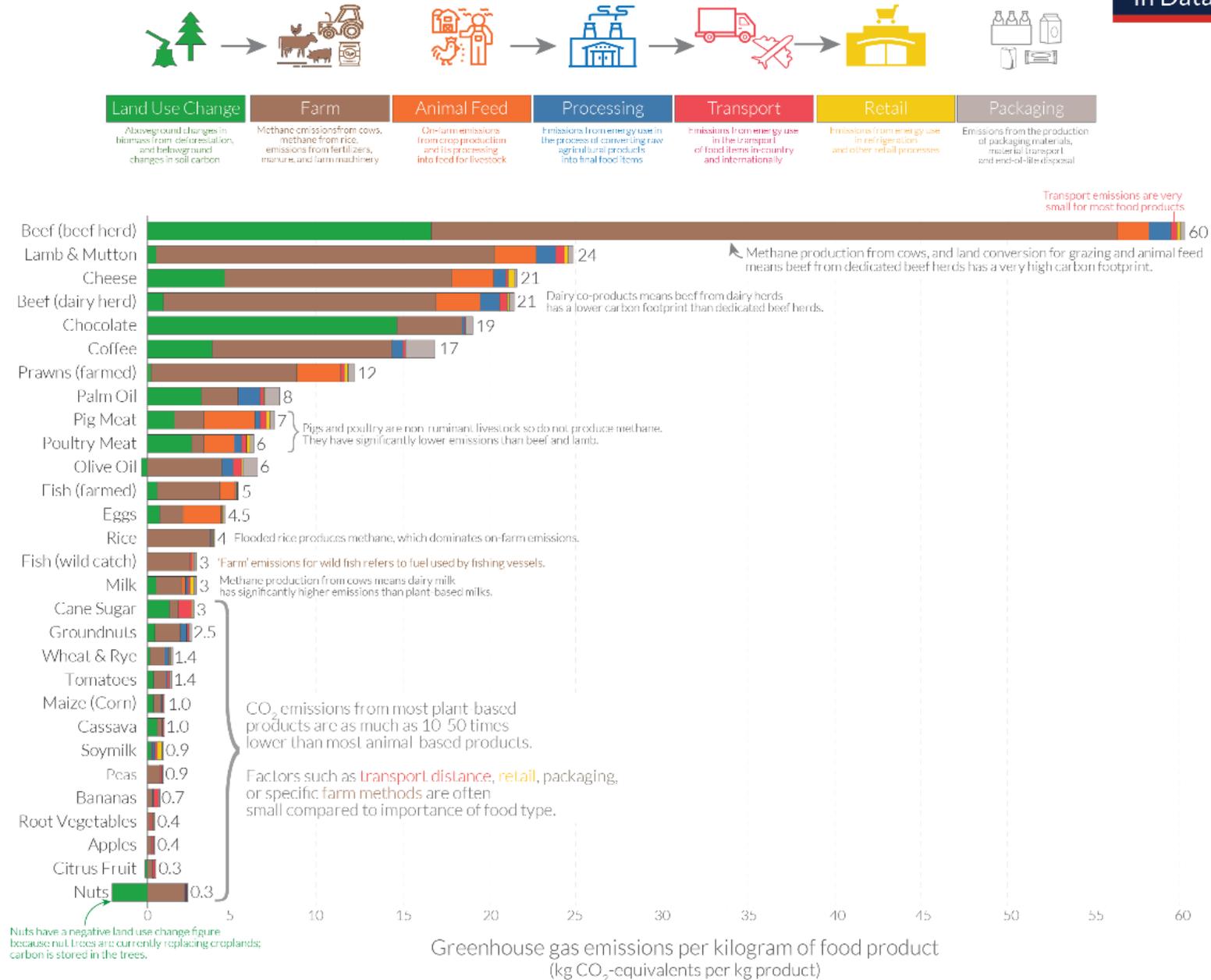
INVENTONS
N&S VIES
BAS CARBONE



0.4
t CO₂e

**Tomorrow's
food**

Food: greenhouse gas emissions across the supply chain



Note: Greenhouse gas emissions are given as global average values based on data across 38,700 commercially viable farms in 119 countries.

Data source: Poore and Nemecek (2018). Reducing food's environmental impacts through producers and consumers. *Science*. Images sourced from the Noun Project.

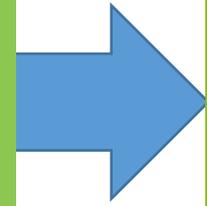
OurWorldinData.org - Research and data to make progress against the world's largest problems.

Licensed under CC-BY by the author Hannah Ritchie.

Meat twice a day

(alternating one meal beef, one meal poultry)

**3,3 t CO₂e
per person**



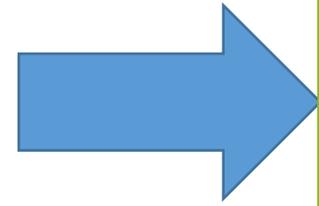
**0.4
t CO₂e**

**Tomorrow's
food**

Meat once a day

(alternating one day beef, one day poultry)

**2,2 t CO₂e
per person**



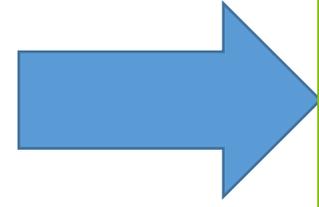
**0.4
t CO₂e**

**Tomorrow's
food**

Meat once a week

(alternating one
week beef, one
week poultry)

