POSITION PAPER

NET ZERO BY REVERSED MINING

How Perpetual Next leads the emerging carbon removal industry

Perpetual Next
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TABLE OF CONTENTS

GLOSSARY

BECCS	Biomass Energy with Carbon Capture and Storage
CCS	Carbon Capture and Storage
CDM	(United Nations) Clean Development Mechanism
CO_2	Carbon dioxide
CO_2e / CO_2eq / CO_2–e	Carbon dioxide equivalent. A metric measure used to compare the emissions from various greenhouse gases on the basis of their GWP, by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming
CORCs	CO_2 Removal Certificates
C–Vertr	Carbon converter technology
DAC	Direct Air (CO_2) Capture
EU ETS	European Union Emissions Trading System
GHG	Greenhouse Gas Emissions
GWP	Global Warming Potential. The heat absorbed by any greenhouse gas in the atmosphere, as a multiple of the heat that would be absorbed by the same mass of carbon dioxide (CO_2)
ICROA	International Carbon Reduction & Offset Alliance
IETA	International Emissions Trading Association
IPCC	Intergovernmental Panel on Climate Change
NETs	Negative Emission Technologies
PPM	Parts per million
RBCF	Result Based Climate Finance
Scope 1 emissions	Direct greenhouse (GHG) emissions that occur from sources that are controlled or owned by an organization (e.g., emissions associated with fuel combustion in boilers, furnaces, vehicles)
Scope 2 emissions	Indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling
Scope 3 emissions	The result of activities from assets not owned or controlled by the reporting organization, but that the organization indirectly impacts in its value chain. Scope 3 emissions, also referred to as value chain emissions, often represent the majority of an organization's total GHG emissions
SDE+	Dutch Renewable Energy Support Scheme
VCM	Voluntary Carbon Market

1. EXECUTIVE SUMMARY

Greenhouse gas emissions are caused by human action and also by nature itself. It is mainly the exhaust gases from the combustion of fossil fuels that pollute the atmosphere with carbon that was previously stored in the earth. Other by-products and tail gases also enter the atmosphere during combustion.

Greenhouse gases such as CO_2 linger in the earth's atmosphere for a very long time: 40% are still there after 500 years. These greenhouse gases are very much diluted in the atmosphere (about 0.04%). Nevertheless, they form an insulation blanket around the earth and therefore retain the heat that is radiated by the sun and this warms the earth. Climate change occurs over time due to global warming. Scientists and politicians have determined that warming must remain "well below 2 degrees" to avoid catastrophe. To this end, the insulation blanket should not become much thicker than it already is: only a little more greenhouse gas is allowed.

This means that greenhouse gas emissions caused by human actions must be reduced as a matter of urgency. This can be done by replacing fossil fuels with non-fossil alternatives such as energy from wind, solar, biomass and nuclear energy. A plan has been made for this reduction in emissions and many countries feel bound by it. It will reduce emissions by 55%, but bringing them all the way to zero will not work, there will always be unavoidable emissions. To achieve the required emissions reductions, companies can pull levers such as improving energy efficiency, transitioning to renewable energy, and addressing value chain emissions. There is general scientific consensus that this reduction is not quick enough to ensure that the concentration of greenhouse gas does not exceed 2 degrees.

This means that the greenhouse gases that are already in the atmosphere must be actively reduced in the earth's crust. However, once those gases are very diluted in the atmosphere, it takes a lot of effort to get them out again. Therefore, it is better to capture the greenhouse gases and put them underground if they have not yet been diluted. The trees and plants are in fact that natural sponge needed for long-term storage of the greenhouse gases, because that is what they are made of. And if trees were guaranteed to last longer than 100 years, forestry would be the unwavering guarantee of reducing the concentration of greenhouse gas in the atmosphere. Unfortunately, that guarantee is not there, because of forest fires, forest extraction and other activities that can destroy a forest. Therefore, other, guaranteed methods are needed to store the carbon contained in the biological residual materials for a long time.

The company Perpetual Next has developed a process in the form of its C-Vertr reactor, by which raw biomass can be charred into a stable biocoal, called biochar. It is the first high-performance installation that does so on unprecedented industrial scale. This is done by heating the raw biomass in a low-oxygen environment. This biochar is not digested when spreading in the soil and remains stable for a long time - more than 1000 years. This thus adds the carbon from the air, via the natural intermediate step of tree and plant growth, back to the soil. A major additional advantage is that this biochar also improves the soil structure and properties. More water is retained, and the nutrients are also stored longer, improving soil quality and fertility. Not only wood, but also other biological waste residues can be used to make biochar and then remove carbon from the carbon cycle and also as a soil improver in agriculture.

Current scenarios indicate that the theoretical market potential for the C-Vertr reactor is 7.500 by 2025 to comply with the climate targets of the industry.

This document is based on extensive knowledge and research on current scientific work on climate change, negative emissions and biochar. Its aim is to encourage interested readers to look at biochar from a variety of perspectives and to rethink carbon cycles. In particular, the document is aimed at:

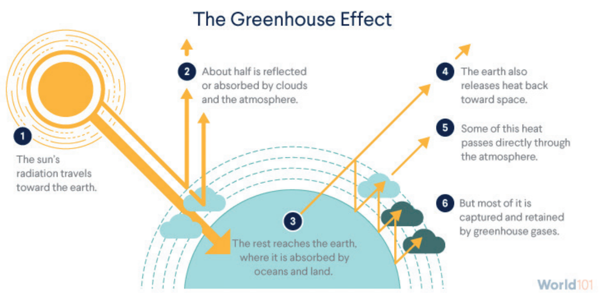
- Decision-makers in Perpetual Next looking for the context of climate change.
- Investor relations staff who want to get an up-to-date picture.
- Investors considering investing in Perpetual Next as a way to enter the fast-growing biochar market.
- Anyone who cares about climate and environmental protection.

2. INTRODUCTION

2.1. High level climate change

The process of climate change starts with the greenhouse effect. That is a natural process responsible for keeping the earth at the temperature needed to sustain life. Acting just like the glass walls of a greenhouse, gases like **carbon dioxide**, **methane**, and **nitrous oxide** trap the sun's heat in the atmosphere and prevent it from escaping into space.

The 'carbon dioxide equivalent' is used as a measure of the strength and thus the influence of each individual greenhouse gas. This indicates the Global Warming Potential (GWP) of each gas.



About half of the sun's radiation that travels toward the earth never makes it to the earth's surface. Clouds and the atmosphere reflect about one-third of the radiation back toward the sun, and they also absorb another 20%. The rest of the radiation – about 50% – reaches the earth, where it is absorbed by oceans and land. This keeps the earth warm and sustains plant, animal, and human life. The earth also releases heat back toward space. Some of this heat passes through the atmosphere, but most of it is captured and retained by greenhouse gases before it can escape. This is the mechanism that keeps the earth warm.

The greenhouse effect has supported life on the earth for millions of years. Today, however, the greenhouse effect is growing stronger as human activities such as **deforestation** and **fossil fuel** use release more and more greenhouse gases into the atmosphere. This traps greater amounts of the sun's radiation, which contributes to rising temperatures, also known as global warming.

WHAT IS GREENHOUSE GAS?

The global warming potential (GWP) is the heat absorbed by any greenhouse gas in the atmosphere, as a multiple of the heat that would be absorbed by the same mass of carbon dioxide (CO_2). GWP is 1 for CO_2. For other gases it depends on the impact of the gas and the duration that it is active, the time frame.

Carbon dioxide equivalent (CO_2e, CO_2eq or CO_2-e) is calculated from GWP. It can be measured in weight or concentration. For any amount of any gas, it is the amount of CO_2 which would warm the earth as much as that amount of that gas. Thus it provides a common scale for measuring the climate effects of different gases. It is calculated as GWP times amount of the other gas. For example, if a gas has GWP of 100, two tons of the gas have CO_2e of 200 tons, and 1 part per million of the gas in the atmosphere has CO_2e of 100 parts per million.

