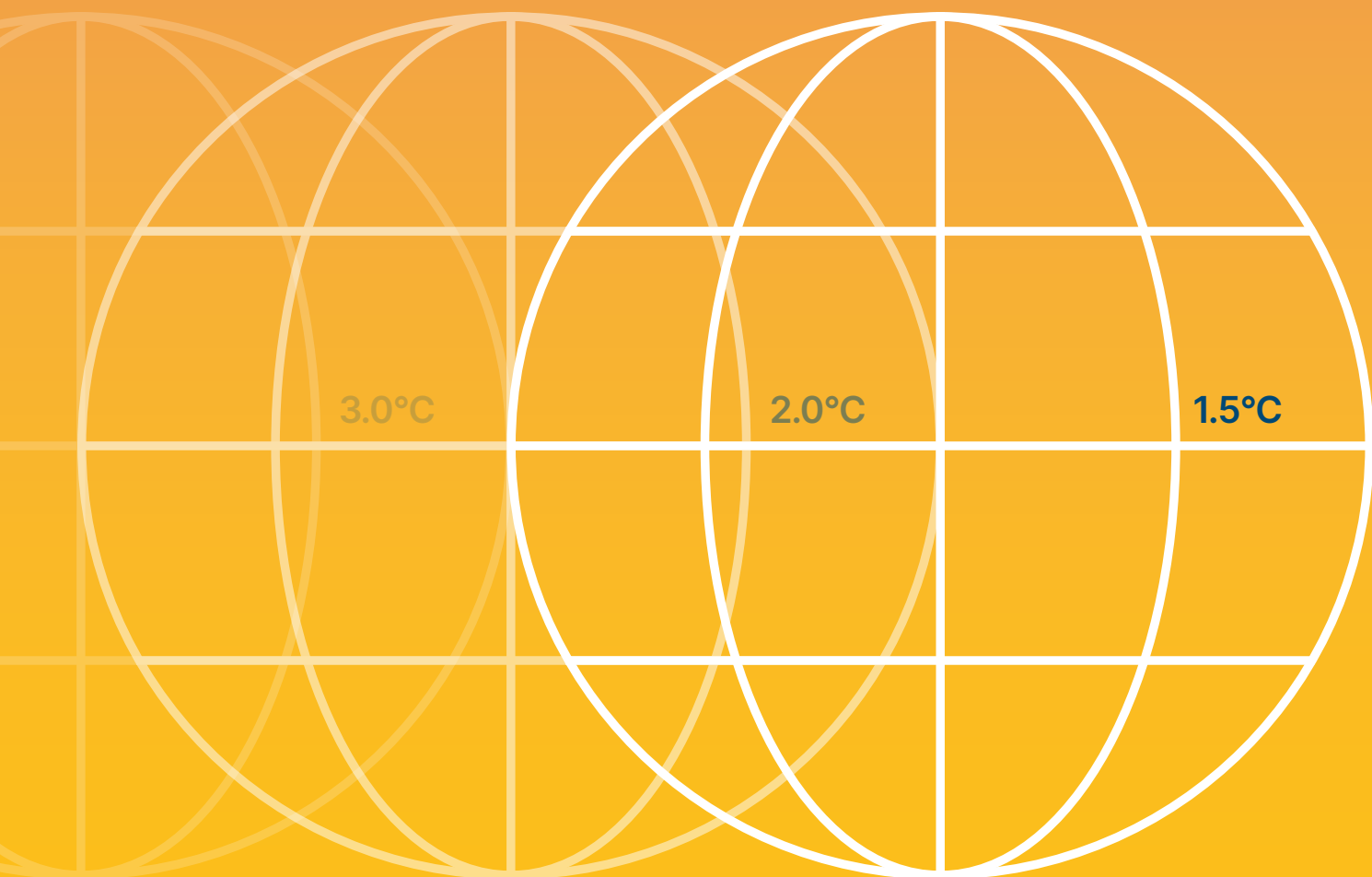


Keeping 1.5°C Alive: Closing the Gap in the 2020s

September 2021



Executive Summary

Version 1.0



Energy
Transitions
Commission

Keeping 1.5°C Alive

Closing the Gap in the 2020s

The Energy Transitions Commission (ETC) is a global coalition of leaders from across the energy landscape committed to achieving net-zero emissions by mid-century, in line with the Paris climate objective of limiting global warming to well below 2°C and ideally to 1.5°C.

Our Commissioners come from a range of organisations – energy producers, energy-intensive industries, technology providers, finance players and environmental NGOs – which operate across developed and developing countries and play different roles in the energy transition. This diversity of viewpoints informs our work: our analyses are developed with a systems perspective through extensive exchanges with experts and practitioners. The ETC is chaired by Lord Adair Turner who works with the ETC team, led by Faustine Delasalle. Our Commissioners are listed on the next page.

Keeping 1.5°C Alive: Closing the Gap in the 2020s was developed by the Commissioners with the support of the ETC Secretariat, provided by SYSTEMIQ. This briefing paper has also been developed in close consultation with experts from companies, industry initiatives, international organisations, non-governmental organisations and academia. The publication was developed with input from the UK COP26 team to enhance the available analysis in the lead up to COP26. This briefing paper draws heavily on work developed by Climate Action Tracker (CAT) and the International Energy Agency (IEA), and ETC knowledge partners BloombergNEF. We warmly thank our knowledge partners and contributors for their inputs.

This report constitutes a collective view of the Energy Transitions Commission. Members of the ETC endorse the general thrust of the arguments made in this publication but should not be taken as agreeing with every finding or recommendation. The institutions with which the Commissioners are affiliated have not been asked to formally endorse this briefing paper.

The ETC Commissioners not only agree on the importance of reaching net-zero carbon emissions from the energy and industrial systems by mid-century, but also share a broad vision of how the transition can be achieved. The fact that this agreement is possible between leaders from companies and organisations with different perspectives on and interests in the energy system should give decision makers across the world confidence that it is possible simultaneously to grow the global economy and to limit global warming to well below 2°C. Many of the key actions to achieve these goals are clear and can be pursued without delay.

Learn more at:

www.energy-transitions.org

www.linkedin.com/company/energy-transitions-commission

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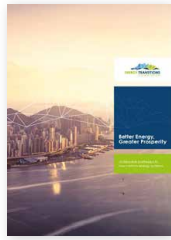
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Ms. Cathy Zoi,
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Major ETC reports and working papers



Global Reports



Better Energy, Greater Prosperity (2017) outlined four complementary decarbonisation strategies, positioning power decarbonisation and clean electrification as major complementary progress levers.



