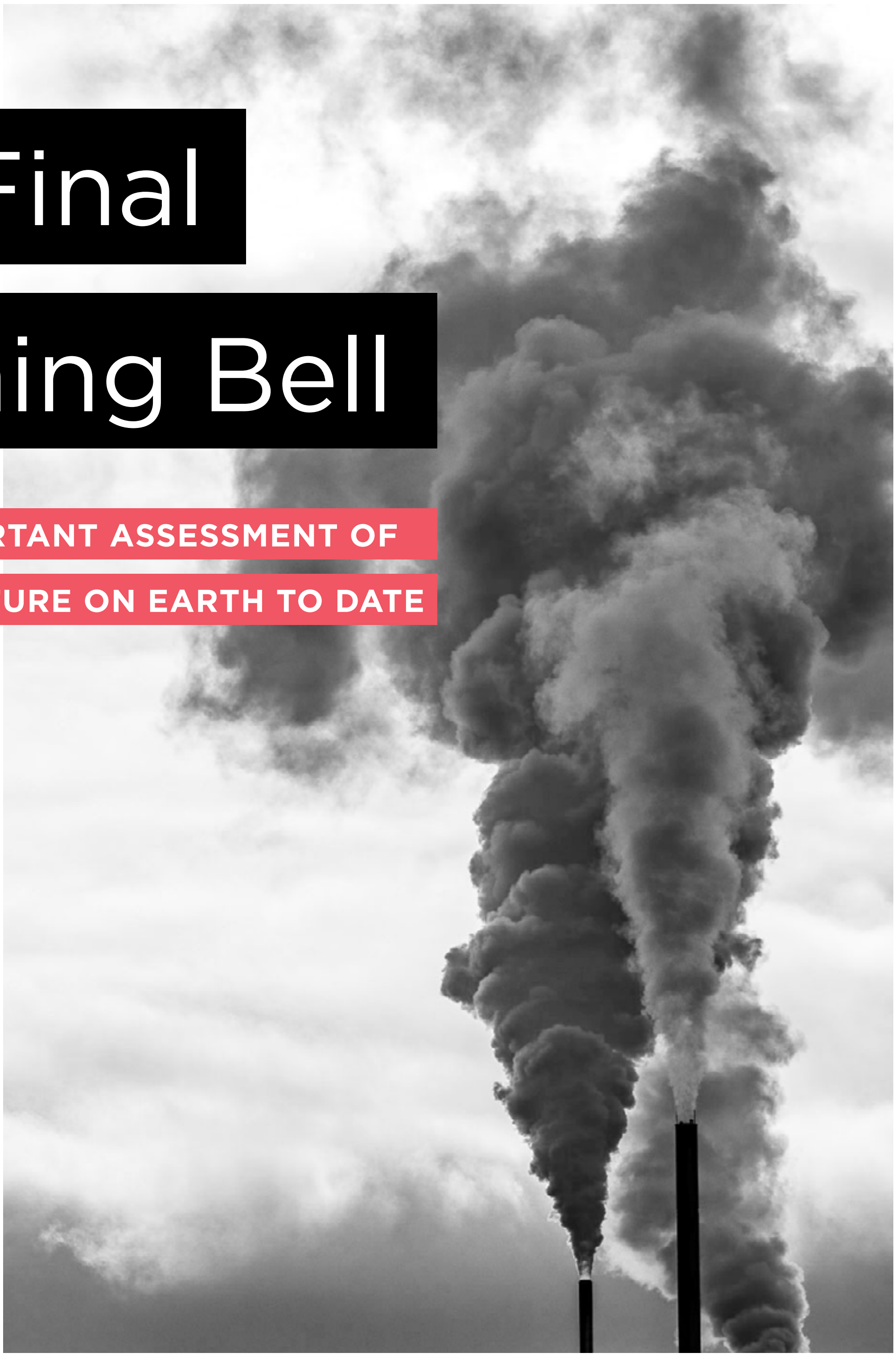
CCAG
Climate Crisis Advisory Group



The Final Warning Bell

THE MOST IMPORTANT ASSESSMENT OF HUMANITY'S FUTURE ON EARTH TO DATE

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An unmanageable future for humanity?

ICE MELT, NUUK, GREENLAND. PHOTO BY ANINGAAQ ROSING CARLSEN

The IPCC 6th Assessment Report (AR6) is the most important assessment of humanity's future on Earth to date. CCAG commends the IPCC and all the scientists involved for their clear and unflinching assessment of the catastrophe we face without immediate action.

Never have we had so much scientific evidence to demonstrate that we are in the midst of a global climate emergency.