100-year Global Warming Potential

Selected compounds (per kg)

Name	Formula	GWP
Carbon Dioxide	CO2	1
Methane	CH4	28
Nitrous Oxide	N2O	265
HCFCs	various	80 - 2,000
HFCs	various	4 - 12,400
CFCs	various	4,600 - 14,000
Nitrogen Trifluoride	NF3	16,100
Trifluoromethyl Sulfur Pentafluoride	SF5CF3	17,400
Sulfur Hexafluoride	SF6	23,500

Source: Dr Robert Rohde @BerkeleyEarth

2.2. The big picture: the world cannot get to 1.5°C without carbon removal

The Paris Agreement, a landmark agreement signed by all 197 member countries of the United Nations Framework Convention on Climate Change (UNFCC), aims to combat climate change by keeping global temperatures well below 2°C above pre-industrial times and, if possible, below 1.5°C. Why does 1.5°C matter? According to climate scientists, a 1.5°C increase is the limit required to avoid the worst impacts of climate change.

Greenhouse gases, such as CO_2, remain in the earth's atmosphere for a very long time: 40% is still remaining after 500 years. The concentration of CO_2 has risen very strongly due to industrialization. The concentration is given in ppm (parts per million).

Figure 1 below shows how the concentration has increased over the years. The pre-industrial level is around 275 ppm and today it is already close to 420 ppm. Scientific consensus exists that 350 ppm is the target that is needed to avert "irreversible catastrophic effects", so the atmospheric concentration has to go down. However, the always present, natural absorption process of the earth is not sufficient to accomplish this target level, and two separate actions need to be taken.

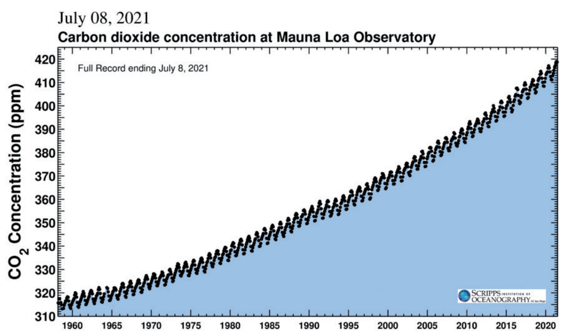


Figure 1. The increase of the CO_2 concentration in the atmosphere. It is measured at the Mauna Loa Observatory on Hawaii at 3400 meters well above human-generated influences and the clouds. It is also the longest continuous record of direct measurements of CO_2. Source: The Keeling Curve (ucsd.edu).

Firstly, to halt further global warming, global emissions must be halved by 2030. This is achieved by reducing emissions, so called **carbon reduction**. This can be done by using fossil fuels more efficiently and by replacing them with non-fossil alternatives such as energy from wind, solar, biomass and nuclear energy. A plan has been drawn up for reducing emissions and many countries feel committed to it. They will aim to reduce real annual emissions by 55% by 2030 and to become net neutral by 2050. This is referred to as **NET ZERO** as indicated in the Figure.

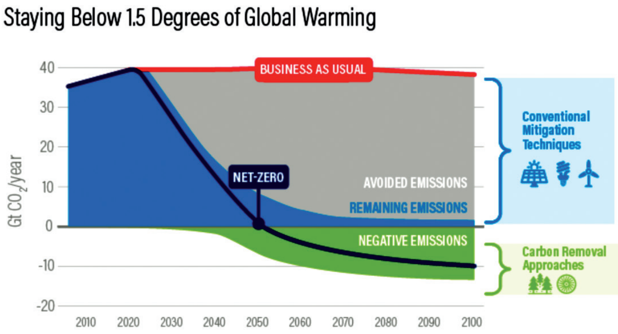


Figure 2. The graph shows the principle of NET ZERO: first, the current emissions need to be avoided by mitigation techniques such as renewable energy. The remaining emissions need to be neutralized by negative emissions, which is the result of carbon removal.

Secondly, because there will always be unavoidable emissions, those greenhouse gases that are emitted must be actively captured and put underground. In addition, greenhouse gases that are already in the atmosphere must be actively returned to the earth's crust. This is called **carbon capture** and **carbon(dioxide) removal (CDR)** respectively.

Only with the combination of carbon reduction, capture and removal the concentration of CO_2 can be reduced to the maximum of 350 ppm, which is the maximum allowed concentration to stay below 1.5°C warming. This combination will result in NET ZERO emissions by 2050. The Special Report on Global Warming of 1.5°C of the Intergovernmental Panel on Climate Change (IPCC) of October 2018 summarizes these insights as follows: **Carbon removal - the process of extracting carbon dioxide from the air and storing it - will be crucial to avoiding the most catastrophic impacts of climate change.**

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>
> *Intergovernmental Panel on Climate Change, October 2018*

2.3. Carbon budget

Limiting global warming requires limiting the total cumulative global human-caused emissions of CO_2 since the preindustrial period, that is, staying within a total carbon budget. This will be crucial to avoiding the most catastrophic impacts of climate change. The carbon budget determines what we can still emit in the coming years. Since the industrial revolution, we have already used up more than three quarters of the available CO_2 budget for the Paris temperature target – limit warming to well below 2 degrees, preferably no more than 1.5 degrees. So there is an urgent problem.

According to the earlier mentioned Special Report on the 1.5 °C target, the atmosphere can absorb, calculated from end-2017, no more than 420 gigatonnes (Gt) of CO_2 if we are to stay below the 1.5°C threshold. Annual emissions of greenhouse gases such as CO_2 – from burning fossil fuels, industrial processes and land-use change – are estimated to be around 42 Gt per year, the equivalent of 1,332 tonnes per second. With emissions at a constant level, the budget would be expected to be used up in less than seven years from now. The budget for staying below the 2°C threshold, for its part, of approximately 1,170 Gt, would be exhausted in about 25 years.

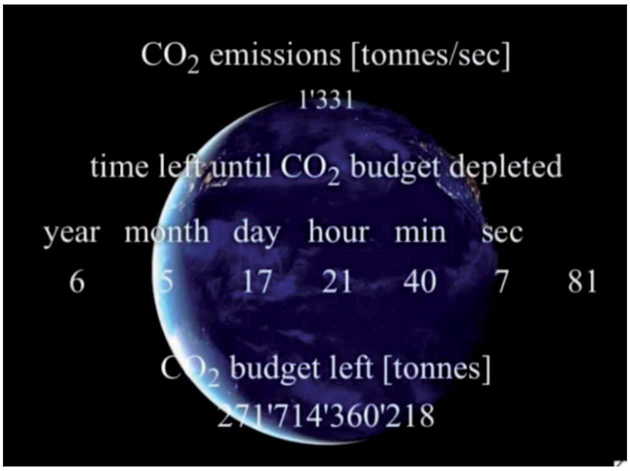
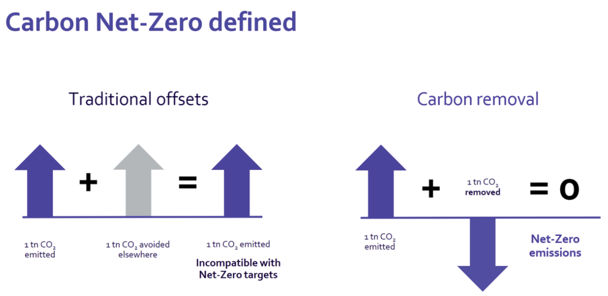


Figure 3. A visual representation of the amount of time left can be found on: https://www.mcc-berlin.net/fileadmin/data/clock/carbon_clock.htm?i=3267263.