Mission Possible (2018) outlined pathways to reach net-zero emissions from the harder-to-abate sectors in heavy industry (cement, steel, plastics) and heavy-duty transport (trucking, shipping, aviation).



Making Mission Possible (2020) showed that a net-zero global economy is technically and economically possible by mid-century and will require a profound transformation of the global energy system.



Making Mission Possible Series – a series of reports outlining how to scale up clean energy provision to achieve a net-zero emissions economy by mid-century. The reports set out specific actions in the 2020s to put this net-zero by 2050 target within reach.



Sectoral and cross-sectoral focuses



Sectoral focuses provided detailed decarbonisation analyses on each of the six harder-to-abate sectors after the publication of the Mission Possible report (2019).

Our latest focus on building heating (2020) details decarbonisation pathways and costs for building heating, and implications for energy systems.

As a core partner of the Mission Possible Partnership, the ETC also completes analysis to support a range of sectoral decarbonisation initiatives:



In October 2020, the corporate members of the Clean Skies for Tomorrow initiative (CST) developed a **Joint Policy Proposal to Accelerate the Deployment of Sustainable Aviation Fuels in Europe**.

Produced for the Getting to Zero Coalition, **“The First Wave – A blueprint for commercial-scale zero-emission shipping pilots”** (2020) highlights five key actions that first movers can take to make tangible progress towards zero emission pilots over the next three to four years.

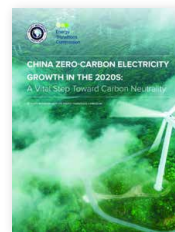
Steeling Demand: Mobilising buyers to bring net-zero steel to market before 2030 demonstrates that demand signals from steel buyers to steel manufacturers can help unlock investment and breakthrough technologies needed for net-zero primary steel.



Geographical focuses



China 2050: A Fully Developed Rich Zero-carbon Economy described the possible evolution of China's energy demand sector by sector, analysing energy sources, technologies and policy interventions required to reach net-zero carbon emissions by 2050.



China Zero Carbon Electricity Growth in the 2020s: A Vital Step Toward Carbon Neutrality (January 2021). Following the announcement of China's aim to achieve carbon neutrality before 2060 and peak emissions before 2030. This report examines what action is required by 2030 aligned with what is needed to fully decarbonise China's power sector by 2050.



A series of reports on the Indian power system and outlining decarbonisation roadmaps for Indian industry (2019-2020) described how India could rapidly expand electricity supply without building more coal-fired power stations, and how India can industrialise whilst decarbonising heavy industry sectors.



Setting Up Industry for Net-Zero (June 2021) explores the state of play in Australia and opportunities for transition to net-zero emissions in five supply chains – steel, aluminium, liquefied natural gas, other metals and chemicals.

Glossary

Abatement cost: The cost of reducing CO₂ emissions, usually expressed in US\$ per tonne of CO₂.

Afforestation and reforestation: “The planting of new forests on land not currently under forest cover. The forests remove carbon from the atmosphere as they grow.”¹

BECCS: A technology that combines bioenergy with carbon capture and storage to produce energy and net negative greenhouse gas emissions (i.e., removal of carbon dioxide from the atmosphere). See ‘BiCRS’.

BEV: Battery-electric vehicle.

BiCRS: Biomass carbon removal and storage. This term includes BECCS and other forms of carbon dioxide removal (e.g., biochar).²

Biochar: “The thermal decomposition of biomass in the absence of oxygen forms a charcoal known as biochar. This can be added to soils to improve soil fertility and to act as a stable long-term store of carbon.”³

Bioenergy: Renewable energy derived from biological sources in the form of solid biomass, biogas, or biofuels.

Biofuels: “Liquid fuels derived from biomass, used primarily for transport, including ethanol, biodiesel and other liquids.”⁴

Biomass or bio-feedstock: Organic matter, i.e., biogenic material, available on a renewable basis from living or recently living organisms. Includes feedstock derived from plants or animals, such as agricultural and energy crops, wood and forestry residues, organic waste from municipal and industrial sources (including manure), and algae.

Carbon capture and storage or use (CCS/U): We use the term ‘carbon capture’ to refer to the process of capturing CO₂ on the back of energy and industrial processes. Unless specified otherwise, we do not include direct air carbon capture (DACC) when using this term. The term ‘carbon capture and storage’ (CCS) refers to the combination of carbon capture with underground carbon storage; while ‘carbon capture and use’ (CCU) refers to the use of carbon in carbon-based products in which CO₂ is sequestered over the long term (e.g., in concrete, aggregates, carbon fibre). Carbon-based products that only delay emissions in the short term (e.g., synfuels) are excluded when using this terminology.

Carbon dioxide removals (CDR): sometimes shortened to ‘carbon removals’ refers to actions such as NCS or DACCS that can result in a net removal of CO₂ from the atmosphere.

Carbon emissions / CO₂ emissions: We use these terms interchangeably to describe anthropogenic emissions of carbon dioxide in the atmosphere.

Carbon offsets: Reductions in emissions of carbon dioxide (CO₂) or greenhouse gases made by a company, sector, or economy to compensate for emissions made elsewhere in the economy.

Carbon price: A government-imposed pricing mechanism, the two main types being either a tax on products and services based on their carbon intensity, or a quota system setting a cap on permissible emissions in the country or region and allowing companies to trade the right to emit carbon (i.e., as allowances). This should be distinguished from some companies’ use of what are sometimes called ‘internal’ or ‘shadow’ carbon prices, which are not prices or levies, but individual project screening values.

Circular economy models: Economic models that ensure the recirculation of resources and materials in the economy, by recycling a larger share of materials, reducing waste in production, light-weighting products and structures, extending the lifetimes of products, and deploying new business models based around sharing of cars, buildings, and more.

Direct air carbon capture (DACC): The extraction of carbon dioxide from atmospheric air. This is also commonly abbreviated as ‘DAC’.

Direct air carbon capture and storage (DACCS): DACC combined with carbon storage.

EBIT sectors: Energy, building, industry, and transport sectors.

Ecosystem services: Services from nature including nutrient cycling, flood and disease control, and recreational and cultural benefits.⁵

Embedded carbon emissions: Lifecycle carbon emissions from a product, including carbon emissions from the materials input production and manufacturing process.

Greenhouse gases (GHGs): Gases that trap heat in the atmosphere. Global GHG emission contributions by gas – CO₂ (76%), methane (16%), nitrous oxide (6%) and fluorinated gases (2%).

Heavy Goods Vehicles (HGV) or Heavy Duty Vehicle (HDV): Both terms are used interchangeably and refer to trucks ranging from 3.5 tonnes to over 50 tonnes.

