Rockstart Biochar Network

Biochar Ecosystem Report

November 2025

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Executive Summary

Europe's biochar industry is expanding rapidly from just 20 plants in 2015 to over 200 by 2024, with 250 expected by 2025. The Nordics, Germany, and the Austria-Switzerland corridor lead the way, driven by early regulation and energy systems well suited to biochar integration.

New EU frameworks are now locking biochar into long-term climate planning. The Carbon Removal Certification Framework (CRCF), together with the Industrial Carbon Management Strategy and a proposed 2040 reduction target, signals a decisive shift: biochar is moving from a voluntary initiative to an essential climate tool.

Denmark illustrates both the promise and the hurdles. Its first certified biochar sale in 2023 marked a breakthrough, but permitting delays and public opposition have slowed progress. Even so, a DKK 10 billion support package and the world's first agricultural carbon tax are set to reignite momentum.

Across Europe, a fast-growing network of startups, corporates, and researchers is turning biochar from pilot to infrastructure. An accompanying certification framework is paving the way for stable financing and long-term carbon removal contracts.

If policy and investment trends hold, Europe could remove 1.5 million tonnes of CO_2 annually by 2030 – and much more by 2040. The sector stands at an inflection point: from potential to performance, and from niche technology to cornerstone of Europe's climate strategy.

About

Who is behind the Biochar Ecosystem Report?

About GUPD (Website) **& the authors**

This report forms part of the GUDP-funded effort to accelerate the Danish and European biochar ecosystem. It was developed with support from the Green Development and Demonstration Programme (GUDP) under the Danish Ministry of Food, Agriculture and Fisheries. GUDP funds market-oriented projects that combine measurable environmental benefits with strong commercial potential. The GUDP recognizes biochar as a strategic climate solution that brings together carbon removal, soil regeneration, and circular resource use.

The aim of this report is to offer a snapshot of the European biochar landscape, outlining key actors, investment trends, innovation pathways, and emerging applications. It is based on ecosystem mapping carried out by Rockstart and is strengthened by the independent journalistic work of Rasmus Thirup Beck, climate journalist at Klimajournalisterne, who combined the underlying cases and data from Rockstart together with independent market research to distill the most relevant insights.

About Rockstart (Website)

We are an early-stage impact investor and ecosystem builder based in Copenhagen, Amsterdam and Bogotá, focused on AgriFood, Energy, and Emerging Tech. We have backed over 300 startups, operating at the intersection of sectors driving climate innovation.

GUDP aligns with our mission to accelerate the transition to a regenerative future. We offer a strong track record in ecosystem building, startup support, and corporate collaboration, leveraging our network of European biochar innovators to translate emerging technologies into scalable narratives.

We lead the GUDP biochar ecosystem-building initiative to connect members, drive adoption, and mobilize the ecosystem needed to scale climate innovation. This report is for innovators, corporates, investors, researchers, policymakers, NGOs, farmers, and networks, to encourage engagement with biochar as a critical tool for climate resilience.

What is Biochar?

And it’s role in climate and agriculture innovation

Biochar is a charcoal-like substance created by pyrolyzing dry biomass at high temperatures with limited oxygen, producing:

Biochar

Stable, carbon-rich solid that can lock away up to 3 tonnes of CO2 per tonne produced

Syngas

Renewable gas that can supply 50-85% of the energy needed to run the pyrolysis system

Bio-oil

Liquid biofuel that typically makes up 60-70wt% of fast pyrolysis output, replacing a substantial portion of conventional heating oil

Benefits of biochar

🌱 **Long-term carbon storage**
Locks carbon in soil for centuries

🌱 **Soil health enhancer**
Improves water, aeration, and nutrient retention

🌱 **Soil pH regulator**
Raises pH in acidic soils, restoring environmental balance

European Biochar Market 🇪🇺

A dramatic European acceleration

The growth of Europe’s biochar sector has been nothing short of remarkable

Until 2015, the European biochar industry counted only around 20 production plants. By the end of 2024, that number had risen to just over 200, with another wave expected that could bring the total close to 250 by 2025.

