Climate Change after Covid19: Diagnosis, Prognosis, and Urgency of Treatment

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Thanks to the Walloon government for supporting <u>www.plateforme-wallonne-</u> <u>giec.be</u> & my team at UCLouvain

Site where my slides are available:

www.climate.be/vanyp/conferences

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Source: @StatisticallyCartoon

How to fight climate change after Covid19?

- The urgency is to « flatten the Covid19 curve », but solving the climate problem needs the GHG emissions curve to be flattened as well!
- Climate experts have warned of the risks resulting from climate change even longer than pandemics experts have warned of the pandemia risks
- We can now all see what happens when scientists are ignored, and short-term perspectives prevail
- There is no vaccine against climate change
- A key question is « How to accelerate the clean energy transition while stimulating the economic recovery? »

in "Global Trends 2025: A Transformed World", US National Intelligence Council (2008), page 75

The emergence of a novel, highly transmissible, and virulent human respiratory illness for which there are no adequate countermeasures could initiate a global pandemic. If a pandemic disease emerges by 2025, internal and cross-border tension and conflict will become more likely as nations struggle—with degraded capabilities—to control the movement of populations seeking to avoid infection or maintain access to resources.

The emergence of a pandemic disease depends upon the natural genetic mutation or reassortment of currently circulating disease strains or the emergence of a new pathogen into the human population. Experts consider highly pathogenic avian influenza (HPAI) strains, such as H5N1, to be likely candidates for such a transformation, but other pathogens—such as the SARS coronavirus or other influenza strains—also have this potential.

If a pandemic disease emerges, it probably will first occur in an area marked by high population density and close association between humans and animals, such as many areas of China and Southeast Asia, where human populations live in close proximity to livestock. Unregulated animal husbandry practices could allow a zoonotic disease such as H5N1 to circulate in livestock populations—increasing the opportunity for mutation into a strain with pandemic potential. To propagate effectively, a disease would have to be transmitted to areas of higher population density.

Under such a scenario, inadequate health-monitoring capability within the nation of origin probably would prevent early identification of the disease. Slow public health response would delay the realization that a highly transmissible pathogen had emerged. Weeks might pass before definitive laboratory results could be obtained confirming the existence of a disease with pandemic potential. In the interim, clusters of the disease would begin to appear in towns and cities within Southeast Asia. Despite limits imposed on international travel, travelers with mild symptoms or who were asymptomatic could carry the disease to other continents.

Waves of new cases would occur every few months. The absence of an effective vaccine and near universal lack of immunity would render populations vulnerable to infection.^a In this worst-case, tens to hundreds of millions of Americans within the US Homeland would become ill and deaths would mount into the tens of millions.^b Outside the US, critical infrastructure degradation and economic loss on a global scale would result as approximately a third of the worldwide population became ill and hundreds of millions died.

Source: https://www.dni.gov/files/documents/Newsroom/Reports%20and%20Pubs/2025_Global_Trends_Final_Report.pdf

^a US and global health organizations currently are working to develop vaccines that may prevent or mitigate influenza pandemics. A breakthrough in the next several years could reduce the risk posed by pandemic influenza during upcoming decades.

^b How fast a disease spreads, how many people become sick, how long they stay sick, the mortality rate, and the symptoms and after-effects will vary according to the specific characteristics of whatever pathogen is responsible for a pandemic. This scenario posits plausible characteristics that fall within a range of possibilities for these variables.

in "Global Trends 2025: A Transformed World", US National Intelligence Council (2008), page 75

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Source: ?

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



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

Diagnosis

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



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



Jean-Pascal van Ypersele (vanyp@climate.be)

Fact n° 1: Because we use the atmosphere as a dustbin for our greenhouse gases, we thicken the insulation layer around the planet

That is why we must cut emissions to ZERO as soon as possible

CO, Concentration, 10 May 2020 Latest CO₂ reading: 417.10 ppm



Source: scripps.ucsd.edu/programs/keelingcurve/

CO₂ Concentration, 13 May 2019 (Keeling curve)



Source: scripps.ucsd.edu/programs/keelingcurve/



Source: Wolfgang Knorr, in The Conversation (2019)

