The IPCC 6th Assessment Report: Progress, Outcome, Relevance for Policies, and Impact on Climate Action

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Information seminar on climate science, Delegation of the European Union to Japan, Tokyo, 18 April 2023

Thanks to the Federal Government and the Walloon Government (funding the Walloon Platform for IPCC) and to my team at UCLouvain for their support

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:



Global warming is happening.

Human activity is the main cause.

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

The impacts are serious and affect people.

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

Source: @JohnfoCook

That small blue dot is the Earth, a 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 (vanyp@climate.be)

What will happen in Shizuoka, where Honda started?



Photo: @JPvanYpersele April 2023

vanyp@climate.be



Working Group I - The Physical Science Basis

Human activities affect all the major climate system components, *Figure SPM.8* with some responding over decades and others over centuries



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Working Group I – The Physical Science Basis

« Sea level rise greater than 15 m

cannot be ruled out with high emissions »

8m 7 m 7m 6m 5m 4m 3m d) Global mean sea level change relative to 1900 m 2 m 2m 2 1.5 Low-likelihood, high-impact storyline, including ice sheet instability processes, under SSP5-8.5 SSP5-8.5 SSP3-7.0 1m SSP1-2.6 0.5 0 0m 1950 2000 2050 2100 2300 2020 1950 2000 2020 2050 2100 2300

e) Global mean sea level change in 2300 relative to 1900 Sea level rise greater than 15m cannot be ruled out with high emissions

9m

Let us also think about the future of these children from Machakos (Kenya) in a warming climate



Photo: @JPvanYpersele April 2015

Heat waves kill





Source: Wolfgang Knorr, in The Conversation (2019)

CO₂ Concentration and Temperature spirals



CO₂ 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 <u>http://openclimatedata.net/climate-spirals/concentration-temperature/</u>

Since 1950, extreme hot days and heavy precipitation have become more common



There is evidence that anthropogenic influences, including increasing atmospheric greenhouse gas concentrations, have changed these extremes

Coral reefs are dying



American Samoa (from www.globalcoralbleaching.org)



Felix Schaad (Tages Anzeiger, Switzerland)

Wallonia Floods, July 2021



Source: VRT Nieuws



▶ Les glaciers, d'un siècle à l'autre Rédaction : Philippe Marbaix et Bruna Gaino



Photo : Walter Mittelholzer, ETH-Bibliothek Zürich

Photo : Dr Kieran Baxter, Université de Dundee





20-7-2020

Photo: @RaphvanYpersele (Instagram)

Why the IPCC ?

Established by WMO and UNEP in 1988

- to provide policy-makers with an objective source or 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



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 socioeconomic 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

IPCC Structure



IPCC Plenary

IPCC Secretariat

IPCC Bureau

IPCC Executive Committee

Working Group I	Working Group II	Working Group III	Task Force on
The Physical Science Basis	Climate Change Impacts, Adaptation and Vulnerability	Mitigation of Climate Change	National Greenhouse Gas Inventories
TSU	TSU	TSU	TSU

Authors, Contributors, Reviewers



These dates are subject to change.

Source: IPCC web site, 2023

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE



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IPCC Provides Strong Basis for Global Climate Policy

First Assessment 1990:	United Nations Framework Convention
	on Climate Change 1992 in Rio (UNFCCC)

- Second Assessment 1995: Kyoto Protocol 1997
- **>** Third Assessment 2001: Ratification Kyoto in 2005
- Fourth Assessment 2007: Copenhagen Accord 2009 (2 degrees limit)
- Fifth Assessment 2013-14: Paris Agreement 2015 ('well below 2 degrees/1.5 °C')
- Sixth Assessment 2021-23: Global Stocktake 2023





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Working Group I – The Physical Science Basis

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Human activities affect all the major climate system components, Figure SPM.8 with some responding over decades and others over centuries

a) Global surface temperature change relative to 1850-1900

°C 5 SSP5-8.5 4 SSP3-7.0 3 SSP2-4.5 2 SSP1-2.6 SSP1-1.9 0 -1 1950 2050 2000 2100 2015



Across warming levels, land areas warm more than oceans, and the Arctic and Antarctica warm more than the tropics



regions with dry baseline conditions

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Wetter

Figure SPM.5

With every increment of global warming, changes get larger in regional mean temperature, precipitation and soil moisture

Drier

Precipitation is projected to increase over high latitudes, the equatorial c) Annual mean precipitation change (%) Pacific and parts of the monsoon regions, but decrease over parts of the relative to 1850-1900 subtropics and in limited areas of the tropics. Simulated change at 1.5 °C global warming Simulated change at 2 °C global warming Simulated change at 4 °C global warming Relatively small absolute changes may appear as large % changes in -30 -20 -10 10 20 0

Change (%)

The Antarctic Ice Sheet presently loses 1 Gt of water every 1.5 day



Source: @Kevpluck, June 2018

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Future global climate risks



Heat stress

Exposure to heat waves will continue to increase with additional warming.