Internal combustion engine (ICE): A traditional engine, powered by gasoline, diesel, biofuels, or natural gas. It is also possible to burn ammonia or hydrogen in an ICE.

Levelised cost of electricity (LCOE): A measure of the average net present cost of electricity generation for a generating plant over its lifetime. The LCOE is calculated as the ratio between all the discounted costs over the lifetime of an electricity-generating plant divided by a discounted sum of the actual energy amounts delivered.

Lifecycle emissions: Emissions from the energy, material, and waste flows of a product and their impact on the environment.⁶ Life cycle assessments (LCAs) should take into account the greenhouse gas impacts across land use change (if applicable), growth, harvesting, transportation, conversion, and use of bioresources.

Natural carbon sinks: Natural reservoirs storing more CO₂ than they emit. Forests, plants, soils, and oceans are natural carbon sinks.

Natural Climate Solutions (NCS): Actions considered to be a subset of nature-based solutions (NBS) with a specific focus on addressing climate change. NCS has been defined as “conservation, restoration, and/or improved land management actions to increase carbon storage and/or avoid greenhouse gas emissions across global forests, wetlands, grasslands, agricultural lands, and oceans.”⁷ NCS can be coupled with technology to secure long-term or permanent storage of GHGs, examples include CCS, the use of technologies such as torrefaction to process biomass or monitoring to improve forest management techniques for increased density.

Negative emissions (or ‘net negative’ emissions): is used for the case where the combination of all sector CO₂ emissions plus carbon removals results in an absolute negative (and thus a reduction in the stock of atmospheric CO₂).

Net-zero-carbon-emissions / Net-zero-carbon / Net-zero: We use these terms interchangeably to describe the situation in which the energy and industrial system as a whole or a specific economic sector releases no CO₂ emissions – either because it doesn’t produce any or because it captures the CO₂ it produces to use or store. In this situation, the use of offsets from other sectors (‘real net-zero’) should be extremely limited and used only to compensate for residual emissions from imperfect levels of carbon capture, unavoidable end-of-life emissions, or remaining emissions from the agriculture sector.

Peatlands: Peatlands contain layers of partially decomposed organic material preserved in waterlogged environments. They contain a large fraction of the world’s terrestrial carbon stock and when damaged or destroyed can become large sources of GHG emissions.

Zero-carbon energy sources: Term used to refer to renewables (including solar, wind, hydro, geothermal energy), sustainable biomass, nuclear and fossil fuels if and when their use can be decarbonised through carbon capture.

1 UK Committee on Climate Change (2018), *Biomass in a low-carbon economy*.

2 Sandalow et al. (2021), Biomass carbon removal and storage (BiCRS) roadmap.

3 UK Committee on Climate Change (2018), *Biomass in a low-carbon economy*.

4 BP (2014), *Biomass in the Energy Industry – an introduction*.

5 BP (2014), *Biomass in the Energy Industry – an introduction*.

6 BP (2014), *Biomass in the Energy Industry – an introduction*.

7 Griscom et al. (2017), *Natural Climate Solutions*.

Executive Summary

In November the world will hold the landmark 26th Conference of the Parties (COP26) in Glasgow, aiming to accelerate global action to avert potentially catastrophic climate change. Ahead of that meeting, many countries, cities, and companies have made commitments to reach net-zero emissions (whether for carbon dioxide or all greenhouse gas emissions (GHGs) by 2050 or 2060). In addition, over 100 countries have submitted new “nationally determined contributions” (NDCs) within the Paris agreement framework, updating their previous targets for reductions to be achieved by 2030. But, the sum of these pledges still falls far short of what is required to deliver a more than 50% chance of limiting global warming to 1.5°C.¹

This report describes 6 sets of action which if agreed at COP 26 and implemented during the 2020s would make it possible to achieve the 1.5°C target. It focuses on actions which are clearly technically feasible and which could initially be progressed by leading groups of governments and/or companies without the need for comprehensive internationally negotiated agreements. Many of these actions would also deliver significant co-benefits, for example through improved local air quality.

Four of the action categories would entail either nil or even negative costs, or costs which could very easily be absorbed by the global economy:

- These include low cost actions to reduce methane emissions, which has not previously received the attention it deserves, given methane’s crucial role in global warming and the big potential for short term reductions and favourable climate impact;
- They also include action to accelerate road transport electrification, energy efficiency improvement, and the decarbonisation of sectors such as steel, cement, shipping and aviation, which until recently were seen as “harder to abate”. In some of these sectors indeed technological progress, cost reductions and corporate commitments make it likely that emission reductions will run ahead of current NDC commitments even if no new agreements were made at COP26. But additional commitments and agreements would reinforce the powerful “ambition loop” between national policy, corporate action and technological progress, enabling still faster emissions reduction, while supporting economic growth.

Two categories of action would however entail material economic cost. Committing to no new coal investments is close to costless, but reducing emissions from existing coal plants before end of life would impose some cost, particularly in some lower income developing countries. So too would action to halt deforestation, which has long been identified as a high priority, but with limited progress. Commitments of climate finance support from developing countries will therefore be required to seize the potential in these two specific categories.

The starting point - how big is the gap?

Box A shows the starting point from which emissions reductions must be achieved and explains the complexities involved in assessing the relative importance of carbon dioxide and methane emissions. According to the period considered over which the warming impacts of methane are felt, current CH₄ emissions of around 375 MtCH₄/year could be considered as equivalent to anywhere between 11 GtCO₂/year (100-year view) and 31 GtCO₂/year (20-year view), and the measure of impact of any given methane emissions reduction varies by the same proportion. There is no clear “correct” way to measure the equivalence of methane emissions, but given the vital importance of reducing global warming soon – and the risk of tipping points and feedback loops from continued warming - there is a strong argument for placing as much emphasis on the 20-year period (which implies a 84 times multiplier vs CO₂) as on the 100-year (28 multiplier) approach. Latest analysis by the IPCC suggests that about 40% of global warming so far has been caused by methane rather than carbon dioxide emissions. In this report, we therefore place very strong emphasis on the importance of reducing methane emissions and show the impact of methane reductions on both the 20-year and 100-year bases.²