This report is unequivocal: anthropogenic greenhouse gas emissions have already set in motion irreversible changes for centuries to come. For example, even if we can limit temperature rise to 1.5°C we will commit future generations to an unstoppable global sea level rise of up to 0.55 metres by the end of the century, dependent on global action and management of instability of ice sheets, continuing to rise over the following hundreds of years by 2–3 metres.[1] If we fail to limit warming the outcomes are far worse and would make many parts of the world uninhabitable.

A key underlying tenet of the Paris Agreement was the belief that heating of 1.5°C would be difficult, but manageable. Today, at 1.1°C of warming, we are experiencing devastating extreme weather events

[1,2] IPCC (2021) Climate Change 2021: *The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Inter-governmental Panel on Climate Change* Cambridge University Press. In Press

which, even without any further greenhouse gas emissions, will become more severe due to the inertia in the climate system and the warming effect of removing air pollution from our cities (rightly identified by AR6 as likely to add another 0.4°C of warming in the coming decades).[2]

It is now inevitable that the world will pass 1.5°C of warming, and that every fraction of a degree of additional warming will amplify the climate risks humanity will face. Every bit of warming also increases the chances of passing points of irreversible change. The Arctic Circle is arguably already beyond its tipping point, as discussed in CCAG's July 2021 report.[3] Earlier this month rain fell on the highest peak in Greenland for the first time in recorded history, an event so unexpected that no gauges were in place to measure it.[4]

As the IPCC makes clear, the coming 9 years until 2030 are critically decisive, and will set in motion changes that will impact humanity for the coming centuries, if not millennia. It is now that we will determine whether we can hold warming to the targets of 'well below 2°C' and if possible 'limit[ed]... to 1.5°C.[5]

The chances of success in this endeavour are uncomfortably low – everything must fall in place and add up globally; everyone must phase out fossil fuels at record speed (cutting emissions in half each decade); everyone must phase out methane, nitrous oxide and ozone-depleting substances at this same dizzying pace; food systems must be transformed from carbon sources to carbon sinks; and all nations must invest in keeping the carbon sinks and stocks in nature intact on land and in the oceans. In effecting this change, those countries with the most resources must give financial and technical assistance to the least developed countries. However we note that electricity power supply is now cheaper by renewable energy than any fossil-fuel-based form of energy.

Even if we are successful in reaching net zero CO_2 emissions by mid-century, atmospheric CO_2 equivalent (CO_2e) levels could climb as high as 540 parts per million (ppm). Hence there is a contradiction between the implications of AR6's scientific findings and the Agreement reached in Paris; allowing warming of 1.5°C will be disastrous, and anything beyond that, catastrophic. While emissions reduction is an essential part of the fight against climate change, it will not be enough to prevent continuing sea level rise, thawing permafrost with the release of methane, and other climate-related changes. Following a pathway leading only to net zero by 2050 is now too little too late.

We can see the IPCC report as the final warning, the bell signalling the final round. It is now or never. There is no room left for manoeuvre, no carbon budget left to spend.

How can we solve this crisis and avoid an unmanageable future? Reducing greenhouse gas emissions is critical to our survival and must be undertaken at a pace and scale more ambitious than ever considered or achieved. Our actions so far have not yet begun to reduce the amount of CO_2 added to the atmosphere each year. Every year of delay increases the required pace of transformation and brings forward the time when net zero must be reached.

We must now also rapidly start removing greenhouse gases from the atmosphere at scale and start repairing our critically damaged climate systems. It's important to note that any country that has committed to net zero has implicitly committed to greenhouse gas removal. Greenhouse gas removal is implicit in all future pathways modelled by the IPCC that meet the goals of the Paris Agreement. And yet there is virtually no focus on this critically important lever in discussions of climate change action. In the preparations for COP26 it is critically important to recognise that without greenhouse gas removal we cannot hit net zero, or continue to progress into the negative emissions required in the second half of this century. This is not an 'either/or', but a 'both/and'.

Should we fail to act now with determination and speed, the price that will be paid by humanity and by our biosystems is far too steep to consider. We have systematically damaged our planet's ecosystem and with it our future: to save ourselves we must now repair the damage.

[3] CCAG (2021) *A Global State of Emergency*. Available from: https://static1.squarespace.com/static/60ccae658553d102459d11ed/t/6102596bc768697d04731d55/1627543921216/CCAG+Extreme+Weather.pdf [Accessed 23rd August 2021]

[4] Carrington, D. (2021) Rain falls on peak of Greenland ice cap for first time on record. The Guardian. Available from: https://www.theguardian.com/world/2021/aug/20/rain-falls-peak-greenland-ice-cap-first-time-on-record-climate-crisis. [Accessed 23rd August, 2021]

[5] Paris Agreement under the United Nations Framework Convention on Climate Change (2015) United Nations Treaty Collection. Available from: https://treaties.un.org/doc/Treaties/2016/02/20160215%2006-03%20PM/Ch_XXVII-7-d.pdf. Article 2a, p3 [Accessed 23rd August, 2021]

