



International
Carbon
Registry

Substitution of fossil fuels for the use of sustainable
biofuels manufactured by Green Fuel Extremadura S.A.

Project Design Description

ACM0017 V3.1

Abstract

Calculation of mitigations of GHG emissions due to the operation of a biofuel plant owned by Green Fuel Extremadura S.A. The GHG emissions mitigations consequent of the biofuel consumption and, therefore substitution of the fossil fuel use, are greater than the ones that would occur if the said plant would not be in operation (baseline scenario).



Green Fuel Extremadura S.A.

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Project Design Description

Basic Information	
ID of Project	ICR0004
Project Name	Substitution of fossil fuels for the use of sustainable biofuels manufactured by Green Fuel Extremadura S.A. Project Design Description
First Date of Submission	September 1, 2021
Date of Validation	September 21, 2021
Version Number of the PDD	1
Date of Version	September 1, 2021
Project Proponent	Green Fuel Extremadura S.A.
Representative	Juan Carlos Benavides Rueda
Host Country(ies)	Spain
Scope of the Project Activity	1. Energy industries (renewable - / non-renewable sources) 5. Chemical Industry 7. Transport 15. Agriculture
Other Requirements Applied	N.A.
Methodology(ies) Applied and Version Number	ACM0017 V3.1
MRV Cycle:	Yearly
Other Certifications:	ISCC – EU and NIS (<i>“National Italian Scheme”</i>)
Estimated Annual Average GHG Mitigation	90.000 T CO ₂ eq /year

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1. Project Description

1.1 Purpose and General Description of the Project

Climate change caused by anthropogenic activity has been identified as one of the greatest challenges the world is facing and will continue to affect businesses and citizens in the coming decades.

Climate change has implications for both humans and natural systems and can have significant impacts on resource availability, economic activity, and human well-being. In response, both the public and private sectors are developing and implementing international, regional, national and local initiatives to mitigate greenhouse gas (GHG) concentrations in the Earth's atmosphere, as well as to facilitate adaptation to climate change.

Most of the economic activities of today's society have a negative balance of greenhouse gas emissions; they emit more greenhouse gases than they absorb. These activities are known as carbon generating sources. Some of these activities are the transport of people and goods, or the generation of electricity and other forms of energy. In contrast, activities that have a positive carbon balance, such as the forestry sector, are called carbon sinks.

The main activity of Green Fuel Extremadura S.A. is the manufacturing and marketing of liquid biofuels. These products are used for mixing with mineral and fuel products in diffuse sectors, mainly in transport. Due to this, the activity of Green Fuel Extremadura S.A. is implying a substitution of a fuel of fossil origin, for one of renewable and sustainable origin. This activity has, among other things, a reduction in GHG emissions associated with its operation.

This report is carried out in accordance with the requirements of the UNE - EN ISO 14064-2: 2019 standard, in order to determine the baselines, monitor, quantify and report on the emissions of the Green Fuel Extremadura S.A. project, designed specifically to reduce GHG emissions.

- Project title, purposes and objectives

The title of this project is "Substitution of fossil fuels for the use of sustainable biofuels manufactured by Green Fuel Extremadura S.A."

Its purpose and objectives are to determine the baselines and monitor, quantify and report the emissions of the Green Fuel Extremadura S.A. project, specifically designed to reduce GHG emissions.

- GHG project type

Displacement of more GHG-intensive fossil fuels for combustion in vehicles, by substituting diesel for sustainable biodiesel in the diffuse transport sector. Green Fuel Extremadura S.A. will produce an amount of biodiesel under the ISCC EU scheme recognized for compliance with Directive 2009/28 / EC of the European Parliament and of the Council of April 23, 2009 on the promotion of the use of energy from renewable sources and which modifies and repeals Directives 2001/77 / CE and 2003/30 / CE (RED I), Directive (EU) 2018/2001 of the European Parliament and of the Council of December 11, 2018 on the promotion of the use of energy from renewable sources (RED II), and a National Scheme for the same purpose: the NIS (*"National Italian Scheme"*). This biodiesel will be blended and consumed instead of fossil fuel (diesel) with higher GHG emissions.

- Emission reductions and increase of removals of GHG emisisions likely to occur as a result of the GHG project

Reductions in GHG emissions will be verified progressively and periodically, and always after the biofuels have been manufactured, sold and consumed.

The procedure will be:

1. During each calendar year, Green Fuel Extremadura S.A. will collect all the information related to GHG from the batches, in accordance with the methodology set forth in the subsequent points.
2. At the end of each calendar year, Green Fuel Extremadura S.A. will make a GHG declaration indicating, among other things, the volumes of biofuels produced and the GHG emissions of each of the batches.
3. These batches will have been sold to a trader, who must declare the country of final consumption of the biofuel. This way, not only upstream traceability is ensured, but it is also known with certainty that the product is sold for transport purposes. The GHG statement will also include this information of every delivery.
4. GHG emission reductions will be calculated in equivalent tonnes of carbon dioxide per year (T CO₂ eq / year).

1.2 Location

Green Fuel Extremadura S.A. is strategically located in Los Santos de Maimona (Badajoz), Extremadura. This privileged location allows easy access to the main distribution and collection centers of the finished product and raw material, such as the southern ports of the Iberian Peninsula, such as the ports of Seville (130 km), Cádiz (250 km), Huelva (210 km) and Lisbon (290 km). In addition to this, the plant is at a central point in relation to the largest collectors of raw material at the local level and in Portugal. The plant also has access to a railway line in which the loading and unloading of the finished product (biodiesel) and raw materials (used oils) are carried out. It has a transport company that works directly for the collection of used oils, and transport of products (biodiesel) and co-products (glycerin).

The coordinates of the plant are the following: 38.4708695, -6.3628227. The location of the plant can also be seen through the following Google Maps link:

<https://www.google.com/maps/place/Greenfuel+Extremadura/@38.4700632,-6.3658268,15z/data=!4m13!1m7!3m6!1s0x0:0x0!2zMzjCsDI4JzE2LjgiTiA2wrAyMicxMy45Ilc!3b1!8m2!3d38.4713205!4d-6.3705151!3m4!1s0xd13ff77881458b5:0x97bc05afd5a13a9!8m2!3d38.4703494!4d-6.3626452!5m1!1e4>



Figure 1. Satellite image of the plant



Figure 2. Aerial image of the plant.

1.3 Technology Applied

The plant has Wesfalia technology that has been adapted for the production of both high and low acid waste. This allows the production process to work with raw materials that come from other production processes such as oleins and fatty acids from chemical or physical refining, from the collection of frying vegetable oils, category 1 fats and other vegetable residues.

In order to process this type of raw material, the plant has a pretreatment in which the residual oils are conditioned, which in later stages will pass to the reaction phases. Depending on the acidity of the residual oil, it will be sent to the transesterification (low acid oils) or esterification (high acid oils) lines for reaction. As a co-product, glycerin is obtained with a concentration of 80%.



Figure 3. Storage tanks.

- Main product

Biodiesel is a product that obtains its basic raw materials from vegetable oils, animal fats, used oils, vegetable oil residues, fatty acids and oleins whose main component is triglycerides.

It is an energy source accessible to all countries, respectful with the environment and that can be used pure as a substitute for mineral diesel or mixed in any proportion as long as it complies with the European quality standard UNE – EN 14214: Fatty Acid Methyl Esters (FAME).

Chemically, they are fatty acid esters with glycerin. To obtain biodiesel, oils and fats are treated by industrial esterification and transesterification processes, which are applied in the preparation of total or partial substitutes for gas oil obtained from petroleum. Biodiesel can be mixed with diesel from petroleum refining in different quantities. Abbreviated notations are used according to the percentage by volume of biodiesel in the mixture: B100 in case of using only biodiesel, or other notations such as B5, B15, B30 or B50, where the numbering indicates the percentage by volume of biodiesel in the mixture.



Figure 4. Main product infographic.



Figure 5. Plant reactor.

- Co-products

Technical glycerin is a co-product that occurs in the biodiesel production process and is used in many industrial processes. Glycerin is a brown viscous liquid (melting point = 18 ° C) with a percentage of glycerol greater than 80%. It is obtained after cleaning, distilling and neutralizing the original crude glycerin, in order to eliminate free acid residues, soaps and reduce methanol. This final product is not applicable in food, animal or human use.

- Expected degree of activity

From the historical operating values of the Green Fuel Extremadura S.A. plant, the following levels of activity can be estimated:

- Maximum plant capacity: 110.000 T / year
- Estimated annual production: 65.000 – 70.000 T / year
- Average production capacity: Approx. 60%

1.4 Funding

Green Fuel Extremadura S.A. has been publicly funded in two opportunities.

1. 25/06/2008:

Incentivos Regionales de M^º de Economía y Hacienda (regional incentives)

- Total: 2.537.226.72 €

Incentivos Exremehos Regionales de la Junta de Extremadura (regional incentives)

- Total: 2.748.660.00 €

	File	Cofunding Entity	Amount [€]
IA-07-0173-6		FEDER	1.970.704,00
		Junta de Extremadura	492.676,00
		Total Autonomic Incentives	2.463.380,00
		Total Regional Incentives	2.273.889,36

Table 1. Public funding of Green Fuel Extremadura S.A. on 2008.

1. 19/11/2019:

Proyecto de investigación industrial (Industrial research project)

- Total: 34.808,71 €
- File: IDAI – 1 8-0046-3
- Founder: *Servicio de recursos de la investigación científica empresarial. Secretaria general de ciencia, tecnología, innovación y Universidad. Consejería de economía, ciencia y agenda digital. Junta de Extremadura.*

1.5 Ownership

The company is made up of national and international capital whose shareholder composition is as follows:

- Impact Finance Investments Iberia
- Luis Olivares
- C. Daboin
- Six, S.L.
- Impact Finance

Its capital stock is represented by four million thirty-four thousand five hundred thirty nine (4.034.539) shares with a par value of 3 euros (€ 3) each, amounting to a total of twelve million one hundred three thousand six hundred seventeen euros (€ 12.103.617,00).

1.6 Project Proponent(s)

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1.8 Other Certifications

The project is included within the activity of Green Fuel Extremadura S.A. The Extremadura plant has been producing sustainable biodiesel as a voluntary activity since 2012, reducing GHG emissions in the transport sector.

As of the formalization of this project, these activities will be monitored, controlled and verified in order to be able to quantify the GHG reductions associated with their activity.

Green Fuel Extremadura S.A. is certified in the scheme recognized by the European Commission for compliance with the requirements of the RED: ISCC - EU since 2012 without interruption. This scheme is voluntary, and Green Fuel Extremadura S.A. has decided to become certified under it to fulfill its commitment to the environment and open the doors to a new market.

This scheme has three basic requirements in order to comply with the Renewable Energy Directives:

- Control of sustainability requirements in plantations and waste generation.
- Control of the traceability of materials between operators.
- Quantification and control of GHG emissions in the biofuel production chain.

Each of the operators that perform a function within the biofuel production and supply chain is audited by independent entities accredited for this purpose, under the same recognized scheme, so that the sustainability of the material and its correct traceability can be guaranteed.

- Sustainability criteria for waste

- a) The raw material with which the biofuel is made must comply with the definition of waste according to Directive 2008/98/EC of November 19, 2008 on waste: Any substance or object from which its holder detaches or has the intention or the obligation to detach.
After a modification, the following requirement was added: Substances that have been intentionally modified or contaminated to conform to said definition are excluded from this definition.
- b) Those agricultural, aquaculture, fishery and forestry wastes or residues must also meet the requirements for products from plantations.
- Sustainability criteria for farms and plantations

It is a set of restrictive criteria whose ultimate purpose is to prevent deforestation of areas of high environmental value. Biofuels whose raw material comes from:

- a) Lands with a high value for biodiversity.
The following are defined as:
 - Primary forests and other wooded areas with native species when there are no clear signs of human activity and ecological processes are not significantly disturbed.
 - Meadows and pastures with a rich biodiversity, both natural (those that will continue to be so in the absence of human intervention and that retain their characteristics) and non-natural, that are rich in species and are not degraded, unless it is shown that the exploitation of raw materials is necessary to preserve your condition.
 - Areas designated by law for the conservation of biodiversity, unless it is demonstrated that the obtaining of raw materials has not intervened for said protection purposes.
 - Areas designated for the protection of rare, threatened or endangered species or ecosystems, recognized by international agreements or by intergovernmental organizations, unless it is shown that obtaining raw materials has not interfered with said protection purposes.
- b) Lands with high carbon stocks.
The following are defined as:
 - Wetlands
 - Continuous wooded areas with an extension greater than one hectare, with trees taller than five meters and a canopy cover greater than 30%.
- c) Peatland.
Unless evidence is provided that the cultivation and harvesting of this raw material does not imply the drainage of previously undrained soils.
- d) Lands of members of the European Union that do not comply with the legal requirements corresponding to their location or good practices in relation to the environment.
Good practices in relation to caring for the environment are defined by the member states (in the case of Spain, powers are transferred to the Autonomous Communities) and refer to agricultural plans.

