

Organisation Volvo Car Corporation	Owner 50130 Global Sustainability	Document type Position Paper	Version 4
Document name Volvo Cars position on carbon removal	Valid from 2024-01-11	Security class Public	

Volvo Cars position on carbon removal

Purpose of this document

This position paper addresses our perspective on the terminology around offsetting and carbon removal, and how we intend to approach carbon removal with regards to our ambition to reach net zero greenhouse gas (GHG) emissions by 2040.

In the public debate, several different names and concepts are used in this context, which can be confusing to stakeholders. Carbon offsetting involves the purchasing of GHG emission credits for either carbon removal or carbon avoidance outside of a company's value chain. The term carbon removal is being used to describe activities that remove CO₂ from the atmosphere. This document contains a section on key concepts and terminology, where the terms used in this paper are defined.

We see a need to define our position in this rapidly evolving field and clarify our approach towards carbon removal and offsetting, respectively. Our aim is to help advance solutions that are credible and necessary to mitigate climate change, to meet our net zero GHG emissions ambition and to provide clarity to suppliers, customers, and other stakeholders.

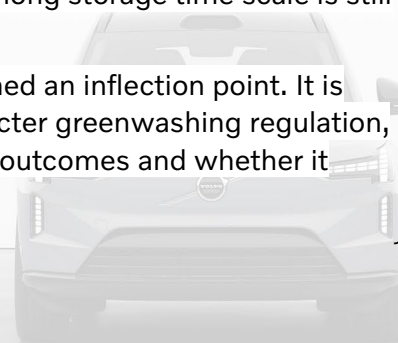
Background and challenge

The world is facing a climate crisis whose impacts can already be seen. If not properly mitigated it will result in catastrophic consequences to biodiversity, human life, society, and the global economy. In 2022, Working Group III of the IPCC published its 6th assessment report, stressing that the next few years are critical in limiting global warming to 1.5°C.¹

To combat climate change, rapidly reducing GHG emissions remains the highest priority. However, climate science tells us that this alone will likely not be enough. Global emissions cannot be reduced fast enough to enable a stabilization of the global mean surface temperature below 1.5 °C. The IPCC states that to reach net zero greenhouse gas emissions, removing and storing carbon that is already in the atmosphere will be unavoidable to neutralise hard-to-abate residual emissions.²

During recent years carbon removal technology development has started to ramp up, with newly founded companies entering the market. In parallel to this development, NGOs and policymakers are working on standardisation, certification, and legislation on the definition and use of carbon removal. Marketplaces for carbon removal certificates are being established. However, the availability of carbon removal with long storage time scale is still very limited.

Meanwhile, the voluntary market for carbon offsets has reached an inflection point. It is increasingly coming under scrutiny, not least considering stricter greenwashing regulation, calling into question whether it is delivering on the promised outcomes and whether it



detracts from emission reduction efforts. The use of offsets for claiming climate benefits declined in 2022, reversing a strong growth trend in the period between 2019 and 2021.³

Volvo Cars position

General

- Volvo Cars is focused on real emission reductions before resorting to carbon removal, and encourages our suppliers to do the same. In support of this approach, the SBTi Net Zero Standard states that most companies will need to reduce emissions by at least 90% before addressing unavoidable emissions through carbon removal.⁴
- To reach our net zero GHG emissions ambition by 2040, Volvo Cars intends to use carbon removal to neutralise unavoidable emissions.
- Carbon removal means human activities removing carbon dioxide (CO₂) from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products. Carbon removal can be used to neutralise unavoidable scope 1, 2, or 3 emissions.
- Unavoidable emissions means residual GHG emissions impossible to eliminate due to technical, market, legal or other reasons.
- Carbon removal will not be used for reaching our CO₂ reduction ambitions, including:^{i,5}
 - Reducing CO₂ emissions by 40 per cent per average car by 2025 and 75 per cent per average car by 2030 compared to our 2018 baseline
 - Climate neutral manufacturing and non-manufacturing operations by 2025
 - 100 per cent climate neutral energy at all directly contracted supplier sites
- Volvo Cars does not consider carbon insetting or mass balance as being carbon offsetting. However, the use of carbon insetting and mass balance must follow our Position on chain of custody models.