2.4. Carbon capture and removal

The principle of NET ZERO emissions by carbon removal is depicted in Figure 4.



CO_2 emissions + avoided emissions = net (positive) emissions

CO_2 emissions + (equal) CO_2 removal = NET ZERO emissions

Figure 4. Carbon NET ZERO defined: there is a distinct difference between the traditional offsets and actual carbon removal. Source: Puro.Earth

The world needs a large volume of negative emissions. Scenarios made by various reputable institutions, including IPCC, McKinsey, Coalition for Negative Emissions and NGFS, require approximately 1 Gton of negative emissions per year by 2030. This is comparable to the emissions from global air travel in 2019. Although solutions are already available and ready to be scaled now, the urgency of action is underlined by the long lead times typically required to develop negative emissions projects due to their scale (for example, large areas of land) or complexity (billion-pound CCS networks). The IPCC has one of the highest stated needs for negative emissions, scaling up to 10 Gton per year by 2050. Negative emissions literally need to reach industrial scale. The IPCC implies a quantity in 2050 that is approximately equivalent to the combined CO_2 emissions of China and India today. Not only are negative emissions needed in large quantities, they are is also needed very soon.

2.5. Possible solutions

To realize the ambitions set in the Paris Climate Accords, it is not enough to lower emission of CO_2. It is also necessary to remove CO_2 that has already been emitted from the atmosphere. To achieve this, so-called Negative Emission Technologies (NETs) are being developed: ways to capture CO_2 from the atmosphere or at the point of emission, both technological and natural, and ways to store it long-term or turn it into usable products.

There are seven major technologies and methods, some of which are nature-based, as depicted below.

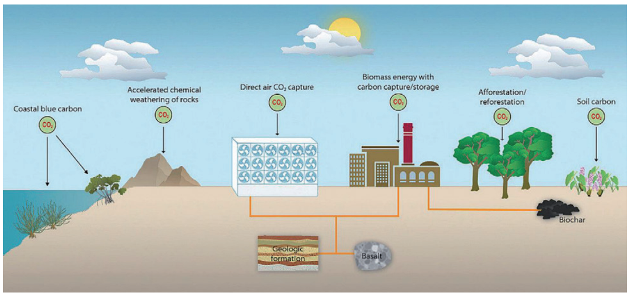


Figure 5. Negative Emissions Technologies (NETs) range from low-tech, such as planting more trees, to more high-tech options, such as developing machines to scrub CO_2 from the air. NATIONAL ACADEMY OF SCIENCES, 2018

1a	Coastal blue carbon: enhanced ocean productivity	Adding iron or nitrogen to the ocean to increase the rate at which tiny microscopic plants photosynthesise, thus accelerating their take up of atmospheric CO_2.
1.b	Coastal blue carbon: 'Blue carbon' habitat restoration	Conservation and restoration of degraded coastal and marine habitats, such as salt marshes, mangroves, and seagrass beds, so they continue to draw CO_2 out of the air.
2.	Accelerated weathering	Spreading pulverized rocks onto soils and/or the ocean to ramp up the natural rock weathering process that takes up CO_2 from the atmosphere and eventually sees it washed into the ocean as bicarbonate.
3.	Direct Air CO_2 Capture (DAC)	Sucking carbon dioxide out of the air and either burying it underground or using it in chemical processes to make anything from plastic to fuel.
4.	Biomass energy with carbon capture and storage (BECCS)	Farming bioenergy crops, which extract CO_2 from the atmosphere as they grow, and then burning them for energy and sequestering the resulting emissions underground.
5.	Afforestation and reforestation	Planting trees where there were previously none (afforestation) or restoring areas where trees have been cut down or degraded (reforestation).
6.	Soil carbon sequestration	Using measures, such as modern farming methods, grassland restoration and creation of wetlands and ponds, to reverse past losses of soil carbon and sequester CO_2.
7.	Biochar	Heating biomass to create biochar and adding it to soils where it holds on to its carbon for thousand years.

Table 1. List of solutions for carbon removal

2.6. Market status and costs of carbon capture

Removing CO_2 from the atmosphere comes with a price tag. Carbon credits can help make carbon removal initiatives economically feasible and scalable. Every technology has its own potential and cost. This is well illustrated in Figure 6.

Negative emissions technology	Afforestation and reforestation	Biomass-energy with carbon capture and storage	Biochar	Direct air carbon capture and storage	Soil carbon sequestration	Enhanced weathering & ocean alkalinity[1]	Ocean fertilization[1]
2050 potential	0.5-3.6 Gt CO_2/p.a.	0.5-5 Gt CO_2/p.a.	0.3-2 Gt CO_2/p.a.	–	2.3-5.3 Gt CO_2/p.a.	1-16 Gt CO_2/p.a. 0.1-10 Gt CO_2/p.a.	0-44 Gt CO_2/p.a.
Costs	USD 5-50/tCO_2	USD 200/t CO_2	USD 30-120/t CO_2	USD 100-300/t CO_2	USD -45-100/t CO_2	USD 15-40/t CO_2 USD 14-400/t CO_2	USD 2-457/t CO_2
Features	• High land and water usage • Lower period of storage than geological storage • Saturation of forests over decades/ centuries • Storage threatened by fire, drought and pests	• Limited by availability of sustainable biomass and secure CO_2 storage • High nutrient and energy consumption • Uncertainties regarding scalability • Land use conflicts	• High land use • Limited maximum storage period determined by available soils • Positive effects on soil fertility	• Costs currently high • Technological challenges • Low land use	• Soil saturation after 10– 100 years • Increases soil fertility	• Problematic scalability and side effects • Higher pH values, release of heavy metals, changes to ecosystems	• Major side effects on existing ecosystems

[1] As these technologies are at a very early stage of development, the potential and costs can only be broadly estimated
Source: IPCC Report Global Warming of 1.5°C, graphic by Siemens Energy

Figure 6. The figure shows the seven different removal technologies and their characteristics. Source: Siemens Energy– after the IPCC reports

Unfortunately, the world is falling well short of the action needed to produce negative emissions at scale, as has been investigated by the Coalition for Negative emissions in a recent report. Negative emissions are primarily funded by compliance and voluntary carbon markets – however, this has only amounted to 300 Mt to date. Almost all of this is through nature-based solutions 5 and 6 of table 1 (afforestation and reforestation: restoring soil, mangroves, seagrass and peatlands). Negative emissions solutions with geological storage are in the pilot stage, with functioning plants capable of producing less than 10 Mt in total. Negative emissions technologies currently have long lead times. Projects can take multiple years to start and decades to reach full potential. Solutions with geological storage currently take around five to ten years to scale up. This means that the present-day pipeline will be a major determinant of the magnitude of negative emissions for at least the first half of this decade. BECCS projects currently under development may achieve in the order of 5 Mt of carbon removal per year by 2025 and DACS projects around 1 Mt. At present rates of reforestation, projects should deliver approximately 150 Mt of sequestration per year by 2025. Finally, there are various other negative emissions approaches under development. Some of these have significant potential and so could play a major role in the future. Biochar, for example, may also make a contribution in the 0-10 Mt range by 2025. However, many others are very unlikely to be ready for scaled up deployment by 2025. This means that no more than 200 Mt of removal can be confidently expected in 2025, missing the IPCC's average annual target of approximately 850 Mt by around 650 Mt. In other words, if there is not a concerted effort to correct this in the next year or two, the world will achieve less than 20 per cent of the annual negative emissions needed by 2025.

