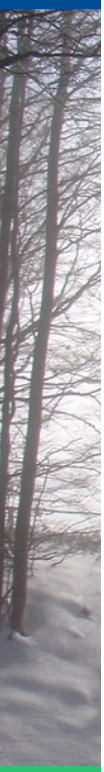
Carbonfuture

Carbonfuture Sink Certification Standards

What are the basic requirements for third-party certificates and certification standards in order to be eligible as a basis for Carbonfuture C-Sink Credits



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1 Background and Scope

The Carbonfuture platform provides both registry services and a trading platform for carbon sinks. Each individual carbon sink is represented and unalterably documented on the Carbonfuture blockchain.

In general, C-Sink Credits will be based on certificates issued under standards set by independent third parties. This document outlines the basic requirements for such third-party certificates and certification standards in order to be eligible as a C-Sink Credit provider.

2 Eligible Certificates

In general, Carbonfuture may accept certificates from any third-party issuer, provided they fulfil the requirements as described in this document. Before initial acceptance of any new certificate or certification standard, Carbonfuture or a third person appointed by Carbonfuture will assess the respective certificate or standard against these requirements. In addition, Carbonfuture will re-assess adherence to these requirements on a regular basis, and if circumstances make such a re-assessment necessary in the view of Carbonfuture.

3 Governance and General Requirements

Certificates issued under any eligible certification standard cannot be altered in retrospect, even if the respective certification requirements and standards are subject to change at a later point in time. This does not impede the possibility to change certification requirements and standards, however, such changes will only affect certificates issued after the change.

Certificates issued under any eligible certification standard must provide a basis to determine the net amount of CO_2 equivalent sequestered by a sink in each year of the certified duration of the sink (the sequestration curve). This can be achieved directly and explicitly, or by providing data such that Carbonfuture or a third person can calculate these quantities in a straightforward manner (e.g., based on a decay rate specified in the certificate).

3.1 Scientific Basis

The respective certification standards must be based on scientifically robust and sound concepts, methodologies and processes. Typically, the adequacy of the applied concepts, methodologies and processes should be corroborated with reference to peer reviewed scientific publications and to standards set by renowned public or private institutions in the respective sectors.

The certification standards must determine and show proof of adequate measures to prevent negative effects on the climate outside the perimeter of the certificates, including but not limited to:

- Greenhouse gas emissions which are not accounted for in the quantification represented in the certificates[1],
- Minimizing the amount of carbon sequestered in feedstock sources[2]

If the certification does not sufficiently consider such environmentally harmful effects outside its system boundary, this may represent a criterion for exclusion. Applying a system thinking perspective is key here.

3.2 The DNSH[3] Condition

As relevant for the carbon sink technology under consideration, the certification standards must determine adequate measures to **prevent the cause of significant harm to other environmental objectives**[4]. These other objectives include:

- Climate change adaption
- Recovery of the Ozone Layer
- Sustainable use and protection of water and marine resources
- Transition to a circular economy, waste prevention and recycling
- Pollution prevention and control, and
- Protection of healthy ecosystems

Carbonfuture reserves the right to accept or reject certification standards based on these minimum requirements at its own discretion.

4 Specific Data Requirements

Any certificate must specify:

- A start and an end date determining the duration of its validity
- The scope of certification, including an explicit disclosure which elements of the sink life cycle are included or excluded, for example the CO_2 balance of feedstock used, or energy consumed for production of the sink

[1] For example, in case of biochar-based sinks, potential methane emissions in the pyrolysis process should be accounted for

[2] For example, in case of biochar-based sinks, woody feedstock for pyrolysis should be subject to certified sustainable management of forests like PEFC

[3] DNSH stands for “Do No Significant Harm”

[4] These requirements follow the Taxonomy Technical Report of the EU Technical Expert Group on Sustainable Finance issued in June 2019

- The amount of net CO_2 equivalent sequestered by the sink (either in absolute or in relative terms)
- The annual decay rate, as applicable
- The localization should be assigned to a sink. However, there might be instances of carbon sinks for which the reference to a location is less unique, for example geological storages, or certain types of applications of the (powdery material) biochar. Therefore, the certification standard should differentiate between localized and diffuse carbon sinks
- The specific type of sink, including an indication of its primary use as applicable (e.g., biochar applied as cow feeding additive)
- Any other data needed to determine the sink in order to identify and prevent potential unintended or fraudulent double counting

5 Documentation

5.1 General Documentation and Disclosure Requirements[5]

The certification standards must be documented in a way such that a knowledgeable third person could independently verify the certificate with respect to the statements made, the calculations performed, and the results obtained.

