SOS PLANET
SURVIVAL ACTION

LAST CALL TO AVOID ENVIRONMENTAL CATASTROPHE AND THE MASS EXTINCTION OF FLORA, FAUNA AND MANKIND

The Carbon Crisis

The carbon crisis is the greatest and most urgent challenge humanity has ever faced. The 2015 Paris Agreement was a political triumph, but the price of agreement was that each nation should set its own carbon reduction targets. Unfortunately, these targets are based on politics, not science. Taken together, even if met, they will allow average temperatures to rise at least 3°-4°C compared to pre-industrial levels by 2100.

Thanks to renewables and low-carbon technology, global carbon emissions are now levelling off. However, average temperature is increasing faster than expected given the current concentration of greenhouse gases[1] in the atmosphere. This acceleration suggests that temperature-driven feedbacks are now adding to heating from CO2 and other greenhouse gases and may push us past irreversible tipping points. Somehow, we must prevent this.

Our actions over the next ten years will determine the future of *homo sapiens* and countless other species for centuries, even millennia, to come. Success or failure in cutting carbon emissions and developing systems to remove vast amounts of CO2[2] from the atmosphere will determine whether future generations thrive in a healthy, biodiverse, post carbon world or struggle for survival amid environmental collapse and species extinction.

In October 2018, the Intergovernmental Panel on Climate Change (IPCC) published a report (Special Report on Global Warming of 1.5°C) into the actions required to keep average temperature in 2100 within 1.5°C of pre-industrial levels (*i.e.* 0.4°C above today's average [3]). Its key message is that carbon emissions from human activity must be almost halved by around 2030, become net carbon neutral[4] by around 2050 and increasingly net carbon negative[5] thereafter.

However, some leading scientists no longer regard 1.5°C as a useful and safe target. Instead, they say we must act without delay to reduce the concentration of CO2 and other greenhouse gases in the

[1] The greenhouse gases (GHGs) are: (i) Carbon dioxide (CO2); (ii) Methane (CH4); (iii) Nitrous Oxide (N2O) and (iv) Fluorinated gases (hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride, and nitrogen trifluoride). *Source*: https://www.epa.gov/

[2] Once emitted, CO2 remains in the atmosphere between 300 to 1,000 years. *Source*: https://climate.nasa.gov/

[3] The current global average temperature is already about 1.1°C above pre-industrial levels. According to an ongoing temperature analysis conducted by scientists at NASA's Goddard Institute for Space Studies (GISS), the average global temperature on Earth has increased by a little more than 1° Celsius (2° Fahrenheit) since 1880. Two-thirds of the warming has occurred since 1975, at a rate of roughly 0.15-0.20°C per decade.

[4] Net carbon neutral means having a balance equal to zero between human-made carbon emissions and carbon absorption from the atmosphere with carbon offsetting solutions or sequestration and storage technologies. In order to achieve net zero emissions, all worldwide greenhouse gas emissions will have to be counterbalanced by carbon sequestration. *Source*: https://www.europarl.europa.eu/; https://www.carbonsink.it/

[5] Carbon negative: to remove more CO2 from the atmosphere than it is emitted. *Source*: https://www.iea.org/

atmosphere, so they fall from the current circa 500ppm[6] CO2-eq to 350ppm CO2-eq by the end of this century.

This is a massive challenge, but the accelerating rise in temperature and rapid increase in emissions of methane – a far more powerful greenhouse gas than CO2[7] – means we must become net carbon neutral far sooner than 2050. This raises a fundamental issue – which UN climate negotiators have failed to resolve after almost 30 years: the need for a fair, maths-based rationale through which nations can agree to share the burden of making rapid and sufficiently deep cuts in global fossil fuel emissions.

The Social Responsibility

We can no longer ignore the social, economic and geopolitical implications of the inequalities, which underlie the climate crisis. Between 1990 and 2015, the richest 10% of the world's population (circa 630 million people, mostly living in developed western nations) were responsible for 52% of cumulative carbon emissions[8]. Annual *per capita* CO2 emissions in the developed world are far higher than in developing countries. In 2016 average *per capita* emissions in the United States were 15 tons of CO2 each year, thirty times the average in Bangladesh, where millions of people are threatened by rising sea level due to climate change. Western[9] nations now realise that climate justice[10] – both between rich and poorer countries and inter-generational – is fundamental in creating a viable post carbon world.

Today the 80% of global energy supply still comes from fossil fuels, but our future depends on urgent, unprecedented and coordinated global collaboration to cut carbon emissions. We can no longer afford to wait to hear what governments say is feasible. Understanding imposes a moral obligation on everyone to make the avoidance of fossil fuels their most urgent and absolute priority – for the sake of generations to come.

