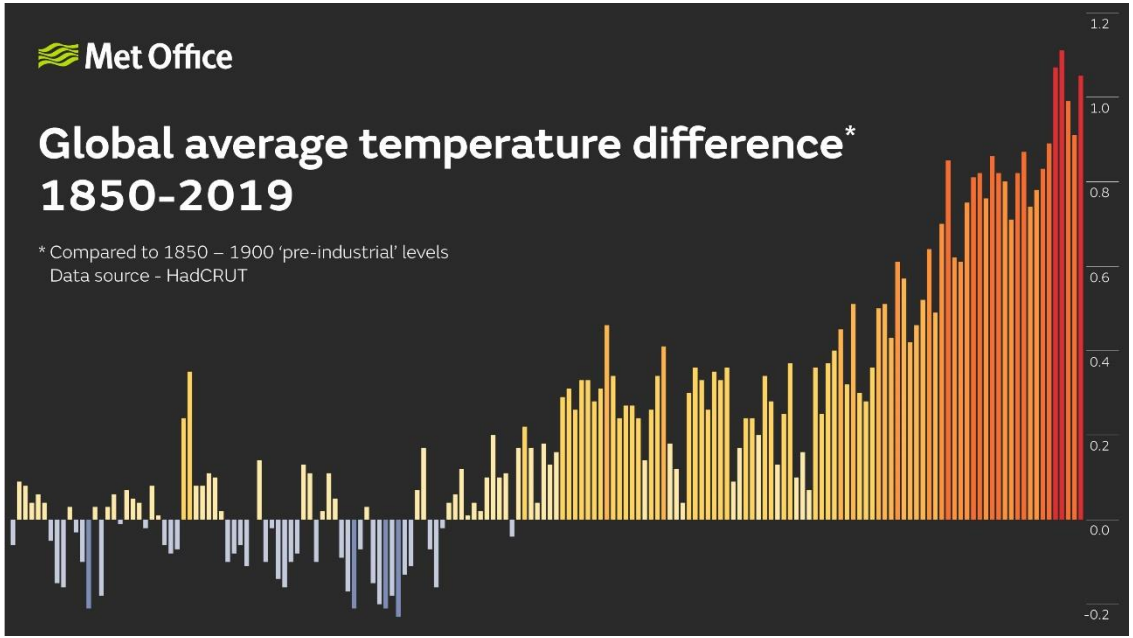
Owning the transition to net zero emissions



Bob Ward

25 February 2020

Grantham Research Institute on Climate Change and the Environment

Centre for Climate Change Economics and Policy

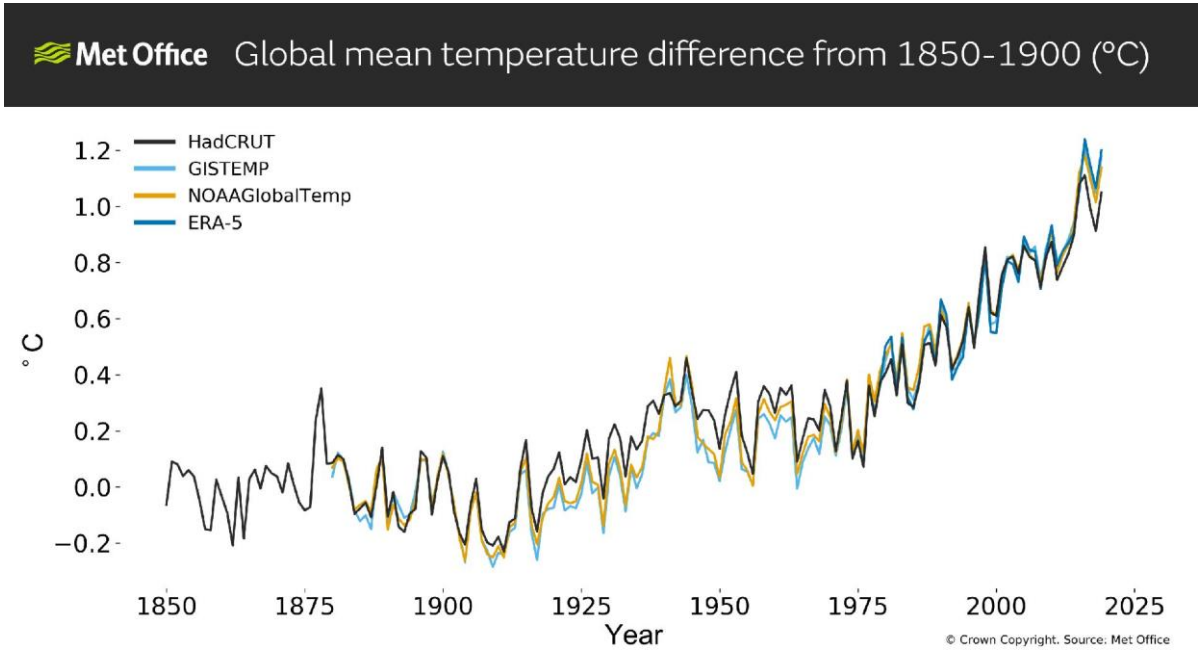
E·S·R·C Economic & Social Research Council