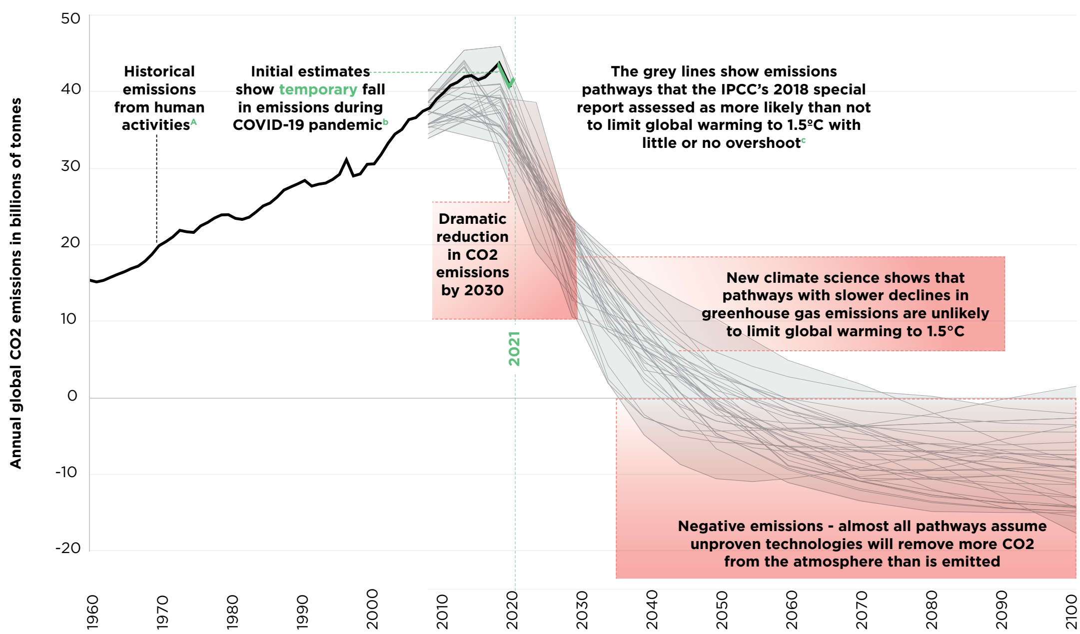
The case for climate repair

The CCAG is clear that the current shift in global emissions is not sufficient to avoid global disaster, and there is no 'remaining Carbon Budget'. The next round of national emission reduction commitments (Nationally Determined Contributions - NDCs) will have to add up to 'net zero' emissions for the world by 2050, with developed countries achieving net zero earlier to create space for others; and even then, further efforts for climate repair will be essential to ensure a safe future for all.

It is further clear that while emissions reduction is an essential part of the fight against climate change, it will not be enough to prevent sea level rise, thawing permafrost, the amplification of extreme climate events, and other climate related changes. Following a pathway leading only to net zero by 2050 is too little too late.

FIGURE 1

Pathways for global CO_2 emissions thought by the 2018 IPCC report to limit global warming to 1.5°C



A. *Emissions from fossil fuel use, industrial processes and land use change from Global Carbon Project (2020). Supplemental data of Global Carbon Budget 2020 (Version 1.0). https://doi.org/10.18160/gcp-2020*

B. *2020 value estimated by Global Carbon Project (2020), 2021 value is a best current estimate assuming 2020 land use emissions and an estimate of change in fossil fuel emissions from International Energy Agency (2021) Global Energy Review 2021. https://www.iea.org/reports/global-energy-review-2021*

C. *Data from Huppman et al. (2019). IAMC 1.5°C Scenario Explorer and Data Release 2.0 hosted by IIASA. https://doi.org/10.5281/zenodo.3363345, data.ene.iiasa.ac.at/iamc-1.5c-explorer*

Figure 1

Can we limit global warming to 1.5°C? ARC Centre of Excellence for Climate Extremes Briefing Note 15.

DOI: https://climateextremes.org.au/briefing-note-15-can-we-limit-global-warming-to-1-5c/

Explicit targets under international agreements have, since the 2015 Paris Agreement, been set to limit CO_2 in the atmosphere to 450ppm;[6] that is reckoned to equate to global average heating of less than 1.5°C. If proper account is taken of all greenhouse gases, and their CO_2 equivalence, the 450ppm threshold has already passed, contradicting the widespread notion of a 'carbon budget' that could still be spent whilst remaining below 1.5°C temperature rise.[7] Immediate and rapid reduction of greenhouse gases is needed, plus equally rapid creation of carbon sinks around the world, so as to achieve global net zero greenhouse gas emissions as soon as possible – followed by continued efforts, using all available sustainable means, to reduce CO_2e in the atmosphere to about 350ppm by the end of this century.