**1,1 t CO₂e
per person**



**0.4
t CO₂e**

**Tomorrow's
food**

INVENTONS
NOS VIES
BAS CARBONE

Vegetarian Diet

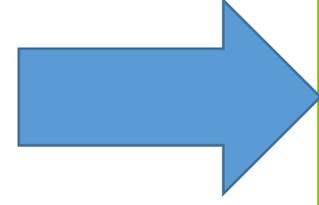
0,9 t CO₂e

or

INVENTONS
NOS VIES
BAS CARBONE

Vegetarian diet without dairy products

0,5 t
CO₂e



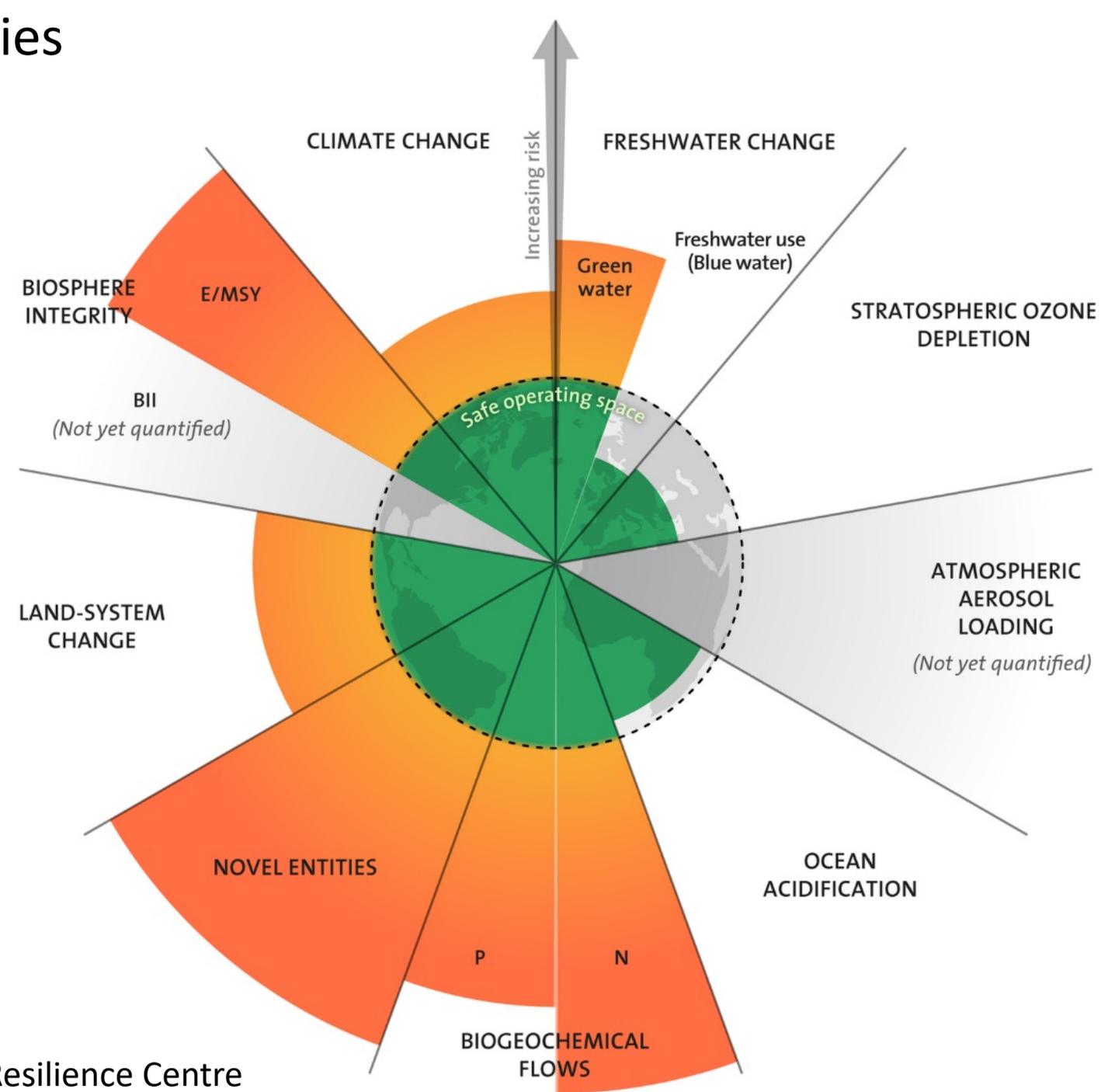
0.4
t CO₂e

Tomorrow's
food

The nine planet boundaries

Steffen et al 2015 ;

Persson et al 2022;



Designed by Azote for Stockholm Resilience Centre

It is essential to reduce our greenhouse gas emissions by 80% otherwise the living conditions of our planet will deteriorate significantly and irreparably.

We have 5 years to proceed for staying under +1,5°

It shall be operated at all levels: individuals, companies and organizations, state and administration : each entity is responsible of its own emissions

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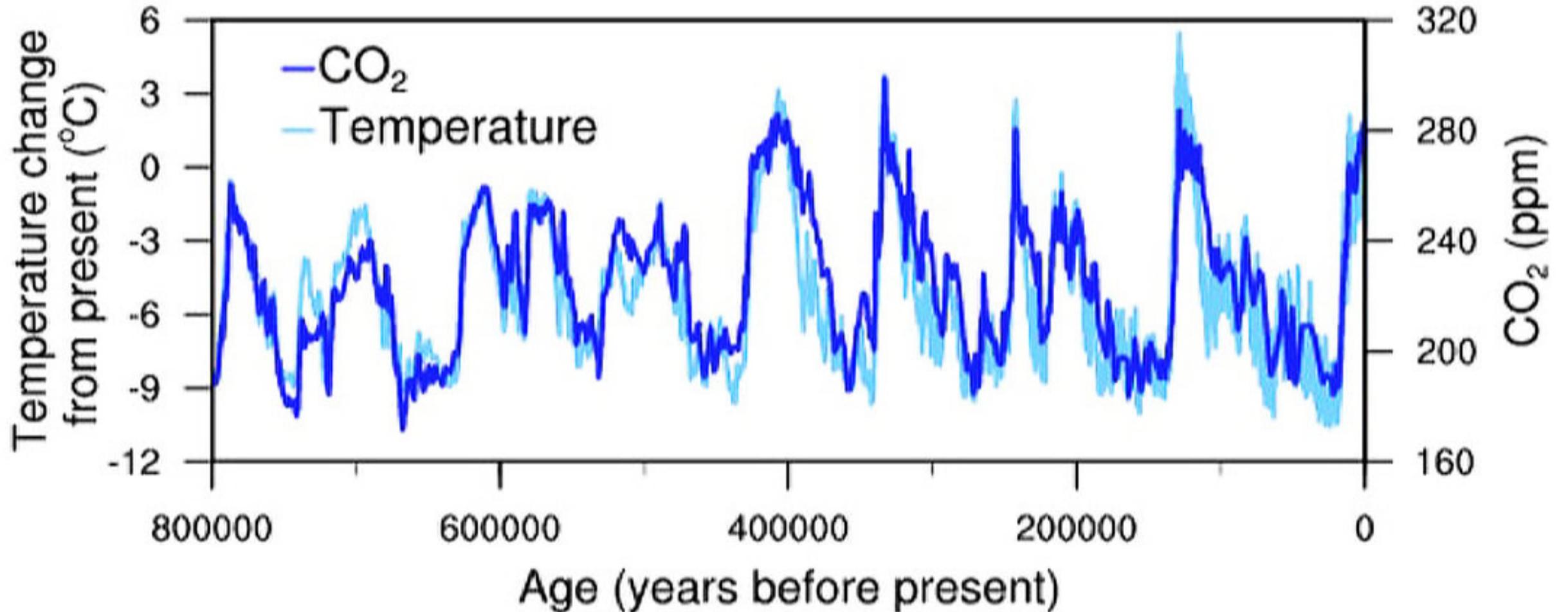
Venice - Italy



