Public Consultation Feedback

Comments Received During 10 August through 8 September 2021 Public Consultation on *VM0044 Methodology for Biochar Utilization in Soil and Non-Soil Applications,* v1.0 and Developer Responses

#	Organization	Section	Category	Comment	Response
1 (1)	Sun24.org	General	Question	I see that the methodology allows for the use of surveys to demonstrate the fate of waste biomass. But I don't see that survey can be used for other purposes. Can they?	The purpose of the survey data is to establish the typical fate of biomass in a project region. That is the only purpose of the survey as it pertains to the methodology. If there are other purposes behind the survey (e.g. price points of biomass, economics of moving it, or something else) that is fine. However, for purposes of the methodology, the survey or data should be from a credible source (as required) to establish the typical fate of waste biomass.
1 (2)	Sun24.org	Monitoring	Question	We have trained tens of thousands of farmers and expect to train millions of farmers this coming year. Each farmer can make at least one tonne of biochar per year with larger farms producing many tonnes per year. We have various models for training, including training the trainers. For example, we are starting a training project in Kasese, Uganda where we train a leader at all parishes (Catholic, Anglican, Seventh Day Adventist) to train commercial farmers on these methods of making biochar. We expect 5,000 commercial farmers to be trained. We can use surveys and other sampling methods to determine the adoption rate. If this model is successful, we will implement it throughout most of Uganda, Tanzania and Malawi and then expand to other countries. I am certain that our training will result in millions of tonnes of biochar used to improve the soil on farms in Africa within a couple years. Our cost for training will be a few pennies (usd) per farmer unless we provide the farmer with tongs (usd 0.05) to remove the embers. It will cost far, far more to demonstrate baseline, feedstock, etc. for each individual farmer. Can we use surveys and other broad methods to demonstrate these among a broad	Not applicable. Methodology states the guidelines for demonstrating additionality and adoption rate.
2 (1)	Dovetail Partners, Inc.	Project Boundary	Question	Your system boundary is from feedstock to biochar, right? So can the user (farmers and forest owners in this case) sell credits for purchased biochar they put into the soil? Or has the producer tied up all that credit?	The methodology does not specify who owns project credits. However, all VCS projects require a project proponent to take responsibility for filing project documentation, taking on legal obligations to the project, and participating in third party verification. In some cases the biochar producer will be the project proponent. In other cases, the producer and the end user (a farmer, for example) may be the same person. There could also be a scenario where the end user is the project proponent. According to *VCS Registration and Issuance Process* Section 4.2.1 *"The only entities that may initiate the project registration process are the project proponent, an entity to which the project proponent has assigned sole right to the GHG emission reductions or removals for the entire project crediting period, or the authorized representative of either of these entities. No other entity can initiate the project registration process".* Overall, defining the project proponent is outside the scope of the methodology.
2 (2)	Dovetail Partners, Inc.	Project Boundary	Question	For low tech producers, they're often also the users, so it's clear they can't double dip, but I'm wondering how the credit flows when it's the end user who's actually doing the sequestration. Would the only way for the buyer to participate be to bargain for a share in the credits?	See answer 2.1
3 (1)	Wagai environmental science and development Programme	General	Support	Solid waste management is becoming a major public health and environmental concern in urban and semi-urban areas of many developing cities in Kenya. The situation in Kenya, particularly in the cities like Kisumu, is experiencing a severe sanitation problem caused by poor waste management system. The public sector in many cities in Kenya, are unable to deliver services effectively, regulation of the private sector is limited and illegal dumping of domestic and industrial waste is a common practice. In general, solid waste management is given a very low priority in African countries. As a result, very limited funds are provided to the solid waste management sector by the governments, and the levels of services required for protection of public health and the environment are not attained. It is my hope that if we could partner with you to adapt the methodology employment of a broad monitoring and accounting framework that captures the GHG impacts into the three important stages of a biochar value chain, would create a positive impact in sourcing stage, production stage, and application stage ,as the applicable methodology provides a framework for the quantification of GHG benefits in the adoption of improved Waste Handling and Disposal (WHD) practices to make biochar in the final utilization of biochar in soils or non-soils applications.Than you so much for this innovation hoping for the best.	Not applicable.
4 (1)	GIZ	General (Permanence)	Question	If carbon is stored in soils as soil organic matter resulting from certain agricultural practices, these practices have to be maintained over long time periods to ensure that carbon is being sequestered and not decomposed. In contrast, if biochar is applied to a soil, the carbon is stored at that very momoent and will stay there even if agricultural practices change. So, biochar application better addresses the problem of permanance and the carbon can be certified and traded rather early after the biochar application. Is that considered in the biochar standard under development?	Following biochar production, an IPCC value is used to determine permanence (depending on feedstock or production temperature). The IPCC value takes the annual decay of biochar when added to soils and multiplies it over 100 years. The values are therefore already adjusted for some fraction of decay that can be expected to occur in out years during the year one calculations. Please refer to the methodology for the values to be used.
4 (2)	GIZ	Applicability Conditions		We understand that the standard intends to only accept waste biomass, in order to make sure that biochar production does not displace other land uses and leads to degradation of other ecosystems. Though, we'd propose to use the wording of residual biomass instead so that crop residues or residues from pruning of agroforestry trees can be included and certified as well. As for woody biomass the standard could demand that only woody biomass from trees on farm can be used.	The scientific literature is filled with different terms for waste biomass for different sectors, including residual biomass, crop residues, logging debris, paper mill waste, mill residues, manure, and biosolids (to name a few). The methodology uses “waste biomass” to describe a broad class of materials across sectors; using “residual biomass” is too narrow given the variety of feedstocks eligible under the methodology. Further, crop residues and/or agroforestry residues is included. Please refer to Section 4, Applicability Conditions in the methodology for more details on the

4 (3)	GIZ	Applicability Conditions		With regard to low tech stoves, only tested stoves / gasifiers should be allowed to make sure that such low tech devices do not cause additional methan or other emissions, which would jeopardize the carbon storage. The Cornelissen data that the Verra standard now refers to is not appropriate for cookstoves, since it is a much more open process where higher emissions can be expected.	The methodology is attempting to accommodate the diversity and variety of biochar production methods. The Cornelissen et al. 2013 data shows that methane production in low-tech devices can be significant and therefore it shall be incorporated in the GHG accounting. In addition, the methodology currently allows the project proponent to present their own emissions data or provide scientific publications that indicates their own devices burn cleaner.
4 (4)	GIZ	Applicability Conditions		A condition as follows should be included: 70% of the thermal energy produced by the pyrolysis system and which is not used within the pyrolysis system itself must be used.	In low-tech systems (particularly in rural/remote areas), utilization of 70% of the thermal energy is not practical. Having a 70% energy utilization requirement would essentially disqualify most low-tech producers. That said, methane emissions for low-tech systems is a concern. The methodology therefore provides a default value (via Cornelissen et al. 2013) which provides an incentive for cleaner low-tech system. Further, the threshold percentage has been discussed with pyrolysis experts and has been revised.
4 (5)	GIZ	Baseline Scenario		Finally, it would be helpful, if the standard could look at alternatives to biomass production. What we mean is that for example in India large amounts of crop residues are burnt which results in huge amounts of GHG emissions and fine dust. If biochar came in here, carbon would be stored, which should be eligible under this standrad.	It is unclear what the commenter means as "alternative to biomass production". Purpose grown crops are currently ineligible. However, the scenario you describe involving crop residues in India is currently eligible under the methodology. The proponent must provide evidence that the baseline scenario for the waste feedstocks is either combustion or decay. The project proponent can quantify baseline emissions in their net GHG quantification following section 8.2.1 of the
5 (1)	Green To Energy	Applicability Conditions	Question	We have read the Methodology for biochar utilization in soil and non-soil applications, and we have some doubts: First, you mention that the technology to produce the biochar might be pyrolysis or gasification. In the case we use another type of technology such as hydrothermal carbonization, would the methodology be applicable?	The IPCC permanence values are based on hundreds of studies of biochar persistence in soil (over years of study). These values are the basis of the carbon benefit calculations accruing to the project activity. The key distinguishing factor of biochar material is its recalcitrance that is largely created by the temperature of production. Lower temperature material (like those produced from torrefaction or hydrothermal carbonization) are produced in lower temperature conditions hence not as recalcitrant or persistent in soil. In addition, Torrefied and Hydrothermal products are designed to be biomass energy products and thus are best suited for VCS Sectoral Scope 1 (Renewable Energy). Hydrothermal carbonization is excluded under the current methodology version.
5 (2)	Green To Energy	Applicability Conditions	Question	And, in our process to produce biochar we use the organic fraction of municipal waste, but in the methodology, we can´t found something related to food waste. Our concern is if this waste can be applied to "recycling economy" or it is not acceptable due to biochar properties requirements as it must be produced only with single feedstocks?	Municipal solid waste is not allowed under the current methodology version. Food waste coming from food processing facilities is allowed. This is in line with the parameters used from IPCC.
6 (1)	Polytechnic of Turin	Applicability Conditions	Comment	As regards the 70% use of the heat generated by the pyrolysis system. This condition is set on the base of and old and surpassed view of the global and local energy system evolution, and how these are going to change, as also described in IEA, IRENA, EC latest reports. In a near future (very close, according to latest Net Zero IEA report, IRENA, EU and OECD documents, etc) the energy scenario will shift towards an extremely large penetration of Variable Renewable Energies (PV, Wind): thus, renewable electricity driven pyroysis units will be more and more a realistic option. Thus, the pyrogas will find other valuable uses. From a scientific, technical and economic point of view, it cannot be assumed a priori that burning the pyrogas for the process correspond to a more sustainable biochar production. This was true in a conventional and today rather old exergy-based based approach, but not in a wind/pv centered scenario, with low electricity prices (see latest IRENA report, which shouw ranges to day between approx 5 and 2 c$/kWhe). Even if so far we have all aimed at providing the high-T heat to the pyrolysis process through the oxidation of pyrogases, it does not mean at all that this will be the most efficient and sustainable mode of operation in the coming years. Thus, this requisite should be reconsidered in your proposed methodology. As a matter of fact, domestic Heat is already historically generated from excess hydropower in Norway and Quebéc. If the path of deployment of variable RES proceed as planned for the next years, many end uses will become electricity-driven by VRE. Thus, using heat from pyrogas not necessarily mean higher efficiency and/or sustainability. And from an engineer perspective, designing an electrical pyrolyser will completely change the perspective. Moreover, biochar production must not be a slave to power generation. The bioeconomy area is moving ahead very fast. Thus, condensate from pyrogas could for instance be used as biocide/biostimulants (regulation allowing), or even the entire pyrogas stream processed in syngas or even better H2. Or many other routes. Anyway, it could become soon unnecessary to burn the pyrogas to provide energy to the pyrolyser, simply because the pyrolyser already receives energy from other RES. You should then identify another way to define the sustainability of the biochar production process, keepin a medium-to-long term view on the energy sector, for instance accounting the embedded energy in the gas-derived products, or the energy value of the gas and liquid products (H2, bio-oil) derived from the pyrogas. You should refer to the chemical energy, in addition to entalpy, in the pyrogas stream.	The criteria has been revised to make it more clear to the project developer. The 70% energy use requirement for high tech equipment was not listed to make biochar “more sustainable”. The percentage is modeled after the European Biochar Certificate program. The energy requirement is also a feature of the PuroEarth program. Both the EBC and PuroEarth programs are based in Europe and as such comply with European laws and regulations. In our view, the 70% waste heat utilization requirement is intended to minimize the external use of fossil fuels (for example propane or heating oil) that may be needed to dry down biomass before pyrolysis occurs. The methodology (as stated in the glossary) allows the operator to show they are meeting the 70% requirement in different ways. The document is not prescriptive on how the energy is used. It can be thermal energy used to dry down feedstocks (many of the feedstocks in the approved list may have a high moisture content), or it can involve the capture of pyrolysis gases that can be distilled into bio-oil and used as an energy source. In addition, if the biochar operator converts the thermal energy to electricity (via an Organic Rankine Engine) that is entirely up to them. The methodology simply sets a 70% energy use requirement. The methodology authors are not aware of any high tech biochar systems that meet their electrical demand with solar panels or wind turbines currently. However, like any other VCS methodology, as technologies develop or conditions change with new laws or regulations, the current biochar methodology can be updated (version 2.0, version 3.0, etc.) which will hopefully mitigate the risk of the document being “born already old and will need to be surpassed very soon”. Finally, the goal of the methodology is to be globally applicable and reflective of the diverse ways biochar is made across the world (both in low and high tech systems). The methodology as drafted is intended to be "technology agnostic".

6 (2)	Polytechnic of Turin	Applicability Conditions		Second important point: agroforestry schemes, catch and cover cropping, cannot be excluded from your methodology, while this constitute an essential component of EU Directives (these methods defines the most sustainable biofuel types, i.e. Advanced Biofuels as redinfed in Annex IX Part A of EU REDII). These are methods that make agriculture more sustainable, even if these cover crops are purpose-grown material. This should be treated in the current methodology, not left to future revision, as there is a clear unbalance and strong disalignment with the Renewable Energy Directive and all major EU Directions/Regulations. It would immediately create an issue in applying your methodology to EU companies subject to RED, as all major HVO producers like ENI, Total, Neste, IP, etc etc.	The methodology does not exclude waste biomass from agroforestry systems or farms that are using conservation practices such as cover cropping. The methodology incorporates a sustainable criteria to avoid displacing current sustainable agriculture land management and convert the agricultural residues into biochar. The July 2021 EU directive that is cited is a comprehensive document describing EU targets for addressing issues of climate change through (in part) promotion of biofuels. However, the use of "purpose grown crops" planted as part of biofuels programs create carbon accounting complexities (mainly related to project boundaries and potential leakage). As such, we are excluding purpose grown crops at this time. (***Note: EBC *does* allow purpose grown crops) https://ec.europa.eu/info/sites/default/files/amendment-renewable-energy-directive-2030-climate-target-with-annexes_en.pdf
6 (3)	Polytechnic of Turin	Quantification of GHG Emission Reductions and Removals		Administrative burden on the project developers or operators. Too complex methodologies add up to overhead costs, that substantially reduce the financial benefits of the credits, and generate loss of interest in companies (unless these are used just to attract investors in their companies). The great advantage of Biochar approach compared to other systems (as Low ILUC certification schemes) comes from its measurable and simple nature. It is rather simple for the user to provide evidence of the sequestered carbon. Given the characterization of the specific biochar type in terms of labile and fixed carbon, and known the amount of biochar deployed in soil, the quantity of recalcitrant carbon sequestered is also known. The decay rate can be taken from literature (including, but not only, IPCC). Thus, quantifying and certifing the C removal should be a relatively simple and doable operation for the economic operator. This is key for the success of any methodology: given the low value of the product, and the intrinsic properties of biochar that makes quantification of fixed carbon very easy, the certification process should base on these and be affordable as well.	We agree that a biochar project must be cost effective to be viable. However, the methodology must be in compliance with all rules and requirements of the *VCS Standard* (including undergoing third party verification and considerations of issues such as additionality, baselines, monitoring and leakage).
6 (4)	Polytechnic of Turin			finally, coupling biochar from pyrolysis and gasification is a major strategic error, on a political and communication perspective. Pyrolysis is a process which aims at keeping C in the solid, and to store it in a form as stable as possible. Gasification aims at bringing the entire amount of carbon in the biomass to CO and other gases, releasing then CO2 at the very end, after the gas is used. A theoretically 100% efficient gasification plant has 0% C in the ashes! The Carbon found in ashes is actually a measure of process inefficiency. Thus, business models and Carbon impacts are completely different between pyrolysis and gasification. The interest in biochar for the gasification chain chain is mostly linked to the possibility to get rid of a waste (ashes, to be disposed off) at low cost, and "cover" process inefficiencies. It is not a sound and long-term vision and business scheme. Pyrolysis is a product (biochar, biooil) oriented, not energy-oriented, pathway. All the positive fundamental arguments that biochar has developed in these years and that gained such great attention are impacted by an energy-oriented view. In pyrolysis energy is a coproduct, just that. The two processes should be kept distinct. Last but not least, also because the type of char that is derived is very different, and the amount of water that can be taken as plant-available-water differs, givent he different pore sizes.	The methodology draws from the IPCC report and published review papers on biochar, where the documents include pyrolysis and gasification as allowable biochar production methods (both are accepted as higher temperature thermochemical conversion of dry materials). Our goal with the methodology is to remain technology agnostic. The same is true as it pertains to the physical characteristics of the biochar produced (for example pore size and it's potential impact on plant-water availability after soil application), so long as the biochar meets IBI / EBC quality criteria.
6 (5)	Polytechnic of Turin	General	Comment	The definition of labile Carbon, most used in biochar, is missing in the Glossary	"Labile carbon" is a term commonly associated with the rapidly oxidizing fraction of soil organic carbon. We use "fixed carbon" which is defined in the glossary as "Amount of organic carbon stored in the biochar as a mass proportion (in %) based on biochar's dry weight". The definition is more expansive because the methodology includes non-soil applications.
6 (6)	Polytechnic of Turin		Comment	I would suggest to modify the glossary on Pyrolysis referring to "a fixed carbon rich product" (NOT RESIDUE!!!!), and not just "carbon"	The definition has been revised.
6 (7)	Polytechnic of Turin	Applicability Conditions	Comment	Table 3, on "Eamples". The examples you report for Harvest Residues are actually "agro-processing residues", not agricultural waste biomass. These categories should be maintained separated.	Comment has been addressed and the Table has been edited in line with EBC's positive list
6 (8)	Polytechnic of Turin	Applicability Conditions	Comment	Table 3. On "sustainability Criteria". The proof should be charged to the agroindustry. Moreover, straw is often removed anyway and sold to the market. Finally, the possibility re-incorporate the biochar on the same field from where it was taken must be allowed.	It is up to the project proponent to present proof of complying with the sustainability criteria. It is out of the scope of the methodology to determine responsibilities within the project design. Biochar can be applied to the same field, however, the project proponent must comply with *VCS Methodology Requirements* and *VCS Standard* guidelines when claiming carbon credits from multiple project activities (e.g., biochar and SOC). Please see *VCS Standard v4.1* Section 3.5.2 for additional guidance on applying more than one methodology at a project site.
6 (9)	Polytechnic of Turin	Applicability Conditions	Comment	Table 3. On Forestry and other wood processing. When you say "but limited to" should instead be "but NOT limited to"	Current version says "*..is not limited to sustainable..*" .
6 (10)	Polytechnic of Turin	Applicability Conditions	Comment	Page 11: add "Digestate from Anaerobic Digestion" to "such as compost or manure". This is much more sustainable approach than manure, for instance.	The suggestion has been considered and revised in the methodology.
6 (11)	Polytechnic of Turin	Baseline Scenario	Comment	Page 15. On Determination of fate of waste biomass. Please refer to "GHG emissions" and not just "methane" emissions, as this is the correct ref. It is also consisten with your Eq.2 and the definition of units for BED and BEC.	The term GHG emission has been revised and adopted.
6 (12)	Polytechnic of Turin	Quantification of GHG Emission Reductions and Removals	Comment	Page 29. Your statement "GHG emissions resulting due to fossil fuel combustion and fertilizer application are considered negligible." is a very rude approximation, inconsistent with actual agriculture.	Indicating Eap = 0 reflects the reality that the application of biochar will not cause additional emissions compared to the baseline of land management and fertilizer application. These emissions are outside of the system boundary as Eap refers only to the biochar-application specific emissions.
7 (1)	Unaffiliated	Applicability Conditions	Comment	Given the urgency of the climate crisis, we strongly recommend that you include crops grown for renewable energy and/or chemicals, plus biochar as eligible for carbon credits as soon as possible. Time to scale is of paramount importance. We believe that purpose grown crops present the fastest way to achieve CDR scale, cost effectively, with existing technology, and with numerous co-benefits. In short, biochar made from the pyrolysis of purpose grown crops is among the most promising natural climate solutions available. See full argument here	Please refer to comment 6.2. Purpose-grown biomass is currently not included in the methodolgy as it adds complexities regarding baseline scenario, monitoring, carbon accounting, leakage, other. However, the methodology has been designed in a way that allows the inclusion of new modules/tools. Further responses are directly in the document.