Our only immediate option is profound behaviour change by governments, businesses and individuals to make urgent and drastic cuts in carbon emissions.

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[6] PPM: parts per million; it is a unit used in atmospheric chemistry to describe the concentration of gases. PPM stands for parts of gas per million parts of air.

[7] Methane (CH4) stays in the atmosphere for a shorter period of time (around 12 years) compared to CO2. Since methane oxidizes almost completely over 12 years, its warming potential over that period will be more than 87 times greater than CO2. However, there is increasing acceptance of its Global Warming Potential (GWP) over 20 years compared to CO2 which results in methane having a GWP 87 times stronger than CO2 over 20 years. *Source*: https://www.iea.org/reports/methane-emissions-from-oil-and-gas; https://pubs.rsc.org/en/content/articlehtml/2018/em/c8em00414e#cit18

[8] *Source*: 'Confronting Carbon Inequality' report, Oxfam, Sept. 2020 (https://oxfamilibrary.openrepository.com/bitstream/handle/10546/621052/mb-confronting-carbon-inequality-210920-en.pdf)

[9] *Source*: https://data.worldbank.org/indicator/EN.ATM.CO2E.PC

[10] Climate justice: 'The concept of climate justice acknowledges that because the world's richest countries have contributed most to the problem, they have a greater obligation to take action and to do so more quickly. However, many fear that whatever international agreement is reached between governments, it will compound the already unjust burden on the poor and vulnerable'. *Source*: https://unctad.org/en/Docs/ngls20092_en.pdf
'The impacts of climate change will not be borne equally or fairly, between rich and poor, women and men, and older and younger generations. Consequently, there has been a growing focus on climate justice, which looks at the climate crisis through a human rights lens and on the belief that by working together we can create a better future for present and future generations'. *Source*: https://www.un.org/sustainabledevelopment/blog/2019/05/climate-justice/

Such change shall take into account the following seven key factors:

1. Education of the public about climate change and the risks and costs of Business As Usual. The understanding of such issues will lead to a sense of responsibility towards future generations and to the recognition that our individual choices can make a difference;
2. Political will and visionary leadership in order to implement legislations and policies needed to introduce necessary changes. Such laws shall not be based on politics and shall take into account the environmental, social and economic aspects needed to tackle climate change and achieve the UN Sustainable Development Goals by 2030;
3. Recognition that the economy is a wholly owned subsidiary of the environment and that for a thriving environment we also need to tackle social issues (food security, education, discrimination, slavery, etc.);
4. Protection and management of biodiversity – which is essential to a healthy, stable and resilient planet – in order to preserve and sustainably utilize the biodiversity and ecosystems, maintain life-supporting systems and essential ecological processes;
5. Preservation of natural carbon sinks through land and marine conservation zones;
6. Research into land and ocean based systems to sequester and store billions of tons of CO2 from the atmosphere; and
7. The development and application of low-carbon (including hydrogen) technology to make ships and airplanes carbon neutral.

Our action plan is linked to an urgent global communications strategy as a catalyst for a sea-change in public opinion. This will help governments introduce effective – but potentially unpopular – measures, including carbon taxes and a ban on using fossil fuels for land transport, heating and energy production.

Our Requests

A. WE ASK ALL INDIVIDUALS & ORGANISATIONS TO IMMEDIATELY:

- consider their carbon footprint and stop wasting energy
- buy 100% renewable electricity, off-set emissions through trustworthy schemes, improve insulation of existing buildings, replace old boilers with solar heating and electric heat pump systems
- make new buildings CO2 neutral
- minimise car use and air travel and walk, cycle or use public transport
- buy zero emission vehicles and replace fossil fueled vehicles as soon as possible
- reduce consumption of meat, eggs and dairy products
- divest from companies that have any involvement with fossil fuels

B. WE ASK ALL NATIONS TO - AS SOON AS POSSIBLE:

- end all subsidies to fossil fuel producers/products
- ban all coal powered electricity generation and shut all gas and liquid fossil fuel power stations
- generate all electricity from renewable energy sources and lower the price of electricity produced from renewable sources
- introduce carbon taxes/fee to discourage fossil fuel use and introduce incentives to install solar panels on roofs

- introduce a binding global agreement to end deforestation and plant new forests
- encourage plant-based diet
- improve soil management to protect and increase natural carbon sinks
- impose tariffs on imports from countries that do not behave as above and use the revenues to fund reforestation, new technologies and incentives
- ban sale of fossil-fueled vehicles, leisure boats and recreational aircraft and ban use of fossil fuels for land transport, heating and energy production
- ban ships and aircraft which do not have zero CO2 emissions and require all new ships and aircraft to have zero CO2 emissions
- increase public investment in research into zero carbon and hydrogen based technologies through 'Mission Innovation'[11] and into carbon capture and sequestration technologies through 'Mission Innovation II'.