Water scarcity

At 2° C, regions relying on snowmelt could experience 20% decline in water availability for agriculture after 2050.



Food security

Climate change will increasingly undermine food security.



Flood risk

About a billion people in low-lying cities by the sea and on Small Islands at risk from sea level rise by midcentury.



Action on adaptation has increased but progress is uneven and we are not adapting fast enough.

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Working Group II – Impacts, Adaptation and Vulnerability







Accelerating adaptation

- Political commitment and follow-through across all levels of government
- Institutional framework: clear goals, priorities
 that define responsibilities
- Enhancing knowledge of impacts and risks improves responses
- Monitoring and evaluation of adaptation measures are essential to track progress
- Inclusive governance that prioritises equity and justice – direct participation

[Axel Fassio/CIFOR CC BY-NC-ND 2.0]

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Working Group II – Impacts, Adaptation and Vulnerability

INTERGOVERNMENTAL PANEL <u>ON Climate change</u>



There are limits to adaptation

- Even effective adaptation cannot prevent all losses and damages
- Above 1.5° C some natural solutions may no longer work.
- Above 1.5° C, lack of fresh water could mean that people living on small islands and those dependent on glaciers and snowmelt can no longer adapt.
- By 2° C it will be challenging to farm multiple staple crops in many current growing areas.

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The wider benefits of adaptation



For more than 3.4 billion people in rural areas: improved roads, reliable energy, clean water, food security



Green buildings, green spaces, clean water, renewable energy, sustainable transport – in cities



Policies that increase youth access to land, credit, knowledge and skills can support agri-food employment



Restored and connected habitats can provide corridors for vulnerable species

SDG 1: No poverty

SDG 3: Good health and wellbeing

SDG 10: Reduced inequality

SDG 14/15: Life on land & below water

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Why net zero emissions are needed as soon as possiblee

@JPvanYpersele



Cumulative emissions of CO₂ largely determine global mean surface warming by the late 21st century and beyond.







Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions.

IPCC AR5 Working Group I Climate Change 2013: The Physical Science Basis



WMO



The temperature will stabilise when we reach net zero carbon dioxide emissions



GLOBAL

(based on IPCC-assessed scenarios)

Emission pathways compatible with below 1.5° C warming:

Global total net CO₂ emissions



Non-CO₂ emissions relative to 2010

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Climate Change 2022

Mitigation of Climate Change

Matt Bridgestock, Director and Architect at John Gilbert Architects



Unless there are immediate and deep emissions reductions across all sectors, 1.5°C is beyond reach.





There are options available **now** in every sector that can at least **halve** emissions by 2030



Demand and services



Energy



Land use



Industry



Urban

A CE

Buildings



Transport

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Energy

- major transitions are required to limit global warming
- reduction in fossil fuel use and use of carbon capture and storage
- low- or no-carbon energy systems
- widespread electrification and improved energy efficiency
- alternative fuels: e.g. hydrogen and sustainable biofuels





[Portland General Electric CC BY-ND 2.0, Harry Cunningham/Unsplash, Stéphane Bellerose/UNDP in Mauritius and Seychelles CC BY-NC 2.0, IMF Photo/Lisa Marie David, Tamara Merino CC BY-NC-ND 2.0]



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Demand and services

- potential to bring down global emissions by 40-70% by 2050
- walking and cycling, electrified transport, reducing air travel, and adapting houses make large contributions
- lifestyle changes require systemic changes across all of society
- some people require additional housing, energy and resources for human wellbeing

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Transport

- reducing demand and low-carbon technologies are key to reducing emissions
- electric vehicles: greatest potential
- battery technology: advances could assist electric rail, trucks
- aviation and shipping: alternative fuels (low-emission hydrogen and biofuels) needed
- Overall, substantial potential but depends on decarbonising the power sector.

[United Airlines, Jeremy Segrott CC BY 2.0, Andreas160578/Pixabay]

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Cities and urban areas

- better urban planning, as well as:
- sustainable production and consumption of goods and services,
- electrification (low-emission energy),
- enhancing carbon uptake and storage (e.g. green spaces, ponds, trees)

There are options for existing, rapidly growing *and* new cities.

