

To the COP30 Presidency,

The Associação CCS Brasil respectfully submits its contribution in response to the COP30 Presidency's invitation for inputs to the COP30 Presidency Roadmap on Transitioning Away from Fossil Fuels in Energy Systems in a Just, Orderly and Equitable Manner.

CCS Brasil is a multi-stakeholder association dedicated to promoting the responsible development of carbon capture, utilization and storage (CCUS) and carbon dioxide removal (CDR) solutions as key instruments for the decarbonization of the Brazilian economy and the achievement of global climate goals.

We commend the COP30 Presidency for undertaking an inclusive and transparent process in the development of this Roadmap, which has the potential to make an important contribution toward translating the outcomes of the Global Stocktake into practical implementation pathways.

We believe that the transition away from fossil fuels must reflect diverse national circumstances, recognize different stages of economic and industrial development, and uphold the principles of justice, equity, and technological neutrality. In this context, carbon capture and storage and carbon removal technologies have an important role to play in enabling emissions reductions in hard-to-abate sectors, supporting energy security, and allowing for transition pathways that are compatible with national realities.

In this spirit, we respectfully submit the following contributions for the consideration of the COP30 Presidency.



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**(a) What are the most critical barriers — whether physical, economic, financial, institutional, technological or social— preventing a transition away from fossil fuels?**

Hard-to-abate industries (including steel, cement, refining, petrochemicals, fertilizers, among others) share characteristics that make the replacement of assets and processes particularly complex. The substitution of fossil fuels in energy-intensive sectors faces significant technological, economic, regulatory, and social barriers, as outlined below:

**a. Technological Barriers:** In industrial processes requiring high-temperature heat or involving process emissions inherent to the chemistry of the reactions, replacing existing assets is extremely costly, slow, and often incompatible with natural investment cycles. In many cases, there are no mature technological alternatives capable of fully replacing fossil fuels in the short to medium term. In other cases, there are no alternatives to products whose manufacturing processes involve intrinsic emissions, as is the case with cement. In addition, some alternative energy sources, such as solar and wind, remain intermittent, while other options, such as biomass and bio-residues, may require significant adaptation of existing infrastructure.

**b. Economic and Financial Barriers:** The CCUS pathway involves significant capture, transport, and storage costs, requiring scale, regulatory predictability, and financing models. Projects depend on demand for captured CO<sub>2</sub> (CCU) or on pipeline infrastructure and shared hubs for carbon storage (CCS). Existing and consolidated fossil fuel infrastructure for both production and consumption also creates structural economic inertia. Nevertheless, considering the very long investment cycles of hard-to-abate industries, it is often more economically viable to implement CCUS in existing assets than to replace them with alternative processes.

**c. Regulatory Barriers:** Climate-related regulatory frameworks remain under development, creating multiple uncertainties. In the case of CCUS, key uncertainties include long-term storage liability; the applicable environmental licensing regime; ownership rules for injected CO<sub>2</sub>; and MRV (monitoring, reporting and verification) and MMV (measurement, monitoring and verification) guidelines.

**d. Social Barriers:** There are multiple pathways to decarbonization, and all emissions reduction efforts should be considered. However, some pathways are less socially accepted than others depending on the societal context in which they are implemented,

particularly where local negative impacts may arise. For public acceptance of geological carbon storage, clear, transparent, and science-based communication is essential. More broadly, public support for the transition depends on effective communication regarding both the necessity of moving away from fossil fuels and the potential impacts on household costs. While environmental benefits are critical, transition measures that significantly affect the cost of living may face greater resistance than anticipated.

**(b) What potential levers, whether economic, financial, institutional, social or technological, exist for accelerating the implementation of the transitioning away commitment?**

CCS technology provides an important technological option to support an orderly and gradual energy transition, ensuring energy system reliability and preserving the competitiveness of hard-to-abate industries while substantially reducing greenhouse gas emissions.

CCUS is an effective emissions reduction solution because it enables the capture and storage of CO<sub>2</sub> from industrial and energy-related processes that are difficult to decarbonize, reducing emissions without requiring the complete replacement of industrial assets or processes.

To enable the deployment of this technology, the following conditions are necessary:

**a. Governance and Institutional Coordination:** The transition should be guided by robust institutional arrangements, with continuous participation from governments, industry, communities, and civil society. Workforce qualification and capacity-building should also be promoted to ensure the availability of skilled professionals to support the transition.

**b. Improved Regulatory Frameworks for CCUS:** Regulatory frameworks should provide legal certainty for project development, including:

- Specific licensing rules for CCUS activities;
- Clear criteria for long-term liability allocation;
- Harmonized MRV and MMV standards;
- Legal definitions regarding CO<sub>2</sub> ownership and transport.

**c. Economic Incentives and Financial Instruments:** Deployment of CCUS requires enabling financial and market conditions, including:

- Carbon pricing mechanisms;
- Support for the development of shared CO<sub>2</sub> transport and storage hubs;
- Financing lines incorporating blended finance instruments and sovereign guarantees;
- Risk mitigation and interoperability mechanisms to improve investor confidence.

