Submission

Climate Analytics submission on topics for the work programme for urgently scaling up mitigation ambition and implementation

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January 2023

An urgent acceleration of mitigation action within this decade will be essential for achieving the Paris Agreement's 1.5°C long-term temperature goal. The work programme for urgently scaling up mitigation ambition and implementation[1] (referred to here as the Mitigation Work Programme) provides an important opportunity to explore high priority mitigation opportunities identified by the IPCC. This submission outlines the key shifts that need to take place this decade to help close the 2030 emissions gap. These key shifts could be considered as topics within the Mitigation Work Programme.

Which sectors currently contribute the most to emissions?

In 2019, global GHG emissions totalled 58.5GtCO_2e. The breakdown of annual sectoral emissions in order of largest contributions globally in 2019 is (i) energy (including electricity and heat, fossil fuel production and petroleum refining) (19.4 GtCO_2e), (ii) agriculture, forestry and land-use (AFOLU) (13.1 GtCO_2e), (iii) industry (11.6 GtCO_2e), (iv) transport (8.7 GtCO_2e), (v) buildings (3.3 GtCO_2e) and (vi) waste (2.4 GtCO_2e).[2] Emissions reductions are needed across all these sectors, but it is clear that the decarbonisation of the energy and energy end-use sectors is fundamental, given their large share of current emissions.

Identifying the most impactful mitigation activities

The Mitigation Work Programme provides an opportunity to discuss priority mitigation activities for this decade, as well as the barriers and challenges that currently prevent accelerated action.

The highest priority mitigation activities this decade include those:

- With high potential for rapidly reducing emissions
- That can reduce carbon lock-in and stranded asset risks
- That are commercially viable but not yet being rolled out quickly enough
- For which alternatives do not exist
- With co-benefits for sustainable development, and limited trade-offs

Focus shifts

Five key shifts characterise the critical transitions that need to happen this decade, taking the above criteria into account:

1. Accelerating and scaling up of renewable energy development
2. Phasing out of fossil fuels (FFs)
3. Mass electrification of systems and fuel-switching
4. Improving energy efficiency
5. Reducing conversion of natural ecosystems (NES)

These were all identified by the IPCC in its sixth assessment cycle Working Group III report as being the most cost-effective measures (costing less than 20USD/tCO_2e) this decade with large contributions to emission reductions (see Figure 1).[3]

There would be value in these key shifts being topics for the Mitigation Work Programme to consider. Their linkages with key sectors are illustrated in Table 1, and more details on each are outlined below.

	Electricity & heat	Fossil fuel production	Industry	Transport	Buildings	AFOLU
Scale up RES	●	●	○	○	○	
Phase out FFs	●	●	●	●	●	
Electrification & fuel switching	○	○	●	●	●	
Energy Efficiency	○	○	●	●	●	○
Reduce NES conversion	○			○	○	●

Table 1: Applicability of focus shifts across key sectors and linkages between them. Full circles signify direct and main priority and importance of mitigation action area for the sector. Hollow circles signify relevance to the sector indirectly.

1. Accelerating and scaling up of renewable energy development

Main sector/s concerned: electricity and heat, and industry, transport and buildings through electrification / fuel switching

i. Wind and solar offer the most cost-effective pathway relative to mitigation potential within this decade, with costings estimated to be less than 20USD/tCO_2e (see Figure 1).

ii. Currently, RES scale up is off track and will require a sixfold increase by 2030. Globally, analysis of 1.5°C pathways show that zero carbon sources need to reach 74 – 92% of electricity generation by 2030, and 98 – 100% by 2050.[2] The rapid scale up of wind and solar in particular will be crucial for reaching these benchmarks.

iii. The *State of Climate Action Report*[2] proposes measures necessary for the scaling up of RES will require setting ambitious RES targets, integrating RES through storage, improving market conditions and regulations and promoting demand-side flexibility and management (such as the expansion of Distributed Energy Resources (DERs) integrating RES prosumers and energy to grid systems).

iv. Successful acceleration of the scaling up of renewable energy will be crucial to enable the decarbonisation of energy end-user sectors (industry, transport

and buildings) and other shifts; phasing out unbated fossil fuels, mass electrification and scaling up zero carbon alternative fuels.

