

# **Climate Change and IPCC: An Introduction**

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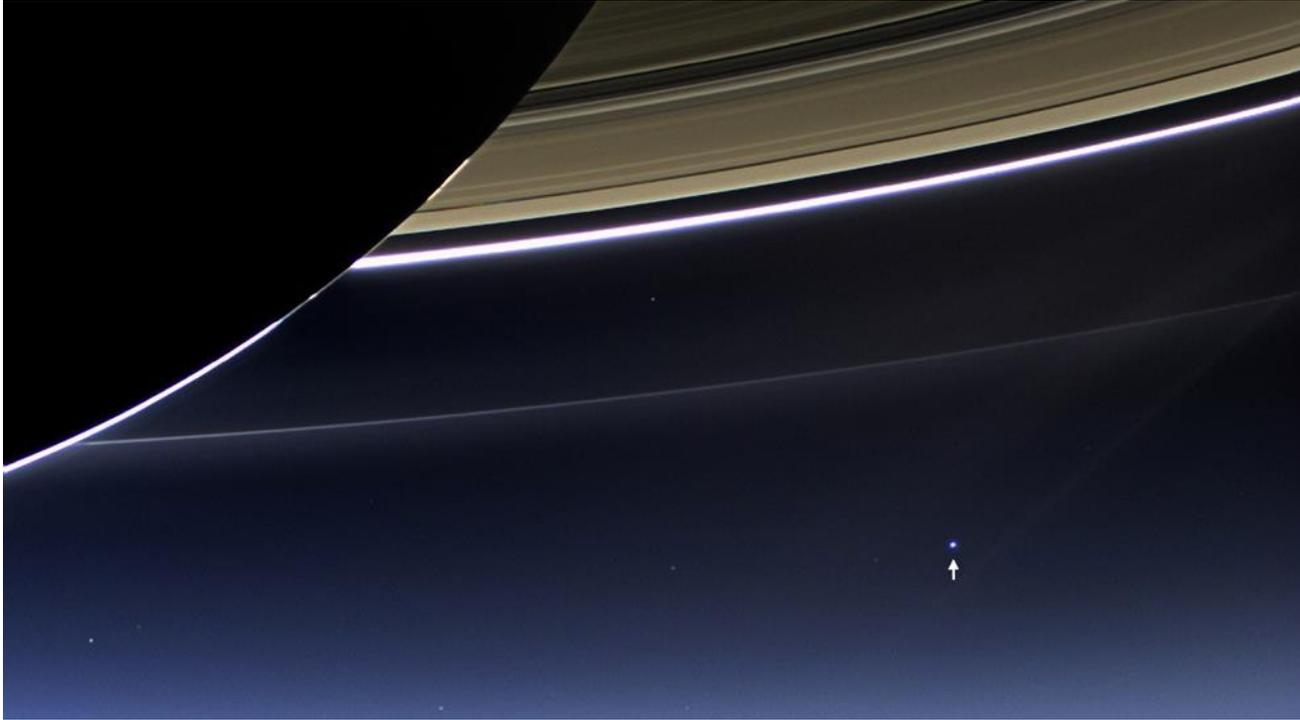
**Former IPCC Vice-Chair (2008-2015)**

**Bluesky & X/Twitter: @JPvanYpersele**

**Université de Liège, course CLIM026, Liège, 7 April 2025**

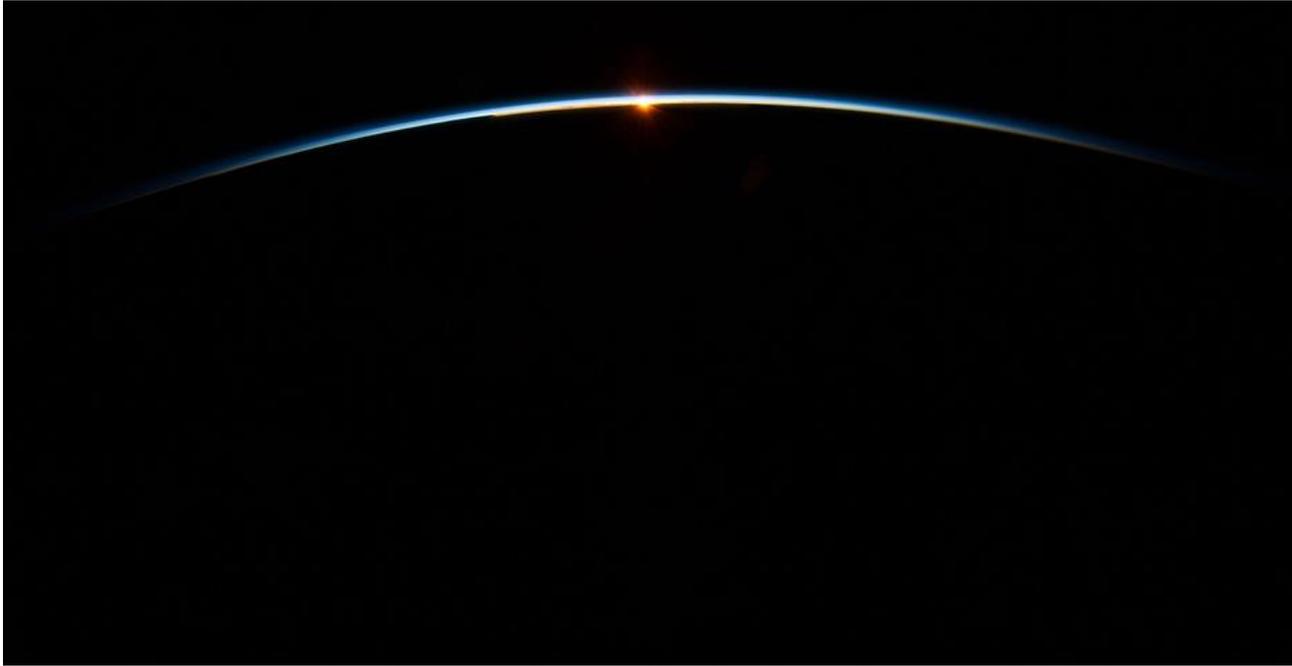
**Thanks to the Walloon Government (funding the Walloon Platform for IPCC)  
and to my team at the Université catholique de Louvain for their support**

**That small blue dot is the Earth, as seen from  
Cassini, orbiting Saturn, 1.44 billion km from  
us, on 19-7-2013**



@JPvanYpersele

# **Our atmosphere is thin and fragile (as seen by ISS crew on 31 July 2013)**



Jean-Pascal van Ypersele  
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# Let us think about the future of these children from Machakos (Kenya) in a warming climate



Photo:  
@JPvanYpersele  
April 2015

# IPCC or GIEC?

- **IPCC = Intergovernmental Panel on Climate Change**
- **GIEC = Groupe d'experts Intergouvernemental sur l'Évolution du Climat**

# Why the IPCC ?

Established by WMO and UNEP in 1988

to provide **policy-makers** with an **objective source of information** about

- causes of climate change,
- potential environmental and socio-economic impacts,
- possible response options (adaptation & mitigation).

WMO=World Meteorological Organization

UNEP= United Nations Environment Programme



# IPCC: Intergovernmental Panel on Climate Change

- Installed by UN through World Meteorological Organization (WMO) and United Nations Environment Programme (UNEP) in 1988
- Organises each 5-7 years a scientific assessment of published literature on climate change, its impacts and its response options
- By teams of scientists from all continents
- Primarily to inform the policymakers of the UN member states

# UN General Assembly resolution 43/53 (1988) calling for the IPCC creation

- “a comprehensive review and recommendations with respect to: 
- (a) The state of knowledge of the science of climate and climatic change;
- (b) Programmes and studies on the social and economic impact of climate change, including global warming;
- (c) Possible response strategies to delay, limit or mitigate the impact of adverse climate change;
- (d) The identification and possible strengthening of relevant existing international legal instruments having a bearing on climate;
- (e) Elements for inclusion in a possible future international convention on climate”.

## The Role of the IPCC is ...

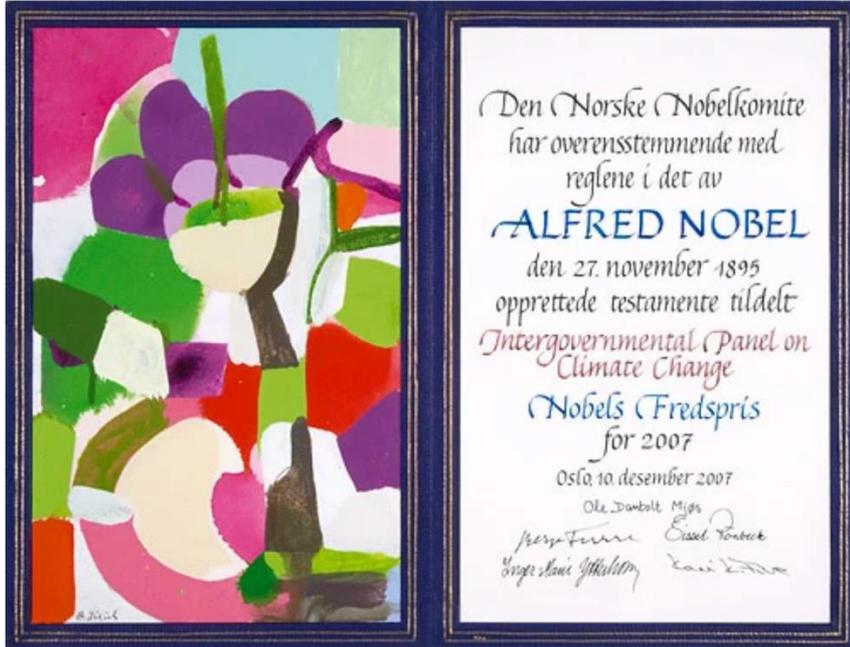
“... to **assess** on a comprehensive, objective, open and transparent basis the **scientific, technical and socio-economic information** relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation.”

“IPCC reports should be **neutral with respect to policy**, although they may need to **deal objectively with scientific, technical and socio-economic factors** relevant to the application of particular policies.”

Principles Governing IPCC Work, paragraph 2

Source: <http://www.ipcc.ch/pdf/ipcc-principles/ipcc-principles.pdf>

# The IPCC was awarded the 2007 Nobel Peace Prize (together with Al Gore)



“...for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change”

The Norwegian Nobel Committee added:

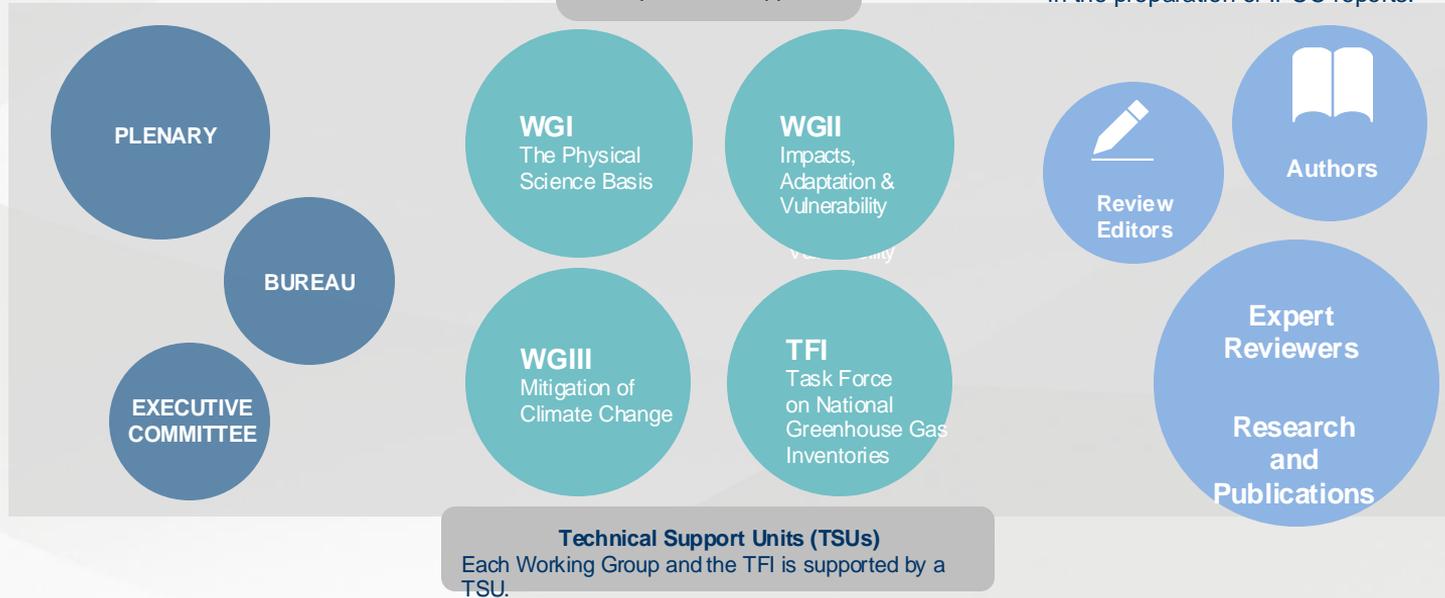
*« According to the IPCC, there is a real danger that the climate changes may also increase the danger of war and conflict, because they will place already scarce natural resources, not least drinking water, under greater pressure and put large population groups to flight from drought, flooding, and other extreme weather conditions. »*

