The AR6 Synthesis Report Must Reinforce the Need to Phase Out Fossil Fuels Without Loopholes to Stay Below 1.5ºC

The Intergovernmental Panel on Climate Change (IPCC) has clearly and repeatedly sounded the alarm that staying below 1.5ºC of warming requires immediate action to rapidly phase out fossil fuels. These alarms have been echoed by the International Energy Agency (IEA), which has shown that fossil fuel expansion is incompatible with holding global warming to 1.5°C, and by the UN Secretary General, who has called on governments to "end our global addiction to fossil fuels".

Governments are beginning to respond. Seventeen national and sub-national governments have joined the Beyond Oil and Gas Alliance, a diplomatic alliance founded at COP26 in Glasgow to facilitate the phase-out of oil and gas production. Also in Glasgow, 39 governments and public finance institutions pledged to end international public finance for fossil fuels by the end of 2022. At COP27 in Egypt, more countries than ever before pushed for the outcome to include a call to phase out all fossil fuels. Furthermore, in 2022, Vanuatu and Tuvalu became the first nation-states to call for a Fossil Fuel Non-Proliferation Treaty, joining 70 cities and subnational governments, the European Parliament, and the World Health Organisation.

However, as the IPCC has warned, a significant gap persists between governments' climate plans and pledges and the scale and pace of action needed by 2030 to hold global average temperature rise below 1.5ºC. Time is running short, and every fraction of a degree of additional warming matters for the survival of people and ecosystems across the world.

In this context, the AR6 Synthesis Report must clearly communicate:

1. The need for rapid and equitable action to phase out fossil fuels in order to avoid and minimize overshoot of 1.5ºC;
2. The actions and investments that provide the greatest certainty of reducing emissions on the scale required by 2030;
3. The risks and costs of large-scale reliance on carbon capture and storage (CCS) and carbon-dioxide removal (CDR) – and that most models relied upon in IPCC reports do not account for the feasibility constraints and equity implications of such reliance.

The following sections highlight excerpts from prior reports in the AR6 cycle that convey these messages most clearly and should thus be reinforced in the Synthesis Report and centered in the Summary for Policymakers that will guide political decision-making in the key years ahead.

Key Messages

1. Phasing out fossil fuels must be the centerpiece of any science-based strategy to avoid overshooting 1.5ºC of warming and prevent irreversible climate impacts.

References to 'abated' fossil fuels weaken the clarity of this message *by suggesting that deploying fossil fuel-sustaining technologies such as CCS is an alternative to rapidly phasing out fossil fuels.*

Existing IPCC language that reinforces this message:

- "Estimates of future CO2 emissions from existing fossil fuel infrastructures **already exceed remaining cumulative net CO2 emissions** in pathways limiting warming to 1.5°C (>50%) with no or limited overshoot (high confidence)," and "If **existing fossil fuel infrastructure** would continue to be operated as historically, it **would entail CO2 emissions exceeding the carbon budget for 1.5ºC** (Section 2.7.2 and Figure 2.32)." [WGIII, Technical Summary, TS.3 at p. 68.; WGIII, Chapter 3, 3.5.2.2 at p. 355]
- "Meeting the ambitions of the Paris Agreement **will require phasing out fossil fuels from energy systems,** which is technically possible and is estimated to be relatively low in cost." [WGIII, Chapter 17, 17.5 at p. 1771]
- "[T]he achievement of long-term temperature goals in line with the Paris Agreement **requires the rapid penetration of renewable energy and a timely phasing out of fossil fuels** [...]" [WGIII, Chapter 17, 17.3.2.2 at p. 1742]
- **"Global fossil fuel use [...] must decline substantially by 2030 to limit warming to 1.5ºC (>50%)** with no or limited overshoot (high confidence). Failing to reduce global fossil fuel use below today's levels by 2030 will make it more challenging to limit warming to below 2°C (>67%). (high confidence)," and, further, **"[I]n all scenarios, fossil fuel use is greatly reduced** and unabated coal use is completely phased out by 2050." [WGIII, Chapter 6, 6.7.4 at p. 698; WGIII, Chapter 3, 3.3.2.4 at p. 333]
- **"Phasing out fossil fuels** in favour of low-carbon sources **is likely to have considerable [Sustainable Development Goal] SDG benefits,** particularly if trade-offs such as unemployment to fossil fuel workers are minimised (high confidence)." [WGIII, Chapter 6, 6.7.7 at p. 705]
- "Limiting warming requires **shifting energy investments away from fossil fuels** and towards low-carbon technologies (high confidence)." [WGIII, Technical Summary, TS.4.2 at p. 85.]
- **"If investments in coal and other fossil infrastructure continue, energy systems will be locked-in to higher emissions,** making it harder to limit warming to 2°C or 1.5°C (high confidence)." [WGIII, Technical Summary, TS.5.1 at p. 89]
- "In [1.5°C pathways], avoidance of significant overshoot implies that **immediate gross reductions** are more relevant than long-term net negative emissions." [WGIII, Chapter 3, 3.3.2.2 at p. 319]