2. Phasing out of fossil fuels

Main sector/s concerned: electricity and heat, industry and transport

i. Other shifts (scaling up RE, electrification and fuel-switching, and energy efficiency improvements) will inherently lead to the phasing out of fossil fuels. But additional measures will be needed to further disincentivise fossil fuel investments, which have continued despite the availability of alternatives.
ii. Analysis of 1.5°C compatible pathways show that global coal and fossil gas use will need to decline rapidly. Global coal use in 1.5°C pathways falls by 75% by 2030, compared to 2019 [4], and fossil gas use peaks this decade and decline at least 30% below 2021 levels by 2030.[5] The IEA's net zero by 2050 roadmap shows that in the 2030s, coal and fossil gas use decline by 10% and 7% per year, respectively.[6]
iii. Fossil fuel phase-out is even faster in the power sector, where coal and fossil gas are effectively phased out by 2040.[7]
iv. The IEA's net zero by 2050 roadmap has shown that declining fossil fuel demand in a 1.5°C scenario would mean no need for new oil and gas fields or coal mines to be opened. It is also clear that LNG capacity that is planned or under construction could lead to substantial oversupply and emissions levels that are not consistent with the Paris Agreement's 1.5°C warming limit. Recent analysis found that cumulative emissions from LNG over the next three decades to 2050 could lead to excess emissions of over 40 $GtCO_2e$ – equivalent to around 10% of the remaining carbon budget.[5]
v. Demand-side options, including establishing market-based measures (such as emission trading, levies and taxation), GHG intensity fuel standards, fossil fuel technology bans and sustainable finance taxonomy, are approaches that can discourage and in cases prevent further investment in fossil fuel practices and technologies. Behavioural shifts will be required in facilitating modal shifts to electric public transportation, increasing active mobility.

3. Mass electrification of systems and fuel switching

Main sector/s concerned: transport, buildings and industry

i. Mass electrification will play a crucial role in phasing out fossil fuels from road transport and rail, although a portion of the road transport can still be transitioned to zero carbon fuel alternatives (a factor which will vary between countries and national circumstances).
ii. Electrification of industry sector processes offers the greatest potential to decarbonise energy-intensive industries.

iii. For sectors where mass electrification is not feasible, mitigation measures will be needed to support the development, scaling up and distribution of zero carbon fuels generated from renewable sources (e.g. green ammonia, hydrogen, methanol). This particularly applies to energy intensive industries, maritime navigation and aviation.

iv. Across the energy end-use sectors, electrification and fuel-switching will require the rapid build-out of infrastructure capacity (e.g. charging infrastructure, grid) to support the uptake of end-use technologies (e.g. EVs, heat pumps). Such measures will need to work in conjunction with financial measures (grants, incentive schemes) that support behavioural changes (e.g. switching to electrical appliances).

4. Improving energy efficiency

Main sector/s concerned: industry, buildings, and transport

i. Improvement of energy efficiency offers one of the most cost-effective approaches with large mitigation potential in buildings and transport (in terms of fuel efficiency), and in industry at net life costs of less than 20USD/tCO_2e.

ii. Demand-side mitigation options include investments in end-use technologies (appliances, building material manufacturing equipment), as well as CO_2 neutral materials.

5. Reducing conversion of natural ecosystems

Main sector/s concerned: AFOLU

i. The AFOLU sector as a whole offers high mitigation potential, but also faces high costs and particular implementation challenges.

ii. Demand-side mitigation options that also enable food security for all will require measures supporting behavioural shifts in diets to healthy, sustainable products – especially in developed countries – and reducing food loss and waste. In addition, demand side technology and infrastructure that can maximise agricultural intensity in smaller land areas can free up space for reforestation and preserving natural carbon sequestering ecosystems.

Many options available now in all sectors are estimated to offer substantial potential to reduce net emissions by 2030. Relative potentials and costs will vary across countries and in the longer term compared to 2030.