Some regions are pulling ahead. Most production capacity is in the **Nordics** (31%), **Germany** (25%), and the **Austria–Switzerland corridor** (15%) — areas that combined early standards with district heating systems perfectly suited to biochar integration.

While a few large-scale European facilities have emerged, no single company yet holds a dominant position. Most output still comes from small and mid-sized plants, though momentum is shifting toward industrial-scale, metallurgy-linked biocarbon projects and municipal circular sites that combine waste handling, heat recovery, and certified removals. If these projects come online as planned, they are likely to become the continent’s largest sources of biochar.

European Biochar Market 🇪🇺

A dramatic European acceleration

Policy is catching up

For years, critics highlighted the lack of a coherent EU policy for carbon removals. That picture is now changing rapidly. The Carbon Removal Certification Framework (CRCF) replaces a maze of national legal systems with a single European certification pathway for high-quality CO_2 removals. Two major policy shifts mark a turning point for the sector:

The Industrial Carbon Management Strategy

Launched in 2024, the Industrial Carbon Management Strategy integrated CO_2 removals, specifically biochar, into core infrastructure planning. This shifted biochar from a marginal concept to a key component of planning lanes alongside pipelines and hubs. Projects near waste streams, biomass, or heat demand can now be included in regional development plans and access infrastructure co-financing. This secures public funding and investor visibility, positioning biochar as a dual-benefit solution for negative emissions and local energy or soil improvement.

90% Net reduction Target Proposal

In July 2025, the European Commission proposed adding a 90 percent net-reduction target for 2040 to the EU Climate Law – and this November the member countries agreed to this. The implication is clear: even after deep cuts, certified removals will be needed to balance the remaining emissions. Once CRCF-labelled credits are available, biochar will move from being a “nice to have” to something that governments and corporations plan to procure over time. The proposal is currently still under negotiation, but it sends a strong demand signal for durable removals.

European Biochar Market 🇪🇺

A dramatic European acceleration

As regulation tightens and product carbon footprints begin to influence contracts, plants that can prove cleaner inputs and traceable removals will gain a clear advantage. If certified removals are allowed to count toward compliance targets, financing will become cheaper, offtake contracts longer, and capacity growth faster.

Because modern pyrolysis plants also generate heat and power, scaling biochar production could quietly strengthen district heating networks and local energy security — adding a valuable co-benefit to climate impact.

Challenges remain. Sustainable biomass sourcing, logistics and densification, and harmonised standards are all needed to support long-term growth. On its current trajectory, analysts expect biochar removals to reach around 1.5 million tonnes of CO_2 per year by 2030, and potentially tens of millions by 2040 if policy momentum continues.

Without that follow-through, the market could plateau much sooner. The next phase will depend as much on policymakers and procurement teams as on engineers and entrepreneurs.

Current trajectory of biochar removals

1.5 million tonnes of CO_2

Per year by 2030

Danish Biochar Market 🇩🇰

Denmark has high hopes but ran into a reality check

Monday, July 3rd, 2023, marked a milestone for biochar in Denmark

On that day, Danish biochar pioneer **Stiesdal SkyClean** sold its first carbon credit certificate. Using pyrolysis to convert degassed biomass into biochar at its plant in Northern Jutland, the company transported the resulting biochar to a farmer in Southern Jutland, who spread it on part of his land. The calculated carbon storage amounted to five tonnes of CO_2, certified by the European Biochar Certificate (EBC), which awarded it the highest possible rating. The accompanying carbon credit was sold on the Carbon Future marketplace — to a Swiss helicopter company seeking to offset part of its emissions.

Price tag: €160 per tonne.

It was also a big day for Danish politicians who, at the time, were counting on biochar to deliver no less than 2 million tonnes of emission reductions by 2030.

Danish Biochar Market 🇩🇰

Denmark has high hopes but ran into a reality check

Slower progress than expected

Since that milestone day, Danish biochar has faced a few reality checks. The rollout of the technology has been slower than expected, and the most recent biochar strategy paper from the Danish government (2024) now projects CO_2 reductions of only 0.3 million tonnes per year by 2030.

