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Carbon Management and the Paris Agreement

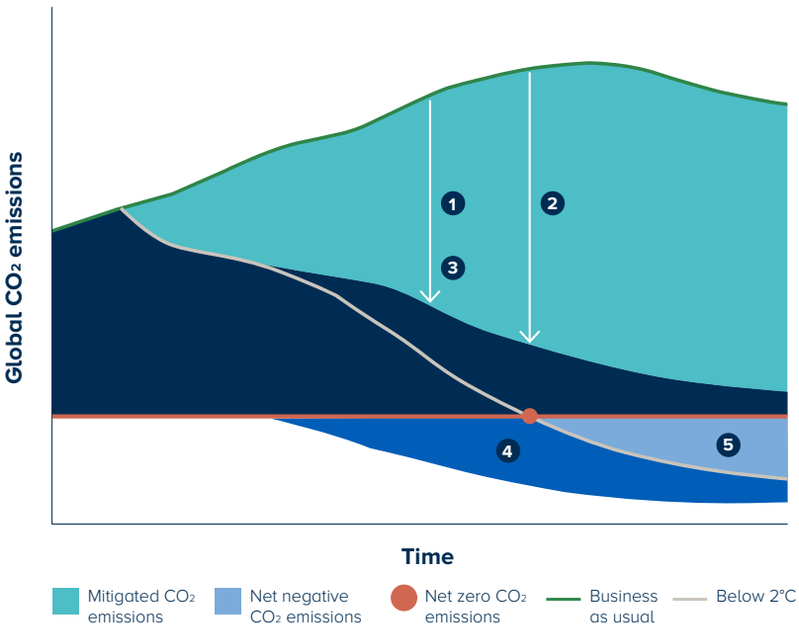
To meet the temperature goals of the Paris Agreement, the world must reach a balance between the emitted greenhouse gases and those removed from the air. Reaching this state is essential to stabilise and eventually reduce the concentration of CO_2 in the atmosphere.

There are two ways to achieve this: emitting less and removing more. Emissions can be lowered by actions such as using less energy, transitioning to zero- and low-carbon electricity, and deploying carbon capture and storage (CCS) at heavy industrial facilities. Removals can be increased by protecting nature (such as through reforestation) and using carbon dioxide removal (CDR) technologies like direct air capture to pull CO_2 directly out of the air.

CCS and CDR are often conflated, but they serve very different purposes:

- CCS stops CO_2 before it can enter the atmosphere.
- CDR removes CO_2 that is already in the air.

Roles of Carbon Management in Achieving Paris Agreement Goals



CCS

1. Enables deep emissions reductions across heavy industries and power assets in the near-to-mid term
2. Develops the enabling infrastructure for large scale CDR in the mid-to-long term

CDR

3. Accelerates the pace of decarbonisation in the near term
4. Counterbalances emissions from sectors (e.g., aviation, agriculture) where alternatives are non-existent, technically difficult, or prohibitively expensive
5. Returns warming to safer levels in the long term

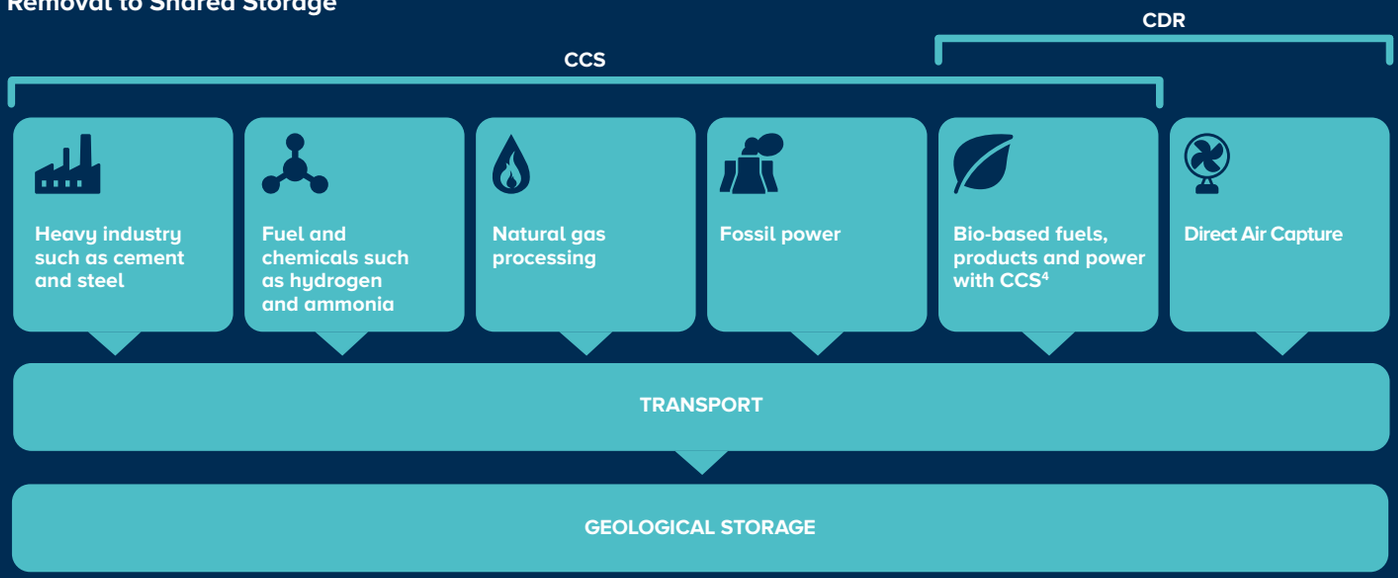
Carbon management is a vital tool within a broad mitigation portfolio necessary to meet the Paris Agreement goals, working in tandem with zero-carbon electricity, energy storage, energy efficiency, land-use mitigation, and reductions in methane and other emissions.