8 (1)	Unaffiliated	Applicability Conditions	Question	I just want to clarify that projects that utilize waste energy or heat are not permitted at all? Or do they just not get carbon credit for the use of the waste heat or energy? Waste heat and energy should be utilized and therefore should be encouraged. That we waste so much energy is a big part of the problem. We should strive for more efficient systems.	Project activity is the application of biochar either in soil or non-soil applications. Quantification of energy/ waste heat for generation of carbon credits is out of the scope of the current methodology. Project proponents are allow to use more than one sectoral scope methodology in their projects following VCS Program requirements on double accounting and establishing project boundaries. Please see *VCS Standard v4.1* Section 3.5.2 for additional guidance on applying more than one methodology at a project site.
9	Cornell University			PDF	Responses are directly in the document
10 (1)	CarbonEx	Definitions	Comment	The most important point for me would be how the energy efficiency of the process is defined. In the text the high technology process is defined as “(b) ability to utilize at least 70% of the waste heat during biochar production”. Whereas in the table it is defined as “use of more than 70% of the energy output of pyrolysis”. These definitions need to be harmonised and the definition should be clarified as 70% of the energy output of pyrolysis. This is because in industrial pyrolysis the energy fluxes including heat are defined in MWh. In this manner the wood (or other biomass) entering the process is expressed in MWh/t, after which the biochar, heat and electricity produced is converted to MWh and the overall energy efficiency of the process can be calculated. If only the heat was considered it would not be representative of an efficient process.	Definition around energy and heat have been revised and harmonized in the methodology
10 (2)	CarbonEx	Applicability Conditions	Comment	It is good to define between high and low technology pyrolysis. But it would also be useful to specify that biomass cannot be imported from within a certain perimeter. In order to avoid the import of non-sustainable biomass from Africa into Europe.	Sustainability criteria and GHG emission accounting boundaries from sourcing to application have been considered in the methodology development. Transport emissions are also included and shall be accounted when applicable
10 (3)	CarbonEx	General (energy production)	Comment	It is also possible to take into account the CO2 intensity of the electricity produced from biochar production. A full LCA can calculate the CO2 intensity of production and if this is less than the country mix then the biochar production process has also avoided potential CO2 emissions	CDM Tool 05 should be used for any grid connected electricity related emissions. The project proponent should also be aware of the *VCS Standard* regulation and requirements on the energy sector (see Table 1 in *VCS Standard v4.1*).
10 (4)	CarbonEx	Applicability Conditions	Comment	If default emissions values for low technology systems are based on Cornelissen et al., 2016 then the technologies should be differentiated by type (Traditional kiln, retort or flame curtain) as there is a very wide range of emissions values in this paper. Furthermore, traditional kilns represent the majority of production techniques in the developing world.	The methodology is technology agnostic. It provides guidelines on technology differentiation but does not differentiate between type, techniques, characteristics and others.
10 (5)	CarbonEx	Applicability Conditions	Comment	Finally from what I can see in the methodology there are no measures against the import of biochar from one continent to another.	Please see 10.2
11	EcoEye			Tracked changes	Responses are directly in the document
12 (1)	Cbiochar Inc.	Applicability Conditions		Regarding (b) ability to utilize at least 70% of the waste heat during biochar production. While this makes sense in a European sub-urban or urban context, it does not in the boreal forests of Northern Quebec. Energy is very cheap here (0.07 CAD per kWh) and clean in its production and use. In Quebec even heating in the winter is at 99% hydro-electric. There is also potential for almost infinite new renewable energies (with coming mobile wind and solar systems as MASWES 30 kWh) where we will be making biochar. We will be producing our biochar on-site, in particular to avoid moving huge quantities of dead logs from far away… There is no obvious use for energy from middle to large size kilns (yet mobile) in the middle of boreal forests. Hence this requirement appears as not being site adapted.	According to your description, your technology is not set up to capture waste heat and will therefore fall into the low technology category. The methodology explains the factors and options for calculating VCUs generated using low technology systems.
12 (2)	Cbiochar Inc.	Applicability Conditions		*« When processed timber is used as feedstock, all plastic, rubber, metals, reactive coating (such as paint, glues) must be removed from the feedstock for health and safety reasons (Hedley et al.,2020; EBC, 2012). »* This restriction would limit the biochar industry by up to 70%. It would also limit industrial societies managing contaminated waste properly. If used in asphalt, ‘second grade biochar’ would have a limited impact on the environment. Currently most contaminated wood waste end up being burned, slurry is even spread on some agriculture lands… Biochar using contaminated material for non-soils uses, is indeed a solution, not a problem, to the contamination of ecosystems. If used in concrete, this ‘not so pure but still usable biochar’, could become a substitute for marine sands, arguably the most destructive material of the construction industry—entire marine ecosystems are being destroyed for marine (gripping) sand. The need for a substitute to marine sands (biochar can be one) is also driven by a shortage of the product, and, its control by illegal and even criminal organisations.	The sustainability criteria has been revised; please see Section 4, Table 3.
12 (3)	Cbiochar Inc.	Applicability Conditions		*« Only biochar produced in high technology production facilities, as defined under the methodology, are eligible to be used in non-soil applications. »* We do not see the justification for such an important restriction? We believe asphalt might be the easiest market for our biochar that will be produced on-site using 100% clean wood with low-technology kilns. This restriction might be very consequential and detrimental for the nascent biochar industry. In fact an argument could even be made for (less problematic) non-soils applications of biochar produced with low technologies. Restricting uses might affect developments of lower-tech kilns to manage problematic waste in developing, cash-limited countries.	At high technology facilities, we can more appropriately account GHG emissions from production of biochar, whereas that is not possible in low tech facilities. Additionally, through high technology we wanted to ensure a minimum quality standard for biochar to be used in non-soil applications. Lastly, the methodolgy intends to incentivise the use of high technology production rather than low technology.
13 (1)	Warm Heart Worldwide	Applicability Conditions	Question	Could you provide clarification regarding the restriction of no mixing of feedstock? Is the "no mixing" set at the category level (e.g., agricultural waste, forestry and wood processing, etc) or specific feedstock (e.g., harvest residues, tree pruning, etc.,.)?	Mixing refers to a specific feedstock; it's initial exclusion was due to the IPCC default values for organic carbon content depend on the initial feedstock. However, the mixing restriction has been revised and updated in the methodology providing clarity on situations where it may be allowed.
13 (2)	Warm Heart Worldwide	Definitions	Question	The methodology states a material change is 10% or greater shift in feedstock. Would we need to establish a new project if greater than 10% shift?	No, it would qualify as a new biochar type.
13 (3)	Warm Heart Worldwide	Quantification of GHG Emission Reductions and Removals	Question	What would be considered an acceptable amount of chemical analysis testing to verify carbon content from the biochar? For example, sampling and testing every 10 tonnes?	The project proponent needs to test against the national or international guidelines such as IBI and EBC. EBC guidelines, for example, -include the steps on how to do sampling for biochar analysis
13 (4)	Warm Heart Worldwide	General (Project development)	Question	What would be considered an acceptable amount of random audits to ensure smallholder farmers pyrolysis process? For example, our team makes site visits to record the farmers' production activities. Would we need to perform the verification for each farmer?	Theis guidelines for validation and verification of a project are covered by the *VCS Standard v4.1* and are out of the scope of methodology.
13 (5)	Warm Heart Worldwide	Definitions	Question	The methodology states a material change is considered when processing time changes by more than 10%. Does this apply to low technology solutions?	The definition has been revised.

13 (6)	Warm Heart Worldwide	Applicability Conditions	Question	The methodology is silent regarding the usage of biochar with animal feed. Would this be considered an accepted non-soil application?	The use of biochar as animal feed is now allowed.However, the project proponent needs to demonstrate the carbon permanence of the biochar in its end use application.
13 (7)	Warm Heart Worldwide	Baseline Scenario	Question	The smallholder farmers will be leveraging "low technology" to produce the biochar. Due to the CH4 emission expenditure of such technology, we will be considering the emission factors for the baseline scenario, predominantly combustion of waste biomass due to open field burning. The methodology states that in the absence of records to determine and prove the fate of waste biomass, we could leverage existing literature. What literature would be accepted as proof of evidence?	Literature can be scientific papers or reports which indicate such a requirement. Further, as described in section 6 of the methodology, “examples of evidence include but are not limited to annual government records, records of a waste disposal facility, records of production facility among others. In the absence of records, the project proponent must utilize data from existing literature, existing survey data of similar industries in the same region, or conduct its own survey”
14 (1)	Corporate Carbon	Definitions	Comment	Definition of biochar: syngas is generated in both pyrolysis and gasification.	The definition has been revised.
14 (2)	Corporate Carbon	Applicability Conditions	Comment	Eligible feedstocks and production: for the waste biomass to be eligible as feedstock for biochar production, the waste biomass would have been left to decay or combusted in the baseline scenario. However, there is no further description of the conditions for such combustion. If the waste biomass was combusted in open fields without energy recovery, then conversion to biochar and sequestration would clearly result in carbon removals. However, if the waste biomass was combusted to provide energy in the baseline scenario, diverting it to biochar may result in carbon leakage as other type of energy source may have to be used tocompensate for this diversion. Please provide more clarity on the conditions for combustion in the	The determination of the baseline has been revised and updated to reflect that the baseline scenario cannot include energy recovery.
14 (3)	Corporate Carbon	Applicability Conditions	Question	Non-soil applications are ineligible if there is a loss of more than 50% of the original biochar produced: what is the rationale for this? A biochar producer may decide to sell 60% of the biochar produced as a substitute for charcoal fuel and 40% as a concrete additive. What do you mean by loss?	The requirement refers to the end use application of the biochar, not to its total production and utilization in different sectors. For example, if biochar is used later to produce activated carbon, then over 50% of the original carbon material in the biochar itself will be reduced
14 (4)	Corporate Carbon	Project Boundary	Comment	*Table 4, CO2 conditionally to be included in a baseline scenario that describes the aerobic decomposition of feedstock* : does this mean that the CO2 emitted during the aerobic decomposition of the biomass waste is not considered to be renewable, i.e., absorbed by the next growth of biomass? Nonetheless, for feedstock production, the method states that: “waste biomass are (sic) also considered renewable per the CDM and project eligibility conditions”. Please provide an example of the conditions for including CO2 as a GHG source in the aerobic decomposition of feedstock in the baseline.	Given the diversity of eligible feedstocks, it is not practical to provide baseline emissions factors for all types of waste biomass (slash, manure, algae, agricultural residues) in all types of environments (temperate and tropical regions). Therefore, the biochar methodology has been set up as a framework which sets the baseline emissions at zero (a conservative assumption). However, the “conditional” term is used in Section 5, Table 4 to allow the project proponent to provide their own emissions factors local to their region so long as the data meets certain criteria.
14 (5)	Corporate Carbon	Quantification of GHG Emission Reductions and Removals		*Quantification of baseline and project emissions* : This methodology states that it “provides a complete, robust and credible approach to quantifying net GHG emissions reduction[s] and removals resulting from biochar management, including the waste biomass sourcing stage, production stage and application of biochar stage”. While this methodology is a step forward in crediting biochar application, it is not complete as the potential emissions avoidance due to fossil fuel displacement with the co-products (heat, electricity, bio-oil, syngas and wood vinegar) is excluded.	Please see 8.1 response. The project activity is the application of biochar. Co-products are important but are out of the methodology scope. Fossil fuels displacement falls under the energy sector and is not considered within the methodology.
14 (6)	Corporate Carbon	Quantification of GHG Emission Reductions and Removals	Comment	*Accounting for the emissions from the thermochemical processes, while excluding the potential GHG emissions avoidance due to the displacement of fossil fuels with the co-products from biochar production* : the entire GHG emissions from the pyrolysis and gasification technologies are attributed unproportionally to only the biochar production process, when in ordinary reality, the benefits provided by the co-products are the game changers. Therefore, this method may have to be stacked up with other methods that consider the potential use of the co-products to displace fossil fuels.	Please see 8.1 and 14.5 responses
14 (7)	Corporate Carbon	Quantification of GHG Emission Reductions and Removals	Comment	*GHG baseline emissions at the sourcing stage:* “The baseline scenario is the situation where, in the absence of the project activity, waste biomass would have been left to decay of would have been combusted until the end of the crediting period within the project boundary”. It would be very difficult to predict, let alone demonstrate, the fate of the biomass waste during the whole crediting period.	Section 8.2 has been revised. The baseline scenario considers the fate of biomass in the year that biochar is made.
14 (8)	Corporate Carbon	Quantification of GHG Emission Reductions and Removals		*Estimate [the] fixed carbon content of biochar* : This value is derived from the dry mass of biochar, carbon content and the decay rate of biochar. It is appropriate to specify that the mass of biochar must be considered in dry weight.	Adding the specifier "dry weight" contributes to the accuracy of the measurement. Consequently this addition has been accepted.
14 (9)	Corporate Carbon	Quantification of GHG Emission Reductions and Removals		*FCp* : the “organic carbon content of biochar for each production type per tonne of biochar”. FCp is a fraction (%) regardless of the units of the biochar.	The unit has been specified in the respective formulas
14 (10)	Corporate Carbon	Quantification of GHG Emission Reductions and Removals		*Emissions associated with the thermochemical process (pyrolysis)* : throughout most of the document, there is an emphasis only on pyrolysis, whereas the technology scope mentions that “the methodology is applicable when biochar is produced from waste biomass through pyrolysis, gasification, and biomass boilers …”. Suggest being consistent and use a general description of the technology, such as eligible thermochemical processes instead of only pyrolysis.	Thermochemical process has been added. However, for the purpose of the methodology, pyrolysis can be read as an overarching term. Please refer to the footnote.
14 (11)	Corporate Carbon	Quantification of GHG Emission Reductions and Removals		*Equation 8* : The definition of PRde states that the Fperm default value of 0.56 shall be used. Do you mean PRde instead of Fperm?	The unit description has been updated referencing the correct IPCC table and formula reference. Further, more details have been added to the footnote.
14 (12)	Corporate Carbon	Quantification of GHG Emission Reductions and Removals		*Table 5, biosolids:* It seems that biosolids are not an eligible feedstock because of the relatively low carbon content of the respective biochar. If that is the case, it would be clearer to remove biosolids from this table and to clearly provide a rationale for their exclusion in the respective section of eligible feedstocks. Otherwise, it can be confusing.	Table 5 has been revised and modified to provide clarity to the project proponent
14 (13)	Corporate Carbon	Leakage		*Leakage emissions due to transport of biomass and biochar* : If there is no transport, then there is no production, no application, no demand, no market. Transport is not leakage; it is an important activity within the project boundaries and a key factor in biochar supply chains.	Project boundaries include sourcing. production and application stages. Hence, most appropriate way of including transport was through leakage.
14 (14)	Corporate Carbon	Quantification of GHG Emission Reductions and Removals		*Moisture content of the biomass waste and the biochar:* Both the biomass waste and the biochar will have a certain amount of moisture, which is important to consider as the calculations are based on the dry mass of both the feedstocks and the biochar. However, there is no guidance to measure, monitor and verify the moisture content of these materials.	See 14(8). Reference to ASTM D1762-84 Standard Test Method for Chemical Analysis of Wood Charcoal (found in Section 4.1 of the IBI Standard) has been added