[Pelargoniums for Europe/Unsplash, City of St Pete CC BY-ND 2.0, Victor/Unsplash, EThekwini Municipality, Arne Müseler/arne-mueseler.com, CC BY-SA 3.0 de]

Buildings

- buildings: possible to reach net zero emissions in 2050
- action in this decade is critical to fully capture this potential
- involves retrofitting existing buildings and effective mitigation techniques in new buildings
- requires ambitious policy packages
- zero energy and zero-carbon buildings exist in new builds and retrofits

[Pelargoniums for Europe/Unsplash, City of St Pete CC BY-ND 2.0, Victor/Unsplash, EThekwini Municipality, Ame Müseler/arne-mueseler.com, CC BY-SA 3.0 de]

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Industry

- using materials more efficiently, reusing, recycling, minimising waste; currently under-used in policies and practice
- basic materials: low- to zero-greenhouse gas production processes at pilot to nearcommercial stage
- achieving net zero is challenging

[Ahsanization/Unsplash, IMF Focus | Industry and Manufacturing CC BY-NC-ND 2.0, Rwanda Green Fund CC BY-ND 2.0, ILO/M. Fossat CC BY-NC-ND 2.0, Stephen Cornwell Pxhere.com]

Land use

- can provide large-scale emissions reductions and remove and store CO₂ at scale
- protecting and restoring natural ecosystems to remove carbon: forests, peatlands, coastal wetlands, savannas and grasslands
- competing demands have to be carefully managed
- cannot compensate for delayed emission reductions in other sectors

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Technology and Innovation

- investment and policies push forward low emissions technological innovation
- effective decision making requires assessing potential benefits, barriers and risks
- some options are technically viable, rapidly becoming cost-effective, and have relatively high public support. Other options face barriers

Adoption of low-emission technologies is slower in most developing countries, particularly the least developed ones.

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Policies, regulatory and economic instruments

- regulatory and economic instruments have already proven effective in reducing emissions
- policy packages and economy-wide packages are able to achieve systemic change
- ambitious and effective mitigation requires coordination across government and society

[World Bank/Simone D. McCourtie, Dominic Chavez CC BY-NC-ND 2.0, Trent Reeves/MTA Construction & Development CC BY 2.0, IMF Photo/Tamara Merino CC BY-NC-ND 2.0, Olga Delawrence/Unsplash.]

Closing investment gaps

- financial flows: 3-6x lower than levels needed by 2030 to limit warming to below 1.5°C or 2°C
- there is sufficient global capital and liquidity to close investment gaps
- challenge of closing gaps is widest for developing countries

Comparison of global emission levels in 2025 and 2030 resulting from the implementation of the intended nationally determined contributions

UNFCCC, Aggregate effect of the intended nationally determined contributions: an update http://unfccc.int/resource/docs/2016/cop22/eng/02.pdf

STANDING FOR

- IPCC as the global VOICE of climate
- Connecting solid science and the world's policy makers
- Delivering a more inclusive, dynamic, and relevant IPCC

UN SDGS CLIMATE JUSTICE AFAIR TRANSITION

With the official support of the Belgian Government

EXPERIENCE & ENERGY

- IPCC Vice-Chair (2008–2015) and active in IPCC since 1995
- 40 years experience in climate science and diplomacy
- Full professor of climate and sustainable development (UCLouvain)
- Global Sustainable Development Report 2019 co-author
- Lead Author for the Third Assessment Report
- High profile media commentator and spokesperson
- Strong track record of advocacy, chairing, and partnerships
- An award-winning science communicator

READY TO REPRESENT

- Global North AND South
- Interdisciplinary science AND policy making
- People, science, AND decisive action

Highly experienced global player from the first Rio Summit in '92 through to the latest COP via a wide range of working groups, task forces, and scientific conferences.

More information www.climate.be/vanyp @JPvanYpersele #IPCCvoiceOfClimate

Key aspects of my IPCC Chair candidacy

1. The IPCC must be the most scientifically solid « Voice of Climate » at the international level

2. The IPCC must become even more useful for policy- and decision-makers, while staying policy-neutral

Key aspects of my IPCC Chair candidacy

3. The IPCC must be inclusive (gender balance, developing countries participation...), respectful of all people and cultures, open to more disciplines and more interdisciplinarity, and help train more young scientists into the IPCC process

4. IPCC procedures & products need to be updated to respond better to the new needs of UNFCCC and others

Conclusions

The challenge is huge: transform the world in a few decades so that the whole world activities are decarbonized and climate resilient

Addressing it open so many opportunities, for research and innovation accross disciplines sectors, and for integrating results of this research in meaningful actions by all: governments, cities, businesses, NGOs, and citizens.

It opens also economic opportunities, and opportunities to address in a synergistic manner other societal goals, such as the 17 UN Sustainable Development Goals (including eliminating poverty and hunger in a few decades).

To go further :

- www.climate.be/vanyp: my slides, under « conferences »
 www.ipcc.ch: IPCC
- www.skepticalscience.com: answers to the merchants of doubt arguments
- www.plateforme-wallonne-giec.be: IPCC-related in French, Newsletter, latest on climate, basic climate science
- Twitter: @JPvanYpersele & @IPCC_CH

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