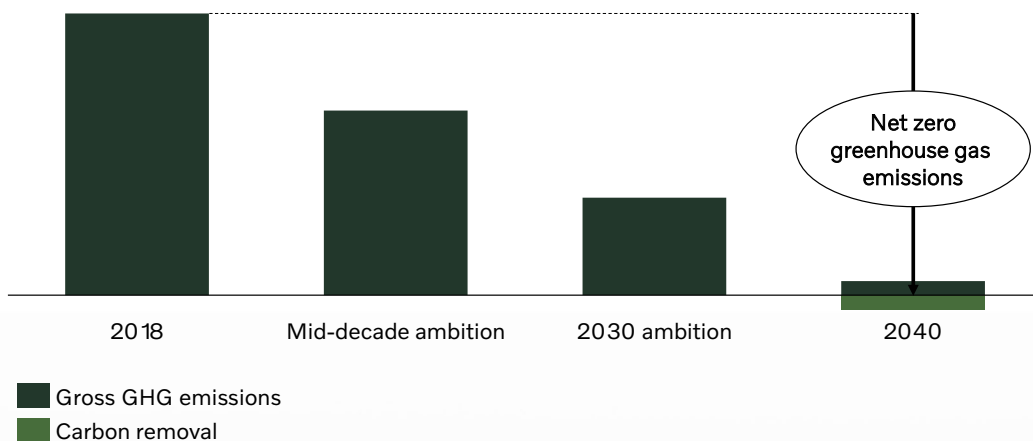
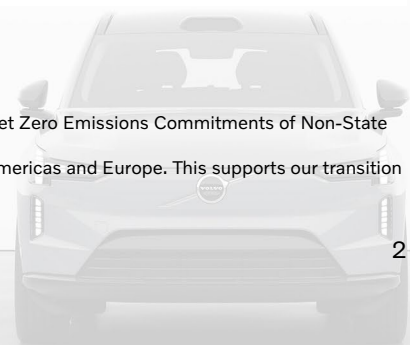


Figure 1 Net zero GHG ambition

ⁱ In accordance with recommendation by the United Nations' High-Level Expert Group on The Net Zero Emissions Commitments of Non-State Entities. Volvo Cars participates in emission credit trading connected to model year compliance within Americas and Europe. This supports our transition towards electrification.



- Volvo Cars does not consider Energy Attribute Certificates (EAC) with high environmental integrity as being carbon offsetting, as EACs are used for GHG emission reduction within the value chain. However, due to the complexity of the different renewable energy markets, we have defined a separate position on EACs. Please see the Position Paper on Energy Attribute Certificates (EACs) for Electricity.

GHG accounting and reporting

- Carbon removal should always be reported separately from the gross GHG emissions. This creates transparency for stakeholders and is in line with CSRD disclosure requirements. The current outlook is that any use of carbon removal will be on a corporate level, not on a product level.
- To enable this, we do not allow suppliers or sub-suppliers to include any carbon removal (or offsets, or carbon credits) in the reported CO₂ footprint of goods and services supplied to Volvo Cars, throughout the procurement process as well as in Environmental Product Declarations (EPDs) and Lifecycle Assessments (LCAs).

Communication

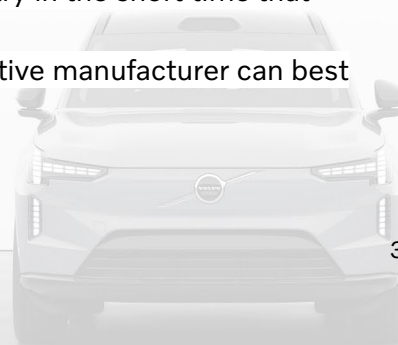
- Volvo Cars does not use the term offsetting in our sustainability communications, as we believe using such a broad term can be misleading. We prefer to use more specific language when it comes to the actions we are taking, providing clarity and transparency to our stakeholders.
- In the context of our ambition to reach net zero GHG emissions by 2040, we use the term carbon removal. Efforts to define how, to what extent, and what type of carbon removal can be used to reach net zero GHG emissions are ongoing among recognized institutions.

Future challenges

- To ensure that early action is directed towards credible solutions, we see an urgent need for a common international standard or definition and a robust certification framework for carbon removal. Such a framework should focus on carbon removal with high quality and environmental integrity. We follow the ongoing work by the UNFCCC, the GHG Protocol, and the EU Commission among others.
- Future net zero guidance should address how to distribute the responsibility of neutralizing residual emissions across the value chain. For example, ensuring that companies take responsibility for neutralizing their own residual Scope 1 and 2 emissions.

Volvo Cars actions

- We recognize that action needs to be taken ahead of 2040 to ensure that sufficient supply of high-quality carbon removal is timely available. Demand from early movers will be critical to help reduce the green premium and enable the technology and infrastructure development needed to scale up this industry in the short time that remains until 2040.
- We are investigating and exploring how we as an automotive manufacturer can best support the scaling-up of carbon removal capacity.