The Grantham Foundation for the Protection of the Environment

University of Leeds

LSE The London School of Economics and Political Science

Global mean surface temperature



Source: https://www.metoffice.gov.uk/about-us/press-office/news/weather-and-climate/2020/confirmation-that-2019-concludes-warmest-decade-on-record

Climate thresholds and tipping points

PERSPECTIVE

Trajectories of the Earth System in the Anthropocene

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Edited by William C. Clark, Harvard University, Cambridge, MA, and approved July 6, 2018 (received for review June 19, 2018)

We explore the risk that self-reinforcing feedbacks could push the Earth System toward a planetary threshold that, if crossed, could prevent stabilization of the climate at intermediate temperature rises and cause continued warming on a "Hothouse Earth" pathway even as human emissions are reduced. Crossing the threshold would lead to a much higher global average temperature than any interglacial in the past 1.2 million years and to sea levels significantly higher than at any time in the Holocene. We examine the evidence that such a threshold might exist and where it might be. If the threshold is crossed, the resulting trajectory would likely cause serious disruptions to ecosystems, society, and economies. Collective human action is required to steer the Earth System away from a potential threshold and stabilize it in a habitable interglacial-like state. Such action entails stewardship of the entire Earth System—biosphere, climate, and societies—and could include decarbonization of the global economy, enhancement of biosphere carbon sinks, behavioral changes, technological innovations, new governance arrangements, and transformed social values.

Earth System trajectories | climate change | Anthropocene | biosphere feedbacks | tipping elements

The Anthropocene is a proposed new geological epoch (1) based on the observation that human impacts on essential planetary processes have become so profound (2) that they have driven the Earth out of the Holocene epoch in which agriculture, sedentary communities, and eventually, socially and technologically complex human societies developed. The formalization of the Anthropocene as a new geological epoch is being considered by the stratigraphic community (3), but regardless of the outcome of that process, it is becoming apparent that Anthropocene conditions transgress Holocene conditions in several respects (2). The knowledge that human activity now rivals geological forces in influencing the trajectory of the Earth System has important implications for both Earth System science and societal decision making. While recognizing that different societies around the world have contributed differently and unequally to pressures on the Earth System and will have varied capabilities to alter future trajectories (4), the sum total of human impacts on the system needs to be taken into account for analyzing future trajectories of the Earth System.

Here, we explore potential future trajectories of the Earth System by addressing the following questions.

Is there a planetary threshold in the trajectory of the Earth System that, if crossed, could prevent stabilization in a range of intermediate temperature rises?

Given our understanding of geophysical and biosphere feedbacks intrinsic to the Earth System, where might such a threshold be?

