All Hands on Deck - NOW!

Key takeaways from the IPCC report on Physical Science Basis (AR6 WG1)

9 August 2021

Climate change is no longer a future threat. It is here and it's rapidly getting worse. The unprecedented heatwaves and wildfires, heavy rains and floods, dying sea-life, melting polar ice and collapsing ecosystems provide painful reminders of just how far into the danger zone we have already plunged. What matters now is where we go from here.

In the Paris Agreement, governments agreed to pursue a warming limit of 1.5°C, and to act accordingly, with national targets and plans that are to be revised every five years. In 2018 world's leading scientists provided governments with further clarity on the target, with an IPCC Special Report, and established the global benchmarks for sufficient action: **by 2030 global CO_2 emissions would need to be halved and by mid-century, at the latest, brought to net zero**, with substantial reductions in other gases in all sectors.

Now scientists zoom back to the very big picture on climate change. The report on Physical Science Basis, published by the Intergovernmental Panel on Climate change (IPCC) Working Group 1 on 9 Aug 2021, provides an update on what's happening to our warming planet and why. The report forms the first part of the IPCC's regular assessment reports, now the 6th, the remaining parts of which (on human impacts and ways to limit warming), will be published next year. It distils the advances in physical climate science since the previous assessment report, AR5 WG1, published 8 years ago.

The report advances what we already knew, with further detail, depth and certainty. Understanding of the climate system's fundamental elements is already robust and well established. The five IPCC assessment cycles since 1990 have comprehensively and consistently laid out the rapidly accumulating evidence of a changing climate system. Overall, observed warming is broadly consistent with projections in the past decades, since systematic scientific assessments began[1].

Below we summarise some of our key takeaways from the latest IPCC report, drawing from its Summary For Policymakers and the underlining chapters. For the exact IPCC wordings and context, see the references in brackets.[2]

Where we are today, and why

It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere (frozen parts of the globe) and biosphere have occurred. (SPM A1)

Multiple lines of evidence indicate the unprecedented nature of recent large-scale climatic changes in the context of all human history. In 2011-2020 global surface temperature was about 1.09°C above pre-industrial levels, and temperatures are now comparable to levels last experienced about 125,000 years ago during the Last Interglacial, when the Greenland ice sheet was smaller and sea-level likely 5-10 meters higher than today. The concentration of atmospheric CO_2 (410 ppm) has not been this high in at least 2 million years. (Ch 1, page 5; SPM A.1.2; SPM A.2.2; TS, p. 43, 44; SPM A.2.1)

[1] IPCC AR6, WG1, Chapter 1, Executive Summary, page 5

[2] SPM = Summary for Policymakers; TS = Technical Summary; Ch = Chapter

GREENPEACE

International

Since the previous Assessment Report (WG1/AR5) global surface temperature has warmed strongly, with the past five years (2016-2020) being the hottest in the record since at least 1850. (TS,Cross-Section Box TS.1. Previous WG1/AR5 was released in 2013)

The rates of sea-level rise and ice loss have accelerated. The rate of sea-level rise has nearly tripled compared to that in 1901-1971, while the average mass-loss rate for the Greenland ice-sheet was about six times faster over the period 2010–2019 compared to the period 1992-1999. The Antarctic Ice Sheet was losing mass on average three times faster in 2010-2019 compared to 1992-1999. (SPM A.1.7; Ch 9, page 7)

We're witnessing more and worse weather extremes, and we have stronger evidence of their attribution to human influence. Evidence of observed changes and their attribution to human-induced emissions has strengthened for several types of extremes since the previous Assessment Report (AR5), in particular for extreme precipitation, droughts, tropical cyclones and compound extremes (including dry/hot events and fire weather). (SPM, section A.3; Ch11, page 6)

Where we are heading from here

The more greenhouse gases we add to the atmosphere, the worse it will get, with every additional increment of warming, as many changes in the climate system become larger in direct relation to increasing warming. More warming brings more frequent and more intense hot extremes, marine heatwaves, droughts in some regions, heavy rains, flooding events, intense tropical cyclones and worsening climate impact-drivers such as melting ice and snow, rising sea-levels, changing ocean circulation as well as acidifying, warming and deoxygenation of oceans. (Figure SPM.10; SPM B2 Figure SPM.5; Figure SPM.6; Figure SPM.8; B.5.1; SPM C2)

There will be an increasing occurrence of some extreme events unprecedented in the observational record, even at 1.5°C of global warming, but more so with higher levels. For example, hot extremes will increase in frequency and intensity even if warming is stabilized at 1.5°C. But with 2°C warming the changes in the intensity would be at least double, and with 3°C quadruple, compared to changes at 1.5°C. *[Nearly 3°C is where we are heading with current pledges and policies, according to CAT.]* (SPM, B.2.2; Ch 11, p 7)

The Arctic is likely to be practically sea ice free in September *at least once* before 2050 in all assessed scenarios. While in high CO2 emission scenarios ice-free gradually becomes the norm, in a 1.5°C compatible scenario about half of the current summer sea-ice extent would remain and even a slow recovery could start. (SPM B.2.5; Figure SPM.8)