Moreover, net zero greenhouse gas emissions by 2050 will not achieve the long-term temperature goals identified in the Paris Agreement, due to several additional omissions. These include the set of climate-affecting substances included (e.g., the effects of sulphate and black carbon aerosols are not considered) and the use of the 100-year Global Warming Potential approximation to calculate required emissions cutbacks. Based on current trends in emissions and mitigation, it is likely that the increase in global average temperature for a month and quite possibly a year will first breach 1.5°C prior to 2030 and 2°C before mid-century, even though the multi-year averages that are reported may take a decade or so longer to be evident. And without very substantial reductions in global emissions, the warming for an individual month or year may exceed 4°C by the early 2060s, especially due to positive carbon-cycle feedback loops (e.g., from emissions from thawing permafrost) that are starting to appear.[8]

With time running out and the upcoming COP26 having to agree on implementing collective international measures to accomplish the temperature goal of the Paris Agreement, AR6 serves as a stark and urgent reminder to governments, policy makers and other key stakeholders that there is absolutely no room left for manoeuvre. Reducing emissions, and helping developing economies leapfrog to green economies, is critical to preserving a safe planet, and we must now also rapidly start repairing the climate.

Climate repair requires removing greenhouse gases from the atmosphere at scale and buying time by rapidly researching ways to protect the melting of the polar ice caps.

We need to combine efforts on a global scale now, much as scientists working on COVID19 vaccines have done. We must act globally to implement safe methods and technologies to repair damaged climate systems while we urgently slash emissions reductions.

What is clear is that the only way to reverse some of these catastrophic patterns, and to regain a kind of stability in climate and weather systems, is a strategy we call **"reduce, remove, repair"** – which demands that we make very rapid progress to net zero global emissions; that there is massive, active removal of greenhouse gases from the atmosphere; and, in the first instance, that we refreeze the Earth's poles and glaciers to correct the wild weather patterns, slow down ice-melt, stabilise sea level, and break the feedback loops that relentlessly accelerate global warming.

CO_2 EMISSIONS BEING RELEASED INTO THE ATMOSPHERE, POZNAŃ, POLAND. PHOTO BY MARCIN JOZWIAK

[6] The Paris Agreement, at Article 2 1. (a), commits to 'pursuing efforts' to limit temperature rise to 1.5°C (United Nations, 2015). The Fourth Assessment Report of the IPCC showed the need for stabilisation at no more than 450ppm to meet that target (IPCC, 2007); but in 2013 arguments for a lower limit predicted the problems of allowing GHGs to reach more than 350ppm, many of which are with us already (Hansen et al., 2013).

[7] This idea of a remaining 'Carbon Budget' is explained in detail in the IPCC Special Report on Global Warming of 1.5°C (2019). Carbon Budgets is an area in which academic caution and long lead-time to publication have resulted in a problem being underestimated. There is no 'remaining carbon budget', even though it was calculated with 'medium confidence' for the IPCC report (IPCC Special Report - Summary for Policymakers, 2019, p. 12, paragraph C.1.3).

[8] COR, 2021

Greenhouse gas removal

ICE MELT, ICELAND. PHOTO BY WILLIAN JUSTEN DE VASCONCELLOS

Net zero greenhouse gas or CO_2 emissions targets are in place for about 70% of the world's economies, over a range of timescales, offering an important starting point for climate repair; but emissions reductions must happen much more rapidly than current proposals,[9] and must be combined with the speedy expansion of carbon sinks to create negative growth of atmospheric greenhouse gases.

There is a pressing need for considerable public finance to fund the research and development necessary to create scalable greenhouse gas sinks, i.e., technologies and approaches that can remove greenhouse gases from the atmosphere and store them safely. Mission Innovation was developed through a commitment of 25 nations to create a fund capable of spending $30billion a year of public money on research and development to create all of the technologies required in the post-fossil-fuel world. The expansion of the budget agreed to reach $40-45 billion a year by 2025 should be used to create finance for greenhouse gas removal technologies. At present, this research is not happening at the scale or pace required for the world to meet its net zero commitments, let alone to reduce greenhouse gases in the atmosphere to a manageable level.

Climate Repair offers a scalable, safe recipe for future climate stability. It comprises:

1. **Deep and rapid emissions reduction;**
2. **Creation of new greenhouse gas sinks (through the capture and sequestration of carbon and methane), removing greenhouse gases to restore atmospheric concentrations to 350ppm CO2 equivalent - a fall of 150ppm - by 2100;**
3. **Repair of parts of the climate system that have passed tipping points – such as refreezing the poles (including the Himalayas); and**
4. **Promotion of agile political and financial responses.**

Each pillar of this strategy is vital for our future.