2. We are in the make-or-break decade for action. **Scaling up renewable energy, increasing energy efficiency, and equitably reducing fossil fuel demand are the keys to rapid and effective emissions reductions** – not fossil fuel CCS.

Existing IPCC language that reinforces this message:

- "All global modelled pathways that limit warming to 1.5°C (>50%) with no or limited overshoot […] involve **rapid and deep and in most cases immediate** GHG emission reductions in all sectors." [WGIII, Summary for Policymakers (SPM), C.3 at p. 24]
- In the Summary for Policymakers of the WGIII report, Figure SPM.7 clearly shows that **wind and solar energy are by far the lowest-cost options with the largest potential to reduce emissions by 2030.** In contrast, **CCS is one of the options with the highest costs and lowest mitigation potential.** [WGIII, SPM, Figure SPM.7 at p. 38]
- "The political, economic, social, and technical **feasibility of solar energy, wind energy and electricity storage technologies has improved dramatically** over the past few years. In contrast, the adoption of nuclear energy and CO2 capture and storage (CCS) in the electricity sector has been slower than the growth rates anticipated in stabilisation scenarios. Emerging evidence since AR5 indicates that **small-scale technologies (e.g., solar, batteries) tend to improve faster and be adopted more quickly than large-scale technologies (nuclear, CCS)** (medium confidence)." [WGIII, Technical Summary, TS.3 at p. 67]
- "In many parts of the world, the cost of **electricity from PV is below the cost of electricity generated from fossil fuels**; in some, it is below the operating costs of electricity generated from fossil fuels (high confidence)." [WGIII, Chapter 6, 6.4.2.1 at p. 630]
- "Investments in **solar, wind, and electricity** transmission, distribution, and storage **increase the most** in mitigation scenarios." [WGIII, Chapter 6, 6.7.2 at p. 694]
- "Decarbonising electricity generation, in tandem with increasing use of electricity (see below), is **an essential near-term strategy** for limiting warming." [WGIII, Chapter 6, 6.7.1.2 at p. 688]
- **"Rapid and deep changes in demand** make it easier for every sector to reduce greenhouse gas (GHG) emissions in the short and medium term. [...] [L]ow energy demand pathways **eliminate the need for technologies with high uncertainty**, such as [Bioenergy with Carbon Capture and Storage] BECCS." [WGIII, Chapter 5, Executive Summary at p. 505; 5.1 at p. 508]

3. **Fossil CCS and engineered CDR, such as Bioenergy with Carbon Capture and Storage (BECCS) and Direct Air Carbon Capture and Storage (DACCS), neither substitute for nor advance action to phase out fossil fuels as quickly as possible.** Reliance on these technologies carries major risks that are not accounted for in most models. **If the phase-out of fossil fuels is delayed on the premise that these technologies will be deployed in the future, and they either fail to materialize or fail to work at scale, overshoot of 1.5°C will be locked in.**

The Synthesis Report must transparently acknowledge the limits of Integrated Assessment Models (IAMs). *Policymakers must be cautioned that the structure and assumptions within IAMs may bias scenario results towards levels of reliance on CCS, BECCS, and/or DACCS that are divorced from real-world feasibility and equity and do not factor in the costs or irreversible climate damage that would result from these technologies failing to work or to work at scale.*