Key concepts and terminology

Table 1 Key concepts

Climate change mitigation		
Within the value chain	Outside the value chain / Beyond the value chain	
<p>Decarbonisation / GHG emission reduction E.g., switching to renewable energy or to production processes and technologies that does not use fossil fuels, or by capturing CO₂ during the production process before it is emitted (CCS)</p>	<p>Carbon removal Various types e.g., biological, chemical, and geochemical. See Figure 3</p>	<p>Carbon avoidance Support projects e.g., renewable energy outside the value chain, cookstoves, waste management</p>

Carbon offsetting

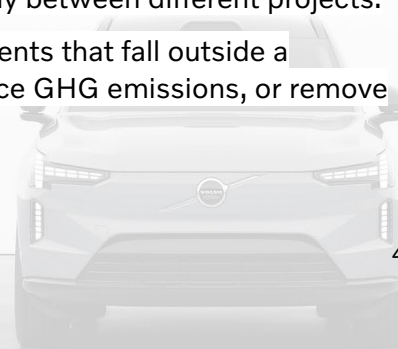
Decarbonisation / Greenhouse gas (GHG) emission reduction: The process of lowering the GHG emissions of a country, individual, company or other entity compared to the previous level.⁶ Used interchangeably with the term decarbonisation and carbon abatement, although the latter two focus on CO₂ as opposed to all greenhouse gases.

Carbon removal: Human activities removing carbon dioxide (CO₂) from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products. It includes anthropogenic enhancement of biological or geochemical CO₂ sinks and direct air carbon dioxide capture and storage (DACCS) but excludes natural CO₂ uptake that is not directly caused by human activities. Carbon removal can be used to neutralise residual scope 1, 2, or 3 emissions. Also referred to as carbon dioxide removal, CDR.⁷

Note: There is a distinction between carbon removal and decarbonisation/GHG emission reduction, although similar technologies can be used. Decarbonisation means preventing CO₂ emissions from entering the atmosphere in the first place. This can be done for example by switching to production processes and technologies that does not use fossil fuels, such as producing steel using hydrogen as reducing agent instead of coal. It can also be done by capturing the emissions at the source through carbon capture and storage (CCS). A typical use case for CCS is cement production, where CO₂ emissions are close to unavoidable as it is a by-product of the chemical reaction that produces clinker and subsequently cement. When the CO₂ is captured in the furnace and stored permanently instead of emitted, the emissions from cement production can be drastically reduced. Crucially, this is not the same thing as carbon removal. Carbon removal on the other hand removes CO₂ that has already been emitted to the atmosphere and leads to a net decrease of atmospheric CO₂ stock. As an example, direct air carbon capture and storage (DACCS) leads to CO₂ being taken out of the atmosphere and permanently stored underground.

Carbon avoidance: Prevention of future emissions of CO₂ into the atmosphere, outside of the value chain. The net contribution is calculated against a counterfactual future (baseline). Carbon avoidance projects are typically associated with lower cost than carbon dioxide removal, and the effectiveness and credibility vary significantly between different projects.

Beyond value chain mitigation: Mitigation action or investments that fall outside a company's value chain, including activities that avoid or reduce GHG emissions, or remove and store GHGs from the atmosphere.⁸



Carbon offsetting: The reduction, avoidance, or removal of GHG emissions by one entity, purchased (often through tradeable certificates) by another entity to counterbalance GHG emissions by that other entity. Offsets are often subject to quality and effectiveness criteria such as avoiding double counting and leakage, use of appropriate baselines, additionality, and timescale of storage.⁹ Used interchangeably with the term climate compensation.

Carbon insetting: Actions taken by companies to reduce emissions in their value chain, either by investing on behalf of a supplier or by buying a product or service where the supplier has reduced the CO₂ footprint.¹⁰ Carbon insetting is typically used in combination with a mass balance approach in areas where physical traceability is currently challenging from a practical perspective, for example in biofuels and sustainable aviation fuel.

Carbon credits: A financial instrument, certified by governments or independent certification bodies. Carbon credits are used to compensate or offset an entity’s GHG emissions and can include both removal, reduction, and avoidance activities. A carbon credit corresponds to one tonne of net CO₂e reduction, removal, or avoidance. Carbon credits are tradable. When the carbon credit is used it becomes an offset and is no longer tradable.¹¹

Energy Attribute Certificates: Energy Attribute Certificates (EACs) are used to claim the use of climate neutral or renewable energy consumption and thus reduce a company’s scope 1 and 2 emissions. EACs are certificates representing the environmental attributes of a generated MWh from a specific asset. See Volvo Cars Position on Energy Attribute Certificates (EACs) for electricity.

