# Weak voluntary certification and flawed carbon accounting are legitimising the biochar boom

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*This technology update on biochar summarises the latest developments on the Geoengineering Monitor Map, highlighting new trends for civil society and climate justice movements to follow in their efforts to oppose geoengineering globally. It was researched and written by **Anja Chalmin**, and published with the support of the Geoengineering Monitor team.*

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Producing biochar involves the conversion of biomass into a solid, charcoal-like substance that has undergone partial burning in an oxygen-free environment, known as pyrolysis. When produced industrially and on a large scale, ostensibly to draw down carbon from the atmosphere, it is considered a form of geoengineering.

A growing number of industrial biochar projects aim to generate profit through sales of carbon removal credits on the voluntary carbon markets. They require large quantities of feedstock, such as wood, forestry and agricultural residues, and other types of biomass. According to the companies involved, the resulting biochar is usually incorporated into agricultural soils.

Underpinning the rapid growth in biochar projects globally is a system of weak, unenforceable, and voluntary certification schemes, all of which are reliant on flawed carbon accounting methodologies. This update focuses on recent developments relating to industrial biochar producers marketing particularly large volumes of carbon credits, with each certificate theoretically equating to the removal of one tonne of $CO_2$ from the atmosphere.

## Critical developments covered in this update

- The global boom in biochar projects is dominated by just a few companies: By spring 2026, the top five companies had (theoretically) delivered almost three quarters of biochar-based carbon removal credits.
- The vast majority of biochar carbon credits are generated in the Global South but used to offset emissions caused by companies in the Global North. Whilst the funds from these credits often flow northwards due to biochar companies largely being headquartered in the Global North, the potential impacts of production remain firmly in the Global South.
- Poor quality management and weak certification in the voluntary carbon markets is likely to lead to long-term impacts from biochar production, particularly in the Global South, such as heavy metal accumulation in agricultural soils. Similarly, the assumptions underlying voluntary carbon standards for emissions from biochar production are flawed, leading to highly variable and inconsistent results.
- Communities in Brazil's Jequitinhonha Valley, which is occupied by 100,000 hectares of Aperam BioEnergia's eucalyptus monocultures, suffer from water scarcity, soil and water contamination by pesticides, and criminalisation by the company. Nevertheless, the operations are certified by both the Forest Stewardship

Council (FSC) and Puro.earth, and the World Bank Group's International Finance Corporation and private lenders are investing heavily in the company.
- Other significant players such as Exomad Green, Varaha, Carboneers and Alcom Carbon Markets have completed significant new funding rounds, attracted new investments and signed offtake agreements for future carbon credit sales.

# The vast majority of "delivered" carbon removal credits are from biochar projects in the Global South

As of  May 2026 the carbon credit providers listed on the CDR.fyi platform had collectively "delivered" around 1.36 million tonnes (Mt) of carbon removal credits, 80% of which were from biochar production. By comparison, biochar production accounted for just 13% of the 47 Mt of carbon removal credits "sold" (do be delivered at a later date), with other technologies such as Bioenergy with Carbon Capture and Storage (BECCS) accounting for a much higher proportion.

This reflects the fact that biochar production is relatively cheap and technically easy compared to other technologies—in many cases, it uses charcoal production methods, whith the resulting char being applied to agricultural land rather than being burned for energy. Overall, the delivery rate for biochar carbon credit sales is 17%, which is significantly higher than many other Carbon Dioxide Removal (CDR) technologies.

The top five sellers of biochar carbon removal credits (delivered and promised) have collectively sold 4.6 Mt (Exomad Green: 2.4 Mt, Liferaft: 1 Mt, Varaha: 0.5 Mt, Alcom Carbon Markets: 0.4 Mt, Empacar: 0.3 Mt), corresponding to 72% of all biochar–based credits, whereas the top five companies in terms of "delivered" credits had delivered 0.8 Mt (Exomad Green: 0.4 Mt, Varaha: 0.2, Carboneers: 0.1, Aperam: 0.1, Wakefield: 0.1), corresponding to 74% of the total, and equating to a delivery rate of 17%.

Over the past few months, the biochar sector has seen several substantial advance purchases of carbon credits and a number of companies have completed significant funding rounds. The largest investments recently came from Microsoft, the US firm WestBridge Capital, the French investment firm Mirova, the Swiss carbon removal financier Altitude, the United Arab Emirates company Offset8 Capital Ltd, and Global North carbon marketplaces Senken, Supercritical, Danish Klimate and Carbonfuture.