The main obstacles have proven to be slow environmental regulation, uncertainties around carbon sequestration measurements, limited suitable farmland for biochar application, and, more recently, public resistance to both biogas and pyrolysis facilities. **Stiesdal**, for example, had to abandon plans to build a new facility on Zealand and is still awaiting approval from local authorities to scale up operations in Northern Jutland.

Aside from Stiesdal, only one other facility in Denmark has progressed beyond the pilot stage: **AquaGreen**, which converts sewage sludge into biochar and sells it to farmers — including, among others, a Danish winemaker.

Danish Biochar Market 🇩🇰

Denmark has high hopes but ran into a reality check

Hope remains high

Despite the challenges, optimism around biochar remains high in Denmark.

With the country introducing the world's first carbon tax on the agricultural sector, farmers are under increasing pressure to offset their emissions. The latest strategy paper highlights a technical potential for sequestering up to 38 million tonnes of CO_2 annually, and between 2027 and 2045, Denmark plans to support the sector with 10 billion DKK in funding.

Encouragingly, the building blocks for scaling are already emerging, as Danish cooperatives, corporates, and municipalities begin integrating biochar into agriculture, district heating, and circular resource flows.

The rise of networks, together with academic leadership, is helping bridge the gap between research, regulation, and deployment. At the same time, Denmark's startup scene continues to punch above its weight, boasting more biochar startups per capita than any other European country. With an active innovation pipeline and growing international interest, Denmark is well positioned to lead, if stakeholders can align on permitting, procurement, and public engagement.

The Stakeholders Landscape

Mapping the biochar landscape

Over the past year, Rockstart has been mapping the European biochar ecosystem. This effort has identified **179 actors, including startups, corporates, investors, academic institutions, and government bodies**. While the list is extensive, it is by no means exhaustive, and will likely become outdated quickly as the ecosystem continues to evolve.

In other words, what follows is a snapshot – but an informative one.
It captures a highly diverse sector made up of players in very different “weight classes.”
In the following sections, we’ll take a closer look at each type of actor.

Startups

The emerging ecosystem

In Spain the company **Climate Farmers** is intent on integrating biochar in the regenerative revolution of agriculture. Other companies, such as Sweden's **OBIO**, have discovered that adding biochar to animal feedstock improves livestock health and reduces methane emissions. In Finland, several companies, including **Carbo Culture** and **Puhi**, sell the pyrolysis equipment needed for biochar production.

Across Europe, some biochar companies have their eyes set on the Global South, while others are focused on developing software and certification systems to document CO_2 storage. More surprisingly, quite a few companies are introducing biochar into the building sector.

In short, the European biochar startup scene is thriving.

Our research has identified **49 biochar startups** across 20 European countries. Denmark stands out as an outlier, with no less than 26 percent of the listed startups based there — likely due to the country's major investment in the technology, amounting to 10 billion DKR over the coming years. Germany and the UK take second and third place, respectively.

The diversity of startups, as outlined above, clearly shows an emerging ecosystem: some companies will provide the hardware, others the software. Some focus on production, while others specialise in measurement and certification.

Most businesses are concentrating on delivering emission reductions within Europe, while a few aim to help companies in the Global South achieve the same goals.

Differences also appear in terms of biomass input, ranging from manure and sewage sludge to by-products from industries as varied as coffee production and furniture manufacturing.

Black Bull Biochar

Website →

Wants to heal farmland

Biochar is often described as a Swiss Army knife for the green transition –
and the growing ecosystem of startups certainly demonstrates its versatility.
When applied to farmland, it can simultaneously sequester CO_2 and improve soil health,
particularly on degraded land, which is widespread around the world.

Improving farmland is precisely the main goal of UK-based Black Bull Biochar.