<https://ostst-altimetry-2022.com/>

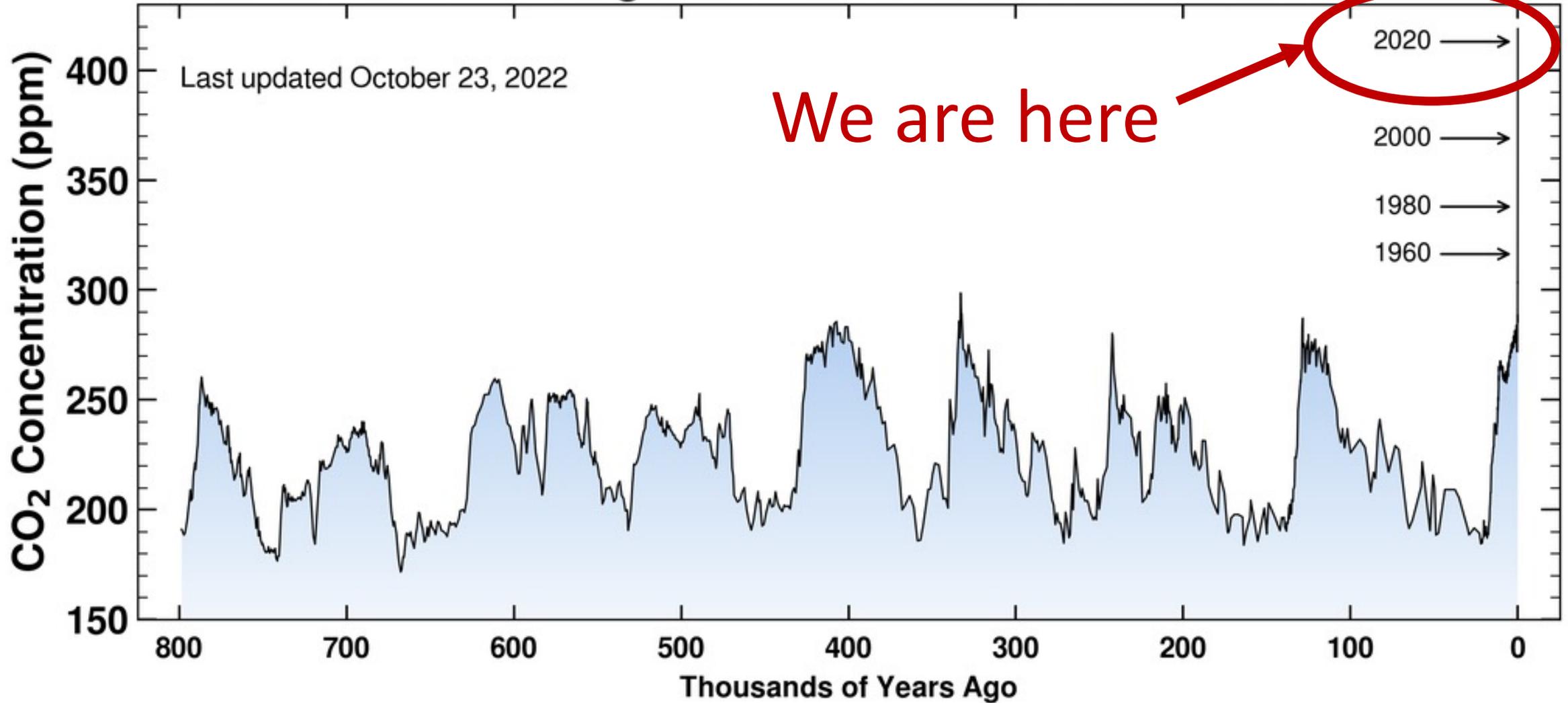
WHAT ABOUT OSTST?

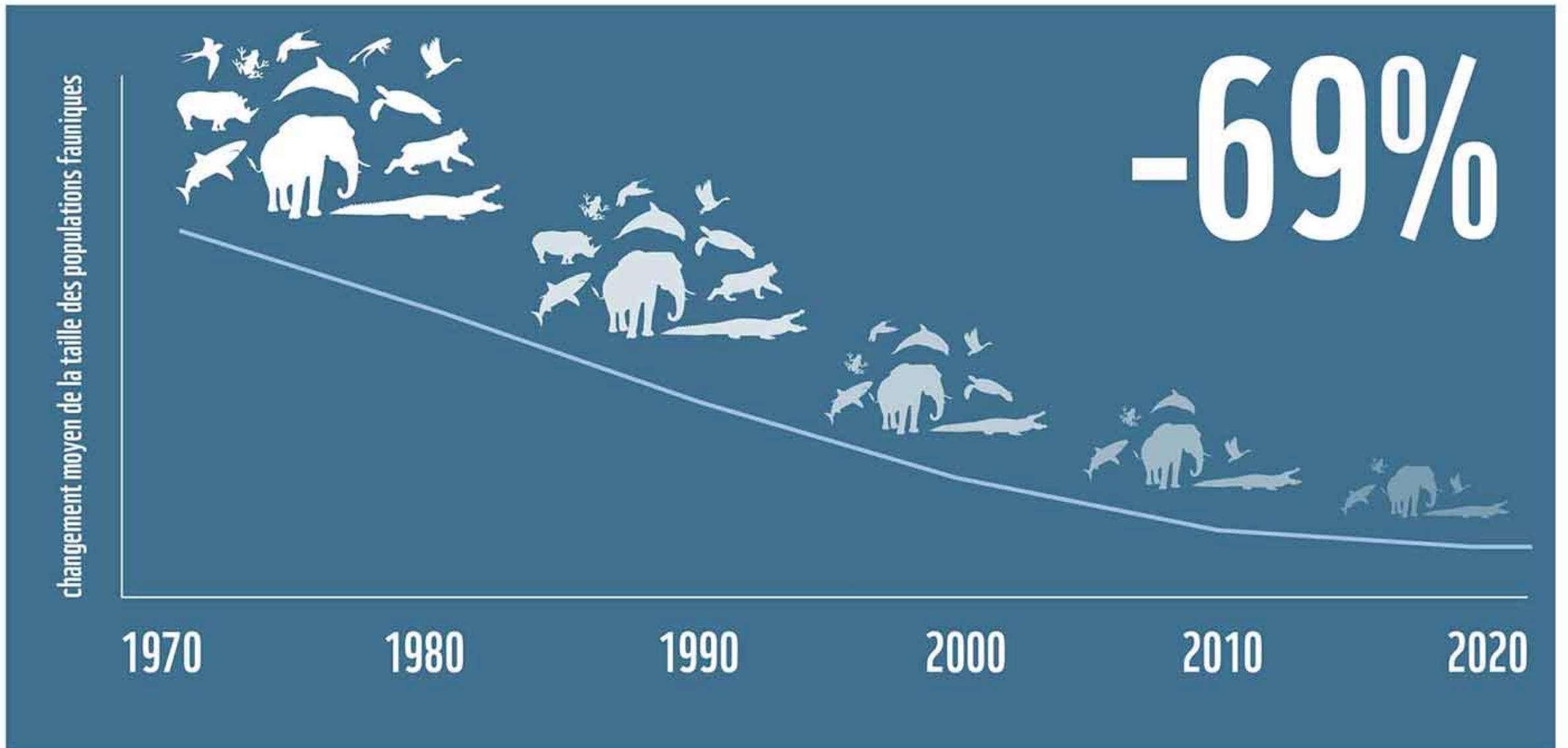
Backup



Temperature change (light blue) and carbon dioxide change (dark blue) measured from the EPICA Dome C ice core in Antarctica (Jouzel et al. 2007; Lüthi et al. 2008).