# Structure IPCC

**Intergovernmental Panel**  
195 member States appointing  
National Focal Points.

**The Secretariat**  
Oversees the process  
and provides support.

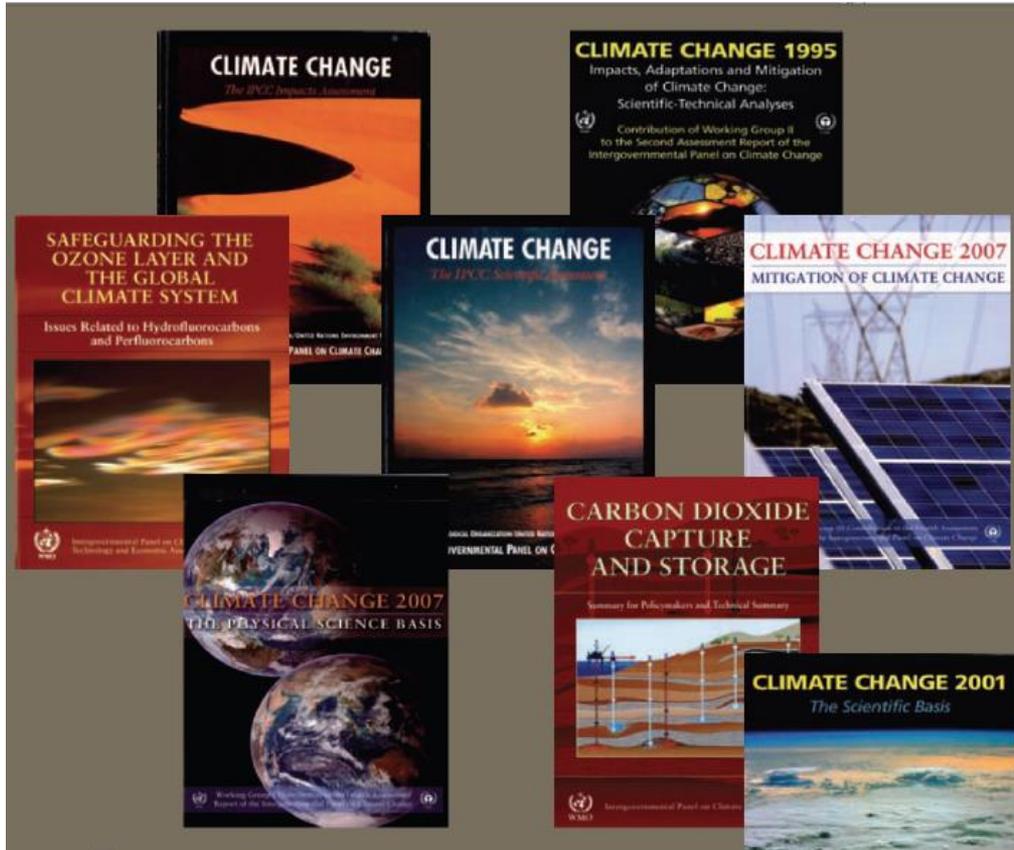
Hundreds of **scientists and experts**  
**from around the world** are involved  
in the preparation of IPCC reports.



# IPCC Products

- **Assessment reports:**  
comprehensive picture of the present state of understanding of climate change (1990 – 1995 – 2001 – 2007 - 2013/14 – 2021/23)
  - ◆ SPM : summary for policy makers; TS : technical summary
- **Special reports:** assessment / a specific issue (next slide)
- **Methodology reports:**  
methodologies for national greenhouse gas inventories, used by Parties to the UNFCCC to prepare their national communications
- **Technical papers:** focus on a specific topic, drawing material from other IPCC reports (e.g. climate change and water)
- **Workshop and Expert meeting reports:** = supporting material, commissioned or supported by the IPCC, but not reviewed following IPCC procedures, and not accepted / adopted by the IPCC

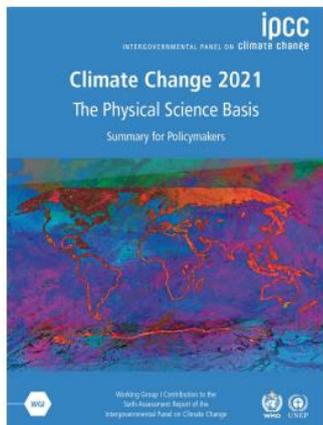
# IPCC Main Products: 'Assessment & Special Reports'



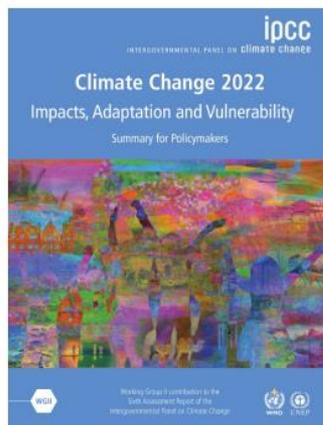
**Assessment Reports:** full assessment for each of the IPCC Working Groups

**Special Reports:** assessment of a specific theme

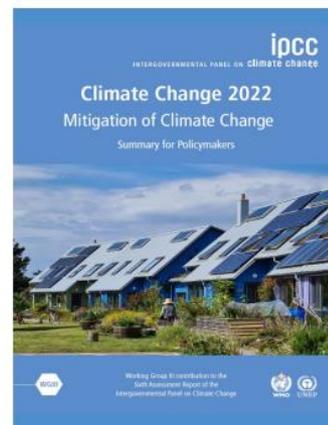
# The 6<sup>th</sup> Assessment Report (AR6):



**234 authors, 65 countries**  
**14,000+** scientific papers  
**78,000+** review comments



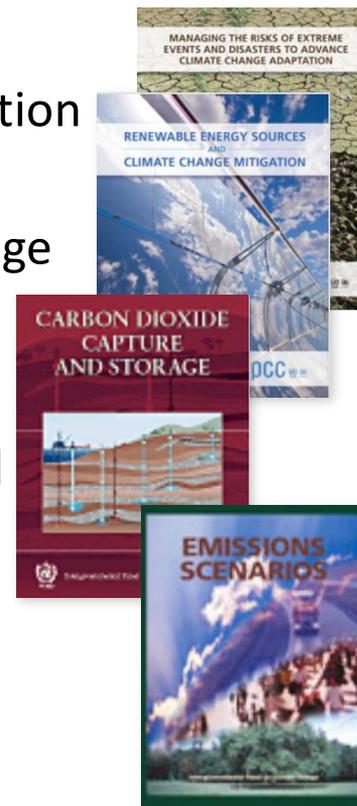
**270 authors, 67 countries**  
**34,000+** scientific papers  
**62,000+** review comments



**278 authors, 65 countries**  
**18,000+** scientific papers  
**59,000+** review comments

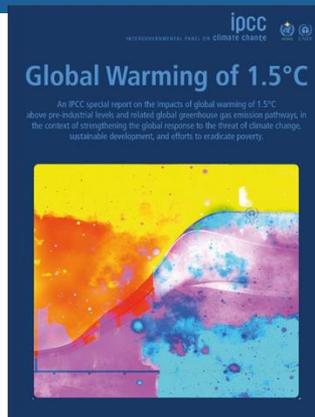
# Some IPCC Special reports

- Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX, 2012)
- Renewable Energy Sources and Climate Change Mitigation (SRREN, 2011)
- Carbon Dioxide Capture and Storage (2005)
- Safeguarding the Ozone Layer and the Global Climate System (2005)
- Methodological and Technological Issues in Technology Transfer (2000)
- Emissions Scenarios (SRES, 2000)

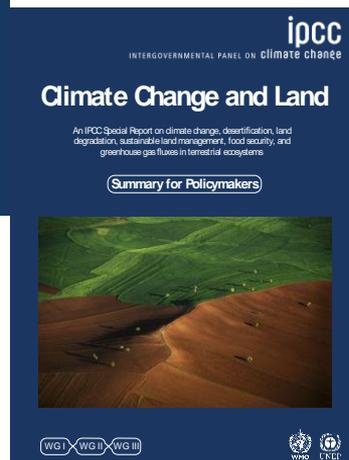


# Most recent IPCC Special reports

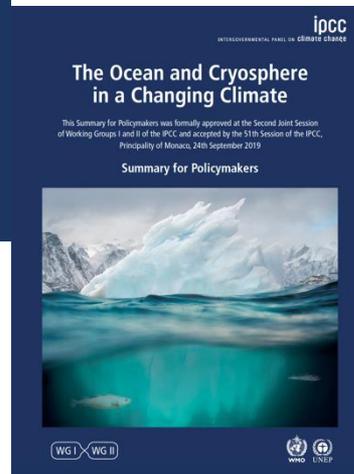
- SR15, 2018  
(1.5°C Warming)



- SRLand, 2019  
(Climate change and land-related-issues)

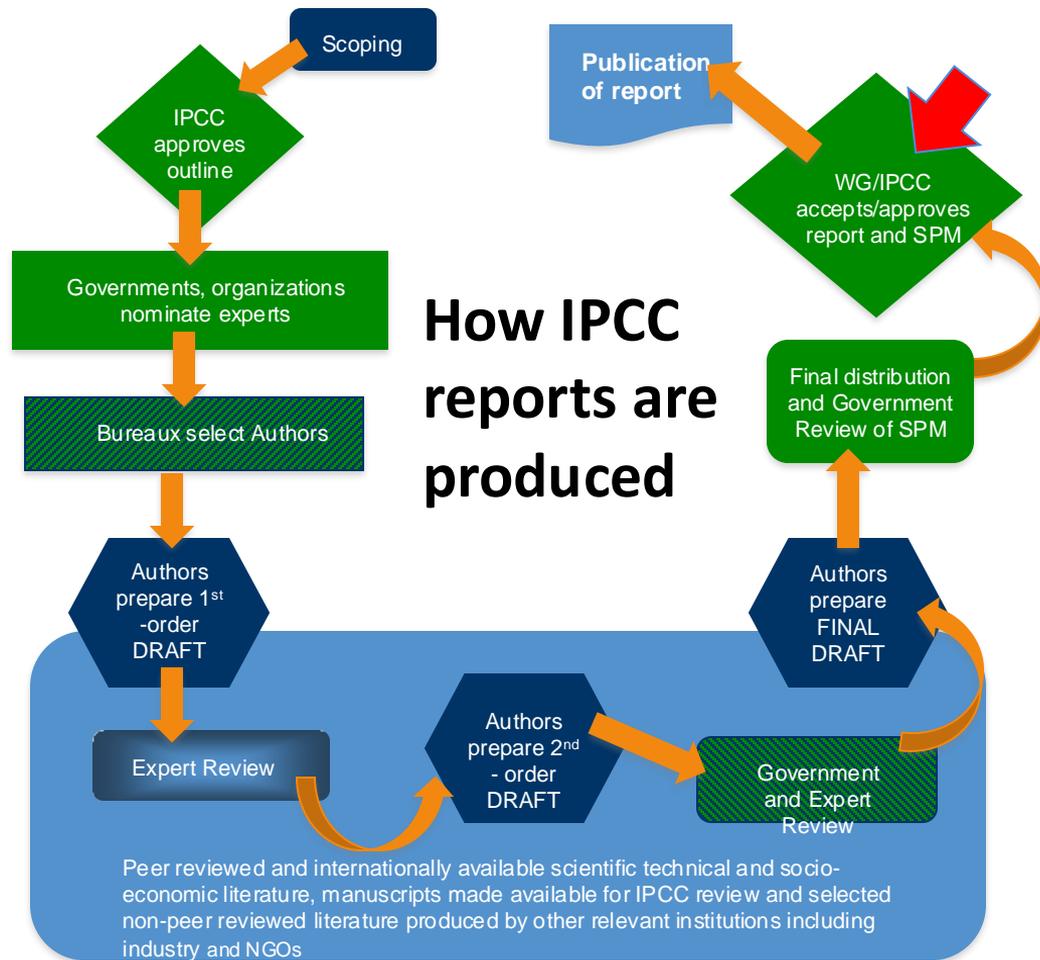


- SROCC, 2019  
(CC, ocean and cryosphere)



## What is a 'Scientific Assessment' IPCC-style?

- It addresses topics identified through a scoping process and agreed by the Plenary
- It draws key conclusions from the full span of available (mostly peer- reviewed) scientific literature
- It is written by a diverse group of qualified authors from all regions of the world– taking different views into account
- Review by voluntary experts and by governments is key to its quality
- When appropriate, its findings are labelled with uncertainty qualifiers



## Report Process | Ten Steps

### 1 Scoping

The outline is drafted and developed by experts nominated by governments and observer organizations.