C. WE ASK THE UNFCCC TO agree a fair, math-based rationale for sharing a safe finite, science-based global carbon budget, so the use of fossil fuels for land transport, heating and energy production is cut to zero by 2030. This will enable nations to check their actions against what is required, create international peer pressure to cut emissions and establish principles for a sustainable and fair post carbon global economy and society which shall be based on climate justice principles.

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SCIENTIFIC NOTES

The rising of the greenhouse gases concentration in the atmosphere

Since the start of the Industrial Revolution in 1750, human activity has added around 1530 billion tons of CO2[12] to the atmosphere trapping heat, mostly from burning fossil fuels. This has raised the concentration of CO2 in the atmosphere from 280ppm of CO2 only (the levels before the Industrial Revolution) to 414 ppm[13] of CO2 only (CO2 levels today are higher than at any point in at least the past 800,000 years[14]). If we include the heating effect of methane emissions and other greenhouse gases, today the atmosphere contains around 500ppm of CO2-equivalent.

Most of the heat due to anthropogenic greenhouse gas emissions has been taken up by the oceans[15]. In particular, between 1971 and 2010, 90% of the heat introduced in the biosphere from burning fossil fuel has been absorbed by the oceans and will be released for centuries to come[16]. According to a study, over the past 150 years, the amount of energy absorbed by the oceans is equivalent to what is

[11] http://mission-innovation.net/
[12] *Source*: https://ourworldindata.org/co2-emissions
[13] In August 2020, the concentration of CO2 in the atmosphere reached 414ppm of CO2. *Source*: https://climate.nasa.gov/vital-signs/carbon-dioxide/
[14] CO2 levels have never exceeded 300ppm of CO2 over the past 800,000 years. *Source*: https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide
[15] The ocean is a carbon sink absorbing around 25% of the CO2 released into the atmosphere from the burning of fossil fuels. *Source*: https://sos.noaa.gov/datasets/ocean-atmosphere-co2-exchange/
[16] *Source*: https://www.pnas.org/content/116/4/1126; https://www.climate.gov/news-features/understanding-climate/climate-change-ocean-heat-content

generated by roughly 1.5 Hiroshima-size atomic bombs per second[17]. This creates the context for action to cool Earth's climate.

It is three millions years since Earth's atmosphere contained so much CO2. Back then, average temperature was 2-3°C above the pre-industrial average and sea level 15-25m higher than today[18]. Global average surface temperature is now 1.1°C above pre-industrial levels, but the Arctic is warming almost three times faster than the rest of the world. In 40 years, the Arctic Ocean has lost about 3/4 of its sea ice volume at the end of the summer season[19] and Greenland's icecap is melting six times faster than 30 years ago. A recent study suggests Greenland's ice could disappear within 1,000 years[20], eventually raising sea level over 7m.

In 1939, the concentration of atmospheric CO2 was 300ppm, an increase of just 20ppm during 189 years since 1750. Over the eight decades since 1939, its concentration has increased by 114ppm. Half of all fossil fuel emissions have occurred in the last three decades. Global carbon emissions continue to rise and the International Energy Agency predicts global energy demand will increase 30% by 2040. Although increasing proportion will come from wind and solar power, global fossil fuel use is rising.

Today we emit circa 40Gtons of CO2-eq (*i.e.* 35Gtons of CO2 + 5Gtons of CO2-eq) per year, which are equal to circa 4.5/5 PPM of CO2-eq per year. If human-related emissions continue at current (2019) rates for the next 20 years, we will add approximately 800Gt CO2 to the atmosphere. By 2039, this will have raised the concentration of CO2 only by some 50ppm to around 464ppm (considering we emit around 2.5ppm of CO2 every year).
(Assumptions: 1ppm CO2 = 7.81 GtCO2; 50% of new emissions retained by forests and oceans[21]. Any decrease in the proportion of CO2 retained in the atmosphere will further raise the concentration of CO2 in the atmosphere and temperature).

If global emissions remain at today's levels over the next fifty years, we will have added 2000 GtCO2 to the atmosphere by 2070 and probably raised the concentration of CO2 (only) in the atmosphere to 538ppm. The geological record shows it is more than ten million years since Earth's atmosphere contained that much CO2, a period when temperature was 4-5°C above the pre-industrial average.

