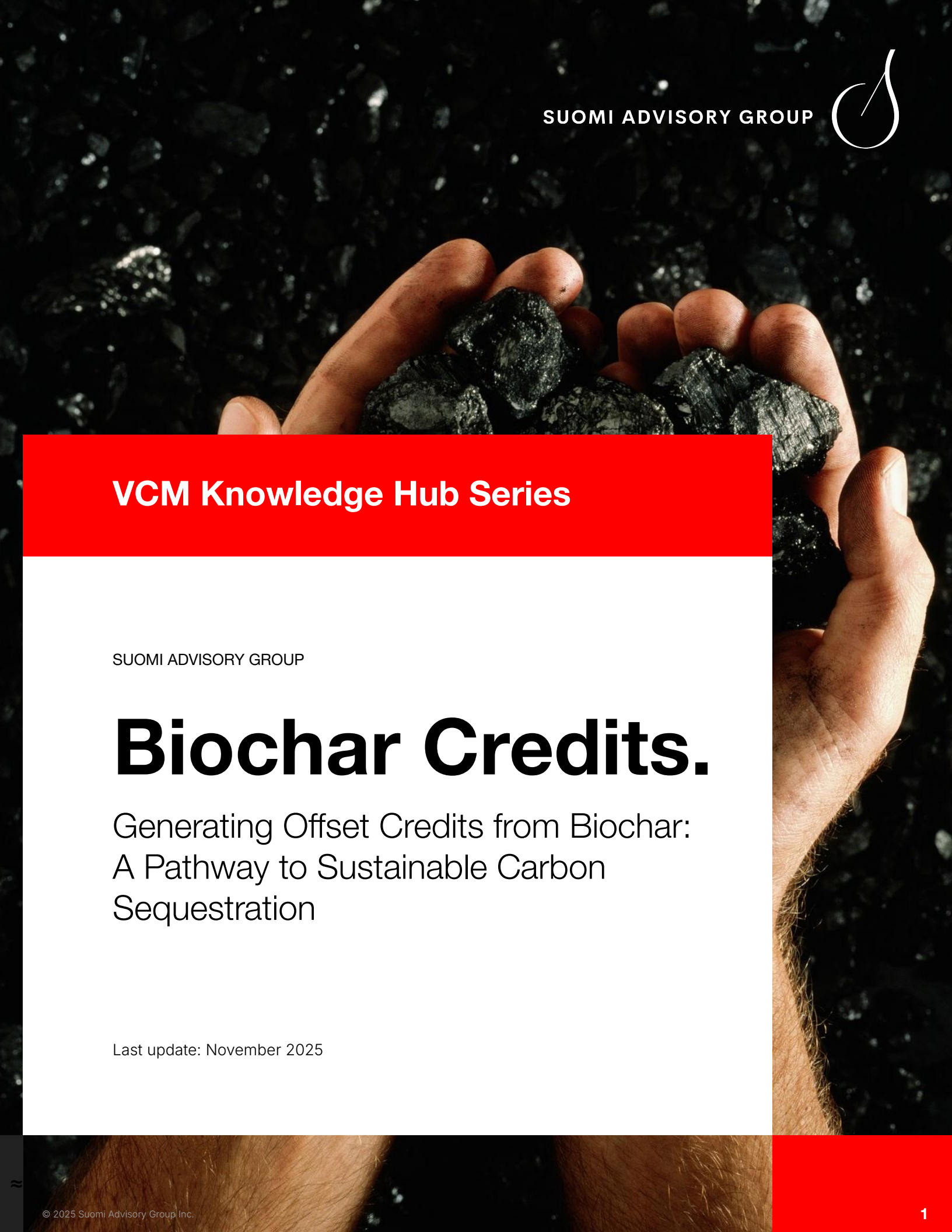

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VCM Knowledge Hub Series

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Biochar Credits.

Generating Offset Credits from Biochar: A Pathway to Sustainable Carbon Sequestration

Last update: November 2025

What is **Biochar?**

Biochar is a stable, carbon-rich material produced through the thermochemical process of pyrolysis, which involves heating organic biomass, such as wood, agricultural residues, or manure, in a low-oxygen environment. This process converts the biomass into a porous, charcoal-like substance that is highly resistant to decomposition. Biochar is primarily used as a soil amendment to enhance soil fertility, improve water retention, and promote microbial activity, while also sequestering carbon in the soil for centuries to millennia, thereby contributing to climate change mitigation.