It's an easy sell to farmers, explains CEO and co-founder Alex Clarke:

> *"Farmers are increasingly seeing biochar's agronomic benefits in soils, while corporates are recognising the value of high-integrity removals."*

Looking beyond his company's operations, Clarke sees
a rapidly evolving European biochar market. One that is, as he puts it:

> *"moving from niche interest to a proven and scalable climate solution."*

Corporates

The big impact potential

European corporations are moving biochar from laboratories and pilot projects into the everyday fabric of people's lives. This shift is evident on farms, where cooperatives and food groups are planning feedstock and field use alongside utility partners, and in boardrooms where buyers are signing multi-year contracts for certified carbon removal.

Today, the technology is commercially proven. The change now lies in integrating it into existing systems, ranging from district heating and wastewater treatment to food and material supply chains. Certification now provides companies with a solid foundation for contracting, allowing projects that were once in the pilot stage to enter the rollout phase.

Agriculture remains the dominant sector

Our mapping identifies **58 European biochar companies**. The majority are in agriculture (39%), followed by energy (19%), waste management (17%), carbon markets (13%), and materials and other niches (12%).

Around one-third of these companies actually produce biochar; the rest are involved in organizing feedstock, operating plants with utility partners, building equipment, or purchasing certified carbon removals.

Denmark stands out as a hub, with 35 out of the 58 European biochar companies, far ahead of Germany (with 4), and Switzerland, Spain, and Sweden (each with 2). Agriculture remains the dominant sector (where Denmark holds a clear lead), while city landscaping, utilities, wastewater treatment, and construction materials are rapidly growing.

The Industry's Current Challenge: Contract-Readiness

Industry data shows that around 70% of European biochar capacity is now certified under EBC/WBC standards, paving the way for multi-year purchase agreements for carbon removals. However, the key obstacles are external. Early-stage capital remains limited, buyer familiarity is still growing, and product rules can add friction.

DLG

Website →

Keeps value close to the farm

The Danish farm cooperative DLG is investing in biochar through energy developer BioCirc, which is building local "circular clusters" near farms. These clusters convert agricultural residues into green gas, power, and heat, with plans for biochar production via pyrolysis. This keeps value and decision-making close to the feedstock.This approach ensures that value and decision-making stay close to the feedstock source.

DLG sees this as a practical shift for farmers: they supply residues, receive low-footprint fertilizer, and can participate in the projects. DLG Chairman Jesper Pagh states:

> “Today, farmers are both food and energy producers. Therefore, it is natural and important for us to bring our 26,000 members closer to the value chain and the synergies that exist between DLG and BioCirc. This is the beginning of a larger share of agriculture’s biomass being used in the production of carbon-neutral energy, helping to reduce the climate impact of the manure spread on fields”

Investors

The driving forces

You can have all the plans in the world, but without funding they're hard to realize — and biochar companies are no exception. The good news is that our survey identified **32 European investors**, including business angel networks VCs, actively pursuing opportunities in biochar. While the list is not exhaustive, it clearly shows that matches can be made.

Once again, **Denmark stands out, with 12 biochar-focused investors identified** — and Northern Europe as a whole dominates the investor landscape.

Reflecting the broader startup and corporate patterns, most investors — about 36 percent — are directing their attention toward agriculture. Given that this is also where most state aid and public incentives are concentrated, the alignment makes perfect sense.

People Ventures

MIKRO FONDEN

Regeneration.VC

NORDIC MAKERS

PSV Tech

NOON VENTURES

SPRING NORDIC

THE FOOTPRINT FIRM

Rockstart

GIANT VENTURES

Rockstart

Rockstart

Website →

Aims to prove that biochar can be profitable

With strong connections across the innovator-ecosystem, Rockstart aims to support startups not only with funding but also with strategic resources, expert guidance, and opportunities to test their solutions in real-world settings. These are all key ingredients for accelerating growth and fast-tracking market entry, as CEO and co-founder Rune Theill explains.