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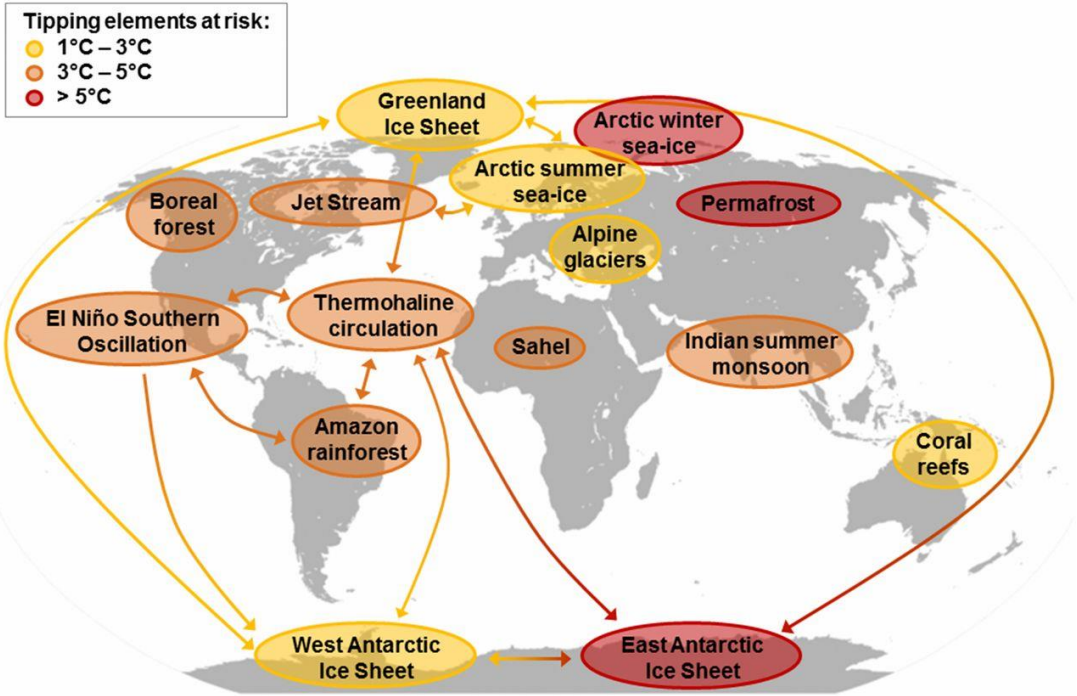


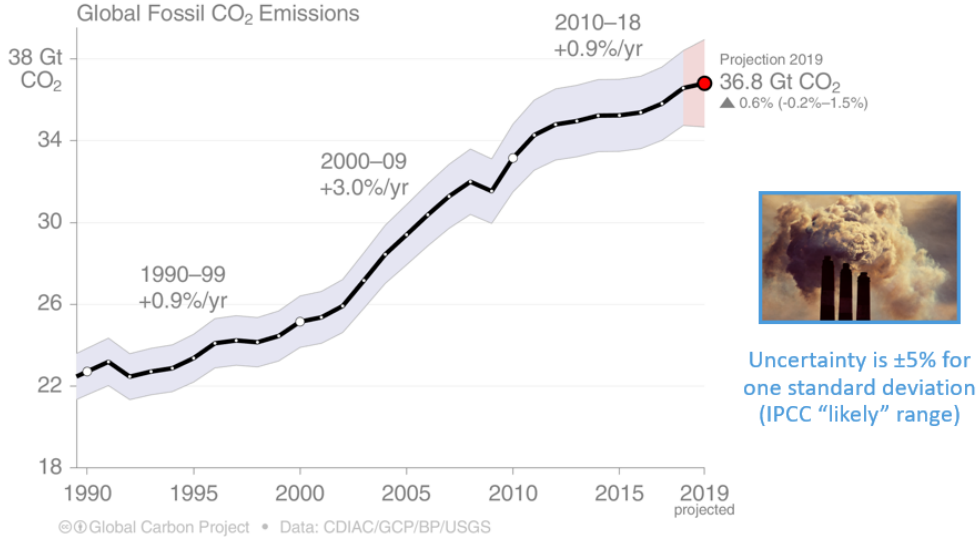
Source: https://www.pnas.org/content/pnas/115/33/8252.full.pdf

Global carbon dioxide emissions from fossil fuels

Global fossil CO_2 emissions: 36.6 ± 2 $GtCO_2$ in 2018, 61% over 1990

Projection for 2019: 36.8 ± 2 $GtCO_2$, 0.6% higher than 2018 (range -0.2% to 1.5%)

Fossil CO_2 emissions will likely be more than 4% higher in 2019 than the year of the Paris Agreement in 2015



Uncertainty is ±5% for one standard deviation (IPCC "likely" range)

The 2019 projection is based on preliminary data and modelling.