A clear trend that is emerging in biochar-based carbon removal schemes is that whilst the emissions being offset originate almost exclusively in the Global North (and in a small number of cases, oil-rich gulf states), the Global South is disproportionately targeted for removals projects. At the same time, many of the biochar companies operating in the Global South are headquartered in the Global North, meaning that a significant proportion of the profits from carbon credit sales is likely to flow northwards, while the potential problems, such as soil contamination and air quality impacts, remain the burden of the Global South.

Of the top 100 companies that have sold carbon credits on the voluntary carbon removal markets to date, 36 are biochar producers, and collectively they have sold around 4 Mt of credits. The vast majority of these credits, more than 85%, originate from operations in the Global South, whereas less than 15% originate from operations in the Global North. On top of this, although 16 of these companies produce biochar in the Global South, only four are headquartered there.

## Major developments in biochar projects selling carbon removal credits

# Aperam BioEnergia, Brazil: Company continues to hold FSC and Puro.earth certifications despite causing significant environmental and social harm

Aperam BioEnergia (also covered in our last biochar technology update) is located in the Jequitinhonha Valley in north-eastern Minas Gerais, Brazil, and produces ~420,000 tonnes of charcoal per year, which is used in a steel mill operated by its parent company in the same state. As biochar is becoming an increasingly popular option for generating income from carbon credit sales, Aperam BioEnergia now refers to the fine charcoal it produces as biochar. Rather than sending it to the steel mill, according to the company it now spreads around 30,000 tonnes per year onto its eucalyptus plantations.

The biomass used for charcoal and biochar production is sourced from 117,000 hectares of FSC-certified land held by the company, the vast majority of which consists of non-native eucalyptus monocultures. In 2025, the World Bank's International Finance Corporation and private lenders invested € 250 million in Aperam BioEnergia, in order to enable the company to acquire new plantations, develop "*improved tree varieties*", produce pyrolysis oil on a commercial scale, upgrade the charcoal production kilns and expand the seedling nursery.

Brazil grows approximately one-third of the world's eucalyptus trees. These plantations are heavily concentrated in the Cerrado, including the Jequitinhonha Valley. The Cerrado is the world's most biodiverse savanna, home to 5% of the planet's animals and plants, including over 11,000 plant species, 45% of which are endemic, meaning they are found nowhere else on Earth. According to the Food and United Nations Agriculture Organization, the Cerrado savanna is "*an immense, hidden carbon sink*". About 70% of its biomass is underground due to its deep root systems, storing around 290 tonnes of carbon per hectare.

Puro.earth, a CDR certification company and carbon offsetting registry, claims that Aperam BioEnergia's "*forests have important biodiversity and economic impacts on local communities*," but evidence suggests otherwise. The large-scale eucalyptus monocultures planted by Aperam BioEnergia are said to be responsible for lowering the local water table and causing water shortages, as monoculture eucalyptus plantations consume enormous amounts of water. In some parts of the Cerrado, they have been found to consume four times as much water as native vegetation. The plantations also pose a threat to human health due to Aperam BioEnergia's extensive use of pesticides. For example, 9,800 litres of glyphosate were used by the company in 2023 alone.

According to a peasant farmer impacted by the company's operations, "*Entire communities have been living with water scarcity due to the vast eucalyptus plantations, in addition to the contamination by pesticides of the little water that still remains, as well as soil contamination, and the alarming increase in cancer rates in the region*".

Puro.earth also asserts that the plantations have a positive impact on local communities, but this is not true. A recent incident is a representative example, where residents were arrested for collecting wood scraps from the forests. This included families who make a living from producing handicrafts and who need firewood to produce their ceramics. However, they have no access to their own forests or firewood. At least 14 communities in the Jequitinhonha Valley are also affected by eucalyptus plantations encroaching on farm land and preventing them from practising agriculture and pottery. These activities are recognised as part of the region's cultural heritage.