14 (15)	Corporate Carbon	Monitoring		*Box 1* : "To prevent double accounting of carbon benefits, the final location of the site where the carbon sink is created should be registered, where possible." How does that prevent double counting? In fact, in many cases, biochar works best when it is applied frequently to the same soils rather than through one-off applications.	Methodology does not limit the number of applications at a location, rather this statement refers to the carbon sink / pool created. In projects that generate carbon credits from the Soil Organic Carbon pool, the project proponent cannot account for that pool if biochar was applied within the same project boundary. Under the *VCS Standard v4.1* , project proponents are allowed to use different methdologies in their project design, however, the project and GHG boundaries must be clearly defined
14 (16)	Corporate Carbon	Appendix 1		*Appendix 1* : the appendix says that biochar trials are likely "to prove the material's effectiveness compared to existing competing products (e.g., as a beneficial soil amendment compared to compost and other well established soil amendments)". This comparison is misleading as, in many cases, biochar works best when mixed with compost, manure or other fertilisers, so these soil amendments work in synergy rather than in competition. For example, the biochars with the highest carbon removal potential (wood-derived biochars) lack nutrients for soil application and are therefore recommended to be mixed with nutrients.	Paragraphs have been re-written to avoid misinterpretation by the reader and highlight biochar benefits.
15 (1)	Aqua Green	Applicability Conditions		On page 7, when defining "Waste biomass" we suggest adding municipal wastewater treatment as an example of a source for Waste biomass. We believe that wastewater sludge will become an increasingly important feedstock for producing biochar, and that this justifies the addition of wastewater sludge/biosolids as an example. The text is suggested to be updated as follows (1st sentence only): "Biomass, by-products, residues and waste streams from agriculture, forestry, municipalities and related industries. "	Definition of waste biomass has been amended. For a list of eligible feedstock please refer to Section 4, Table 3
15 (2)	Aqua Green	Applicability Conditions		Table 3, page 10 lists the eligible feedstocks for biochar production. In order to be characterized as a Recycling Economy feedstock, the sustainability criteria column refers to CDM EB 23 Report Annex 18, which states that: "Biomass is "renewable" if one of the following five conditions applies: 1.. 2.. 3.. 4.. 5. The biomass is the non-fossil fraction of an industrial or municipal waste." Since sewage sludge can be characterized as a non-fossil fraction of municipal waste, we conclude that sewage sludge can be considered a Recycling Economy feedstock. To avoid and mitigate any confusion around this, we suggest that wastewater sludge is mentioned in the column of examples changing the text to: "Urban green cuttings, non-hazardous municipal green waste, waste paper, wastewater sludge".	Table 3 has been revised. The addition of wastewaster sludge has been considered and approved
15 (3)	Aqua Green	Quantification of GHG emissions reductions and removals		In section 8.2.21 Step 1 the CCy,t is calculated using the factor PRde. This is conservatively set to a value of 0.74. referring to literature from 2013 and 2015 and European Biochar Certificate methodology. IPCC has in 2019 published information on the same topic. Please see: "Appendix4: Method for Estimating the Change in Mineral Soil Organic Carbon Stocks from Biochar Amendments: Basis for Future Methodological Development" which can be found on *19R_V4_Ch02_Ap4_Biochar.pdf (iges.or.jp). The factor Fpermp used by IPCC has the identical definition as the PRde used by you. It is evident from Table 4AP.2 in the IPCC method description, that the pyrolysis temperature has a strong impact on PRde (see the data in the table below). We would like this to be included in the VCS standard and that the PRde is given a value of 0.89 for biochars produced at temperatures > 600 °C, i.e. that the values found by the comprehensive IPCC review are used for the VCS methodology and that 3 intervals based on the pyrolysis temperature are included. Further it could be included that pyrolysis time should be > 5 minutes in order to use a PRde above the default value of 0.74 for high tech. processing.	The option to determine the appropriate degradation factor has been added based on the new parameter Tprod. The utilized values are indeed derived from the IPPC source as approved by the commentator. To remain conservative, the uncertainty has been deducted from the factor, which was indicated to yield more transparency.
16	Restoration Bioproducts LLC	Applicability Conditions	Comment	Restoration Bioproducts LLC is a nascent biochar producer in the United States. We hope to produce biochar, and utilize the pyrolysis gas to produce power and/or heat for industrial applications. Our first project will use waste wood fibers. Our subsequent projects may utilize purpose-grown biomass feedstocks particularly switchgrass (Panix virgatum). Switchgrass has been studied extensively as a crop to reduce runoff, increase carbon sequestration, and restore soils. Our experience with it indicates that we can grow switchgrass and achieve all those goals concurrently with a biochar production project. Carbon finance is an important component of the financial model. Sustainability is readily achieved and documented, and we feel strongly that we can show that the food production competition issue isn't applicable. The acres where we grow switchgrass are either abandoned, fallow, or otherwise underutilized. My recommendation is to allow project developers to document that acres used to grow switchgrass are not restricting food production in the country or region where the feedstock is grown thereby eliminating this concern. Furthermore, the sustainability of purpose-grown feedstock should be addressed in terms of carbon emissions to indicate an indisputably conservative estimate of a de minimis (or more likely sequestering) carbon pool impact. This analysis should address land use change 10 years prior to	Please see comment 6.2
17 (1)	Novo Carbo	Quantification of GHG Emission Reductions and Removals	Comment	The degradation rate for 100 years is taken from EBC. There is an ongoing discussion as to whether this is the right value. CarbonFuture has a more precise approach. EBC is actually taking a middle value, that does not take into account, that in the first years more C will be degraded. And it does not take into account, that on top oft hat if less C is available fro degradation, the rate will go down. I recommend you have a look at the arguments and calculations that CarbonFuture hass et up.	The degradation process of biochar as utilized in the CarbonFuture model has been discussed between the developers and CarbonFuture in the past. While we generally agree with this understanding, the consortium suggests the use of internationally approved values from the IPCC (2019) report, which is closely aligned with the requirements from VCS as well.
17 (2)	Novo Carbo	Baseline Scenario	Comment	You state that possible avoided emissions from decaying/bruning biomass might be incorporated if certain documents can be provided. Does it refer to the Delta existing between possible emissions like Methan and the CO2 equivilant accounted for in the carbon sink? Based on the different factors than you muiltilply methan (X298) and Co2 with when you include it in the GHG accounting? Because from my understanding the C of the biomass (in Co2 equivilant) when burnt can not be included in the methodolgy, as it is already accounted for in the biochar. This will be double counting.	Baseline avoided emission scenario has been set ~~up~~ as zero following a conservative approach and in order to avoid double accouting.

17 (3)	Novo Carbo	Project Boundary	Question	What about avoided emissions like nitrous oxide from N-fertilization if biochar is present in the soil?	The methodology accounts for sourcing until final application of biochar either in soil or non-soil application. The project boundary includes all emissions related to the sourcing, prodution and application. N-fertilization is not part of the current project boundary emissions
18 (1)	Woodwell Climate Research Center	Applicability Conditions		First, we are concerned that the maximum residue removal rates may not be conservative. Two citations, Battaglia et al. 2020 and Andrew 2006 are referenced in the protocol to support the 70% residue removal threshold. Battaglia et al. 2020 references Blanco-Canqui and Lal 2009 in stating that removal rates of greater than 75% reduced SOC between 20% and 30% (we presume this is where the 70% threshold came from). But, in reading Blanco-Canqui and Lal 2009, there is a clear linear decline with SOC with increased removal rates until 75% removal, after which 75% removal causes the same declines in SOC as 100% removal. As such, the paper concludes that only 25% of crop residues should be removed. Ruis and Blanco-Canqui 2017 likewise found that >50% residue removal reduces SOC stocks by 0.87 Mg ha-1 yr-1 whereas <50% residue removal reduces C stocks by 0.31 Mg ha-1 yr-1. In any event, both scenarios constitute a significant source of SOC leakage that could occur as a result of project activities. Verra should either substantiate the chosen 70% residue removal threshold within the protocol or lower the threshold to be indisputably	Papers have been reviewed and the percentage removal has been revised.
18 (2)	Woodwell Climate Research Center	General (Double counting)	Comment	Our second concern is that the protocol does not provide adequate safeguards against double counting, and this is especially concerning given that the protocol allows virtually any end user to submit a project, presumably for the same biochar. Double counting is addressed twice in the protocol: 1) when project boundaries overlap with other methodologies, proponents need to demonstrate no double-counting, and 2) if a biochar facility sells energy back to the grid as part of a separate renewable energy program, the biochar facility cannot claim these avoided emissions while using the Verra protocol. However, the protocol does not describe how double counting will be avoided within this biochar protocol, or across competing protocols. For instance, as the protocol is written, a biochar producer and a farmer could both submit projects using the same biochar. An even more likely scenario is that a biochar producer submits a project, and a secondary manufacturer (e.g. water filter manufacturers) also submits a project, either under Verra or under a competing biochar carbon market.	Safeguards for double accounting are found within the *VCS Program* guidelines and requirements, which any project implementing this methodology must comply with. The methodology accounts for GHG emissions from the biochar value chain, from sourcing until application. The methodology project activity is the final application of biochar that can be secured and registered as a carbon sink. Further, before a project issues carbon credits, they undergo validation/ verification in order to avoid claiming multiple GHG benefits. Emission reductions claimed for energy sold is excluded from this methodology. Additionally, VCS omits grid connected RE projects as per Section 2.1 of *VCS Standard 4.1*
18 (3)	Woodwell Climate Research Center	Quantification of GHG Emission Reductions and Removals	Question	Last, we found several places where clarity should be improved with regards to the permanence calculation for biochar. Project managers will presumably receive %C, %N, and %H when they contract the CHN analysis, but the text isn't clear on whether projects actually need to report the H:Corg to Verra. Likewise, it is not clear what projects should do if the H:Corg is above 0.4 for a high tech system. Should those projects use the default low-tech system calculation of 56%? Third, it is not clear from the protocol how the value of 74% was determined for high-tech systems and why it is conservative; the literature cited in the protocol, Budai et al. 2013, states that a lower permanence value of 70% should be inferred for an H:Corg below 0.4.	~~H:Corg shall be present to the auditor since this is a parameter for equation 4.~~ The value for H:Corg has been modified to 0.7. Also, the 74% has been modified and currently is based on the temperature process following a conservative approach
18 (4)	Woodwell Climate Research Center	Applicability Conditions	Question	Finally, we feel that the applicability conditions for allowing additives (10%) needs further elaboration. What is the rationale for allowing additives, and how does this support the end goal of net climate mitigation? The protocol should also explicitly state whether additives could bias the carbon concentration calculation, and how this bias is avoided.	A segment of biochar producers add certain additives to their products to adjust pH, increase functionality, among other reasons. The rationale for including it in the methodology is to be inclusive and reflective of how biochar is sometimes made in the real world. Further, ~~by~~ setting a 10% limit ensures that if an additive like rock powder (which the scientific literature has shown is beneficial in soil) is used it will have a de minimus impact on the overall benefit calculations.
19	BC Biocarbon			Tracked changes	The comments have been addressed directly in the document.
20 (1)	Swedish University of Agricultural Sciences	Applicability Conditions	Comment	I have done research on biochar production in cookstoves in Kenya. I see that you also have several cookstove projects. So I think it should be possible for you to adapt the biochar method to not only cover biochar made from waste biomass, but also biochar produced from wood in cookstoves. Projects that meet cookstove standards + produce biochar and use it in soil, should be able to get VCUs also for the biochar part of the project. Some references: https://link.springer.com/article/10.1007/s11027-020-09920-7 ; https://www.mdpi.com/1996-1073/12/22/4285	The methodology is agnostic regarding technology. The methodology provides a framework for GHG accouting independent of the type of technology used.
21 (1)	Eni	Applicability Conditions		Eligible feedstocks: Eni understands that the list of eligible feedstocks included in the proposed methodology is non-exhaustive and that any biomass residue meeting the feedstock requirements included in the methodology are eligible for biochar production. However, Eni suggests expanding the list of eligible feedstocks already mentioned in the VCS methodology for biochar utilization (Table 3). To do this, the methodology should be aligned with the most advanced regulations of the sector, such as Annex IX to "Directive (EU) 2018/2001 of the European Parliament and of the European Council of 11 December 2018 on the promotion of the use of energy from renewable sources" (https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001&from=EN) and the implementing rules of the "European Union initiative for Sustainable biofuels, bioliquids and biomass fuels – voluntary schemes" (https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12723-Sustainable-biofuels-bioliquids-and-biomass-fuels-voluntary-schemes-implementing-rules-_en). In particular, Annex 4 of the latter sets out the minimum requirements in the method for certifying waste and residues, listing them in the following categories: food-feed processing residues and waste; agricultural/forestry residues and waste; landscape care biomass; animal residues and waste; wastewater and derivatives; fats, oil and freases;	Section 4, Table 3 has been revised and updated.
21 (2)	Eni	Baseline Scenario		Baseline scenario: Concerning point 3) of Verra's request for input about baseline emissions, Eni considers appropriate to sets baseline emissions to zero as conservative assumption. However, the methodology should keep in consideration that in many projects and geographical areas the advantage in GHG emissions reduction is primarily associated to the avoided emissions of the gases released from the decay or combustion of the feedstock that otherwise results in open-air landfill also contributing to local air pollution (e.g. sugar can residues decay in African countries). Thus, Eni welcomes the opportunity for project proponents to assess project specific avoided emissions baseline.	Please see comment 17.2