For points (a), (b) and (c) another condition is added. Biofuels whose raw materials comes from lands that belonged to these categories as of January 1 of 2008, may not be considered sustainable, regardless of whether they continue to be in the same situation. Therefore, it must be verified that in 2008 the land where the raw material is being cultivated did not meet these conditions. This can be a

problem for plantations in certain countries, where it can be problematic to demonstrate the condition of the plantation land.

- GHG emissions savings

One of the requirements that all biofuels used in transport must meet in order to be considered sustainable is a certain saving of emissions in their environmental life cycle (from the planting or generation of the waste to its combustion in the vehicle) compared to the fossil fuel.

This forces the agents in the sustainability chain to transfer information regarding the GHG emissions that have been emitted so far.

The reduction of GHG emissions derived from the use of biofuels and bioliquids will be, at least, 60% for those biofuels produced in facilities that began to be operational after October 5 of 2015. Otherwise, the minimum savings will be 50%. A facility is considered to be operational when physical production of the biofuel has been carried out.

- Specific requirements ISCC - EU

In addition to these sustainability requirements proposed in RED I and RED II, the ISCC - EU certification scheme itself includes 5 other sustainability principles that must be met in the process of obtaining biomass:

- Responsible environmental protection to protect soil, water and air.
- Safe working conditions.
- Compliance with human, labor and land rights.
- Compliance with international laws and treaties.
- Good administrative and continuous improvement practices.

The details of all these principles can be found in document ISCC 202 - Sustainability Requirements, which can be accessed through the following link: <https://www.iscc-system.org/process/iscc-documents-at-a-glance/iscc-system-documents/>

- Traceability

As there are multiple entities that contribute to the manufacture, transport and distribution of biofuel, it is important to keep track of the traceability of the material. For this reason, it is usual that the last biofuel distributor is not aware of the raw material from which it comes, whether or not it meets the sustainability conditions or the GHG emissions in the life cycle, so it is essential to have a control of the traceability of the product. With each change of ownership of the raw material, intermediate and final products, it is necessary to attach documentation with the necessary information to comply with the requirements: type of material, raw material from which it was manufactured, origin of this, GHG emissions up to the moment, etc. This will imply that it may be possible for economic agents that have in their power (at the same time) biofuels with different sustainability characteristics; being necessary,

by operation, to be mixed in the same container or tank. This reality implies the need to work with a “mass balance” approach; a material control system that:

- a) Allow to mix sustainable material batches with different sustainability characteristics.
 - b) Have the information on the sustainability characteristics and volumes of the batches of the mix and allow the information to remain associated with the mix.
 - c) Assume that the sum of all the batches removed from the mix will have the same sustainability characteristics, in the same quantities, as the sum of all the batches added to the mix.
- Control by Green Fuel Extremadura S.A.

This way, the raw material that is processed by Green Fuel Extremadura S.A., provided that it is certified by a scheme that recognizes these principles, and regardless of the processing chain that has undergone:

1. It will comply with the sustainability requirements of the Renewable Energy Directive in force.
2. Will have information on GHG emissions calculated according to the criteria of the Renewable Energy Directive in force.

These two characteristics have been corroborated by verification entities according to validated schemes for compliance with the directives, which have a well-defined calculation methodology recognized by the European Commission, as well as a baseline with which to compare these emission reductions of GHG.

The Green Fuel Extremadura S.A. plant is characterized by the sole and exclusive processing of used vegetable oils. In other words, it is a plant that processes 100% residual material and does not work with crude oils from plantations. It is clarified that the plant could technically process crude oils but it does not do so due to market strategies.

- RED I - RED II transition

These requirements correspond to the Renewable Energy Directives. During the duration of the project, the schemes will be modified to comply with the requirements of the RED II that has entered into force on July 1 of 2021. The critical points of both directives remain identical: compliance with sustainability requirements, calculation of emissions of GHG, permission to use a mass balance and certification obligation to all economic agents in the biofuel production chain. Therefore, although some points are slightly modified, the principles remain the same.

- ISO 14064-2

The company is certified under ISO 14064-2 for this project. This certification is what provides robustness to the issuance of credits.

1.9 Participation under Other GHG Programs

The company is not participating in any other GHG Programs.

1.10 Additional Information

No additional information must be included.

All information in this project can be shown to the public.

1.11 Other Benefits

All the benefits of the program, in addition to GHG savings, are described in point 1.8 Other Certifications:

- Responsible environmental protection to protect soil, water and air.
- Safe working conditions.
- Compliance with human, labor and land rights.
- Compliance with international laws and treaties.
- Good administrative and continuous improvement practices.

As this are requirements for the ISCC-EU certification.

2. Crediting

2.1 Project Start Date

01/01/2020

2.2 Expected Operational Lifetime of the Project

As long as the plant remains in operation and modifications in regulations do not invalidate the project design.

2.3 Crediting Period

From 01/01/2020 to 31/12/2029, with the possibility of renewing the crediting period

2.4 Start Date of Crediting

01/01/2020

2.5 Duration of Crediting

From 01/01/2020 to 31/12/2029, with the possibility of renewing the crediting period

2.6 Estimation of Mitigations

- Quantification of GHG emissions and / or removals

When carrying out a project based on the GHG emission reductions due to the substitution of one product for another, these emissions are quantified for each batch (delivery) of material and, therefore, the emissions will be quantified per unit of mass or energy of the marketed product. These units of mass or energy will always be accounted for per dry unit (without moisture content) of the product.

In order to frame the sources identified in the project within the voluntary ISCC EU scheme (under which the project is based), each of the SSR will be grouped in the different terms of the global sum of GHG emissions proposed in the Directive on Renewable Energy. Said global sum is defined by the following expression for RED I or RED II:

$$E = e_{ec} + e_l + e_p + e_{td} + e_u - e_{sca} - e_{ccs} - e_{ccr} - e_{ee} \quad (1)$$

Where "E" represents the total emissions of the biofuel.

They represent the final value of GHG emissions in the environmental life cycle of the final product. They must be expressed in grams of carbon dioxide equivalent per megajoule of

energy (g CO₂ eq / MJ), thus, they can be compared with the reference fossil fuel, and the potential savings calculated:

$$S_T^i[\%] = \frac{E_f - E^i [g \text{ CO}_{2\text{-eq}}/\text{MJ}]}{E_f [g \text{ CO}_{2\text{-eq}}/\text{MJ}]} \times 100 \quad (2)$$

Where:

S_T^i : savings in % of emissions from the item i .

E_f : emissions associated with fossil fuel.

- e_{ec} : Emissions from cultivation and extraction of raw material

Emissions from the extraction or cultivation of raw materials apply to all agricultural raw materials, such as rapeseed/canola, palm, soybean, wheat, corn or sugar cane. If waste or residues are used as feedstock for a process, GHG emissions from the extraction or cultivation of the feedstock are considered zero and emissions at the point of origin of the waste or residue are zero.

The calculation of GHG emissions will always refer to a single raw material, for which the different input values are collected. The actual GHG value of a raw material must be provided to the recipient of the raw material in the unit kg CO₂ eq / dry tonne of raw material.

Collection of data on the site

The following data for the calculation of GHG emissions from the crop must be collected on site. They will be the basis for calculating GHG emissions. All input values must be collected for the same reference area and time period. The following example uses the time period of 1 year (year) and the reference area of 1 hectare (ha):

- Amount of seeds in kg of seeds per ha and year
- Quantity of phytosanitary products (PPP) in kg of active ingredient per ha and year (e.g. kg of glyphosate / (ha · year))
- Amount of synthetic fertilisers:
 - Phosphorus (P₂O₅)
 - Potassium (K₂O)
 - Calcium (CaO)
 - Nitrogen (N)
 - Fertiliser in kg of nutrients per ha and year (e.g. kg of nitrogen / (ha · year))
- Amount of organic nitrogen (N) - fertilisers in kg N / (ha · year)
- Amount of crop residues in kg N / (ha year)
- Diesel consumption, electricity consumption and other energy consumption (for any work related to the cultivation and drying of biomass)
- Yield of raw material in humid tonne / (ha · year) and moisture content to determine the yield of dry matter.

Data obtained from bibliographic sources

The following data for the calculation of GHG emissions are normally obtained from the literature or other officially recognized or certified sources:

- Emission factors (EF) for seed in kg CO₂ eq / kg seed
- Emission factors for phytosanitary products in kg CO₂ eq / kg active ingredient
- Emission factors for synthetic fertilisers that reflect the emissions from production, extraction and processing of fertilisers in kg CO₂ eq / kg of nutrient (to be applied for P₂O₅-, K₂O-, CaO- and synthetic N fertilisers)
- Emission factor for field emissions of all nitrogen fertilisers, including synthetic and organic nitrogen fertilisers and crop residues in kg CO₂ eq / kg N (EF_{field})
- Emission factors for diesel, electricity or other energy source in kg CO₂ eq per unit of energy used

Calculation formula

The GHG emission formula for raw material extraction or cultivation e_{ec} includes all emissions from the extraction, processing and production of relevant inputs during field preparation, cultivation, harvest and post-treatment (e.g. raw material drying) :

$$e_{ec} \left[\frac{kg \text{ CO}_2\text{-eq}}{ton} \right] = \frac{(EM_{fertiliser} + EM_{N_2O} + EM_{inputs} + EM_{diesel} + EM_{electricity}) \left[\frac{kg \text{ CO}_2\text{-eq}}{ha * yr} \right]}{yield \text{ raw material} \left[\frac{ton}{ha * yr} \right]} \quad (3)$$

The sum of GHG emissions from fertilisers, plant protection products, seeds, diesel and electricity (EM, here in kg CO₂ eq per ha per year) is divided by the raw material yield in tonnes per ha per year to calculate the specific GHG per tonne of raw material. Production refers to the dry matter content. Therefore, the emissions are divided by the amount of dry raw material or calculated by applying a humidity factor:

$$e_{ec} \text{ feedstock} \left[\frac{kg \text{ CO}_2\text{-eq}}{ton_{dry}} \right] = \frac{e_{ec} \text{ feedstock} \left[\frac{kg \text{ CO}_2\text{-eq}}{ton_{moist}} \right]}{(1 - m)} \quad (4)$$

Where " m " is the moisture content between 0 and 1.

The emissions of the different inputs (EM) are calculated by multiplying the input data with the respective emission factors:

$$EM_{diesel} \left[\frac{kg \text{ CO}_2\text{-eq}}{ha * yr} \right] = diesel \text{ consumption} \left[\frac{l}{ha * yr} \right] * EF_{diesel} \left[\frac{kg \text{ CO}_2\text{-eq}}{l} \right] \quad (5)$$

Where EF represents the emission factor of each product.

To calculate EM_{diesel} , the diesel consumption of all activities during field preparation, cultivation, harvesting or further processing of the feedstock must be determined and multiplied by the emission factor for diesel.

This is applicable to all inputs, whatever the term, unless otherwise indicated.

- $EM_{electricity}$

$$EM_{electricity} \left[\frac{kg \text{ CO}_2\text{-eq}}{ha * yr} \right] = electricity \text{ consumption} \left[\frac{kWh}{ha * yr} \right] * EF_{electricity} \left[\frac{kg \text{ CO}_2\text{-eq}}{kWh} \right] \quad (6)$$

If electricity is consumed from the grid, the emission factor of the regional electricity mix will be used. In this way, the possibility of falling into double counting is eliminated (because if green energy is consumed, it would be emitting carbon credits for it). If electricity from renewables is consumed directly (i.e. not supplied from the grid), an emission factor adapted for the type of renewable electricity could be used.

- EM_{input}

It refers to plant protection products and seeds. Reference should always be made to the kg of active ingredient of the phytosanitary product.

$$EM_{input} \left[\frac{kg \text{ CO}_2\text{-eq}}{ha * yr} \right] = input \left[\frac{kg}{ha * yr} \right] * EF_{input} \left[\frac{kg \text{ CO}_2\text{-eq}}{kg} \right] \quad (7)$$

- $EM_{fertiliser}$

$$EM_{fertiliser} \left[\frac{kg \text{ CO}_2\text{-eq}}{ha * yr} \right] = fertiliser \text{ input} \left[\frac{kg \text{ nutrient}}{ha * yr} \right] * EF_{production} \left[\frac{kg \text{ CO}_2\text{-eq}}{kg \text{ nutrient}} \right] \quad (9)$$

The amount of fertilisers always refers to the main nutrient (e.g. nitrogen). For synthetic fertilisers other than nitrogen (e.g. P_2O_5 , K_2O , CaO), only the production of $EF_{production}$ is relevant and should be applied.

For nitrogen fertilisers, the production $EF_{production}$ applies only to synthetic nitrogen fertilisers.

For synthetic and organic nitrogen fertilisers and crop residues remaining in the field, the field N_2O emissions must be additionally calculated.

To account for N_2O emissions from soils, the IPCC methodology should be applied, including those described as “direct” and “indirect” N_2O emissions from synthetic and organic nitrogen fertilisers and crop residues.