Mauna Loa Data starting in 1958. Ice-core data before 1958.





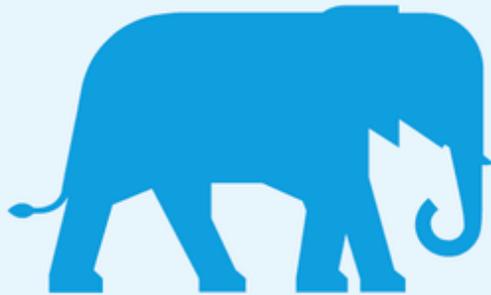
The Living Planet Index (LPI) - which tracks populations of mammals, birds, fish, reptiles and amphibians - reveals an average 69% decrease in monitored wildlife populations since 1970. The 2022 LPI analysed almost 32,000 species populations. It provides the most comprehensive measure of how they are responding to pressures in their environment. Source : WWF 2022

WEIGHT OF VERTEBRATE LAND ANIMALS

10,000 YEARS AGO



1% HUMANS



99% WILD ANIMALS

TODAY



32% HUMANS



1% WILD ANIMALS

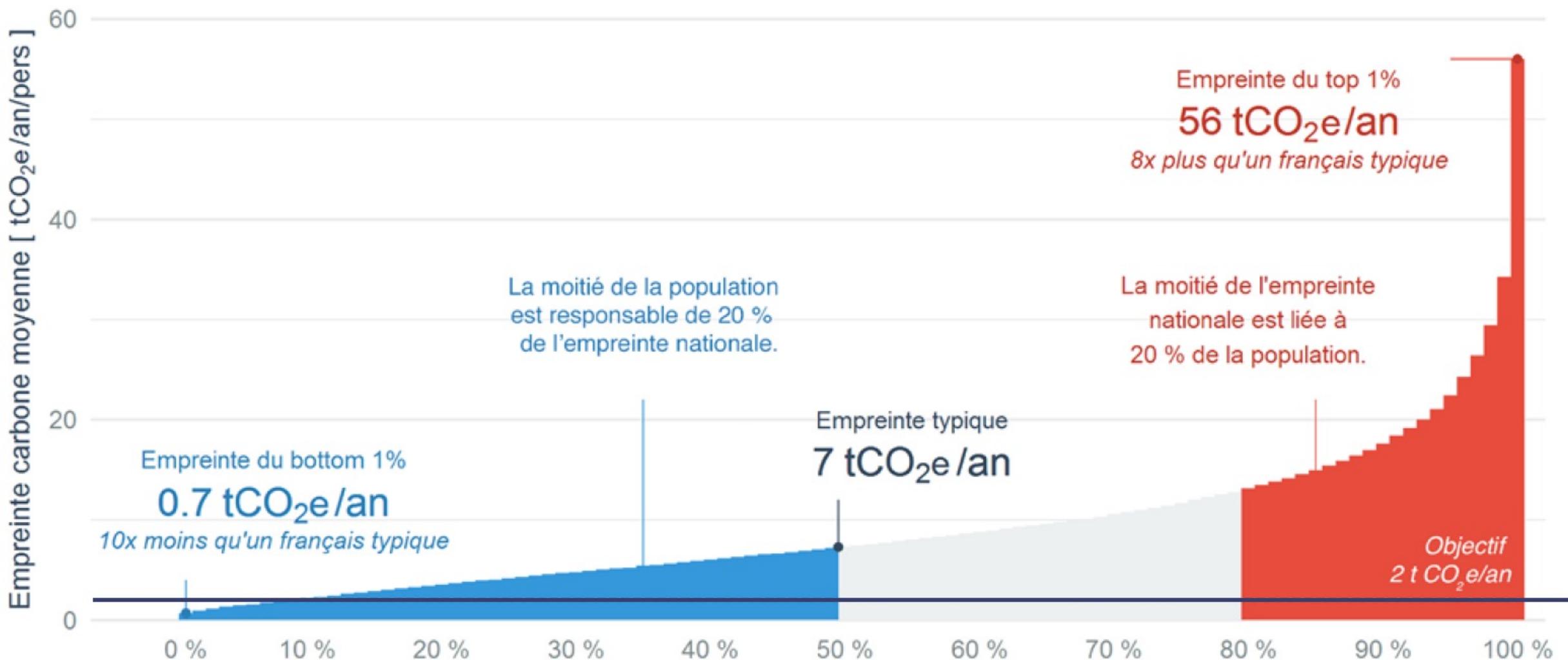


67% LIVESTOCK

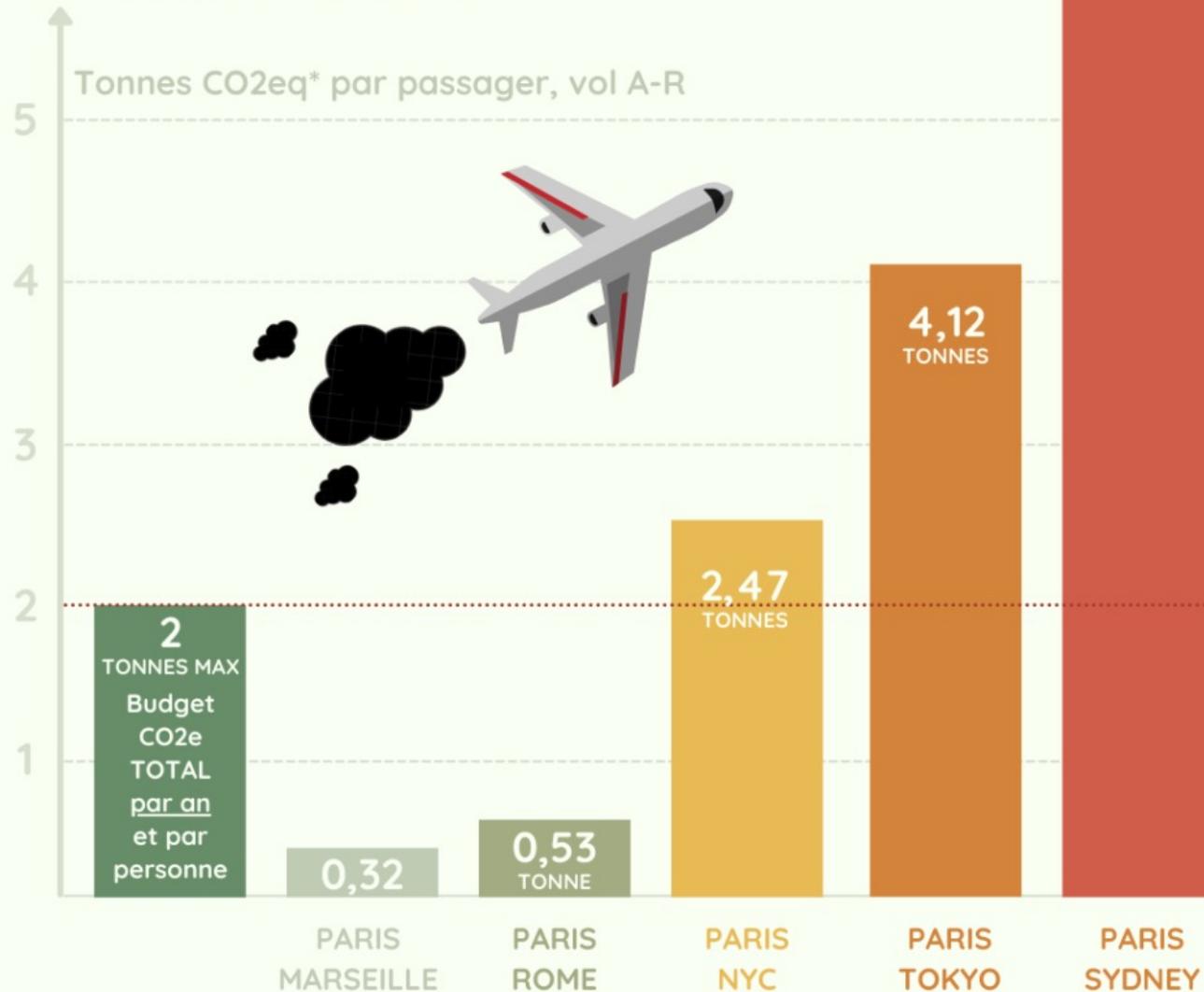
Calculations based on Smil (2011)

