XPRIZE Carbon Removal – Musk Foundation – Perpetual Next submission

Carbon removal

Climate technology is our background. We develop technology to remove CO_2 directly from the atmosphere and lock it away in a durable and sustainable way that can scale massively to gigaton levels. We do so by making high quality renewable carbon out of the lowest possible organic waste. We upgrade those low grade organic residues, containing carbon atoms, to renewable carbon in the form of biochar.

Our belief

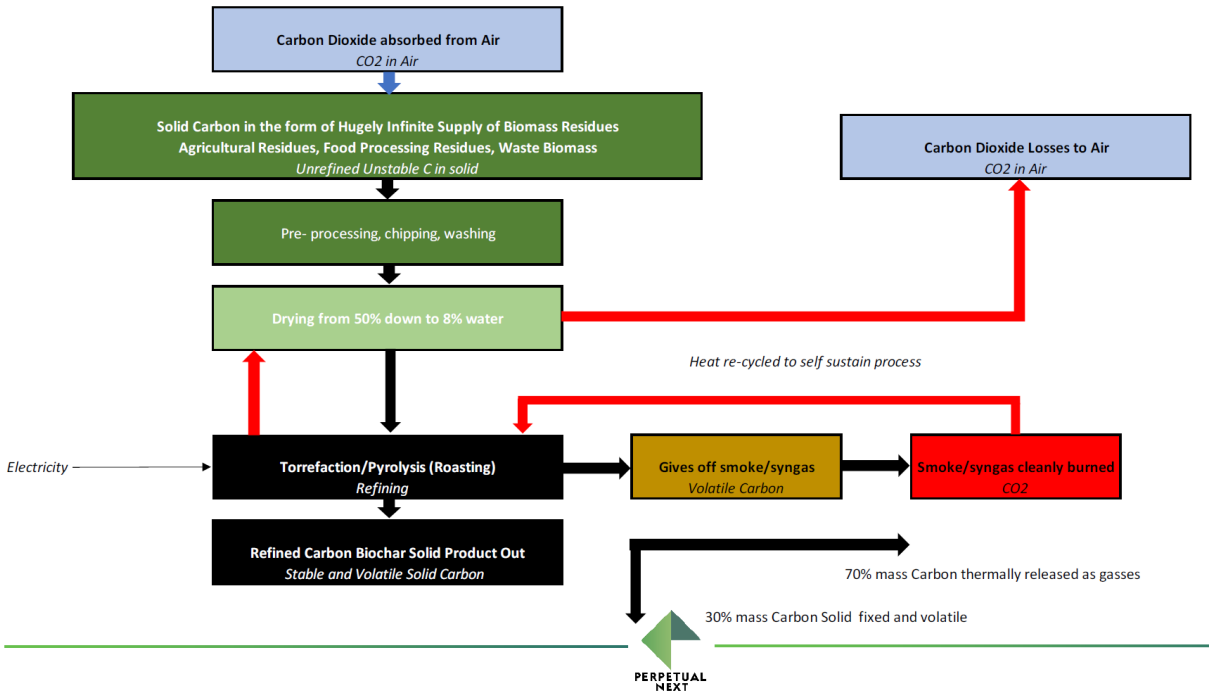
We would love the world to change forever the way raw materials are used, produced, consumed and wasted. Organic material should never become waste again!

Sustainable feedstock

Our technology captures CO_2 from the air in a completely natural and biological way by harvesting the increasing amount of low-quality residues of forests and agricultural produce. These low value residues are left over after sorting out material for principal products such as timber and agricultural products. The feedstock we use should always be obtained through sustainable forestry and agriculture and as low value as possible. To ensure the feedstock is sourced in an ecologically responsible way, it will only be processed if properly certified by the strictest schemes such as that of Forestry Stewardship Council (FSC).

A closer look at our technology

The feedstock is collected and treated in a process called mild pyrolysis. This involves heating the feedstock in an advanced oven at temperatures of several hundred degrees Celsius, in the absence of oxygen, so that the mass will not be incinerated. The heat originates from the evaporated gases thus avoiding the need for external heat sources and this making the process very energy-efficient. It subsequently transforms the feedstock into biochar, a stable solid which is rich in carbon, namely around 75% of the weight.