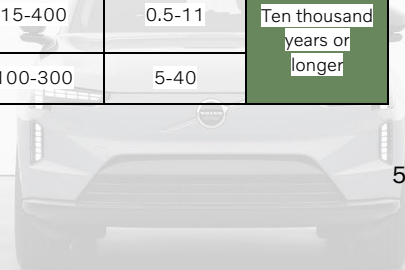
Mass balance: Mass balance is a chain of custody model that helps to track materials from its source to end product. It matches output with input flows for a given system under a set period of time. Mass balance allows for certified material flows and non-certified material flows to be mixed during processing. Mass balance can be carried out on different levels: batch, manufacturing site and group level. See Volvo Cars Position on chain of custody models.

Carbon removal

Carbon removal refers to a range of methods with different characteristics, but with the common feature of removing and durably storing carbon dioxide from the atmosphere. The IPCC categorises methods by removal process and storage timescale, an overview can be found in the table below.

Table 2 Types of carbon removal¹²

Removal process	Type	Example	Maturity (Technology readiness level)	Cost (USD/t CO ₂)	Mitigation potential (Gt CO ₂ /yr)	Storage timescale
Land-based biological	Afforestation, reforestation, agroforestry, improved forest management	Tree planting, bio-based products	8-9	0-240	0.9-21.5	Decades to centuries
	Soil carbon sequestration	Agricultural practices, pasture management	8-9	-45-100	0.6-9.3	
	Biochar	Cropping and forestry residues, purpose-grown biomass crops	6-7	10-345	0.3-6.6	Centuries to millennia
	Bioenergy with carbon capture and storage (BECCS)		5-6	15-400	0.5-11	Ten thousand years or longer
Chemical	Direct air carbon capture and storage (DACCS)	Solid sorbent, liquid solvent	6	100-300	5-40	Ten thousand years or longer



Geochemical	Enhanced rock weathering	Silicate rocks	3-4	50-200	2-4	Decades to centuries
Land-based biological	Peatland and coastal wetland restoration	Rewetting, revegetation	8-9	-	0.5-2.1	
Ocean-based biological	Blue carbon management (rooted vegetation in coastal zone)		2-3	-	<1	
Geochemical	Ocean alkalinity enhancement (transforming CO ₂ into bicarbonate and carbonate ions)	Carbonate rocks, silicate rocks	1-2	40-260	1-100	Ten thousand years or longer
Ocean-based biological	Ocean fertilisation	N&P fertilisation	1-2	50-500	1-3	Centuries to millennia

Carbon removal is necessary to achieve net zero GHG emissions and have an essential role in scenarios that limit warming in line with the Paris Agreement. It plays a role both near- and long-term¹³:

- Near-term: Further reducing net emission levels
- Mid-term: Balancing residual emissions to help reach net-zero emissions
- Long-term: Achieving and sustaining net-negative emissions

The amount of carbon removal with a very long storage timescale through direct air carbon capture and storage (DACCS) and bioenergy with carbon capture and storage (BECCS) varies widely across IPCC modelled pathways, the highest being 1090 Gt CO₂ cumulatively between 2020 and 2100. As a reference, global GHG emissions in 2019 were 59 Gt.¹⁴ In the International Energy Agency's (IEA) Net Zero Emissions (NZE) Scenario, approximately 190 Mt CO₂ per year is removed through BECCS and 75 Mt CO₂ by DACCS already by 2030.¹⁵

Current deployment is still in the pilot- and demonstration phase, with around 20 small-scale DAC plants in 2023, most selling rather than sequestering the captured CO₂.¹⁶ Plans for new facilities, including the first large-scale DAC plant, could reach the 75 Mt CO₂ per year required in 2030 under the IEA NZE Scenario.¹⁷ Carbon removal via BECCS could reach just under 50 Mt CO₂ per year by 2030, which falls far short of the approximately 190 Mt CO₂ per year removed through BECCS by 2030 in the IEA NZE Scenario.¹⁸

Currently, there is no widely accepted certification of carbon removal, and guidelines for measurement, reporting and verification are still under development. This can hamper the uptake and, according to the EU Commission, risks that financial support goes to low-quality projects.