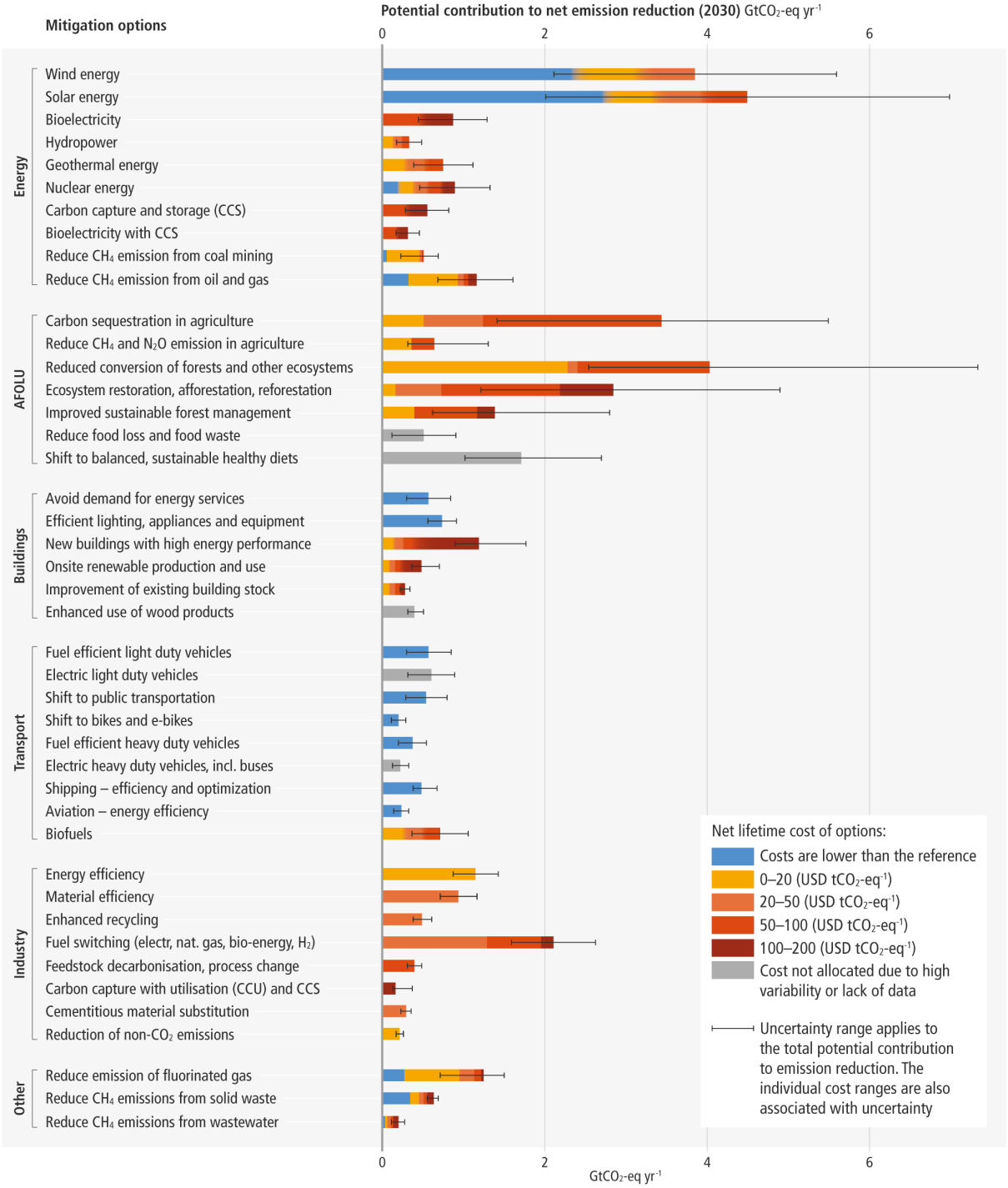

Figure 1: Relative costs and mitigation potential for mitigation options across different sectors from IPCC AR6 WGIII Report [3]

References

1. UNFCCC. Decision-/CMA.4 Matters relating to the work programme for urgently scaling up mitigation ambition and implementation referred to in paragraph 27 of decision 1/CMA.3. *Decision -/CMA.4* (2022).
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