Source: CDIAC; Friedlingstein et al 2019; Global Carbon Budget 2019

Source: https://www.globalcarbonproject.org/carbonbudget/19/presentation.htm

Paris Agreement (2015)

Article 2

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

Article 3

“In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty”

Comparing emissions pathways

- **Special Report on Global Warming of 1.5°C (IPCC):** at least 50% probability of limiting global warming to 1.5°C – *global carbon dioxide emissions are reduced to net zero globally by about 2050.*
- **Sustainable Development Scenario (IEA):** holds global warming to below 1.8 °C with a 66% probability without reliance on global net-negative carbon dioxide emissions, equivalent to limiting the warming to 1.65 °C with a 50% probability - *global carbon dioxide emissions fall from 33 billion tonnes in 2018 to less than 10 billion tonnes by 2050 and are on track to net zero emissions by 2070.*
- **Emissions Gap Report 2019 (UNEP):** even if all current unconditional commitments under the Paris Agreement are implemented, global warming will reach 3.2°C by 2100 - *global greenhouse gas emissions would need to fall by 7.6% each year between 2020 and 2030 to meet the 1.5°C target.*

World Energy Outlook 2019

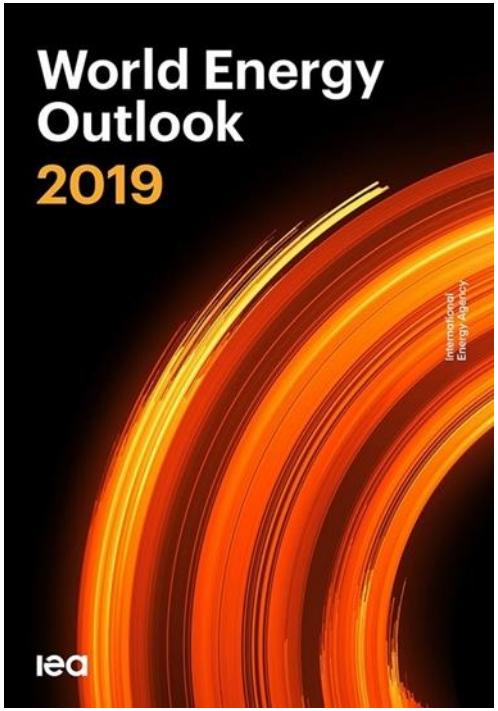
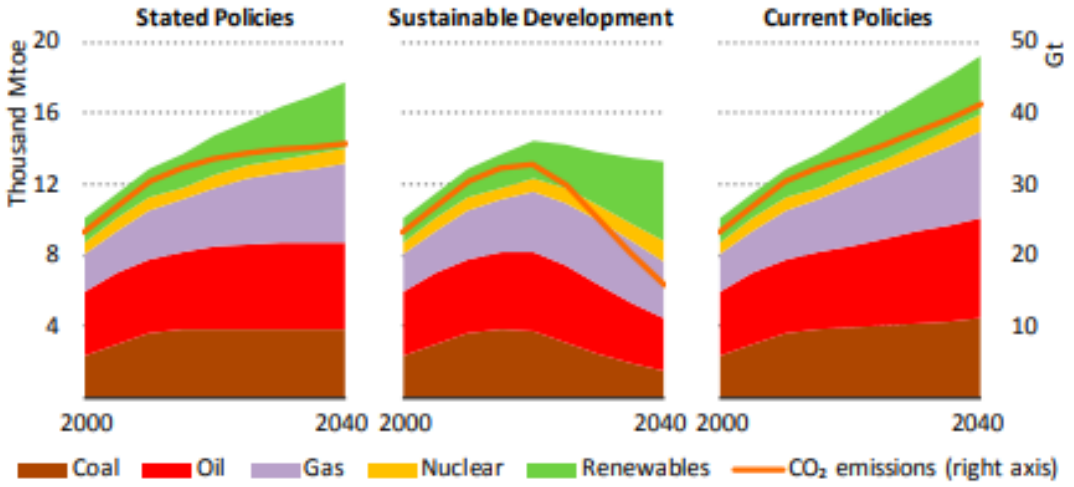