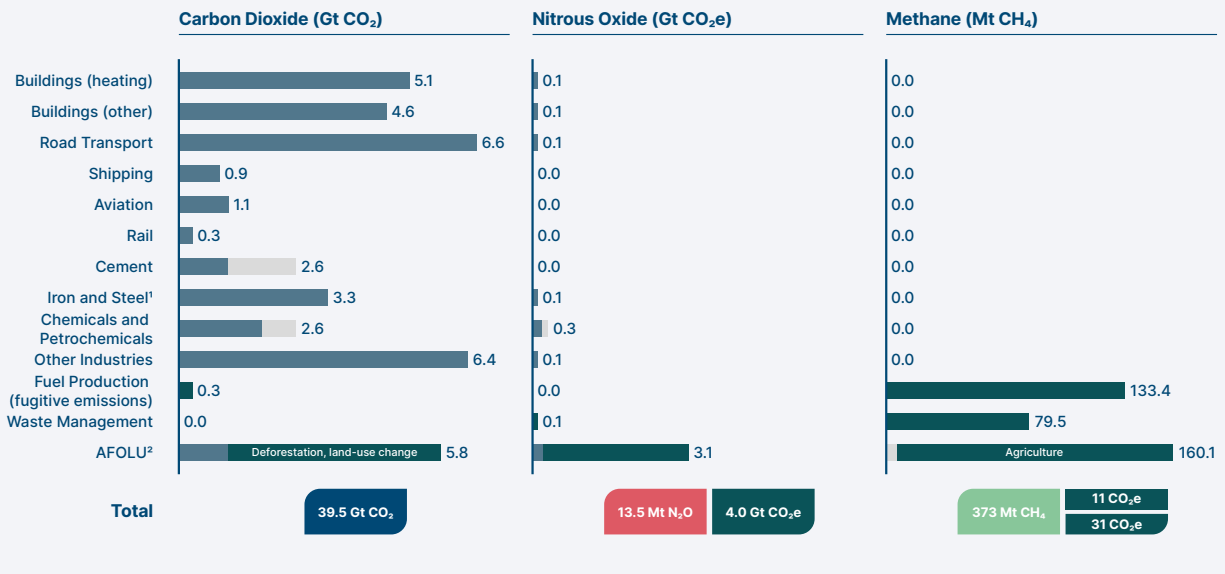
1 The Paris agreement committed the world to limiting global warming to “Well below 2°C, while pursuing efforts to limit the temperature rise to 1.5°C”. The IPCC *Special report on Global Warming of 1.5°C*, published in Autumn 2019 argued that a limit of 1.5°C should be the objective given the increasing harm which would result as temperature rises to and beyond that point. It is already close to impossible to ensure a high probability that warming will be limited to 1.5°C. This report focuses on the actions required to give a 50:50 chance of limiting warming to 1.5°C and a 90% chance of keeping it below 2°C.

2 Emissions from other greenhouse gases are also important - particularly nitrous oxide, much of which results from use of fertilisers in the agricultural sector, and fluorinated gases, typically used as refrigerants – however the actions identified in this report focus solely on reducing emissions from carbon dioxide and methane.

Total emissions today are 40 GtCO₂, 4 GtCO₂e from N₂O and 375 MtCH₄ from EBIT sectors, waste and AFOLU

Scope of emissions considered (2019)

Fuel Emissions Process Emissions Other



NOTES: ¹ Due to the production process, process emissions and fuel emissions are typically not separated for iron and steel; ² AFOLU: Agriculture, Forestry, and Other Land Use. Estimates of global greenhouse gas emissions in 2019 range widely as a result of varying assumptions, including different assumptions on GWP of methane. SOURCE: SYSTEMIQ analysis for the ETC based on: IEA (2020), *Energy Technology Perspectives*; EDGAR database; SSP database by IIASA; IEA (2020), *Methane Tracker*.

The main gases responsible for global warming are carbon dioxide, methane, nitrous oxide and fluorinated gases. Estimated 2019 emissions are shown in the box above, at around 40 GtCO₂, 13.5 Mt N₂O and around 375 MtCH₄. In each case, the “forcing effect” which induces global warming, is a function of the atmospheric concentration of the gas at any time. Differences in the average lifetime of gases have implications for whether emissions reductions objectives should focus on stocks (the total quantity) or flows (the annual rate), and for how to compare the relative importance of carbon dioxide and methane emissions:

- Carbon dioxide and nitrous oxide are both long-lived gases, which take many decades or centuries to dissipate. Annual flows must therefore fall to zero to prevent further increases in atmospheric concentrations and thus temperature, and emission reduction strategies should ensure that cumulative future emissions do not exceed defined maximum “budgets”. One tonne of N₂O has a forcing effect equal to about 260 times a tonne of CO₂, and today’s 15 Mt of annual N₂O emissions can thus be considered equivalent to around 4 GtCO₂.
- By contrast, methane is a relatively short-lived gas. Concentrations and the forcing effect would therefore stabilise if the flow of new methane emissions ceased to rise. However, this does not mean that the appropriate objective should be simply to stabilise rather than reduce methane emissions. The fact that methane is short-lived means that reducing methane emissions is the most powerful lever to reduce short-term temperature rises and risks of unlocking climate feedback loops. Appropriate objectives for methane emissions are therefore expressed in terms of how fast annual flows should fall over time rather than “budgets”.³

Given the different lifetimes of carbon dioxide and methane, estimates of the “carbon equivalent” effect of methane emissions depends on the timescale assumed. Over 100 years, a tonne of methane emitted today has a forcing effect (and therefore impact on temperature on average over the period) about 28 times that of a tonne of carbon dioxide emitted today. However, viewed over 20 years, methane’s impact is around 84 times greater per tonne emitted. (These were corrected to 29.5 and 82.5 respectively in the IPCC’s recent AR6 report). Neither measure is definitively “correct”, but the possibility of climate feedback loops and the need to limit temperature increases as rapidly as possible argues for a strong focus on the 20-year time frame and 84-times multiplier measure.

3 ETC Consultation Paper (2021) *Reaching climate objectives: the role of carbon dioxide removals*.

Using the 100-year approach referenced in many external sources, current total GHG emissions amount to about 55 GtCO₂e equivalent (“CO₂e”, see exhibit in Box A) and that figure would continue to rise under a business-as-usual scenario. Analysis suggests that policies already in place could deliver a reduction to as low as 51 GtCO₂e by 2030. New NDC commitments could bring emissions down by another 2-5 GtCO₂e, to a level around 46-49 GtCO₂e in 2030. However, reductions in total emissions to somewhere around 25-30 GtCO₂e by 2030 would be needed to put the world on a pathway which would limit global warming to 1.5°C.⁴ The world, therefore, faces an “emissions gap” of around 20-23 GtCO₂e between what needs to be achieved and what is likely to be committed to in NDCs agreed by COP26.⁵

Six sets of actions to close the gap

Almost all of this gap could be closed via the feasible actions identified in this report. Methane emissions could be cut by 40%, delivering about 130 MtCH₄ of reduction not already included in current NDCs. This would be equivalent to a CO₂e reduction of around 3.5 Gt on the 100-year (28 multiplier) basis, and around 11 Gt on the 20-year basis (84 multiplier) (Exhibit 1). Feasible actions could reduce carbon dioxide emissions by an additional 17 GtCO₂ beyond NDC commitments, with 6.6 Gt CO₂ of reductions delivered by “Nature-Based Solutions” and over 10 GtCO₂ via accelerated reduction of emissions from the energy, building, industry and transport (EBIT) sectors (Exhibit 2).