As reduction is generally well-understood and much-discussed, this report will focus on removal, with a future report covering repair and the political and financial responses needed to facilitate the other three pillars of the strategy.

Various approaches for greenhouse gas removal exist or are in development today. These are often

[9] In 2019 the amount of CO2 equivalent gases in the atmosphere increased by 55 Gt – and that figure is growing each year, heading towards 80 Gt CO2 equivalent per year by 2050 (The World Counts, 2021). If global net zero were to be achieved by 2050 (exceeding current ambitions) it is estimated that the final level of CO2 equivalent greenhouse gases would have risen to 550ppm – implying global warming of well over 2 degrees above pre-industrial levels.

described as 'nature-based' (for example, ecosystem restoration) or 'technical'.

Only technologies capable of capturing and sequestering at least 1 billion tons per year of CO_2 each should be under consideration, since scalability is critical in any response to the current crisis. Cost is also a consideration, as is public engagement to create a social mandate for large-scale technological intervention in natural systems.

Technical greenhouse gas removal solutions include:

1. Capturing carbon at point of emission: e.g., the incorporation of 'carbon capture' into manufacturing processes – so that CO2 emitted in the steel and concrete industries is captured and stored or used in the manufacturing process, or in 'mineralisation'
2. Removing from the atmosphere excess greenhouse gases already emitted. Direct Air Capture technologies are under development – where CO2 and other greenhouse gases are pulled directly from the air for sequestration.
3. More complex technologies are required for removal or oxidation of methane from methane-emitting areas and from the atmosphere.

CARBON CITIES, LONDON, UNITED KINGDOM. PHOTO BY ROBERT BYE

Nature-based solutions include:

1. Land-based solutions which remove CO_2 from the atmosphere through conserving and restoring natural ecosystems and through agricultural systems management. The 'AFOLU' sector (Agriculture, Forestry, and Other Land Use) contributes about 24% of global greenhouse gas emissions, with marked regional differences between agricultural emissions and land-use change.[10] Indeed the IPCC's special report on land and climate issued an alert that land is coming under increased pressure due to multiple demands. [11] Land-based emissions are growing and the IPCC warns that energy systems cannot be considered the only 'culprit' in this equation. AR6 highlights the critical role of natural sinks in removing CO_2 from the atmosphere while indicating that advancing climate change may reduce the efficiency of such sinks. Recent studies indicate, for example, that parts of the Amazon already behave as sources rather than sinks of carbon due to a combination of local and global processes of environmental change.[12] AR6 projections of an increase in fire-weather conditions pose additional challenges to the maintenance of healthy and functional ecosystems. Nevertheless, fire management policies can help prevent wildfires, reducing greenhouse gas emissions and reducing the loss of natural and social systems.

2. Ocean-based solutions such as 'marine up-welling', which extends the scale of marine kelp, sea grasses and seaweed farms, offering new carbon sinks, plus production of food for cattle – which increases milk yields whilst lowering methane emissions from livestock. A second approach is 'Ocean Iron Fertilisation', in which fertilising deep ocean areas with light sprinklings of iron dust such as that from deserts can generate, in a matter of months, green, plankton-rich forests, accompanied by burgeoning fish stocks and a huge variety of marine wildlife including whales. Trials are being launched for the careful monitoring of adverse impacts of ocean fertilisation, such as the creation of anoxic zones in the ocean, potential changes to rainfall, water supply, biodiversity, food production and land-use. Both processes already occur in nature, and the 'technology' involves triggering marine afforestation to extend the scale and frequency of these events. These programmes are growing in confidence and acceptability.

TREES, NATURE'S CARBON SINK. GÄVLE, SWEDEN. PHOTO BY GERAN DE KLERK

[10] Tubiello, F., Rosenzweig, C., Conchedda, G., Karl, K., Gütschow, J., Xueyao, P., & Sandalow, D. (2021). Greenhouse gas emissions from food systems: building the evidence base. *Environmental Research Letters*, 16(6), 065007.

[11] IPCC, 2019: Summary for Policymakers. In: *Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems* [P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.- O. Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M. Belkacemi, J. Malley, (eds.)]. In press.

[12] Gatti, L., Basso, L., Miller, J. Gloor, M. Gatti, D., Lucas, C., Henrique, L.,et al. (2021): Amazonia as a carbon source linked to deforestation and climate change. *Nature* 595 (7867), 388–393. Available from: DOI: 10.1038/s41586-021-03629-6.