### 2 Agreement on Outline

The Panel agrees upon the outline.

### 3 Nomination of Authors

Governments and observer organizations nominate experts as authors.

### 4 Selection of Authors

The Bureau selects authors.

### 5 Expert Review First Order Draft (FOD)

Authors prepare a first draft which is reviewed by experts.

### 6 Government and Expert Review Second Order Draft (SOD)

The second draft of the report and first draft of the Summary for Policymakers (SPM) are reviewed by governments and experts.

### 7 Final Draft Report and SPM

Authors prepare final draft of the report and SPM which are sent to governments.

### 8 Government Review of Final Draft SPM

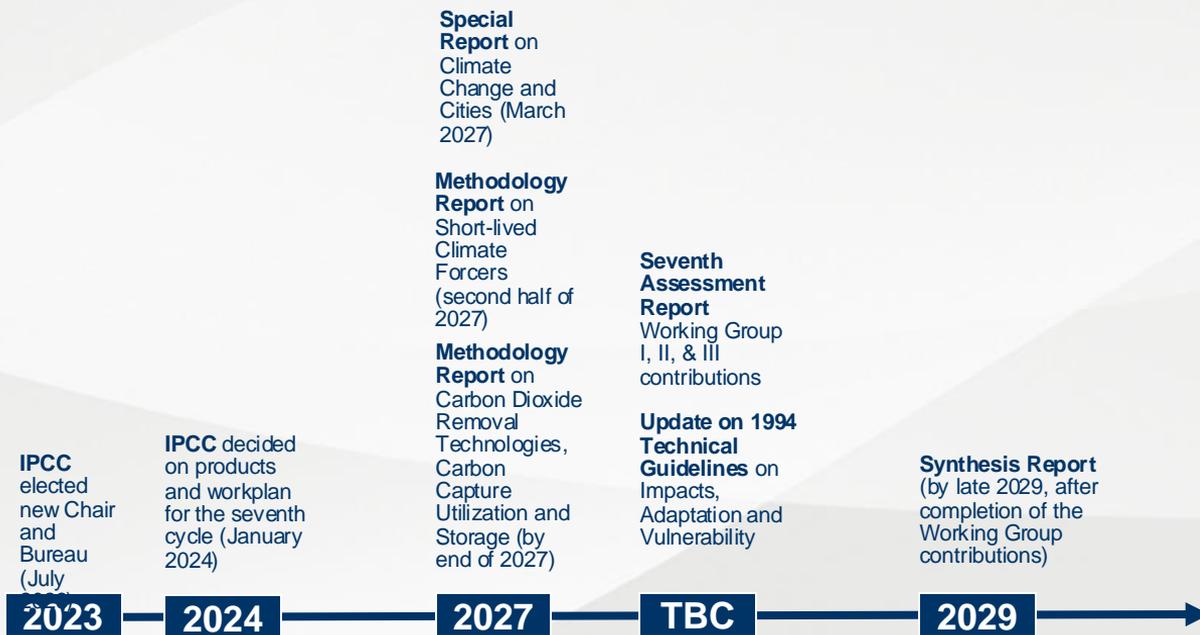
Governments review the final draft in preparation for its approval.

### 9 Approval & Acceptance of Report

Working Group/Panel approves SPM and accepts reports.

### 10 Publication of Report

## Seventh Assessment Cycle | Timeline



# Typical implementation plan

2025	
7 March-17 April	Call for Author nominations
30 June – 2 July	Decision on selection of Authors
27-31 October or 1-5 December <i>depending on location</i>	Joint First Lead Author Meeting
2026	
27 April - 1 May	Second Lead Author Meeting
10 August - 2 October	Expert Review of the First Order Draft
2 - 6 November	Third Lead Author Meeting
2027	
3 May - 25 June	Expert and Government Review of the Second Order Draft
26-30 July	Fourth Lead Author Meeting
20 December - 25 February	Final Government Distribution of the Final Draft and Final Government Review of the Summary for Policy Makers
2028	
1 - 5 May	Approval of the Summary for Policymakers and acceptance of the underlying Report

Not Approved!!

Tentative Implementation plans available for [WG1](#), [WG2](#) and [WG3](#) not approved!!

# Engagement with the IPCC

- **Coordinating Lead Author (CLAs)** are responsible for coordinating work on major sections of a report such as chapters.
- **Lead Authors (LAs)** are responsible for the production of designated sections of the report within a chapter on the basis of the best scientific, technical and socio-economic information available.
- **Review Editors (REs)** help identify expert reviewers, ensure that all substantive comments are afforded appropriate consideration, and advise Lead Authors on how to handle contentious or controversial issues
- More Information on the roles is available in Annex 1 of Appendix A to the [Principles Governing IPCC Work](#).

# Other ways to engage with IPCC

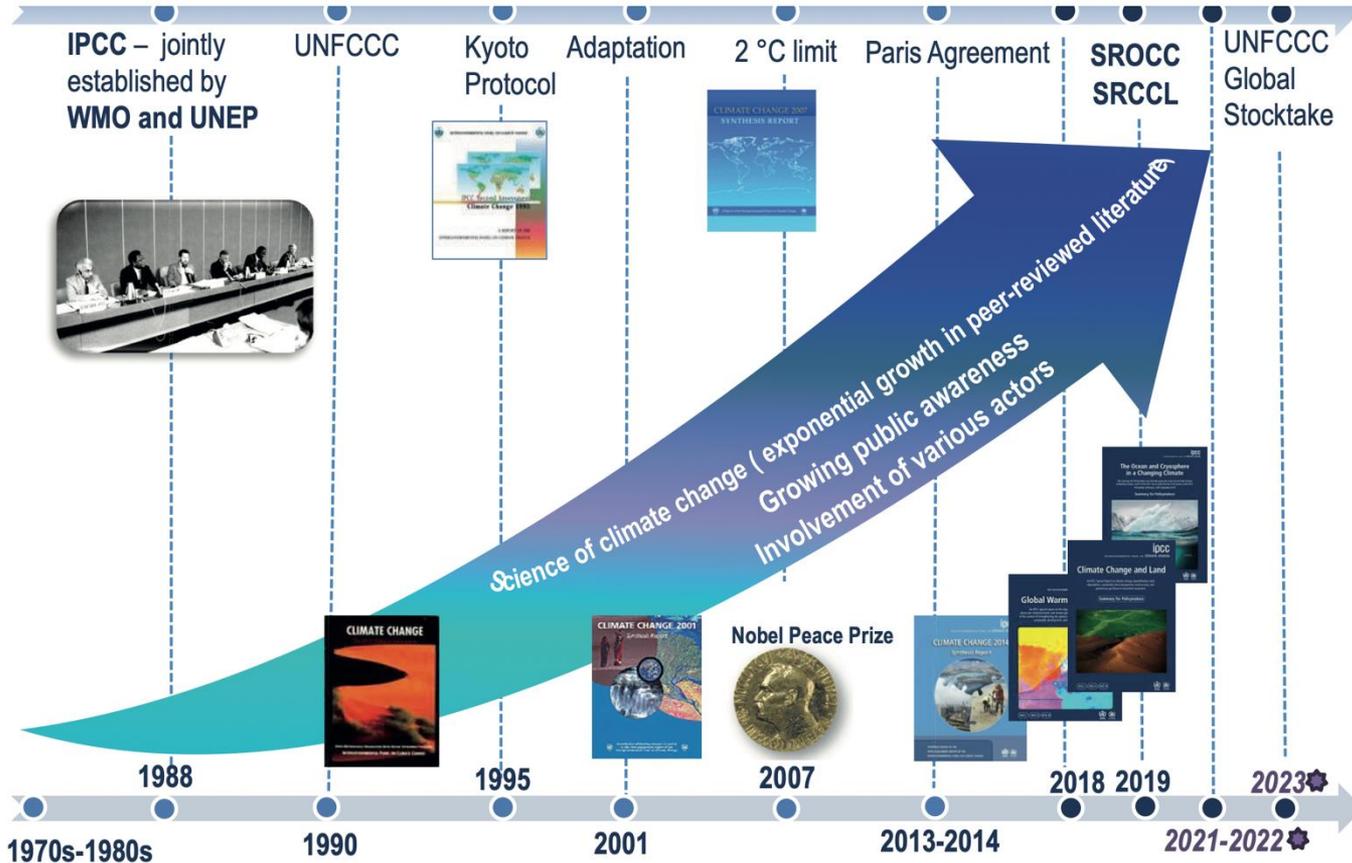
[How to](#)

## [Participate in IPCC](#)

- **Contributing Authors** provide specific knowledge or expertise in a given area and help ensure that the full range of views held in the scientific community is reflected in the report. Selection via CLAs and Las.
- **Chapter Scientists** provide technical and logistical support to author teams.
- **Expert Reviewers** comment on the accuracy and completeness of the scientific assessment contained in the drafts. An Expert Reviewer may decide to comment on one section of the report, on a complete chapter, or on the report as a whole.
- **Contribute to literature.** Cut-off approximately one to three months before completion of the final draft. More information: [IPCCFactSheet\\_Literature.pdf](#)

[ipccfocalpoint@belspo.be](mailto:ipccfocalpoint@belspo.be)

**IPCC is the global voice of climate!**



⚙️ *These dates are subject to change.*

Source: IPCC web site, 2023

# The Essential Truth About Climate Change in Ten Words

The basic facts of climate change, established over decades of research, can be summarized in five key points:

IT'S REAL

Global warming is happening.

IT'S US

Human activity is the main cause.

EXPERTS AGREE

There's scientific consensus on human-caused global warming.

IT'S BAD

The impacts are serious and affect people.

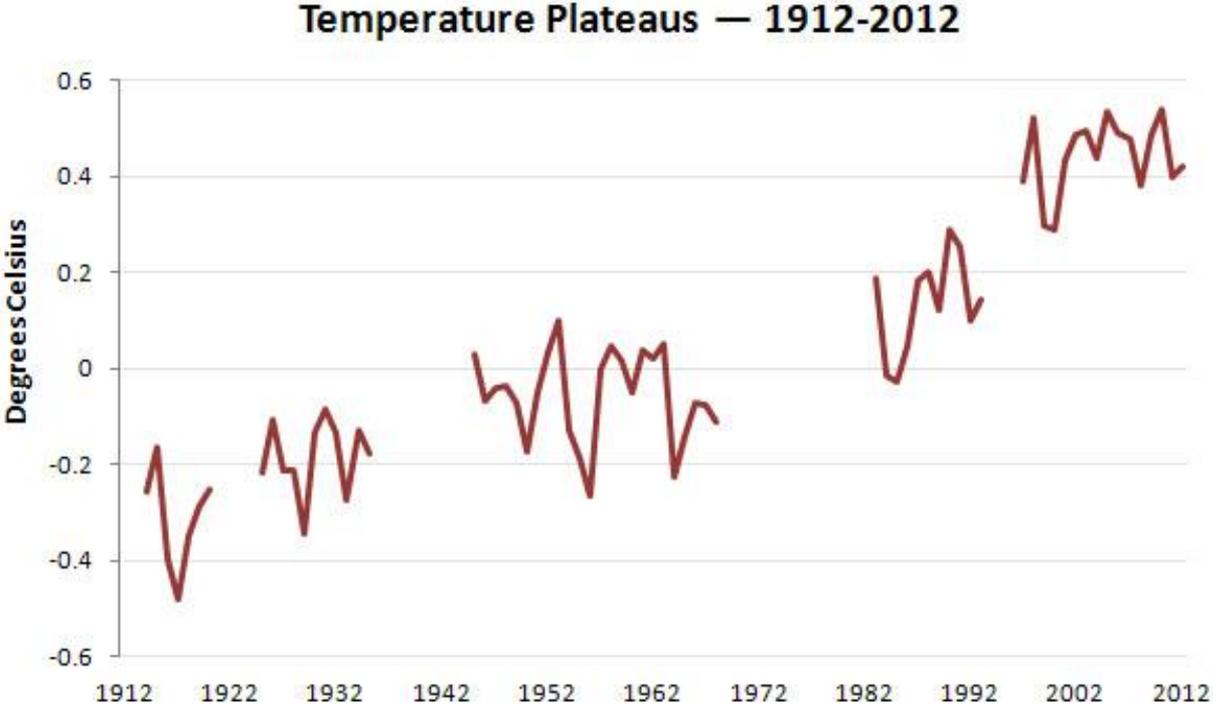
THERE'S HOPE

We have the technology needed to avoid the worst climate impacts.