Existing IPCC language that reinforces this message:

Limits and risks of CCS:

- "Implementation of CCS currently faces technological, economic, institutional, ecological-environmental and socio-cultural barriers." [WGIII, SPM, C.4.6 at p. 28]
- "The economic feasibility of [CCS] deployment is **not yet clear."** [WGIII, Chapter 4, 4.2.5.4 at p. 438].
- **"CO_2 capture costs present a key challenge.** [...] The capital cost of a coal or gas electricity generation facility with CCS is almost double that of one without CCS [...]. Additionally, the energy penalty increases the fuel requirement for electricity generation by 13–44%, leading to further cost increases." [WGIII, Chapter 6, 6.4.2.5 at p. 642]
- "CCS requires considerable increases in some resources and chemicals, **most notably water.** Power plants with CCS could shut down periodically due to water scarcity." [WGIII, Chapter 6, 6.4.2.5 at p. 643]

Limits and risks of CDR:

- "CDR ramp-up rates and absolute deployment levels are **tightly limited** by techno-economic, social, political, institutional and sustainability constraints [...]. CDR therefore **cannot be deployed arbitrarily** to compensate any degree of overshoot. [...] [I]t can be expected to only make a **limited contribution** to reaching net zero CO2 as fast as possible." [WGIII, Chapter 3, 3.5.2.1 at pp. 354-55]
- "[E]ven in strategies with net negative CO2 emissions, the **emission reduction via more conventional mitigation measures** (efficiency improvement, decarbonisation of energy supply) **is much larger than the CDR contribution** (Tsutsui et al. 2020)." [WGIII, Chapter 3, 3.3.2.2 at p. 324]
- **"CDR deployed at scale is unproven, and reliance on such technology is a major risk in the ability to limit warming to 1.5°C.** CDR is needed less in pathways with particularly strong emphasis on energy efficiency and low demand." [Special Report on Global Warming of 1.5°C, Chapter 2, Executive Summary at p. 96]
- **"Prioritising early decarbonisation with minimal reliance on CDR** decreases the risk of mitigation failure and increases intergenerational equity." [Special Report on Climate Change and Land, Chapter 7, 7.2.3.2 at p. 687]
- "[T]wo extensive reviews (Lawrence et al., 2018; Nemet et al., 2018) conclude that it is implausible that any CDR technique can be implemented at the scale needed by 2050," meaning that, **"CDR cannot serve as a substitute for deep emissions reductions."** [WGI, Chapter 4, 4.6.3.2 at p. 622; WGIII, Chapter 12, 12.3 - Box 8 at p. 1261; see also WGIII, Chapter 6, 6.6.2.7 at p. 681] Even in modeled scenarios that assume deployment of large volumes of CDR, annual CO2 removal from DACCS amounts to "0 [0–0.02] GtCO2 yr–1 by 2030" and barely reaches "0.02 [0–1.74] GtCO2 yr–1 by 2050." [WGIII, Chapter 12, 12.3 at pp. 1264–1265]

The limits of IAMs in representing CCS/CDR feasibility and risks:

- "The vast majority of IAM pathways do not consider climate impacts. [...] As most IAM pathways follow the cost-effectiveness approach, they do not make any additional equity assumptions. [...] IAM and sectoral models **represent social, political, and institutional factors only in a rudimentary way."** [WGIII, Chapter 3, 3.2.2 at pp. 304-5]
- **"[D]rivers for large-scale CDR deployment in IAM scenarios** [include] insufficient representation of variable renewables, **a high discount rate** that tends to increase initial carbon budget overshoot and therefore **inflates usage of CDR** to achieve net-negative emissions at later times, omission of CDR methods aside from BECCS and A/R (Emmerling et al. 2019; Hilaire et al. 2019; Köberle 2019), and **limited deployment of demand-side options** (Grubler et al. 2018; van Vuuren et al. 2018; Daioglou et al. 2019)." [WGIII, Chapter 12, 12.3 at p. 1265]

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This document was produced jointly by Oil Change International (OCI) and Center for International Environmental Law (CIEL) for the upcoming AR6 Synthesis Approval Session in Interlaken.

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