21 (3)	Eni	Applicability Conditions		Activated carbons and other non-soil applications: Eni notes some inconsistencies in what is written in the methodology: - at page 7 of the methodology (non-soil applications definition) it is stated that some activated carbons are ineligible in non-soil applications. It is not clear if the ineligibility is referred to the type of activated carbon (i.e. its physical characteristics) or to its application. Moreover, it is stated that biochar is not eligible in other non-soil applications (other than the ones mentioned) if the fossil fuel inputs are excessive; - at page 11 of the methodology is generally stated that biochar must not be processed into activated carbon. It is required to clarify the following: is the ineligibility referred to some activated carbons or to all of them? In the first case, which are the discriminating factors? For non-soil application in general, when is an	The wording will be adjusted. Activated carbon is ineligible because (in our understanding of the production process) more than 50% of the original biochar material is consumed during production. For example, if you start with 100 units of biochar, by the time you expose it to steam or sulfuric acid to convert it into activated carbon, you may only have 5 units of final product. The second reason is that the fossil fuel inputs necessary to manufacture/engineer biochar into products like activated carbon are significant (hence counteracting climate benefits). By comparison, if you have biochar and you are making a filtration product you may only need to sift the material to make sure it is of uniform size, and the biochar producer can use the fines in a compost product. In the later scenario, the fossil fuel inputs are not excessive and the majority of the original product is utilized.
22 (1)	Net Zero	Applicability Conditions	Comment	Section 4, “Eligible feedstocks and production” • NetZero demands that all feedstocks be collected at a maximum range of 200 km from the biochar production facility, in order to minimise transport emissions and to ensure sufficient knowledge of the feedstock collection environment • For wood-based feedstock specifically, NetZero makes two observations. First, in too many places around the world, wood is linked to deforestation, and it can be very difficult to differentiate between sustainable wood and deforestation wood. Second, all forms of wood residues can already be valued in non-biochar uses that are also beneficial for our climate; this ranges from bioenergy (climate-neutral) to plywood (climate-positive, with long-term carbon sequestration potential). Consequently, NetZero demands that the following criteria be added to this section: “Wood-based feedstocks shall be regarded as eligible for biochar production only when they meet the following cumulative criteria: (i) With the exception of waste sourced from precisely identified orchard renewal programmes, feedstock must come from wood certified as deforestation-free by high-quality, recognised standards (ii) No industry capable of processing such feedstock exists in a 200 km radius of the biochar facility that could use such feedstock for non-biochar sustainable uses” Not including requirement (i) would be de facto accepting to condone the laundering of deforestation wood.	The methodology accounts for the transportation emissions. If the feedstock is more than 200 km from the production facility, then the project proponent must include the transport emissions in the net GHG accounting. The methodology contains sustainability criteria regarding wood based feedstocks. The methodology is intended to be globally applicable and such a specific certification would not be available worldwide. The project proponent shall present proof of the sourcing feedstock at validation and every verification event. The VVB shall assess if the proof is sufficient or more documentation is required in order to certify the project
22 (2)	Net Zero	Applicability Conditions		Section 4, table 3, “Forestry and other wood processing” category • Include carbonised biomass needing to be removed after wildfires • Remove last hyphen, as it is redundant with the first hyphen for most cases, it is too vague, and it is mostly not true (barks and chips not meeting quality specifications can be used for plywood, wood pellets, etc., which have commercial value)	Table 3 will be modified to say “trees burned by wildfires”. The fourth hyphen has been revised. The eligibility criteria for feedstocks are “biomass waste”. If the material has commercial value (e.g., as a plywood or wood pellet product) it would not be a waste product and hence ineligible as a feedstock.
22 (3)	Net Zero	Applicability Conditions		Section 4, table 3, “Aquaculture plants” category • Include invasive algae on beaches • Consequently, rename category as “Marine waste”	The list is a non-exhaustive list. However, to add clarity~~,~~ invasive species has been added to the text.
22 (4)	Net Zero	Applicability Conditions		Section 4, “Eligible biochar end-use application criteria” • For bullet point #5, remove “and/or reliable documentation” as it is too vague and a non-scientific approach, differing from the rest of this high-standard methodology • Consequently, remove bullet point #6	Section 4 has been updated to reflect the information needed for the decay rate of biochar
22 (5)	Net Zero	Project Boundary		Section 5, table 4 • For all occurrences of “Default baseline is zero […]”, replace with “Default emission avoidance baseline is zero […]” for clarity	The suggestion has been considered and revised in the methodology.
22 (6)	Net Zero	Baseline Scenario		Section 6, §1 Replace “The default baseline emission scenario […]” with “The default baseline emission avoidance scenario […]” for clarity	The suggestion has been considered and revised in the methodology.
22 (7)	Net Zero	Baseline Scenario		Section 6, step 2 Either remove “or conduct its own survey” or replace with “pay for a professional, independently conducted survey, pre-validated by Verra”, as there is no way to verify the results of the survey conducted by the project proponent	Please see comment 17.2. Baseline avoided emission has been set ~~out~~ as zero.
22 (8)	Net Zero	Quantification of GHG Emission Reductions and Removals		Section 8.2.1, equation (1) • Replace “ERSS” with “ERSS,y” for consistency • Simplify “SUMy(BESS,y – PESS,y)” as “BESS,y – PESS,y”	The equation has been corrected
22 (9)	Net Zero	Quantification of GHG Emission Reductions and Removals		Section 8.2.1, equation (2) Where equation parameter BESS,y is defined, simplify “Sum of the baseline emissions […]” as “Baseline emissions […]”	The equation has been corrected
22 (10)	Net Zero	Quantification of GHG Emission Reductions and Removals		Section 8.2.2 • In §2 (starting by “In the project scenario”), the notion of carbon sequestration is missing although this paragraph is about GHG removals; only production-related emissions are mentioned. The paragraph should be written as such: “In the project scenario, GHG removals at the biochar production stage refer to the difference between the carbon contained in the biochar produced and the GHG emissions from feedstock pre-treatment (when applicable) and from conversion of waste biomass into biochar.” • Where equation (3) parameter CCy,t is defined, change “tCO2e” to “t” as the unit • Where equation (3) parameter 44 12 is defined, change “tCO2e” to “CO2e”	As per the methodology, the sequestration/removal occurs once the biochar is applied to its end use. Hence, the production stage will not yield removals but a carbon balance. The explanatory text has been amended in accordance. The parameter description for CC has been amended The parameter description for 44/12 doesn't need to be amended, since it correctly refers to CO2eq.
22 (11)	Net Zero	Quantification of GHG Emission Reductions and Removals		Section 8.2.2.1, step 1 Carbon decay rate should be differentiated based on pyrolysis temperature, as suggested by the IPCC (2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Annex 4, table 4AP.2), since higher pyrolysis temperature produces more stable carbon	Table has been revised. See 15(3)
22 (12)	Net Zero	Quantification of GHG Emission Reductions and Removals		Section 8.2.2.1, step 2 Equation (5) is unclear: either “PEPS,y” should be “PEPS,y,t”, or “(My,t / Mx,t)” should be removed together with the initial sum to only have: “PEPS,y = PED,y + PEP,y + PEC,y”	The comment is correct and values have been updated to reflect the changes.

22 (13)	Net Zero	Quantification of GHG Emission Reductions and Removals	Section 8.2.2.2, step 1 Default values for organic carbon content have too wide confidence intervals; a conservative maximum threshold should be set to prevent overestimates (e.g., when a value is 0.13 ± 50%, a 0.5 safety margin factor could be used, so that the maximum value would become 0.13+25%)	The values are based on IPCC latest information on organic carbon content. However, the table has been updated to reflect the value that the project proponent shall use following a conservative approach
22 (14)	Net Zero	Quantification of GHG Emission Reductions and Removals	Section 8.2.3 • For equation (13), replace "EAS,P" by "EAS,P,y" for consistency • For emissions associated with processing of biochar, review syntax of "project proponents must quantify emissions related to grinding and other mechanical transformation of biochar energy related emissions", writing instead something like "project proponents must quantify emissions related to energy use from grinding and other mechanical transformation of biochar"	The comment is correct and the respective section has been updated.
22 (15)	Net Zero	Quantification of GHG Emission Reductions and Removals	Section 8.3, equation (16) • Replace "LEbl" with "LEbl,y" for consistency • Where equation parameters are defined, parameters "FCp" and "PRde" are missing • Where equation parameters are defined, rearrange variables order to put PEPS,y at the very end for consistency	The comment is correct and the respective section has been updated.
22 (16)	Net Zero	Quantification of GHG Emission Reductions and Removals	Section 8.3, § LEtap Add the word "from" in points i. and ii. for clarity: "i. Transport emissions from biochar facility…" and "ii. Transport emissions from processing facility…")	The comment is correct and the respective section has been updated.
22 (17)	Net Zero	Quantification of GHG Emission Reductions and Removals	Section 8.4.1.1 Replace last paragraph of the section (starting with "In a scenario when […]") with the following text: "In case a GHG risk event (e.g., fire, erosion, etc.) arises, all the subsequent credits generated by the biochar project should be diverted to compensate for the GHG released during this risk event. Only when all GHG emissions from the risk event have been compensated should the credits be allowed to be commercialised	The paragraph has been updated to reflect the risk associated with the GHG emissions.
22 (18)	Net Zero	Monitoring	Section 9.1, "Fe" table, "Value applied" row • Replace "CO4" by "CH4" • Change closing bracket position from "The Global Warming Potential (GWP100 for CH4 is 28)" to "The Global Warming Potential (GWP100) for CH4 is 28" • Add GWP100 for N2O, as N2O is also taken into account in emission calculations	The table and parameters have been revised.
22 (19)	Net Zero	Appendix I	Appendix I, section A1 In the paragraph where terms are defined for the activity penetration formula, replace AP by APy for consistency	The text has been modified.
23 (1)	Fachverband Pflanzenkohle e.V.	General	The German Biochar Association (Fachverband Pflanzenkohle e.V.) greatly appreciates efforts to mainstream the use of biochar as a negative emission technology. The reviewed standard is an important step towards a global use of biochar as a carbon sink. We value the fact that the methodology is based on several international standards and other methodologies, which helps to create global awareness of these standards and methodologies and leads to mutual benefits. However, we would also like to point out critique of the proposed methodology, with the goal of making it more robust and applicable. Our main critique points are (a) the lack of a clear distinction between C-sinks and C-offsets and (b) reckoning of methane	a) refer to 23(2) b) The reference to methane emissions is unclear - which might related to conversion of CH4 to CO2eq in the reporting
23 (2)	Fachverband Pflanzenkohle e.V.	Quantification of GHG Emission Reductions and Removals	Main critique (a): unclear distinction between C-sinks and C-offsets A clear differentiation between carbon removals (negative emissions - NE, creation of C-sinks) and carbon offset (avoiding emissions) in the methodology is a prerequisite to establishing a C-sink economy. In chapter 8.5 (Net GHG Emission Reductions and Removals) a formula is presented that sums up all removals, reductions, emissions and leaks into one factor – this is a sharp contrast to the definition of NE as used by most stakeholders. Also, commonly, C-sinks are looked at as more valuable than C-offsets, which results in different pricing of certified C-sinks (100-1000 € t-1 COeq) and offset-certificates (25±x € t-1 COeq). Mixing both values does overinflate the actual removal by adding reductions. If a bad baseline scenario is chosen the reductions could outnumber the removals greatly. This does mislead the buyer of the removal-certificate. It also devalues the main purpose of your biochar-based C-sink certificate and it could even harm the reputation of VCS and other methodologies. We therefore urge you to establish a methodology that results in separate certificates for offsets and C-sinks. Reductions (offsets) must be counted as regular CDM-certificates, not as removal-certificates. These two should be clearly separated and also priced	Verra's registry does not differentiate between emission avoidance/reduction with GHG removals. If a project wants only sinks, *i.e.,* removals only, the project can and should use conservative baseline scenario of not accounting emissions avoidance. In the future, if Verra differentiates between credit types on the Registry, a revision can be made to differentiate between emissions reduction and removals
23 (3)	Fachverband Pflanzenkohle e.V.	Quantification of GHG Emission Reductions and Removals	Pyrolysis technology and methane emissions: The criteria provided are not suited to unequivocally distinguish, high-tech pyrolysis units from low tech pyrolysis devices. Most importantly, these criteria do not allow to distinguish units with high and low emissions. In the end, it will be necessary to measure methane emissions of each individual technology, which will result in individual factors for high-tech units. For low tech pyrolysis a positive list could be used. Traditional kilns and any self-developed unproven technology should be ruled out due to potentially very high methane emissions. In chapter 8.2.2.1 point c) and also Step 2 under PEP,y; = 0 you should add that methane emissions must	Please refer to comment 6.1
23 (4)	Fachverband Pflanzenkohle e.V.	Applicability Conditions	Low-tech pyrolysis technology and methane emissions: There is a broad scientific consensus that the GHG-emissions of the current and the next few decades will be the pivot point that determines whether we can stay within the 1.5 or 2 °C goal. Methane has a severe impact on global warming within the first 25 years after its release. Therefore, we think that you should reflect more on the methane emissions, as high methane emissions during pyrolysis can offset any carbon removal at least in the first decades after the pyrolysis. We think that you should encourage the use of high tech pyrolysis which have proven to achieve low methane emissions or low tech pyrolysis that is known for relatively low methane emissions and reject low tech solutions that are known for high methane emissions or that have not yet proven how they perform in terms of methane emissions (precautionary principle).	The applicability of the methodology for small scale units has been a key concern of the consulted stakeholders. Therefore the consortium has decided to allow both technologies while ensuring a conservative approach, that reflects the voiced concerns. Methane emissions are accounted for in low-technology production, and overall, the methodology is technology agnostic. The selected approach in the methodology includes a high degradation factor as well as a relatively inefficient C-conversion. Both options lead to a lowered attractiveness of these approaches. We therefore believe the methodology reflects the concerns presented in the comment.

23 (5)	Fachverband Pflanzenkohle e.V.	Applicability Conditions		Non-soil applications: We think that the average lifespan of the product must be taken into consideration for any non-soil application. Even many long-life products, have lifespans much shorter than 100 years (concrete unprotected from weather 60-80 years1, plastic stored indoors less than 40 years2). Short-lived C-sinks are valuable; however, the lifespan and the product's end-of-life need to be reflected in the certificate and its	The methodology indicates permanence of products as a required characteristic of the end uses. In alignment with the *VCS Standard* , we do not consider shortened permanence timeframes.
23 (6)	Fachverband Pflanzenkohle e.V.	Applicability Conditions		In Chapter 4 under "Eligible feedstocks and production" you state: One of the following must be established for the waste biomass to be eligible as feedstock for biochar production: o waste biomass utilized as feedstock would have been combusted. It should be clarified that you mean combustion without using the energy of the combustion. Removing a source of energy in order to turn it into biochar, could lead to indirect land use change because additional energy sources must be found, if the biochar production does not create usable energy itself.	Please see 14.2. In addition, "without using the energy of combustion" cannot be added because eligible production types in the methodology include biomass energy plants that produce High Carbon Fly Ash (HCFA). We set a limit on the amount of biomass that can be diverted from biomass energy production to biochar at 5% of the annual biomass supply. As such, we intend to keep the Chapter 4 wording as "combustion" or "decay".
23 (7)	Fachverband Pflanzenkohle e.V.	Applicability Conditions		Also in Chapter 4 you state that "Biochar must not be used for energy purposes.". We would recommend to amend this by a statement like this: "Biochar must not be used in applications in which substantial amounts of the biochar are oxidized, e.g. burned or used as a reduction agent in steel production" Many pyrolysis practitioners, who contact our association, are unaware that using biochar (or coke) to reduce iron ore will also release all contained carbon as CO2, presumably because "use biochar in steel" sounds like a legitimate long term application.	The comment has been considered and the respected section has been updated.
23 (8)	Fachverband Pflanzenkohle e.V.	Applicability Conditions		Also in Chapter 4 you state: When biochar is applied into soils it must comply with biochar material standards to avoid the risk of transferring unwanted heavy metals and organic contaminants to soil. Project proponents must meet the IBI "Standardized Product Definition and Product Testing Guidelines for Biochar That is Used in Soil" and/or EBC "Guidelines for a sustainable production of biochar" , or national regulations for avoiding soil contaminations. We recommend to not write "and/or" but only "or", because this could imply that several standards must be met at the same time. And for "biochar, or" we recommend to write "and", since many national regulations will not be fit to judge biochar yet, and both national standards and biochar-standards must be met. Furthermore, it should be defined, how the proponents have to prove the conformity to these regulations. EBC is an audited certification. IBI on the other hand does not provide certification, thus it needs to be	The project proponent needs to prove to the project auditor that the biochar complies with regulations on end use. Also, IBI does issue material standard certifications for biochar. It is on the project proponent to provide the documentation required for the certification.
23 (9)	Fachverband Pflanzenkohle e.V.	Project Boundary		In Chapter 5, Table 4 you state: "Expected to be de minimis if less than 200 kilometers" We recommend to always calculate transportation with a proxy value from a LCA database, as distance is very easy to determine. Also, transportation emissions will probably be higher in areas with poor road infrastructure and would be considerably lower for rail or ship. It is unclear if 200 km means road length or beeline. You should always aim at minimizing transport distances.	The applicability conditions state that biochar can be only transported through vehicles; there is no approved approach to calculate emissions from rail and ships. Also, the methodology discourages the long distance transportation of feedstock and biochar. The limit of 200km is based on CDM Tool 16, which includes an option for conservative default values.
23 (10)	Fachverband Pflanzenkohle e.V.	Quantification of GHG Emissions Reductions and Removals		Table 5: Values for Organic Carbon content in biochar. Although these values obviously have a high error margin, we think that a clear instruction should be given, which exact proxy values one should use for estimates.	Table 5 has been updated accordingly.
23 (11)	Fachverband Pflanzenkohle e.V.	Quantification of GHG Emissions Reductions and Removals		It is unclear to us, how biochar can be lost during droughts. Also, while biochar can be washed away during floods, the carbon removal will still remain, as biochar will end up in sediments of a river, lake or ocean where it remains at least equally stable as in soil.	Drought has been reviewed and removed. If biochar is lost due to runoff, then it is outside the project boundary and there is no appropriate and adequate procedure to account for that. Hence, run off is included in the risk.
23 (12)	Fachverband Pflanzenkohle e.V.	Definitions		Treatment of waste materials falls under laws and regulations on waste (at least in the EU), which would be a burden for biochar producers. Most of the materials you are referring to, are residues, not wastes. Also, this wording could cause considerable public communication issues on biochar-use in soil.	The comments has been reviewed but waste biomass is an internationally accepted terminology. We will maintain the term.
23 (13)	Fachverband Pflanzenkohle e.V.	Quantification of GHG Emissions Reductions and Removals		In chapter 8.2.2 you state that "In the project scenario, GHG removals at the biochar production stage refer to GHG emissions from feedstock pre-treatment (when applicable) and from conversion of waste biomass into biochar." We think that a clear distinction should be made between a potential removal (at the factory gate of the pyrolysis) and an actual removal (when the biochar is used and thus cannot be oxidized any more neither on purpose nor accidentally).	The comment has been reviewed and section 8.2.2 has been rephrased. The project activity is the final use of biochar either in soil or non-soil applications, and thus, the project proponent cannot claim credits if they only produce biochar. The project proponent needs to prove an application.
23 (14)	Fachverband Pflanzenkohle e.V.	Quantification of GHG Emissions Reductions and Removals		You state that "Eap corresponds to emissions during the application of biochar to the soil. GHG emissions resulting due to fossil fuel combustion and fertilizer application are considered negligible. Thus, Eap is zero" Do you mean, when biochar is applied in combination with fertilizer or a fertilizer product that contains biochar? Biochar itself is not a fertilizer.	The comment has been reviewed and the sentence has been rephrased.
23 (15)	Fachverband Pflanzenkohle e.V.	Quantification of GHG Emissions Reductions and		You state that 44/12 is a "Fraction to convert fixed carbon to tCO2e". We recommend to use the more precise wording "coefficient" rather than fraction.	Fraction has been changed to coefficient
23 (16)	Fachverband Pflanzenkohle e.V.	Applicability Conditions		In the beginning of Chapter 4 you state that the final application must be permanent. Permanent is a rather unclear term, since biochar may not be permanent when looked at on a geological or even astronomical scale. Also, the term permanent is often used for applications that are not really permanent, even on a short timescale. We therefore would recommend to set a certain timespan as your definition of permanence.	see 23 (5)
24 (1)	New South Wales Department of Primary Industries	General	Support	I support the general approach taken to quantification of GHG benefits from biochar systems, inducing the scope, sources and sinks covered, and calculation of benefits. I appreciate the breadth with respect to feedstocks, production technologies and applications, and that there are options for proponent to obtain required data where default data are not included.	We appreciate the feedback.
24 (2)	New South Wales Department of Primary Industries	Baseline Scenario		I support providing the option to include avoided baseline emissions. I would like to see this extended to a broader range of biomass fates in the baseline, including field spreading of raw or composted manure.	Fate of biomass has been maintained; the methodology developers will not extend to a broader range at this time.