The Aperam eucalyptus monocultures hold FSC certification for sustainable forestry despite the issues described above, and in contradiction of the FSC standard, which requires watercourses to be maintained, biodiversity to be conserved, and the rights, land ownership and management of local and indigenous communities to be upheld. The latest publicly available inspection document, dated 26 November 2025, reveals that the FSC is still failing to adequately address the situation:

- Despite numerous recent complaints, only one stakeholder meeting was held during the inspection. Imaflora, the responsible certification body, did not address the complaints raised during the meeting regarding water scarcity and pesticide contamination.
- Aperam claims that it "*recognizes and regulates the customary use rights of local communities, allowing sustainable practices such as the manual removal of forest residues and the native fruits harvesting (e.g., Pequi) in delimited areas*". However, the aforementioned arrests and other reports contradict this claim.
- Although Aperam has been FSC-certified since 2010, it still has no functioning monitoring system in place to evaluate its environmental and social impacts, such as the evaluation of ecosystem services, water

sampling and water availability. The FSC requirement to "*develop and implement a monitoring plan including indicators and targets in relation to relevant environmental, social and economic aspects*" has not been met. Imaflora comments: "*In fact, there is no structured monitoring plan.*"

## Exomad Green, Bolivia: World's largest carbon removal credit provider is scaling its energy-intensive production

Headquartered in Santa Cruz, Bolivia, Exomad Green is currently the world's leading provider of biochar-based carbon credits. In early May, its sales volume was more than double that of its nearest competitors. Founded in 2023 as a subsidiary of Exomad SRL—a leading Bolivian exporter of tropical hardwood sawn timber and veneers—Exomad Green has experienced rapid growth. It currently has two operational biochar plants in Bolivia, located in Concepción and Riberalta. A third plant is under construction in Guarayos, with two more planned.

Exomad Green's pyrolysis plants convert what the company refers to as "*hardwood forestry residues*" into biochar. The company classifies this material as residue, but it is actually a valuable resource that could be used to make building materials and furniture. Exomad's biochar production requires a significant amount of energy because, prior to pyrolysis, the wood must be transported, chipped and dried.

In 2025, Exomad Green doubled the biochar production capacity of its Concepción and Riberalta plants. The two sites now have a combined total of 13 biochar production lines, with an annual production capacity of up to 108,000 tonnes of biochar. The Guarayos site is expected to produce up to 64,000 tonnes of biochar with its eight production lines. This production expansion has been made possible through extensive offtake agreements, including:

- An agreement with Supercritical, covering 500,000 tonnes of $CO_2$ in 2026 and 130,000 tonnes in 2025;
- An agreement with the Senken carbon market, covering 105,000 tonnes of $CO_2$ in 2026 and 81,600 tonnes in 2024;
- An agreement with Microsoft in 2025, covering 1.24 Mt of $CO_2$, to be delivered by 2035;
- Additional agreements with NextGen and Supercritical in 2024 and with Puro.Earth in 2023.

## Varaha, India: Major investments have led to numerous commercial activities in India and elsewhere

Varaha Climate AG Pvt Ltd was founded in 2022 and is headquartered in Delhi, India. The company sells carbon credits generated in various ways, including biochar and enhanced weathering projects in India. Varaha's first biochar program was developed in Kothur, Telangana, in 2022, and the following year, the company commissioned biochar programs in the Indian states of Gujarat and Rajasthan. In 2026, Varaha announced plans to establish an additional biochar program in the Indian state of Maharashtra.

Production in Gujarat is conducted in cooperation with local partners on a small scale in the Banni Grasslands using Kon Tiki kilns, with the invasive species *Prosopis juliflora* and cotton stalks serving as the biochar feedstock. In 2025, Google announced the purchase of 100,000 carbon credits from the project area, which Varaha is using to set up six large-scale pyrolysis plants in Gujarat, each with an expected $CO_2$ capture capacity of up to 11,000 tonnes per year. In 2026, Microsoft also announced a purchase of 100,000 carbon credits from Varaha. Under this agreement, Varaha plans to build 18 pyrolysis facilities in India's cotton belt in the state of Maharashtra, and plans to utilize cotton stalks from smallholder farms as biochar feedstock. The facilities are expected to operate for 15 years, capturing at least 2 Mt of $CO_2$.

Over the past few years, Varaha has attracted significant additional investment and offtake agreements, including:

- In 2026, WestBridge Capital led a US$ 45 million funding round. Microsoft purchase (see above).
- In 2025, Varaha signed an offtake agreement with Kellanova. The investment firm Mirova provided US$ 30 million, and Conductor Capital, based in the UK, provided another multi-million dollar investment.