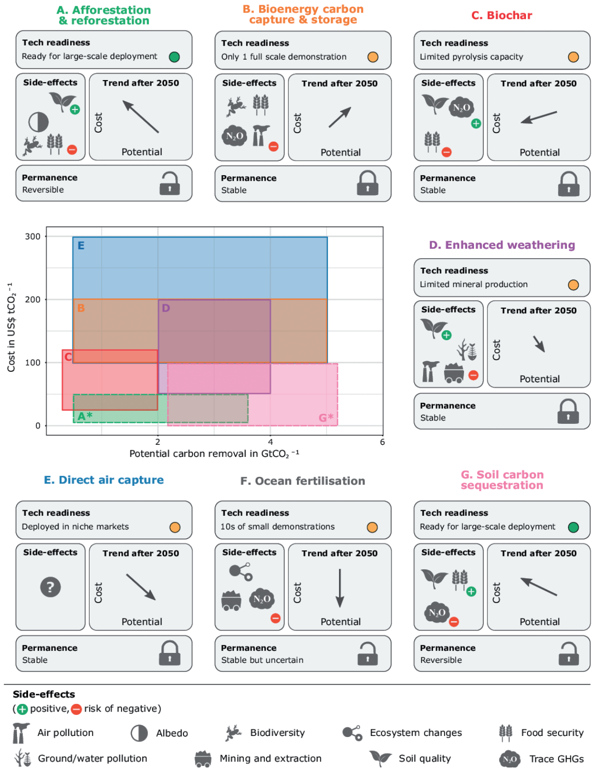


Figure 7. This shows a complete overview of the carbon removal potential in combination with costs and their side-effects and technology readiness. Source: Negative emissions: Research landscape and synthesis - Jan C Minx et al 2018 Environmental Research

Figure 7 shows the potential and costs (from table 1) concisely in the central block diagram, supplemented with key-side effects. All ranges result from assessments of these individual technologies and are not additive as technologies compete for limited geological storage, land and biomass feedstocks.

It shows that annual deployments of soil carbon sequestration (G) and afforestation (A) cannot be sustained as long as other technologies (due to rapid sink saturation). Thus a portfolio of multiple carbon removal options is necessary. Note that risks of negative side effects are often contingent on implementation, e.g. large-scale afforestation with mono-cultures versus agroforestry projects, or biochar from dedicated crops versus residues.
The overall conclusion after examining the different technologies is as follows:

- Most carbon removal options show relevant potential, but all have limits
- There is no silver bullet
- All have constraints which are bio-physical or economic limits

1 ton CO_2 is emitted when you...

- burn 319 liter diesel
- fly 7x to Paris
- use 300 kilo standard office paper
- travel 16.000 km by train
- respirate 500 days

1 ton CO_2 looks like...

- 500 CO_2 fire extiguishers
- A small hot- air balloon of 500 m³
- 125.000 liters cola
- 17 containers of 20 foot

3. WHAT ARE CARBON CREDITS MARKETS?

Carbon pricing is an instrument that captures the external costs of greenhouse gas (GHG) emissions. Such as the costs of emissions that the public pays for e.g. damage to crops, health care costs from heat waves and droughts, and loss of property from flooding and sea level rise. It ties the GHG emissions to their sources through a price, usually in the form of a price on the carbon dioxide and other greenhouse gases emitted. A price on carbon helps shift the burden for the damage from GHG emissions back to those who are responsible for it and who can avoid it. Instead of dictating who should reduce emissions where and how, a carbon price provides an economic signal to emitters, and allows them to decide to either transform their activities and lower their emissions, or continue emitting and paying for their emissions. In this way, the overall environmental goal is achieved in the most flexible and least-cost way to society. Placing an adequate price on GHG emissions is of fundamental relevance to internalize the external cost of climate change in the broadest possible range of economic decision making and in setting economic incentives for clean development. It can help to mobilize the financial investments required to stimulate clean technology and market innovation, fueling new, low-carbon drivers of economic growth.

There is a growing consensus among both **governments** and **businesses** on the fundamental role of carbon pricing in the transition to a decarbonised economy. For governments, carbon pricing is one of the instruments of the climate policy package needed to reduce emissions. Businesses use internal carbon pricing to evaluate the impact of mandatory carbon prices on their operations and as a tool to identify potential climate risks and revenue opportunities. Finally, **long-term investors** use carbon pricing to analyze the potential impact of climate change policies on their investment portfolios, allowing them to reassess investment strategies and reallocate capital toward low-carbon or climate-resilient activities.

3.1. Compliance and voluntary

We can distinguish between **compliance** and **voluntary** markets. Carbon markets can trade either quotas or credits. **Allowances** are compliancy units of **quota** issued by the government, or tradable, bankable entitlements to emit pollutants. **Credits** are certificates created when a person or an entity underutilizes a 'right' to pollute or creates an opportunity to capture carbon.

3.1.1. Compliance

Mandatory or compliance carbon markets are regulated by national, regional of provincial law and mandate emission sources to achieve compliance with GHG emissions reduction requirements. In practice, the regulated entities obtain and surrender emissions permits (allowances) or externally purchased offsets in order to meet the predetermined regulatory targets. In most cases, the compliance programs exist as cap-and-trade emission trading schemes, such as the European Union Emissions Trading Scheme (EU ETS). The most active compliance carbon offset program is the United Nations Clean Development Mechanism (CDM).

3.1.2. Voluntary

The voluntary carbon market (VCM) encompasses all transactions of carbon instruments that are not purchased with the intention to surrender into an active regulated carbon market. Voluntary demand for carbon offsets is driven by companies and individuals that take responsibility for offsetting their own emissions, known as purely voluntary buyers, as well as entities that purchase pre-compliance offsets before emissions reductions are required by regulation.

How are carbon credits generated?

Projects that generate carbon credits – each equivalent to one ton of carbon dioxide avoided or removed from the atmosphere – focus on carbon abatement. As an example, when trees take in carbon from the atmosphere and store it in the tree and soil. For a carbon project to qualify as a verified emissions reduction and be claimed as an offset, stringent rules must be met, and verified by an independent third party. Carbon credits should represent emission reductions or carbon dioxide removals that are:

- **real and measurable** – realized and not projected or planned, and quantified through a recognized methodology, using conservative assumptions.
- **permanent** – not reversed: relating to projects with a reversibility risk such as forestry projects, which could suffer from fire, logging, or disease. Here, comprehensive risk mitigation and a mechanism to compensate for any reversals need to be in place.
- **additional** – would not have been realized if the project had not been carried out, and the project itself would not have been undertaken without the proceeds from the sale of carbon credits.
- **independently verified** – verified by an accredited, independent third party.
- unique and traceable-transparently tracked in a public registry and not double-counted.

Additionally, it is important that appropriate safeguards are in place to ensure projects comprehensively address and mitigate all potential environmental and social risks.

Each project engages with a certifying organization that validates the projects authenticity, claims and the scientific methodology used to calculate the CO_2 offsets generated. There is a finite number of credits per project and vintage, and they cannot be duplicated or unretired.

An increasing number of projects also achieve other environmental, economic, social and cultural benefits. These are known as co-benefits, and they offer additional value to companies trying to meet their sustainability commitments.

3.2. Emission allowances, credits and retirements

Carbon pricing can take different forms and shapes. It refers to initiatives that put an explicit price on GHG emissions, i.e. a **price** expressed as a value per ton of **carbon dioxide equivalent (tCO_2e)**. In Figure 8 a schematic overview is given of various approaches. Considering these different carbon pricing approaches, an emissions trading system (ETS), on the one hand, provides certainty about the environmental impact, but the price remains flexible. A carbon tax, on the one hand, guarantees the carbon price in the economic system against an uncertain environmental outcome. Other main types of carbon pricing offset mechanisms are the group of results-based climate finance (RBCF) schemes. These are financial instruments including subsidies, loans and grants that delivers in some form a key objective of climate action. In the Netherlands the SDE+ subsidy scheme is such a RBCF instrument. Also, an energy tax is a form of carbon pricing, yet without addressing the climate aspect as it does not distinguish between on the carbon content of the various forms of energy.