Economic operators could use all three levels of the IPCC. For the calculation of field N_2O emissions according to the IPCC Tier 1 methodology, the “Annotated example of a GHG calculation using the methodology of the EU Renewable Energy Directive” provides further practical guidance.

After calculating the GHG emissions per dry tonne of product, the certified agricultural producers or FGP/Headquarters (on behalf of the farmers belonging to the group) send the GHG information for e_{ec} in $kg \text{ CO}_2 \text{ eq} / \text{dry tonne of raw material}$ together with the agricultural product: raw material itself.

An assignment of emissions to waste such as straw is not possible.

- e_L : Annualized emissions for soil carbon change due to land use change

A land use change is any change in carbon stocks among the six categories of land classified by the IPCC: forest, grassland, cropland (including land for annual and perennial crops and fallow land), wetlands, settlements and other lands. 'Cropland' and 'perennial cropland' (specified as palm trees and short rotation scrub) will be considered as a single land use. A change in farmland structure or management activities, tillage practice, or manure input practice is not considered a land use change.

In the table below, the different categories of land are shown in ISCC and in RED I.

The only difference shown in RED II is that a category is added in forest lands: High biodiversity forests and other wooded areas. It is characterized by being a surface rich in species and not degraded or that has been categorized by the authorities as having high biodiversity.

IPCC land categories	EU RED land categories		Criteria	Status change after Jan 2008?	Use of raw material from land?
Cropland	Cropland		Includes annual and perennial cropland. Perennial crops are defined as multi-annual crops, the stem of which is usually not annually harvested such as short rotation coppice and oil palm	Yes	Yes
	Fallow land		Land set at rest for one or several years before being cultivated again	Yes	Yes
Forest land	Primary forests and other wooded land		- Land of native tree species, - No clearly visible indications of human activity and, - Ecological processes are not significantly disturbed	No	No
	Continuously forested areas		- Span > 1 ha, trees higher five meters and - Canopy cover > 30%	No	Yes, if land has same status
	Sparsely forested areas		- Span > 1 ha, trees higher five meters and - Canopy cover 10- 30%	Yes, if GHG saving fulfilled	Yes, if land has same status
Grassland	Natural grassland	Highly biodiverse	- Would remain grassland in the absence of human intervention - Maintains the natural species composition and ecological characteristics and processes	No	No
		Non highly biodiverse	- Would remain grassland in the absence of human intervention - Does not maintain the natural species composition and ecological characteristics and processes	Yes, if GHG saving fulfilled	Yes
	Non-natural grassland	Highly biodiverse	- Would cease to be grassland in the absence of human intervention; and - Is not degraded and is species-rich	No	Yes, if harvesting necessary to preserve status
		Non highly biodiverse	- Would cease to be grassland in the absence of human intervention; and - Is degraded and not species-rich	Yes, if GHG saving fulfilled	Yes
Wetland	Wetland		Covered with or saturated by water permanently or for a significant part of the year	No	Yes if land has same status
	Peatland		- First 60 cm of soil has organic matter horizon $\geq$ 30 cm - Organic carbon in organic matter fine soil: $\geq$ 20 mass-%	No	Yes if land has the same status
Other areas	Designated nature protection areas		- Areas designated by law or by the relevant competent authority for nature protection purposes - Areas for the protection of rare, threatened or endangered ecosystems or species - Areas recognised by international agreements or - Areas included in lists drawn up by intergovernmental organisations or the International Union for the Conservation of Nature (IUCN) or - Areas recognized by the European Commission	No	Yes, if production of raw material does not interfere with protection purpose

Table 2. Land Categories under RED I

Annualized emissions from changes in carbon stocks caused by land use change are calculated by averaging total emissions equally over 20 years according to the following formula:

$$e_l \left[\frac{kg \text{ CO}_{2-eq}}{ton} \right] = \frac{CS_R \left[\frac{kg \text{ C}}{ha} \right] - CS_A \left[\frac{kg \text{ C}}{ha} \right]}{yield \text{ raw material} \left[\frac{ton}{ha * yr} \right] * 20 [yr]} * 3.664 \quad (9)$$

To calculate the emissions in kg CO₂ eq / t of raw material), the carbon stocks of the real land use (CS_A) are subtracted from the carbon stocks of the real land use of reference (CS_R). The result is divided by the yield of the raw material (it refers to the dry matter or the emissions must be adapted by applying a humidity factor) and it is annualized over 20 years. To convert carbon into CO₂ eq emissions, the conversion factor of 3,664 must be applied.

Given that the total variation in complete carbon stocks is annualized over 20 years, GHG emissions from land use change must be considered for a period of 20 years, starting from the date on which the land use change is produced.

- CS

Reference land use (CS_R) and actual land (CS_A) are defined by the mass of carbon in soil and vegetation per unit of land:

CS_R (land carbon stocks before conversion to agricultural land) are the carbon stocks associated with the reference land per unit of land (measured as mass of carbon per unit of land, including both soil and vegetation). Reference land use should correspond to land use in January of 2008 or 20 years prior to harvest, whichever is more recent.

CS_A (carbon stocks per unit of land after conversion to agricultural land) are the carbon stocks per unit of area associated with actual land use (measured as mass of carbon per unit of land, including both soil and vegetation). In cases where carbon stocks accumulate over more than one year, the value attributed to the CSA will be the estimated value of the stocks per unit area after 20 years or when the crop reaches maturity, depending on whichever is the earlier of the two dates. Carbon stocks (CS) of land use i (reference or actual) consider the organic carbon of the land, as well as the carbon of the vegetation:

$$CS_i = (SOC + C_{veg}) * A \quad (10)$$

A refers to the converted area (it is equal to 1 if the entire area is subject to conversion). C_{veg} is the carbon stock of the vegetation below and above the ground. The vegetation value for cropland is zero.

- SOC

Soil organic carbon (SOC) consists of four factors, which depend on climate, soil type, management practices and input practices C (C-input practice): standard soil organic carbon in the surface layer of the soil (0-30 cm top soil layer, SOC_{st}), the soil use factor (F_{LU}), the management factor (F_{MG}) and the input factor (F_i):

$$SOC = (SOC_{st} * F_{LU} * F_{MG} * F_i) \quad (11)$$

More information and standard values of the four SOC factors can be found in the IPCC documents.

Together with the batch of the respective agricultural raw material, the supplier sends the actual GHG value for the land use change in kg CO₂ eq / dry tonne of raw material to the recipient.

- e_b

RED II also provides the option of a GHG bonus in the case of restoring degraded land:

$$e_b = 29 \text{ g CO}_{2\text{-eq}}/\text{MJ} \quad (12)$$

This bonus applies to biofuels, bioliquids, and biomass fuel, if said biomass is obtained from degraded land that has been restored.

The 29 g CO₂ eq / MJ bonus can only be applied and attributed if evidence is provided that the land:

- it was not in use of agriculture or any other activity in January of 2008; and
- it is severely degraded land, including land that was previously in agricultural use.

The bonus of 29 g CO₂ eq / MJ may be applied for a period of 20 years from the date of conversion of the land to agricultural use, ensuring a sustained increase in carbon stocks, as well as a considerable reduction in the phenomenon of soil erosion of the land for falling into the category of severely degraded land. *Severely degraded land* means land that, for a significant period of time, has been significantly salted or had significantly low organic matter contents and has been severely eroded (e.g. characterized by soil erosion, significant loss of soil quality or biodiversity).

The auditors need to verify at the farm/plantation level during the farm audit whether the previously expressed requirements are met in order to apply the bonus. If a farm/plantation meets these requirements, the respective information needs to be sent through the supply chain with the Sustainability Declarations and the final biofuel product can deduct said bonus from the total GHG value of the final product in the Proof of Sustainability of the final biofuel (PoS).

The use of e_b will not be considered in the calculation methodology of this project because it is an incentive to promote the restoration of degraded land. If the emission calculations associated with land use changes are adequate, the GHG savings associated with restoring such degraded land are taken into account.

- e_p : Processing emissions

Database

A processing unit can include one or more processing stages (e.g. oil mill and refinery). The limits of the individual calculation system therefore always depend on the product, for which GHG emissions can be calculated. If GHG emissions are only to be calculated for refined oil, the oil mill and refinery can be treated as a single processing stage.

If crude oil with a GHG emission value is also sold, the oil mill and refinery must be divided into two phases of the process. The actual GHG values of an intermediate product must be provided to the product container in the unit kg CO₂ eq / dry tonne of product.

For the calculation of emissions from processing (e_p), at least the following data must be determined, e.g. the respective amounts must be extracted from the respective documents of the previous year and must be verified by the auditor.

Collection of data on the site

On-site data should always be collected for the entire process and not just for biofuel-related processes. The following data for the calculation of GHG emissions must be collected on-site. All input values must be collected for the same time period.

- Quantity of main product and co-products in tonnes per year. Refers to dry matter or emissions must be adapted by applying a humidity factor.
- Amount of process specific inputs used (e.g. methanol, NaOH, HCl, H₂SO₄, hexane, citric acid, charge earth, alkali, process water, diesel or other fuel) in kg per year and liters per year.
- Electricity consumption in kWh / year and electricity source (e.g. grid).
- Heat consumption in MJ / year, fuel for heat production (e.g. natural gas) and type of heating system (e.g. boiler or combined heat and power system).
- Amount of waste (e.g. palm oil mill effluent (POME), wastewater) in kg / year.

Published data

The following data must be collected from recognized and / or certified sources:

- Emission factors for specific process inputs in kg CO₂ eq / kg and fuels used in kg CO₂ eq / liter.
- Emission factors for electricity consumption, based on the source of electricity in kg CO₂ eq / kWh.
- Emission factors for heat consumption, based on biofuels and type of heating system in kg CO₂ eq / MJ.

Calculation formula for processing emissions

Each processing unit must ensure that all GHG emissions from processing, waste emissions (sewage) and emissions from specific process inputs are included in the emissions calculation. Annual average figures can be used. The calculation should be based on the following formula:

$$e_p \left[\frac{kg \text{ CO}_2\text{-eq}}{ton} \right] = \frac{(EM_{electricity} + EM_{heat} + EM_{inputs} + EM_{wastewater}) \left[\frac{kg \text{ CO}_2\text{-eq}}{yr} \right]}{yield \text{ product} \left[\frac{ton}{yr} \right]} \quad (13)$$

For intermediate products, the yield should refer to the dry matter content. Therefore, the emissions are divided by the amount of dry intermediate product or calculated by applying a humidity factor:

$$e_p \left[\frac{kg \text{ CO}_2\text{-eq}}{ton_{dry}} \right] = \frac{e_p \left[\frac{kg \text{ CO}_2\text{-eq}}{ton_{moist}} \right]}{(1 - m)} \quad (14)$$

The emissions from the different inputs (EM) must be calculated according to the following formula and must be divided by the main product yield. If more than one main product is produced, the calculation must be repeated for each main product, including the different yields of the different main products.

The components of the formula to calculate EM are:

- $EM_{electricity}$

$$EM_{electricity} \left[\frac{kg \ CO_2-eq}{yr} \right] = electricity \ consumption \left[\frac{kWh}{yr} \right] * EF_{regional \ electricity \ mix} \left[\frac{kg \ CO_2-eq}{kWh} \right] \quad (15)$$

If the electricity comes from sources outside the grid, the electricity emission factor of the regional electricity mix (average emission intensity for a defined region, $EF_{regional \ electricity \ mix}$) must be used. In the case of the EU, the most logical option is that of the whole EU. If electricity from renewables is consumed directly (i.e. not supplied through the grid), an EF adapted to the type of renewable electricity could be used.

- EM_{heat}

To calculate emissions from heat production, two different formulas can be used, based on available units of heat supplied:

$$EM_{heat} \left[\frac{kg \ CO_2-eq}{yr} \right] = fuel \ consumption \left[\frac{kg \ or \ l}{yr} \right] * EF_{fuel} \left[\frac{kg \ CO_2-eq}{kg \ or \ l} \right] \quad (16)$$

$$EM_{heat} \left[\frac{kg \ CO_2-eq}{yr} \right] = heat \ produced \ from \ fuel \left[\frac{MJ}{yr} \right] * EF_{fuel/heat \ system} \left[\frac{kg \ CO_2-eq}{MJ} \right] \quad (17)$$

As emission factors for heat production are distinguished between fuel and heating systems, both data must be documented. To calculate EM_{heat} , the consumed heat or fuel consumption for heat production for all activities during processing must be determined and multiplied with the respective emission factors (EF). If heat and electricity are consumed from a cogeneration system (CHP), there are two emission factors for the heat and electricity produced. You can determine the total fuel consumed in cogeneration and multiply it by the emission factor of the fuel or determine the production of electricity and heat and apply the different emission factors for heat and electricity.