Carbon management is widely used as an umbrella term that encompasses both CCS and the engineered approaches to CDR.[1] Even though CCS and CDR do different jobs, they often share the same technologies and infrastructure, such as pipelines and ships for transporting the CO_2 and deep underground rock formations for permanent geological storage. Due to shared technical, economic, societal and policy considerations, stakeholders commonly use the working term of Carbon Management to address these integrated systems collectively.

[1] Nature-based CDR, such as afforestation and wetland restoration, falls outside the common working definition of Carbon Management because it does not share as many of the same industrial infrastructure or policy considerations as engineered approaches.
[2] Source: IPCC AR6 Annex I Glossary.
[3] IPCC uses terms such as 'long-term isolation' and 'durably storing' CO_2 in geological reservoirs to indicate storage of CO_2 for 10,000 years or more, when sites are appropriately selected and managed, and it is considered permanent.

	Carbon capture and storage (CCS)	Carbon dioxide removal (CDR)
Formal definition[2]	A process in which a relatively pure stream of carbon dioxide from industrial and energy-related sources is separated (captured), conditioned, compressed and transported to a storage location for long-term isolation[3] from the atmosphere.	Anthropogenic activities removing carbon dioxide from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products.
Sources of CO_2	Point sources. CO_2 from exhaust stacks at industrial sites or power plants.	Ambient environment. CO_2 from the air or ocean.
Mechanism	CCS captures CO_2 at the point of emission and stores it safely and permanently. It is a direct emissions reduction (abatement) technology, lowering the amount of CO_2 emissions released into the air.	CDR extracts CO_2 from the atmosphere or ocean and stores it safely and permanently. It is a removal technology, lowering the concentration of CO_2 in the air.

The Carbon Management Value Chain: From Diverse Capture and Removal to Shared Storage



[4] For a CCS process to be also considered CDR, the entre chain of activity results in a net removal of carbon from the atmosphere.

Stakeholder Terminology

Stakeholders use terminology that aligns with their specific institutional roles and objectives. Within the UNFCCC process, which is focused on international governance and diplomacy, the preferred terms are generally "abatement and removals." The IPCC, as the scientific body supporting the UNFCCC, uses more technical terms of CCUS[5] and CDR within its assessment reports and methodologies. In contrast, the operational community – including industry, academic institutions, and implementation-focused coalitions -- commonly uses the umbrella term Carbon Management to describe the integrated system of CCS emissions abatement and engineered CDR approaches.

Regional Terminology Variations

The scope of "Carbon Management" is not universally fixed. While technical practitioners generally apply it for engineered systems (CCS/CCUS and engineered CDR), some regional policy frameworks expand the term to encompass broader natural sinks, or use it generically to cover the entire suite of decarbonisation tools from renewables to nuclear energy.

Alignment of Terminology with Paris Agreement

While grouped under the Carbon Management umbrella, emissions reductions and carbon removals serve distinct yet complementary roles. Maintaining clarity between them is essential to ensure that the deployment of removal technologies does not displace or delay deep, immediate reductions at the source.

Terminology	UNFCCC Descriptor	Paris Agreement Reporting Classification[6]	Paris Agreement Alignment[8]
CCS	Abatement	Emissions Reduction	Articles 4 and 6
CDR	Removals	Carbon Removal	Articles 4 and 6
Carbon Management	Abatement & Removals[7]	Mitigation Activity[7]	Articles 4 and 6

[5] CCUS is Carbon Capture Utilisation and Storage, where utilisation refers to re-using captured CO_2 in products, fuels, or industrial applications.
[6] Classifications reflect the reporting categories mandated by Decision 18/CMA.1 and the Common Reporting Tables of the Paris Agreement's Enhanced Transparency Framework, where climate actions must be quantified as either 'emission reductions' or 'removals'.
[7] Carbon Management is a functional industry term but is not official terminology used by the UNFCCC or the Paris Agreement.
[8] While this table highlights direct alignment with Article 4 (emissions-removals balance) and Article 6 (carbon markets), Carbon Management functions more broadly as an underlying technological and economic lever across the Agreement's finance, technology transfer, and transparency provisions. For more information, see *CCS and CDR in the UNFCCC: Key Policy Entry Points.*