POINT REYES NATIONAL SEASHORE, INVERNESS, UNITED STATES. PHOTO BY IVANA CAJINA

Meanwhile, there is a leaning towards nature-based solutions because they operate safely 'in the wild' and offer opportunities for scale-up without massive geo-engineering. They also tend to be more publicly acceptable than purely synthetic approaches.[13]

An important consideration of any greenhouse gas removal approach is the impact on land use and local populations. Regions that are still home to extensive areas of natural ecosystems are also home to enormous biological diversity. The tropics lost 12.2 million hectares of tree cover in 2020, being approximately 34% of humid tropical primary forests.[14] COP-15 on the Convention of Biological Diversity, to be held in October 2021 in Kunming, China, offers an opportunity to deepen the links between climate and biodiversity goals.

It is essential to highlight here the importance of equity and defence of the rights of indigenous peoples and traditional communities in different parts of the world. Indigenous peoples include more than 5,000 different peoples, with over 370 million people, in 70 countries on five continents.[15] Forests cover more than 80% of the area occupied by indigenous peoples (330 million hectares) which points to their critical role in forest governance.[16] Therefore, financing and mitigation efforts in line with biodiversity conservation must include the different worldviews of peoples who maintain ancestral relationships with their territories.

If all feasible greenhouse gas removal technologies are deployed at scale, there is a reasonable chance of sequestering 30 – 40 billion tons of CO_2 annually - less than the total amount being emitted currently each year. Greenhouse gas removal at scale is essential for stabilising the planet and its weather systems, but not sufficient – hence reinforcing the need for deep and rapid emissions reductions, and climate repair.

[13] Corner, A. and Pidgeon, N. (2014) Like artificial trees? The effect of framing by natural analogy on public perceptions of geoengineering. Climatic Change 130 (3), 425-438. DOI 10.1007/s10584-014-1148-6

[14] Weisse, M. & Goldman, E. (2021) Forest Pulse: The latest on the world's forests. *World Resources Institute.* Available from: https://research.wri.org/gfr/forest-pulse [Accessed 24th August 2021]

[15] United Nations Indigenous Peoples Partnership (UNIPP) Annual Progress Report, 2012. Available from http://www.ilo.org/wcmsp5/groups/public/---dgreports/---nylo/documents/publication/wcms_213616.pdf [Accessed 24th August 2021]

[16] Garnett, S., Burgess, N., Fa, J. *et al*. A spatial overview of the global importance of Indigenous lands for conservation. *Nat Sustain* 1, 369–374 (2018). Available from: https://doi-org.ezp.lib.cam.ac.uk/10.1038/s41893-018-0100-6; and Fa, J., Watson, J. Leiper, I., Potapov, P., Evans, T., Burgess, N., Monar, Z., Fernandez-Llamazares, A., Duncan, T., Wang, S., Austin, B., Jonas, H., Robinson, C., Malmer, P., Zander, K., Jackson, M., Ellis, E., Brondizio, E., Garnett, S. (2020) Importance of Indigenous Peoples' lands for the conservation of Intact Forest Landscapes. *Frontiers in Ecology and Environment* 18 (3), 135-140. Available from: https://doi-org.ezp.lib.cam.ac.uk/10.1002/fee.2148

THAWING PERMAFROST THAT FELL INTO THE OCEAN ON ALASKA'S ARCTIC COAST. PHOTO BY U.S. GEOLOGICAL SURVEY

CCAG's comments on AR6

The priority conclusions gathered by the CCAG from IPCC AR6 are that human influence is pervasive and undeniable, with at least 1.5°C of warming cemented into the future alongside irreversible sea level rise. All additional greenhouse gas emissions will increase the risks we face from extreme weather events, and the likelihood of passing irreversible tipping points.

This IPCC report recognises more strongly than before the risk of destabilising Antarctica, the Arctic, and deep ocean circulation (i.e., the AMOC); while still a relatively low risk, these possibilities would have catastrophic consequences for the world. Despite AR6 being the most severe assessment to date, there remains a higher risk of crossing climate thresholds than recognised.

Robust science reveals we are in a key governmental commitment phase: our actions now and over the next two decades will determine the outcome for humanity over centuries to millennia. AR6 recognises this, by emphasising climate impacts beyond 2100. For example, with warming limited to 1.5°C, future generations will nonetheless face an unstoppable global sea level rise of well beyond 2 metres. If warming is not limited to 1.5°C we could see this sea level rise by 2100 and a millennial-scale commitment of more than 20 metres.[17] This is the moral responsibility for us today - to avoid leaving a legacy to our children in which the whole planet - and entire nations - will inevitably move towards disastrous sea level rise.

[17, 18, 19] IPCC (2021) *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Inter-governmental Panel on Climate Change* Cambridge University Press. In Press

On the current trajectory, the most likely rise by 2100 is estimated to be up to 1 metre.