24 (3)	New South Wales Department of Primary Industries	Applicability Conditions	It is inappropriate that mixing of feedstocks is prohibited; often a mix of feedstocks (such as manure and straw) is beneficial for producing high quality biochar, giving greatest benefits as a soil amendment. Does this requirement preclude the use of poultry litter (manure on bedding)? That would be particularly unfortunate as this feedstock makes excellent biochar.	The individual biochar soil-persistence values in the methodology (PRde) are based on IPCC data backed by meta-data at a global scale. However, the mixing has been revised and updated in the methodology to provide clarity on which cases are allowed.
24 (4)	New South Wales Department of Primary Industries	Applicability Conditions	Please include biosolids (sewage sludge) in Table 3, under "Recycling economy". Delete or modify "Feedstocks must not contain heavy metals". The issue of heavy metal contamination should be managed through requirement for compliance with relevant standards and guidelines, and applied to all feedstocks. Here, if you want to alert users that these feedstocks you could say something like "Risk of heavy metal contamination: Confirm that relevant thresholds for heavy metals are not exceeded".	The comment has been reviewed and the table has been updated.
24 (5)	New South Wales Department of Primary Industries	Applicability Conditions	I encourage the inclusion of purpose-grown biomass as an eligible feedstock, to facilitate scaling up of biochar production.	Please see 6.2. The first version of the methodology will not include purpose-grown biomass as eligible feedstock due to sectoral scope, additional GHG emission quantification with growing biomass feedstock, baseline scenario, monitoring
24 (6)	New South Wales Department of Primary Industries	Quantification of GHG Emissions Reductions and Removals	8.2.2.2 c): Unclear. The statement of the criterion is incomplete	The comment is not clear. However, section 8.2.2.2 has been revised.
24 (7)	New South Wales Department of Primary Industries	Quantification of GHG Emissions Reductions and Removals	Re Estimation of fixed carbon content (CC) of biochar for high technology facilities. I can't find what decay rate is proposed for biochar with H:Corg>0.4. Are you proposing the same classes as Budai et al, 2013? Are the source details provided for the cited references?	The value has been corrected. Now it reads H:Corg < 0.7.
24 (8)	New South Wales Department of Primary Industries	General (Priming)	Priming should be permitted as an optional GHG benefit that can be included when justified (ie applied to appropriate soil type). Priming is now well-proven (Joseph et al 2021 https://doi.org/10.1111/gcbb.12885 ; Schmidt et al, 2021 https://doi.org/10.1111/gcbb.12889)	There is no clear effect of priming based on the latest publication of Woolf, Lehman, et at (2021). Further, the scope on priming is related to the SOC carbon pool, and the project activity for this methodology is the application of biochar in soil and non-soil end uses. Therefore, the GHG emissions associated with priming are outside the boundaries of this methodology.
24 (9)	New South Wales Department of Primary Industries	General (International standards)	Please note that Australia New Zealand Biochar Industry Group is finalising a Code of Practice that provides guidance on sustainable, safe production and use of biochar as a soil amendment, including limits for a range of inorganic elements and organic compounds. This could also be referenced. https://anzbig.org/wp-content/uploads/2020/07/ANZBI-Biochar-Code-of-Practice_2June2020_Draft.pdf	At this time, the ANZ Code of Practice has still not been finalized, but it may be included in future versions of the methodology.
25 (1)	Carbon Future	Applicability Conditions	"*When biochar is applied into soils it must comply with biochar material standards to avoid the risk of transferring unwanted heavy metals and organic contaminants to soil. Project proponents must meet the IBI "Standardized Product Definition and Product Testing Guidelines for Biochar That is Used in Soil"5 and/or EBC "Guidelines for a sustainable production of biochar"6, or national regulations for avoiding soil contaminations.*" (p. 11) Leaning only on national regulations poses a risk and a loophole for watering down the "do no harm" principle. This should only apply in case of even stricter national regulations that are already in place. In several countries there might be an absence of sufficient regulation (e.g., failed states). Leaning on national regulations in such cases, poses a severe risk of allowing the use of contaminated material.	Wording has been corrected. Please also see comment response 23 (8)
25 (2)	Carbon Future	Applicability Conditions	"*To establish the decay rate of biochar in a given non-soil application, in the absence of supporting documentation, the project must apply the default decay rate of biochar in soils following a conservative approach.*" (p.11) The term "Conservative approach" should be defined. Applying a soil-based decay rate in non-soil applications runs the risk of significantly over -or underestimating the decay rate and no reliable quantifications can be performed in this case. We advise not to include applications without a proper scientific foundation	Following a conservative approach means to use conservative assumptions, values and procedures to ensure that net GHG emission reductions or removals are not overestimated. The use of the soil decay rate for non-soil applications is because non-soil applications present a lower decay rate than soil application, therefore, if there is no value, the default value is soil decay rate.
25 (3)	Carbon Future	Applicability Conditions	*Distinction between Low- and High-Tech Pyrolysis* We think that the criteria for the distinction between Low- and High-Tech Pyrolysis are insufficient. For the for Low Tech Pyrolysis there should be a minimum standard that is carefully defined. The current definition could include technologies that have way higher methane emissions than the most common low-tech pyrolyzers (Kon-Tiki or rotary Kiln). Furthermore, while the criteria for high-tech pyrolyzers can easily be met by the most common low-tech pyrolyzers (Kon-Tiki), some of the low-tech criteria are met by high-tech pyrolyzers. Thus, we think that the distinction between the high- and low-tech is insufficient and should be revised. For further detail please see the Appendix.	The methodology is agnostic regarding technology. The methodology provides a framework for GHG accounting independent of the type of technology used. For both technologies, the GHG emissions (especially methane) have been considered.
25 (4)	Carbon Future	Project Boundary	*"Low technology systems are provided a default emission value based on published literature"* (p.13) As mentioned before, low-tech technologies may vary highly in terms of their process emissions (particularly methane). Assigning only a default emission value may significantly underestimate relevant emissions, causing more harm than positive impact. Reliable date for each pyrolysis plant type is necessary here!	We argue to maintain the formula. The calculation is already conservative and effectively yields higher emissions than removal potential (see sheet AnnexInformation)
25 (5)	Carbon Future	Baseline Scenario	*"Continuation of pre-project waste biomass disposal practices is the most plausible baseline scenario" (p. 14)* This is incorrect as soon as the regulatory framework concerning waste biomass disposal changes. This should be kept in mind. In general, we consider issuing avoidance credits to be quite tricky and trust is key. The baseline needs to come with a proper buffer and there need to be regular checkups in place to prove if this baseline scenario can still be considered valid.	The baseline scenario has been revised to reflect that waste biomass disposal practices refer to the year in which biochar is made. See also comment 14.7
25 (6)	Carbon Future	Applicability Conditions	*Methane Emissions* Methane emission accounting for high-tech production should be included!	Please refer to comment 6.1

26 (1)	IBI	Additionality	Comment	*Durability of the Additionality Criterion*. In Appendix 1, the total available biomass for conversion is incorrectly estimated as 1 521 073 296 metric tonnes. There is a mistake in the calculation of the mass equivalent of the cubic meters of wood waste available. 336 858 637 cubic meters has been multiplied by 1.25, but should have been divided. When corrected we find an estimate of 1.1 plus 0.269486910 giving 1.369 Gt instead of 1.521 Gt, for the total annual worldwide feedstock resource. 5% of this is 68.45 million tonnes, rounding off some of the spurious precision. On my understanding of the argument, so long as the biochar produced annually does not consume more than this amount of biomass, the proposed additionality criterion would not be violated. Let's consider how much biochar could be produced from that amount of biomass. I suggest we should divide the raw biomass by 8 to estimate the carbon in the biochar, because there are three multiplicative factors of ½: - Half the mass of dry (not oven-dried) wood is water; - Only about half the mass of oven-dried cellulose is carbon; - About half the carbon is lost to gases and condensable liquids during pyrolysis. Each of these statements is approximate but not wildly so. Those who claim much higher yields of biochar from a given feedstock are either working with high-ash material or are not driving the conversion far enough to produce a stable biochar. If we divide the 'permissible' feedstock of 68.45 million tonnes by 8 we get 8.55 million tonnes. Present production is estimated at 0.773 million tonnes annually. We believe production is expanding rapidly so I suggest it might reach 8 million tonnes per year in only 5 or 10 years. That implies that the lifetime of the Additionality Criterion may be quite short.	The wood waste portion of the calculation has been corrected, although it did not have an impact on the calculation of APy. The commenter suggests taking 5% of the total waste biomass produced annually (68.45 million tonnes) as the metric for calculation of APy, which is incorrect. However, it is true that multiple tonnes of biomass are needed to produce a tonne of biochar. If we assume an average yield of 20%, then it will require 5 tonnes of biomass inputs to produce 1 tonne of biochar. The current global estimate of biochar is 0.773 million tonnes, so that reflects utilization of 3.8 million tonnes of biomass per year. Using this approach, the APy value would be 0.27%. Even if we assume a 10% yield of biochar per biomass input the APy would only be 0.50%. Both values are well below the 5% threshold required by the *VCS Standard* (see *VCS Methodology Requirements* Section 3.5.9).
26 (2)	IBI	Applicability Conditions		Sewage sludge ('biosolids') from wastewater treatment should be included as a source material. This is a severe omission and might seriously constrain an important development area for biochar projects. I accept it may be difficult but the biochar so produced should be judged on its merits (as assessed by analysis) rather than by assumption of guilt before trial. Biochar from sewage sludge might be used in asphalt even if occasionally higher in some heavy metals, for example.	Please refer to 15.2
26 (3)	IBI	Quantification of GHG Emission Reductions and Removals		*Sign conventions, notation and units in the equations*. For example, in section 8.2.1 equation (1) is written as a sum with subscript y; in mathematical convention that would imply a sum on y, whereas the y subscript just indicates the year y as a label. I suggest the equations could be made easier to understand if the subscript "y" were dropped throughout and the words around each equation specified that it referred to a single year. What is the sign convention for equation (1) and indeed elsewhere? If BEss is zero but PEss non-zero then ERss will be negative – is that what is intended? A worked example following each equation would improve clarity very considerably. I have difficulty linking this to equation (3). In equation (3) the left side ERps is surely a positive quantity but that implies that on the right side, PEps is positive (so that the removals are reduced by the emissions?) In equation (4) the units seem to be inconsistent between the left and right sides. Would it not be better to use tonnes of C throughout with a conversion to CO_2e at the end? On the left side of equation (4) the note says the units of CCt are tCO_2e whereas the quantities on the right side (specifically Mt) are in tonnes. I have the same problem with equation (8) on page 25. Also on this page the paragraph describing PRde talks about Fperm but that is apparently the same thing.	Equations and units have been revised and updated Equation 1 has been updated (converted - to +) Equation 3 can be maintained since project emissions will be a positive value and hence deducted from the Sequestration potential (CCy) The description of C has been updated in Equation 4. Equation 8 has been restructured to maintain consistency. The respective equation 17 had to be updated accordingly
26 (4)	IBI	Quantification of GHG Emission Reductions and Removals		Equation (11) on page 27 is another example of untidy notation: the SUM term has subscripts y and t but the summation is on the label t (not on y which is just a label). I suggest as before, that the y subscript be eliminated and replace by statements, as often as necessary, to the effect that the assessment refers to a single year.	The equations have been updated; the SUMs indicate the respective summation and labels have been removed.
26 (5)	IBI	Quantification of GHG Emission Reductions and Removals		In equation (12) the sum is correctly indicated as over the label "i" and the use of y as a subscript is potentially confusing.	No change implemented: The summation accross all energy types (i) is required.
26 (6)	IBI	Quantification of GHG Emission Reductions and Removals		Equation (13) – inconsistent use of subscripts, suggest drop the "y" on the right hand side.	Formula maintained.
26 (7)	IBI	Quantification of GHG Emission Reductions and Removals		Page 30. I am not comfortable with the neglect of transport emissions over a distance a large as 200 km. Repeated transport of small quantities of biochar over significant distances could reduce (or nullify) the net storage.	The 200 km limit is aligned with CDM Tool12 *Project and leakage emissions from transportation of freight*. The limit remains.
26 (8)	IBI	Quantification of GHG Emission Reductions and Removals		After equation (16) on page 31 CCtl is defined in the notes but does not appear in the equation, whereas FCp does appear in the equation.	Equation has been revised and modified.
26 (9)	IBI	Quantification of GHG Emission Reductions and Removals		Section 8.4.1.2 – biochar-infused plastics may be combusted at end of life.	Plastics as an end use has been excluded from the current methodology version.

27 (1)	Earthworm Foundation	General	Earthworm Foundation is an impact-driven non-profit that works on the ground to create conditions for nature and people to thrive. Partnering with businesses, civil society and governments, it focuses on implementing responsible sourcing commitments in value chains, innovating practical solutions to the social and environmental challenges of production practices, and catalysing industry-wide chain reactions to help achieve transformation at scale. In this context, EF is working with charcoal retailers, importers, and producers to transform the charcoal supply chain. In particular, EF teams have been placing a strong emphasis on bringing transparency to a very opaque industry. EF began working on charcoal in 2013 by analysing market trends (imports and exports) and linking these to environmental and social injustices in supply chains of the charcoal imported into Europe. EF has been conducting field work and bags analysis in this space ever since. In 2019, EF launched the Charcoal Transparency Initiative, a platform for the European charcoal industry, which connects actors involved in responsible charcoal and helps educate consumers about the social and environmental impact of the charcoal they buy. The platform can be	Thank you for your feedback and information relating to charcoal supply chain.
27 (2)	Earthworm Foundation	General (Integrity of credits)	Going further, EF seeks to engage its members towards adopting regenerative practices. Biochar, having beneficial agronomic properties and being, by definition, a carbon sink, can participate in this regenerative approach. We understand the importance of carbon credits in building momentum for the development of the biochar industry and biochar success as a credible climate solution. However, we also worry that carbon credits might create incentives for irresponsible actors to enter the market. Today, several risks threaten the integrity of carbon credits as well as the climate potential of biochar at all stages of the supply chain: • At the sourcing stage, the lack of transparency regarding the biomass origin means that carbon credits could unintentionally sanction biomass sourcing associated with forest degradation and/or deforestation and other environmental degradations. This is a risk heightened by the lack of volume transaction monitoring prevalent in the industry. • At the production stage, the very relevance of biochar as a climate solution rests significantly on the environmental performances of the carbonization technology. Carbon credit standards therefore must be able to account for the technology used toproduce biochar and the associated GHG emissions. • Carbon credits for biochar projects must necessarily include the application of the biochar within the project boundaries. Indeed, when leaving the factory, the biochar is only a potential carbon sink, it only becomes an actual sink once it is applied. Therefore, the integrity of carbon credits is dependent on the Standard's capacity to control for the end-use of the product. Without such capacities, risks of fraud are high. Therefore, we would like to applaud VERRA's effort to set stringent guidelines to ensure the sustainability and credibility of carbon credits awarded to biochar projects and would like to suggests some additions. This document constitutes EF's contribution to the public consultation launched following the release of the Methodology for biochar utilization in soil and non-soil applications ("the Standard" thereafter). We have distinguished between comments on specific points in the Standard, questions and recommendations when we believed it was warranted.	Thank you for your feedback
27 (3)	Earthworm Foundation	Definitions	Chain of custody is defined by the International standardization organization (ISO) as "process by which inputs (3.2.2) and outputs (3.2.3) and associated information are transferred, monitored and controlled as they move through each step in the relevant supply chain (3.2.1) (Source: https://www.iso.org/obp/ui/#iso:std:iso:22095:ed-1:v1:en). Hence, any standard must document the whole supply chain activities from the source to the final product as well as its application. In our understanding, the term chain of custody for biochar should thus incorporate all steps of the production from the source (e.g. forest) to the sink (e.g. farm land). Yet, in the current wording of the Standard's definition, it seems as though the chain of custody starts at the production facility rather than at the biomass source. Recommendation: Based on EF experience, certification schemes with weak or incomplete COC supply chain verification systems can be exploited by "irresponsible" companies. This can lead to significant reputation loss to the certification scheme by CSOs. EF recommends that each biochar supply chain verified under VCS can be traced all the way back to the biomass source.	The chain of custody definition has been modified. Also, the boundaries has been clarified to reflect that it is from the sourcing stage until the end-use application
27 (4)	Earthworm Foundation	Definitions	The term waste biomass, as defined in the Standard, indicates a previous commercial activity, which resulted in a by-product considered as "waste" or residues of a biogenic resource which cannot be used for its primary industrial application. For EF, the sustainability and proof of sustainable management of a feedstock needs to be guaranteed to classify the waste or residues as eligible for sustainable biochar production. A transparent and clear documentation on the origin (e.g. a resource suppliers' list) should be publicly available.	Table 3 details the sustainability criteria for every feedstock category. The project proponent shall present the evidence to the VVB that reflects that initial waste biomass comes from a sustainable sourcing.
27 (5)	Earthworm Foundation	Applicability Conditions	Could you please clarify what "practice" refers to? Is it the practice of collecting the residues or the agricultural practice itself? Recommendation: The Standard requires that "primary raw woody sources coming from forests must prove that biomass comes from sustainable sources". EF suggests for the standard to include similar requirements for biomass waste to come from sustainable agricultural practices. Such requirements could include: • No agricultural waste from land that was subject to forests conversion after 2015 • Agricultural waste must come from organically managed fields	It refers to the implementation of the project activity. The paragraph has been updated. Recommendation on avoiding forest conversion has been considered. However, the methodology is applicable globally where organic fields requirement would be too restrictive. Therefore, the second recommendation has not been included.
27 (6)	Earthworm Foundation	Applicability Conditions	p.9 What falls under the definition of by-products from forest-based industries? Do charcoal fines, produced as by-product of charcoal production, fall under the definition if charcoal production initially used logs, which did not show any indication of defects or inferior quality? Do wood classification systems have any relevance for the exclusion or inclusion of forests logs/residues as eligible feedstock? • Are logs classified as "firewood" considered as forest residues?	By-products refers to wood chips, off cuts, sawdust for example. Charcoal does not fall under this definition. If the material has commercial value (e.g. as a plywood or wood pellet product) it would not be a waste product and hence ineligible as a feedstock.