**d. Integration with Other Technological Pathways:** CCUS should be considered complementary to other decarbonization pathways, including biofuels, low-carbon hydrogen, electrification, and nature-based solutions, in line with broader economy-wide decarbonization strategies and climate commitments focused on both emissions reductions and removals. CCUS also supports carbon removal pathways such as BECCS and DACCS.

**e. Social Engagement and Transparency:** Public communication and stakeholder engagement programs should be structured to strengthen confidence in geological storage projects and promote broader societal understanding of the benefits of the energy transition. Behavioral change should be encouraged through public awareness campaigns and incentive policies that support the substitution of fossil fuel consumption with renewable alternatives, such as electric mobility and distributed solar generation.

**f. Prioritization of Hard-to-Abate Sectors and Technology Deployment:** The transition does not necessarily require the immediate elimination of fossil fuels, but rather hybrid strategies combining energy efficiency, low-carbon fuels, carbon capture technologies, and long-term industrial process transformation. Policy frameworks should prioritize the adoption of commercially mature technologies where available, while also promoting technology transfer and innovation for solutions at earlier stages of technological readiness.

**(c) What country, regional or sector roadmap experiences, best practices, and lessons learned can be shared?**

To accelerate learning and reduce costs, the COP30 Roadmap may draw inspiration from the following initiatives:

**a. Norway (Longship / Northern Lights):** Norway's national carbon capture and storage project, financed through a partnership between the Norwegian government and private sector actors. It is structured as a national program comprising three components:

1. **Industrial CO<sub>2</sub> Capture:** Initially implemented at two facilities (Heidelberg Materials cement plant and Hafslund Oslo Celsio waste-to-energy plant).
2. **Liquefied CO<sub>2</sub> Maritime Transport:** Transport of captured CO<sub>2</sub> by specially designed vessels.
3. **Permanent Geological Storage:** Offshore storage in the North Sea, operated by the Northern Lights joint venture (Equinor, Shell, and TotalEnergies).

The financing model is hybrid, with the Norwegian government covering approximately 80% of investment costs and part of operational expenditures, thereby reducing investor risk. Private companies operate the infrastructure and bear part of CAPEX and OPEX. This arrangement reduces both technological and demand-side risks, which is critical for emerging technologies.

Northern Lights operates as an open-access hub, allowing other European industries to ship CO<sub>2</sub> for storage. This helps dilute costs, creates economies of scale, and accelerates the development of a broader European carbon storage market.

**b. United Kingdom (CCUS Cluster Sequencing Programme):** Policy framework designed to develop carbon capture industrial clusters in the country's most emissions-intensive regions, including Humber, Teesside, and Merseyside. Industries within the same region share pipelines, compressors, and storage infrastructure, significantly reducing costs. The program employs two regulatory/financial models to reduce investor risk:

1. **Contracts for Difference (CfDs):** Guarantee a minimum price per tonne of CO<sub>2</sub> abated or per unit of decarbonized energy produced.
2. **Regulated Asset Base (RAB):** Provides regulated returns on infrastructure assets, reducing the cost of capital.

**c. United States (45Q Tax Credit):** The principal federal incentive for CCUS in the United States, originally established in 2008 and expanded in 2018 and 2022 through the Inflation Reduction Act (IRA). It provides a tax credit per tonne of CO<sub>2</sub> captured

and stored, which may be deducted from tax liabilities or monetized. This guaranteed value for captured CO<sub>2</sub> reduces market risk, attracts project developers, and enables private financing.

**(d) How can a just, orderly and equitable transition best reflect the diverse realities of countries at different stages of development and with different degrees of dependence on fossil fuels?**

**Technological Neutrality Should Be a Core Principle of the Transition.** We emphasize that the energy transition requires differentiated pathways, particularly for developing countries with strong industrial bases, and that CCUS can contribute to emissions reductions in a manner compatible with energy security, industrial competitiveness, and socioeconomic justice.

The transition should be grounded in effective emissions reductions rather than predetermined technological preferences. Technologies should compete on their merits, and each region should retain the ability to prioritize the solutions most appropriate to its specific circumstances and comparative advantages.

While the need to transition away from fossil fuels is broadly recognized, the key challenge lies in calibrating transition targets to the realities of each country, given differing policy frameworks, infrastructure limitations, and regulatory conditions. In Brazil, for example, it would be impractical to establish aggressive fossil fuel reduction targets in isolated regions where electricity access still depends on diesel-fired generation. In such contexts, assessing regional realities and setting feasible targets is more relevant than adhering to uniform numerical goals established at the international level.

In addition, financial support and technology transfer to developing countries are essential, as the transition becomes more feasible when supported by countries at more advanced stages of technological and economic maturity. Such support, when aligned with local solutions and comparative advantages—such as biomass, biofuels, wind, and solar resources in Brazil—can reduce fossil fuel dependence while also enhancing regional strengths.

Finally, the adoption of just transition policies, particularly those aimed at mitigating socioeconomic impacts, can facilitate progress toward fossil fuel transition goals by



strengthening public acceptance and supporting the broader dissemination of sustainable practices.