Apart from the RBCF schemes, there are currently 63 carbon pricing initiatives in place worldwide or scheduled for implementation (World Bank, 2021), of which 32 are compliance markets. In compliance carbon markets (which can be on the international, national or regional level), a couple of (often) large or industrial emitters are required by law to comply with a limit on the amount of greenhouse gases they can emit. The limit can be introduced as an overall cap on the sector or as relative baseline on the emitters. Emitters can buy or sell allowances or credits depending on whether they produce more or less emissions than they are supposed to. The EU ETS market is the world's largest carbon market by volume and value, and the carbon price has been above 30 €/ton CO_2e since 2019, apart from a drop during the Covid-19 crisis. Since September 2021 the carbon price has been around 60 €/ton CO_2e.

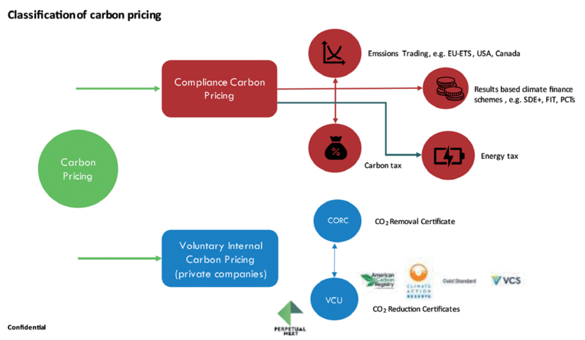


Figure 8. Schematic representation of the principles of carbon price schemes. Compliance schemes are schemes underpinned by supra-national, national, or regional legislation. Voluntary schemes are non-mandatory and non-regulated. The most important schemes nowadays are American Carbon Registry (ACR), Climate Action Reserve (CAR), Gold Standard and Verified Carbon Standard (VCS)

Voluntary carbon markets are often non-governmental initiatives which issue tradable emission units to actors who voluntarily implement emission reduction activities. Voluntary crediting units can be traded and purchased by other actors, e.g. companies, to 'compensate' for their emissions, as mentioned earlier.

This is in contrast to compliance markets such as ETS, where actors either reduce their emissions or pay for the surplus. These voluntary crediting units can be used in regulated schemes, such as carbon taxes or ETS, if policymakers choose to give the regulated emitters an alternative means of compliance. Article 6 of the earlier mentioned Paris Agreement serves as the global international regulation for cross-border trading of carbon credits and determines to what extent they can be accounted for in the plans of emission reduction for individual nations. The scheme is still under development and will underpin the importance of the credits for the carbon sinks, i.e. the negative emissions credits such as CORCs, as more countries are pledging NET ZERO targets. These national, NET ZERO targets cannot be achieved without the deployment of negative emissions. The IETA – the international stakeholder group of Article 6 players – expects that over time the removal credits will take over in importance from the current reduction credits.

Carbon credits trading and retirements

When carbon credits are issued for a certain project, each tonne of CO_2 offset is individually identifiable with a unique number, vintage and project identity. Credits are traceable, tradable and finite: When they are purchased, they are retired forever.

Entities can neutralize, or offset, their emissions by retiring carbon credits generated by projects that are reducing GHG emissions elsewhere. Of course, it is critical to ensure, or verify, that the emission reductions generated by these projects are actually occurring. This is the work of the voluntary carbon schemes VCS Program – to ensure the credibility of emission reduction projects.

This revenue helps to fund projects and activities that protect or restore forests, often supporting local communities with alternative livelihood opportunities that keep trees standing, and it helps fund programs to do so in perpetuity.

firstclimate Dedicated, Naturally.

Other Baseline & Credit Standards

Features	Gold Standard (GS)	Verified Carbon Standard (VCS)	Climate Action Reserve (CAR)	American Carbon Registry (ACR)
Governing Body	Gold Standard Foundation	VCS Association	California Air Resources Board	Winrock Board of Directors
Carbon Unit	Verified Emission Reduction (VER)	Verified Carbon Unit (VCU)	Climate Reserve Ton (CRT)	Registry Offset Credits (ROCs) + Early Action Offset Credits (EAOCs)
Type of Market	Voluntary and Compliance Market	Voluntary Market	Voluntary carbon market and California's regulated carbon market	Voluntary carbon market and California's regulated carbon market
Regional Scope	Implemented in countries without an emission cap	Implemented in non-Annex 1 countries + in countries without an emission cap	USA	California compliance market + global voluntary carbon market
Project Types	EE, RE, Afforestation	All including REDD, excluding new HFC	GHG reduction	All types

3.3. Carbon reduction vs. carbon removal

It should be noted, however, that the emissions covered by compliance markets are still being emitted, only with a price. In contrast, the Mtons CO_2e traded in voluntary markets are emissions which are indeed avoided, i.e. not emitted in the first place, or withdrawn from the atmosphere. The literature on the effects of the EU ETS on actual emissions reductions is inconclusive. From 2021 onwards, the overall number of emissions allowances will decline at an annual rate of 2.2% which equals emission reductions of 55 Mton in 2021. This is already in a similar order of magnitude as the avoided or sequestered emissions from the voluntary carbon offsets.

3.4. Removal certificates CORCs

The existing removal commerce is a complex and time-consuming process. For example, Apple has decided to neutralize the emissions of Apple Maps cars by investing in the restoration of mangrove forests. However, this has required several people at Apple to identify and rate thousands of projects and finally select this approach as the optimal means for CO_2 removal. In addition, management and control of the project will consume resources. This cumbersome approach is possible nor wise for the majority of organizations.

Instead, a marketplace where verified, comparable CO_2 removal certificates (CORCs) are offered from all methods, enables more buyers to become carbon-neutral with less effort, sooner and more effectively.

CO_2 Removal Certificates (CORCs) are digital tradable carbon assets that confirm 1 tonne of CO_2 has been absorbed and stored in a carbon net-negative product. CORCs are issued for only the extra carbon absorbed after a third party verification of the product has proven that it is carbon net-negative from cradle-to-gate.

For that reason, the Finland-based company has created the first marketplace to offer verified CO_2 removals since 2019. The marketplace auctions are open to suppliers, companies that build and run carbon net-negative operations, and buyers, ambitious companies who after reducing their emissions want to also remove CO_2 from the atmosphere and explore CORCs as a solution to meet their voluntary climate objectives. The CORCs compliance to the rules is audited by an independent assessor – at the moment DNV GL – which is one of the largest verifiers in the world for ISO 14000 and ISO 9000 certificates. The marketplace has submitted an approval procedure with the ICROA (International Carbon Reduction & Offset Alliance).

CORCs are traded on the platform of Puro.Earth, which is currently sourcing CORCs from 14 suppliers of which are 10 biochar producers. These producers have fairly limited production capacities, which reflects the current state of the industry. Market volume is therefore supply constrained, and although Puro.Earth's target is to trade 1.000.000 CORCs in 2021, the company reported a transaction volume of 60.000 CORCs by June 2021. This demonstrates further the need for large scale CORC production. Transactions currently trade at €100 per CORC.

4. TRENDS IN THE MARKETS

4.1. Supply and demand volume and pricing

Price is determined by supply and demand. Much research has been done and much has been written about the voluntary carbon market. There is no unambiguous price to indicate for CO_2e and therefore also not for the total market volume. Trove Research estimates the 2019-2020 market volume at 95MtCO_2e/yr, Ecosystem Marketplace/ World Bank at 104MtCO_2e/yr and McKinsey at 138MtCO_2e/ yr (based on an estimation of 5 standards: VCS, Gold Standard, Climate Action Reserve, American Carbon Registry, and Plan Vivo).

