


EBC carbon sink certificate

General Data	ID of C-sink certificate = C-sink register ID	cs-ull4-vtgf-j7w3-huu9_1 (replaces cs-ull4-vtgf-j7w3-huu9_1)
	EBC ID	co-de-52
	EBC Batch ID	ba-de-52-1-3
	Production periode (from-til)	2022-02-01 - 2023-01-31
	QR-Code of Biochar Batch Analysis	

Producer	Abfallwirtschaft und Stadtreinigung Freiburg GmbH Hermann-Mitsch-Strasse 26 79117 Freiburg Deutschland
GPS of production	N 48.04885183995528, E 7.834066501598406 www.abfallwirtschaft-freiburg.de buerger@abfallwirtschaft-freiburg.de

Biomass	Type of biomass (EBC-class)	F-02 Forestry wood
	Total amount of biomass (dry matter) used for the certified batch	346 t
	Emissions due to fertilization per batch	0 t CO ₂ eq
	Transportation of biomass to pyrolysis site per batch	0.3 t CO ₂ eq
	Preparation of feedstock per batch	4.4 t CO ₂ eq
	Emissions for drying of feedstock per batch	- t CO ₂ eq
	Feedstock storage emissions per batch	0.50 t CH ₄
	Total biomass related GHG emissions without CH₄ per batch	4.7 t CO₂eq

Pyrolysis	Source of electric energy used on site	Renewable from the grid
	Emissions due to electricity consumption for entire pyrolysis plant incl. post pyrolysis treatment per batch	0 t CO ₂ eq 3 t CO ₂ eq
	Emissions due to carrier gas per batch	0 t CO ₂ eq
	CH ₄ -emissions of entire batch	0.03 t CH ₄
	Total pyrolysis related GHG emissions without CH₄ per batch	3.0 t CO₂eq

Methane	Total methane emissions per batch	0.53 t CH ₄
	Amount of compensated methane emissions	0 t CH ₄
	Type of methane compensation	-
	Total non compensated CH ₄ emissions per batch	0.53 t CH ₄
	Total non compensated CH₄ emissions in CO₂eq per batch (@ GWP20 of 86)	45.82 t CO₂eq

Margin of security	10% of total GHG emissions (incl. GWP20 of CH₄) per batch	5.4 t CO₂eq
--------------------	---	-------------------------------

Total emissions	Total GHG emissions in CO₂eq per batch	58.9 t CO₂eq
	Total GHG emissions in C per ton of biochar (dry matter)	0.157 t C

Energy	Carbon neutral thermal energy per batch	- MWh
	Carbon neutral electricity per batch	- MWh

Biochar	Amount of biochar (DM) produced per certified batch	102.00 t
	H/Corg ratio	0.13
	C-content	85.1 %
	C-sink potential	69.4% of DM

Data per ton of biochar	Total GHG emissions per t biochar (dry matter)	0.58 t CO ₂ eq
	CO ₂ eq-content per t of biochar (dry matter) [gross C-sink]	3.12 t CO ₂ eq
	C-sink potential in tCO ₂ eq per t of biochar (dry matter) [net C-sink]	2.54 t CO ₂ eq
	Csink₁₀₀ in tCO₂eq per t of biochar (dry matter) [persistent C of the sink after 100 years when applied to soil @ P₁₀₀=74%]	1.88 t CO₂eq

EBC Carbon Sink Certificate

Issued for Abfallwirtschaft und Stadtreinigung Freiburg GmbH

The biochar batch ba-de-52-1-3 produced by Abfallwirtschaft und Stadtreinigung Freiburg GmbH has carbon sink potential of 69.4 %. Each ton of biochar from the certified batch has a carbon sink potential of 2.54 t CO₂eq. When applied to soil, the accountable fraction of carbon persistent after 100 years (C_{sink100}) is 1.88 t CO₂eq.

The carbon sink potential of 69.4 % provides the percentage of a mass unit of biochar that, on a dry matter base, can be considered as a temporal carbon sink. For example, a big bag containing 131 kg biochar (dry matter) has a carbon sink potential of (131 kg * 69.4 % C_s) = 90.9 kg C which is the equivalent of 333.4 kg CO₂eq per bigbag.

The 90.9 kg carbon of a 1m³ big bag of biochar is the amount of carbon that can be considered a carbon sink once the biochar is applied to soil, to compost, to digestate, to animal feed or to any other durable product or protective matrix.

The production of 1 t of biochar (dry matter) caused emissions of 157 kg CO₂eq due to feedstock production, transportation, storage, preparation and operation of the pyrolysis plant and methane emissions during both biomass storage and the combustion of the pyrolysis gases. These emissions were deduced from the carbon sink value of the biochar.

The CO₂ emissions of the combustions of the pyrolysis gases used for energy production are considered as carbon neutral as the feedstock for the pyrolysis originated from forest management residues.

The CH₄ emissions were measured repeatedly during regular operation on at least three pyrolysis plants of the same type. The methane values are thus subject to some uncertainty in regard to start-up and shut down of the process or possible problems during regular operation. For this reason, a margin of 50% was added to the measured CH₄ emissions. The chipped feedstock is stored longer than 30 days before drying to below 20% water content, therefore CH₄-emissions due to self-heating were considered. All electricity used for the production was provided as renewable, carbon neutral energy.

Neither the carbon expenditures necessary to transport the biochar from the production site to the location of the final C-sink (via a merchant and/or processor) nor the carbon expenditures when manufacturing or blending the biochar into a carbon sink product are considered so far. These emissions must be deduced as soon as a C-sink certificate or an offset service is generated for an end customer based on this C-sink potential certificate. Equally, when applied to soil, only the carbon fraction that is persistent after 100 years (C_{sink100}) or any other EBC-defined sequestration period should be traded as C-sink certificate.

During the biochar production, 0 MWh thermal energy was produced. As all GHG emissions of the entire process were deduced from the biochar carbon sink potential. The total certified amount of carbon neutral heat will be provided at the end of the batch.

The present ***EBC carbon sink potential certification*** is valid for the entire biochar batch produced between 01/02/2022 and 31/01/2023 and can be used for carbon sink certification and trade procedures.

The present EBC carbon sink potential certification was issued by the Ithaka Institute (Switzerland) on 30th May 2022.



Hans-Peter Schmidt
Head of Ithaka Institute