Modèles climatiques



Résolution typique ~ 2°x 2°(modèle global, atmosphère) Intervalle de temps typique : ≤ 30 minutes

UCL - LENVI2005 - #

A Progression of Understanding: Greater and Greater Certainty in **Attribution**

AR1 (1990): "unequivocal detection not likely for a decade"

AR2 (1995): "balance of evidence suggests discernible human influence"

AR3 (2001): "most of the warming of the past 50 years is likely (odds 2 out of 3) due to human activities"

AR4 (2007): "most of the warming is **very** due to greenhouse gases"





Fact n° 2: We have changed the composition of the atmosphere and disturbed the climate system

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

Heat waves kill



Floods cost



Plateau Glacier (1961) (Alaska)



http://www.weather.com/news/science/environment/alaskas-glaciers-capturing-earthchanging-our-eyes-20131125?cm_ven=Email&cm_cat=ENVIRONMENT_us_share

Plateau Glacier (2003) (Alaska)



http://www.weather.com/news/science/environment/alaskas-glaciers-capturing-earthchanging-our-eyes-20131125?cm_ven=Email&cm_cat=ENVIRONMENT_us_share

Fact n° 3: Average temperature is probably on its way to exceed the « conservation temperature » for the Greenland and (some of the) Antarctic ice sheet

There is therefore a very high risk that average sea level would increase by several metres over the next century or two

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



Source: @Kevpluck, June 2018

Fact n° 4: World Health Organization (2018): Air pollution kills 7 million people per year (inc. 500 000 in Europe)

Sources of air pollution are broadly the same as those affecting climate: fossil fuels, wood and biomass combustion

Fine particulates from fossil fuel and wood burning kill



Photo: Jerzy Gorecki, Pixabay

Children are particularly vulnerable to pollution



Photo: Indiatoday.in, 6-12-2017

Fact n° 5: Climate change impacts poor people first, but we are all on the same spaceship

Risk = Hazard x Vulnerability x Exposure (Victims of New Orleans floods after Katrina in 2005)



AP Photo - Lisa Krantz (http://lisakrantz.com/hurricane-katrina/zspbn1k4cn17phidupe4f9x5t1mzdr)

Fact n° 6: Ecosystems suffer more and more, while our wellbeing depends on their good state

The « Sixth Extinction » has started, and climate change is one of the causing factors

2016: Only 7% of the Great Barrier Reef has avoided coral bleaching



JCU Australia - ARC Centre of Excellence for Coral Reef Studies / Tom Bridge and James Kerry
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

Turley et al. 2006

Slide courtesy of Carol Turley, PML

Fact n° 7: 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...)

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

- Existence of global warming
- Human responsability in the warming
- Uncertainties around the science
- More research needed before taking measures
- Cost of decarbonization
- Drawbacks from alternatives

(recent example: so-called enormous needs of cobalt for electric mobility reported on CNN; see critical analysis on <u>https://www.desmogblog.com/2018/05/02/cnn-wrongly-</u> <u>blames-electric-cars-unethical-cobalt-mining</u>)

Fact n° 8: European Union spends at least 1 billion euros *per day* simply to buy fossil fuels outside its borders.

True, decarbonizing the EU economy will cost, but not doing it could cost much more in impacts. Saving these 400 billions €/year could offer many

EU: annual cost of buying fossil fuels



Source: www.energycoalition.eu

Prognosis

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RCP Scenarios: Atmospheric CO₂ concentration



Three stabilisation scenarios: RCP 2.6 to 6 One Business-as-usual scenario: RCP 8.5

AR5, chapter 12. WGI

Projected global temperature increase during 21st century



4

RCP2.6





Hatching [hachures] indicates regions where the multi-model mean is small compared to natural internal variability (i.e., less than one standard deviation of natural internal variability in 20-year means).

Stippling [pointillés] indicates regions where the multi-model mean is large compared to natural internal variability (i.e., greater than two standard deviations of natural internal variability in 20-year means) and where at least 90% of models agree on the sign of change

North Europe - Map of temperature changes: 2081–2100 with respect to 1986–2005 in the RCP8.5 scenario (annual)



Projected Change in Precipitation



Hatching indicates regions where *the multi-model mean is small compared to natural internal variability* (i.e., less than one standard deviation of natural internal variability in 20-year means).