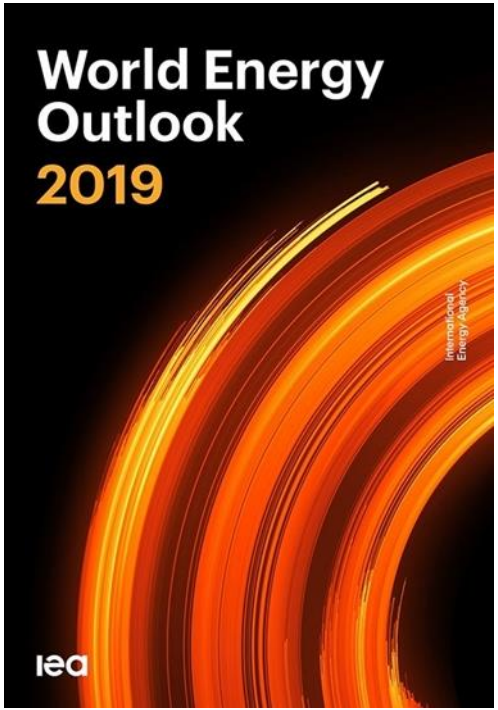
Figure 1.1 ▷ World primary energy demand by fuel and related CO_2 emissions by scenario



Existing policies and announced targets slow growth in global emissions to 2040, but they are not strong enough to force a peak in an expanding energy system

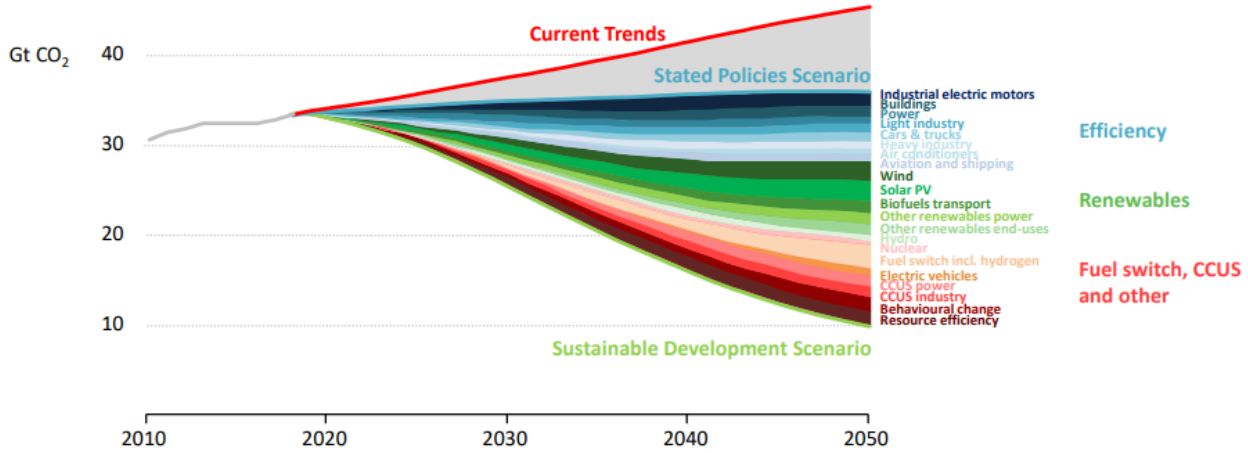
Source: https://www.iea.org/reports/world-energy-outlook-2019

World Energy Outlook 2019



No single or simple solutions to reach sustainable energy goals

Energy-related CO_2 emissions and reductions in the Sustainable Development Scenario by source