The price estimates range from USD 2.7–5.0 per tonne of CO_2e.

Over the years, the situation on the carbon markets has been one of oversupply of credits – accordingly, the average prices have dropped almost every year since 2008 (from USD 7.3 per ton CO_2e to around USD 2.7 in 2019), resulting in decreasing market value (see Figure 9), despite relatively stable demand for credits (World Bank, 2020).

Figure 9. The trends in market volume and prices of the voluntary carbon credits. Source: based on data provided in Ecosystems Marketplace, 2020

It should be noted that, despite the relatively low carbon price, the prices differ widely depending on the project category and even within a project category. The difference in price is determined by a number of factors. First of all, the question of whether there is reduction or removal. Obviously, a higher rating is attached to removal because it results in negative emissions. In addition, the duration of the removal is a factor. A tree takes CO_2 from the air for about 30 years, biochar for up to 1000 years. See Figure 13 for a detailed explanation.

The lowest average prices are paid for renewable energy projects (USD 1.4 /ton CO_2e), whereas projects in forestry and land use see the highest average prices (USD 4.3 / ton CO_2e). The lower average prices from 2019 can be attributed to cheap carbon credits from old renewable energy projects, i.e. from before 2017. In 2019, prices for offsets from renewable energy decreased by 16% while their volume surged by 78% (Ecosystems Marketplace, 2020). These credits are cheap because their additionality is contested.

Prices of new (nature-based) credits are actually rising: in 2019, prices for carbon credits from nature-based solutions and natural climate solutions rose by 30% (Ecosystems Marketplace, 2020).

When we take the middle estimate of the three institutes mentioned, the volume of the voluntary carbon market was estimated at 104 Mton CO_2e with an average price of USD 2.7 /ton CO_2e in 2019 by Ecosystem Marketplace/ Worldbank. This brings the market value to USD 282.3 million. The voluntary carbon market is hence dwarfed by existing compliance markets: USD 48 billion was raised in carbon revenues in 2019 (both carbon taxes and ETS). The global ETS account for 47%, a total of USD 23 billion. More than 3,000 Mton of CO_2e are already covered on compliance markets.

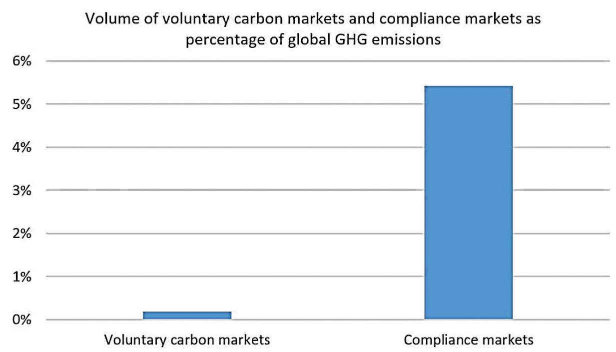


Figure 10. The volume of emissions priced in compliance versus voluntary carbon markets. Source: Ecosystem Marketplace (2020) and World Bank (2020)

Currently the voluntary carbon market is small with demand around 95-138 $MtCO_2e$/yr, representing 0.2% of global greenhouse gas emissions as compared to the global emissions. However, analysis shows that demand is likely to increase significantly, driven by a growing number of corporate NET ZERO commitments, underpinned by legislative measures. This in turn will increase scrutiny that real emissions reductions are being achieved.

With the ever increasing pressure on corporations to show climate action, the demand for voluntary credits are expected to grow 5-10 times up to 2030, 8-20 times by 2040 and 10-30 times by 2050. This increase in demand in the voluntary carbon market would account for around 5% of the global GHG emissions. According to the most recent estimate by ClearBlue, the global demand for offsets is expected to ramp up even more swiftly until 2030 at which point the growth will slow down with a peak around 2035. Demand could be as high as 1,900 Mton CO_2e in the mid-2030s, compared to the 100 Mton last year. As new emission reduction technologies mature, it is expected that the reliance on the offsets will diminish.

As demand for carbon credits increases, the costs of undertaking real emission reduction projects will need to rise as lower cost projects are used up. If the financing of voluntary projects is to genuinely reduce emissions beyond those that would otherwise have occurred, today's average prices of \$3-5/tCO_2e will need to increase to \$20-50/tCO_2e by 2030 and potentially \$100/tCO_2e if governments undertake lower cost projects first. Prices are then expected to keep rising further towards the year 2050.

This means that projects become economically viable as soon as the average prices of tCO_2e rises. Price and CO_2 abatement therefore go side by side. As can be seen in the demand curve depicted in Figure 11.

There is indeed consensus about the direction of the market in the literature. The market is getting bigger and prices are going up.

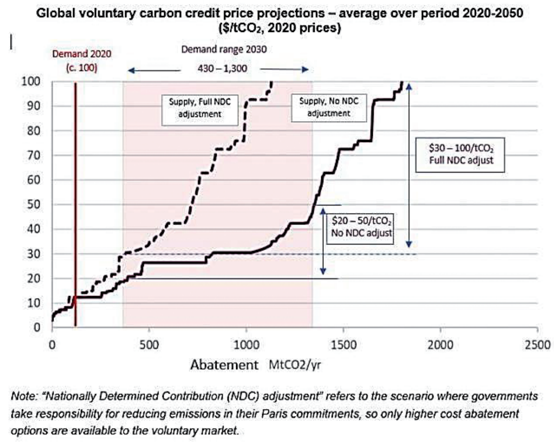


Figure 11. Global annual average sequestration supply curve 2020-2050 (\$/ tCO_2) (2020 prices). Source: Trove Research Global Carbon Credit Supply model

As a proxy for the carbon pricing in the voluntary market, a parallel can be drawn with the compliance market. The market is followed by reputable institutes and the consensus among the analysts is that the medium upward price trend will continue, until a peak in mid 2022 at €110. After this peak, the price will decline to about €50 and subsequently increase on a trends to €75 and will follow an upward trend to about €75-€100 towards 2030. The underlying rationale is by a detailed mix of the influence from political measures by governmental bodies and it is corroborated by the movements made by corporates.

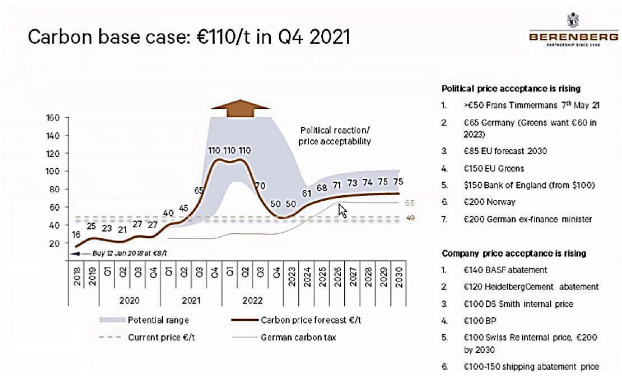


Figure 12. Carbon EUA price level as estimated by Berenberg, underpinned by political and corporate development (June 15 2021)

In summary, the outlook for the voluntary market is that of an exponential growth in demand. However, the market supply tends to move slower than the demand, as new projects can take several years before issuing the first credits. As a consequence, of the increasing demand, it is expected that prices for the voluntary credits will have to increase considerably.

4.2. Pricing of carbon sinks

In order to obtain an indication of the prices of carbon removal (sink) certificates, it is necessary to be able to compare the storage capacity of the sinks. The comparison of the sequestration curves in the examples in Figure 13 show sink performances of different carbon sinks over a period of 100 years. The respective endpoints correspond to the expiry dates specified in typical projects (contractually). Of course, the expiration of this period does not necessarily mean the destruction of the sink (for example, through clearing). However, at this point the contractual partners are free to change management practices, harvest timber or otherwise claim the sink benefit.