- In 2024, an offtake agreement was signed with Danish carbon market place Klimate, covering more than 230,000 carbon credits.
- In 2023 and 2022, Varaha completed a US$ 8.7 million funding round and US$ 4 million in pre-seed funding round respectively.

Varaha is using the US$ 45 million investment from WestBridge Capital to advance industrial biochar projects on a global scale with the aim of producing marketable carbon credits. To this end, Varaha launched the Varaha Industrial Partners Programme (VIPP) in 2026, developing biochar projects in collaboration with local partners. VIPP will implement the measurement, reporting and verification processes for these projects, as well as managing the commercialisation of the carbon credits. According to a press report, initial commercial VIPP projects include Revata Carbon's West Africa Cashew Project in Côte d'Ivoire, as well as collaborations with several agribusiness partners in India and a leading Indian steel company.

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# Poor quality management shaped by economic interests increases the risk of long-term adverse consequences such as the degradation of agricultural soils

In the Banni Grasslands, Varaha uses *Prosopis juliflora* and cotton stalks as feedstock to produce biochar, which is then spread on agricultural land. However, using *P. juliflora* could pose a long-term risk to soil quality, as the plant accumulates heavy metals. If these metals are present in the biochar and applied to agricultural land over a prolonged period, they will build up in the soil. Different biochar feedstocks have different associated toxins and risks, which are also influenced by their origin and variations in the pyrolysis process. A report issued by Carbon Standards International (CSI) on Varaha's Banni Grasslands project does not address this specific characteristic of *P. juliflora* and the associated risks in the local context. Such scrutiny would, however, be essential in order to rule out the short and long-term risks associated with applying biochar to agricultural land.

Quality assurance within the voluntary carbon market is problematic in other respects, too. One example is the Integrity Council for the Voluntary Carbon Market (ICVCM), which CSI and other standards such as Isometrics, Puro.earth, and Verra cite as a form of quality assurance. The ICVCM describes itself as "*an independent governance body for the voluntary carbon market.*" However, the ICVCM structures are indicative of an organisation with a strong economic vested interest. The ICVCM's Multi-Stakeholder Working Groups (MSWGs) are responsible for "*assessing categories of carbon credits*" and "*carbon crediting methodologies*". The MSWGs' 'participant organisations' include carbon credit buyers and market participants, and firms specialising in carbon credit management and rating, including Amazon, Bezos Earth Fund, Calyx Global Inc., Carbon Limits, Climatrader, Promethium Carbon, Rubicon Carbon, Shell, Sylvera and Verra. This structure shows that it is simply not possible to ensure credible, independent oversight of the development and quality of voluntary standards, nor of those who develop them. The potential impacts on farmers where biochar is applied to land is not taken into account, even though they alone must deal with the potential long-term risks of using biochar.

## Carboneers United B.V., Netherlands: Dutch company is expanding its production in the Global South

Carboneers is a Dutch company founded in 2021, and has collaborated with local partners in Ghana and India to produce biochar and sell carbon credits since 2023. In India, Carboneers works with partners in the states of Assam and Odisha, where biochar is produced by farmers on a small scale using soil pit and chamber kiln pyrolysis. The biomass feedstock comprises rice husks and stalks, corn cobs, cotton stalks and tree prunings, and the biochar produced is spread onto agricultural fields. Carboneers is currently expanding its activities in Darrang District, Assam, in collaboration with Dubai-based Terrafront Ventures, with the intention of establising 25 pyrolysis facilities by 2026.

In Ghana, local farmers in the Ahafo, Ashanti, Eastern, Oti and Volta regions produce biochar on a small scale through soil pit and earth kiln pyrolysis using corn, sorghum and soybean stalks, as well as cocoa pods, as a feedstock. The biochar produced is spread onto agricultural fields, and Carboneers is currently expanding its activities in Ghana in collaboration with the German organisation Atmosfair gGmbH. The partners intend to supply 'small-scale pyrolysis units' to farming communities to replace the production of biochar in soil pits. In 2025, Carboneers and Planboo announced their 'Bonding over Biochar ' collaboration, which aims to advance biochar production from cacao pod husks in Ghana's Oti region.