Such a documentation must be made available to Carbonfuture in written form prior to the first transaction of any certificate based on the respective certification standard on the Carbonfuture platform. Furthermore, such a documentation must be made available to any eligible public authority or audit body appointed by Carbonfuture upon request.

Carbonfuture encourages the unrestricted public disclosure of the respective documentation, to the extent business confidentiality and intellectual property rights are not affected.

5.2 Specific Documentation Requirements

The documentation must disclose in detail the **methodology** applied in the quantification of the sink, in particular with respect to:

- The scientific basis of the applied methodology including references to the respective peer reviewed publications
- The measurement techniques
- Mathematical functions and statistical models

[5] These requirements will enter into force only after a pilot phase which will last until end 2020. This is because the applied certification standards are partially still under development.

- The calibration of models as well as measurement instruments as applicable
- Methods applied to collect data

The documentation must disclose the **processes** applied in the quantification of the sink, in particular with respect to:

- Frequency of revision and re-certification
- Personnel involved, including their qualification
- Utilization of outsourcing partners and / or sub-contractors including documentation ensuring that also they adhere to the set standard in all relevant aspects

5.3 Prevention of Double Counting

Carbonfuture does not issue C-Sink Credits for carbon sequestration that is claimed elsewhere, be it in the voluntary market or in state regulated markets. Therefore, Carbonfuture requires the specification of adequate measures for the prevention of double counting.

6 Proportionality

To foster and support innovation, the requirements of these standards, Carbonfuture may accept certificates that, by the time of initial acceptance, do not yet fully comply with these standards subject to the following conditions:

- Provision of the relevant data for the calculation of the amount of sequestered carbon per year over the sink's lifetime (the *sequestration curve,* see below), as well as the start and end date of each sink is mandatory in any case.
- Disclosure of the basic principles of the certification in terms of applied methodologies, the scientific basis and the involved processes is mandatory in any case.
- The depth and detail of the respective methodology and process documentation may be reduced as long as per year, the amount of sequestered CO_2 equivalent under the respective certificate does not exceed the significance threshold. This threshold differs between the various CO_2 removal technologies. For biochar the significance threshold amounts to 10,000 metric tons[6], which is the estimated capacity of a medium to large pyrolysis plant.

[6] Averaged over 100 years beginning in the year under consideration

- Similarly, Carbonfuture may, based on own discretion, grant a pilot phase for sink providers before a fully documented third-party certification is available for their sinks[7]. Such a pilot phase is limited to 1/10 of the significance threshold for each sink provider per annum[8].

C-Sink Credits for sinks under these alleviated conditions must not be blended in portfolios with regular C-Sink Credits based on eligible third-party standards and the lower standards must be explicitly made evident to end clients funding the respective climate credits.

7 Validity and Review

These standards are entering into force 1 January 2020. They will be reviewed and updated on a regular basis, at least bi-annually and if scientific, political or other relevant developments warrant.

Certificates issued under these standards as valid at the time of issuance will not be altered in retrospect in case of changes to these standards.

8 Specific Requirements for Biochar-Based Sinks

For biochar-based sinks, the C-Sink Credits are based on the following two elements:

- The biochar producer registers the **Production Certificate** for his or her pyrolysis facility. This certificate assesses the percentage of a mass unit of biochar which can be considered as carbon sink, net of emissions related to feedstock preparation and pyrolysis. This figure represents the **sink potential** of the biochar at production site. Currently, an eligible production certificate is issued by the EBC[9] (the "EBC-Sink" certificate)[10] [11].
- The biochar user, retailer or wholesaler registers the individual sinks. This includes uploading the confirmation of carbon preserving application of the biochar (e.g. by the farmer) on the signed **Carbonfuture Coupon** (see section 8.1), and the documentation of transport and processing emissions.