Low-likelihood outcomes, such as ice sheet collapse, abrupt ocean circulation changes, compound extreme events and substantially larger warming cannot be ruled out and are part of risk assessment. The probability of low-likelihood, high impact outcomes increases with higher global warming levels. Abrupt responses and tipping points, such as strongly increased Antarctic ice melt and forest dieback, cannot be excluded. If warming increases, some compound events with low likelihood in past and current climate will become more frequent, and there is a higher chance of historically unprecedented events and surprises. (SPM, section C.3; Ch 11, Box 11.2)

There's now only a "medium confidence" that the Atlantic Meridional Overturning Circulation will not abruptly collapse before 2100. The AMOC is very likely to weaken over the 21st century for all emission scenarios. But while IPCC AR5 assessed it to be "very unlikely that AMOC will undergo an abrupt transition or collapse in the 21st century for the scenarios considered", AR6 now sees only a "medium confidence that there will not be an abrupt collapse before 2100". (SPM C.3.4; AR5 WG1 SPM p. 24)

Different regions are facing different combinations of climatic impact drivers, which are also modulated by natural drivers and internal variability. Understanding regional

climatic drivers is important for risk assessment and preparedness. The scientific community is now enabling governments to explore this information, with an interactive online regional atlas. (SPM Section C.2, and The Interactive Atlas at https://interactive-atlas.ipcc.ch)

Some very long-term changes are already locked in, regardless of what we do, resulting in continued worldwide loss of ice, sea level rise and changes in the ocean (ocean warming, deep ocean acidification and deoxygenation). But the scale and speed of these changes varies substantially depending on emissions we release from here on. (SPM section B5; SPM Figure SPM.8)

Melting ice-sheets could leave a legacy of very high sea-level increases. Deep uncertainty remains regarding ice-sheet-related processes and resulting sea-level rise. As a new feature since AR5, the IPCC now extends sea-level rise estimations to 2300, assuming different emission pathways. The likely ranges in 2300 span from less than 0.5 meters to about 7 meters, acknowledging that, assuming a very high emission future, even sea level rise greater than 15m cannot be ruled out, due to ice sheet processes. (Figure SPM.8)

What it takes to limit further impacts and extremes

Warming will continue until carbon emissions reach net zero. Limiting human-induced warming to any specific level requires reaching at least net zero CO2 emissions and strong reductions in other warming gases. The effects of emission cuts would emerge earlier as slower growth of greenhouse gas concentrations, slower warming rates and improved air quality. (Figure SPM.10, SPM sections D1 and D2; TS, page 28)

Meeting the Paris Agreement long-term goal of 1.5°C would mean less of everything – sea-level rise, worsening weather extremes and harshening living conditions in both land and ocean -– compared to higher warming levels. It would reduce the risks of crossing key tipping points, facing abrupt changes and crippling with compound events. The differences between current warming, 1.5°C and 2°C are significant, and specified already in more detail by the IPCC Special Report on 1.5°C in 2018. (SPM Section C.2 Figure SPM.5; Figure SPM.6; Figure SPM.8; B.5.1; SPM C.3.2 and C.3.3)

1.5°C warming limit is still within reach, from a physical perspective, but only with rapid emission cuts that bring carbon emissions to net zero and beyond. The report reaffirms the findings of the IPCC Special Report on 1.5°C on 1.5°C scenarios, anticipated time of reaching 1.5°C (when apples are compared to apples), and the remaining carbon budget which, after methodological improvements, is of the same magnitude. (Hence the emission reduction benchmarks established by that report, of halving global carbon emissions by 2030 and bringing them to zero by 2050 are still valid). (SPM B.1.3; SPM D.1.3; footnote 27)

Failing to cut global emissions from current levels could eat up the remaining carbon budget for 1.5 °C by 2030. To limit global warming to 1.5°C above pre-industrial levels with either a one-in-two (50%) or two-in-three (67%) chance, the remaining carbon budgets amount to 500 and 400 billion tonnes of CO2 respectively, from the beginning of 2020. Currently human activities are emitting over 40 Gt CO2 in a year (*about 39 Gt in 2020 but the IEA projects a rebound to near pre-covid levels, so near to 42 Gt*). (SPM Table SPM.2)

Strong, rapid and sustained reductions in methane emissions are also needed, and would come with the co-benefit of improved air quality, by reducing global surface ozone. However, CH4 emissions have grown faster since the AR5. (SPM D1; Ch 6, p 7)

Carbon removal methods have potential to remove residual CO2 from the atmosphere, but can have potentially wide-ranging effects on biogeochemical cycles and climate, and influence water availability and quality, food production and biodiversity. If net negative emissions were reached and sustained, it would gradually reverse surface temperature increase, but it wouldn't reverse other climate changes, such as sea-level rise, triggered by

then. (SPM, D.1.4-D.1.6. A comprehensive assessment of the ecological and socio-economic dimensions of CDR options is left to the WGII and WGIII reports that will be published next year.)