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What are **Biochar Credits?**

Biochar credits are a form of carbon offset credits that represent the amount of carbon dioxide equivalent (CO_2e) sequestered through the production and application of biochar. These credits are generated when biochar is created and applied in a manner that verifiably locks carbon in a stable form, preventing its release into the atmosphere.

Biochar credits are typically issued under carbon market standards or registries such as the Verified Carbon Standard (VCS), Gold Standard, or Puro.earth, which certify the carbon sequestration potential based on the biochar's carbon content and longevity. These credits can be purchased by individuals or organizations to offset their greenhouse gas emissions, supporting projects that promote sustainable agriculture and carbon sequestration.

Key Features of Biochar Credits:

Long-Term Sequestration
Biochar's carbon stability ensures sequestration for 100–1,000 years, far exceeding other offset credits.

Co-Benefits
Enhances soil fertility, water retention, and crop yields, providing additional value to landowners.

Scalability
Utilizes abundant biomass waste, making it feasible across diverse regions and scales.

Why Are Biochar Credits **Important for the VCM?**

Biochar credits are becoming a key part of most large credit buyers portfolios.

Biochar credits are a cornerstone of the VCM due to their reliability, scalability, and alignment with global climate goals. The VCM relies on high-integrity credits to attract corporate and institutional buyers aiming to achieve net-zero targets. Biochar credits meet this demand by offering:

High Permanence
Unlike forestry or soil carbon projects, biochar's chemical stability minimizes reversal risks, ensuring long-term carbon storage.

Measurable Impact
Rigorous methodologies (e.g., VCS VMR0005, ACR Biochar Methodology) enable precise quantification of CO2e sequestration.

Sustainability Synergies
Biochar projects support circular economies by converting waste biomass into valuable products, aligning with sustainable development goals (SDGs) such as improved agriculture and waste management.

In 2024, the global biochar market was valued at USD 2.1 billion, with projections to reach USD 4.5 billion by 2030, driven by demand for carbon credits and sustainable agriculture (Statista, 2024). Biochar credits accounted for approximately 5% of VCM transactions in 2024, with growth expected as methodologies standardize and awareness increases.

The Paris Agreement **Article 6**

Article 6 of the Paris Agreement establishes frameworks for international cooperation in carbon markets, enabling countries to trade carbon credits to meet their Nationally Determined Contributions (NDCs). Biochar credits are well-positioned to contribute to Article 6 mechanisms, particularly under Article 6.2 (cooperative approaches) and Article 6.4 (a centralized mechanism for sustainable development).

Fit Within Article 6

Article 6.2 (Cooperative Approaches)
Biochar projects can generate Internationally Transferred Mitigation Outcomes (ITMOs), allowing countries to transfer carbon credits to support NDC targets. For example, a biochar project in a developing nation could produce credits purchased by a developed nation to offset emissions, fostering global collaboration.

Article 6.4 (Sustainable Development Mechanism)
Biochar credits align with the Article 6.4 mechanism, which emphasizes sustainable development and environmental integrity. Biochar's co-benefits, such as improved soil health and reduced methane emissions from biomass waste, enhance its eligibility for Article 6.4 credits.

Additionality and Permanence
Biochar projects meet Article 6's stringent requirements for additionality (demonstrating emissions reductions beyond business-as-usual) and permanence, given biochar's long-term carbon stability.

Potential for Credits

Scalability for Global Impact
Biochar projects can be deployed in diverse regions, particularly in agriculture-heavy developing countries, enabling significant ITMO generation. In 2024, pilot biochar projects in Africa and Southeast Asia generated 150,000 tonnes of CO2e credits, with potential to scale to 5 million tonnes annually by 2030 under Article 6 frameworks (UNFCCC, 2025).

Cross-Sector Benefits
Biochar's ability to reduce emissions from waste management and enhance agricultural resilience aligns with Article 6's focus on sustainable development, making it attractive for bilateral agreements.