Stippling indicates regions where the multi-model mean is large compared to natural internal variability (i.e., greater than two standard deviations of natural internal variability in 20-year means) and where at least 90% of models agree on the sign of change





18-20000 years ago (Last Glacial Maximum)

With permission from Dr. S. Joussaume, in « Climat d'hier à demain », CNRS éditions.



Today, with +4-5 $^{\circ}$ C globally

With permission from Dr. S. Joussaume, in « Climat d'hier à demain », CNRS éditions.



Effects on the Nile Delta, where more than 10 million people live less than 1 m above sea level



NB: + 1 m is possible in the next 100 years...

(Time 2001)

The SR15



Global Warming of 1.5°C

An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, ir the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.



HALF A DEGREE OF WARMING MAKES A BIG DIFFERENCE: EXPLAINING IPCC'S 1.5°C SPECIAL REPORT



Responsibility for content: WRI

How the level of global warming affects impacts and/or risks associated with the Reasons for Concern (RFCs) and selected natural, managed and human systems

Five Reasons For Concern (RFCs) illustrate the impacts and risks of different levels of global warming for people, economies and ecosystems across sectors and regions.



Impacts and risks associated with the Reasons for Concern (RFCs)

Purple indicates very high risks of severe impacts/risks and the presence of significant irreversibility or the persistence of climate-related hazards, combined with limited ability to adapt due to the nature of the hazard or impacts/risks.

- Red indicates severe and widespread impacts/risks.
 Yellow indicates that impacts/risks are detectable and attributable to climate change with at least medium confidence.
- White indicates that no impacts are detectable and attributable to climate change.

Urgency of Treatment

@JPvanYpersele

I want you to panic... and act

"I don't want your hope. I don't want you to be hopeful. I want you to panic ... and act as if the house was on fire. "

Greta Thunberg Environmental Activist

To stay below 1.5°C warm:ing:

Global emissions pathway characteristics

General characteristics of the evolution of anthropogenic net emissions of CO₂, and total emissions of methane, black carbon, and nitrous oxide in model pathways that limit global warming to 1.5°C with no or limited overshoot. Net emissions are defined as anthropogenic emissions reduced by anthropogenic removals. Reductions in net emissions can be achieved through different portfolios of mitigation measures illustrated in Figure SPM3B.



Source: IPCC SR15



Greenhouse gas emissions pathways

- Limiting warming to 1.5° C would require changes on an unprecedented scale
 - Deep emissions cuts in all sectors
 - A range of technologies
 - Behavioural changes
 - Increase investment in low carbon options





Greenhouse gas emissions pathways

- Progress in renewables would need to mirrored in other sectors
- We would need to start taking carbon dioxide out of the atmosphere (Afforestation or other techniques)
- Implications for food security, ecosystems and biodiversity



Fact: The present national plans (NDCs) introduced ahead of the Paris Agreement are far from what is needed to respect the 1.5° C objective, and even to stay below 2°C warming

Please note that the Paris Agreement speaks about 1.5° C and « well below 2° C » warming, not 2° C 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

Percentage points difference between ESR targets and projected emissions in 2030



(2019)

Objectifs de la Belgique dans le cadre européen



Evolution des émissions en Belgique et objectifs de réduction (secteurs non-ETS)

(2005-2015: émissions réelles; 2015-2035: projections)

Source: Commission Nationale Climat (2017)

(Element) of solution n° 1: The survival of humanity and ecosystems must become a much higher political priority

... as if we were all running for our life.

@JPvanYpersele



The Paris Agreement (COP21, December 2015)

Vision

« ... strengthen the **global response to the threat of climate change**, in the context of **sustainable development** and efforts to **eradicate poverty** »

Objectives

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

b) Adaptation and Mitigation

- « Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and
- Iow greenhouse gas emissions development, in a manner that does not threaten food production»

c) Finances

 « Making *finance flows consistent* with a pathway towards low greenhouse gas emissions and climate-resilient development. »

Solution n° 2: Economic actors must be confronted much more clearly with their responsibilities

Degrowth of climate-unfriendly activities must be accepted, while growth of activities helping climate protection and poverty eradication must be encouraged