## Temperature Change From 1961-1990 Average

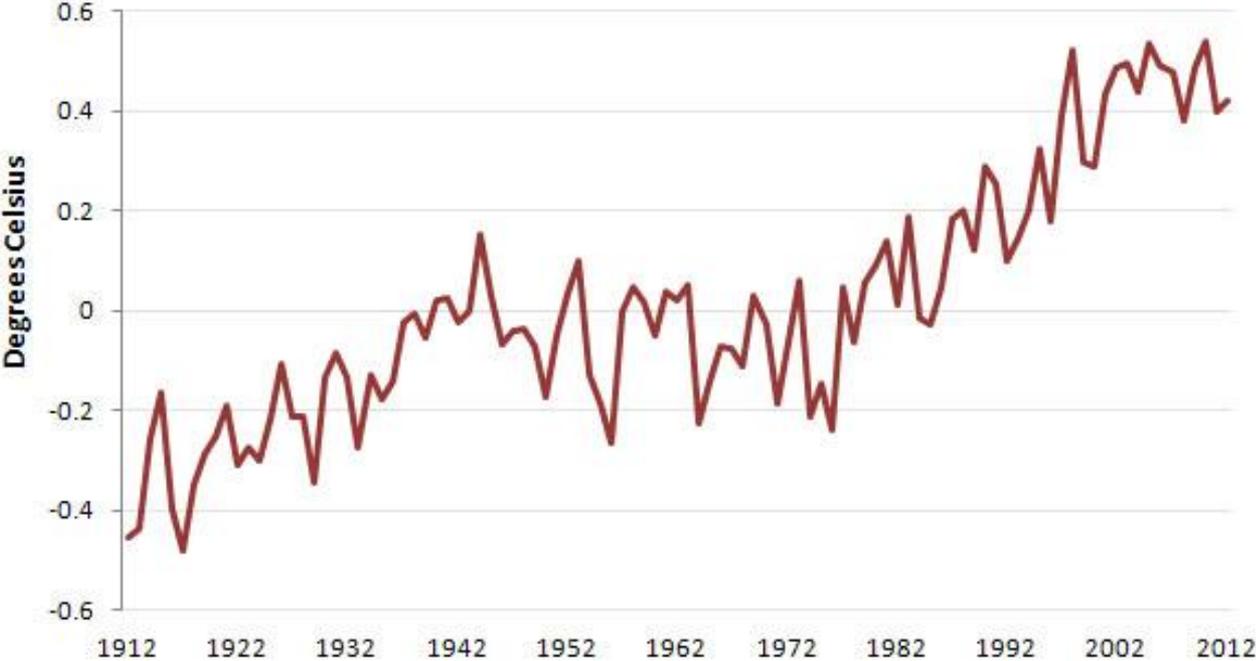


# Lying With Statistics, Global Warming Edition

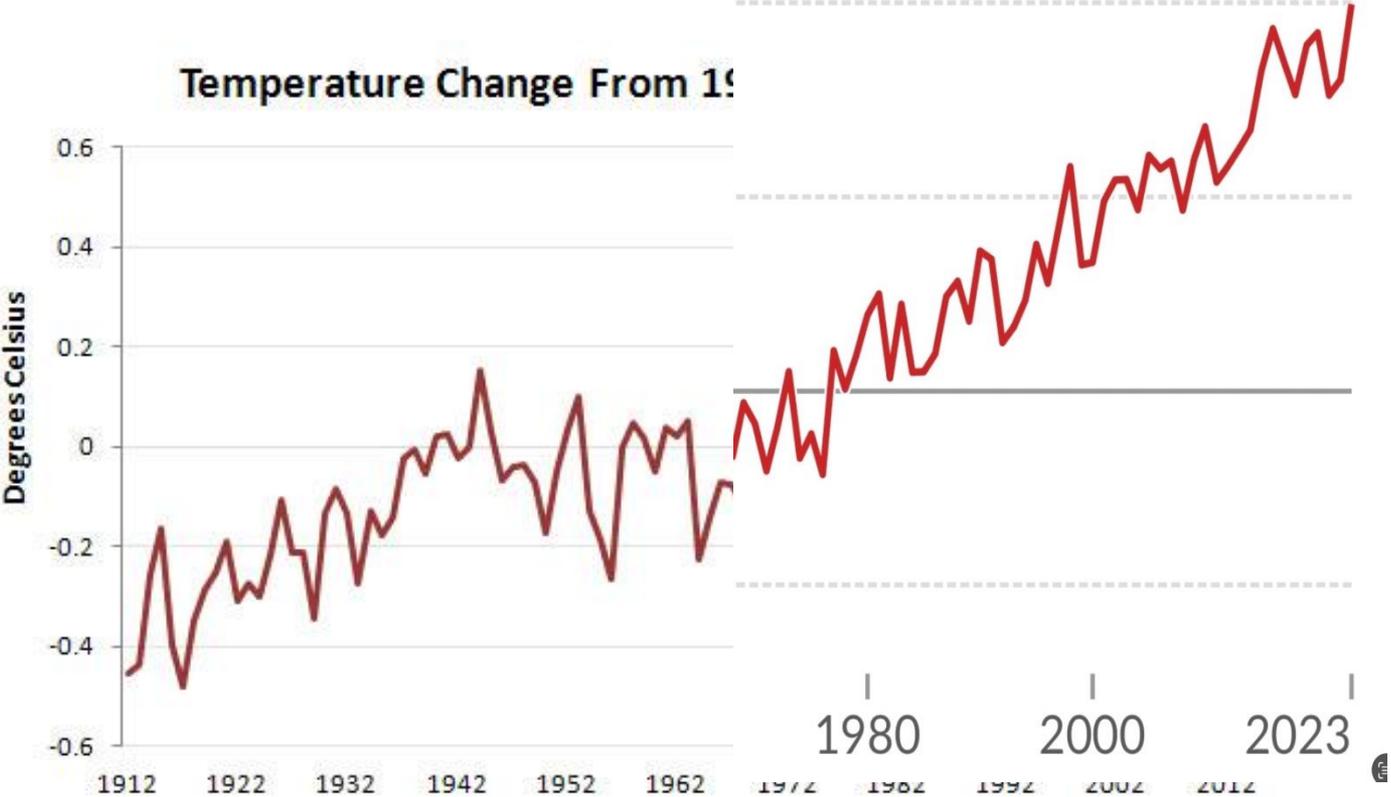


# Lying With Statistics, Global Warming Edition

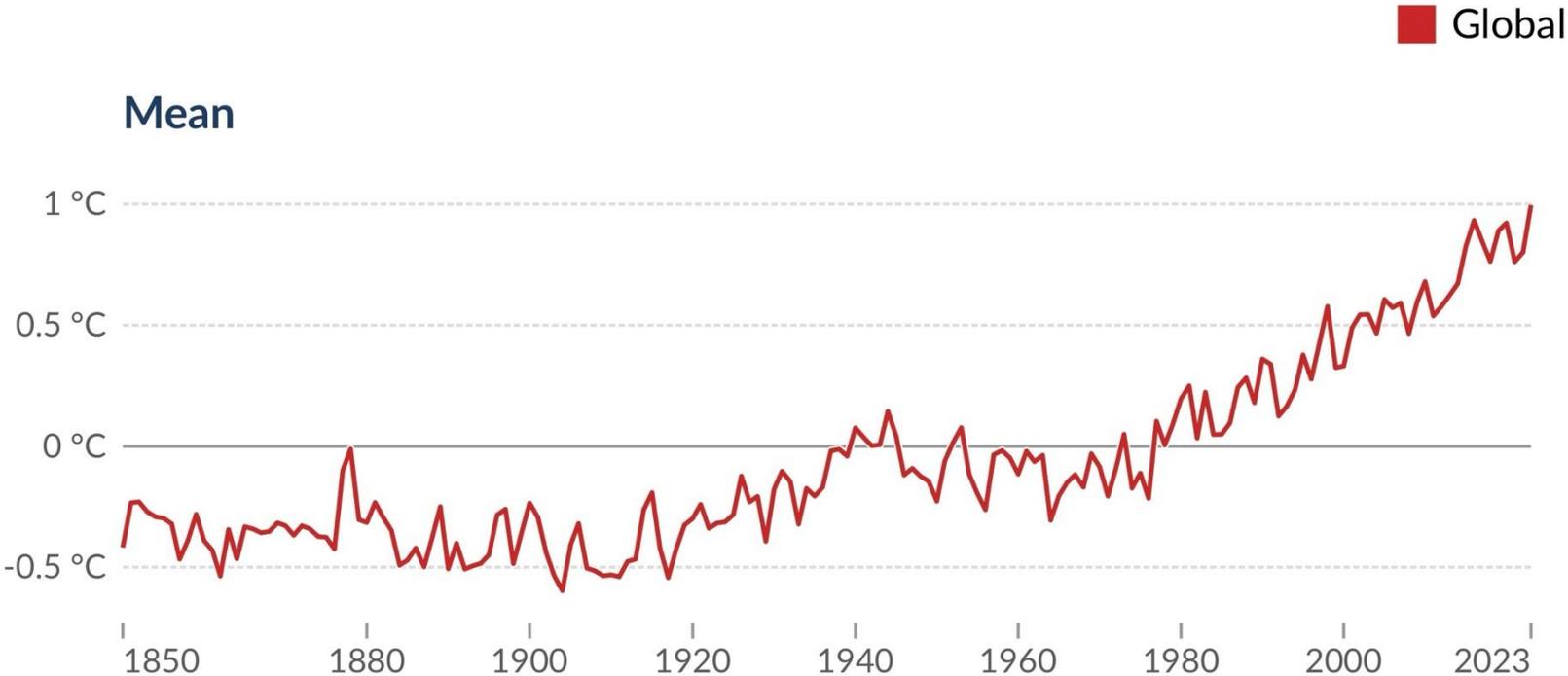
## Temperature Change From 1961-1990 Average



# Lying With Statistics, Global Warming Edition



# Lying With Statistics, Global Warming Edition



Plot: Our World in Data; Data source: Met Office Hadley Centre (2023)

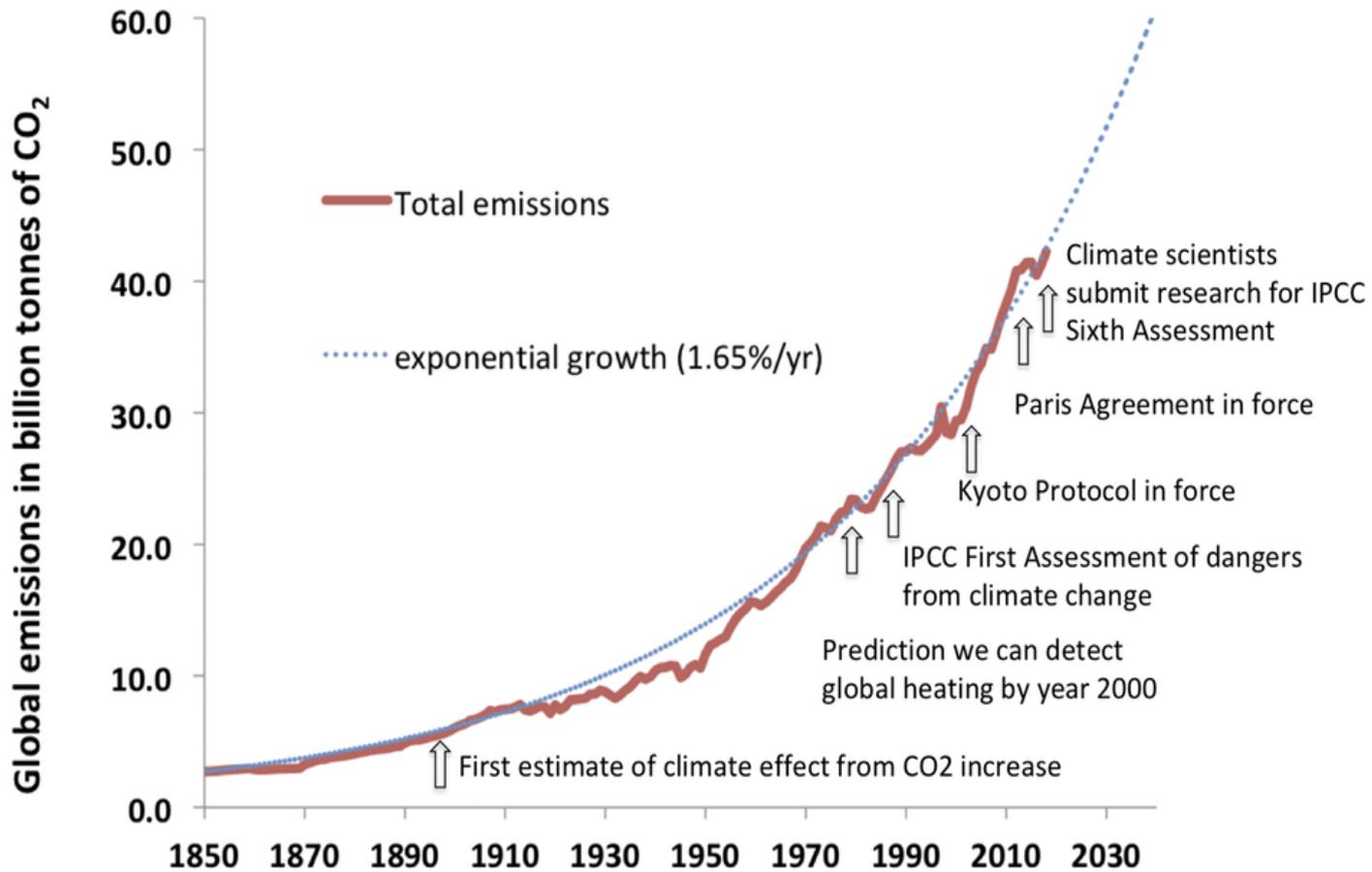
**In the USA alone, organizations  
which sow doubt about climate  
change spend almost a billion  
dollars/year! (Brulle 2014, average numbers for  
2003-2010)**

The European Union fares a little better, but  
many Brussels lobbyists try to dilute the EU  
environmental efforts (see the car  
industry...)