Market Development
As Article 6.4's operational rules mature, biochar credits are expected to gain traction due to their high integrity and measurable outcomes. By 2028, biochar could account for 10% of Article 6.4 credits, driven by standardized methodologies (BloombergNEF, 2025).

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Types of **Biochar Projects**

Biochar projects vary based on feedstock, production technology, and application methods.

Feedstock Types

Agricultural Residues	Corn stover, rice husks, or straw. These are abundant and reduce waste disposal emissions (e.g., open burning).
Forestry Residues	Pine sawdust, wood chips, or logging waste. High carbon content ensures efficient sequestration.
Urban Green Waste	Grass clippings, tree trimmings, or municipal organic waste. Ideal for urban-based projects.
Invasive Species / Bush Encroachment	Biomass from invasive plants (e.g., mesquite) supports ecosystem restoration.

Production Technologies

Batch Kilns	Low-cost, labor-intensive systems suitable for small-scale operations. Yield: 20–30% biochar by weight.
Continuous Pyrolysis Units	High-efficiency systems for large-scale production, offering consistent quality. Yield: 25–35%.
Gasifiers	Co-produce biochar and syngas for energy, maximizing resource use but requiring advanced expertise.

Application Methods

Soil Incorporation	Mixing biochar into agricultural fields to enhance fertility and sequester carbon.
Surface Application	Spreading biochar on land surfaces, suitable for forests or degraded lands.
Compost Integration	Combining biochar with compost to improve nutrient retention and microbial activity.

Sample Biochar **Production Outcomes**

Feedstock Type	Corn Stover	Pine Sawdust	Urban Green Waste	Bush Biomass
Quantity of Dry Biomass (tonnes)	100	200	50	150
Moisture Content (%)	15	10	20	25
Carbon Content of Feedstock (%)	40	50	35	45
Pyrolysis Temperature (°C)	500	600	450	550
Residence Time (hours)	1	2	3	1.5
Biochar Yield (% by weight)	30	25	20	28
Biochar Produced (tonnes)	30	50	10	42
Carbon Content of Biochar (%)	70	80	65	75
Stable Carbon Sequestered (tonnes)	21	40	6.5	31.5
CO2e Sequestered (tonnes)	77.07	146.8	23.855	115.005
Offset Credits Generated (tCO2e)	77.07	146.8	23.855	115.005

Disclaimer for Sample Data: The sample data provided in the table above is for illustrative purposes only and is based on hypothetical scenarios derived from general industry knowledge. It is not intended to represent actual project outcomes or serve as a basis for operational, financial, or investment decisions. Actual biochar production outcomes, carbon sequestration, and CO2e calculations depend on specific project conditions, methodologies, and verification processes. Suomi Advisory Group disclaims any liability for actions taken based on this sample data. For accurate and project-specific data, consult with qualified professionals and accredited verifiers.

Quantifying The **Impact**

Biochar Credits generate significant Co-Benefits:

Agricultural Productivity
Biochar increases crop yields by 10–20% in tropical soils (Nature, 2023).

Water Retention
Biochar-amended soils retain 15–25% more water, reducing irrigation needs (Soil Science Society, 2024).

Emissions Reduction
Diverting biomass from open burning avoids methane emissions, equivalent to 0.5–1 tonne CO2e per tonne of biomass processed.

Impact Today

Biochar projects have demonstrated significant potential in the VCM:

- In 2024, biochar projects globally sequestered an estimated 1.2 million tonnes of CO2e, equivalent to removing 260,000 cars from the road for a year (EPA, 2024).
- Biochar enhances soil productivity by up to 20% in nutrient-poor soils, supporting food security in developing regions (FAO, 2023).
- It is estimated that over 100 biochar projects were registered under VCS in 2024, with 60% located in North America and Europe.

Impact Tomorrow

- By 2030, biochar credits are projected to represent 10–15% of VCM transactions, driven by increasing corporate demand for high-permanence credits (BloombergNEF, 2025).
- Global biochar production capacity is expected to reach 10 million tonnes annually by 2030, potentially sequestering 25 million tonnes of CO2e per year.
- Emerging markets in Africa and Southeast Asia are anticipated to account for 30% of new biochar projects by 2030, leveraging abundant agricultural residues.