- EM_{input}

$$EM_{input} \left[\frac{kg \ CO_2-eq}{yr} \right] = inputs \ consumption \left[\frac{kg \ or \ l}{yr} \right] * EF_{input} \left[\frac{kg \ CO_2-eq}{kg \ or \ l} \right] \quad (18)$$

EM_{input} refers to all the chemical products consumed, other production goods, process water as well as diesel or other fuels used during the production process.

- $EM_{wastewater}$

$$EM_{wastewater} \left[\frac{kg \ CO_2-eq}{yr} \right] = wastewater \left[\frac{cbm}{yr} \right] * EF_{wastewater} \left[\frac{kg \ CO_2-eq}{cbm} \right] \quad (19)$$

All wastewater production that occurs during processing activities must be documented and multiplied with the respective emission factor. Total GHG emissions are calculated per unit mass of the main product (e.g. kg CO₂ eq / dry tonne of palm oil).

Emissions from processing should be assigned to main products and co-products.

- e_{td} : Emissions from transport and distribution

They will include emissions from transportation and storage of raw materials, intermediate and final products throughout the entire supply chain. The transport and storage produced during the cultivation will not be taken into account (since the corresponding factor is already found).

It is the one that presents the greatest complication when calculating it since there are many actors involved in transport and storage. All traders, oil operators, warehousemen, waste collection points, first collection points and even processing units must calculate this value.

On-site data collection

For the calculation of e_{td} , the following information must be provided by on-site collection. All input values must be collected for the same period.

- Transport distance (d) loaded / empty respectively (it is not necessary to include return transports that are not empty)
- Mode of transport (e.g. diesel truck, 40t)
- Quantity of product transported

Published data

The following impact factors must be extracted from the "ISCC list of emission factors" or from another recognized / certified source:

- Fuel consumption of the respective mode of transport per km, when loaded K_{loaded} in liters per km.
- Fuel consumption of the respective mode of transport per km, when empty K_{empty} in liters per km.
- Fuel emission factor (EF_{fuel}) in kg CO₂ eq per liter of fuel.
- Alternatively, an emission factor based on tonne-kilometer transported can be used and it can be multiplied with the quantity and distance transported [kg CO₂ eq / t-km]. This EF is especially relevant for maritime transport.

As an alternative to using fuel consumption data from the literature, logistics service providers can also measure fuel consumption and provide it to the economic operator, who is in charge of calculating transport emissions. Reports from logistics providers must be verified or the logistics provider must be certified.

Calculation formula for transport emissions

GHG emissions from upstream transport of input material or downstream transport of product e_{td} can be calculated using the following formula:

$$e_{td} \left[\frac{kg \text{ CO}_2\text{-eq}}{ton} \right] = \frac{T_{needed} * \left(d_{loaded} [km] * K_{loaded} \left[\frac{l}{km} \right] + d_{empty} [km] * K_{empty} \left[\frac{l}{km} \right] \right) * EF_{fuel} \left[\frac{kg \text{ CO}_2\text{-eq}}{l} \right]}{\text{amount transported input material [ton]}} \quad (20)$$

To find out how often a transport system was used for the quantity transported, T_{needed} must be calculated. This value is calculated by dividing the quantity of goods transported by the load weight of the transport system used. E.g. If 100 tonnes of input material is transported in a 20-tonne truck, 5 trucks ($T_{needed} = 5$) are needed to transport all input material. The sum of the fuel consumption of the loaded and empty transport (if applicable) is multiplied with the necessary transport (T_{needed}) and the fuel emission factor.

Alternatively, the tonne-km methodology can also be used:

$$e_{td} \left[\frac{kg \text{ CO}_2\text{-eq}}{ton} \right] = \frac{(\text{amount}_{transported} [ton] * \text{distance}_{transported} [km]) * EF_{transport type} \left[\frac{kg \text{ CO}_2\text{-eq}}{ton * km} \right]}{\text{amount transported raw material [ton]}} \quad (21)$$

The amount of material transported is multiplied with the total distance and a tonne-km emission factor for the type of transport.

If upstream transport is calculated, GHG emissions are divided by the amount of input material to receive GHG emissions in kg CO₂ eq / dry tonne of input material. As the processing unit calculates the upstream transport emissions in kg CO₂ eq / dry tonne of the input material, but has to provide the GHG value for the product, it has to determine kg CO₂ eq / dry tonne of product by applying the factor of raw material (feedstock factor, FF).

Together with the batch of the respective material, the supplier transmits the real GHG values from the transport and the distribution e_{td} in kg CO₂ eq / dry tonne of product to the container.

- e_u : Emissions from fuel use

This value represents the direct emissions that are made when burning the biofuel. According to the directive, this value must be considered $e_u = 0$ for biofuels and bioliquids.

$$e_u = 0 \frac{kg \text{ CO}_2\text{-eq}}{ton} \quad (22)$$

- e_{sca} : Savings of GHG emissions derived from the accumulation of carbon in the soil through better agricultural management

Improved agricultural management refers to practices that cause an increase in soil carbon. According to the communication of the European Commission (2010/C160/02), this may include practices such as:

- Change to reduced or no tillage.
- Improved crop and / or cover crop rotation, including crop residue management.
- Improved fertiliser or manure management.
- Use of soil amendments (e.g. compost).

Emission savings from these improvements can be taken into account if evidence is provided that the above practices were adopted after January of 2008. In addition, it must be verified that they are implemented in accordance with best practices, so that a increase in soil carbon during the period in which the raw materials in question were grown. Soil carbon measurement can also serve as additional evidence.

To calculate annualized GHG emission savings from changes in carbon stocks due to improved agricultural management e_{sca} , the formula indicated in point 7, Annex V of RED I and more specified in Annex II of the RED I can be used. Commission communication (2010 / C160 / 02):

$$e_{sca} \left[\frac{kg \ CO_2-eq}{ton} \right] = \frac{CS_R \left[\frac{kg \ C}{ha} \right] - CS_A \left[\frac{kg \ C}{ha} \right]}{yield \ raw \ material \left[\frac{ton}{ha * yr} \right] * cultivation \ period \ raw \ material \ [yr]} * 3.664 \quad (23)$$

CS_R and CS_A refer to carbon stocks from reference land use (R) and actual land use (A). They are calculated as shown in section 8.2. As an alternative to calculating the SOC with standard values, it is also possible "to use other appropriate methods [...] to determine the SOC. As long as these methods are not based on measurements, they will take into account the climate, the type of land, land cover, land management and inputs ". The result is divided by the yield of the raw material (either it refers to the dry matter or the emissions must be adapted by applying a humidity factor and annualized during the cultivation period of the raw material).

Together with the batch of the respective agricultural raw material the supplier transmits to the recipient the real GHG value for the accumulation of carbon in the soil through an improved agricultural management e_{sca} in kg CO₂ eq / dry tonne of raw material.

- e_{ccs} : Savings in GHG emissions from carbon capture and geological storage

The reduction of emissions from the capture and geological storage of carbon (e_{ccs}) that have not already been accounted for in e_p , should be limited to the emissions avoided through the capture and sequestration of CO₂ emitted directly related to extraction, transportation, fuel processing and distribution.

e_{ccs} can only be taken into account if there is valid evidence that CO₂ has been effectively captured and safely stored. If CO₂ is stored directly, it should be verified whether the storage is in good condition, whether there are no leaks, and whether the existing storage ensures that the leakage does not exceed the current state of the art. If CO₂ is being sold for storage, one option to test storage is to provide contracts and invoices from a professionally recognized storage company.

The following formula should be used to calculate e_{ccs} (in g CO₂ eq per MJ of fuel):

$$e_{ccs} \left[\frac{g \ CO_2-eq}{MJ} \right] = \frac{\left(produces \ CO_2 \ [kg] - energy \ consumed \ [MWh] * EF \left[\frac{kg \ CO_2-eq}{MWh} \right] - input \ materials \ [kg] * EF \left[\frac{kg \ CO_2-eq}{kg} \right] \right) * 1000}{produced \ quantity \ of \ biofuel \ [t] * 1000 * lower \ heating \ value \ biofuel \ \left[\frac{MJ}{kg} \right]} \quad (24)$$

On-site data collection

For the calculation of e_{ccs} the following data must be collected on site:

- Amount of biofuel produced.
- Amount of biogenic CO₂ captured during the biofuel production process.
- Origin of biogenic CO₂ (extraction, transport, processing and distribution of fuel).
- Amount of energy consumed for CO₂ capture and processing (e.g. compression and liquefaction).
- Other input materials consumed during the CO₂ capture process and processing.

Published data

The following information should be obtained from recognized / certified sources:

- GHG emission factors for all inputs and their sources (e.g. for incoming materials, energy consumption etc.)
- Lower calorific value of the main product (LHV_{mp}) in MJ per kg
- e_{ccr} : Savings in GHG emissions from carbon capture and replacement

The REDs establish that the reduction of emissions derived from the capture and replacement of carbon (e_{ccr}) must be limited to the emissions avoided by capturing CO₂ whose carbon comes from biomass and which is used to replace CO₂ derived from fossil fuels used in commercial products and services.

e_{ccr} can only apply, if there is evidence that CO₂ replaces CO₂ derived from fossil fuels used in commercial products and services. Therefore, the recipient must provide information on how the CO₂ being replaced was previously generated and declare in writing, that due to the replacement, emissions are avoided. It is the auditor who must decide on a case-by-case basis whether the requirements of the REDs are met, including whether emissions are actually avoided. There is no need to conduct audits at the recipient's facilities, as the CO₂ recipient is not part of the chain of custody related to biofuel production.

The following formula can be used to calculate e_{ccr} (in g CO₂ eq per MJ of fuel):

$$e_{ccr} \left[\frac{g \text{ CO}_2\text{-eq}}{MJ} \right] = \frac{\left(\text{produces CO}_2 [kg] - \text{energy consumed [MWh]} * EF \left[\frac{kg \text{ CO}_2\text{-eq}}{MWh} \right] - \text{input materials [kg]} * EF \left[\frac{kg \text{ CO}_2\text{-eq}}{kg} \right] \right) * 1000}{\text{produced quantity of biofuel [t]} * 1000 * \text{lower heating value biofuel} \left[\frac{MJ}{kg} \right]} \quad (25)$$

On-site data collection

For the calculation of e_{ccr} , the following data must be collected on site:

- Amount of biofuel produced.
- Amount of biogenic CO₂ captured during the biofuel production process.
- Origin of biogenic CO₂ (extraction, transport, processing and distribution of fuel).
- Amount of energy consumed for CO₂ capture and processing (e.g. compression and liquefaction).
- Other input materials consumed during the CO₂ capture process and processing.

Published data

The following information should be obtained from recognized / certified sources:

- GHG emission factors for all inputs and their sources (e.g. for incoming materials, energy consumption, etc.).
- Lower calorific value of the main product (LHV_{mp}) in MJ per kg.
- e_{ee} : Savings in emissions from excess electricity

If the electricity is produced through cogeneration (CHP), the excess electricity, which is introduced into the grid, can be credited under certain conditions. These conditions are:

- The cogeneration plant is fed with a fuel or an agricultural crop residue, not with a co-product of the process. If the co-products of the process are burned in the cogeneration plant, no excess electricity credits can be applied.
- If the cogeneration plant is not only used for the biofuel production process, but also for other processes, its size and therefore the production of heat and electricity should theoretically be reduced to the minimum size necessary to produce the heat used in the biofuel production process. The electricity produced must be reduced in proportion to the reduction in heat.
- To calculate excess electricity, the electricity consumed in the process unit is subtracted from the theoretically reduced electricity produced in the cogeneration plant.

On-site data collection

For the calculation of e_{ee} , the following data must be collected on site:

- Steam consumption in MJ per year - verification of whether the steam produced in the cogeneration plant fully supplies the steam consumed in the process or if a theoretical reduction was applied.
- Electricity production in kWh per year from the cogeneration plant - reduced in proportion to steam production.
- Process electricity consumption in kWh per year.
- Excess electricity in kWh per year - annual amount of electricity produced in an internal cogeneration plant (after theoretical reduction) but fed into an external network.
- Fuel type for the cogeneration plant - type of fuel used within the CHP plant.
- Quantity of main product and co-products in tonnes per year.

Published data

The excess electricity credit equals the amount of GHG emissions from the production of an equal amount of electricity in a power plant that uses the same type of fuel as the cogeneration plant. For the calculation of e_{ee} the following data can be extracted from recognized / certified sources:

- Fuel emission factor in kg CO₂ eq per kWh - Emission factor for the production of electricity from the equivalent fossil fuel in a power plant.

Calculation formula for excess electricity

$$e_{ee} \left[\frac{kg \text{ CO}_{2-eq}}{ton} \right] = \frac{\text{excess electricity} \left[\frac{kWh}{yr} \right] * EF_{fuel} \left[\frac{kg \text{ CO}_{2-eq}}{kWh} \right]}{yield_{product} \left[\frac{ton}{yr} \right]} \quad (26)$$

The excess electricity must be multiplied with a typical emission factor for the production of electricity from the fossil fuel used in a power plant.