Rockstart's *"biochar guy"*, Mark Durno, who manages Rockstart Agrifood, views the European biochar ecosystem as a *"compelling investment opportunity."* He notes that as carbon credit markets mature and institutional interest grows; *"the time to invest is now."*

> *"Our world cannot produce more land; soil regeneration is a central piece of the puzzle in building a resilient future food system,"*

As a result, he sees growing enthusiasm among investors for the sector:

> *"Investors trending toward nature-based solutions to combat climate change are excited about biochar as a powerful means of CO_2 sequestration — and for its soil enrichment qualities through improved water retention and fertility."*

Academia

The intelligence-engine

Like other stakeholders, research institutions have shown increasing interest in biochar over the past two decades. From just a handful of papers in 2007, the field has expanded to hundreds of studies per year by 2024.

Today, the focus is shifting from short-term lab tests to longer-term field trials examining biochar's impact on soil fertility, nutrient cycling, and long-term stability.

As in other sectors, the Nordics remain the focal point for biochar research. Here, policy support and funding are driving laboratories to be closely linked with farms and industry, shortening the gap between scientific evidence and practical uptake.

Given the limited public understanding of biochar and the ongoing lack of standardized regulations, academia plays a crucial role in shaping its real-world applications and scaling its use.

Research Tracks Standards and Use Cases

Research on biochar's permanence and practical benefits is heavily dominated by Nordic institutions, with 14 of the top 16 European research centers mapped in Denmark. Their focus includes farm trials, agricultural knowledge synthesis, carbon locking materials pilots, and new permanence metrics.

Sweden and Norway offer complementary expertise.
The **Swedish University of Agricultural Sciences** specializes in urban applications (soils, wastewater, life-cycle assessments of climate benefits). The **Norwegian University of Life Sciences** concentrates on soil science (water retention, properties, and converting municipal waste into climate-positive products).

Other key players include the **UK Biochar Research Centre** in Edinburgh, which provides standardized methods and reference biochars, and Germany's **Fraunhofer UMSICHT**, which leads in developing methods for challenging residual feedstocks.

Geological Survey of
Denmark and Greenland

G E U S

GEUS

Website →

Makes biochar permanence measurable

Before cities or large buyers can commit to biochar on a significant scale, they need assurance that the carbon it contains will remain locked away for the long term. Denmark's Geological Survey, GEUS, provides a clear way to verify this.

Researchers at GEUS compare biochar to inertinite, a stable, fossilized form of carbon. Under the microscope, they shine light through the samples and measure how much light bounces back. If the reading is at or above two percent, the biochar behaves like ultra-stable carbon. Using software, they calculate the proportion of the sample that meets this benchmark and generate a single number that projects can use for permits and contracts: the percentage of biochar that is effectively permanent.

This figure integrates seamlessly into emerging regulatory standards. It complements the European Biochar Certificate's stability criteria, which require a low H/Corg ratio, and it aligns with the EU's efforts to develop a dedicated biochar methodology as part of its new carbon-removal framework.

At this stage, research is vital both for testing new applications and for communicating the latest findings to decision-makers in industry and policy.

Biochar Innovation Spotlight

I’ve got 55 problems, but biochar ain’t one

By now it should be clear that biochar is the very definition of a versatile material.

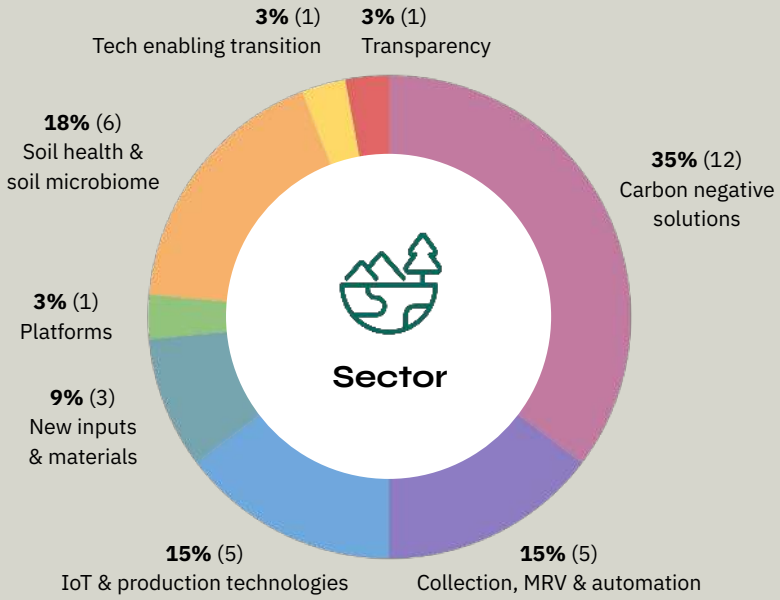
The biochar community often refers to a 2014 paper in The Biochar Journal by Hans-Peter Schmidt of the Ithaka Institute for Carbon Strategies and Kelpie Wilson, founder of Wilson Biochar Associates. In it, they listed no fewer than **55 potential uses for biochar**, ranging from well-known applications in agriculture to more unconventional ones such as soil and water decontamination, or even as a *“fabric additive for functional underwear.”*