Solution n° 3: The best understood language is the price. Destroying the environment must become more and more expensive. Collected funds must be used to help the decarbonization, and avoid impacting the poor disproportionately

EU Emission Trading System, CO₂ taxes, fines, internal CO₂ price (firms do « as if » CO₂ emission was expensive). NB: Price must match the effect desired! Solution n° 4: Transition towards a clean and sustainable economy and energy system must be « just », and other synergies with the SDGs must be seeked

> Ex : The Polish energy system cannot be transformed without facilitating the coal miners reconversion @JPvanYpersele







Joel Pett, USA Today

Solution n° 5: Before looking at how to produce energy cleanly, much more attention must be given to reducing energy demand and efficiency, in all sectors

> All production and consumption patterns must be reconsidered, helped by energy audits, etc.

> > @JPvanYpersele
- Substantial reductions in emissions to stay under 2° C would require large changes in investment patterns e.g., from 2010 to 2029, in billions US dollars/year: (mean numbers rounded, IPCC AR5 WGIII Fig SPM 9)
- energy efficiency: +330
- renewables: + 90
- power plants w/ CCS: + 40
- nuclear: + 40
- power plants w/o CCS: 60

- 120

fossil fuel extraction:

Solution n° 6: Building sector: offers many opportunities in energy saving, economic activity, improving wellbeing...

@JPvanYpersele

Trying to practice what I « preach »:

- Energy audit before renovation
- Strong external insulation (wood fiber)
- Super-efficient windows
- Air tightiness + heat recovery ventilation system
- Ground-water heat pump replacing oil furnace
- Solar PV covering all consumption
- No tropical wood
- Small, used electric car

Trying to practice what I « preach »



Trying to practice what I « preach »



Solution n° 7: Mobility : much more space and priority to pedestrians, bicycles, and public transport; reduce priority given too long to individual transport in urban planning

Electrify remaining vehicles (with clean electricity). Fly less, only if essential.



Foto Marieke de Lange / OEK (Fietsersbond Amsterdam)



Figure III-1 : Consommation de carburant et densité urbaine, d'après Newman et Kenworthy (1989a), traduit en français par Heran (2001).

Solution n° 8: Food and agriculture. A possible change with big positive impact: eat less (red) meat and cheese, of better quality! Eat more plant-based food (produced cleanly)

... It is good for health as well!

@JPvanYpersele

Solution n° 9: The Sun gives us in two hours about as much energy as the world uses in *one year*, all forms of energy considered

The cost of solar kWh is crashing, wind power, heat and electricity storage, and smart grids are moving forward

@JPvanYpersele

The International Energy Agency has missed that point...

Annual PV additions: historic data vs IEA WEO predictions In GW of added capacity per year - source International Energy Agency - World Energy Outlook 120.0 PV History please send comments to: a.e.hoekstra@tue.nl WEO 2018 New Policies Scenario (NPS) added per year100.0 WEO 2016 NPS WEO 2004 REF 80.0 WEO 2002 REF WEO 2015 NPS



Yes, the planet got destroyed. But for a beautiful moment in time we created value for shareholders



"Yes, the planet got destroyed. But for a beautiful moment in time we created a lot of value for shareholders."

http://www.newyorker.com/humor/issuecartoons/2012/11/26/cartoons_20121119#slide=6

RCP2.6





Humanity has the choice

This gives me hope:

Wellinformed young people speaking truth to power



With @GretaThunberg at COP24

Greta is inconvenient, like the truth

Greta is inconvenient, like the truth¹

Jean-Pascal van Ypersele (@JPvanYpersele)

Professor of climatology at the Université catholique de Louvain (Belgium) Former IPCC Vice-Chair (2008-2015), Member of the Académie royale de Belgique

Greta Thunberg is inconvenient, and has been the subject of renewed criticism since her <u>speech</u> to the United Nations in New York. Some, often older white men, criticize her appearance or her so-called "mental illness." They call her "unstable" and seem to take pride in bullying her.

But maybe they feel threatened because Greta is gifted. She understands the challenges of the climate crisis much better than most political or economic leaders.

I have seen this myself. As a physicist and dimate scientist for nearly 40 years, and a former Vice-Chair of the <u>Intergovernmental Panel on Climate Change</u> (IPCC), I am no stranger to the climate orisis. But Greta has raised awareness about the climate orisis to a level never before seen.