For intermediate products the dry yield of the product applies. Therefore, the emissions are divided by the amount of dry intermediate product, or they are calculated by applying a humidity factor.

In the same way as in the base scenario, this general equation has undergone modifications with the change of directive. As of the entry into force of RED II, the term e_{ee} is exempt from the expression, which did not undergo other modifications. It is also subject to the reviews of the legal framework that will take place annually.

- SSR categorization within ISCC EU

In order to correctly monitor and calculate the influence of each of the identified SSR, they must be considered within each category presented by the calculation methodology of the ISCC EU scheme to be used. With this objective it is defined:

Emissions term	Source, sink or reservoir
e_{ccr}	Carbon sequestration of CO ₂ whose carbon originates from biomass and is used to replace fossil-derived CO ₂ used in commercial products and services
e_{ccs}	Capture and sequestration of CO ₂ emitted directly related to the extraction, transport, processing and distribution of fuel under the authority of the economic operator in the supply chain
e_{ec}	Biomass cultivation in a dedicated plantation
	Production and management of residues of fertilizers, pesticides and other chemical products in the crop
	Anaerobic treatment of wastewater in the production of raw materials
e_l	Land use change
e_p	On-site energy consumption at the biofuel production plant
	On-site energy consumption at raw material production plant(s)
	Production and management of waste chemical acids and bases, process water, lubricants, catalysts and other chemicals in the biofuel production plant and the raw material production plant(s)

	Combustion of fossil fuel derived methanol in biodiesel ester
	Waste treatment in biofuel production plant
	Waste treatment at the raw material production plant(s)
e_{sca}	Improved agricultural management / best practices leading to increased soil carbon
e_{td}	Raw material transportation
	Transport of biofuel to the mixing facility
	Transport of mixed fuel to the service station and energy consumption at the service station
e_u	Final vehicles consuming fossil fuel

Table 3. Relationship between sources, sinks and reservoirs and their names in directives and ISCC-EU.

- Waste and residues

Although it has already been explained in each of the terms of the sum of total emissions, it must be taken into account that waste and residues (as a raw material for the production of biofuel) has many of the terms of the sum null (specifically, the values of cultivation and change of land use, values that can become very high). According to the standard and regardless of the origin of these, the waste or residue has a value of emissions associated with a null life cycle at the point of origin, which allows them to have very high emission savings.

- Work with the incoming emission values and the allocation of emissions to the main products and co-products

Incoming GHG emission values should be adjusted from kg CO₂eq per tonne of input material to kg CO₂eq per tonne of product. To achieve this, the input material emissions are multiplied by a feedstock factor (FF). To some of the actual GHG values received, such as emissions from processes or emissions from transport, we must add the actual values themselves at each stage of the chain of custody. Whenever a process step produces co-products, the emissions must be allocated using the so-called allocation factor (AF).

Emissions delivered with the input material as well as the upstream emissions from the transport that are provided in kg CO₂eq / tonne of input material, must be multiplied with the raw material factor (FF) to calculate the emissions in kg CO₂eq per tonne of product.

Intermediate products

For the calculation of FF, the following formula should be applied when processing intermediate products:

$$FF = \text{Ratio of ton dry feedstock required to make 1 ton dry intermediate product} \quad (27)$$

FF is calculated by dividing the total amount of inputs by the total amount of the main intermediate product. The following formula shows an example for the application of the raw material factor (for the example e_{ec} of when processing intermediate product a):

$$e_{ec} \text{ interm. product}_a \left[\frac{kg \text{ CO}_{2-eq}}{ton_{dry}} \right] = e_{ec} \text{ feedstock}_a \left[\frac{kg \text{ CO}_{2-eq}}{ton_{dry}} \right] * FF_a \quad (28)$$

Once the GHG emissions of the input material are converted into GHG emissions of the intermediate product, the additional emissions from the receiver must be added to the emissions accordingly.

In addition, the assignment of emissions of intermediate products and co-products is possible for emissions from cultivation (e_{ec}), processing (e_p), transportation and distribution (e_{td}), change in land use (e_l) and excess electricity (e_{ee}). Emission savings such as e_{sca} , e_{ccr} or e_{ccs} should not be allocated to co-products. Only emissions up to production and including the production of the intermediate product and co-products can be included in the allocation, e.g. the following emissions from processing or transport and distribution from an intermediate product, cannot be added before the allocation, as these emissions are not related to co-products. It is not possible to assign GHG emissions to products that are considered waste or residues (including agricultural residues such as straw) or to other products with no lower calorific value.

The following formula is used to calculate the emissions allocated when processing intermediate products (for the example of e_{ec} processing intermediate a):

$$e_{ec} \text{ interm. product}_a \text{ allocated} \left[\frac{kg \text{ CO}_{2-eq}}{ton_{dry}} \right] = e_{ec} \text{ interm. product}_a \text{ non - allocated} \left[\frac{kg \text{ CO}_{2-eq}}{ton_{dry}} \right] * AF_a \quad (29)$$

The allocation is made based on the allocation factor (AF), which reflects the relationship between the total energy content of the main intermediate product and the total energy content of all products. The energy content is calculated from the lower calorific value and the corresponding product yield. The lower calorific value always refers to the moisture content of the material.

$$AF_{\text{intermediate product}} = \frac{\text{Energy content}_{\text{intermediate product}} [MJ]}{(\text{Energy content}_{\text{intermediate product}} [MJ] + \text{Energy content}_{\text{co-product}} [MJ])} \quad (30)$$

with

$$\text{Energy content}_{\text{intermediate product}} [MJ] = \text{yield}_{\text{intermediate product}} \left[\frac{dry - kg}{yr} \right] * LHV_{\text{main product}} \left[\frac{MJ}{kg} \right] \quad (31)$$

$$\text{Energy content}_{\text{co-product}} [MJ] = \text{yield}_{\text{co-product}} \left[\frac{dry - kg}{yr} \right] * LHV_{\text{co-product}} \left[\frac{MJ}{kg} \right] \quad (32)$$

The yields of intermediate products and co-products should be measured in situ while the lower calorific values of these products should be based on published sources. For calculation purposes, co-products with negative energy content are considered to have zero energy content. After the allocation,

the supplier of the respective product transmits the information on GHG emissions in kg CO₂ eq / tonne of the intermediate product together with the product itself.

- Final biofuels

For the final biofuels, the following formula is applicable to the relevant elements of the calculation methodology (shown in the example of e_{ec}):

$$e_{ec}^{biofuel a} \left[\frac{g \text{ CO}_{2-eq}}{MJ \text{ biofuel}} \right] = \frac{e_{ec}^{feedstock a} \left[\frac{g \text{ CO}_{2-eq}}{kg \text{ dry}} \right]}{LHV_a \left[\frac{MJ \text{ feedstock}}{kg \text{ dry feedstock}} \right]} * FF_{biofuel a} * AF_{biofuel a} \quad (33)$$

In which it applies:

$$AF_{biofuel a} = \left[\frac{\text{Energy in biofuel}}{\text{Energy biofuel} + \text{Energy in co-products}} \right] \quad (34)$$

$$FF_{biofuel a} = [\text{Ratio of MJ feedstock required to make 1 MJ biofuel}] \quad (35)$$

For the purposes of this calculation, raw material factors (FF) based on plant data should be applied. FF is calculated by dividing the total energy of the input materials by the total energy content of the main product. The energy content is calculated from the lower calorific value (LHV) of the materials. Note that for the calculation of the raw material factor it is necessary to apply the values of LHV per dry tonne, while for the calculation of the allocation factor it is necessary to use the values of LHV for wet biomass, since this approach was also applied for calculating the default values.

- Default values

The total defaults, as well as the disaggregated defaults, are provided in Annex V of RED I. These defaults reflect standardized biofuel supply chains and processes and are conservative. RED I contains total default values for the different types of biofuels, as well as disaggregated default values for cultivation (e_{ec}), processing (e_p), and transportation and distribution (e_{td}). Default values listed in Annex V can only be applied if the processing technology and feedstock used for biofuel production match the respective scope of the default value. Certified economic operators can only use default (disaggregated) values if the following criteria are met:

- The total default value for GHG emission savings established in part A or B of Annex V of RED I can only be used if it reflects the production process and if e_l (GHG emissions derived from land use change) calculated is equal to or less than zero.
- The total default value can only be used if the minimum GHG emission savings is reached (facilities that were in operation on or before October 5 of 2015: 35% until December 31 of 2017 and 50% from January 1 of 2018; respectively 60% for biofuel and bioliquid facilities whose production began after October 5 of 2015). E.g. the full default value for soy biodiesel cannot be used, because the default GHG emission savings are only 31%.

- The raw material and the certified economic operator process match the total default or disaggregated default value in question, e.g.:
 - o The default value for "Palm Oil Biodiesel (Oil Mill Methane Capture Process)" can only be applied if applying the mill methane capture method ensures that methane is captured efficiently, similar to what has been assumed in the calculation of the default values. For the calculation of the default values, it was assumed that methane emissions are reduced in such a way that without assigning emissions to the palm oil mill effluent (POME), the plants emit less than 5,46 kg of methane per tonne of crude palm oil (CPO).
 - o Corn producers outside the European Community cannot apply the default value for "Community produced corn ethanol".
 - o If an ethanol plant uses lignite as process fuel in a conventional boiler, none of the default (disaggregated) values can be used, as they only give values for natural gas process fuels in a cogeneration plant (combined heat and power, CHP) or a conventional boiler or brown coal in a cogeneration plant.
- Within the EU: In the European Community, the full default or disaggregated defaults for the crop can always be used regardless if the NUTS2 requirements are met.

If the total default value is applied, certified economic operators up to the final processing unit state "Use of total default value" on their Sustainability Declarations. No further information is required. The final processing unit of the biofuel/bioliquid can then state the total default value of its specific supply chain in g CO₂ eq per MJ of biofuel and the GHG emission savings in % on its Sustainability Declaration. The respective values are provided in the RED. The information on GHG emissions can be reported as an aggregate. If relevant, both the process technology and the raw material used need to be specified. During the certification audit, the auditor needs to verify the suitability of the input material and process as well as the correct application of the total default value.

While the total default values are always applied to a final biofuel or bioliquid, the disaggregated default values are for certain elements in the supply chain (cultivation (e_{ec}), processing (e_p) and transport and distribution (e_{td})). In sections D and E of Annex V of the RED different disaggregated default values for biofuels and bioliquids are provided. Using these values provides the possibility to combine default values with actual values from individual GHG calculations (e.g. to use the disaggregated default value for the incoming raw material and do an individual GHG calculation for own processing emissions, or an individual calculation for processing and the use of the disaggregated default value for transport & distribution). For applying disaggregated default values, the same conditions apply as for total default values.

When using disaggregated default values for one or more elements in the calculation methodology, certified economic operators up to the final processing unit have to state "Use of disaggregated default value" on their Sustainability Declarations.

- Estimation of GHG emissions mitigations yearly average

As it is described above, the estimation of emissions mitigations will depend on the amount of biofuel production, the characteristics of the raw material and, between other things, the baseline scenario.

As it is described in the point “4. Methodology”, the baseline will have a greater amount of emissions than the ones produced during the project activity.

Following that methodology, the emissions mitigations will be stimated using the data of 2020 of the production of the company, and changing the baseline according to the modification of the legal frame work.