In order to achieve this, we propose a programme of action involving six action areas:

1. Significant and rapid reductions in methane emissions, delivering an additional reduction of 3.5 GtCO₂e (100-year view) to 11 GtCO₂e (20-year view) beyond current NDCs, depending on the time period assumed. This could be achieved via two distinct categories of action:

- Emissions arising from fuel production, transport, and use, which currently amount to around 135 Mt CH₄, could and should be reduced by 60% or more by 2030, led by reduction of 75% in US, Russia, Canada and China. Coal-related emissions will automatically fall if coal use is phased out in the power sector, while emissions arising from leaks in the oil and gas production and distribution system could be radically reduced through an array of technically feasible actions. Many of the actions required to achieve this will entail negative, zero, or minimal cost, but rapid progress will only be achieved through strong action by key governments, companies, and the financial sector supported by strong regulation, independent monitoring, and certification.
- Reducing emissions in the waste and agricultural sectors will be more challenging. Low-cost opportunities clearly exist, but progress will require actions by very large numbers of companies and individual producers across the world or entail consumer behaviour shifts towards more plant-based and less meat-based diets. However, a strong international focus on achieving the potential reductions, supported by multiple forms of national, corporate, city, and consumer action, could deliver reductions of 30% by 2030.

Given the vital importance of reducing methane emissions fast, COP26 should therefore be used as an opportunity to launch an initiative to reduce annual methane emissions by at least 40% by 2030, or 150 MtCH₄ per year, building on (but strengthening) the Global Methane Pledge.

2. Halting deforestation, beginning reforestation and other carbon sequestration opportunities. The potential and need to reduce carbon dioxide emissions by ending deforestation has long been recognised. By 2030, 3.6 GtCO₂ of annual emissions could be eliminated if deforestation ceased, and almost 3 GtCO₂ per annum could be removed from the atmosphere via reforestation and other nature-based actions to sequester carbon in soils and restored ecosystems. Development of new technology is not necessary to achieve this (though it can be an enabler), and in principle the costs of abatement are low, but success will require a combination of:

- Flows of finance from developed to developing countries to cover the short-term opportunity cost of preserving tropical forests rather than exploiting them for alternative activities such as feedstock crops or cattle rearing, and to support reforestation of around 300 million hectares of land by 2030. Estimates suggest that the cost of such action would be low compared with other mitigation options – for instance nearly 2 GtCO₂ could potentially be avoided at a cost of less than \$10 per tonne of CO₂, with a further 1 GtCO₂ available at less than \$100 per tonne of CO₂.⁶ Estimates for reforestation and afforestation are consistently in the range of around \$5-50/tCO₂.⁷ Large-scale financial flows will be required to achieve the potential reductions – for example \$200 billion per annum would be required to achieve 5 GtCO₂ of reductions at an average cost of \$40 per tonne.
- Jurisdictional approaches to land management at a regional or national level, that ensure emissions are genuinely reduced, rather than simply displaced.
- Widespread changes in consumer behaviour to begin a shift from meat-based to more plant-based diets.

4 The GHG emissions level baselines and pathways in this report are based on analysis from Climate Action Tracker. Further details on this analysis and comparison with other methodologies are included in the Annex. CAT’s estimates for NDCs are consistent with the September 2021 update of the UNFCCC *NDC Synthesis Report*.

5 The emissions gap would be larger if using a 20-year multiplier for methane, however this report consistently uses the 100 year multiplier when referring to the 2030 emissions gap in CO₂e.

6 Based on estimates in Griscom et al. (2017) *Natural Climate Solutions*.

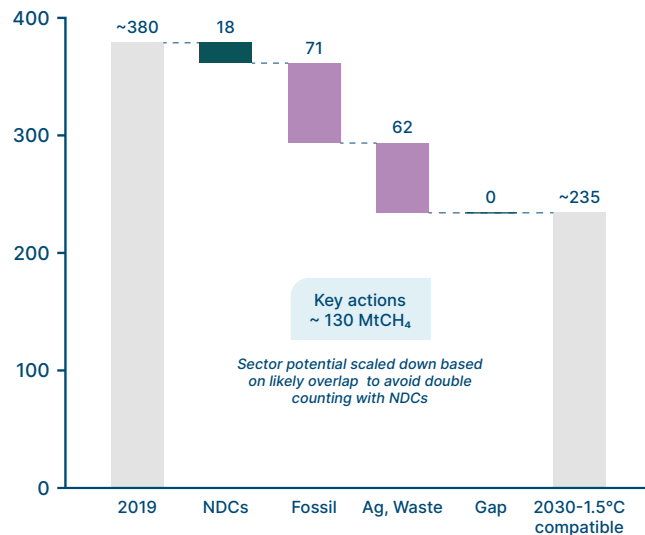
7 Royal Society (2018) *Greenhouse Gas Removal*. Fuss et al. (2018) *Negative emissions—Part 2: Costs, potentials and side effects*.

In addition to nature-based forms of carbon sequestration it is possible to achieve 0.1 GtCO₂ carbon removal by 2030 via carbon capture technologies combined with geological storage of CO₂, whether via BiCRS (biomass carbon removal and storage) or DACCS (direct air capture of CO₂ plus storage). Early projects in the 2020s can ensure these technologies are available to deploy at scale beyond 2030.

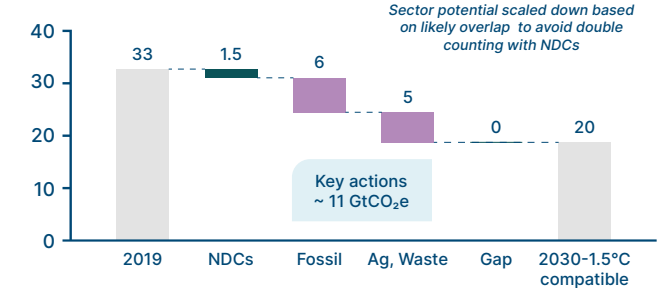
Highly feasible actions to reduce methane can deliver an additional ~130 MtCH₄ (3.5-11 GtCO₂e) beyond current NDCs in 2030

Global CH₄ emissions

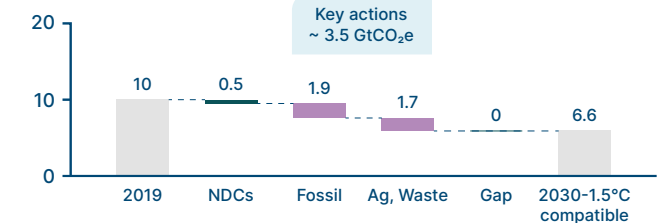
Mt CH₄, Global, annual



GtCO₂e, Global, annual
Based on 20-year GWP = 84



Based on 100-year GWP = 28



NOTE: NDC emissions reductions are based on average of CAT "pledges and targets" pathway adjusted for CH₄. 1.5C compatible levels in 2030 are based on IPCC 1.5C no/low overshoot scenario median.