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# The assumptions underlying voluntary carbon standard for kiln emissions are flawed

Soil pit and earth kiln pyrolysis are simple, low-cost methods of producing biochar and widely used by smallholder farmers. However, they generate significant quantities of toxic pollutants and greenhouse gases, including particulate matter, volatile organic compounds, carbon dioxide, methane, nitrous oxide and carbon monoxide. Flame curtain 'Kon-Tiki' kilns are an alternative low-tech approach,but they also generate considerable emissions when compared with industrial-scale biochar production technologies, and proper combustion and temperature control throughout the process requires skilled management.

Studies by Cornelissen et al. in 2016 and 2023 reveal how highly inconsistent biochar production processes can be, and demonstrate that flame-curtain pyrolysis is difficult to do well. Cornelissen et al. (2024) conclude that different feedstocks result in different gas and aerosol emissions and that various other factors can also cause large deviations. These include the size, density and moisture content of the feedstock, as well as external factors such as soil moisture, which can result in lower temperatures in soil pit and flame-curtain kilns, and increased gas emissions, particularly methane.

Although the experiments were conducted under optimal conditions in the studies, with the kilns being intensively supervised by experienced personnel, significant differences in results were still obtained. Real-world production methods in certified projects are therefore likely to result in even greater differences, and cannot be subjected to the same level of supervision.

For example, Carboneers describes how "*Our biochar projects in Ghana spans across 1,000 farming communities in the Volta, Oti, Ashanti, Eastern and Ahafo region*", but the company does not operate a sufficiently tested, comprehensive internal control system to ensure that the production standards implemented by farming communities are similar to those of the Cornelissen et al. studies. In practice, this means that larger quantities of toxic pollutants and climate-damaging gases are generated than the studies determined. It also means that standards based on Cornelissen et al.'s data, such as the current Verra standard, are flawed, for example with regard to methane emissions from kilns.

As well as feedstock type, Cornelissen et al. (2024) highlight significant knowledge gaps relating to other variables that affect emissions, such as preventing methane spikes that occur at the end of the pyrolysis process, and the transferability of the data to regions with different climatic conditions.

The authors also point out that the pyrolysis of finely grained feedstocks, such as the cashew shells that will be used in Varaha's new VIPP West Africa Cashew Project, is not yet well understood. They state that it *"is a challenge in finding suitable pyrolysis technologies for finely grained feedstocks like coffee husks, rice husks, cacao husks, cashew shells, and other nut shells"*. In these circumstances, it is hardly possible to rule out high emissions, which pose risks to manufacturers and users of biochar in terms of the formation of pollutants. The standards and verification systems in place show no sign of making a thorough effort to close these comprehensive data gaps, which further undermines the credibility of voluntary certification.

## Alcom Carbon Markets, Singapore: Expanding its activities in India and the Philippines

Alcom Carbon Markets is a Singapore-based company that was founded in 2020 with the aim of generating carbon

credits from biochar. As of May 2026, the company is among the top-five sellers of biochar-based carbon credits and operates pyrolysis facilities in the Philippines and India. In the Philippines, it operates the NuevaChar plant in Palayan City and the ElectroChar plant in Oriental Mindoro using rice husks and rice straw as biochar feedstock. In India, the company has set up a demonstration plant in Varanasi, Uttar Pradesh, and a commercial plant in Surat, Gujarat, using rice husks, cotton stalks and an invasive tree species. The biochar produced is used in fertilizers and spread on farmland, and the company has attracted the following investments:

- In 2025, the Swiss carbon removal financier Altitude committed to buying 360,000 carbon credits.
- In 2024, the investment firm Capital Code led a US$ 5 million funding round.

## Bio-Logical Carbon Ltd., UK: Significant investment despite questionable claims

Bio-Logical Carbon is a UK-based company founded in 2022. In 2024, the company announced plans to open four biochar production sites in Kenya and has so far established plants in Kabati and Hola using agricultural residues as a feedstock, although other sources also mention wood. The biochar produced is crushed and mixed with compost, including chicken manure and avocado pulp. It is then sold to farmers as fertilizer under the brand name Asili.

Bio-Logical Carbon claims that "t*he result is a stable form of carbon called biochar, which can lock up carbon for up 1000 years*", and promises yield increases of more than 50%. However, there is no independent evidence to substantiate these claims. Furthermore, pyrolysis can generate pollutants, including carcinogenic and mutagenic polycyclic aromatic hydrocarbons (PAHs). If biochar containing PAHs enters the soil, it can contaminate crops and pose a cancer risk to humans. Other potential soil pollutants in biochar include dioxins, polychlorinated biphenyls (PCBs) and heavy metals. There is no indication suggesting that these parameters are being controlled.