@JPvanYpersele

# The « merchants of doubt » have evolved in their arguments:

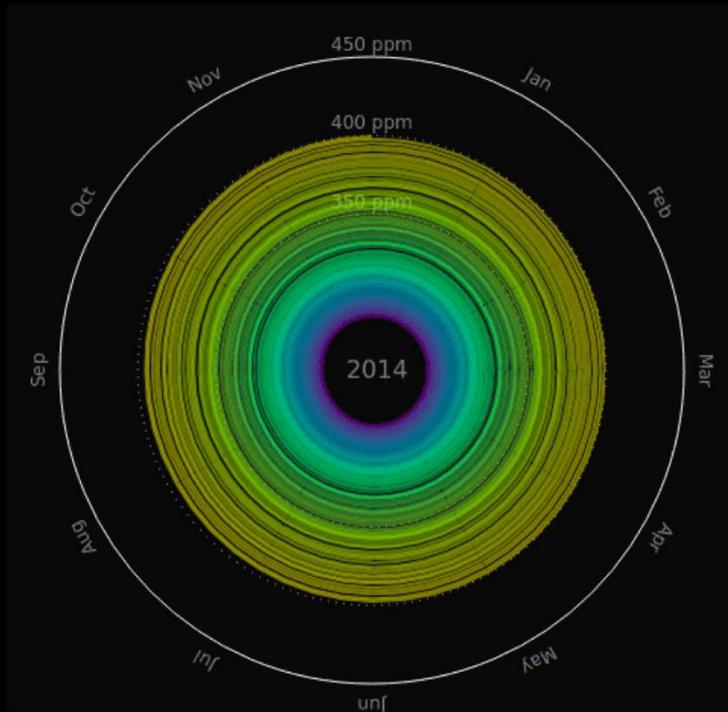
- Existence of global warming
- Human responsibility in the warming
- Cost of decarbonization
- Drawbacks from alternatives



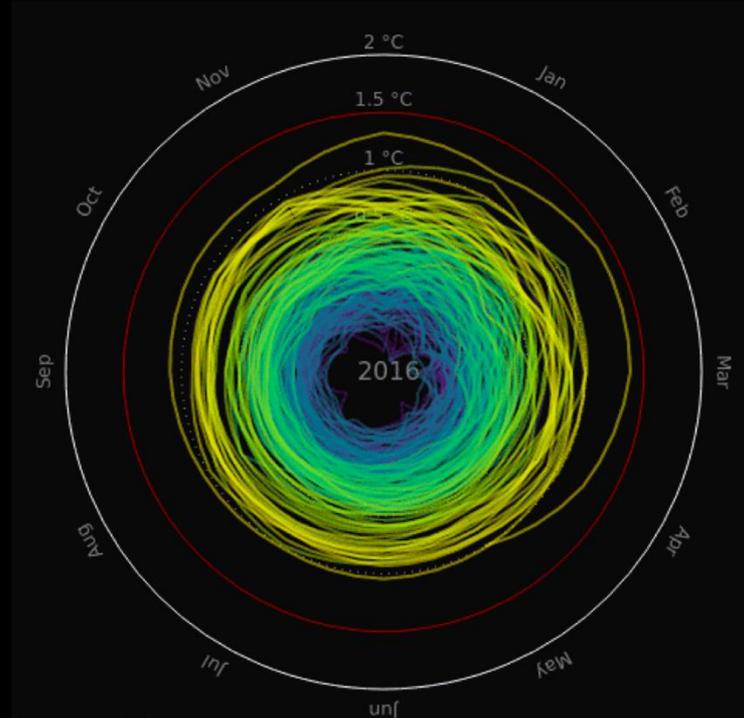
Source: Wolfgang Knorr, in *The Conversation* (2019)

It's real

# CO<sub>2</sub> Concentration and Temperature spirals



**Concentration Spiral** pik-potsdam.de/primap-live/ & climatecollege.unimelb.edu.au, Gieseke, Meinshausen. Thx to Ed Hawkins



**Temperature Spiral** pik-potsdam.de/primap-live & climatecollege.unimelb.edu.au, Gieseke, Meinshausen. Thx to Ed Hawkins

CO<sub>2</sub> Concentration since 1850 and Global Mean Temperature in °C relative to 1850 – 1900

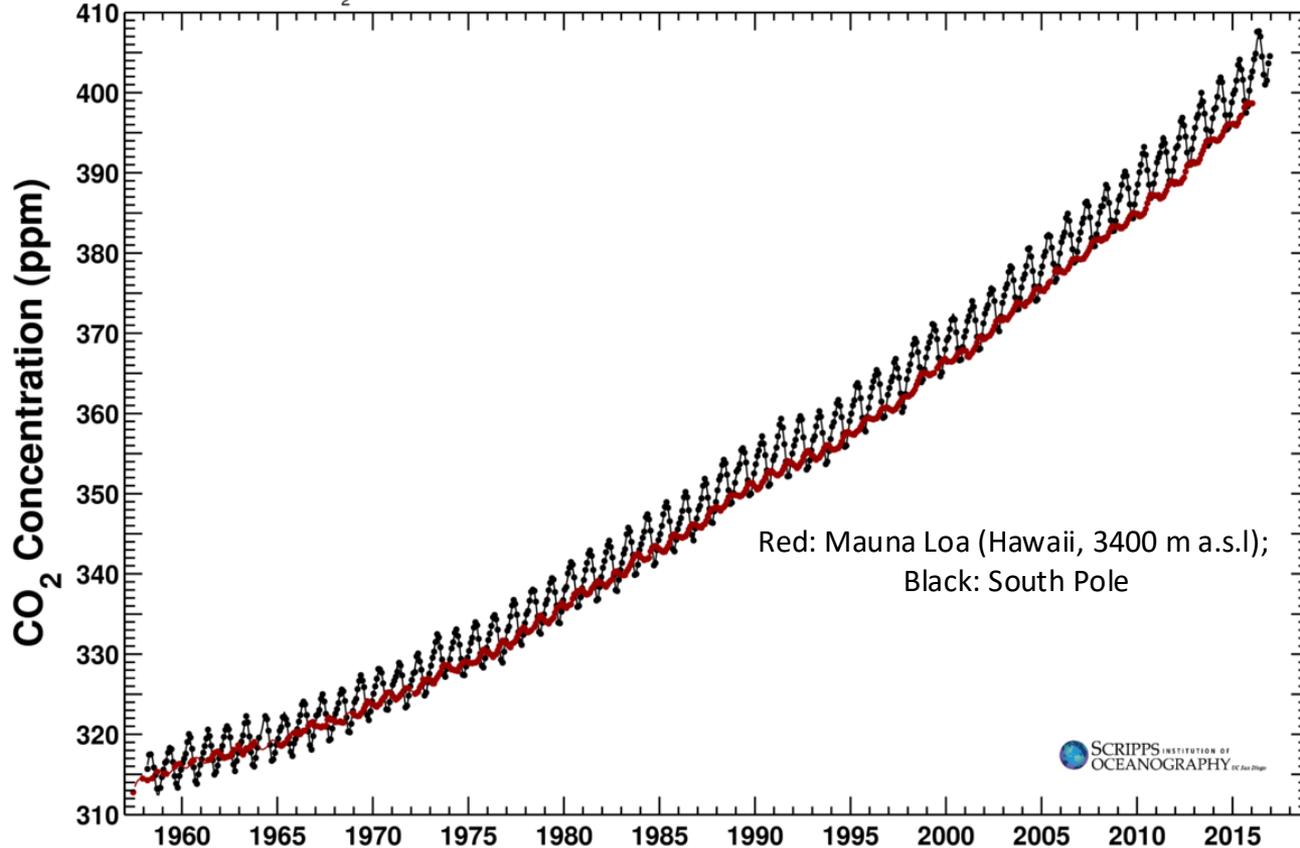
Graph: Ed Hawkins (Climate Lab Book) – Data: HadCRUT4 global temperature dataset

Animation available on <http://openclimatedata.net/climate-spirals/concentration-temperature/>

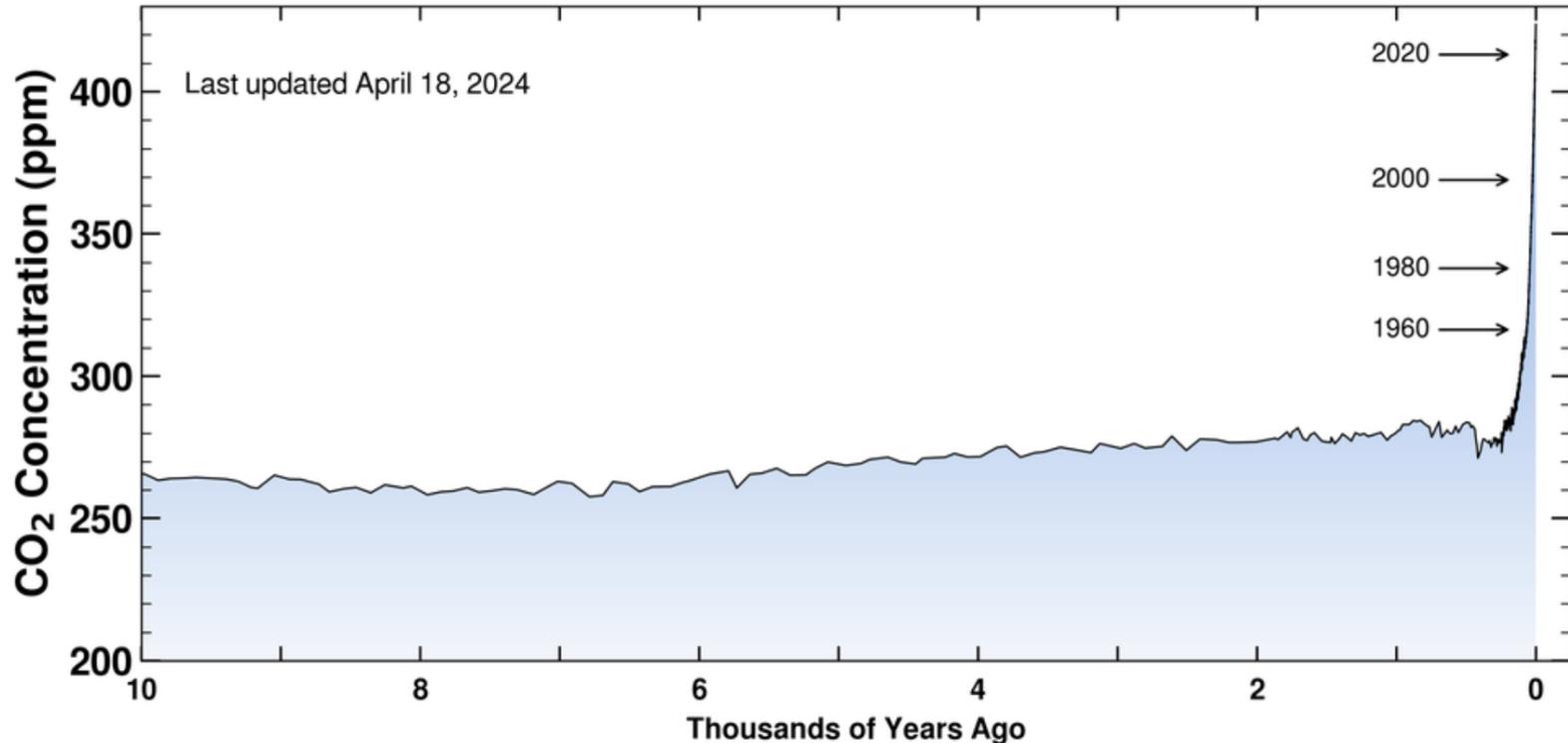
# Atmospheric CO<sub>2</sub> concentration