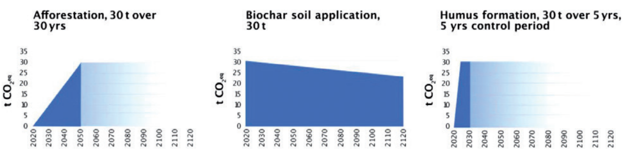


Figure 13. Comparison of the sequestration curves of different carbon sinks. In all cases it was assumed that a maximum of 30 t CO_2 equivalents are bound

Quantification of the climate benefit of different types of carbon sinks

A simplified, but initially suitable standardization for the service provided is the unit tonnes CO_2 equivalent multiplied by the number of years (in short "ton years"). For this, it is necessary to define an appropriate time horizon - otherwise permanent sinks such as the use of biochar in concrete, for example, would not be comparable with forest projects. A time horizon of 100 years seems appropriate, because this is long enough to avoid unwanted speculation, it is consistent with the horizon of the end of the 21st century, which is usually used in climate policy and climate science, and it is easy to communicate.

Let's consider a simplified example of a reforestation project on a defined area that runs for 30 years (example of common practice) and ideally binds exactly one ton of CO_2 per year, i.e. has bound 10 tons in year 10 of the duration. Within the project duration, the project will therefore yield: ½ x 30 years x 30 tons = 450 ton-years (area of the triangle: one half x base side x height). So there is multiplier of 15 between ton and ton years for reforestation.

In comparison, the illustrated sink on the basis of biochar depicted in the figure above, assuming an annual degradation rate of 0.3% over 100 years, produces a sink capacity of approximately 2,600 ton-years (area below the curve). So there is a multiplier of 87 between ton and ton-years for biochar.

In the voluntary market, up to 35 €/tCO_2e is currently paid for high-quality reforestation projects. This means that a ton-year for such a project costs an average of €2.33 (divide by 15). Sink certificates based on biochar applications are currently offered on the voluntary market for 100 €/tCO_2e over 100 years, i.e. €1 per ton-year. Even if the price of €100 for the certificates seems high at first, it is comparatively cheap in view of the service provided.

4.3. Corporate climate pledges: Microsoft leading the pathway

Around 2257 companies have pledged to become carbon neutral or NET ZERO, as reported by ClearBlue Markets on July 15, 2021. Most companies have made the pledge in 2020 or 2021 and aim to reach carbon neutrality by 2050. However, an increasing number of companies is pushing their neutrality dates forward to 2030, which will likely mean higher demand for removal credits. Only the companies tracked by ClearBlue already represent a volume of 685 million tCO_2e in scope 1 and 2 emissions and 935 million tCO_2e in scope 3 emissions. A concrete case is Microsoft, as one of the first companies that announced to be carbon negative by 2030. In practice this means that by 2025 it will have driven down the scope 1 and 2 emissions and the scope 3 emissions by 2030.

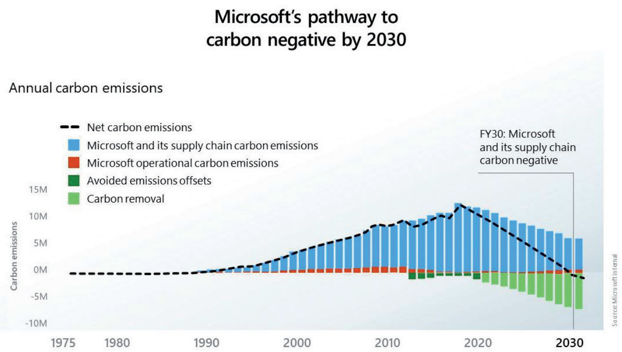


Figure 14. Microsoft's pathway to NET ZERO is composed of emission reductions, emission offsets and carbon removals. Furthermore, historical emissions need an extra effort in carbon removal of 24 million tons

The target is partially achieved by energy efficiency measures, renewable energy sourcing and further electrification, but the residual, hard-to-eliminate emissions will require a volume of 6 million tons of carbon removal in 2030, and continued annually in subsequent years. Moreover, to eliminate all historical emissions, the company must remove an additional 24 million tons between 2030 and 2050. On the short term, the target for 2021 is set at 1 million ton removal. A $1 billion Climate Innovation Fund was announced to support the ambition. To make it actionable, the company issued a request for proposal (RFP) process in 2021 and selected 15 projects from the inflow of 79 applications, thereby acquiring 1.2 million tons of carbon removal. The type of projects included forestry, biochar, BECCS and DACS. Of particular relevance here are the three biochar projects that were included, which were sourced from the marketplace Puro.Earth and concern the conversion of green waste and sustainable feedstock into biochar for soil amendments or other long-term application that store the carbon more than 100 years.

Other companies that have pledged to adopt a similar approach are depicted below.

5. CARBON REMOVAL WITH BIOCHAR

Biochar is a charcoal-like substance that is produced by carbonisation, which is the heating of organic agricultural and forestry waste (biomass) in the absence of oxygen. Without oxygen, the material does not combust but the chemical compounds (that is, cellulose, hemicellulose, and lignin) that make up the biomass thermally decompose into charcoal and combustible gases. The proportions of these byproducts vary based on biomass feedstock and carbonisation process parameters.

Biochar is a highly porous stable solid that is rich in carbon. It is commonly used as a soil additive and helps reduce the need for fertilizers. It can endure in soil for hundreds of years, helping to bind and retain water and nutrients. Although biochar is considered a more recent approach to carbon sequestration, adding charred biomass to improve soil quality dates back 2,500 years to the Amazonian basin, where indigenous people created areas of rich, fertile soils called terra preta (meaning "dark earth").

5.1. Abatement by biochar

If biomass is carbonised (i.e. "baked" in a low or no oxygen environment), about half of the carbon compounds of the biomass are converted into biochar. This high-carbon material is very durable and resists biological or chemical decomposition. If biochar is not burned but rather remains in the soil or is used in other long-lasting material applications, a carbon sink is created, always provided that the provision of the biomass does not diminish existing carbon stocks (EBC, 2020).

What is decisive for climate benefit is the overall balance of biomass production, carbonisation, further processing and application. Only if this balance is overall positive for the climate can we speak of a true carbon sink. The European Biochar Certificate (EBC) for quality control (EBC, 2012), has established the standard for the certification of carbon sinks (EBC, 2020). The most important elements include:

- **Biomass production must be climate-neutral**, i.e. it must not diminish existing carbon sinks. This can be ensured, for example, by using agricultural or other waste, rapidly growing biomass or other material recovered from the care maintenance of biodiversity areas, the countryside and roadsides. Wood from sustainably managed forests can also meet the criteria.
- **Emissions from the entire carbonisation process must be deducted.** These include, in particular, emissions related to the transport and processing of the biomass, to any treatment after the process and to the energy required to start the pyrolytic process. Emissions from the transportation of the biochar to the place of application and, where appropriate, emissions from further processing of the biochar must also be deducted.
- **The final use of biochar determines the durability of the carbon sink.** In soil applications, for example, a scientifically based annual decay must be assumed. If the biochar is used as a sand substitute in concrete, however, this is not necessary, as the biochar cannot oxidise in the absence of air. When used as a filter material, on the other hand, a permanent carbon sink is only created if it can be ensured that the filter material is deposited on a long-term basis. While it may well make sense for biochar to be used to replace fossil carbon for energy purposes or, for example, as a reducing agent in metal production, because it replaces fossil raw materials, this does not constitute the creation of a carbon sink.