Given the nascent status of carbon removal and the breadth of methods, assessing the quality of projects puts a heavy burden on buyers of carbon removal credits. Leading companies in this field are allocating significant resources to identifying, assessing and following-up individual projects forming their carbon removal portfolio. Storage timescale, costs, additionality, and co-benefits (e.g., impact on biodiversity- and social aspects) vary, as do the risks of reversal, double-counting, and negative impacts.



Several initiatives to address this are ongoing. In 2022, the EU Commission proposed legislation on establishing an EU certification framework for carbon removal, with the aim of defining high-quality carbon removal and the process of monitoring, reporting and verification.¹⁹ The Greenhouse Gas Protocol is developing a new Land Sector and Removals Guidance, expected to be published in mid-2024, addressing definitions of carbon removal and how to account and report on the use.²⁰ The SBTi will include eligible approaches to carbon removal in a future revision of the Corporate Net-Zero Standard, that may include DACCS, BECCS and enhanced weathering.²¹ Further to this, work is ongoing by The Integrity Council for the Voluntary Carbon Market (ICVCM) and the Voluntary Carbon Markets Integrity Initiative (VCMI) among others.²²

References

- ¹ IPCC (2023), Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_FullVolume.pdf
- ² IPCC (2022), Climate Change 2022: Mitigation of Climate Change Working Group III contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_FullReport.pdf
- ³ IPCC (2023), Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. pp.21. https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_FullVolume.pdf
- ⁴ WEF and Bain & Company (2023), The Voluntary Carbon Market: Climate Finance at an Inflection Point.
- ⁵ European Commission (2022), Proposal for a regulation of the European Parliament and of the council establishing a Union certification framework for carbon removals. Greenhouse Gas Protocol (2023), Land Sector and Removals Initiative – Project Overview.
- ⁶ United Nations' High-Level Expert Group on The Net Zero Emissions Commitments of Non-State Entities, Integrity matters: Net zero commitments by businesses, financial institutions, cities and regions. <https://www.un.org/sites/un2.un.org/files/high-level-expert-group-n7b.pdf>
- ⁷ Based on IPCC definition of Decarbonization. <https://www.ipcc.ch/sr15/chapter/glossary/>
- ⁸ https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Annex-II.pdf
- ⁹ Science Based Targets Initiative (2023), Public Consultation on Beyond Value Chain Mitigation (BVCM). Table 1. <https://apps.ipcc.ch/glossary/>
- ¹⁰ <https://www.weforum.org/agenda/2022/03/carbon-insetting-vs-offsetting-an-explainer/>
- ¹¹ <https://climatepromise.undp.org/news-and-stories/what-are-carbon-markets-and-why-are-they-important>
- ¹² IPCC (2022), Climate Change 2022, Mitigation of Climate Change. Figure TS.2, p.25. https://www.ipcc.ch/report/ar6/wg3/downloads/outreach/IPCC_AR6_WGIII_Factsheet_CDR.pdf
- ¹³ IPCC (2022), Climate Change 2022, Mitigation of Climate Change, p.1247, p.1262.
- ¹⁴ IPCC (2022), Climate Change 2022, Mitigation of Climate Change. Figure TS.2, p.25.
- ¹⁵ <https://www.iea.org/energy-system/carbon-capture-utilisation-and-storage/bioenergy-with-carbon-capture-and-storage>
- ¹⁶ https://iea.blob.core.windows.net/assets/78633715-15c0-44e1-81df-41123c556d57/DirectAirCapture_Akeytechnologyfornetzero.pdf
- ¹⁷ <https://www.iea.org/energy-system/carbon-capture-utilisation-and-storage/direct-air-capture#tracking>
- ¹⁸ <https://www.iea.org/energy-system/carbon-capture-utilisation-and-storage/bioenergy-with-carbon-capture-and-storage>
- ¹⁹ European Commission (2022), Proposal for a regulation of the European Parliament and of the council establishing a Union certification framework for carbon removals.
- ²⁰ Greenhouse Gas Protocol (2023), Land Sector and Removals Initiative – Project Overview. https://ghgprotocol.org/sites/default/files/2023-06/Project%20Overview_16%20June%202023.pdf
- ²¹ Science Based Targets Initiative (2023), Public Consultation on Beyond Value Chain Mitigation (BVCM). Table 1.
- ²² United Nations' High-Level Expert Group on The Net Zero Emissions Commitments of Non-State Entities, Integrity matters: Net zero commitments by businesses, financial institutions, cities and regions. <https://www.un.org/sites/un2.un.org/files/high-level-expert-group-n7b.pdf>

