

puro

**Reversing
climate change
with Puro
CO₂ removal
marketplace.**

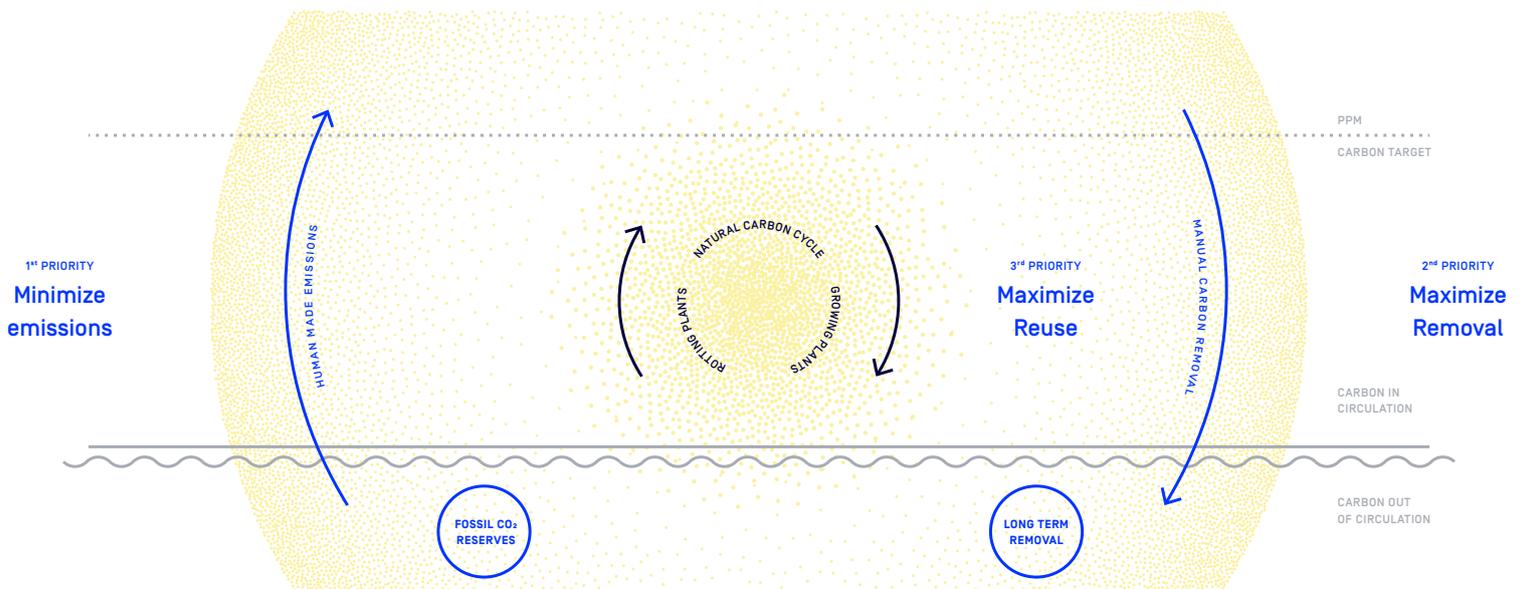
01

The problem we're all facing

Everybody can do something to help reduce greenhouse gas emissions, but nobody can stop causing emissions completely. When we breathe, consume food or use transportation, we emit CO₂. The accumulation of carbon dioxide in the atmosphere has continued for 150 years resulting in 1000 billion tons [=Gt] surplus²

of CO₂ remaining in the air. As the IPCC report states¹, emissions and CO₂ removals need to be in balance by 2050. Currently less than 50% of yearly human caused emissions are sequestered (absorbed away from the atmosphere) by the oceans, soils and other natural means. And so to limit the global warming to 1.5°C we must both reduce CO₂ emissions and remove CO₂ from the atmosphere.

↓ LET'S LOOK AT THE WAY CARBON CIRCULATES ON THE PLANET.