What is further clear in AR6 is that the limit of 1.5°C warming is a contradictory goal. The report estimates we have already loaded the atmosphere to reach 1.5°C of heating, but that we only observe 1.1°C today, due to the air pollutants (sulphates and nitrates) in cities that dim incoming solar radiation. As cities invest in reducing air pollution and coal usage declines this dimming effect will be decreased. Meanwhile, climate scenarios in the report suggest that limiting global warming to 1.5°C will only succeed after decades of overshoot, revealing that we are at risk of a faster than expected warming pulse in the coming decades.[18]

Crucially, the CCAG highlights that there is an identifiable risk that an increase of 1.5°C may be breached in or before 2030, taking the world into a zone of uncertainty. There is concern amongst those who have investigated the possible outcomes of climate change that between an increase of 1.5°C and 2°C major damage will occur, and certain irreversible changes could be triggered. There is no contingency plan to address the resulting uncontrollable climate change; an event that would unquestionably have catastrophic impacts on civilization as we know it.

The CCAG identifies further grave concerns with the state of permafrost thaw, in line with AR6 which states that 'many changes in the climate system become larger in direct relation to increasing global warming. Additional warming is projected to further amplify permafrost thawing,' with 'loss of permafrost carbon irreversible at centennial timescales'.[19] Permafrost soils may be a remote feature for populations outside Northern regions, but they provide essential ecosystem services to Indigenous peoples. In addition, AR6 highlights the dangerous prominence of the greenhouse gas methane as the second largest contributor to global warming from 2010-19.[20] Combining this radiative forcing potential with thawing permafrost may lead to enhanced warming in coming decades when methane deposits are released from locations such as the Yamal Peninsula, Siberia.[21] From a planetary ecology perspective, climate system feedbacks such as emissions from thawing permafrost constitute a major future risk.

Findings from IPCC AR6 confirm the necessity to commit to deep and rapid emissions reduction, in which we expect COP26 to play a pivotal role. In addition to this, greenhouse gas removal and climate repair must follow to complete the strategy we call **"reduce, remove, repair"**. This strategy demands that we make very rapid progress to net zero global emissions. Massive and active removal of greenhouse gases from the atmosphere at scale will then be required by every country committed to reaching net zero. Following this, climate repair must be conducted, which will be further explored in a future report. Only together can these three pillars start to correct wild weather patterns, slow down ice-melt, stabilise sea level, and break the feedback loops that relentlessly accelerate global warming.

[20] IPCC (2021) *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Inter-governmental Panel on Climate Change* Cambridge University Press. In Press

[21] Gray, R. (2020) The Mystery of Siberia's exploding craters. *BBC Future*. Available from: https://www.bbc.com/future/article/20201130-climate-change-the-mystery-of-siberias-explosive-craters. [Accessed 23rd August 2021]

THAWING PERMAFROST IN THE ALASKAN TUNDRA. PHOTO BY NASA/JPL-CALTECH/CHARLES MILLER

APPENDIX

The Paris Architecture

The 2015 Paris Agreement represented a truly pragmatic effort to pull together three dimensions of the climate change challenge. Firstly, it set a long-term temperature goal against which all countries could collectively measure their policies and progress: to limit average global temperature rise to 'well below 2°C' and pursue efforts to limit temperature increase to 1.5°C above pre-industrial levels; recognizing implicitly that at higher temperature levels, for instance, human life might not remain sustainable on small island states threatened by sea-level rise.

Secondly, the Paris Agreement described a target pathway for greenhouse gas emissions: 'global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing countries[...] and 'rapid reductions thereafter in accordance with best available science'.[21] This pathway requires a balance to be struck between greenhouse gas emissions and the creation of carbon sinks – with the net effect being measured. Each country is required to submit its Nationally Determined Contribution (NDC) at periodic intervals, accompanied by information about how it will reduce emissions, increase sinks, and manage the already-unavoidable impacts of climate change, and do so in a way that is fair and reflects its 'highest possible ambition' as well as its 'common but differentiated responsibilities and respective capabilities, in light of different national circumstances'.[22]

Thirdly, the Paris Agreement established a mechanism for evaluating the cumulative impact of NDCs against the long-term goals of the Paris Agreement, including its temperature goal, the well-below 2°C/1.5°C limit 'in the light of equity and the best available science'.[23] Countries committed to submitting new or updated NDCs every five years towards achieving this temperature limit. This global stocktake of collective progress enables the real impacts of climate change to be observed against national and international efforts at climate action in relation to mitigation, adaptation and support. The first of these stocktakes is scheduled for 2023.

UNFCCC processes, including those under the Paris Agreement, are advised by scientific reports of the IPCC, an international advisory committee upholding the most rigorous standards of peer-reviewed scientific reporting and publishing on climate change. This rigour brings certain time lags: IPCC reports, which go through several iterations and rounds of comments from government and expert reviewers, take several years to produce. IPCC reports rely on peer-reviewed scientific findings published in reputable journals; those findings may not therefore always reflect the very latest research.