Que se cache-t-il derrière l'empreinte carbone de la France ?

Distribution de l'empreinte carbone des français en 2011, d'après les données de l'étude "Carbon consumption survey".



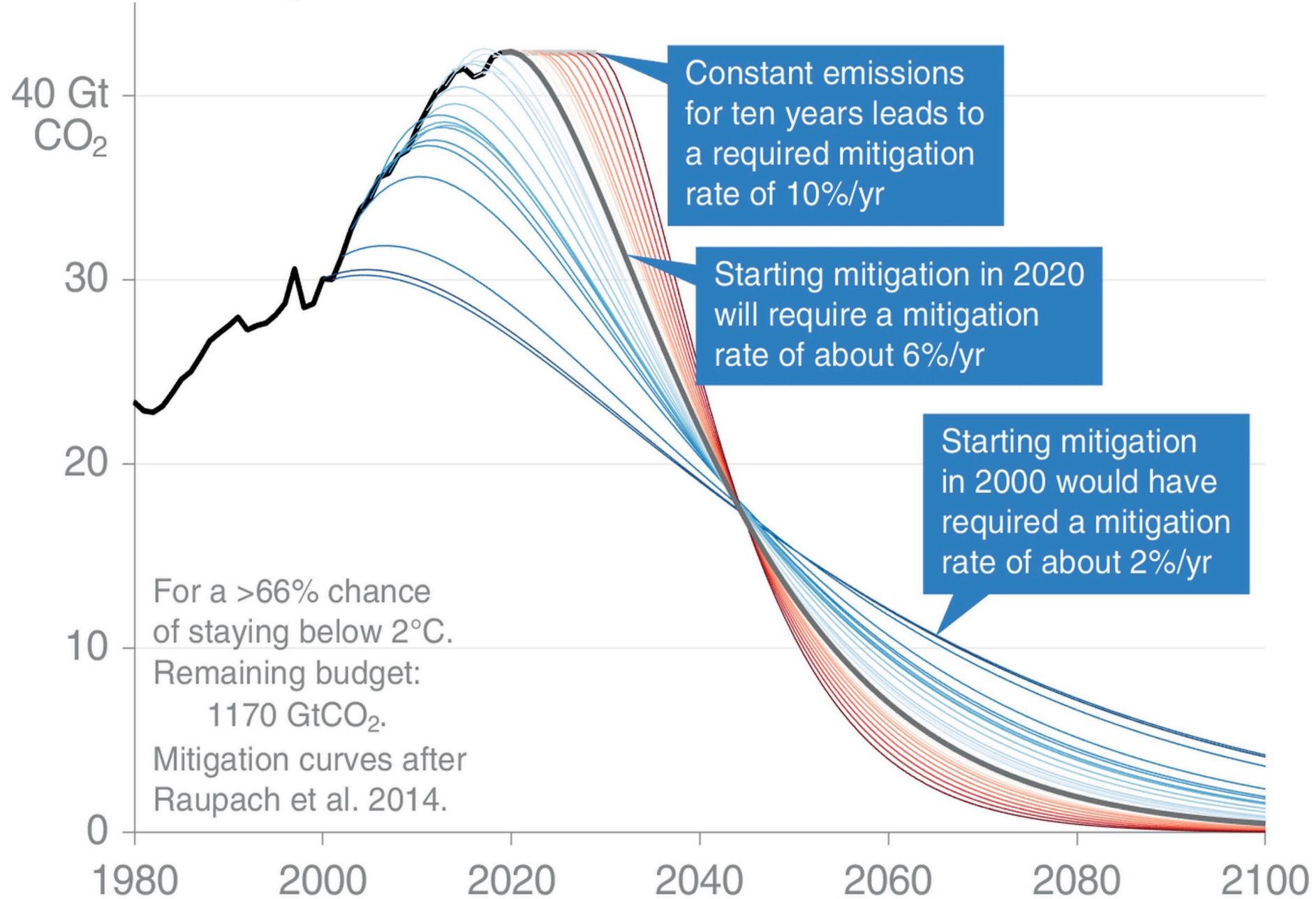
TON TRAJET EN VAUT-IL VRAIMENT LA PEINE ?