[7] The background to this alleviation is that the Carbonfuture standards are new and access to the respective third-party certifications in due time is not yet available to most sink providers. This challenge is exacerbated severely by the actual Covid-19 crisis. Accordingly, Carbonfuture allows for this alleviation to help the market for high quality certified carbon sinks develop and grow.
[8] In the case of biochar-based sinks, this threshold is applicable to both sink producer and sink registrar. Accordingly, if a biochar wholesaler trades biochar from several producers in pilot phase, the wholesaler must adhere to the threshold for the total of his or her registered sinks.
[9] EBC stands for "European Biochar Certificate", issued by the Ithaka institute, see https://www.european-biochar.org/en/home
[10] See https://www.european-biochar.org/en/c-sink
[11] In principle, Carbonfuture is open to alternative production certificates provided they fulfill the required quality standards. However, we strongly encourage alignment and collaboration between the respective national, regional and global standards, the EBC and the IBI in order to ensure comparability and a level playing field.

The two elements are linked on the Carbonfuture platform. After validation, Carbonfuture issues a C-Sink Credit for each individual sink. The owner of the C-Sink Credit may sell it to any entity which acts as Broker on the Carbonfuture platform. Initially, Carbonfuture GmbH will act as the primary Broker and will buy the C-Sink Credits from the sink registrar (e.g., the wholesaler). As the marketplace evolves, we expect and encourage new brokers to join.

8.1 The Production Certificate

There are two aspects to the production certificate:

- **The pyrolysis plant** must be certified. This includes in particular an assessment of the emissions (in particular the methane emissions) and energy consumption of the pyrolysis process.
- **The individual production process** must be certified. This includes an assessment of the feedstock sources with respect to C-neutrality, and of the feedstock preparation and pyrolysis processes and the used energy mix.

Currently, the EBC is the only issuer of eligible production certificates. The EBC-Sink certificate may be issued for biochar productions which are certified by the EBC or by the IBI[12]. The requirement of EBC or IBI certified biochar as a basis for the EBC-sink certificate ensures that the biochar used in the applications generating the recognized sinks is of good quality and the sinks fulfil the DNSH condition (*see section 3.2*). In particular, appropriate application of high-quality certified biochar is considered to be beneficial for the soil ecosystems.

8.2 The Carbonfuture Coupon[13]

Biochar as a raw material comes in a huge variety of qualities and respective price levels. In addition, biochar has a vast range of potential applications ranging from filtration material, construction additive to agricultural use. Not all of these applications lead necessarily to a stable carbon sequestration and hence to not qualify as a stable carbon sink. Therefore, Carbonfuture requires that wholesalers and producers must follow the EBC C-Sink. Following the EBC C-Sink, the biochar must be taken over at the factory gate by a tracking system that assesses all carbon expenditures and greenhouse gas emissions that occur on its pathway (i.e. transporting, milling, processing). As soon as the biochar is mixed into agricultural substrates such as fodder[14], compost, liquid manure, and fertilizer or into durable materials such as concrete or resins, the C-sink potential can be converted into tradable C-sink certificates.

[12] IBI stands for "International Biochar Initiative"
[13] An example of the Carbonfuture Coupon is provided in the Appendix
[14] Additional parameters and analytical methods for the EBC-certification of biochar as animal feed additive (EBC FEED) are outlined in the linked document

Therefore, the key to creating an accurately quantified carbon sink based on biochar lies in confirmation and documentation of the actual carbon preserving application of the material. To ensure that the biochar is used in a manner that does actually sequester the carbon, the biochar wholesaler together with the end user must document the use of the material on the Carbonfuture platform.

This documentation validates the actual sinks in a very granular way. For each shipping of biochar from the wholesaler to the end user, an individual Carbonfuture Coupon, filled out and signed by the end user of the biochar, provides the required evidence. Furthermore, with this document, the end user **warrants to transfer all rights that come with the respective carbon sink creation**. This is key to prevent double counting.

From Q2 2021, a fully digital sink tracking will be available, including a digital Coupon. Physical signatures are still possible and accepted, but a fully digital and streamlined process will be available.