27 (7)	Earthworm Foundation	Applicability Conditions	Could you please elaborate on the term “overstocked”? Do you consider thinning operations in later forest stand development statuses also eligible as feedstock? Comment: Without more precision on the meaning of “overstocked”, one could justify that any wood from thinning operations in general can be used for biochar production. As a result, almost all of the wood, except the final harvest, could thus qualify as eligible feedstock for biochar production. The average growing stock varies depending on the forest biomes and regional forest characteristics. In Europe, the growing stock varies from Sweden 130 m3/ha to Germany 355 m3/ha (https://fra-platform.herokuapp.com/SWE/fra2020/growingStock/). Recommendation: Defining what overstocked means in the respective context should be based on robust data and context specific. In the absence of solid and robust data about the wood stock available, wood resources from “Forest and other wood processing” as defined in the Standard should not be eligible for biochar production.	Overstock has been defined. Also, the thinning coming from that operation shall have no commercial value to be classified as waste biomass.
27 (8)	Earthworm Foundation	Applicability Conditions	p. 9/10. forestry certification including but limited to Programme for the Endorsement of Forest Certification (PEFC) and Forest Stewardship Council (FSC) or meeting requirements of Renewable Biomass as defined by the CDM tool (EB 23Report Annex 18). “Including but limited to”. Was this meant to say “including but NOT limited to”? Otherwise, said certifications have proven to be flawed and these certifications alone should not be the only proof of sustainable forest management required. In 2021, the environmental NGOs Earthsight and Greenpeace released damning reports targeting certification schemes in the forest sector, documenting how certified wood continues to be linked with forest degradation and illegal logging. While the Standard has a requirement for primary raw woody sources, it has no requirement regarding the forest source of wood-industry by-products. However, based on our experience, sawmill and other wood-processing facilities’ residues often contain significant shares of illegal and/or non-certified wood. Without traceability requirements for wood-processing waste biomass, carbon credits thus risk indirectly condoning such practices. In light of EF’s experience with the charcoal industry, cases of fraud typically occur due to a lack of volume transaction checking. In such settings, a producing company can source its biomass from certified and legal sources and then buy additional charcoal for resale from much less responsible producers. A lack of volume transaction monitoring can thus lead to the illegal wood laundering.	Text has been corrected. it should read "not limited to"
27 (9)	Earthworm Foundation	Applicability Conditions	Recommendations: Although we understand the difficulty of tracing residues back to the forest source, EF suggests requiring: • A risk analysis of the area in which residue suppliers source their biomass • The certification of the wood-processing facility • The knowledge of the country of origin of wood residues Further, we recommend that the Standard require producers to present robust volume transaction verification systems where the volume of biochar can be compared with the volume of raw material biomass. Wishing to reinforce transaction monitoring, EF developed methodology to monitor incoming wood sources, charcoal / biochar production yield and delivery to make sure that declared numbers are coherent.	Sustainable criteria requirements and the monitoring system are two criteria for avoiding illegal deforestation. Comment on input vs output has been considered
27 (10)	Earthworm Foundation	Applicability Conditions	p. 11 The methodology is not applicable if the project activity leads to a decrease of other carbon pools especially SOC on agricultural lands, or excessive removals of forest woody debris or litter. For example, collection of dead wood from a forest. Question: How is carbon pool degradation determined? In the case of forest residues numerous forest-related studies have proven that leaving forest residues after harvesting in the forest enhance the vitality and biological activity of the forest soil, regenerating the nutrient and water household of the same and that conversely removing forest harvesting residues has negative	Carbon pool reduction is determined by measuring the carbon pool at the baseline scenario and later with the implementation of the project activity. The baseline sceranio is outlined in section 6

27 (11)	Earthworm Foundation	Project Boundary	p. 12 The abstract concerning “Feedstock production”: Excluded. Waste biomass are considered renewable per eligibility condition EF comment: EF would like to raise comments and concerns that this definition can lead to significant logic as well as calculation gaps in determining the carbon sink potential of biochar. The supposed carbon neutrality of biomass has been the subject of much debate and has been called out by multiple actors at the European level. The EU commission has announced the commissioning of a comprehensive assessment of the biomass supply and demand in Europe to ensure that biomass- related policies are sustainable. Further, in the EU Commission’s biodiversity strategy it is highlighted that “The overall objective is to ensure that EU regulatory framework on bioenergy is in line with the increased ambition set out in the European Green Deal”. As an example the paper lists the following statement “The use of whole trees and food and feed crops for energy production – whether produced in the EU or imported – should be minimized” (https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590574123338&uri=CELEX:52020DC0380). Finally, even if GHG emissions from feedstock harvest can be minimised, they can never be zero (emissions due to forestry machinery / transport and local disruption of the ecosystem’s carbon cycle will always be present). These emissions are too difficult to measure for all cases but can be estimated. EF is currently developing a tool to calculate the carbon footprint of various charcoal sources. Please do not hesitate to contact us if you would like to discuss our methodology. Recommendation: EF suggests developing a weighing system to take into account that the carbon footprint of biomass differs depending on the source (at least from country of origin to country of origin). Question: What about imported biomass for biochar production? Are the emissions from transportation included?	Waste biomass is considered as renewable based on Renewable Biomass as defined by the CDM tool (EB 23 Report Annex 18. The CDM tool is an approved methodology for carbon accounting. Also, the methodology is based on using waste biomass, and not purpose grown crops where emission would have been accounted. Emission from transportation are included as leakage
27 (12)	Earthworm Foundation	General (Project development)	How do you check/assess the different technologies? Are auditors trained to evaluate the different types of technologies? Based on our experience, carbonization technologies vary in type and extent. Are there technologies, which are not admissible by the standard? E.g. traditional carbonization technologies or rather primitive, low technology systems (e.g. Ukrainian drum kiln)? Recommendation: Biochar projects using low technologies should not be able to receive carboncredits	the methodology outlines the technology criteria but its goal is to remain technology agnostic.low technlogies have been set up with conservative default values
28 (1)	Suez	Applicability Conditions	"Utilization of Biochar in soil application is likely to be reliant on agricultural seasonal cycles. In an adverse scenario where the project developer loses a biochar off taker for some share of the biochar production, it might take more than one year before returning the biochar to the soil. Indeed, it could be reasonably assumed that it might take several months to find a new off taker for the product (commercial prospection and negotiation). Therefore, if the appropriate period of the year is passed, it might be necessary to wait another year to place the biochar at the right season on top of the transitional period to find a new biochar off taker. Moreover, this criteria might introduce an asymmetric bias between biochar producer and biochar off takers at the advantage of the later. Knowing this constraint potential biochar off takers are likely to linger commercial negotiations in order to negotiate discounted biochar price." "Considering the properties of the biochar decrease marginally if not over time we propose the following change: 4. Applicability Conditions Eligible biochar end-use application criteria ""Biochar is eligible to be utilized and accounted for under the methodology if it is being utilized within two years of its production.""""	Biochar is subjected to natural decay and permanence of biochar is calculated for a period of 100 years. To adhere to the decay factor established for 100 years, biochar must be utilized in soil or non-soil application, as appropriate, within the first year of its production. Also, carbon removal credits can only be claim if biochar has been used in an end application
28 (2)	Suez	General (Project development)	Can you give some example of reliable documentation so as to guide the Verification and Validation Body and avoid discrepancy between certification bodies as to what is a reliable documentation ? Add a few example of reliable documentation	Reliable information such as a decay rate analysis. Further, the sentence has been re-written to show the requirement
28 (3)	Suez	Additionality	"Biochar projects are complex and long-term projects requiring to mitigate many uncertainties and relying on several supply and offtake contracts to be negotiated and put in place. In order to scale up the number of biochar projects it is necessary to give the right signal to all biochar project participants limiting uncertainties where possible. As such, it is important that the eligibility of biochar projects is perceived as currently achievable and as remaining achievable for a period of time consistent with biochar projects typical time frame and related contracts commercial terms. We believe, the five percent threshold is too low and will give a wrong signal to project participants that the penetration criteria is only certain to be met by the first batch of biochar projects." Proposed change: Adopt a treshold of at least 10%	If there is rapid growth in the biochar sector, it is true that the APy value may exceed 5% at some point in the future. In Section 3.13.1(2) of the VCS Standard version 4.0 “the project proponent shall demonstrate to the validation/verification body that the simplified procedure is appropriate to apply to the project considering the project characteristics…”. And furthermore, “Failing this demonstration, the project proponent shall not use the simplified procedure for demonstrating additionality and shall instead use an appropriate additionality assessment method in substitution”. In the event of strong growth in the biochar sector that exceeds the 5% value--a project proponent will have to provide an alternative assessment of additionality that meets VCS criteria.
28 (4)	Suez	Additionality	It is unclear whether, after such re-assessment of the penetration rate, it could prevent already certified projects to generate verified carbon credits in the future. Proposed change: Clarify that additionality of the project cannot retroactively be denied because of the three years penetration rate reassessment outcome.	This is clarified in the *VCS Standard* guidelines and *VCS Methodology Requirements*.

28 (5)	Suez	Additionality		"It is our understanding for two different biochar projects developed (certified) in the same given geography but a few month interval before and after the penetration rate re-assessment, one could automatically meet the additionality criteria while the author would have to undergo the full barrier demonstration process. Such uncertainty is likely to discourage biochar project developers to invest in early stage but time consuming and costly project development activities and to impact the scalability of the biochar solution. Project developers might be inclined to disregard country with an already existing project. Proposed change: If the penetration rate is not exceeded locally (country wise), the project developer should not have to undergo the barrier demonstration.	Our current calculations on additionality shows that the current global estimate of biochar is 0.773 million tonnes, so that reflects utilization of 3.8 million tonnes of biomass per year. Using this approach, the APy value would be 0.27%. Even if we assume a 10% yield of biochar per biomass input the APy would only be 0.50%. Both values are well below the 5% threshold in the VCS standardized approach to additionality.
28 (6)	Suez	Quantification of GHG Emission Reductions and Removals		8.2.1 p.17 Wording ? "Emissions **reductions** at the feedstock sourcing stage are estimated as the sum of the difference between baseline emissions and project emissions in a given year according to the following equation:"	Wording has been corrected
28 (7)	Suez	Quantification of GHG Emission Reductions and Removals		"Decreasing at a so low level the H:Corg ratio means in practice that the technology (whatever it is) will need to operate at much higher level of temperature (>500°C) and will drastically reduce the yield of conversion of the initial biomass. Said differently, production cost of biochar will increase further requiring a higher additionality effect through the CDR economical contribution. Since existing methodologies (PURO.earth, Carbon Future) set an acceptable and although challenging threshold at H:Corg<0.7 and O:Corg<0.4, supported by professional organization such as EBI, EBC ..., it is very disturbing (for project developer ready to launch new biochar capacities based on ""published and agreed"" criteria) to fit with another standard that will be much more difficult to reach and will for sure jeopardize the scaling up of this promising biochar solution. We strongly advocate that you take into account the well known paper from Spokas (Review of the stability of biochar in soils: Predictability of O:C molar ratios, Dec. 2010), which clearly established that O:Corg is much more relevant (compared to H:Corg) to predict half-time of the carbon (in biochar) : Spokas set up O:C molar ratio at 0.4 which was corresponding to a much more permanency ratio criteria of biochar carbon stability estimation. Considering the above, we wonder if there may be here some confusion between H:C and O:C ratios ? Please advise" Proposed change: "Keep ratios @ O:Corg<0.4 and/or H:Corg <0.7 well known and used by current players Review the decay rate (0,3%/year) which sounds too much conservative compared to other scientific references EBI's recommandation should be considered"	H:Corg has been revised. Currently it is H:Corg<0.7. Permanence values have been updated based on temperature production using IPCC values.
28 (8)	Suez	Leakage		"It is unclear how long the obligation to monitor a GHG risk event shall apply and whether this limited to one year or if it extends to the full crediting period. It might prove extremely complex and costly to monitor and justifying GHG risk events have not occurred for batches of biochar applied several year ago on small land parcel" Proposed change: Assuming the provision listed at the beginning of the section 8.4.1.1 have been complied with so as to apply biochar on soil and limit natural leakage risks , the project developer should be exempted to monitor the occurrence of GHG risk events	The project proponent shall provide proof of biochar application for carbon credits to be issued. Please refer to the bullets points at the end of the section.
28 (9)	Suez	General (Project development)		Please consider adding a specific section detailing the crediting period and the renewal process if any	Please refer to *VCS Standard v4.1* . This is outlined by the Standard, not the methodology.
29	Permex	Applicability Conditions	Question	Wollastonite is very similar to Biochar. It will capture co2 for centuries-millennia. It increases plant growth and is often compared to biochar as a SIlicon amendment. Could this methodologie be also used by Wollastonite? https://soilsatguelph.ca/trapping-carbon-with-wollastonite/ Using Wollastonite and Biochar together would be even better. The usual term for the Wollastonite co2 capture is Enhanced weathering but it is often looked at apart from it's effect of vegatative growth of plants and trees. By replacing Lime with Wollastonite we would reduce by 50% de co2 emission. In Québec we spread approx 350,000 tons per year. Lime and Dolomite (dol-lime) is used to increase the pH of the soil and supply calcium, an essential plant nutrient. But these carbonate minerals are full of carbon, and when they break down, they will release 25% to 44% of their weight as CO2 to the atmosphere. Wollastonite is a carbon-negative replacement for lime products that can remove instead of add Co2 to the atmosphere. In a recent study, beans showed a 177% greater dry biomass weight, and corn showed a 59% greater plant height and a 90% greater dry biomass weight than the control while capturing 9x more CO2 from the atmosphere. https://www.canadianwollastonite.com/wp-content/uploads/2019/01/CO-Benefits-of-	Currently the methodology focuses on the application of biochar produced from waste biomass, thus enhanced weathering is not applicable. Nonetheless, Verra's newly launched CCS+ initiative is working to develop new VCS methodologies where enhanced weathering may be included as a project activity.
30 (1)	SEATA	General (International standards)		Important that Verra also recognises the ANZ Biochar Industry Group Code of Practice (COP), in addition to IBI and EBC guidelines, as it is soon to be finalised (draft issued for consultation is being finalised by November 2021). This COP establishes three grades of biochar (each with sub-grades based on carbon content) that align to applications ranging from Industrial, Standard to Premium Chars (eg feed chars). The consultation period for our draft ANZBIG COP has been several months, and we'd recommend longer consultation on the draft Verra method for wider industry consultation globally due to time commitments and impacts (including Covid-related of course).	The methodology developers recognize the ANZ biochar industry group. However, to date, there is not a finalized version of the Code of Practice that can be included in this version of the methodology.
30 (2)	SEATA	Quantification of GHG Emission Reductions and Removals		The well-established H/Corg (hydrogen to organic carbon) method of assessing biochar stability could/should be considered.	The H:Corg has been considered to set the limit for biochar. The limit is set at H:Corg <0.7