02

Balancing carbon circulation

There's two carbon circulations that need to be discussed separately. As fossil carbon reserves are consumed, the amount of carbon dioxide in the atmosphere increases. Minimizing fossil emissions is the first priority, but unfortunately, emission reductions are not progressing at the required pace. As the second priority, we need to maximize the downward arrow – the CO₂ removals – to balance the emissions and the activities that store the carbon back away from circulation. In the long run, what goes up, must come down.

Furthermore, to avoid extracting more carbon from fossil sources, utilization of carbon that is already in circulation needs to be maximized. When biomass is used in a product, it ties the carbon away from the atmosphere for the lifetime of the product.

03

Accelerating carbon removal methods

Creating new ways to remove CO₂ from circulation need to be accelerated. Identifying new CO₂ removal methods and scaling up old carbon sinks that can sequester significant quantities is a massive undertaking and it needs to be started today. This essential effort would help to balance the 50% of CO₂ emission – almost 20 billion tons per year – that is not absorbed by natural sinks in oceans, forests and soils. Many potential removal methods are currently overlooked and therefore underdeveloped. The dormant CO₂ removal methods could be activated if there was an economic driver for them.

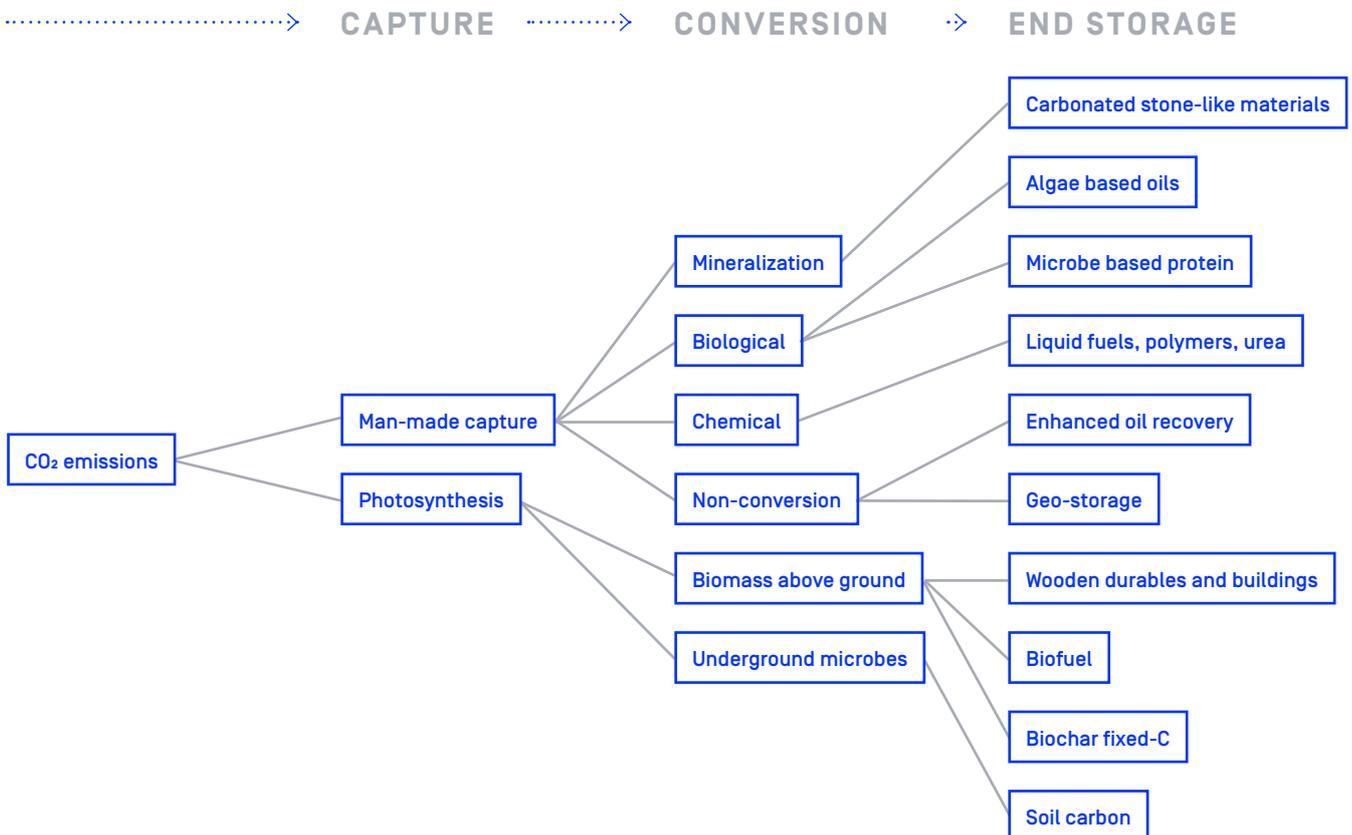
The European Emission Trading Scheme (EU ETS) for emissions excludes the utilization of CO₂ removals. The scheme is locked until 2030, so voluntary mechanisms need to be established as soon as possible. This parallel voluntary mechanism can demonstrate that it is possible to measure and verify CO₂ removals and that they should be included in the toolbox to reverse climate change and return to balanced CO₂ cycle.