Mapping The **Future For Biochar Credits**

The future of biochar credits is promising, with several trends shaping their growth.

Methodology Advancements
New methodologies, such as Puro.earth's updated biochar standard, will streamline verification and increase credit issuance efficiency.

Technological Innovation
Advances in continuous pyrolysis and gasification technologies will reduce costs and improve scalability.

Policy Support
Governments in the EU and US are exploring incentives for biochar projects, including subsidies and integration into compliance markets.

Digital Integration
Digital monitoring, reporting, and verification (MRV) systems will enhance transparency and trust in biochar credits, leveraging IoT and blockchain for real-time data.

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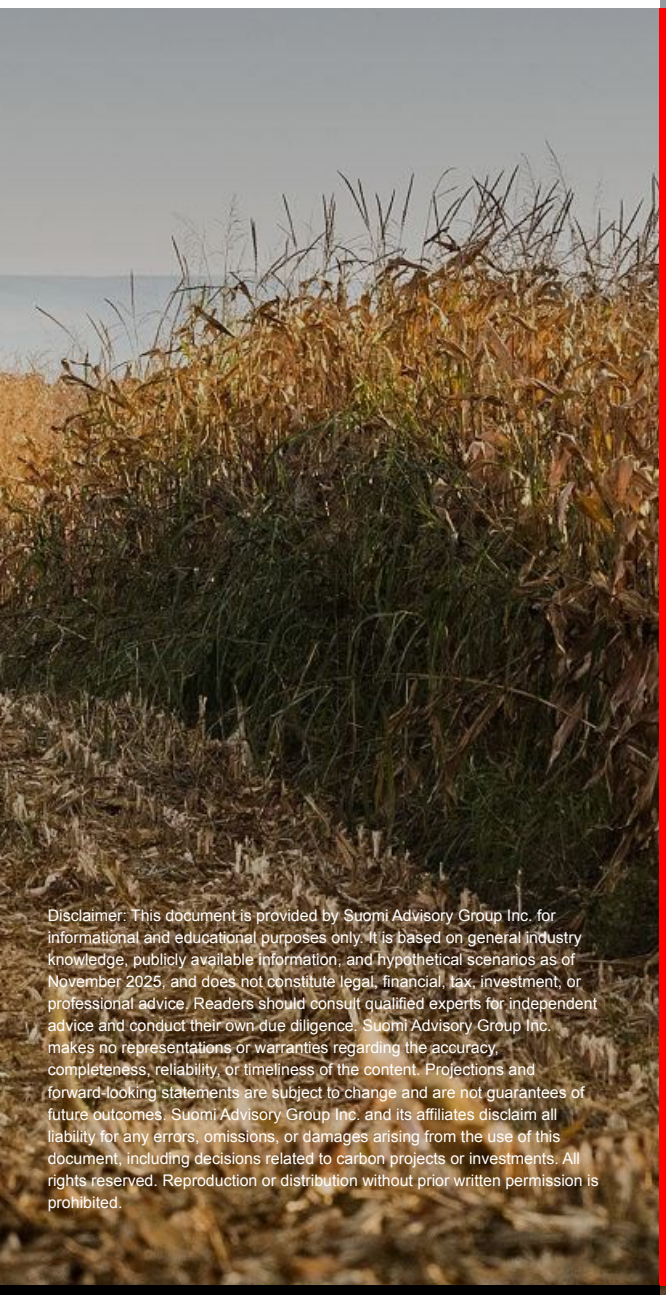

The **VCM Knowledge Hub Series**, produced by Suomi Advisory Group, is a collection of technical papers designed to provide in-depth insights into key aspects of the voluntary carbon market (VCM). Targeted at industry experts, corporate sustainability leaders, and policymakers, the series aims to establish thought leadership by delivering authoritative, data-driven analyses on topics such as high-integrity credits, carbon registries, and digital MRVs, among others. The purpose is to educate stakeholders and foster trust in high-integrity carbon markets by showcasing expertise in navigating complex VCM opportunities, ultimately driving sustainable and profitable carbon projects aligned with global climate goals.

Contact us today to explore how we can drive your success in the global carbon economy.

Reach Out

www.suomigroup.ca
info@suomigroup.ca