Greenpeace conclusions for action

The IPCC does not have the mandate to make policy recommendations. Nor does the report discuss ways to mitigate climate risks, as that will be covered in their reports next year. Below we present ***Greenpeace conclusions*** *for action.*

The science is clear, the situation is serious, and now it's all hands on deck. We must do everything faster and bolder, at all levels, leaving no sector behind.

Heading for zero global emissions, through halving them by 2030, as established by the IPCC in its 1.5°C report, provide clear benchmarks for action. Those with more capacity and responsibility must lead the way and support others in their journey.

Governments must align their targets and plans with 1.5°C by the COP26 climate conference in Glasgow this year. With current policies we are still on track to an apocalyptic 2.9°C future. Even if all pledges were backed with sufficient policies, we'd be heading towards roughly 2.4°C warming, with nearly 80% chance of exceeding 2°C.

Strong green recovery measures from COVID-19 offer a make or break opportunity, so let's grasp it! Strong recovery measures could slow-down warming rates, avoiding 0.3°C warming by 2050 and give a good chance of keeping the 1.5°C target within reach.

There can't be any new fossil fuel investments anywhere, and the phase out of existing fossil fuel infrastructure must align with the 1.5°C budget. Smart, efficient and sustainable solutions are ready to deliver and meet all our energy needs, if allowed to.

We must protect and restore ecosystems to build resilience. Healthy ecosystems are more resilient in the face of inevitable climatic changes. We must protect 30% of our land and oceans and reduce all pressures to our ocean ecosystems. We must end deforestation, restore forests and other terrestrial ecosystems, and adopt agroecology along with a reduced production and consumption of animal products and more plant-based diets.

Carbon dioxide removal offers no silver bullet. It is fundamental that we protect and improve the ability of our forests and soils to sequester more carbon. But additional carbon removal on a large scale comes with many challenges and risks. Our utmost priority must be in stopping further emissions from entering the atmosphere right now, rather than relying on theoretical large-scale removals far in the future.

Financial institutions - banks, asset managers and insurers, as well as the companies to whom they lend and whose shares they own, must align their business with the objectives of the Paris Agreement, to pursue limiting global average temperature increase to 1.5°C as shifting investment will be key to avoiding high-carbon lock-in. Greenwash with empty net-zero pledges relying on imaginary offsets only add fuel to the problem.

We must prepare for the unavoidable - with justice. All future development and water management plans, infrastructure projects and food security programmes must factor in climate reality. The 'polluter pays' principle must be at the heart of adaptation and compensation efforts between and within countries.

We must deliver in solidarity. Today the true costs of climate change are paid predominantly by those who have caused it the least. Rich governments must deliver on their Paris climate finance commitments and get serious with addressing loss and damage.

And we can!

The challenges are huge, but so are opportunities. Since the IPCC AR5 (published in 2013-2014), the world has already changed a lot, and not only for the bad. **We now have a truly global climate agreement with a 1.5°C goal**, and a lot more.

- **Solar and wind have become the cheapest forms of new electricity in most of the world**, and costs continue to decline. This has the potential to change everything, if only we allow it to, by making sure that oil, coal and gas are phased out at the speed required.
- **Even the International Energy Agency now sees a pathway to 1.5°C**, into an energy system dominated by solar and wind, coming with "huge benefits". There should be no investment in new fossil fuel supply projects, and no further final investment decisions for new unabated coal plants, and by 2035 no sales of new cars running on oil, says the IEA - a body created to ensure the security of oil supplies, and one with big influence on investment and business strategies.
- **The financial sector has finally *started to* wake up**, with some of the world's largest bond purchasers and asset owners now *pursuing* to align their strategies with the Paris Agreement and 1.5°C limit, and some top global investors moving away from the massive climate-related risks associated with fossil fuels, into building renewable energy.
- **Some of the business strategies are *starting to* sound different**, with car companies announcing combustion engine phase outs, energy utilities early coal phase outs and an oil giant *cuts* in their oil and gas production.
- **People are winning in courts:** Movement-led climate court cases are bringing justice to those most impacted, and an increasing number of judges and courts are applying the law to hold polluters accountable. In just three years climate litigation cases have nearly doubled, and only last year, an unprecedented number of key judgments with potentially far-reaching impacts were issued, including on the cases against Shell and against Germany. Now, more than ever, climate litigation has become a real threat for laggard governments and big polluters.
- **Most importantly: People power is forcing justice and action**. In recent years we've witnessed a growing wave of citizen action, from mass demonstrations to climate elections and blooming court cases for justice. And it is forcing change! New climate targets have been adopted, and a wave of victories in courts is changing the game. (For Greenpeace supported court cases, please see here.)

None of this is enough. Not even close. But all of it points to new potential for change. Most of these developments would have been deemed impossible just a few years ago. Now we must speed up and scale up for good, with massive public pressure.

This is our moment of truth, a time for radical honesty. With incremental action we are only fooling ourselves. Big polluters must stop doing better and start doing enough. **This is the moment to rise up, be bold and think big. And there's a role to play for everyone.**

For more information, contact:
Kaisa Kosonen
Senior Policy Advisor, Greenpeace Nordic,
IPCC Focal Point for Greenpeace International
kaisa.kosonen@greenpeace.org

greenpeace.org

GREENPEACE

International