I first saw Greta at the Katowice Climate Conference in December 2018. She was alone on a podium at a United Nations dimate conference, answering questions from a host and the audience. She has no cards, but answers without hesitation, sometimes simply saying: "I don't know, I'm only 15 years old, ask the experts." But she already knows a lot. She also recognizes that "no one is too small to make a difference." I am blown away by the accuracy of her words, based on a serious knowledge of the mechanisms at work and the causes of the dimate crisis.

A few days later, I heard Greta addressing the diplomats and negotiators in the plenary room. "The year 2078, I will celebrate my seventy-fifth birthday. If I have children, then maybe they will spend that day with me. Maybe they will ask about you. Maybe they will ask why you didn't do anything, while there still was time to act. You say that you love your children above everything else. And yet you are stealing their future." The video of her speech was shared around the world.

In all my years working on dimate change in the United States, Belgium, and with the IPCC, and having participated in each meeting of the UN's climate treaty. I had never heard such a strong and moving dimate speech. Her heart was talking, and she was right.

Greta read the IPCC reports. She understands the immense risks that the accumulation of greenhouse gases poses to life on Earth. She does not confuse the ozone hole, air pollution or the daily weather forecast with the dimate crisis.

Few leaders can say the same.

Greta speaks without any shame about her Asperger's syndrome. In fact, it probably helps her see the contradiction between the speeches of world leaders and their actions. With great emotional intelligence, she expresses her fear of this gap. A fear that is shared by millions of young people.

The adults who blame Greta for sharing her concern would do better to listen to this fear, and to take action. Many adults defend themselves by attacking or devaluing youth. They try to make people believe that the decarbonization Greta is demanding implies a return to the Stone Age and poverty. They believe that they must protect the status quo of unlimited economic growth that relies on fossil fuels—their status quo.

Clearly these critics of Greta and the climate strikers have not read the IPCC reports. A just energy and ecological transition can lead to a better quality of life for everyone, particularly if it's integrated with the pursuit of the 17 Sustainable Development Goals adopted by the United Nations in 2015. The recent UN <u>Global Sustainable Development Report</u> has just emphasized this point.

Greta is no longer alone, as she was at the beginning of the <u>movement</u> she started. In many countries, including the United States, young people are rising to the challenge through dialogue and collective non-violent action. Greta's leadership and ability to speak truth to power has earned her a nomination for the Nobel Peace Prize...and I hope she receives this prize of prizes.

We have so much to learn from them. It is our generation's short-term thinking and actions that have brought us to the brink. We must listen to these young people who dare to speak about their fears for their future, and stop believing that we know better than they do. We must change our attitudes, and utilize the technological, economic, and political tools that will make it possible to transform young people's fears into a force of hope for a sustainable and just future.

Those who refuse to do this have signed their own death wish – for themselves, their children and their grandchildren.

I support Greta because she supports life.

¹ Adapted from the tribune published in « Le Monde » on Octobre 1st 2019 (https://www.lamonde.fr/idees/article/2019/10/01/jean-pascal-van-ypersele-greta-derangecomme-la-verite 6013798 3232.html); this text is available on www.climate.be/vanyp

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



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Bij EPO (februari 2018)

Voorwoord: Jill Peeters Jean-Pascal van Ypersele met medewerking van Thierry Libaert en Philippe Lamotte

> In het OOG van de klimaatstorm

To go further :

- www.ipcc.ch : IPCC
- www.realclimate.org : answers to the merchants of doubt arguments
- www.skepticalscience.com : same
- www.plateforme-wallonne-giec.be : IPCC-related in French, Newsletter, latests on SR15, basic climate science
- Twitter: @JPvanYpersele & @IPCC_CH

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Also :

www.wechangeforlife.org
250 Belgians experts speak

- www.klimaatpanel.be : our report (FR/NL) on behalf #YouthForClimate (14 May 2019)
- www.climate.be/vanyp : my note (in FR & NL) presented to the royal informers on 4 June 2019

If you understand French:

 My new video: « Osons rêver après le Covid19... »: <u>https://www.facebook.com/JPvanYpersele/videos/167</u> <u>3442186131589/</u>

Site where my slides will be available:

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