5.2. The biochar market: recent developments and outlook

Until 2015 the European market had been very small, and since then the dynamics increased substantially. In 2020 there were 15 new systems installed and commissioned. By the end of 2020 in Europe 72 biochar producing plants were under operation (Source: European Biochar Industry, EBI). By the end of 2020, the production capacity was just above 20.000 ton, and the actual production was approximately 17.000 ton. The average capacity per installation is under 300 tons per annum, reflecting that the large-scale production units have not come online yet. Yet, the market is growing substantially: the production capacity doubled in two years from 2018 to 2020.

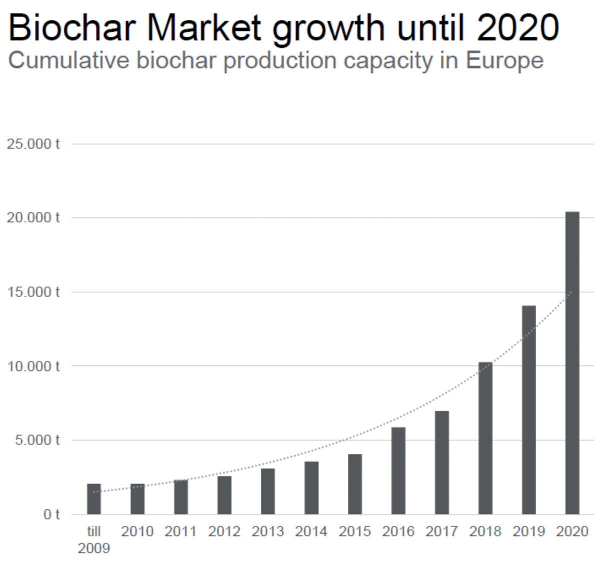


Figure 15. Cumulative biochar market production capacity installed in the EU. Source: European Biochar Industry

Key countries for the production are Germany, Sweden, Switzerland and Austria, which house nearly 70% of European biochar production. Whilst the demand for carbon removal capacity of 850 Mton is estimated to be reached in 2025, the challenge is if the biochar production capacity can be scaled fast enough to fulfill the demand. The EBI calculates that if 30% of the demand is supplied by biochar, then the production capacity needs to be scaled up with 80% per year continuously to reach a capacity of 255 million tCO_2e by 2035. In conclusion, the market forecast for the demand of carbon removal creates a supply driven market situation for biochar abatement.

6. REVERSED MINING BY PERPETUAL NEXT

The Netherlands-based enterprise Perpetual Next has developed a full concept of carbon capture, storage and removal, which is entitled reverse mining. It starts with the intake of biomass in the form of woodchips, agroresidues and other biobased residual waste. This feedstock material is processed by way of different conversion technologies, of which some of them are proprietary and protected by patents. The resulting output is threefold:

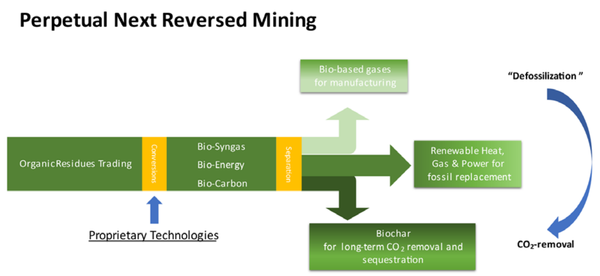


Figure 16. Schematic representation of the reversed mining proposition of Perpetual Next. It is composed of a fully integrated international operating platform with proprietary leading technologies supporting industrial decarbonisation and atmospheric carbon removal and long-term sequestration

1. **Volatile biobased gases for manufacturing**
   Gaseous products are extracted from the biomass feedstock and serve applications in the chemical and manufacturing industry. Examples are hydrogen, methane and carbon dioxide. The methane can be fed into the national gas grid and is then called green gas.
2. **Heat and power**
   Energy in the form of power is delivered for end-use. Examples include district heating for households and utility buildings, industrial heat for drying and food processing and weed elimination. Electric power is delivered to the national grid for general distribution. All applications have in common that they replace and reduce the use of fossil fuels.
3. **Biochar**
   Biocarbon and a special form of that is biochar. The biochar can serve applications such as soil amendments, reducing agent for the metal production, filtering materials and many others. All have in common that the use ensures a long term storage of the concomitant carbon dioxide in the biochar.

Perpetual Next deploys a set of operating companies that are situated close to the source materials to benefit from the supply of these materials.

6.1. Carbon content of biochar leads to CORCs

Perpetual Next is the producer of the biochar and as such also the direct CO_2 removal supplier under the rules set for the generation of the CO_2 removal certificates. The point of creation of the certificate is the production process of biochar (carbonisation of biomass to biochar). However, end use of the product needs to be proven to be other than energy use. When the use is proven to be non-energetic, the CO_2 storage in biochar is considered permanent. Carbon content of biochar is proved by sampling process (e.g. according the European Biochar Certificate, EBC), sampling results for the EBC on the carbon content can be used for quantification of the CO_2 removal. Carbon content in biochar is described as kg CO_2/kg biochar. The precise carbon content of Perpetual Next's carbon is company proprietary and depends on processing parameters and input material. For the calculation purposes in this document, the industry number of 3.0 will be used: 1 ton biochar contains the same amount of carbon atoms that are contained in 3 ton CO_2 from the atmosphere.

6.2. Market potential for Perpetual Next

Perpetual Next has developed a patent-protected reactor technology that produces biochar in a continuous process, entitled C-Vertr. The annual production capacity per reactor line is 6.000 tons biochar.

As stated earlier, the short term (2025) need for carbon removal is 850 Mton CO_2e. The European Biochar Industry has quantified the proportion fulfilled by biochar abatement at 30% of the market demand. This translates into a theoretical market potential of 12.600 C-Vertr reactors by 2025. The realizable, economic potential for Perpetual Next is determined by its market share, lead times, planning permission and similar factors.

6.3. Financial benefits and outlook

Perpetual Next has started the process to create CORCs from its facilities in Derby, UK. The first batch biochar is produced for a group of farmers in UK, and the soil application benefits are researched by the University of Nottingham. The first CORCs will be offered on the market in due course. Furthermore, Perpetual Next is preparing its carbonisation plant in Estonia (Baltania) for the CORC production, as soon as the UK pilot production is completed. The nameplate production capacity in the Baltania facility is 145.000 CORCs.
Other locations for deployment of the Perpetual Next reverse mining concept are under investigation and will be announced separately. It is realistic to assume that Perpetual Next will be the frontrunner by being the owner and provider of the market standard technology for carbon mining.

7. RECOMMENDED READING

1. *Global warming of 1.5°C,* Intergovernmental Panel on Climate Change, 2019.
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3. *Can voluntary carbon markets change the game for climate change*, Rabobank Research, March 2021.
4. *Microsoft carbon removal*, Microsoft, 2021.
5. *The case for Negative Emissions*, Coalition for Negative Emissions, June 2021.
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7. *Reversing climate change with Puro CO_2 removal marketplace*, Puro.Earth.

PERPETUAL NEXT

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ABOUT THE COMPANY

Perpetual Next is an organization centred around three separate, but complementary, business divisions (Trading, Conversions and Technologies) devoted to the valorisation of organic waste and residues into sustainable use to meet the growing demand for biobased energy, fuels, chemicals and materials. This is an opportunity to get returns from organic residues and to reduce waste and pollution. At the same time it reduces the demand for and dependence on fossil fuels.

With their products and services Perpetual Next makes industries and businesses around the world more sustainable in their journey towards 2050 by generating more value from waste and eliminating fossil carbon.

Perpetual Next takes its corporate social responsibility very seriously and commits to Environmental, Social and Governance (ESG) initiatives that are relevant and valuable to their business, their people and society. In addition, they are devoted to 7 Sustainable Development Goals (SDGs), two of which underly their organization's very existence. Perpetual Next is on track to certify themselves as a B Corporation.

The future is now. The future is Perpetual.