## Mauna Loa Observatory, Hawaii and South Pole, Antarctica Monthly Average Carbon Dioxide Concentration

Data from Scripps CO<sub>2</sub> Program Last updated January 2017

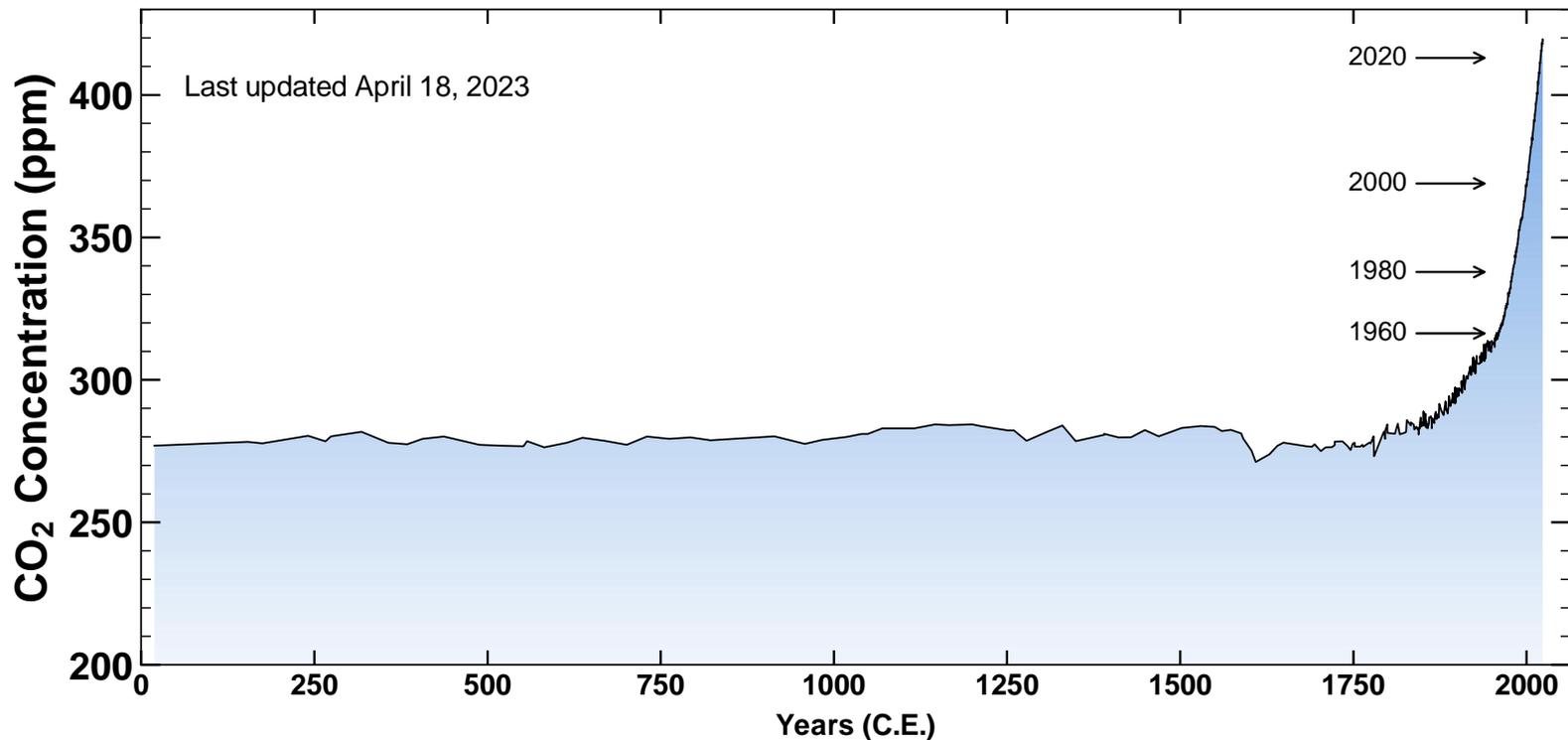


# CO<sub>2</sub> Concentration 18 April 2024: 427,14 ppm (Keeling curve + last 10000 years)



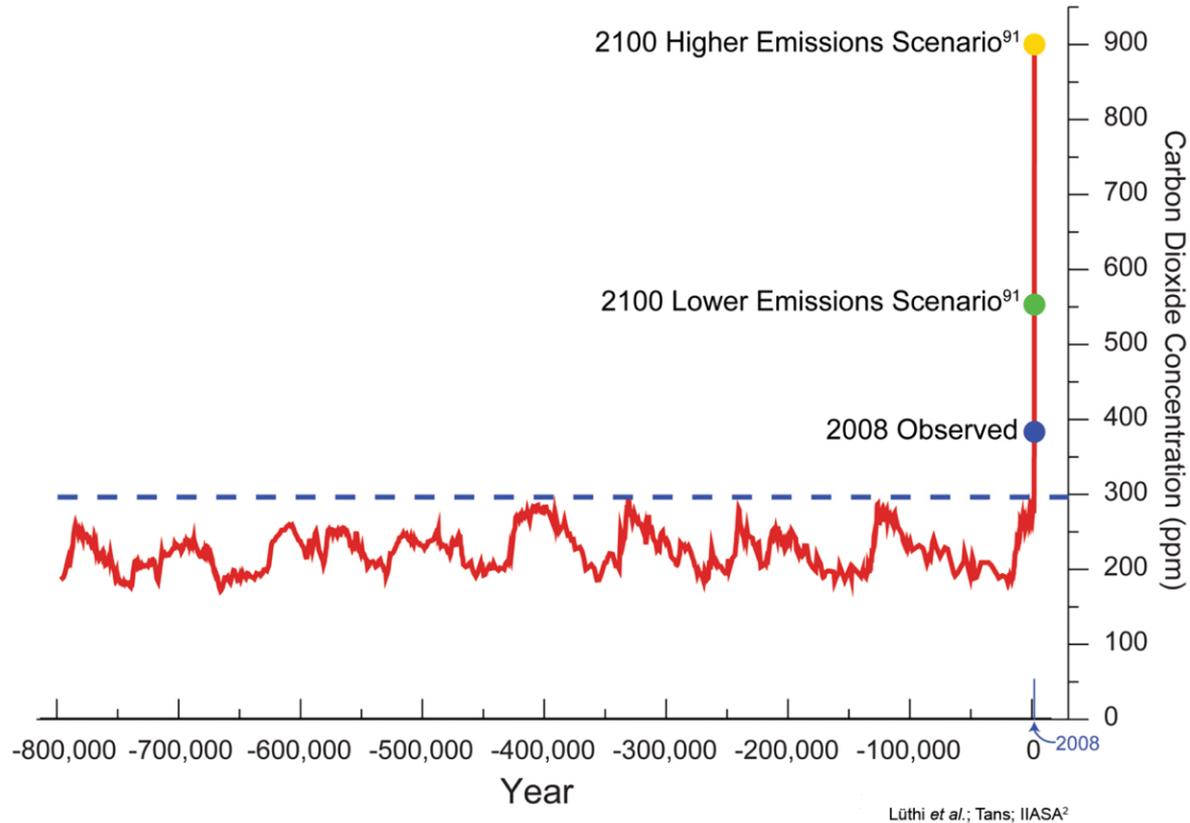
Source: [scripps.ucsd.edu/programs/keelingcurve/](https://scripps.ucsd.edu/programs/keelingcurve/)

# CO<sub>2</sub> Concentration 18 April 2023: 424,03 ppm (Keeling curve + last 2000 years)

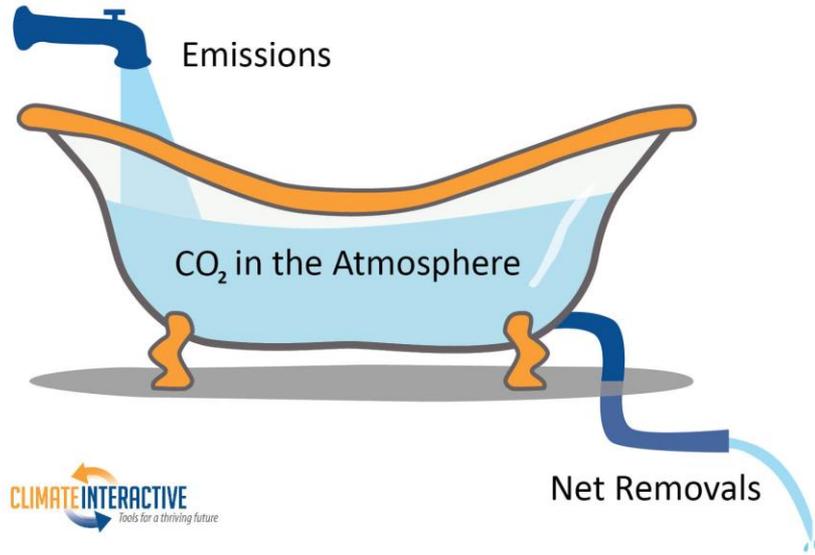


Source: [scripps.ucsd.edu/programs/keelingcurve/](https://scripps.ucsd.edu/programs/keelingcurve/)