Data for 2020:

- Quantity of valid biodiesel: 80.175,99 m3
- Baseline emissions: 110.347,37 T CO₂ eq
- Batches produced emissions: 28.556,58 T CO₂ eq
- Total mitigations: 81.790,79 T CO₂ eq

Estimation for 2021:

- Quantity of valid biodiesel: 80.175,99 m3
- Baseline emissions: 117.063,02 T CO₂ eq
- Batches produced emissions: 28.556,58 T CO₂ eq
- Total mitigations: 88.506,45T CO₂ eq

Estimation for 2022 and further:

- Quantity of valid biodiesel: 80.175,99 m3
- Baseline emissions: 123.778,68 T CO₂ eq
- Batches produced emissions: 28.556,58 T CO₂ eq
- Total mitigations: 95.222,10 T CO₂ eq

Year	Estimated GHG emission mitigations (tCO ₂ -e)
2020	81.790,79
2021	88.506,45
2022 and following	95.222,10

3. Safeguards

3.1 Statutory Requirements

European

- Directive 2009/28 / EC of the European Parliament and of the Council of April 23, 2009 on the promotion of the use of energy from renewable sources and which modifies and repeals Directives 2001/77 / EC and 2003/30 / EC.
- Directive (EU) 2018/2001 of the European Parliament and of the Council of December 11, 2018 on the promotion of the use of energy from renewable sources
- DIRECTIVE 2009/30/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC
- COUNCIL DIRECTIVE (EU) 2015/652 of 20 April 2015 laying down calculation methods and reporting requirements pursuant to Directive 98/70/EC of the European Parliament and of the Council relating to the quality of petrol and diesel fuels
- COMMISSION REGULATION (EU) No 1307/2014 of 8 December 2014 on defining the criteria and geographic ranges of highly biodiverse grassland for the purposes of Article 7b(3)(c) of Directive 98/70/EC of the European Parliament and of the Council relating to the quality of petrol and diesel fuels and Article 17(3)(c) of Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources
- REGULATION (EC) No 1069/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation)
- COMMISSION REGULATION (EU) No 142/2011 of 25 February 2011 implementing Regulation (EC) No 1069/2009 of the European Parliament and of the Council laying down health rules as regards animal by-products and derived products not intended for human consumption and implementing Council Directive 97/78/EC as regards certain samples and batches exempt from veterinary checks at the border under that Directive

National

- Ley 34/1998, de 7 de octubre, del sector de hidrocarburos
- Real Decreto 61/2006, de 31 de enero, por el que se determinan las especificaciones de gasolinas, gasóleos, fuelóleos y gases licuados del petróleo y se regula el uso de determinados biocarburantes
- Real Decreto 1597/2011, de 4 de noviembre, por el que se regulan los criterios de sostenibilidad de los biocarburantes y biolíquidos, el Sistema Nacional de Verificación de la Sostenibilidad y el doble valor de algunos biocarburantes a efectos de su cómputo
- Real Decreto 1085/2015, de 4 de diciembre, de fomento de los Biocarburantes
- Real Decreto 235/2018, de 27 de abril, por el que se establecen métodos de cálculo y requisitos de información en relación con la intensidad de las emisiones de gases de efecto invernadero de los combustibles y la energía en el transporte

- Orden ITC/2877/2008, de 9 de octubre, por la que se establece un mecanismo de fomento del uso de biocarburantes y otros combustibles renovables con fines de transporte
- Resolución de 27 de diciembre de 2013, de la Secretaría de Estado de Energía, por la que se actualiza el anexo de la Orden ITC/2877/2008, de 9 de octubre, por la que se establece un mecanismo de fomento del uso de biocarburantes y otros combustibles renovables con fines de transporte
- Orden TEC/1420/2018, de 27 de diciembre, por la que se desarrollan los aspectos de detalle del Sistema Nacional de Verificación de la Sostenibilidad y de la emisión del informe de verificación de la sostenibilidad
- Resolución de 11 de marzo de 2019, de la Secretaría de Estado de Energía, por la que se incluye el biopropano en el anexo de la Orden ITC/2877/2008, de 9 de octubre, por la que se establece un mecanismo de fomento del uso de biocarburantes y otros combustibles renovables con fines de transporte. (BOE 22/03/2019)
- Resolución de 11 de marzo de 2019, de la Secretaría de Estado de Energía, por la que se incluye el biopropano en el anexo de la Orden ITC/2877/2008, de 9 de octubre, por la que se establece un mecanismo de fomento del uso de biocarburantes y otros combustibles renovables con fines de transporte. (BOE 22/03/2019)

Other

- UNE-EN 14214:2013 V2+A1:2018. Liquid petroleum products - Fatty acid methyl esters (FAME) for use in diesel engines and heating applications - Requirements and test methods

3.2 Potential Negative Environmental and Socio-Economic Impacts

In December of 2015, an Environmental Impact study was carried out for the biodiesel manufacturing plant of Green Fuel Extremadura S.A. by the company IDEXMA, Environmental Consultants. The following is a summary of the results of that study.

Global impact value without corrective measures

- Construction phase

FACTOR	IMPACT VALUE	QUANTITATIVE VALUE	CORRECTIVE ACTION
Atmosphere	COMPATIBLE	-12	Admitted
Land	COMPATIBLE	-16	Admitted
Water	MODERATE	-15	Admitted
Natural risks	COMPATIBLE	-10	Admitted
Vegetation	NEUTRAL	*14	Admitted
Fauna	COMPATIBLE	-9	Admitted
Landscape	COMPATIBLE	-14	Admitted
Socio-economy	BENEFICIAL	22	Not admitted
OVERALL ASSESSMENT		-54	

Table 4. Global impact value without corrective measures. Construction phase.

As seen in the Table 4, the impact is mostly compatible (atmosphere, soil, water, natural risks, fauna and landscape), neutral for the vegetation, and beneficial for the socio-economy, being the overall qualitative assessment of -54.

- Exploitation phase

FACTOR	IMPACT VALUE	QUANTITATIVE VALUE	CORRECTIVE ACTION
Atmosphere	COMPATIBLE	-14	Admitted
Land			
Water	MODERATE	-17	Admitted
Natural risks			
Vegetation	BENEFICIAL	19	Not admitted
Fauna	MODERATE	-17	Admitted
Landscape	NEUTRAL	*20	Admitted
Socio-economy	BENEFICIAL	25	Not admitted
OVERALL ASSESSMENT		-4	

Table 5. Global impact value without corrective measures. Exploitation phase.

As seen in the Table 5, the impact in the exploitation phase is compatible for the atmosphere, being moderate for water and fauna, neutral for the landscape and beneficial for the vegetation and the socio-economy. Therefore, the overall rating is -4.

Integrating the construction and operation phases, without corrective measures, the joint qualitative assessment is -58.

It is important to note that all negative impacts admit corrective measures in both phases, which, as will be seen, will minimize, neutralize and even change their nature.

Global impact value with corrective measures

- Construction phase

FACTOR	IMPACT VALUE	QUANTITATIVE VALUE
Atmosphere	NEUTRAL	*10
Land	NEUTRAL	*10
Water	NEUTRAL	*10
Natural risks	NEUTRAL	*9
Vegetation	BENEFICIAL	15
Fauna	NEUTRAL	*9
Landscape	NEUTRAL	*10
Socio-economy	BENEFICIAL	22
OVERALL ASSESSMENT		37

Table 6. Global impact value with corrective measures. Construction phase.

As seen in the Table 6, by adopting the proposed corrective measures, all negative impacts are neutralized (atmosphere, soil, water, fauna and landscape), with the exception of the impact on vegetation, which becomes beneficial, together with the socioeconomic impact. Therefore changing the global nature of the impact caused by the construction phase to positive and presenting a qualitative global value of +37.

- Exploitation phase

FACTOR	IMPACT VALUE	QUANTITATIVE VALUE
Atmosphere	NEUTRAL	*10
Land		
Water		
Natural risks		
Vegetation	BENEFICIAL	19
Fauna	NEUTRAL	*9
Landscape	BENEFICIAL	17
Socio-economy	BENEFICIAL	25
OVERALL ASSESSMENT		61

Table 7. Global impact value with corrective measures. Exploitation phase.

As seen in the Table 7, by adopting the proposed corrective measures, all impacts of a negative nature are neutralized or canceled (atmosphere, water and fauna) and even change their nature (landscape). Therefore, the global nature of the impact caused by the exploitation phase is positive, presenting a qualitative global value of +61.

Finally, the global nature of the impact originated, considering the construction and exploitation phases to be positive, once the proposed measures have been adopted, it is considered beneficial, it presents a combined global value of +98.

Environmental monitoring program

The following Environmental Surveillance Program is established that will allow the monitoring and control of the identified impacts and the efficiency of the preventive and corrective measures mentioned above.

The objectives of the program are:

- Define the aspects and / or indicators to be controlled to monitor the identified environmental impacts, as well as the compliance and effectiveness of the preventive and corrective measures established.
- Determine the data needs to carry out said monitoring and control of environmental impacts and corrective measures.
- Define responsibilities, criteria and frequency of controls.

- Prepare periodic reports that collect the results of the established control and monitoring, defining their content and frequency of issuance.

Conclusions

Taking into account all the information presented in the Environmental Impact Study, and considering that the main raw material of the process will be vegetable oil used to produce biodiesel (alternative fuel), it is argued that the exploitation (operation) of the biodiesel plant whose promoter and owner is Green Fuel Extremadura S.A., not only will it contribute to the generation of jobs and wealth in the region, but it will also provide a solution to a major environmental problem: waste from used vegetable oils.

Therefore, the industrial facility itself incorporates the environmental variable (eco-industry) from its production and market philosophy, being, in addition, another benchmark in Europe for Industrial plants that transform waste into alternative fuels (biodiesel).

3.3 Consultation with Interested Parties

As a communication action, an open communication channel is established with the stakeholders identified permanently throughout the life of the project. Said identified stakeholders include, but are not limited to: shareholders, local authorities (city council), regional authorities (Junta de Extremadura) and state authorities (MITECO).

3.4 Mitigations

- Risk analysis

Green Fuel Extremadura S.A. presents a risk management system that aims to set the guidelines associated with the possible risks that may arise during the operation that may affect the sustainability of the product offered in the market.

In this sense, an attempt is made to define a framework of action in order to identify, evaluate, prevent, mitigate, correct and monitor possible risks that may threaten the necessary sustainability requirements according to the Renewable Energy Directives and the ISCC - EU scheme.

The specific objectives of the risk management system are:

1. Identify the critical points.
2. Identify the risks associated with each critical point.
3. Evaluate the causes or sources of the risk.
4. Design a risk prevention plan.
5. Design an action plan in the event of an occurrence.
6. Establish control and monitoring mechanisms.
7. Assign functions and responsibilities to company personnel associated with the identified risks.

The methodology that is implemented in order to achieve the objectives set out above is defined below:

Risk identification

1. Identify critical points.
2. Identify risks at each of the critical points.

Risk analysis

1. Determine the causes or sources of risk and responsible personnel.
2. Evaluate probability of occurrence and consequences.

Risk management

Once the risk has been identified and a profile has been established:

1. The preventive actions associated with each risk, the person responsible for fulfilling said function and the associated monitoring and control documentation are determined.
2. Actions in the event of an occurrence and corrective actions are determined. In addition, a person in charge of fulfilling said function and of issuing the associated documentation is assigned.

Monitoring and control

1. The monitoring and control methodology for the associated risk is determined.
2. The documentation associated with the specific monitoring and control mechanism and the person responsible for said documentation are established.

3.5 Additional Information on Risk Management

All information about risk management is described in the mitigations above.

4. Methodology

4.1 Reference to Approved Methodology

The methodology selected is the ACM0017: Production of biofuels, V3.1.

Even though this methodology is very general, due to national and European requirements, the methodology is modified in order to be more strict.

This requirements are:

- Directive 2009/28 / EC of the European Parliament and of the Council of April 23, 2009 on the promotion of the use of energy from renewable sources and which modifies and repeals Directives 2001/77 / EC and 2003/30 / EC. (RED I)
- Directive (EU) 2018/2001 of the European Parliament and of the Council of December 11, 2018 on the promotion of the use of energy from renewable sources. (RED II)

And the documentation for the voluntary schemes and national schemes that fulfill this requirements (ISCC – EU and NIS, mainly)

4.2 Applicability of Methodology

The project activity complies with the applicability requirements of ACM0017:

Applicability Conditions in the Methodology	Proposed Project Activity
The ACM0017 is applicable to project activities that reduce emissions through the production of blended biofuels to be used in existing stationary installations and/or in vehicles.	Since Green Fuel Extremadura S.A. produces biofuels for such use, it complies with this requirement.
The biofuel is produced from one or a combination of the following feedstocks: (a) Waste oil/fat (b) Seeds or crops that are cultivated in dedicated plantations (c) Biomass residues (e.g. agricultural residues, wood residues, organic wastes).	Since Green Fuel Extremadura S.A. uses waste oil/fat as a feedstock, it complies with this requirement.
In order to avoid double counting of emission reductions, the methodology ensures that the ICCs can only be issued to the producer of the biofuel. The project proponent shall demonstrate that double counting of emission reductions will not occur e.g. via a contractual agreement with the end-user(s), feedstock producer or other stakeholder involved in the supply chain.	Green Fuel Extremadura S.A. has presented a declaration of where each of its produced batches of biofuels is destined and in which country will such batch be consumed. According to the legal requirements of each of those consumers countries, double counting of emission reductions is avoided. Also, since the ICCs will be issued to Green Fuel Extremadura

	S.A., it complies with this requirement.
If the biofuel in the project plant is only partly produced from the following sources: - Waste oil/fat - Seeds or crops that are cultivated in dedicated plantations - Biomass residues (e.g. agricultural residues, wood residues, organic wastes) Any volumes of biofuel that are also produced in the project plant but from other feedstock sources, are not included in the quantity of biofuel for which emission reductions are claimed.	Since Green Fuel Extremadura S.A. only uses waste oil/fat for its production, it complies with this requirement.
The alcohol used for esterification is methanol from fossil origin. Volumes of biodiesel produced with alcohols other than methanol (for example, ethanol) are not included in the quantity of biodiesel for which emissions reductions are claimed.	Since Green Fuel Extremadura S.A. only uses methanol from fossil origin, it complies with this requirement.
The fossil fuels, the biofuels and the blended biofuels comply with national regulations (if existent) or with suitable international standards.	Since Green Fuel Extremadura S.A. complies with all national regulations and also with the ISO 14214 standard, it complies with this requirement.
The project activity involves construction and operation of a biofuel production plant.	Since Green Fuel Extremadura S.A. operates the biofuel production plant, it complies with this requirement.
Any by-product (e.g. glycerol) is not disposed of or left to decay. It should be either incinerated or used as raw material for industrial consumption or sold.	Since Green Fuel Extremadura S.A. sells the glycerol as a by-product, it complies with this requirement.
If biomass or biofuel is used at the project plant(s) (processing, production or blending plant) as fuel (e.g. for heat or electricity generation), then at least 95% of the biomass or biofuels used in these plants should be either biomass residues from the dedicated plantations established under the project activity or biofuel generated in the project plant. The amount of biofuel used should not be included in the quantity of biofuel for which emission reductions are claimed.	Since Green Fuel Extremadura S.A. does not use its own production of biofuel in the process, it complies with this requirement.
The (blended) biofuel is used by consumers within the host country in existing stationary installations (e. g. captive generators) and/or in vehicles.	Green Fuel Extremadura S.A. produces biofuels that are consumed in other countries apart from the

	host country itself. However, a legal requirement study is carried out to evaluate the situation of each country in order to amend this deviation and is considered to be sufficient to comply with this requirement.
In case of vehicles, the target consumer group (e.g. captive fleet of vehicles, gas stations, bulk consumers) and distribution system of the biofuel shall be identified and described in the PDD.	Given that the whole supply chain and distribution system is well identified and described in such document, it complies with this requirement.
Only biofuel consumed in excess of mandatory regulations is eligible for the purpose of the project activity	Since the baseline scenario defined in the PDD sets the same standard as the legal requirements for such consumption, the project activity itself describes the excess consumption of biofuel, complying with this requirement.