There are also unanswered questions regarding the company's life cycle assessment, such as how the biomass is transported and over what distance. Bio-Logical's recent technical investments in drying and shredding biomass for biochar production highlight the significant energy consumption required for biochar production, on top of that required for pyrolysis.

Despite unproven claims and potential risks, the company is receiving substantial investment:

- In 2025, the carbon credit investment firm Rubicon Carbon purchased 15,000 carbon credits.
- In 2024, Microsoft purchased 10,000 carbon credits for delivery in 2024/25. As of May 2026, Bio-Logical Carbon has sold 28,000 tonnes of $CO_2$, but only 3% have been delivered so far.
- In 2024, a number of investment and asset management firms including CrossBoundary Group and Steyn Group, as well as the consultancy firm Redshaw Advisors, provided US$ 1.3 million.
- In 2023, the Steyn Group led a US$ 1 million funding round.

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# The claim that biochar can lock carbon away for a thousand years is yet to be proven

Bio-Logical Carbon is one of many biochar producers claiming that biochar *"can lock up carbon for up to 1000 years"*. In its 2024 report, Biofuelwatch highlights that inconsistent results from scientific studies involving biochar mean that there is still no conclusive evidence that the production of biochar effectively removes carbon from the atmosphere over meaningful timescales. Without multi-decade biochar field trials, claims about long-term carbon residence times can only be based on modelling and extrapolation from short-term laboratory and field trials. To date, field studies have produced mixed results, including variations in biochar decomposition rates and low carbon residence times in tropical soils or at lower soil pH levels. In some cases, losses of existing soil organic carbon following biochar application can exceed the amount of carbon added to the soil in the form of biochar. Key factors

affecting the durability of biochar include the type of feedstock used, pyrolysis temperature, the soil conditions to which the biochar is applied, and the application method. Biofuelwatch describes how: *"…very few studies have looked at the fate of biochar carbon in natural conditions over even a few years, making extrapolation to thousands of years…meaningless, and policies supporting biochar as a reliable climate mitigation tool, dangerous."*

## BIOSORRA LLC, USA: Company expands its operations in Kenya with recent seed funding

BIOSORRA LLC is a US-based company that was founded in 2021. Its first biochar production site, Project Hippo, opened in Kiambu County, Kenya, in 2023. The biochar is produced from agricultural residues, including pomace, kernels, husks, grist, press residues and macadamia nut shells. It is currently sold under the brand name Biochar Bora for around US$ 400 per tonne to customers such as the Kenya Nut Company, a multinational agribusiness that grows a variety of crops. Although the fertilizer is labelled as organic, it is not certified for use in organic farming.

BIOSORRA promises yield increases of 40% and a 30% reduction in water usage, and in 2022 even promised yield increases of up to 200%, but does not provide proof for these claims. Similarly, the claim that "*the durability of carbon removed is in the 500 – 1000 year range*" is not supported by evidence. BIOSORRA has secured the following investments:

- In 2025 it raised US$ 3.5 million in seed funding, which it plans to use to expand its biochar operations in Kenya.
- In 2024 it sold around 100,000 carbon credits on the Carbonfuture platform, and the carbon market Klarna announced an investment in the company.

## Green Carbon Inc, Japan: Biochar projects in the Global South are being driven by Japan's climate targets

Green Carbon Inc. is a Japanese company founded in 2019 that aims to generate and sell carbon credits, including from biochar projects, for the Japanese Joint Crediting Mechanism (JCM) and other international carbon markets. The JCM was launched by the Japanese government in 2013 to reduce or eliminate greenhouse gas emissions in partner countries in the Global South through the generation of carbon credits, with these reductions being credited towards Japan's Nationally Determined Contributions (NDCs). Japan has so far signed bilateral JCM agreements with 31 countries, and aims to save 100 Mt of $CO_2$ by 2030, rising to 200 Mt by 2040. JCM projects are supported by several bodies, including the Japanese Ministry of the Environment, Japan's national research and development agency NEDO and the Asian Development Bank Trust Fund.