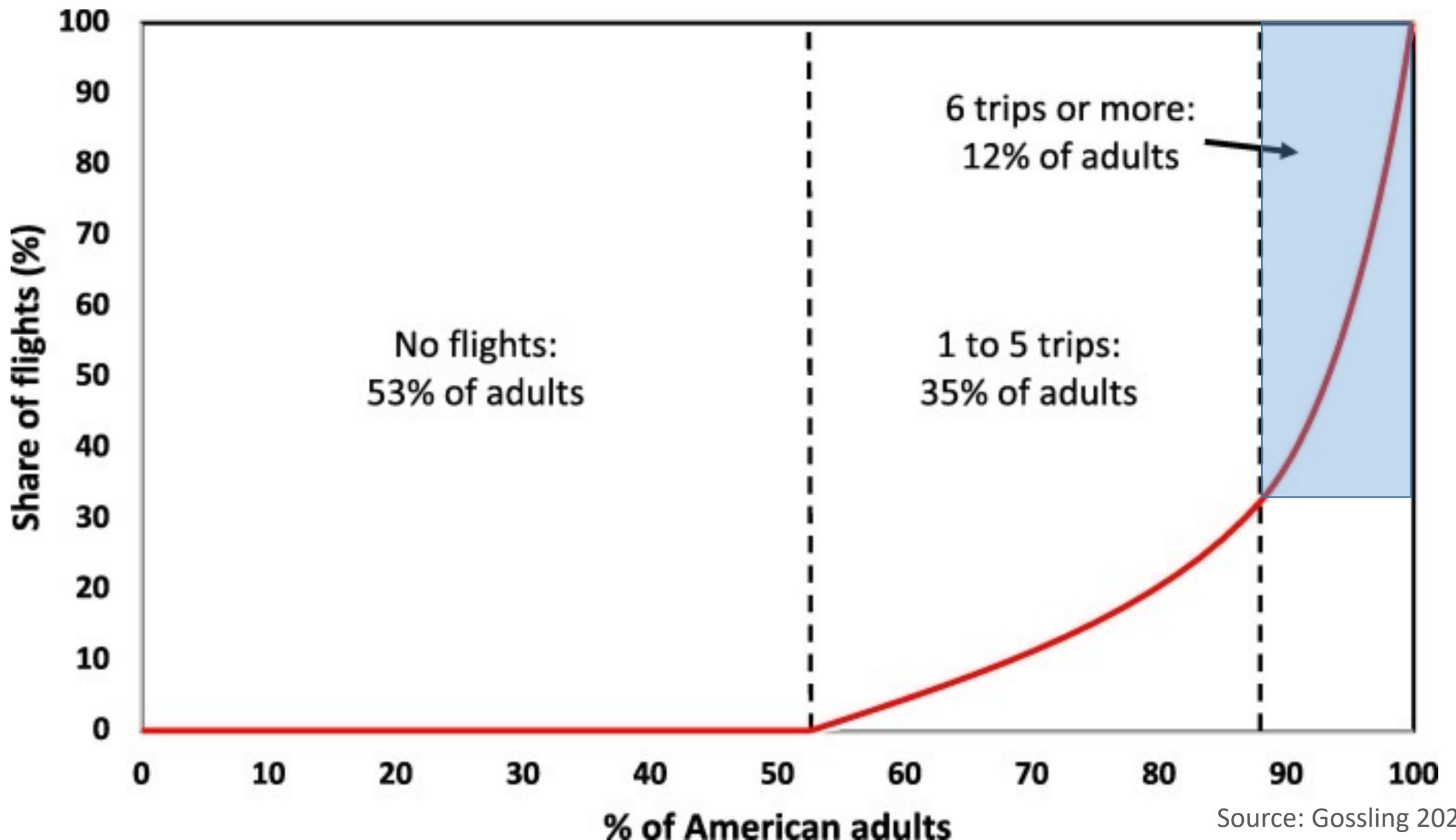


@bonpote

*LES GAZ HORS CO₂ COMPTENT POUR 2/3 DU FORÇAGE RADIATIF.
SOURCE : LEE & AL 2021. EXPLICATIONS SUR BONPOTE.COM

CO₂ mitigation curves: 2°C





Les services numériques



1 168 MILLIONS D'ÉQUIPEMENTS TERMINAUX ET OBJETS COMMUNICANTS
 dont 70 MILLIONS DE SMARTPHONES,
 35 MILLIONS DE TABLETTES,
 106 MILLIONS D'ÉCRANS ET TV



10 % DE LA CONSOMMATION ÉLECTRIQUE ANNUELLE vient des services numériques.



Cela représente pour chaque Français :



→ l'équivalent de la consommation électrique d'un radiateur de 1000 W alimenté sans interruption pendant 30 jours;

→ le même impact environnemental qu'un trajet de 2 259 km parcouru en voiture.

48,7 TWh
 C'est la consommation électrique annuelle des équipements numériques en France.



62,5 MILLIONS DE TONNES DE RESSOURCES sont utilisées par an pour produire et utiliser les équipements numériques.



78 % DE L'IMPACT ENVIRONNEMENTAL DU NUMÉRIQUE sur les émissions de gaz à effet de serre est lié à l'étape fabrication. Celle-ci nécessite une extraction importante de métaux stratégiques et est surtout effectuée dans des pays au mix énergétique fortement carboné.

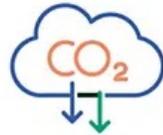
→ **6,937** exaoctets transmis sur les réseaux fixes et mobiles (1 exaoctet = 1 milliard de Go)



→ **16,9 Mt** équivalent CO₂, soit 2,5 % des émissions de GES nationaux répartis entre :
 • les terminaux (80 %)
 • les datacenters (15 %)
 • les réseaux (5 %)

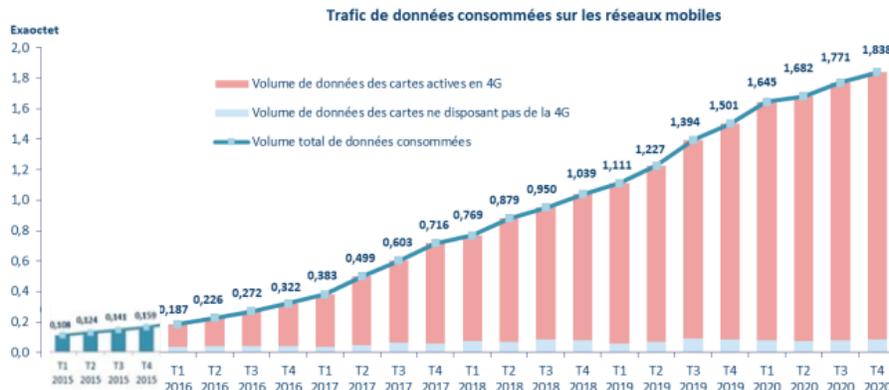


→ La production sur l'ensemble du cycle de vie de **20 MÉGATONNES DE DÉCHETS**



→ **2,5 %** de l'empreinte carbone de la France est liée au numérique. C'est un peu plus que le secteur des déchets.

→ **55 %** concernent les usages grand public, **45 %** les usages professionnels.





ENSEMBLE AU CNES POUR LANCER
DES ACTIONS À IMPACT RESPONSABLE

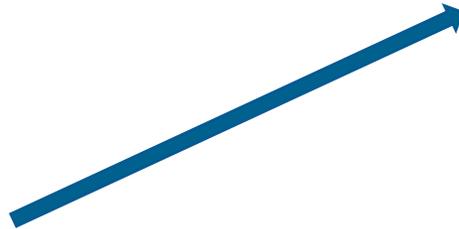


And at CNES?



ECLAIR is a collective of CNES employees which propose concrete actions to CNES headquarters

GREC is a think tank focused on ecological issues at the French space agency



SHOOP © CNES - 2020-18



HOUSING

around **2 t CO₂e**

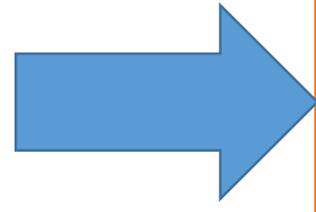
Energy

(heating,
domestic
hot water,
electricity, etc.)