The failure of the Paris Agreement

The 2015 Paris Agreement commits all nations to keep temperature within 2°C of the preindustrial average by the end of this century, with the ambition to stay within 1.5°C. However, few nations are even on track to meet their inadequate self-set carbon targets which, if met, will allow average temperatures to rise 3-4°C compared to pre-industrial levels by 2100. Global emissions remain flat, with a slight drop due to Covid-19, but without drastic action we could be heading for catastrophic, worst-case temperature increase between 6°C and 12°C by 2200.

[17] *Source*: https://www.theguardian.com/environment/2019/jan/07/global-warming-of-oceans-equivalent-to-an-atomic-bomb-per-second; http://joannenova.com.au/2013/12/sun-dumps-500-times-as-many-hiroshima-bombs-of-energy-as-climate-change/
[18] *Source*: https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide
[19] *Source*: https://tc.copernicus.org/preprints/tc-2019-2/#:~:text=In%2040%20years%20the%20Arctic,thickness%20by%20half%20on%20average.&text=In%202018%20the%20Arctic%20MYI,over%20the%20past%2040%20years.
[20] *Source*: https://www.sciencealert.com/greenland-s-ice-sheet-will-disappear-over-the-next-1000-years-nasa-model-shows
[21] *Source:* https://sos.noaa.gov/datasets/ocean-atmosphere-co2-exchange/

The 2018 IPCC Special Report ("SR 1.5") makes it clear that the risks associated with keeping temperature within 1.5°C of the pre-industrial average are far less than 2°C. It says global CO2 emissions from human activity must fall around 45% from 2010 levels by 2030 and reach net zero around 2050. The report acknowledges the scale of the challenge: "*Limiting global warming to 1.5°C … would require rapid and far-reaching transitions in energy, land, urban and infrastructure ... (which) are unprecedented in terms of scale …and imply deep emissions reductions in all sectors, a wide portfolio of mitigation options and a significant upscaling of investments in those options*".

However, leading climate scientists are concerned that SR 1.5:

1. Underestimates the risk of sudden sea level rise and warming caused by non-CO2 feedbacks, notably the release of methane from melting permafrost in Arctic regions, where temperature is rising three times faster than the global average.

2. Does not take into account methane, a powerful GHG which is now at record levels in the atmosphere. Unlike CO2, methane oxidizes in the atmosphere and rapidly loses its warming effect, but its emissions are rising from rice paddies due to increased rice production and from industrialized meat production, since cattle belching produces methane. Leaks from poorly maintained oil and gas wells and from fracking is a growing problem. Methane is 87 times more potent than CO2 as a greenhouse gas over a period of 20 years in the atmosphere.
   Rapid cuts in methane emissions would therefore have an immediate cooling effect and it is essential.

3. Assumes human activity will be 'carbon negative' after 2050. However, nobody knows when we will stop burning fossil fuels for air travel and shipping, whether enough new forest will be planted to absorb vast quantities of atmospheric CO2, or whether new technologies will be ready to remove billions of tons CO2 from the atmosphere after 2050.

4. Underestimates the existential threats to humanity. The tipping point for exponential climate change may be less than 2°C above pre-industrial levels. If so, rising sea level could cause mass migration within decades.

A possible scenario if we do not immediately cut carbon emissions

As temperature rises, other parts of the world will become uninhabitable due to drought, water shortage, floods, crop failure and life-threatening heat stress. Sudden environmental change has caused civilizations to collapse. Given the changes triggered by fossil fuel emissions, we have no grounds to think this will not happen again.

If emissions were to continue at current rates over the next 100 years, the energy added to the biosphere may raise sea level 15m over 500 years[22] and continue for millennia to come as the Antarctic ice cap melts, eventually raising sea level 60m once all the ice has gone.

Despite the increase in renewable energy, the amount of oil used for road and air transport is rising and more coal is being burned to generate electricity. The failure of governments, institutions and others to act is no excuse for inaction.

[22] *Source*: https://e360.yale.edu/features/takingthe-long-view-the-forever-legacy-of-climate-change

Temperature is now rising hundreds of times faster than at any time in the past. This includes the Permian Event 250 million years ago, when super-volcano eruptions and/or methane clathrate release raised concentrations of CO2, causing an 8°C increase in average temperature and the mass extinction of the vast majority of species.

Without immediate global action to avoid fossil fuels, the man-made carbon crisis will provoke another ‘Great Dying’.