30 (3)	SEATA	Applicability Conditions	Mixed Animal bedding (eg manure & sawdust, eg poultry litter) should be included in Table 3 as eligible sources.	Sawdust and animal manure are included in Table 3. The project proponent should be aware of the eligible feedstock and production eligibility criteria outlined in Section 4 regarding mixing of
30 (4)	SEATA	Applicability Conditions	Blending options (biomass with other co-feeds) should be clarified further.	Please refer to comment 13.1
30 (5)	SEATA	Applicability Conditions	Table 3 "Recycling Economy"- use of urban green waste should also control other common cross-contaminants in it, particularly plastics (due to associated pollutant risk, eg dioxins/furans).	Table 3 has been revised and updated. Green urban waste shall comply with international standards or guidelines for use as feedstock.
30 (6)	SEATA	Applicability Conditions	Use of municipal biosolids should be considered alongside animal manures, acknowledging appropriate applications pending resulting biochar quality/grade (eg industrial use vs agricultural).	Please refer to comment 30 (9)
30 (7)	SEATA	Additionality	Appendix A – are we correct in understanding that the quoted MAP figure of 1.5B tpa (noting only for wood and crop residues) and the 5% threshold placed for additionality would equate to 75 Mtpa max biomass available globally for biochar production? Shared between 195 countries globally (there are nearly that many signatories to the Paris Agreement) = only 384 Ktpa each if shared equally. Granted whilst biochar global production in total is <1 Mtpa, China's production alone already exceeds 500,00 tpa as quoted and aims for 3Mtpa in near future, with other areas of the developed world expecting to follow suit in order to meet Net Zero commitments which urgently require long term stable NETS (also noting NETs such as forestry are under threat, as attested to by the wildfire impacts in the US on the carbon securities held by the likes of Microsoft who are now looking for more secure NETs in their portfolio. Biochar represents such security. This may lead to non-linear uptake (indeed potentially exponential) and this (in addition to other commercial co-benefits not offered by other NETs like DAC etc) is why some studies such as Grandview Research are suggesting that the global biochar market size for biochar is estimated to reach USD $3.1 billion by 2025 and It is expected to expand at a CAGR of 13.2% over the forecast period (Grand View Research 2019). Accordingly, it is recommended that the MAP figure quote could quickly become constraining and the 5% threshold should be considered more closely. Indeed as a minimum some assurance that it will be revised (upwardly) would be required in order for Biochar to attain the Gt scale potential quoted on the very first	Yes, the 75 million tons per annum value is correct. See response to comment 26 above for more details. If there is rapid growth in the biochar sector as you describe, it is true that the APy value may exceed 5% at some point in the future. In Section 3.13.1(2) of the *VCS Standard v 4.0* "the project proponent shall demonstrate to the validation/verification body that the simplified procedure is appropriate to apply to the project considering the project characteristics…". And furthermore, "Failing this demonstration, the project proponent shall not use the simplified procedure for demonstrating additionality and shall instead use an appropriate additionality assessment method in substitution". In the event of strong growth in the biochar sector that exceeds the 5% value--a project proponent will have to provide an alternative assessment of additionality that meets VCS criteria.
30 (8)	SEATA	Applicability Conditions	Development of the mentioned potential future inclusions for Purpose-grown biomass (both terrestrial and aquatic) should be considered as a priority, and can be done sustainably (e.g. exclude biomass grown in high value cropping soils areas to deter such practices (avoiding criticism for competition with rightful higher need/priority for food production). Otherwise may prematurely constrain significant emerging opportunities rather than encouraging them, especially for regenerating degraded land. o Eg residues from new aquatic biomass (eg macroalgae/kelp/seaweeds) opportunities. For example kelp residues sent into AD with digestate then pyrolyzed (or direct process via high moisture pyrolysis methods such as HTC/HTL etc).	Please refer to comment 6.2. Purpose-grown biomass is currently not included in the methodolgy as it adds complexities regarding baseline scenario, monitoring, carbon accounting, leakage, other. However, the methodology has been designed in a way that allows the inclusion of new modules/tools in future versions.
30 (9)	SEATA	Definitions	S3 Definitions - Definition of Waste Biomass – "Biomass, by products, residues and waste streams from agriculture, forestry and related industries….". there are other biomass feedstocks and industries inferred in Table 3 that extend beyond this definition. Suggest this definition is widened to say (at least) Biomass, by products, residues and waste streams from agriculture, forestry and related/other industries including all those inferred in Section 4 (Applicability Conditions) and Table 3." This would capture those. For example urban green waste and invasive weeds (in Table 3) are neither agriculture, forestry or related industries under the current definition. o See also related comments below regarding feedstocks context to emissions reduction/avoidance vs sequestration/CDR…this has context to defining biomass vegetation feedstocks (that provide sequestration) compared to other feedstocks currently falling under the broad umbrella of "biomass" which provide emissions reduction benefits rather than CDR (eg animal manures/biosolids). This important context could be clarified further in defining biomass. See also related comment further below regarding the commercial need for mixing these feedstocks (e.g. vegetation biomass mixed with biosolids etc) to make more viable and effective biochars for various soil and non-soil applications.	Definition of waste biomass has been revised and updated to make it clearer for the project proponent.
30 (10)	SEATA	Applicability Conditions	*Contaminant levels (including heavy metals)* - Any reference to all types of contaminant levels/criteria (including but not limited to heavy metals) throughout the document (eg Table 3) should be in context of being fit for purpose in context of end use application and associated relevant guidelines. For example non-soil applications may indeed be fine for higher levels of certain contaminants not suitable for soil applications (eg heavy metals in roads etc which are (even more) bound up and not bioavailable). This is why ANZBIG has established the three grades of biochar to allow a "horses for courses" approach to match biochar quality needs to end use applications, building on the initial work of IBI and EBC and others. The highest quality criteria is required for Premium grade chars for applications such as feed supplements, appropriate criteria for Standard Grades used in soils, and "lower" criteria appropriate for industrial applications (industrial Grade chars). Table 3 current mentions that "Feedstocks must not contain heavy metals" (for urban biomass). This is neither realistic nor practicable as biomass in natural soils (without any anthropogenic contamination) includes varying levels of heavy metals (typically reflective of the natural soils and their geology/geomorphological origin). Further, total metals concentrations compared to leachable and bioavailable concentrations is an important consideration in any biochar application – is it fit for purpose? (soils vs roads vs carbontech vs concrete vs activated carbon biochar etc etc). Whether the final biochar exceeds relevant guidelines for bioavailability as appropriate for various end uses once processed in biochar is key to managing risk. Further, the relative risk presented by current accepted management activities globally such as open burning in both agriculture and forestry (hazard reduction) is a huge air pollution problem linked to many diseases (and indeed many deaths)…. alternative processing to biochar in both the developing and developed world presents a far lower relative risk to society than the status quo. Prescriptive criteria need to consider relative risk context in each application, just as we do with considering avoided CO_2 emissions. ANZBIG is pursuing a risk-based approach to biochar production and use in its	Feedstock shall comply with relevant thresholds regarding heavy metals according to the final end use application, either in soils or non-soils. Table 3 has been revised and updated to reflect the comment feedback.

30 (11)	SEATA	Applicability Conditions	S4 Eligible Feedstocks and production - Mixing of Feedstocks (co-processing) – As Verra has noted, biochar has suffered historically in market uptake due to factors including commerciality. It is inappropriate that mixing of feedstocks is prohibited as often a mix of feedstocks is beneficial for producing high quality biochar dedicated to a target purpose, giving greatest benefits (including as a soil amendment and non-soil applications too). Co-processing to create "Biofertilisers" with biochar and many other soil and non-soil applications has high potential for growth, and is being heavily pursued by the worlds leading biochar economy China, and many others. The proposed constraint in s4 of <10% blending and "no chemicals shall be used" will preclude many climate-beneficial project applications for biochar, and in particular is not relevant at all for non-soil applications (eg roads, concrete, bioplastics/carbontech)…indeed those aspects can be core to enhancing the final product characteristics required. We suggest that if the outcome sought is quantifying carbon credit value (as both emissions reduction/avoidance and/or CDR value) for a given process, keeping the narrative outcome focused to those objectives rather than prescriptive exclusion of processing could yield higher uptake and climate benefit across many existing and emerging biochar applications. We and others within ANZBIG would be happy to discuss further if Verra seeks further consultation on potential options to resolve any issues to allow mixing of feedstocks.	The individual biochar soil-persistence values in the methodology (PRde) are based on IPCC data backed by meta-data at a global scale. However, the mixing has been revised and updated in the methodology providing clarity in which cases it is allowed
30 (12)	SEATA	Baseline Scenario	Separation/Clarity of accounting Emissions Reduction/Avoidance and CDR/Drawdown - We support the option to include avoided emissions in baseline considerations, but also note the critical importance of ensuring clarity and separation in disclosing both Emissions Reduction/Avoidance values separately from sequestration/CDR/Drawdown. Net Zero ultimately requires both to be integrated for a net result of course, but clarity in separated accounting is vital as noted by a number of environmental economics and climate proponents globally (see article from Carbonbrief here). This is particularly important for animal and human manures (agricultural and municipal biosolids) where the reduced/avoided emissions benefits are high, but CDR benefit is low (but resulting biochar is of importance and value in end-use application so should be encouraged)…what matters is the accounting declaration.	Please see comment 23.2
30 (13)	SEATA	Baseline Scenario	Nitrous Oxides - The avoided emissions for biochar applications involving nitrous oxides (eg N2O) could/should also be considered due to their significance as a GHG and their potential for substantial reductions when integrated with biochar (eg in composts and agricultural soils among many others including agricultural and municipal biosolids application to land vs conversion to and use of biochar).	There is no clear effect of priming based on latest publication of Woolf, Lehman, et at (2021). Further, the scope on priming it is related to the SOC carbon pool, the project activity of this methodology is the application of biochar in soil and non-soil end uses. Therefore, the GHG emission associated with priming are outside the bounaries of this methodology.
30 (14)	SEATA	Baseline Scenario	Avoided emissions in non-soil applications for biochar such as roads and concrete can also be substantial.	The methodology / project boundary accounts for GHG emissions from sourcing of feedstock until the final application of biochar, either in soils or non-soils. Also, the project activity is the application of biochar. The avoided emissions referring to the use of biochar in other industries is out of the scope of this methodology.
30 (15)	SEATA	Applicability Conditions	Priming ("negative priming") benefits in soil applications has been scientifically established (see here and here) and should have potential for inclusion where suitably assessed and justified	There is no clear effect of priming based on the latest publication of Woolf, Lehman, et at (2021). Further, the scope of priming is related to the SOC carbon pool, and the project activity in this methodology is the application of biochar in soil and non-soil end uses. Therefore, the GHG emissions associated with priming are outside the boundaries of this methodology.
31 (1)	UK Biochar Research Centre	Definitions	Page 6, 3. Definitions The use of the term "Fixed carbon content" should be reconsidered as it is traditionally used in Proximate Analysis (see ASTM D1762-84) to indicate the recalcitrant fraction of coal or charcoal used as a fuel (e.g. (Aller et al., 2017)). However, proximate analysis and the use of the term "fixed carbon content" is also common in current biochar research. As the fixed carbon to volatile matter ratio of biochar can be used to approximate biochar stability (Crombie et al., 2013), using the same term with a different meaning within this methodology will likely lead to misunderstandings. Therefore, to avoid confusion, the term "fixed carbon" as used throughout the proposed methodology should be replaced by an alternative term (e.g. stable, permanent, secured, etc.).	The fixed carbon term has been disscused and revised. Currently, the agreed term used in the methodology is "Organic carbon content on dry weight basis". The definition is more expansive because the methodology includes non-soil applications.
31 (2)	UK Biochar Research Centre	Applicability Conditions	Page 11, 4. Applicability Conditions: Biochar is eligible to be used in non-soil applications including but not limited to cement, asphalt, and plastics. For non-soil applications, project proponents must demonstrate that biochar is a long-lived and stable carbon sink using peer-reviewed literature and/or reliable documentation. We have doubts about the inclusion of biochar-amended plastics as an eligible non-soil application. While plastics might be long-lived and stable, the common use phase will not cover the whole timeframe relevant for carbon sequestration (i.e. 100 years). Therefore, biochar use in plastics is difficult to define as an end application and has to include the post-use application of the product as well. If any recycling method other than landfilling (which is being banned in various countries) will be used, some of the carbon will be released and the soil decay rate might not be applicable anymore. Furthermore, the risk of double-counting the carbon content will be present either when the material is recycled or if the used biochar plastic is utilised in other waste treatment technologies such as composting or anaerobic digestion. We suggest adding additional more strict requirements or limitations for the use of biochar-amended plastics, such as a positive list for eligible applications (e.g. the use of biochar amended plastics as soil	Plastics as end use has been revised and excluded from the revised methodology version.
31 (3)	UK Biochar Research Centre	Quantification of GHG Emission Reductions and Removals	Page 20: 8.2.2.1. Mass of biochar of type t applied to the respective end-use in the year y (tonnes)12, see application stage. The produced mass of biochar shall be determined in alignment with CDM tool 13 Option 1 using a weighing device or Option 2 without a weighing device. Using a weighing device only for determining the produced mass of biochar will certainly lead to inconsistencies. Biochar is well known to adsorb moisture from ambient air. Hygroscopicity can result in weight differences of more than 10%wt (d.b.) (Kymäläinen et al., 2015; Popescu et al., 2015). Therefore, any use of biochar weight has to be based on a dry basis by subtracting the moisture content of the biochar at the time of measurement. This is especially important as the carbon content of biochar is measured by dry-combustion and therefore reports on a dry basis. A combination of wet mass of biochar and the dry carbon content will artificially increase the calculated amount of stable carbon.	Moisture content has been revised and considered. The methodology points at the USDA moisture protocol as example. Further, the carbon content is based on dry weight basis.
31 (4)	UK Biochar Research Centre	Quantification of GHG Emission Reductions and Removals	Page 20: PRde A clarification is needed for what decay rate will be used if biochar exceeds an H:Corg ratio of 0.4. Also, Budai et al. (2013) and Camps-Arbestain et al. (2015) are not included in the reference list.	H:Corg ratio is a metric to determine the level of carbonization of biomass material and therefore the biochar's stability. H:C org has been revised and clarification has been made about the limits.

31 (5)	UK Biochar Research Centre	Quantification of GHG Emission Reductions and Removals	Page 21: Step 2: Estimate project emissions for high technology production facilities My,t – Should be changed to dry basis Mx,t – Should be changed to dry basis	Agreed and amended accordingly
31 (6)	UK Biochar Research Centre	Quantification of GHG Emission Reductions and Removals	Page 23-24, 8.2.2.2. Option P.2: Low technology production facility, FCp The organic carbon content values show a large variation highlighting discrepancies between production technologies. As the organic carbon content displays an inverse correlation to the biochar yield, the use of average values can provide incentives to produce biochar with lower than average carbon contents. This is because the use of lower production temperatures will maximise biochar yields and therefore financial gain, while lowering the actual carbon content and stability of the produced biochar. This would counteract the idea of long term carbon removal. We strongly argue against an average value as being an appropriate assumption to determine the carbon content of low-tech biochar. A sunset clause might be used to require the determination of the organic carbon content at some reference point after the individual project starts to allow a recalculation and ensures that the necessary laboratory analysis is not prohibitive. This could also provide the possibility of monitoring the applicability of the values used by the IPCC for future amendments.	The values for low technology are sufficiently conservative regarding the Fcp. The Fcp value consider the standard deviation deduction.
31 (7)	UK Biochar Research Centre	Quantification of GHG Emission Reductions and Removals	Page 26-27: Emissions associated with the thermochemical process The average emission factor of 0.09 t CH4/t biochar might not be a conservative assumption. As outlined in the mentioned publication, the use of 100% herbaceous biomass led to much larger emissions of up to 0.15 t CH4/t biochar and this might be the case for many marginal feedstocks with varying moisture contents. As also stated by the author, CH4 emissions are relatively difficult to measure and also highly dependent on the operator, feedstock conditions, and rate of measurements. Additional research should be identified to bolster the claim of average CH4 emissions over various pyrolysis systems.	We argue to maintain the formula. The calculation is already conservative and effectively yields higher emissions than removal potential. The project proponent must seach for data for the pyrolysis type they will use if the default value will not be used
31 (8)	UK Biochar Research Centre	Leakage	Page 31, 8.3. Leakage: Considered zero if the project proponent establishes that 100% of the biochar originally intended for the application stage is not lost before its application. The moisture content of the applied biochar must be measured to establish if 100% of the produced biochar is actually applied. Hydroscopic moisture uptake of biochar can easily disguise more than 5% biochar leakage.	Moisture content has been revised and considered. The methodology points at the USDA moisture protocol as example. Further, the carbon content is based on dry weight basis.
32	Cornell University		PDF	The comments has been addressed directly in the document
33 (1)	Rainbow Bee Eater	General (International standards)	Include the Australian and New Zealand Biochar Industry Group Code of Practice in addition to IBI and EBC guidelines, as it is soon to be finalised (draft issued for consultation is being finalised by November 2021).	We acknowledge the ANZBIG COP, however, it has not been approved. Furthermore, the methodology also points out that national /regional guidelines /standards can be followed.
33 (2)	Rainbow Bee Eater	Quantification of GHG Emission Reductions and Removals	Further recognise H/Corg as the current best estimate of permanence to enable 100 year and 1000 year biochars to be acknowledged and valued.	We acknowledge the H/Corg paramether as described in comment 31 (4). However, the IPCC values for demonstration of permanence has been chosen in the methodology as a peer review and scientifc source
34	Olivann		PDF	The comments has been addressed directly in the document
35	TerraCarbon	Baseline Scenario	If I understand correctly the baseline emissions are assumed to be 0 in most cases and the climate impact of biochar is calculated based on the CO2-eq content of the final product. But if biochar is primarily impacting the climate by displacing CH4 emissions, wouldn't this be a low estimate in terms of GWP? Or is this a conservative approach based on the idea that decay emissions could include multiple GHGs, so project activities are based just on an estimate of CO2-eq in the biochar?	Baseline avoided emission scenario has been set as zero following a conservative approach and in order to avoid double accouting.
36	Native Eco	Applicability Conditions	Regarding mixing of feedstocks - dairy farms often bed their cows on sawdust, which gets mixed in with the manure. We have a project that makes biochar from manure. It seems odd that each of sawdust and pure cow manure, if otherwise left to decay or to be combusted, would be an eligible feedstock, but not if they are mixed (and mixed for reasons other than changing the composition of biochar). Can you make an exception for this case? Otherwise a lot of dairies will be left out of that potential revenue stream.	Please refer to comment 13.1
37 (1)	ALG Corp	Applicability Conditions	Feedstock mixtures of differing or mixed waste biomass types should not be excluded. It is possible to correctly account for the differing carbon content of the feedstock components and associated volumes. For example, there exists potential to mix woody biomass with manure to further increase the carbon content of the biochar product.	Please refer to comment 13.1
37 (2)	ALG Corp	Applicability Conditions	Request to include additional wood waste items in the definition of "Recycling economy" such as cardboard, wood pallets, and other wood waste.	Table 3 has been revised and upated. Please consider it is a non-exclusive example list.
37 (3)	ALG Corp	Applicability Conditions	Request to include non-soil application eligibility for environmental remediation, wastewater treatment, and other biological treatment purposes.	Environmental remediation is a soil application therefore it is included as an end use. The project proponent must prove long-term permanence for any final use of biochar.
38	Pacific Biochar		PDF	The comments have been addressed directly in the document
39 (1)	Shell	Applicability Conditions	Purpose-grown feedstock is currently out of scope for the Verra protocol. This is probably to avoid competition for land with food resources. But what about fast-growing plants in marginal lands? How would these lands be identified? How could this be managed? Furthermore, the residue feedstocks in Table 3 could create increased competition with other uses (biofuels and energy production from biomass) that could lead to increased emissions with more land use change, and so these factors would need to be considered. Dedicated fast growing feedstocks on for example marginal land could mitigate competition for	Please refer to comment 6.2
39 (2)	Shell	Applicability Conditions	How can it be ensured that feedstocks will not be mixed in low-technology pyrolysis cases? Smallholder production systems are given as an example for the low-technology scenario. These systems are highly diverse in space and time. Single feedstocks in these systems would be more realistic when aggregation of waste happens at a higher level than the farm. At that level, high-technology pyrolysis might be more applicable and lead to higher quality credits.	Please refer to comment 13.1
39 (3)	Shell	Definitions	What compositional measurements are included when determining the material change threshold?	Material change is defined in the methodology. However, the term has been revised since mixing is allowed and a laboratory analysis is required.