Construction and maintenance

Others

INVENTONS
N&S VIES
BAS CARBONE



0.4
t CO₂e

**Tomorrow's
Housing**

INVENTONS
N&S VIES
BAS CARBONE

Heating a poorly- insulated home - Class E

2 t CO₂e

-1°C - 0,14 t CO₂e

+1°C + 0,14 t CO₂e

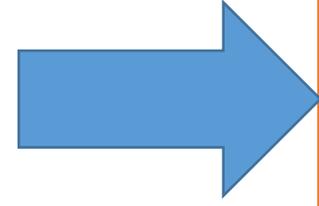
19°C during the day, 16°C at night - Standard temperature

vs

INVENTONS
N&S VIES
BAS CARBONE

Heating a very well-insulated home
- Class A

0,2 t CO₂e



0.4
t CO₂e

Tomorrow's Housing

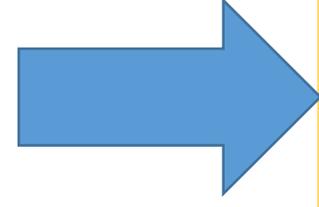
CONSUMPTION around **2 t CO₂e**

Clothing

**Other goods
and services**

**IT, Internet
and technology**

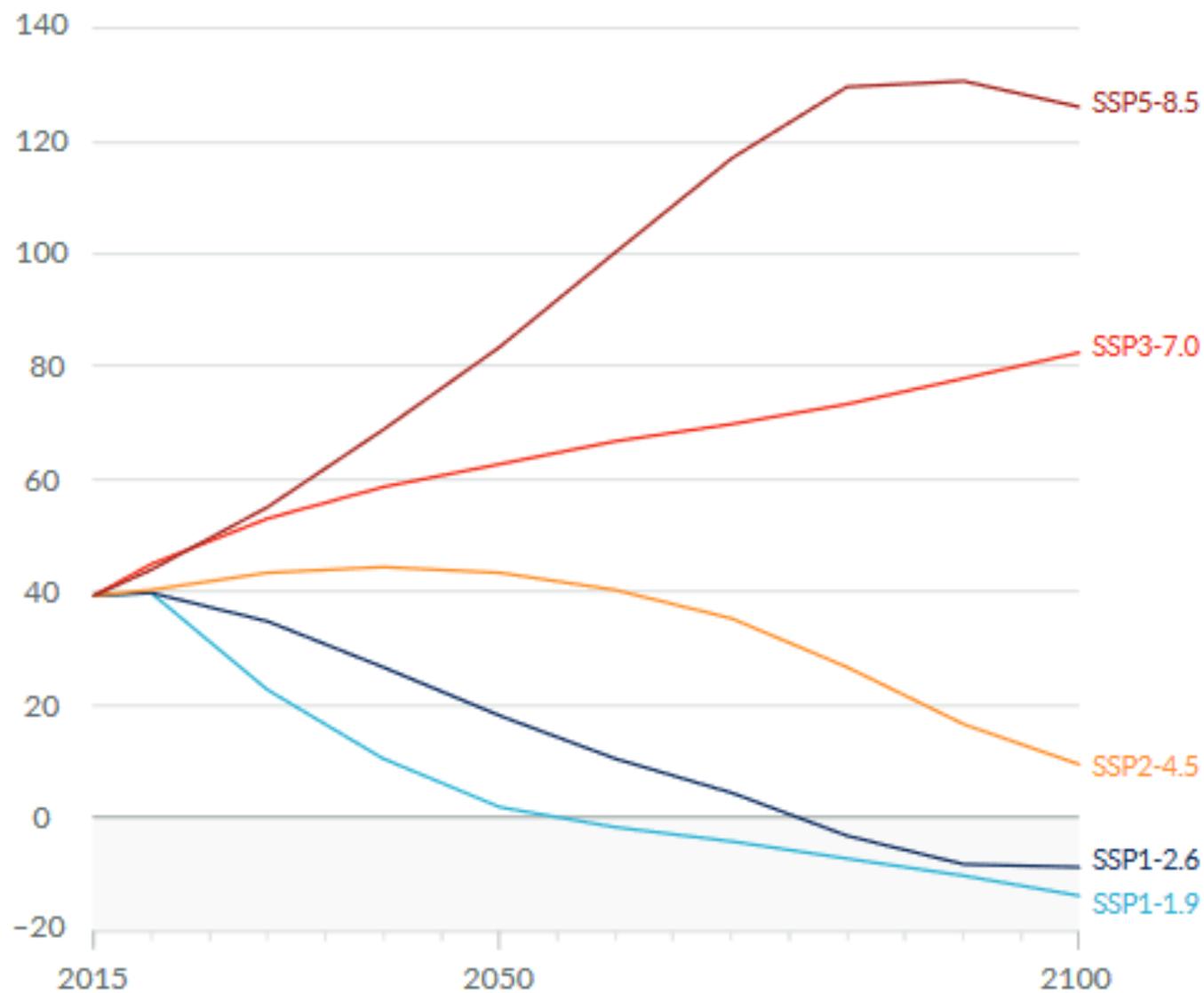
INVENTONS
NOS VIES
BAS CARBONE



0.4
t CO₂e

**Tomorrow's
consumption**

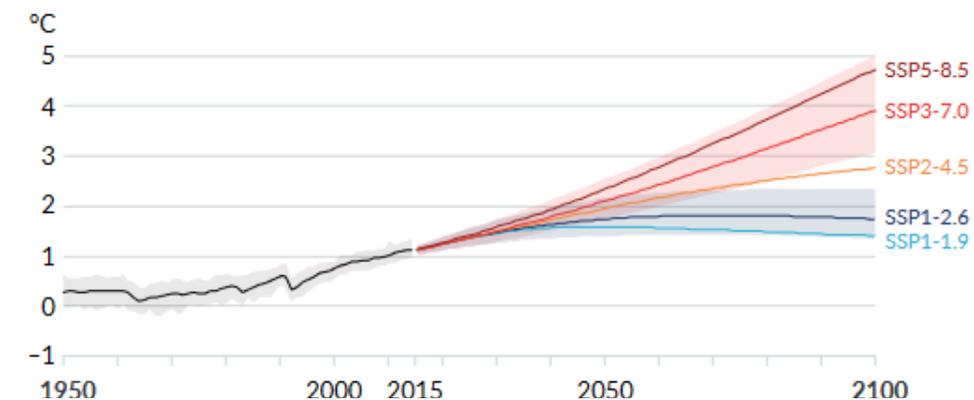
Carbon dioxide (GtCO₂/yr)



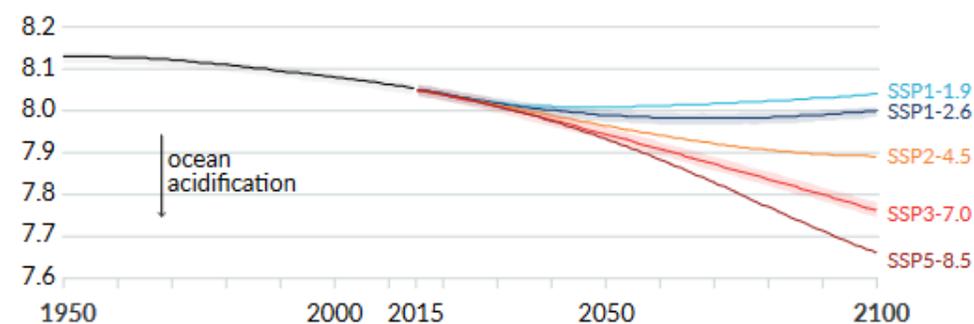
Note : les derniers nombres (1.9, 2.6, 4.5, 7.0 et 8.5) nommant chaque trajectoire correspondent aux forçages radiatifs induits à l'horizon 2100 par rapport à l'ère préindustrielle, exprimés en W/m².