4.3 Deviation from Methodology

The methodology is modified in the following points:

- More SSR are quantified for the baseline and the project.
This is due to the ISCC certification and European regulations. They are taking into account more emissions than the CDM methodology, so it would be counterproductive to exclude this SSR. Also, the parameters that are described as leakage in the methodology, are taken into consideration as SSR for the baseline.
- Naming of the data/parameters and variables.
As Green Fuel Extremadura S.A. is following the RED I and RED II methodology with its own naming, it makes no sense to change it. All new naming is described in the documentation.
- Leakage.
There will be no estimation of leakage, because when the project activity is compared with the baseline scenario defined, the parameters that the ACM0017 calculates as "leakage" are already taken into consideration in the calculation. This is due to the extensive detail of the calculation considered and defined in the PDD.

This deviations from the methodology meet the criteria and specifications for permitted methodology deviations, making this modifications only applicable for this project. Also, the deviations positively impact the conservativeness of the quantification of GHG emission mitigations.

4.4 Additionality

- Determination of the GHG baseline

The GHG baseline is defined following the methodology established for this by the United Nations in the “Clean Development Mechanism ACM0017: Large-scale Consolidated Methodology for Production of Biofuel”.

To define the baseline, the following information must be taken into account:

- The description of the project, including identified GHG SSR.
- Existing and alternative types of projects, activities and technologies that provide the project with an equivalent type and level of product or service activity.
- Data availability, reliability and limitations.
- Other pertinent information related to present or future conditions, such as legislative, technical, economic, sociocultural, environmental, geographic, site-specific, and temporal assumptions or projections.

The ultimate goal of this project is the generation of carbon credits in the voluntary market and, therefore, in order to define the most appropriate baseline, we will first study the concept of additionality, and its applicability to the project; as well as the applicable legislative framework.

Additionality

Additionality is an important characteristic of GHG emission reductions, because it indicates that they represent a net environmental benefit and a real reduction in GHG emissions and can therefore be used to offset GHG emissions made by other companies. The concept of additionality is a fundamental consideration in quantifying project-based GHG reductions. Additionality is only recognized for project activities that would not have "happened anyway".

ICR's approach to additionality is the demonstration of a positive legal requirements test result and the additionality test based on a positive list or project-specific test.

Test of legal requirements

The projects are not additional if their implementation and / or operation is required by any law, statute or other regulatory framework, agreements, agreements or other legally binding mandates that require implementation and operation, or require the implementation of similar measures that would result in the GHG emission mitigation levels in the host country.

European legal regulations

- European regulation: RED I and RED II

- Modifications made to Directive 2015/1513

This regulation restricts us to the following requirement:

- Each Member State of the Union must reach a certain percentage of renewable energy. Each state stipulates a procedure to comply with these requirements, the most widely used being the determination of a biofuel quota that must be introduced to the market.
- 60% GHG savings (compared to the applied fossil fuel comparator) for facilities that start operating after October 5, 2015. 50% GHG savings (compared to the same fossil fuel comparator) in any other case.

Green Fuel Extremadura S.A. began operating before October 5 of 2015, so the minimum GHG emission savings required by law is 50%.

State legal regulations

Another limiting factor for the project would be that the production plant was obtaining an incentive for the manufacture of this product in its own country.

On the other hand, it is possible that in some of the countries where biofuel is being consumed, some type of aid, subsidy or tax incentive is being received for the use of these biofuels.

Due to the complexity of the study, it was decided to hire a consulting firm to define these legal requirements. Both in the EU as a whole, as well as in each of the countries where each of the product batches is to be sold.

This report is presented as an annex. You can see some summary tables below.

Country	Policy measure	Period in force
Spain	Fiscal benefits	2002-2012
	Biofuel blending mandate	Since 2011
	Certification system	Since 2008 (Grace period 2013-2016)
	Double counting	Since 2011
France	Fiscal benefits	1996-2015
	Biofuel blending mandate	Since 2005
	Certification system	Since 2012
	Double counting	Since 2005
United Kingdom	Fiscal benefits	2007-2010 for all biofuels 2007-2012 for UCO biodiesel
	Biofuel blending mandate	Since 2007
	Certification system	Since 2007
	Double counting	Since 2007
Germany	Fiscal benefits	2002-2013
	Biofuel blending mandate	Since 2007
Italy	Fiscal benefits	1995-2011

	Biofuel blending mandate	Since 2006
	Certification system	Since 2012
	Double counting	Since 2014
	Biofuel blending mandate	Since 2006

Table 8. Summary of the specific policies of each country and period in force.

Country	Biofuel blending mandate
Spain	Mandatory minimum biofuel targets according to Royal Decree 205/2021: 5% (2017), 6% (2018), 7% (2019), 8.5% (2020), 9.5% (2021) and 10% (2022).
France	According to the Finance Law introduced in 2005, the evolution of the biodiesel targets are: 7.7% (2014-2018), 7.9% (2019) and 8% (2020-2021).
United Kingdom	The RTFO established for 2020 ensures that a minimum of 9.75% of the fuel they supply comes from renewable sources, and the 12.4% established for 2032.
Germany	GHG reduction quota from 3.5% (2015-2016) to 4% (2017-2019) and 6% (2020 onwards).
Italy	According to the Ministerial Decree: annual mix target of 10% (2020); Biodiesel blending obligation of 1.2% (2018-2019), 1.6% (2020-2021) and 2% (2022- onwards).

Table 9. Summary of the characteristics of the mixing mandates in each country.

From these reports we can draw the following conclusions:

- In Spain, biofuel production plants are not receiving any type of tax exception due to their activity or potential savings in GHG emissions.
- In Spain, United Kingdom, Italy and France, there are legal regulations that oblige wholesale operators (among other business figures) to introduce a certain percentage of sustainable biofuel to the market (under the sustainability requirements of RED I). Although it would be indirect, it can be understood as an aid to these biofuels and, therefore, to a hypothetical saving of emissions.

Due to this, in the event that the biofuel production plant did not exist, other plants would cover their market share.

However, in relation to GHG emission savings, the only requirement to comply with this quota is determined by the applicable renewable energy directive (RED I or RED II) which, in the case of the project plant, implies a minimum saving of 50% of GHG emissions compared to the reference fossil fuel. That means that all savings above that are made on a voluntary basis, and have no implications on the price of the product or are required by the legislative framework. All savings greater than 50% pass the legal requisition test.

- In Germany, on the other hand, the legal requirement refers to a specific saving of GHG emissions and, therefore, it is understood as a direct aid to energy saving. In the absence of the

biofuel production plant, another plant would cover its market share and, therefore, GHG savings.

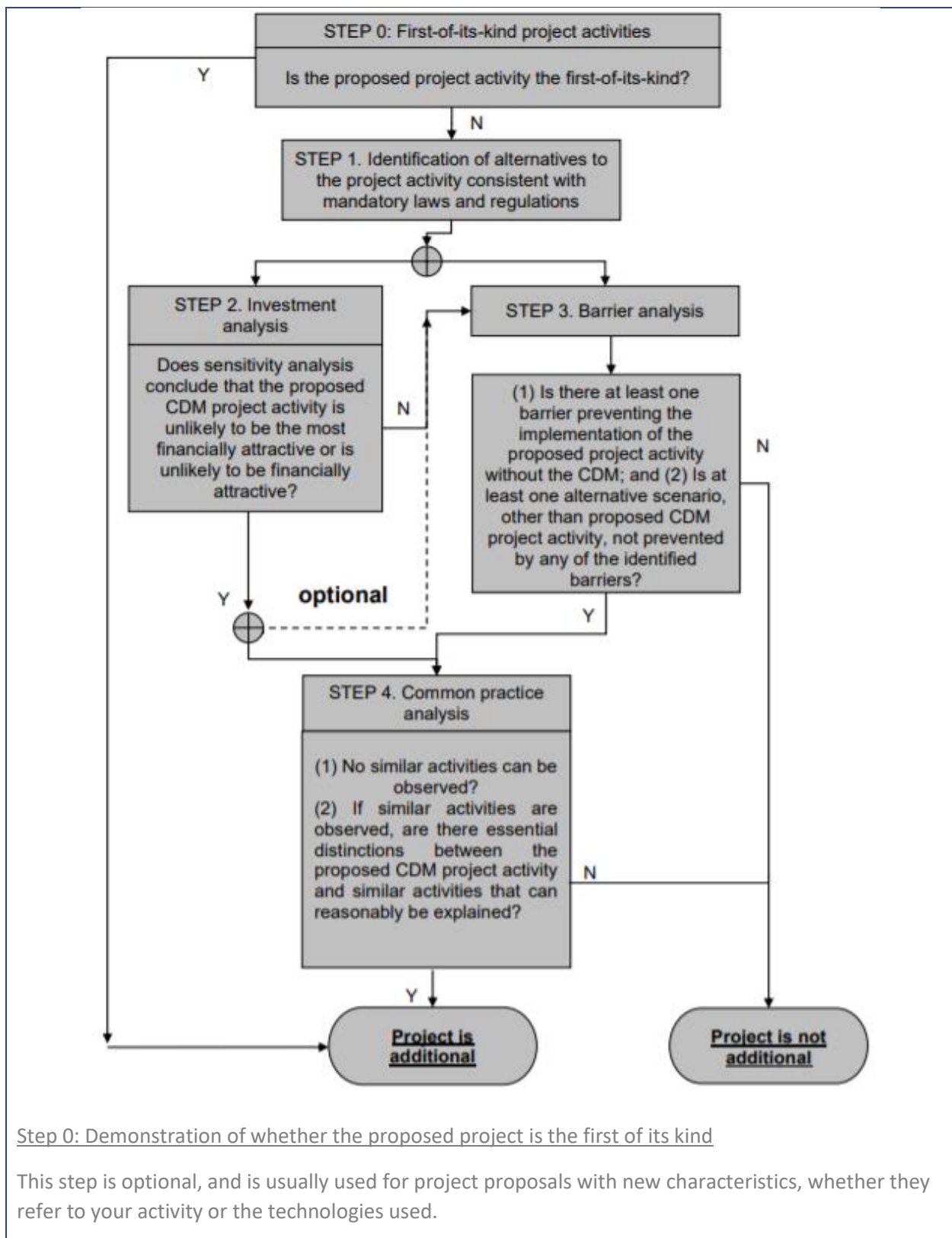
Regardless of the savings produced by the biodiesel plant, the project does not pass the legal requisition test.

In order to ensure compliance with these requirements throughout the duration of the project, a similar study will be requested annually in relation to the legislative changes applicable to it. In the same way, in the case in which it was decided to introduce product batches in the project that were consumed in countries other than those studied, it would be possible to expand it as long as it could be adequately justified.

Additionality test

Project proponents must demonstrate the additionality of the project following the approved methodology applied, if mandated by the methodology, and requires that GHG emissions be mitigated below those that would occur in the absence of the project.

Since the approved methodology used, “Clean Development Mechanism ACM0017: Large-scale Consolidated Methodology for Production of Biofuel”, requires to demonstrate additionality through a 6-step procedure, the methodological tool “TOOL01: Tool for the demonstration and assessment of additionality”.



If used, this step refers to the methodological tool "TOOL23: Additionality of first-of-its-kind project activities".

For the particular case of this project, its characteristics do not meet the requirements of said methodological tool, which is why it cannot be considered the first of its kind. To demonstrate its additionality, it is necessary to proceed to step 1.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

The objective of this step is to be able to define alternative scenarios to the project activity that are realistic and credible. For this purpose, first those alternative scenarios that provide the same services and / or products as the proposed project will be defined, and then those that are not consistent with the mandatory laws and regulations will be discarded.