Green Carbon is implementing or planning biochar projects in Cambodia, India, Japan, the Philippines, Thailand and Vietnam, and intends to expand its operations to Latin America and Africa:

- In India, the company has opened biochar facilities in partnership with Varhad Capital Private Ltd, and it plans to open more in collaboration with Excellent Enfab Inc.
- In the Philippines, Green Carbon has signed a memorandum of understanding (MoU) with Alcom Carbon Markets, a Singapore-based manufacturer of biochar plants. The two companies intend to convert rice husks into biochar in the provinces of Bulacan and Nueva Ecija.
- In Vietnam, Green Carbon signed an MoU with the US company Regrow Agriculture Inc., with the aim of generating carbon credits from biochar projects using agricultural residues as feedstock.
- In Thailand, Green Carbon signed an MoU with Thailand's Rubber Authority (RAOT) to generate carbon credits from biochar produced using residues from rubber trees that have stopped producing latex. In 2025, the company announced an additional MoU with the Singapore-based company Living Roots Pte. Ltd, with plans to produce 3,000 tonnes of biochar annually.
- In Cambodia, Green Carbon has signed an MoU with Amru Rice, a Cambodian rice miller and wholesaler, and

is considering investing in up to five biochar plants by 2028.

## Arukah Capital Pte. Ltd, Singapore: Company expanding its operations in Asia and Africa

Arukah Capital Pte. Ltd is headquartered in Singapore and was founded in 2021. In 2025, the company commissioned a biochar plant in Bati Province, Cambodia. The plant produces biochar from rice husks collected from local mills, and it is expected to generate around 10,000 carbon credits per year.

Arukah Capital plans to develop additional biochar projects in the Global South, including in the Philippines. In 2026, the company signed an MoU with the local government in Carmen, Surigao del Sur province to develop Project Bridge. This project intends to utilise coconut farming residues as biochar feedstock and will be implemented in the northeast of Mindanao.

In 2025, Arukah Capital received funding to develop a biochar project in Indonesia, and in the same year signed an MoU with CJ Commodities and Oman Carbon to develop a biochar project in Ghana.

## Sawa EcoSolutions, Indonesia: First biochar plant commissioned

Sawa EcoSolutions Inc. was founded in Singapore in 2021, and "*aims to establish 100 production facilities across Southeast Asia, removing 1 million tonnes of carbon dioxide annually*". In 2024, the company commissioned the Majalengka biochar project, located in the Jatitujuh Sugar Factory complex in West Java, Indonesia. The factory's owner, PG Rajawali II, is a leading regional sugar producer, and sugarcane bagasse is used as the biochar feedstock. First, the bagasse is dried using syngas (pyrolysis gas), and then pyrolysed in an oxygen-limited environment at temperatures of up to 600°C. The pyrolysis plant is expected to process up to 30,000 tonnes of biomass per year, producing 5,000 tonnes of biochar and theoretically capturing 5,000 tonnes of $CO_2$ in the process.

Sawa EcoSolutions has received significant investments, including:

- In 2024, Offset8 Capital Ltd, a United Arab Emirates company, purchased 180,000 carbon credits from the project, costing US$ 50 million.
- In 2023, Canadian company Solaires Entreprises pre-purchased an undisclosed quantity of carbon credits.

## Alt Carbon Tech Ltd, India: Plans to use seed funding to increase biochar production using agricultural residues

Alt Carbon Tech Ltd was founded in 2023 and is headquartered in Bengaluru, India. In 2025, the company inaugurated its first biochar plant, Nobojagoron, in the Darjeeling region of West Bengal, producing its first batch of biochar in 2026. According to Alt Carbon, the biomass feedstock is agricultural residues, and the production site currently has one pyrolysis reactor, though the company plans to increase capacity. By 2030, Alt Carbon aims to process one million tonnes of agricultural residues, spread biochar over two million hectares and capture half a million tonnes of $CO_2$ per year. While Alt Carbon claims that biochar is "*a stable form of carbon designed to remain locked away for centuries*", it does not provide proof of this. The company has received substantial financial support, including:

- In 2025, it received US$ 12 million in seed funding, with tech investor Lachy Groom leading the funding round, and signed an offtake agreement with the shipping company MOL Group for 10,000 tonnes of $CO_2$.
- In 2024, it signed a US$ 0.5 million pre-purchase agreement with the Frontier carbon market.
- Additional supporters include Google, Match, Mitsubishi Corporation, NextGen, Shopify and Stripe.

# Further reading

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