SOURCE: IPCC (2018), *Global warming of 1.5°C. An IPCC Special Report*, Climate Action Tracker (CAT), SYSTEMIQ analysis for the Energy Transitions Commission (2021).

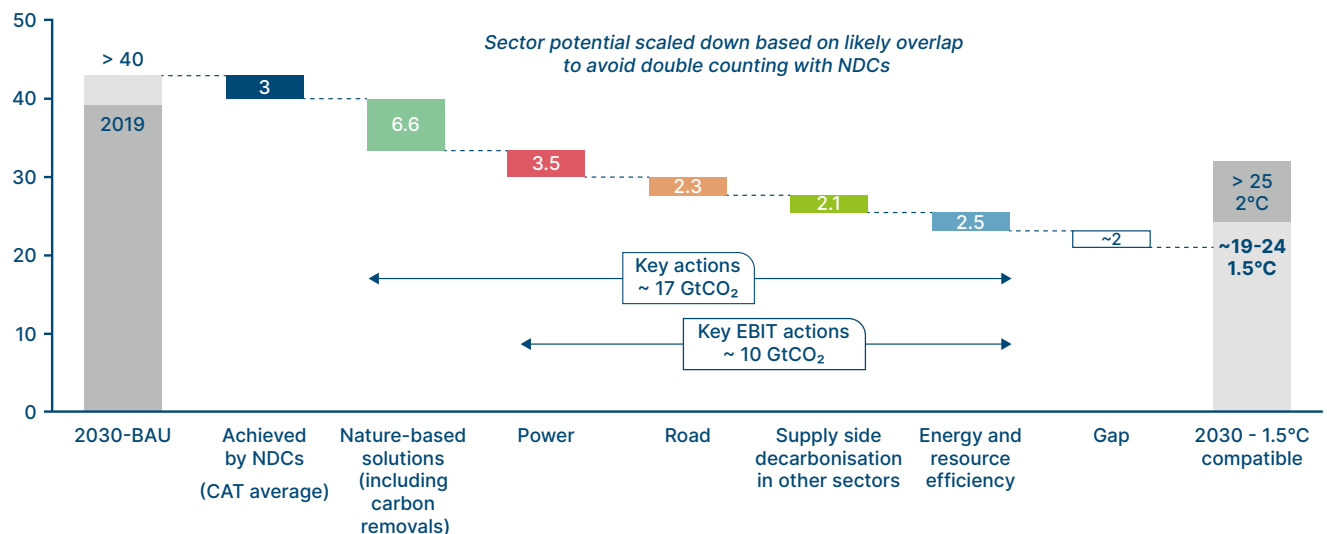
Exhibit 1

Highly feasible actions to reduce carbon dioxide can deliver an additional ~17 GtCO₂ reductions beyond current NDCs in 2030

Global CO₂ emissions

Gt CO₂, Global, annual

EBIT = Energy, Buildings, Transport and Industry



NOTE: 2030 BAU CO₂ emissions are estimated based on CAT CO₂e 2030 BAU average (53GtCO₂e) minus current methane levels in GWP=25 terms (9.3 GtCO₂e). NDC emissions reductions are estimated based on average of CAT "pledges and targets" pathway adjusted for CO₂. 1.5°C and 2°C compatible levels in 2030 are based on IPCC 1.5°C no/low overshoot scenario ranges.

SOURCE: IPCC (2018), *Global warming of 1.5°C. An IPCC Special Report*, Climate Action Tracker (CAT), SYSTEMIQ analysis for the Energy Transitions Commission (2021).

Exhibit 2

A crucial priority for COP26 should be to gain as strong an agreement as possible on ending deforestation, supported by appropriate flows of international climate finance. An end to deforestation, the beginning of reforestation and other nature-based solutions should indeed (along with action to eliminate emissions from existing coal plants – see below) be the highest priority for use of the funds which rich developed countries have committed to international climate finance.

3. Decarbonising the power sector – accelerating coal phase-out. Power sector CO₂ emissions were over 13 Gt in 2019, with 9.5 Gt of this arising from coal-fired power. In addition, coal-related CH₄ emissions of an estimated 40 MtCH₄ produce an equivalent impact of 1 GtCO₂e (100-year view) to 3 GtCO₂e (20-year view). Accelerating the move beyond coal power generation is therefore one of the highest potential actions to reduce emissions in the short term. An additional 3.5 GtCO₂ reductions, beyond current NDC commitments, together with proportional cuts in coal-related methane, could be achieved via a combination of three actions:

- Clear international agreement to build no new coal plants, scrapping the vast majority of the 300 GW of proposed new coal capacity still in the pipeline. This is a close to costless commitment since renewables are now cheap enough to deliver increases in power production and consumption at total system costs fully competitive with new coal.⁸
- Commitments by all OECD countries to completely phase out any unabated coal generation by 2030 – either through closing coal plants entirely or by adding CCS. The costs of this will be very small relative to the GDP of rich countries.⁹
- Action to phase out ~760 GW older existing coal plants (e.g. plants greater than 20 years old) in middle-income and developing economies. This may entail a significant net cost and should be a high priority for the use of climate finance funds by which the rich developed world supports accelerated decarbonisation in lower-income developing countries.

A strong agreement between major countries to move beyond coal in the 2020s is therefore a vital COP26 priority. This should align and expand on existing initiatives such as the Powering Past Coal Alliance and entail financial support from developed countries to middle-income and developing countries.¹⁰

4. Accelerating road transport electrification: Technological progress and cost reduction in batteries and electric vehicles (EVs) now make it possible to drive road transport electrification far more rapidly than seemed feasible five years ago. Within the next decade, shifting to passenger EVs will be a negative cost transition, delivering savings to consumers rather than additional costs. National strategies for vehicle electrification included in the NDCs have begun to reflect this potential, but in most cases still do not reflect the size of the potential zero-cost prize. Agreement at COP26 to ban all sales of ICE light-duty vehicles by 2035, combined with city-based action to restrict the use of existing ICE vehicles beyond defined future dates, could lead to around 20% of cars on the road being electric by 2030 and deliver around 2 GtCO₂/year of reductions, with an additional 0.6 GtCO₂/year of savings possible from low or negative cost action to improve heavy-duty truck efficiency.