8.3 Calculation of the CO_2 Equivalent Value of Biochar-Based Sinks

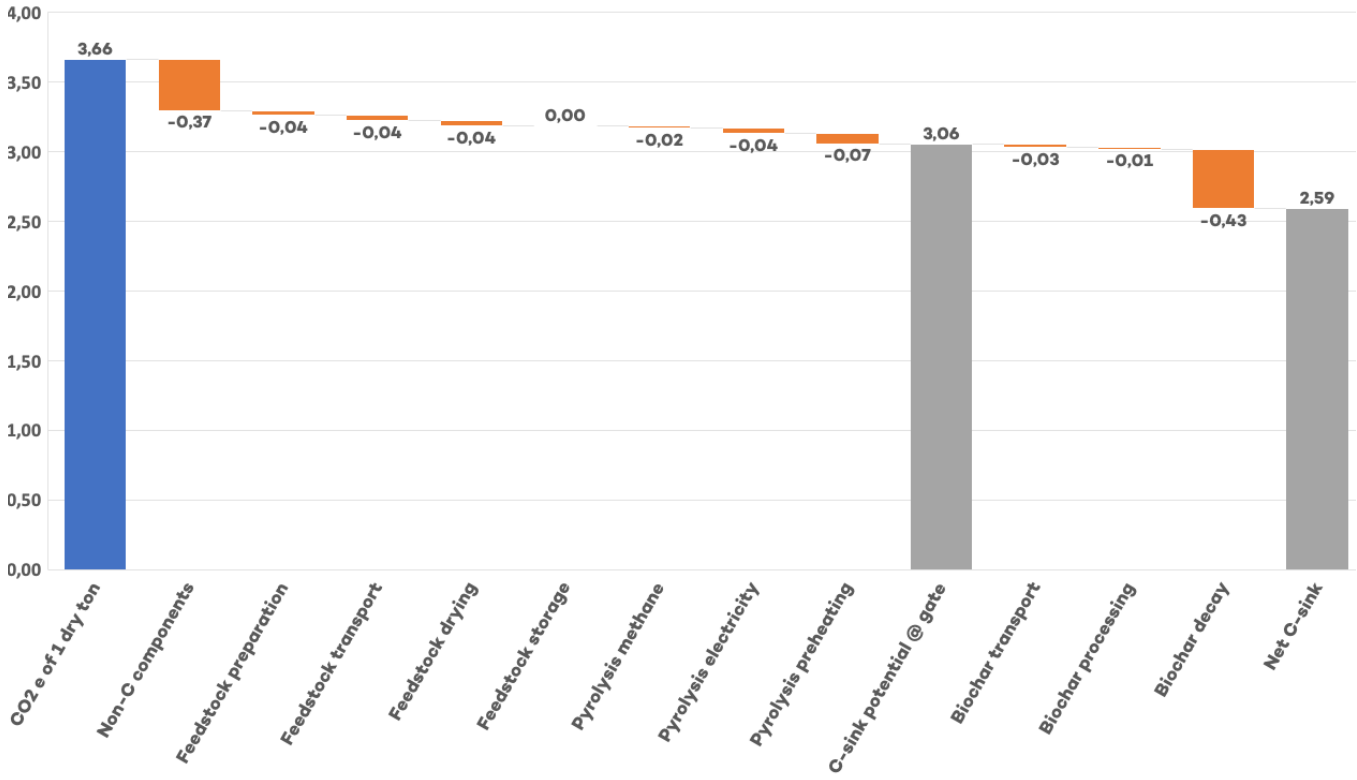
In order to calculate the net CO_2 equivalent value of a biochar-based sink, the following calculation steps are performed (*see Figure 1*). The conversion of the gross weight of a unit biochar into dry mass needs to be provided by the sink registrar, either based on individual measurement of humidity or based on volume and bulk density measurements (the protocols must be stored and disclosed to Carbonfuture or an appointed auditor upon request). All deductions based on dry mass biochar which are made to come up with the net carbon sink value after pyrolysis (i.e., at production site), are provided by the production certificate (EBC-Sink).

Further deductions for transport and processing are based on data provided by the sink registrar on the Carbonfuture platform. The respective calculations are performed by Carbonfuture. The annual decay is determined to be 0.3% provided the production certificate asserts H/Corg < 0.4. This decay rate is a conservative estimation based on scientific evidence, see 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Appendix 4.[15]

[15] More detailed research supporting this decay rate as a very conservative upper bound is found in:

- Lehmann, Johannes & Abiven, Samuel & Kleber, Markus & Pan, Gen-Xing & Singh, Bhupinder Pal & Sohi, Saran & Zimmerman, Andrew. (2015). Persistence of biochar in soil. Biochar for Environmental Management: Science, Technology and Implementation. 235-282. (see Figure 10.5).
- Budai, A., Zimmerman, A.R., Cowie, A.L., Webber, J.B.W., Singh, B.P., Glaser, B., Masiello, C.A., Andersson, D., Shields, F., Lehmann, J., Camps Arbestain, M., Williams, M., Sohi, S., Joseph, S., 2013. Biochar carbon stability test method: An assessment of methods to determine biochar carbon stability'.
- Camps-Arbestain, M., Amonette, J.E., Singh, B., Wang, T., Schmidt, H.-P., 2015. A biochar classification system and associated test methods, in: Lehmann, J., Joseph, S. (Eds.), Biochar for Environmental Management. Routledge, London, pp. 165–194.