# Atmospheric CO<sub>2</sub> over the last 800000 years



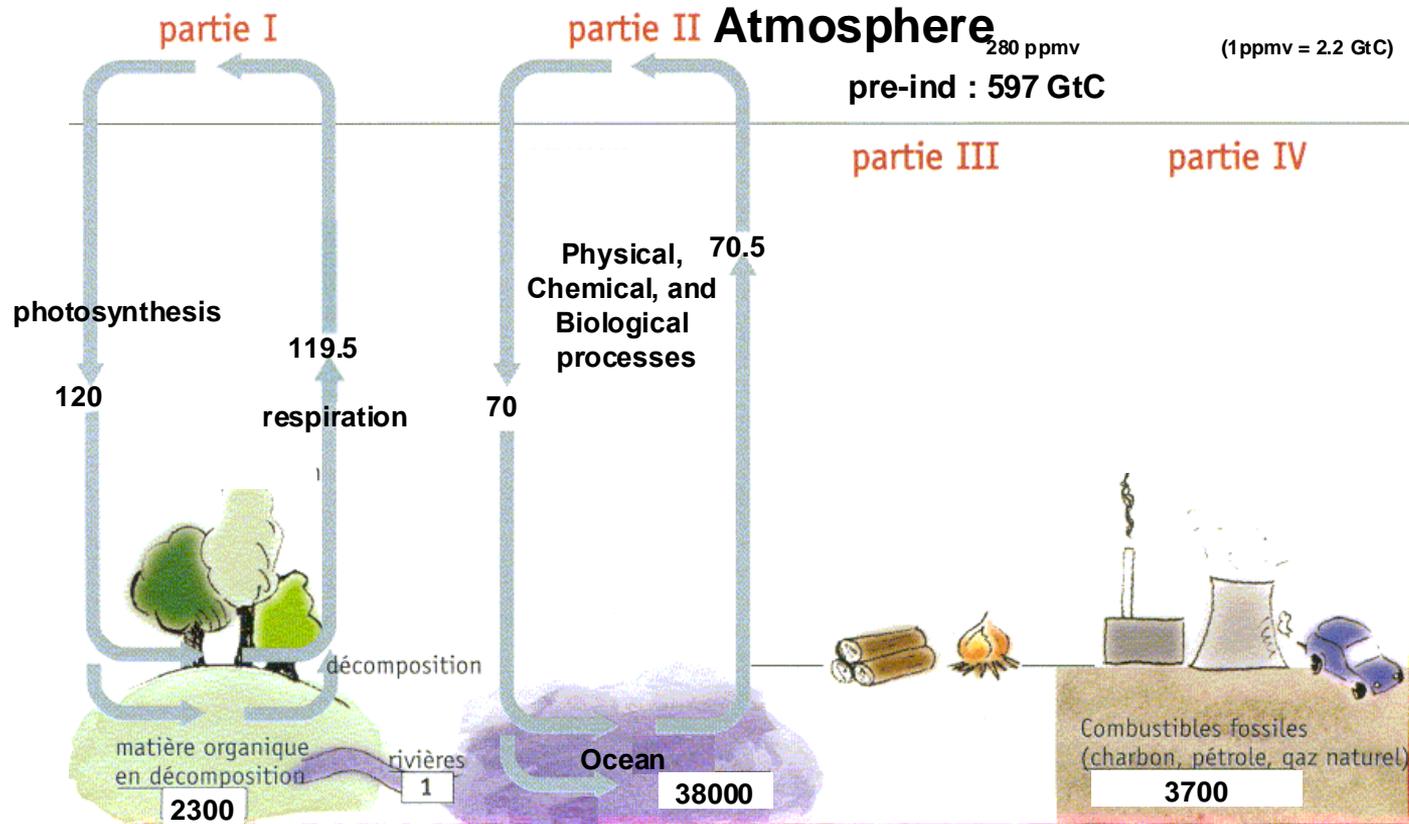
# The Carbon Bathtub



Overall framing by Dr. John Sterman, MIT Sloan

Source: @CarbonInteractive

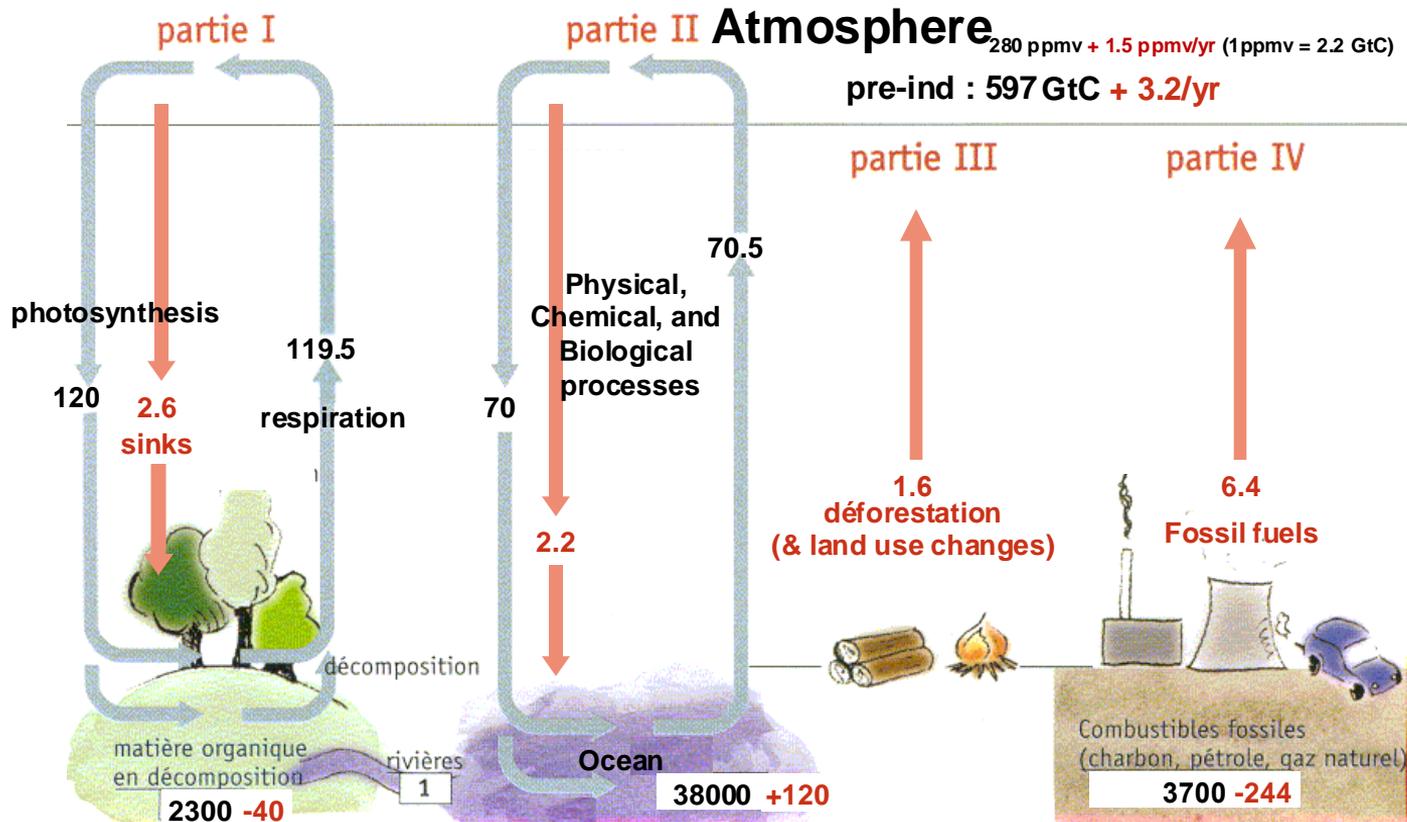
# Carbon cycle: unperturbed fluxes



Units: GtC (billions tons of carbon) or GtC/year (multiply by 3.7 to get GtCO<sub>2</sub>)

# Carbon cycle: perturbed by human activities

(numbers for the decade 1990-1999s, based on IPCC AR4)

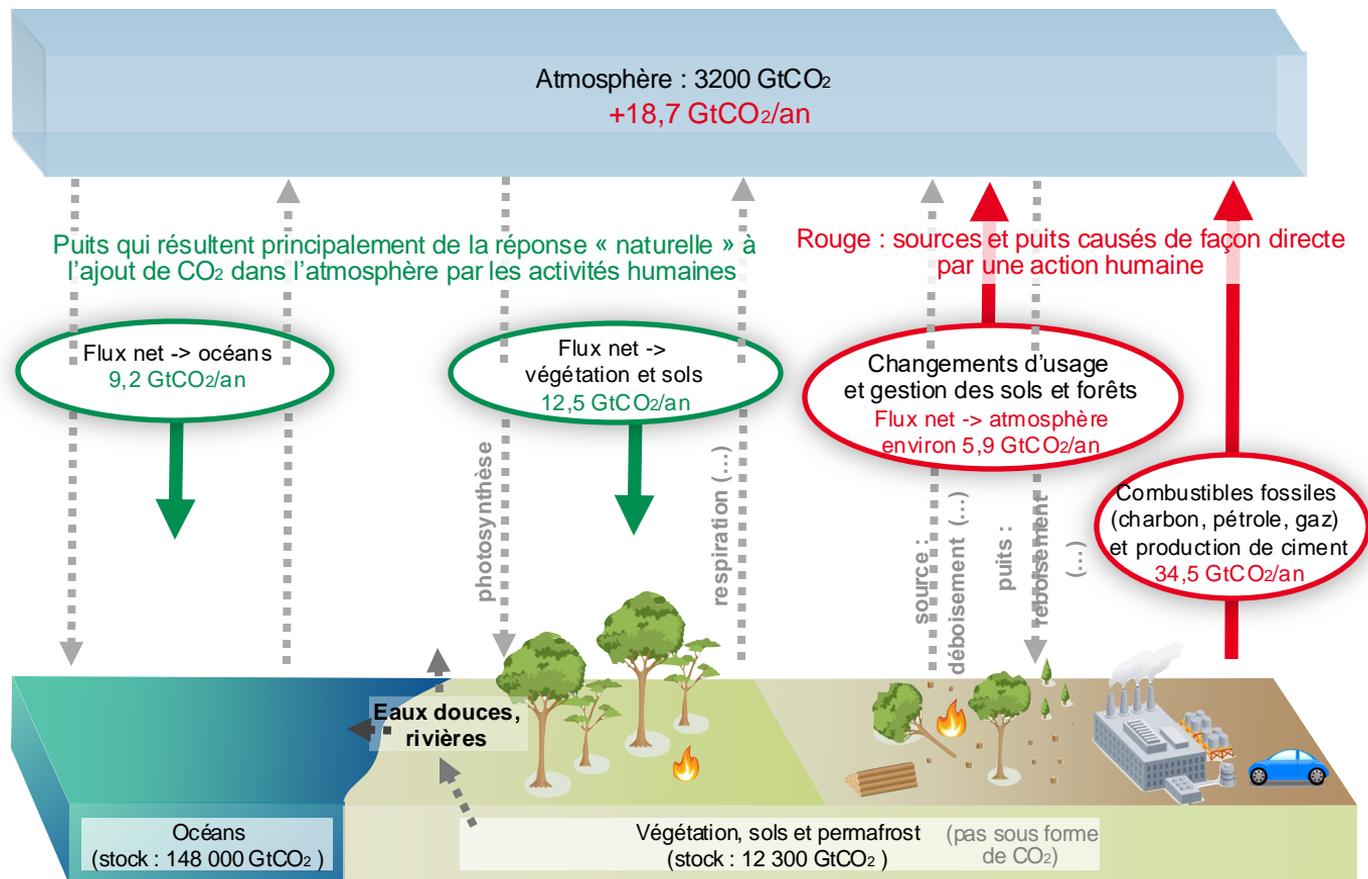


Units: GtC (billions tons of carbon) or GtC/year

Stocks!