04

How carbon removal methods work

It's possible to draw carbon dioxide out from the atmosphere and recycle it in biomass and soil or extract from circulation by "re-fossilizing". The diagram below shows some examples of the available CO₂ removal methods. There are large variations in how the CO₂ removal in these methods can be measured and verified. There are also big differences in their current operational scale and future potential as well as stability and lifetime of the CO₂ storage.

Examples of the very long term, stable CO₂ Removal methods are mineralization to carbonates, biochar with high content of fixed-C, geo-storages and wooden buildings. On the other hand, examples of the dynamic recycling of CO₂ that is already in circulation and can be reused in products are bio-based fuels, foodstuff and other consumable products made of biomass or organic waste streams. Due to the lack of financial incentives, these – and other yet undiscovered – CO₂ Removal methods have not reached their full potential scale yet.



05

Introducing Puro – the world’s first marketplace to offer verified CO₂ removals.

Puro is a pioneering initiative to test how CO₂ removals can be made visible and tradable. As always with marketplaces, it is about making the interests of various parties meet. On one hand there are organizations that want to become carbon neutral. On the other hand, underutilized CO₂ removal methods would be developed and scaled-up if there was a revenue stream that could be used to finance the investments and operational expenses.

Puro is based on these principles

1. **Voluntary** – since quick action is essential and waiting for regulation would take too much time, we’ve chosen to start operations now together with the voluntary organizations.
2. **CO₂ removals only** – there is an abundance of mechanisms, schemes and marketplaces for pricing and reducing emissions and many of them are contributing to the deceleration of climate change. These mechanisms cover 20% of global GHG emissions³. We aim to complement them by trading with verified CO₂ removal methods, so that carbon sequestration and recycling can be increased.
3. **Geographical area is not limited** unlike e.g. in the Kyoto accord, where actions are meant to take place in the developing countries⁴. CO₂ Removal Certificates [CORC] can be issued to suppliers in any country and purchased by organisations in any country.
4. **Business to business** – buyers are primarily companies, municipalities, states and governments to get sufficient trading volume and liquidity right from the beginning. Consumer movements and B2C-retail are likely to emerge but from the perspective of this marketplace they are considered channel partners for our wholesale operation.
5. **Technology and sector agnostic** – the marketplace encourage the development of all verifiable CO₂ removal methods in any industry. Carbon balancing can take place between unrelated sectors.
6. **Science-based** – certificates must be comparable and represent the real CO₂ removed from the atmosphere. Our verification methodologies require scientific measurement and quantification of the removed CO₂ as the foundation for credibility.
7. **Post-transition regulation** – we are optimistic that in the long term carbon pricing will cover 100% of both emissions and removals in all sectors so that removals are rewarded, and emitters must pay for cleaning. Governments can also play an important role by use the national ETS income on the marketplace and thus actually remove the emissions that were allowed through the ETS mechanism.



05

Introducing Puro – the world’s first marketplace to offer verified CO2 removals.