Figure 1: Calculation of the net C-Sink value of the soil application of 1 dry metric ton of biochar



8.4 Assessment of Additionality

Typically, GHG emission reduction or removal undertakings have to fulfill additionality criteria with respect to a baseline, see e.g. ISO 14064-2 (2019). These standards require that "the GHG project should result in […] removal enhancements in addition to what would have happened in the absence of the project". Therefore, additionality requires to quantify both the removal enhancements and the baseline. For C-sinks based on carbon preserving biochar applications, this is particularly straightforward:

- **The baseline is net zero emissions**. This is based on scenarios of alternative usage of the biomass (which is required to be C-neutral by the EBC-sink certificate). Such scenarios could be thermic usage, bioenergy, or degradation on a landfill. Given that these alternative scenarios would cause GHG emissions in production and processing (including potential methane / nitrous oxide emissions), a baseline of zero is a conservative assumption. Since the current market prices for EBC certified biochar lead to a very narrow spectrum of economically viable applications, mainly in specialty agriculture, the respective C-sinks are to be considered additional also from an economic perspective.

- **The removal quantification** includes two building blocks:
    - The EBC-Sink certificate which determines the C-sink potential of the material at the factory gate. This is the C-content net of production and processing emissions, including a C-neutrality assessment of the input biomass. As the sink potential relates to "the outcome of future activities" depending on the way the material is used, the EBC-Sink certificate should be considered as a **validation** of the C-sink in the sense of the ISO 14064-2 (2019), 3.4.3.
    - The documentation of the C-preserving application of the material by the user with the Carbonfuture Coupon. As this relates to data and information about the actual C-sequestration, this step should be considered as a **verification** of the C-sink in the sense of the ISO 14064-2 (2019), 3.4.2. Note that the type of application determines the permanence quantification.

9 Appendix: Example of Carbonfuture Coupon

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CO_2-Senken Zertifikat
carbonfuture Coupon

To be filled out by the biochar wholesaler / sink registrar		Return coupons to
Name / firm		Email: registrar@carbonfuture.earth
Date	2021-02-22	
Shipping note (external ID)	LS00003	
Batch-No.[1]	21.04.2021	
Quantity[2]	Gross weight 3.0 t	Volume n/a m³
Optional Information	Coupon-No. 1008	Sealing-Nr

[1] *Alternatively, the production date may be provided*
[2] *Either gross weight or volume must be provided*

To be filled out by the end client / biochar user		
Name / firm	Beerwein AG	
Address	**Head Office**	**Address / location of sink if different**
Street	Musterstr. 1	Musterstr. 1
City, ZIP	12345 Musterstadt	12345 Musterstadt
Country	Germany	Germany
Type of application (please tick as appropriate)	☐ Direct soil application ☐ Compost additive ☐ Liquid manure treatment ☐ Bedding for farm animals ☐ Feeding of farm animals	☐ Sillage additive ☐ Additive for anaerobic digestion (biogas facility) ☐ Biochar-based organic fertilizer

By signing this document, the biochar user confirms and agrees:

- The biochar and the manure (in case of biochar application as bedding or feeding) and the digestate (in case of anaerobic digestion) will be brought into soil and will **not be burnt or pyrolyzed.**
- He or she explicitly warrants that **the claim on the carbon sink service provided is transferred** to the wholesaler / sink registrar indicated above. He or she will not claim any rights related to this service. In particular, he or she will not claim any such rights in relation to any private or public subsidy or support program in the context of soil organic carbon or as part of the CO2 accounting in his or her own sustainability report.
- He or she explicitly agrees that his or her **data** which is registered and stored in relation to the referenced sink may be used by carbonfuture. They will be made public in an anonymized way, e.g. as part of statistics on the carbonfuture platform. In addition, they will be disclosed in complete and not anonymized form for control and audit purposes to persons who are authorized for this by carbonfuture or under the EBC certificate.

Optional:

☐ I consent to the **publication of the exact sink location** on the carbonfuture platform

Place and date _____ Signature biochar user _____