Biochar applications

When mixed with soil the biochar improves amongst others the soil fertility and increases agricultural productivity leading to lower use of fertilizers and higher yields. Other use of biochar includes application as a filler material in concrete, thus creating carbon-negative concrete, or as a solid filler in abandoned mine shafts.

Our proven technology roadmap

The mild-pyrolysis technology of Perpetual Next has been developed and optimized since 2014 and the fourth generation is now in commercial deployment. The unique features of the technology are that it is energy efficient because of its self-sustaining ability, the process does not require external energy for heating. The system is designed modularly, so it is very scalable by operating parallel lines, as to create economies of scale.

Our scaling approach

R&D and scaling to 1000 Tonnes of carbon removal

The research and development took place in Derby (United Kingdom) by a dedicated team and now a research effort is underway in collaboration with 12 farms located within a 50 km radius, coordinated by Nottingham University. In this project, residual virgin waste will serve as the feedstock and will then be thermally processed to become stable biochar. The biochar will be used as a soil amendment on these farms. To achieve the target of net sequestration of 1000 tons CO_2 per year, a quantity of 665 tons biochar is required, which can be easily met as the minimum quantity of biochar that the farms will use is 1000 tons biochar per annum. The first 160 tons has been kicked off.

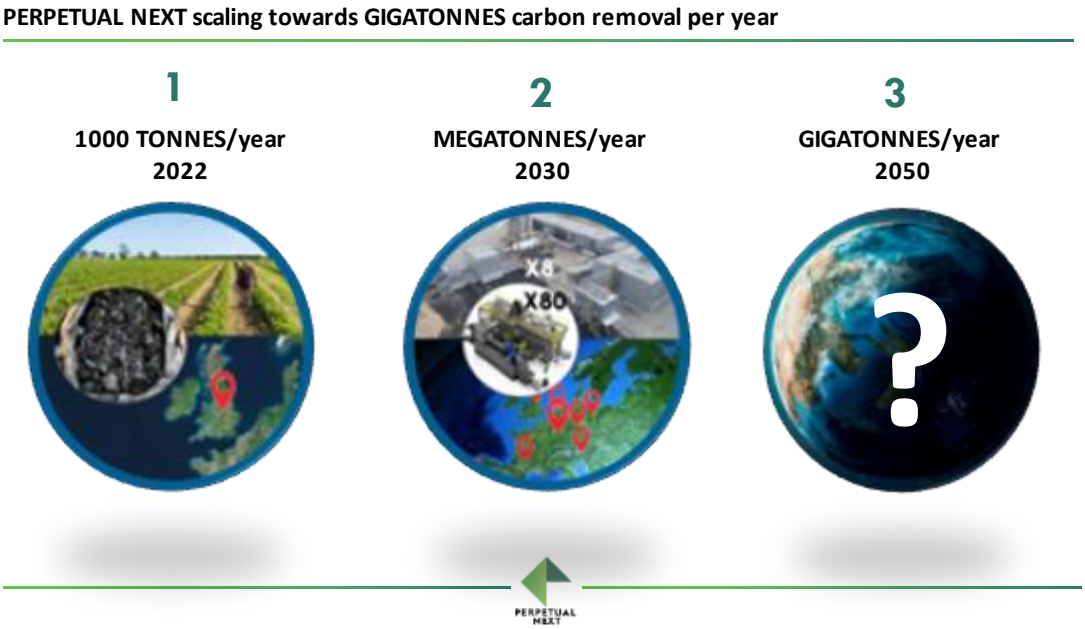
Learn more about the Nottingham project:

https://linkprotect.cudasvc.com/url?a=https%3a%2f%2fwww.nottingham.ac.uk%2fnews%2f4.5m-study-sustainable-technology-to-remove-co2-air&c=E,1,jHym_7M2zC4lbzkXdAYib6SJOsLzs1ej_z-Hi6V3yYrq65DwypclJwEDkLkhnlQ8p0MmqtGcjD72peHNnkhPRbxrC53USFsj2WwEkL9Hvg,,&typo=1

Scaling to Megatonnes of carbon removal

Our commercial-scale plant in Estonia with 8-10 parallel reactors, covers 3 hectares of which the production output is currently being ramped up while fine-tuning the operational systems. This plant, called Baltania plant, serves as a blueprint for the realization of our Megatonnes scale sequestration, where the aim of net CO_2 removal will be accomplished with 8 Baltania-sized plants.

