Philanthropy Briefs

CARBON MANAGEMENT

Biochar

a series by Active Philanthropy

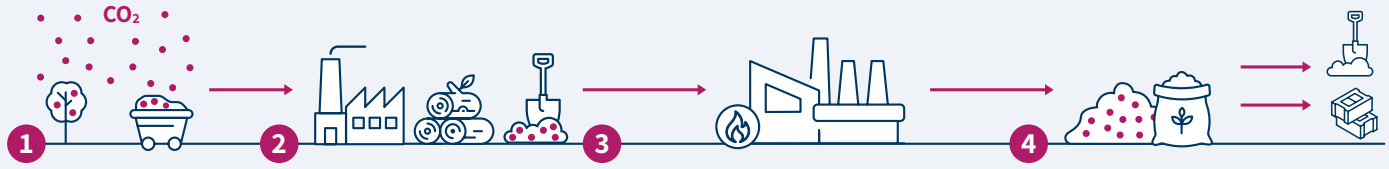
WHAT IS IT ABOUT?

Biochar is a lightweight, black, and highly porous material produced by heating biomass in the absence of oxygen, a process known as pyrolysis. This process alters the natural carbon cycle.

During growth, plants absorb CO_2 from the atmosphere through photosynthesis and store it in their biomass. In the natural carbon cycle, 99% of that CO_2 is released back into the atmosphere when the biomass decomposes[1]. Biochar production changes this pathway by **converting a large part of that carbon into a stable solid,** sequestering it for many years (potentially 100+) instead of releasing it into the atmosphere.

This process, known as **biochar carbon removal (BCR),** is considered a hybrid form of Carbon Dioxide Removal (CDR) as it combines biological carbon uptake with engineered stabilisation.

Creation of biochar



1. Trees or other biomass store CO_2 as part of the photo-synthesis process.
2. Biomass waste (which contains this CO_2) is collected (e.g. from forest residues or industrial waste).
3. The biomass is burned in the pyrolysis process at 350-700°C, ideally industrially, so that gases can be re-collected and contribute to the heating process. Other processes like Kon-Tiki kilns and trench mounds are more accessible but result in (signifi-cant) air pollution and are therefore less efficient.
4. The result is biochar that sequesters carbon and can then be used in various industries.

● = CO_2

Adapted from Sanchez and Belmont 2025

WHY IS BIOCHAR IMPORTANT FOR OUR CLIMATE?

Biochar is a technically mature CDR solution with the potential to provide multiple co-benefits when utilised in suitable contexts. Compared to more capital-intensive CDR approaches like DAC, biochar is relatively cost-efficient[2]. What is more, the material can be produced from widely available biomass in-cluding agricultural or forest residues, construction debris, organic waste, seaweed, shells, and also bio waste from industries such as from paper mills, sawmills or breweries.

Beyond its core function of carbon removal, biochar offers climate benefits through its application in two sectors: agriculture and concrete production.

Biochar in the agricultural sector:

Biochar's highly porous structure helps soil to retain and gradually release nutrients and water. This enhances plant growth, enabling farmers to reduce nitrogen fertiliser, which is itself a source of greenhouse gases, and water use[3]. The highest impact of biochar has shown to be on (nutrient-) deprived tropical soils[4]. By supporting more reliable harvests, biochar can hence also help farmers in the Global South adapt to climate impacts.

Biochar in the production of concrete:

Biochar can reduce emissions in cement production by cutting clinker use and replacing aggre-gates, while its porous structure can enhance the concrete's compressive strength. Cement encloses the biochar and therefore the carbon it contains, storing the carbon in a stable form[5].

[1] Anaxee 2025, [2] Planet2050 2026, [3] Ghoniem and Krol 2024, [4] Jeffery et al. 2017, [5] Puro Earth 2025

WHAT FUNDERS CAN DO

Strengthen the evidence base for biochar:

The exact duration of carbon storage in biochar can currently only be estimated[6]. While biochar is one of the first CDR approaches for which the European Commission has adopted certification methodologies for permanent carbon removal[7], more field research is needed to provide robust measurements of long-term sequestration[8]. This includes studying how different types of biochar behave in different soils and climates, and how durability varies depending on how and where it is used. Funders can support academic research that improves data on carbon storage durability (e.g. Stanford University) or that helps optimise biochar for different applications (e.g. University of Edinburgh's UK Biochar Research Centre, or ETH Zurich's research into biochar's use in cement production).

Create awareness and actively form narratives:

The adoption of biochar use in both sectors depends on stakeholder engagement.

In agriculture, educating local stakeholders about its (co-)benefits, such as enhancing long-term soil health and reducing dependence on price-volatile chemical fertilisers, is crucial. Funders can support various NGOs in the Global South that partner with local farming communities, such as biochar.life or Solidaridad.

In the cement industry, biochar remains an emerging solution. As its technical feasibility becomes clearer through research, widespread adoption will depend on effective communication and knowledge sharing across the sector, especially with regards to policy makers that set the standards of cement. Funders can support stakeholder platforms such as Biochar Europe or the International Biochar Initiative.

There are many different strategies to engage in climate philanthropy. See our Spotlight on Climate Funding Strategies to learn more.

3 FAST FACTS

3 gigatons

is the potentially removable amount of CO_2 through BCR p.a. This is the equivalent of India's annual emissions.[9]

USD 2 billion

the estimated market size of biochar by 2033.[10]

5x

the contracted credit sales of the second-largest removal method make biochar by far the leading CDR approach in the voluntary carbon market.[11]

THINGS TO CONSIDER

Ensure contextual fit:

Funders need to ensure that the type of biochar and soil converge and that enough waste biomass is available, ideally by integrating biochar in existing value chains. Biochar used in an agricultural context offers the rare opportunity to both store carbon and exert financially and ecologically valuable co-benefits, which are most pronounced in the Global South.[12]

Consider different funding models:

A range of capital can be deployed to support the development of the biochar market. Grants can support early-stage research or NGOs pursuing the wider adoption of biochar, helping to reduce uncertainty and build the evidence-base. Alternatively, investing in biochar carbon credits helps establish the market and drive demand needed to scale it. In addition, impact investors have identified biochar as an investing opportunity, particularly Vietnam and India.[13]

Link to bibliography

[6] Biswal and Balasubramanian 2025, [7] Directorate-General for Climate Action 2026, [8] Ringsby and Maher 2025, [9] Paatelma 2025, [10] Grand View Research, [11] Grillo et al. 2025, [12] Saldarriaga and López 2025, [13] Aquila Knowledge Hub 2026