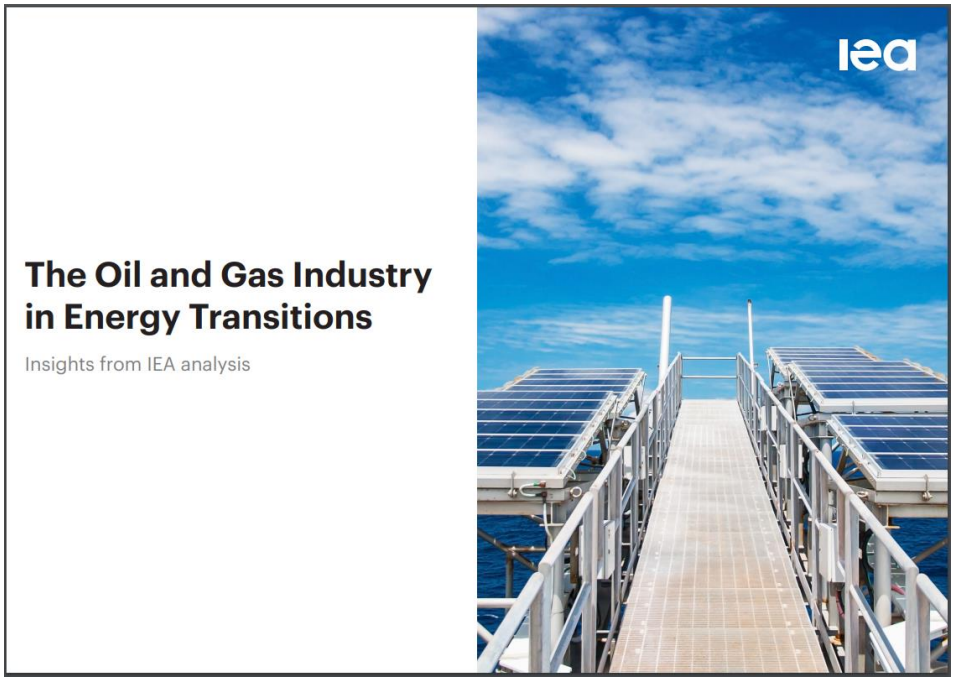


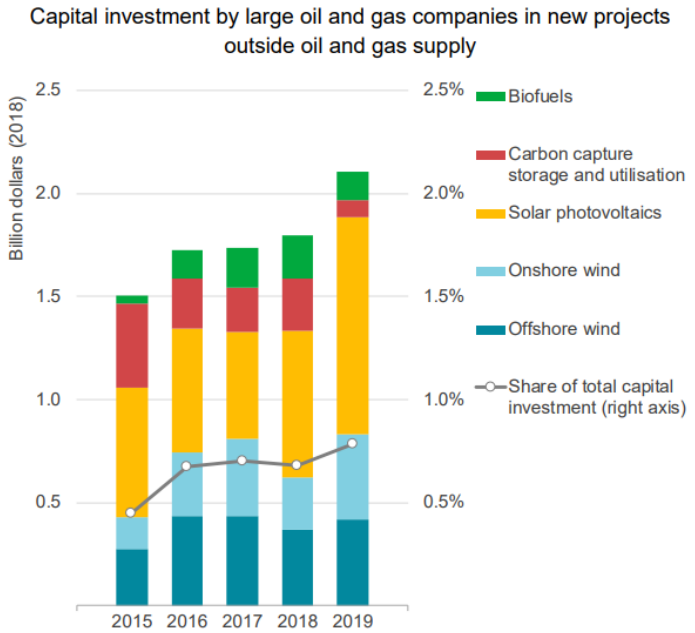
A host of policies and technologies will be needed across every sector to keep climate targets within reach, and further technology innovation will be essential to aid the pursuit of a 1.5°C stabilisation

iea

Source: https://www.iea.org/reports/world-energy-outlook-2019

World Energy Outlook Special Report





Source: https://www.iea.org/reports/the-oil-and-gas-industry-in-energy-transitions

By COP25 73 Parties had pledged net zero by 2050

Antigua and Barbuda, Argentina, Armenia, Austria, Bahamas, Barbados, Belgium, Belize, Benin, Cabo Verde, Canada, Chile, Colombia, Comoros, Cook Islands, Costa Rica, Democratic Republic of Congo, Denmark, Dominica, Dominican Republic, Ecuador, Estonia, Ethiopia, European Union, Federated Stated of Micronesia, Fiji, Finland, France, Germany, Grenada, Guyana, Iceland, Ireland, Italy, Jamaica, Kiribati, Lao PDR, Lebanon, Luxembourg, Maldives, Mauritius, Mexico, Monaco, Namibia, Nauru, Netherlands, New Zealand, Nicaragua, Niue, Pakistan, Palau, Papua New Guinea, Peru, Portugal, Republic of Marshall Islands, Samoa, Seychelles, Solomon Islands, South Sudan, Spain, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Sweden, Switzerland, Timor-Leste, Tonga, Trinidad and Tobago, Tuvalu, United Kingdom, Uruguay, Vanuatu

The challenge

- The world must rapidly cut global emissions of greenhouse gases to net zero to avoid dangerous climate change, and adapt to those impacts that cannot now be avoided, while continuing to raise living standards.

- The vast majority of the world's greenhouse gas emissions are due to energy consumption, and fossil fuels still accounted for 81% of primary energy supply in 2018.

- The fossil fuel industry will continue to be targeted as public enemy no.1 by environmental campaigners.

- The entire energy sector must own the transition to net zero.