A sourcing area of 20 to 30 thousand hectares is required per plant for the required feedstock, depending on the type of feedstock. It should be stressed again that these are secondary waste materials from forestry and agriculture activities which otherwise would remain unused.

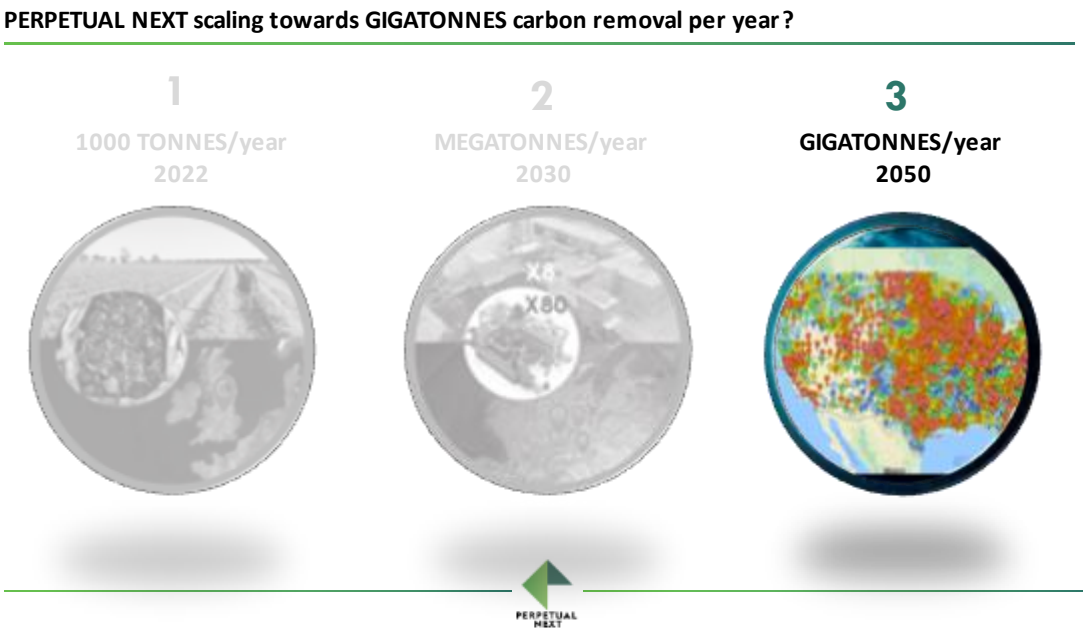


How are we going to do a 1000 times this amount, a Gigatonne of CO2 removal in a single year?

Scaling to Gigatonnes and democratizing carbon removal

During deployment our technology will improve in two ways:

1. We aim to increase the output of the Baltania-sized plants by 30-50% over ten years by methodological and technological advances that can typically be achieved for these types of factories over time.
2. We'll convert smaller feedstock volumes at any location into biochar on the spot.
   We will disentangle the feedstock chain by developing mobile single-line production units that operate turnkey on farms and similar sites with bio-based residues.



The smaller single-line units enable producers of agricultural residues, primarily farmers and growers, to produce self-made biochar on their own premises and apply the generated biochar on-site. This creates a very efficient circular operation. It prevents unnecessary shipping of agro-residues offsite. This avoids that these residues enter the economy under waste management legislation which induces high administrative burdens. Moreover, local char production will democratize carbon removal at local communities, enabling new economic models and social involvement.

The larger plants must be located near centers with large quantities of agro-residues. Examples are Poland (agro waste), France (wine stems), Netherlands (tomato stems), Portugal (wood waste). A solid control of the chain of custody is under design, using blockchain technology, so as to ensure the sustainability of the feedstock.

Our differentiators

1. Proven technology
2. Team with a track record in international climate tech
3. We democratize carbon removal. With local deployment by using smaller mobile units enabling local farmers to use their own agro residues. Every farmer and every forester in the world can create his carbon removal legacy with our biochar
4. No energy needed - self sustaining
5. Organic material no longer waste but valuable feedstock
6. We facilitate everybody to create their own carbon removal legacy
7. Modularity
8. Realistic yet cost effective
9. Replacing fossil carbon with renewable carbon
10. Scalable platform solution