→ So far, we have identified half a dozen CO₂ removal methods that have significant volume potential and where costs are reasonable. These three are available in the experiment phase:

- 1. Carbonated building elements:** Manufacturing of cement causes 6–8% of greenhouse gas emissions globally. However, it is possible to manufacture concrete-like building elements without cement by utilizing slag from the steel industry. In the hardening process CO₂ is carbonated into the element and is mineralized permanently. The benefits include easy measurability and long duration of the storage.
- 2. Wooden building elements:** When wood that originates from sustainably grown forest is used for buildings, the carbon stays away from the atmosphere for the lifetime of the building and at times also after end-of-life. Carbon balance of using building materials is also possible to measure and verify.
- 3. Biochar is made from biomass via pyrolysis.** It is a stable diamond-like form of carbon that can endure in soil for thousands of years. Waste biomass is increasingly available when bio-based products come to end-of-life.

In addition, soil carbon and geo-storages have large scale potential as CO₂ removal methods. Current agricultural practices assume inversion tilling of fields after every harvest and very little attention is paid for the continuous coverage of the land. There are numerous research studies ongoing around the world modelling the CO₂ sequestration process in soil carbon to facilitate the verification.

06

Existing CO₂ removal commerce is complex and time-consuming

There are numerous great examples of sustainable companies that have decided to nullify their emissions totally or be carbon neutral regarding a certain product or a function. For example, Apple has decided to neutralise the emissions of Apple Maps cars and so invested in the restoration of mangrove forests⁵.

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 CO₂ removal. In addition, management and control of the project will consume resources. We don't believe that this cumbersome approach is possible or wise for great majority of organizations. Instead, a marketplace where verified, comparable CO₂ removal certificates are offered from all methods, enables more buyers to become carbon neutral with less effort, sooner and more effectively.

07

Puro is an ecosystem of pioneering companies and experts

Voluntary action is the fastest way to move forward. Puro is the first marketplace in Europe to offer verified CO₂ removals. It's a pilot to experiment if CO₂ removals can be made visible and tradable through an open, online platform.

Puro is an ecosystem by a group of 23 pioneering companies that are devoting their time and expertise to make the marketplace operational. Fortum was the initiator and Fortum Innovation and Venturing is also covering the costs of setting up and operating the experimental marketplace.

We have looked for expertise and best available resources to develop methodologies, trading platforms and verification. Wherever possible, we make use of the existing methodologies to minimize costs. In the long run, gathering supply data will be automated to the extent most possible and the immutability will be ensured using state-of-the-art technologies. In the experiment, we have prioritized time-to-market and used manual methods.

08

For now, Puro is a time-boxed agile experiment

The ecosystem has created the rules and practices for the registry and the marketplace in a co-creation process during March and April 2019.

Puro will hold the first auctions where CO₂ Removal Certificates (CORC) will be traded in May and June 2019.

Puro auctions are open to all companies wanting to provide CO₂ removal or to explore CORC as a solution to meet their voluntary climate objectives. This phase forms the core of the experiment where we aim to validate our hypothesis. Here are the most important ones:

- We can create a verification scheme that can produce certificates that are so trustworthy that organizations are willing to buy them and use them in their business operations.
- We can create a marketplace that is so easy and rewarding to use that people recommend it to others
- We can create positive publicity that attracts new participants during the auctions

The experiment phase will end in September 2019. By that time the ecosystem has tested and learned:

- If we can create a verification scheme that can produce certificates that organizations are willing to buy them and use them to meet their climate objectives
- If we can create a marketplace that is so easy and rewarding to use that people recommend it to others
- If we can create positive publicity that attracts new participants during the auctions



Join the next auction on Puro

If your company is ready to make CO₂ removal part of their climate change actions, contact us to register your interest and join our next CO₂ removal auction:
contact@puro.earth



More information

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Links

1. <https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/>
2. https://en.wikipedia.org/wiki/Carbon_dioxide_in_Earth%27s_atmosphere
3. <https://openknowledge.worldbank.org/bitstream/handle/10986/29687/9781464812927.pdf?sequence=5&isAllowed=y>
4. <http://www.fao.org/3/a0413e/a0413E05.htm>
5. <https://qz.com/1391782/apple-investing-in-negative-emissions-via-mangrove-restoration/>



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