Source : Giec, 1^{er} groupe de travail, 2021

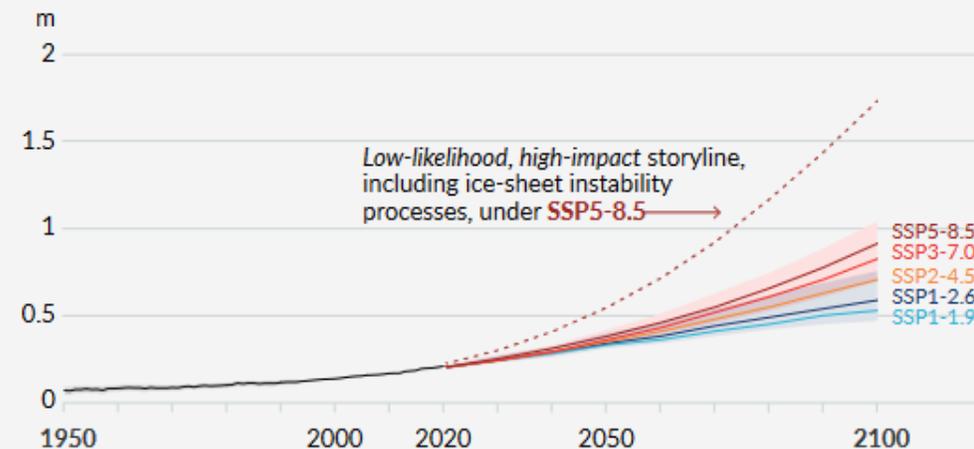
(a) Global surface temperature change relative to 1850-1900



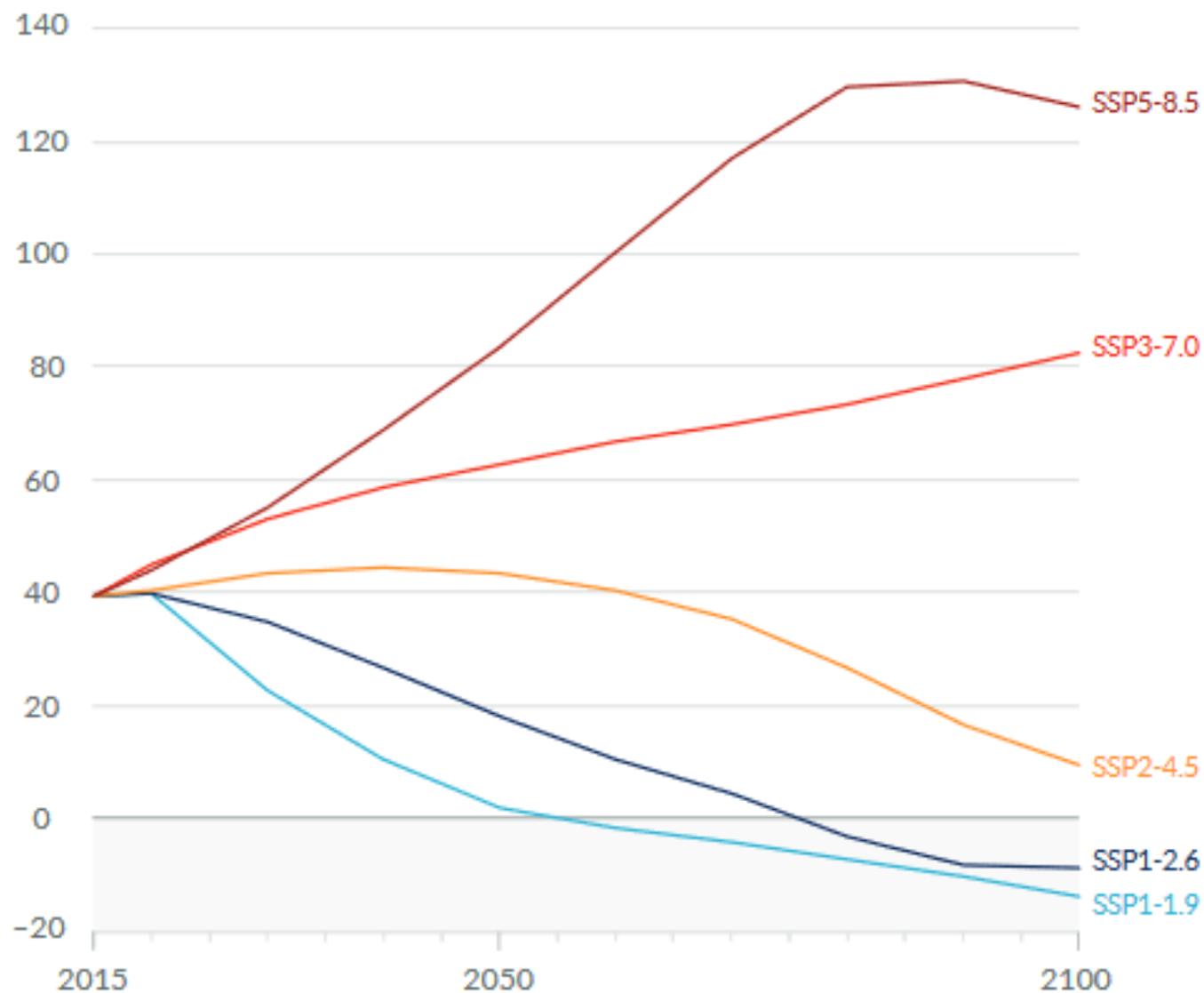
(c) Global ocean surface pH (a measure of acidity)



(d) Global mean sea level change relative to 1900



Carbon dioxide (GtCO₂/yr)



Note : les derniers nombres (1.9, 2.6, 4.5, 7.0 et 8.5) nommant chaque trajectoire correspondent aux forçages radiatifs induits à l'horizon 2100 par rapport à l'ère préindustrielle, exprimés en W/m².

Source : Giec, 1^{er} groupe de travail, 2021