39 (4)	Shell	Applicability Conditions	Although we do understand that the inclusion of the low-technology option aims at enabling access for smaller players, how will Verra ensure high-quality credits resulting from activities using the low-technology? Research has shown that recording temperature would be a minimum requirement to assess the persistence of biochar in soil. The consistency of credit quality can be jeopardized by not recording at least the temperature in the low-technology scenarios. While pyrolysis temperature and pyrolysis time at maximum temperature can vary in a project using low-technology, so will the quality and permanence of the resulting biochar. This can have a direct effect on the consistency of the quality of the credits and can lead to questions related to the integrity of credits resulting from projects using low-technology as well as high-	Conservative values has been taken to allow for the inclusion of low-technologies. The values are based on peer reviewed data and IPCC defaults.
39 (5)	Shell	General (Energy production)	I don't seen anything about high technology that experts heat and energy that can displace and reduce fossil fuel use/emissions, would this be considered as part of this or accounted for separately in the renewables sector?	The project activity is the application of biochar either in soil or non-soils. The GHG emission reduction due to displacement of fossil fuels is not within the methodology boundaries.
39 (6)	Shell	Quantification of GHG Emission Reductions and Removals	Given the large uncertainties in Table 5 on Fcp, why not allow projects to measure and demonstrate their actual feedstock Fcp values even for low technology? This would significantly reduce subsequent uncertainty on the credit volumes issued from such low technology options.	The methodology states that a material analysis is preferred to determine Fcp. But when this is not possible, then default factor shall be used.
39 (7)	Shell	Leakage	Biochar oxidation can increase with transportation leading to leaching and lateral export with water. Currently, the risk for water erosion is estimated to be minimal in the proposed methodology. Does this	Risk is only considered when biochar is applied to the soil. For anything lost during transportation, it is considered under leakage.
39 (8)	Shell	Applicability Conditions	Can we assume that sequential additions of biochar on the same land are allowed under this methodology?	Yes, as long as the relevant national guidelines and best practices are maintained, this is an option. However, it is not the scope of a carbon methodology to advise on suitable application rates, which are determined by the local context
39 (9)	Shell	Baseline Scenario	Given that biochar has soil carbon and GHG benefits when applied to soil why are N2O emissions not also considered under the anaerobic decomposition definition, I would think this baseline and then comparison with biochar amended to soil would result in significant reductions.	This methodology primarily focuses on the removal potential of biochar. The numerous and evolving application scenarios will be better reflected in other protocols, such as VM0042. It is therefore strongly suggested to look into these options.
39 (10)	Shell	Applicability Conditions	Given the published literature on the varying effects of biochar addition on soil macro and microfauna, do VERRA propose constraints on land application rates both acute and chronic over time for a given area?	See above answer 39 (8)
39 (11)	Shell	Applicability Conditions	The biochar combinations as a nutrient delivery mechanism with fertilizers would be excluded, yet would provide both carbon and GHG benefits in terms of subsequent slow release fertilizer delivery for plant uptake that would limit N2O emissions. This should be part of the accounting with projects for emissions reduction benefits.	See above answer 39 (9)
39 (12)	Shell	Leakage	The risk of loss from flooding or drought with biochar should have no effect on biochar stability or decomposition as evident by the age of charcoal present in coastal sediments deposited from natural fires and transported from the point of production by wind and water erosion. This is simply a measurement and accounting challenge for in situ based measurements. Fire would however potentially result in losses back to the atmosphere	Fire and other natural factors are differentiated in section 8.4.1.1. of the methodology. However, erosion due to wind and water are still considered as reversal as the fate of biochar outside the project can not be determined and confirmed, applying the conservative approach a loss of biochar due to soil and wind erosion is considered as reversal.
39 (13)	Shell	Quantification of GHG Emission Reductions and Removals	Again on tables with default factors for feedstock carbon contents I would use measured rather than default factors.	See above answer 39 (6)
39 (14)	Shell	Quantification of GHG Emission Reductions and Removals	The protocol lacks the ability to include additional emission reductions through measurement technology such as flux chamber and eddy covariance to directly assess the biochar effects on reductions in GHG emissions (specifically N2O and CH4). The protocol should allow for project proponents to demonstrate these benefits and additional credit volumes through the use of robust measurement and monitoring	The potential avoided emissions of N20 or CH4 from soil following biochar application are beyond the scope of the methodology. The biochar methodology is a global methodology and trying to assign N20 and CH4 avoidance factors for all types of biochar in all types of soil is entirely impractical. Furthermore there is no scientific consensus on N20 or CH4 reductions following
39 (15)	Shell	Additionality	The activity penetration will be re-assessed within 3 years of the initial approval of the methodology. How will that affect the existing projects?	Please see comment 30 (7). The activity penetration reassessment shall not affect existing project implementation. However, when renewing a project crediting period, the project proponent shall use the most up-to-date methodology version (see *VCS Standard v4.1*, Section 8).
40	ESG Partners	General (Project development)	if ESG Partners was to do a biochar project meeting these guidelines in Australia, would we be able to get VCS certification for it, for voluntary credits?	Project proponents shall follow a country's climate policy agreements (NDCs) and be aware that there is no double accounting of climate benefits permitted.
41	Char2Cool e.V.	Applicability Conditions	We produce biochar from water weed – water hyacinth, Salvinia molesta, etc. These aquatic plants are not represented in the methodology. Isn't it? But these aquatic plants have a higher potential for biochar production than land biomass. And it's a weed.	Water hyacinth and water invasive species are within the classification "Aquaculture plants". Table 3 has been revised and updated. Please consider that the examples are non-exhaustive.
42 (1)	Biochar Technologies	Quantification of GHG Emission Reductions and Removals	The methodology does not account for the initial pulse of CO2 emitted during pyrolysis (e.g., Campbell et al., 2018), which will delay the positive GHG effect of the production / application of biochar depending on the efficiency of the process, the feedstock and the environment.	Cambell et al. 2018 considers the dynamics between forest carbon reductions from forest harvest (and the decay of slash piles over time) with biochar based pyrolysis and application. We do not believe the "pulse" or potential debit is an issue given sustainability criteria for forestry feedstocks and other eligibility requirments for biomass waste.

42 (2)	Biochar Technologies	Quantification of GHG Emission Reductions and Removals	The permanence adjustment factor PRde is based on Budai et al. (2013), a source about which I have many concerns: a. It is a surprise the authors did not even consider the H:Cfixed (Cfixed: fixed carbon as estimated by proximate analysis) as a possible estimator for PRde. Differently from the selected H:Corg, H:Cfixed does not include the labile portion of Corg, which is known to have a low permanence, i.e., I would expect H:Cfixed to be a better estimator of per-manence. b. The data set derived from two other studies is just too small to cover the plethora of biochars that can be produced from the diverse combinations of feedstocks and py-rolysis conditions. And even for this limited set the linear relationship estimated only accounts for about 50% of the variability in the data, which is a poor result for the purpose of calibration, as is intended here. c. The estimation of permanence does not account for the impact of environmental fac-tors. d. This approach to estimate permanence was already objectively criticized as inade-quate by Noel Gurwick (and others) in the public comments (pg. 99 ff) to the biochar methodology submitted to the American Carbon Registry – a methodology which was never implemented in practice. e. The authors themselves anticipated their methodology would be outdated by 2021: "… with continued research and development … we are confident that the test meth-odology will grow more robust and more rigorous over time, allowing for a more com-plete and precise estimation of stable carbon in biochar."	The IPCC guidelines and factors are global, rigorous, and derived from peer reviewed data.
42 (3)	Biochar Technologies	Quantification of GHG Emission Reductions and Removals	While accounting for low technology pyrolysis in the methodology has important social and environmental benefits, it is simply impossible to have a reasonable estimate of the biochar permanence adopting a unique universal factor (PRDE = 0.56 as stated on page 24).	The 0.56 value is a conservative assumption to estimate the bicohar permanence. However, when the project proponent can measure temperature and do a material analysis, then values from Table 5 should be used
42 (4)	Biochar Technologies	Definitions	The term "fixed carbon content" is unfortunate as "fixed carbon" is one of the quantities quan-tified by proximate analysis (i.e., what remains after subtracting the weights of moisture, vol-atile matter and ash from the sample weight) and proximate analysis is commonly used to characterize biochar. Would "sequestered carbon" be an alternative to "fixed carbon content" here? Additionally, shouldn't it be stated in the definition "… expressed as tCO2e" – at least this is what I depicted from equation (4), pg. 20.	Please see comment 6.5
42 (5)	Biochar Technologies	Applicability Conditions	I do not understand the fetish in the biochar community with a limit for the heat recovery of the pyrolysis process when addressing the biochar's capacity to sequester carbon / remove CO2 from the atmosphere. Indeed, the recovery of the heat can contribute to reduce fossil fuel GHG emissions, something that should be addressed by other methodologies or as a sep-arate part of the present methodology, but this will often not be the case: in Brazil for exam-ple, in the countryside there is little or no use for the heat – hence, to recover it, it will be necessary to transport the feedstock over large distances and requires much more elaborate and expensive pyrolysis technologies, which will make the economic viability and adoption of	Heat recovery is needed (to avoid use of propane or other fossil fuels) and it is within the project boundary
42 (6)	Biochar Technologies	Applicability Conditions	The inclusion of purpose-grown biomass into the methodology would allow for and incentivize the remediation of degraded land, which is a worldwide problem: o the degraded land itself can be used for cultivation of the biomass – bamboo is an exceptional plant species for this purpose in tropical and subtropical regions: it can be planted in areas even severely affected by erosion, its rhizome helps stabilize the soil, it is fast growing and very productive; o indirect land use change will be minimal because of the low productivity of degraded land; o the biochar produced from the biomass can itself be used to remediate thedegraded land;	Please see comment 6.2
42 (7)	Biochar Technologies	Applicability Conditions	Additives (e.g., lime, bentonite, rock powder, clay or soil) are restricted to 10%. Is there an objective reason for this restriction? Higher rates could be beneficial for the pyrolysis process and / or the biochar properties (e.g., Frances et al., 2018).	The restriction is due to the GHG impact that the additives could have in the net GHG balance. Also to secure the use of the emission factors.
42 (8)	Biochar Technologies	References	Camps-Arbestain et al., 2015 is cited on pg. 20 but not listed in the references. If the reference is to the book chapter "A biochar classification system and associated test methods" it is in-deed irrelevant because it simply reproduces the information from Budai et al. (2013).	Reference section has been revised and the author has been added
42 (9)	Biochar Technologies	Quantification of GHG Emission Reductions and Removals	The column "Values for FCP" (Table 5, pg. 25) should include single values and not an interval – to be consistent with the FCP value of 0.56 for low technology facilities (pg. 24) it would be 0.19 for biochar produced from animal manure by pyrolysis (the lower 95% confidence limit), for example. (It would have been better and consistent with the PRDE value to use the lower 95% prediction limit, a small but important difference, but this value is not supplied in the reference.)	The table has been updated to show single values following a conservative approach
43 (1)	EBI Consortium	Quantification of GHG Emission Reductions and Removals	The decay rate is set to 0.3% per annum according to the IPCC. This might be correct for the first years and in case of not fully cabonized biochars. For biochars with a H/C ration <0,7 (not<0.4) and high pyrolysis temperatures over 600°C, we suggest to use a value of .89 after 100 years. For temperatures between 450 and 600°C and pyrolysis time over 5 minutes, we suggest to use the factor .80. Please find the relation of H/C O/C and permanence here: https://www.researchgate.net/publication/344413546_Feedstock_choice_pyrolysis_temperature_and_type_influence_biochar_characteristics_a_comprehensive_metadata_analysis_review	The H:Corg value has been corrected as H:Corg<0.7. The 0.3% per annum is appropriate (per the IPCC and the EBC).
43 (2)	EBI Consortium	General (Double counting)	There exists a risk of double accounting if customers are able to certify an emission reduction AND the creation of carbon sinks of the same C atoms.	This methodology considers the application of biochar as the main project activity. Therefore no risk of double counting exists between the production and application of the biochar. However, if the same C atom would be credited under this methodology and subsequently flagged as increased SOC (i.e. under VM0042), this would relate to double counting. Therefore the stacking of methodologies within the same area must be carefully implemented according to the *VCS Standard v 4.1*. Further, the methodology has been revised to exclude any avoided emissions from feedstocks in the baseline.The default baseline emission avoidance scenario for the project activity feedstock is zero (a conservative assumption). No avoidance emission are considered.

43 (3)	EBI Consortium	Quantification of GHG Emission Reductions and Removals	The reduction of emissions and the creation of carbon sinks are two distinct systems which should strictly be separated. This is not the case in the draft methodology. Please differentiate.	Verra's registry does not differentiate between emission avoidance/reduction with GHG removals. The methodology has been revised to exclude any avoided emissions from feedstocks in the baseline.The default baseline emission avoidance scenario for the project activity feedstock is zero (a conservative assumption). No avoidance emission are considered. The result is that in this proposed version all VCUs issued will effectively be removals and could theoretically be marketed as such.
43 (4)	EBI Consortium	Applicability Conditions	Sewage sludge is supposed to be part of the eligible feedstock. In the document, we don't see it being specifically mentioned.	Table 3 has been revised. Biosolids have been added.
43 (5)	EBI Consortium	Definitions	The term "waste biomass" is politically difficult, we are generally talking about residues. The latter do not necessarily have to be waste	Please refer to comment 8.4
43 (6)	EBI Consortium	General (International standards)	The produced biochar must comply to standards such as IBI, EBC or national regulations. We are convinced that national regulations do not necessarily provide sufficient prevention of potential risks and would like to see all biochar comply to international standards like IBI or EBC.	The section has been revised. The project proponent shall comply with IBI or EBC, and the national regulations. The word "OR" has been deleted.
43 (7)	EBI Consortium	Applicability Conditions	The definition of high-tech production facilities is rather weak and does not prevent the emission of potent greenhouse gases. Especially the definition of low-tech lacks precision. Different existing production technologies have to be mentioned and evaluated. Emissions of all types have to be measured as literature is, with the exception of the Kon-Tiki, where there is some evidence, practically non-existent. We suggest a positive list of technologies that will need a scientific basis, where, inter alia, possible emissions have to be determined	It is not the intention and scope of the methodology to define which technologies are approved or not. The methodology is technology agnostic and only provides a framework and guidelines for quantification aligned with the applicability conditions.
43 (8)	EBI Consortium	Leakage	With regards to the loss of biochar via erosion or deflation, we see no net loss. If biochar particles are transported off the site, where the sink was created, they will be deposited elsewhere and continue to serve as a carbon sink.	If they go elsewhere, that is outside the project boundary. The methodology does not account for removals outside the project boundary. Also, sink documentation /permanence must be proven.
43 (9)	EBI Consortium	Applicability Conditions	Contrarily, if biochar is used in materials like plastics (non-soil application), the end of life has to be clearly defined. While in asphalt and concrete, the carbon will be stored for very long periods of time, this is questionable for materials like plastics, tyres and many consumer goods.	The demonstration of permanence is on the project proponent. However, plastics have been excluded in this initial version of the methodology