A strong agreement to commit to ending sales of light-duty ICE vehicles by 2035 at the latest is therefore a crucial COP26 priority, supported by clear targets from countries and car manufacturers.

5. Accelerating supply decarbonisation in buildings, heavy transport, and heavy industry. As the Energy Transitions Commission (ETC) showed in its *Mission Possible* report in November 2018, it is technically and economically feasible for even the so-called “harder to abate” sectors of the economy – such as steel, cement and chemicals, long-distance aviation and shipping – to reach net zero emissions by mid-century at a trivial cost to global economic growth and living standards. Many leading companies in these sectors have now made net zero by 2050 commitments.

Until recently however, most published pathways for emission reductions in these sectors assumed a strongly convex shape, with very limited progress to 2030, followed by gradual acceleration in the 2030s. Most current NDCs therefore reflect this minimal near term ambition. The Mission Possible Partnership (MPP) is now working to define and agree sectoral pathways to 2030 and on to 2050. In some sectors these will still suggest only moderate reduction potential in the 2020s given the inherent challenges created by long lasting capital assets. But action to maximise progress could still deliver an additional reduction of around 1 GtCO₂ per annum by 2030, and enable full decarbonisation of these industries between 2030-2050. The concentrated and inherently global nature of these industries makes them natural targets for internationally agreed action at COP26. Actions focused on key enabling technologies – in particular hydrogen and CCS – could support sectoral focused initiatives.

⁸ ETC (2021) *Making Clean Electrification Possible*.

⁹ ETC (2021) *Making Clean Electrification Possible*.

¹⁰ The PPCA encourages countries and corporates to commit to phase out coal by 2030 in the OECD and EU, and by no later than 2050 in the rest of the world.

International agreements to accelerate electrification of parts of industry and buildings – e.g. via the deployment of heat pump and other technologies relevant to residential heating and of light industry - could also help deliver an additional 1 GtCO₂/year of emissions reductions.

COP26 should aim to achieve agreements between leading coalitions of countries, companies and sectoral organisations to drive accelerated decarbonisation of the steel, cement, aviation and shipping sectors. Leading countries could also commit to accelerated electrification (e.g. via heat pumps), and scaling up clean hydrogen.

6. Energy and resource efficiency: Many past analyses have identified a major opportunity to reduce emissions by improving the energy efficiency of buildings, equipment and materials use, and through wider changes to increase overall “energy productivity” (energy use per unit of GDP) through, for instance, better-designed cities, digital technologies, and more circular production systems. However, progress has been disappointingly slow and has declined in recent years, in part because it requires action by many millions of economic actors across the world. Moreover, many aspects of required policy are inherently local in nature, limiting the potential role for international agreements. But an international agreement for specific standards and regulations focused on improving the energy efficiency of new buildings could deliver 1.4 GtCO₂ per year reduction by 2030, with another 1.5 GtCO₂ potentially from a series of other actions (e.g. retrofits to existing buildings and improved longevity and recycling of consumer goods). Early action to encourage less carbon-intensive city design is essential in the 2020s to deliver faster progress in the 2030-40s.

Government commitments to adopt best-in-class building standards and product efficiencies should therefore be a priority at COP26.

The infographics on the following pages set out a selection of specific actions which could be taken to seize the opportunities identified and highlights potential discrete international agreements that could be used to increase ambition at COP26. A comprehensive list of actions is found at the end of this report.

Almost inevitably, agreements made at COP26 will not be sufficient in themselves to make it certain that a 1.5°C pathway can be achieved. But if COP26 can gain agreement that these are the areas for highest potential short-term action, achieve some progress on each, and put in place processes for future reinforcement of commitments over the next two years – leading to a stocktake in 2023 - it could still play a crucial role in keeping alive the potential to limit global warming to 1.5°C.

The rest of this report sets out this argument in detail, covering in turn:

- **The need for faster progress in the 2020s.**
- **What has changed since Paris? Technologies, costs, and scientific understanding.**
- **Assessing the potential to go beyond NDCs: methodology and approach.**
- **Feasible actions to accelerate emissions reductions – 6 key categories for priority action.**
- **Adding it up – can we close the gap?**
- **Actions at and after COP26.**

HOW TO KEEP 1.5°C ALIVE

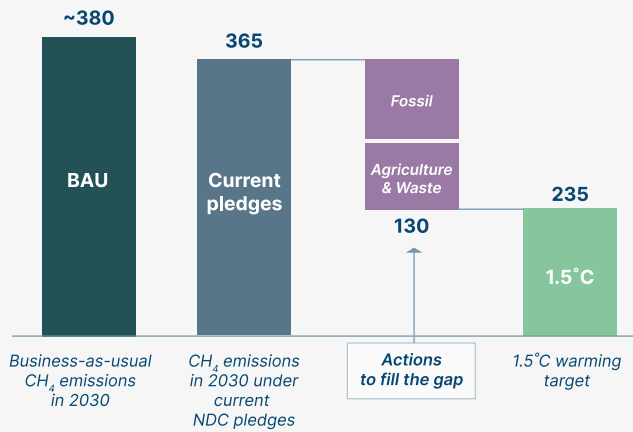
WHAT IT WILL TAKE



REDUCE METHANE EMISSIONS BY 40%

CH₄

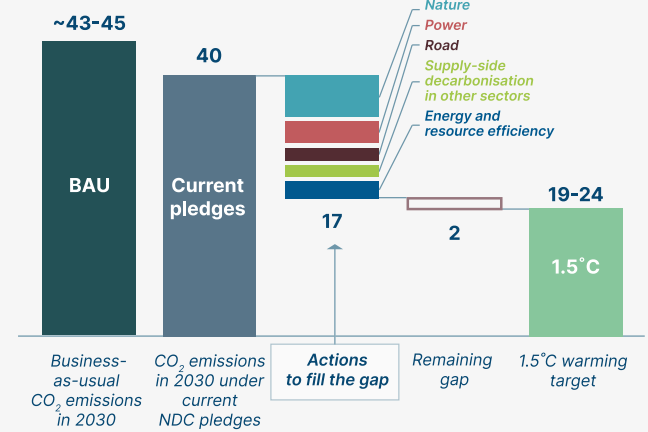
Global annual methane emissions (MtCH₄), 2030