# Cycle du carbone

D'après l'AR6, simplifié



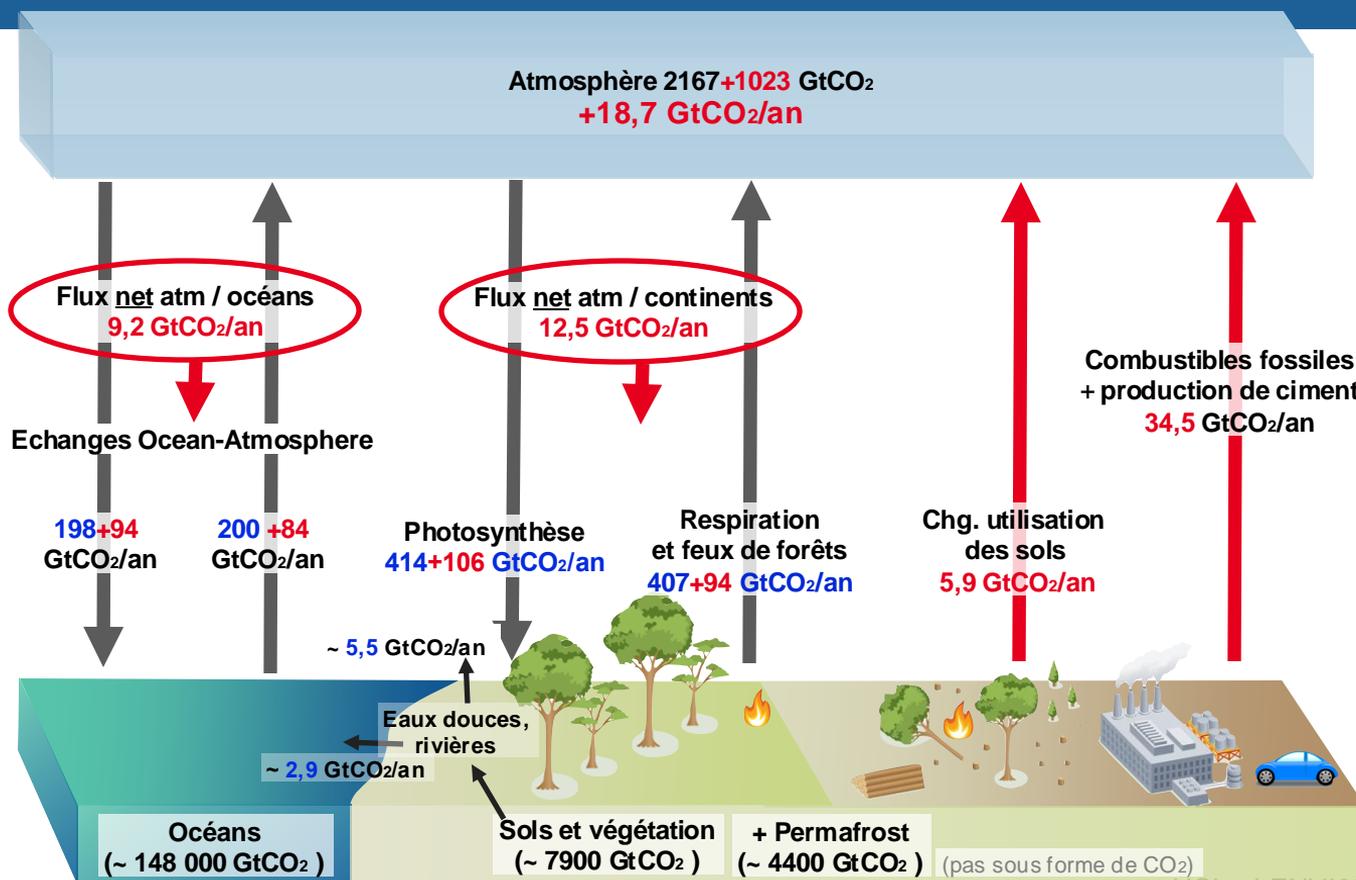
# Cycle du carbone

Valeurs AR6 (2021), arrondies

Bleu : pré-industriel

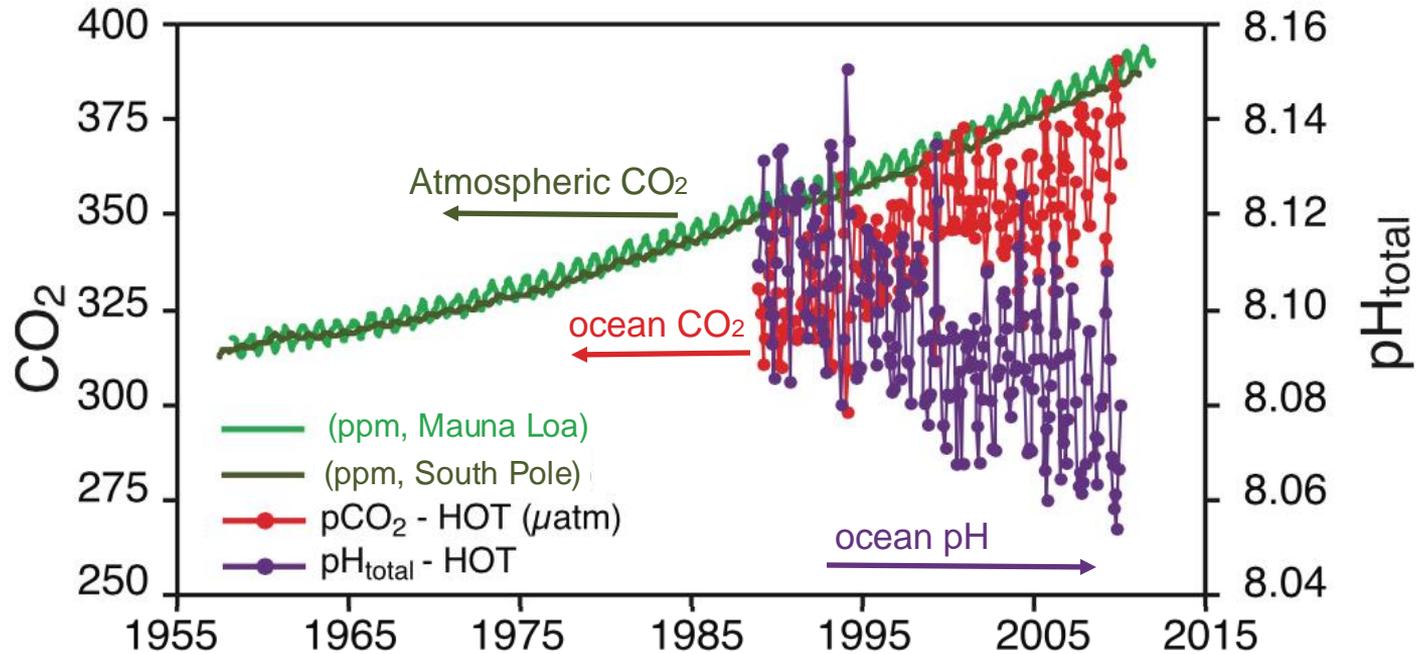
Rouge : influence humaine (années 2010-19)

GtCO<sub>2</sub> = milliards de tonnes de dioxyde de carbone



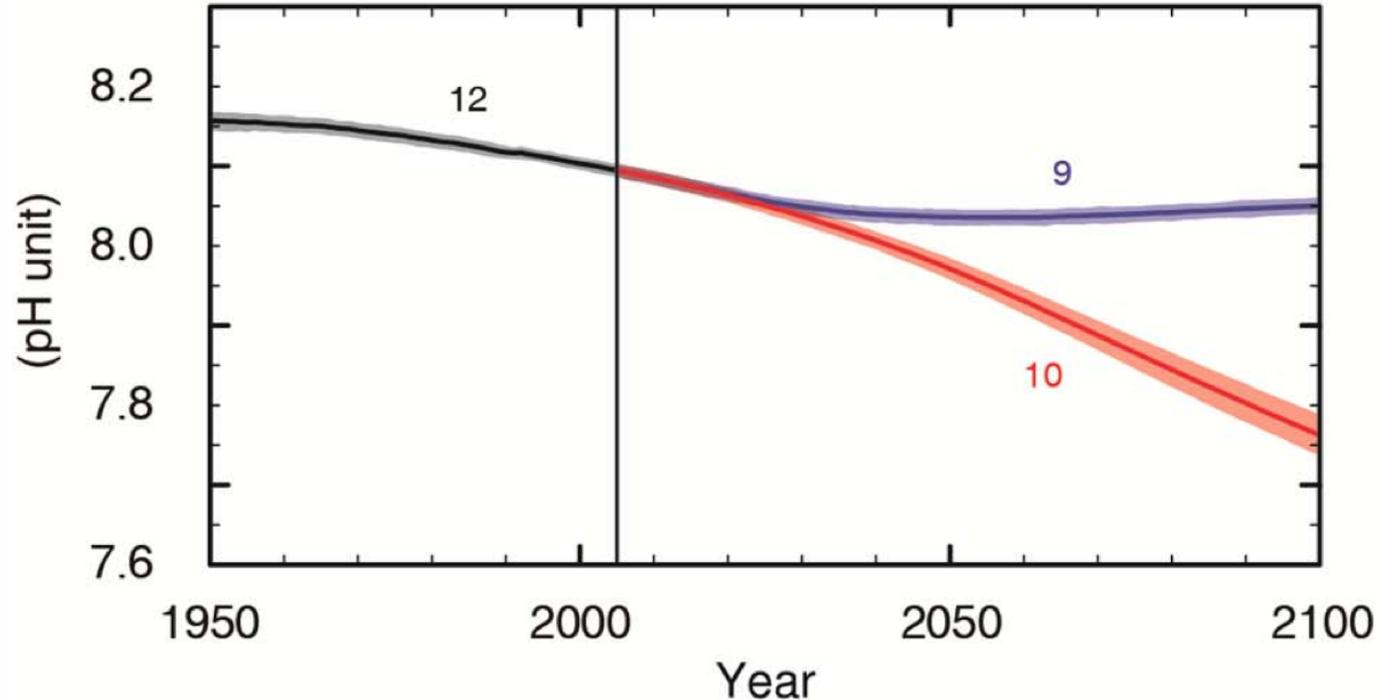
# Atmospheric CO<sub>2</sub> and ocean pH

- Les océans ont absorbé ~40% du CO<sub>2</sub> émis par les activités humaines



# Global ocean surface pH (projections)

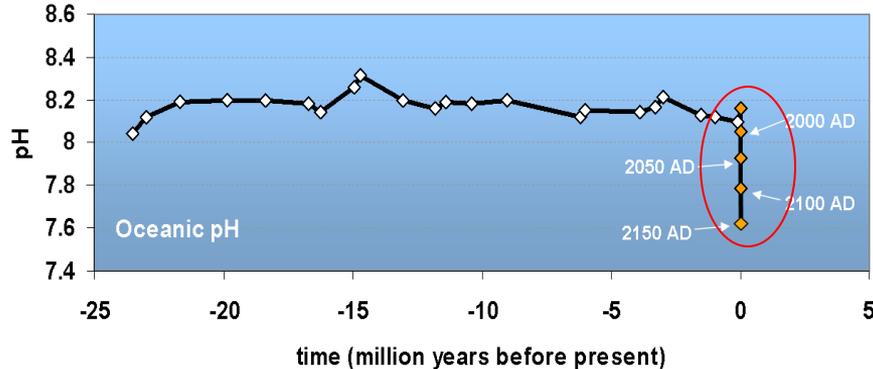
Ocean Acidification, for RCP 8.5 (orange) & RCP2.6 (blue)



**IPCC AR5 WGI, Fig SPM 07**

# Oceans are Acidifying Fast .....

## Changes in pH over the last 25 million years



“Today is a rare event in the history of the World”

- It is happening now, at a **speed and to a level** not experienced by marine organisms for about 60 million years
- Mass extinctions linked to previous ocean acidification events
- Takes 10,000' s of years to recover

# The carbon cycle is policy-relevant

- **CO<sub>2</sub> accumulates in the atmosphere as long as human emissions are larger than the natural absorption capacity**
- **Historical emissions from developed countries therefore matter for a long time**
- **As warming is function of cumulated emissions, the carbon « space » is narrowing fast (to stay under 1.5 or 2° C warming)**

# Climatic Change: Are We on the Brink of a Pronounced Global Warming? (Broecker, 1975)

Table 1. Reconstruction and prediction of atmospheric CO<sub>2</sub> contents based on fuel consumption data.

Year	Chemical fuel CO <sub>2</sub> (× 10 <sup>16</sup> g)	Excess atmospheric CO <sub>2</sub> * (× 10 <sup>16</sup> g)	Excess atmospheric CO <sub>2</sub> (%)	Excess atmospheric CO <sub>2</sub> (ppm)	CO <sub>2</sub> content of the atmosphere† (ppm)	Global temperature increase‡ (°C)
1900	3.8	1.9	0.9	2	295	0.02
1910	6.3	3.1	1.4	4	297	.04
1920	9.7	4.8	2.2	6	299	.07
1930	13.6	6.8	3.1	9	302	.09
1940	17.9	8.9	4.1	12	305	.11
1950	23.3	11.6	5.3	16	309	.15
1960	31.2	15.6	7.2	21	314§	.21
1970	44.0	22.0	10.2	29	322§	.29
1980	63	31	14	42	335	.42
1990	88	44	20	58	351	.58
2000	121	60	28	80	373	.80
2010	167	83	38	110	403	1.10

\*On the assumption that 50 percent of the CO<sub>2</sub> produced by the burning of fuel remains in the atmosphere.  
 †The preindustrial atmospheric partial pressure of CO<sub>2</sub> is assumed to be 293 ppm. ‡Assumes a 0.3°C global temperature increase for each 10 percent rise in the atmospheric CO<sub>2</sub> content. §Value observed on Hawaii for 1960, 314 ppm; value for 1970, 322 ppm (8). ||Post-1972 growth rate taken to be 3 percent per year.

Ecrit pour les  
jeunes (et moins  
jeunes), avec des  
liens vers des  
ressources utiles

Plateforme Wallonne pour le GIEC  
Lettre N°13 - avril 2019

**'Sauver le climat' :  
les bases**

te Saint-Louis & social sciences  
tions against climate change

Suite à l'intense mobilisation des jeunes, les changements climatiques ont fait l'objet de beaucoup d'attention au cours des derniers mois. Éèves du secondaire, étudiants, professeurs, parents et grand-parents sont descendus dans la rue pour montrer leur désarroi face à la lenteur de l'action vis-à-vis des changements climatiques.

Nous nous réjouissons de cette mobilisation, car notre rôle nous met encore plus fréquemment que l'ensemble de la population en position de témoin des risques que font courir les changements climatiques, ainsi que de l'ampleur des efforts nécessaires pour mettre en œuvre les objectifs que se sont fixés les membres des Nations Unies à Paris en 2015 (COP21).

Une démarche essentielle en faveur de ces jeunes est de les aider à se former, à appréhender les principaux éléments de la problématique du climat, et plus largement, de l'influence de nos activités sur notre environnement et sur le futur de l'humanité. L'éducation est un des instruments essentiels pour évoluer vers une société plus durable et plus juste.

Pour y contribuer, nous présentons ici une brève synthèse de la problématique et une sélection de références commentées. Nous espérons que cette Lettre aidera enseignants et élèves à disposer d'une base d'information solide et ainsi à prendre leur part dans la solution à ce problème planétaire : agir à leur niveau et favoriser l'action dans leur entourage et au niveau societal.

Plusieurs témoignages d'élèves ou de professeurs sont également présentés.

Nous vous souhaitons une bonne lecture !  
Jean-Pascal van Ypersele, Philippe Marbaix et Bruna Gaino

**Sommaire**

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Agenda .....	16

  
Wallonie  
environnement  
Awac

Disponible gratuitement, 6X/an: [www.pplateforme-wallonne-giec.be](http://www.pplateforme-wallonne-giec.be)

# To go further :

- z [www.climate.be/vanyp](http://www.climate.be/vanyp) : my slides (under « conferences »)
- z [www.ipcc.ch](http://www.ipcc.ch) : IPCC
- z [www.skepticalscience.com](http://www.skepticalscience.com) : answers to the merchants of doubt arguments
- z [www.plateforme-wallonne-giec.be](http://www.plateforme-wallonne-giec.be) : IPCC-related in French, free newsletter
- z **X/Twitter: @JPvanYpersele & @IPCC\_CH**