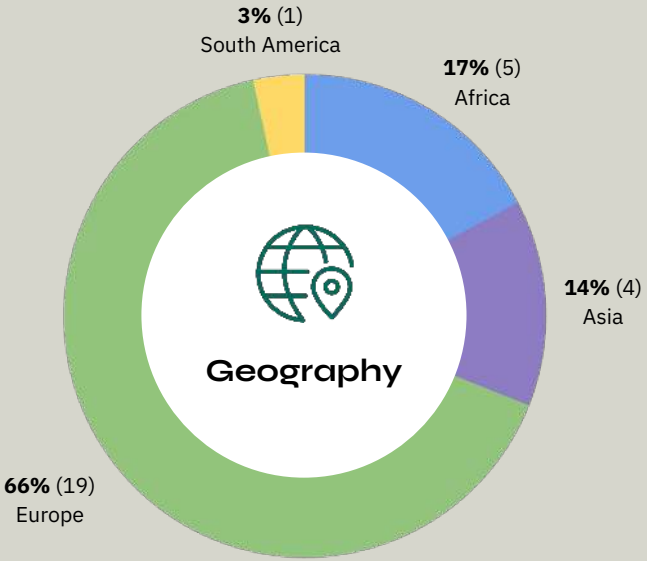
Not all of these 55 uses have reached commercial scale, but many have, as reflected in both our ecosystem analysis and our biochar innovation competition, which attracted **34 startup applications**. Some outstanding and innovative use-cases are:

- **Ecolocked**, which produces biochar-infused concrete that both performs better and stores CO_2.
- **Charbiome**, which develops “biochar probiotics” for more sustainable pig farming.
- **Plantilizer**, which combines biochar and microorganisms to create a powerful natural fertilizer.
- **Rockwood Operations**, which uses biochar to remove phosphate safely from problem areas and redeploy it where it is needed.

Biochar Innovation Spotlight

Sectors & origins of the companies participating in our biochar innovation competition





Trends & Opportunities

What's to come?

As the preceding pages have shown, considerable time, thought, policymaking — and yes, money — have been invested in European biochar over the past few years. Researchers, politicians, entrepreneurs, established companies, and investors all see great potential in this natural form of carbon sequestration, along with its many valuable side benefits.

As an emerging technology, biochar faces uncertainties: Does it work as expected? How much CO_2 will it actually store, and for how long? And, crucially, will it scale? While answers are still developing, much suggests that the outlook is promising.

The more pressing question for investors is which parts of the technology and which companies will succeed. Will soil sequestration continue to dominate, or will biochar in building materials catch up? Will feedstock supplementation drive agricultural yields to new heights, or will biochar play a central role in the steel industry's path toward circularity?

Whether you are an innovator, an investor, a corporate, a policymaker, or just have a curiosity for biochar, you might be encouraged by the words of Denmark's Minister for Climate, Lars Aagaard, who stated at the opening of the country's first biochar plant:

> *"We don't have many tools in the toolbox when it comes to climate action and CO_2 reduction — but this is one of them."*

Rockstart Biochar Network

Become a part of our growing community

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