REDUCE CARBON DIOXIDE EMISSIONS BY 45%

CO₂

Global annual carbon dioxide emissions (GtCO₂), 2030



CLOSING THE METHANE EMISSIONS REDUCTION GAP

MtCH₄

1.9 GtCO₂e (100-year view)
- 6 GtCO₂e (20-year view)

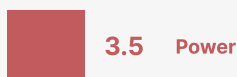


1.7 GtCO₂e (100-year view)
- 5 GtCO₂e (20-year view)



CLOSING THE CARBON DIOXIDE EMISSIONS REDUCTION GAP

GtCO₂



COP26 TARGET OUTCOMES

- Countries and companies to cut global fossil methane emissions by 60% in the 2020s (building on the Global Methane Pledge)
- Country and company commitments to cut non fossil methane emissions by 30% in the 2020s (building on the Global Methane Pledge)

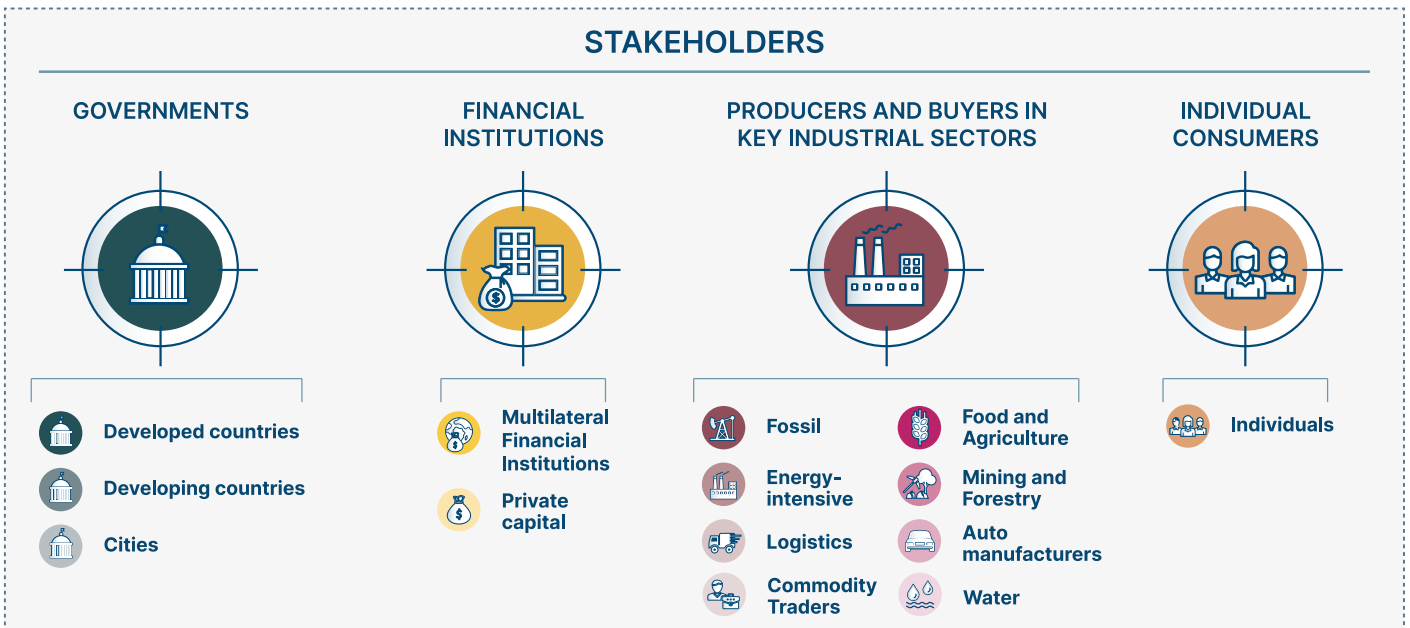
- Strong agreement on ending deforestation and driving ecosystem restoration, supported by clear commitments for international climate finance from developed nations
- Strong agreement between major countries to move beyond coal in the 2020s, with clear commitments to no new coal, and developed country support for early exit
- Strong agreement to commit to ending sales of light-duty ICE vehicles by 2035 at the latest, supported by clear targets from countries, cities and auto manufacturers
- Strong agreement between countries, companies and sectoral organisations for accelerated decarbonisation of the steel, cement, aviation and shipping sectors
- Strong agreement to make energy and resource efficiency key features of future NDCs, supported by adoption of best-in-class building standards, product efficiencies

HOW TO KEEP 1.5°C ALIVE

WHAT WE NEED TO DO



STAKEHOLDERS



ADDITIONAL EMISSIONS REDUCTIONS BY 2030

WHAT – ACTIONS FOR THE 2020s

STAKEHOLDER

	ADDITIONAL EMISSIONS REDUCTIONS BY 2030	WHAT – ACTIONS FOR THE 2020s	STAKEHOLDER
METHANE	Fossil 71 MtCH₄	<ul style="list-style-type: none"> Limit maximum leakage rates to well below 1%, starting in top emitting countries, backed by large fines and certification schemes (e.g. MiQ) Funding for satellite monitoring of methane leakage 	
	Agriculture & Waste 62 MtCH₄	<ul style="list-style-type: none"> Reducing food waste on farms and in transit via logistics and technology Food product labelling highlighting emissions impact and support for development of alternative proteins to drive diet shift Investment in wastewater treatment and waste collection 	
CARBON DIOXIDE	Nature 6.6 GtCO₂	<ul style="list-style-type: none"> Rapid scale-up in finance from developed countries, and ambitious corporates Commitment to deforestation-free supply chains R&D funding for high-yield crops; campaigns to promote lower-impact diets 	
	Power 3.5 GtCO₂	<ul style="list-style-type: none"> Immediate end to new coal financing Targeted financial support from developed countries for early coal retirement 	
	Road 2.3 GtCO₂	<ul style="list-style-type: none"> Global light-duty ICE sales ban by 2035 at the latest Fleet-wide fuel efficiency standards for heavy-duty vehicles, and incentives for low-carbon fuels Commitments and funding for EV charging infrastructure 	
	Supply-side decarbonisation in other sectors 2.1 GtCO₂	<ul style="list-style-type: none"> Introduce policy support to overcome “green premiums” (e.g. carbon pricing, mandates or product standards, public procurement) Commitments to procure low-carbon materials and goods (e.g. green steel) 	
	Energy and resource efficiency 2.5 GtCO₂	<ul style="list-style-type: none"> Global commitments to adopt best-in-class building & appliance efficiency Low-carbon travel zones in cities; increased tax on business class flights Separate collection of waste and recyclables, delivered by local government; commitments to repair from industry 	



Energy
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