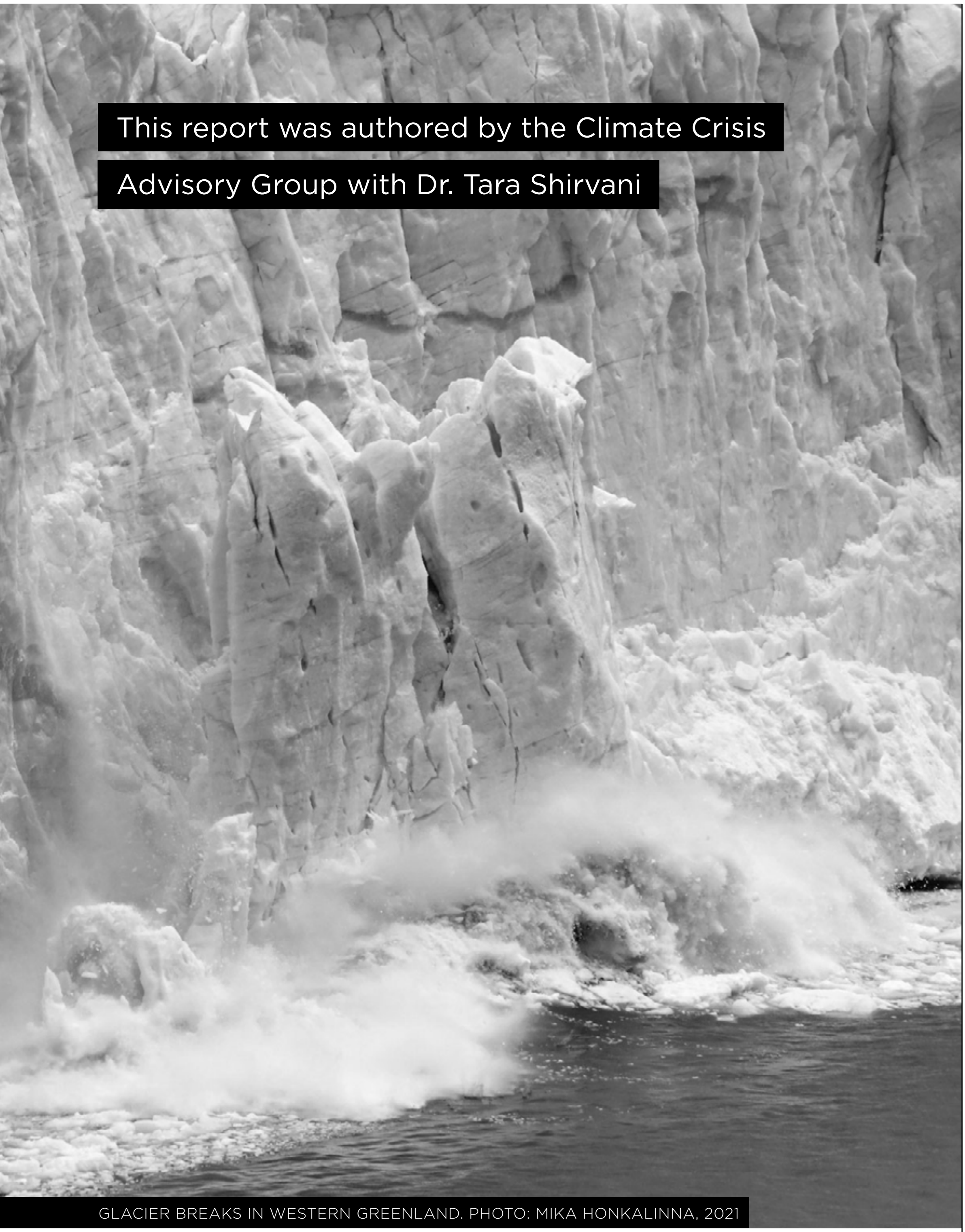
[22] Article 4.1 of The Paris Agreement to the United Nations Framework Convention on Climate Change. United Nations. (2015).

[23] Article 4.3 of The Paris Agreement to the United Nations Framework Convention on Climate Change. United Nations, (2015).

[24] Article 14 of The Paris Agreement to the United Nations Framework Convention on Climate Change. United Nations. (2015).

CLIMATE PROTEST IN BONN, GERMANY, 2019. PHOTO BY MIKA BAUMEISTER

This report was authored by the Climate Crisis Advisory Group with Dr. Tara Shirvani



GLACIER BREAKS IN WESTERN GREENLAND. PHOTO: MIKA HONKALINNA, 2021

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