From this step the following alternatives are defined:

1. Same biodiesel production due to the activity of a production plant that uses virgin oils as raw material (first generation biofuels).
2. Same biodiesel production due to the activity of a production plant that uses the same raw material (UCO) with the minimum mitigations of GHG emissions required by mandatory laws and regulations (50%).

Step 2: Investment analysis

This step allows you to determine if the proposed activity is not:

- The most economically or financially attractive; or
- Economically or financially feasible, without the proceeds from the sale of certified emission reductions (CERs).

Due to the characteristics and activity of the proposed project, it is necessary to resort to a comparative analysis of investment costs. Through it, it will be possible to conclude that the proposed activity is not the most economically or financially attractive.

1. Comparison with alternative scenario 1: Given that the cost of UCO (and other waste input materials) in the market far exceeds the costs of virgin oils used in the production of biodiesel, it is clear to result in a higher cost \$ / GJ for the activity of the project proposed as a result of this difference in the cost of the raw material. Added to the cost of the raw material, the final value of \$ / GJ is simultaneously affected by the availability of the raw material, the production of virgin oils being more abundant than the availability of waste / residues for input in the market.
2. Comparison with scenario 2: Given the additional cost associated with the mitigation of GHG emissions that are carried out above what is required by law, it is clear to result in a higher cost \$ / GJ for the proposed project activity as a result of these mitigations.

Given these considerations, it is determined that the proposed project activity is not the most attractive from an economic or financial point of view. With the positive result of this step, it is a sufficient condition to advance to step 4.

Step 3: Barrier Analysis

This step is used to define barriers that may arise to the implementation of the proposed project activity. It mainly focuses on barriers of the following types:

- Investment barriers
- Technological barriers
- Institutional barriers, or other types.

Since it is not necessary to analyze each step of this methodological tool (TOOL01), and as the result of step 2 was positive to advance in the flowchart, the analysis of step 3 is avoided and it is advanced to step 4.

Step 4: Analysis of "Common Practices"

The above generic additionality tests will be complemented by an analysis of the extent to which the proposed project type (eg technology or practice) has already spread to the relevant sector and region. This test is a credibility check to complement the investment analysis (Step 2) or the barrier analysis (Step 3).

Following the methodological tool "*TOOL24: Common practice*", the result is that the activity of the proposed project is estimated as "common practice", and therefore, the project could not be considered as additional. This result is due to the approach that the ACM0017 methodology gives to the analysis of projects, since this approach was designed to evaluate the competitiveness of new technology projects and their degree of insertion in underdeveloped regions. This is not the application scenario of the proposed project, since it is developed in Europe, and the technologies are largely developed in the area.

Given the complementary nature of this step, and exposed all the information requested to demonstrate the additionality of this project, the ACM0017 methodology will be modified in this step to comply with the additionality justification requested by ICR.

4.5 Boundary

Although the proponent of the project is Green Fuel Extremadura S.A., the manufacturing and supply chain includes different entities until the finished product is consumed. For this reason, it is of great importance to define correctly and clearly the boundaries of the project.

The group of companies that participate in the production and commercialization of liquid biofuels are similar regardless of the final product (biodiesel, bioethanol, HVO, etc.). Although the chemical processes to which they are treated are different, from the point of view of the traceability of the material, the type of entity that performs them is similar: a processing plant. On the other hand, the main difference between the actors who carry out actions on the material is found in the origin of the

raw materials: farms and plantations or waste / residues generators. The most complex operation will be described in order to define all the actors involved in its production.

Raw materials from plantations

This group includes all first-generation liquid biofuels.

Whether we are talking about biodiesel or first generation bioethanol, the first entity involved in its production is the farm or plantation. The raw material with which the biofuel is to be produced is cultivated (typically corn or wheat for bioethanol, and soy, palm, rapeseed and sunflower for biodiesel).

The grain reaches the "first collecting point", which can be from a small group of farmers to large international companies. They obtain the crops directly from farms or plantations and are the ones that store the raw material.

The material passes into the hands of a trader, its only job is to buy the material at the collection point and take it to a processing unit. These traders can either store the material in silos or just transport it. Its role is critical when it comes to studying GHG emissions from biofuels, since the location of plantations and factories can be found on different continents.

The processing units can be different, from simple oil mills or crushing plants, to refineries. The last processing units are always the biodiesel or bioethanol plants. It is unusual for all the processing units necessary to manufacture biofuel to be located in the same place, so it is common for different traders to participate in the transfer of material from one unit to another.

After passing through the last processing plant, it is taken by other traders until it reaches the wholesale operators of petroleum products. These are the ones in charge of putting both fossil fuels and biofuels, normally mixed, in gas stations and other consumption stations. These companies use distributors in their logistics to distribute the product. Although the latter have legal possession of the material, they exercise the role of transporters, it is actually the operators who have to declare their purchases and sales to the competent authority.

Raw materials categorized as waste

In the case of liquid biofuels whose raw material is waste, there are more possibilities when it comes to defining the first link in the chain.

Unlike plantations, where a legal entity is in charge of producing a material and is economically remunerated for its sale, waste is generated both by companies (e. g. a potato chip factory that uses large amounts of oil) as by individuals.

Those points where the waste is generated are called "points of origin", and they usually do not have the legal capacity to work with waste. Due to its condition, the waste must be treated by a waste management entity, which are called "collecting points", and they are responsible for putting that product on the market. From this point on, the product supply chain is very similar to that of raw materials from plantations.

All the entities described above are part of the supply and production chain, as they are essential for the manufacture of biofuel, with the final biofuel production plant being the proponent of the project.

There are entities that are outside the scope and borders of this project. These are those that provide associated products or services (mainly the elaboration of chemicals for the manufacture of intermediate and final products, and the management of waste generated during these phases). The emissions associated with these products and services, even outside the project border, must be taken into account as affected GHG sources, sinks and reservoirs.

In the Figure 6, a summary of the project boundaries is displayed.

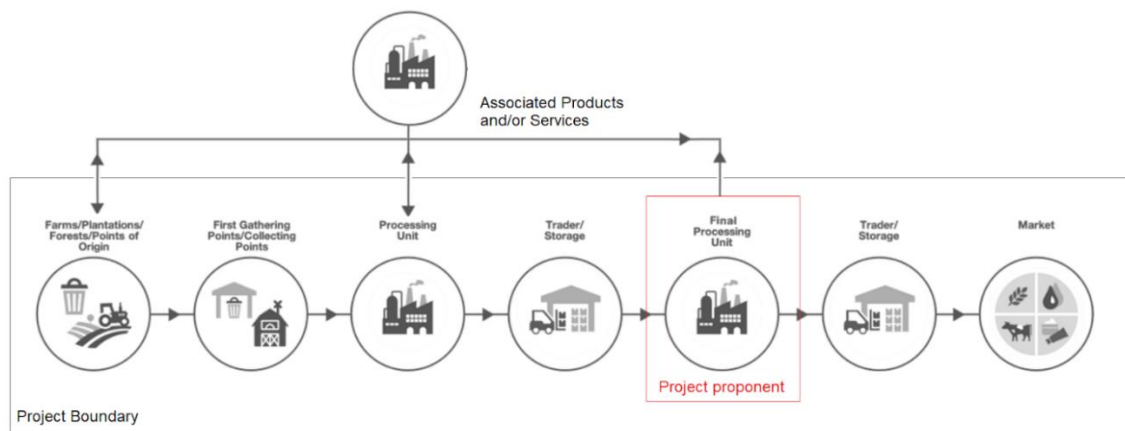


Figure 6. Project boundaries

4.6 Description of Baseline Scenario

- GHG baseline period

The baseline period is contemporary with the project activity.

The baseline of the project, although described below, refers to values and calculations made by the European Commission described in the RED I and RED II directives, which are constantly being reviewed and modified by community organizations.

There is a calculation valid until July 21 of 2021 (RED I) and another from this date (RED II) until the relevant legislation is modified.

The period of said baseline will then be from the beginning of 2020 and indefinite as long as the plant remains in operation.

In the case of carbon storage in the land, it will be taken as a reference on January 1 of 2008. Any change in carbon in the soil prior to that date will not be accounted for.

One of the strengths of this project is that the baseline is defined with information recognized by international organizations such as the European Commission.

- Methodology for determining the specific baseline for this project

The baseline scenario will be separately identified among all realistic and credible alternatives for the following items:

- Fuel production (P):** What would have happened at the production level in the absence of the project activity?
In the absence of the project activity, at the production level, the production quota would be assumed by a similar processing unit. This processing unit is considered to comply with the legal requirements of the product.
- Consumption (C):** What fuel would have been consumed in the absence of the project activity?
In the absence of the project, the most likely reference scenario among all the realistic and credible alternatives would be the consumption of a blended biofuel due to a legal requirement, that is, a saving of 50%.
- Material (M):** What would have happened to the material used as input for biofuel production in the absence of the project activity?
In the absence of the project activity, the material used as input for biofuel production would be used for the same purpose in a different processing unit.

Definition of the project baseline

The legal requirement of energy saving required for a biodiesel production facility prior to October of 2015 (50%) will be taken as a baseline for those batches that have been consumed during each of the annual periods in one of the following countries:

- Spain
- France
- Italy
- United Kingdom

The calculation of this saving will be carried out according to the calculation methodology defined by the legislation in force; the renewable energy directives:

The savings for each batch are calculated as:

$$S^i = E_B^i - E^i \quad (36)$$

Where " S^i " is the saving of the batch " i ", and " E_B^i " is the comparator of the project baseline. Such that

$$E_B^i = \frac{E_f^i}{2} \quad (37)$$

Where " E_f^i " is the current reference fossil comparator

For both directives, the calculation methodology is the same, however, the fossil fuel comparator is updated.

- Before 01/07/2021, RED I is in force:

"For biofuels, for the purpose of the calculation referred to in point 4, the fossil fuel comparator E_f will be the last average of real available emissions for the fossil part of oil and diesel consumed in the European Community, as reported in Directive 98/7/EC. If no data is available, the value used will be 83.8 g CO₂ eq/MJ."

- As of 07/01/2021, RED II is in force:

"For biofuels, for the purpose of the calculation referred to in point 3, the fossil fuel comparator E_f will be 94 g CO₂ eq /MJ."

These requirements are subject to modification in the event that a new regulation (community, state or regional) enters into force throughout the project period.

Therefore, in order to calculate the savings relative to the baseline, those comparators must be half (50% savings) for the calculation to be correct:

- Until 07/01/2021, RED I is in force: 41.9 g CO₂ eq /MJ
- As of 07/01/2021, the RED II is in force: 47 g CO₂ eq / MJ
- Identification of GHG SSR relevant to the baseline scenario

When identifying GHG SSR relevant to the baseline scenario, the project proponent must:

- Consider the criteria and procedures used to identify GHG SSR relevant to the project.
- If necessary, explain and apply additional criteria to identify relevant GHG SSR.
- Compare GHG SSR identified from the project with those identified in the baseline scenario.

Based on the scenario defined in the previous section, and in general, all sources, sinks and reservoirs that apply to the project will apply, since it is assumed that biodiesel deliveries would be used with the legal emission savings to be considered sustainable.

On the other hand, other sources of emissions will be associated with the extraction of crude oil, its refining and its consumption in mobile vehicles, as it is the way to define the value of the reference fossil fuel that is replaced (as it is necessary to calculate the savings).

All SSR presented in section 4 need to be accounted for in the baseline scenario defined for this project, because this will allow to calculate the mitigations of the project activity having in consideration all the leakage emissions already accounted for when comparing with the baseline scenario. Therefore, all SSR already presented are relevant and will be taken into account for the baseline scenario.

Sources, sinks and reservoirs		Gas	Included	Justification / Explanation
Base line	Final vehicles consuming fossil fuel	CO ₂	YES	Main source of baseline emissions

		CH ₄	NO	Excluded for simplification. CH ₄ and N ₂ O emissions are assumed to be very small. No systematic difference with the project activity
		N ₂ O	NO	
	Biomass cultivation in a dedicated plantation	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Production and management of residues of fertilisers, pesticides and other chemical products in the crop	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Raw material transportation	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	NO	Excluded for simplification. CH ₄ and N ₂ O emissions are assumed to be very small. No systematic difference with the project activity
		N ₂ O	NO	
	On-site energy consumption at the biofuel production plant	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	On-site energy consumption at raw material production plant(s)	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions

		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Production and management of waste chemical acids and bases, process water, lubricants, catalysts and other chemicals in the biofuel production plant and the raw material production plant(s)	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Combustion of fossil fuel derived methanol in biodiesel ester	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Anaerobic treatment of wastewater in the production of raw materials	CO ₂	NO	Excluded for simplification. CO ₂ emissions are assumed to be very small
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	NO	Excluded for simplification. N ₂ O emissions are assumed to be very small
	Waste treatment in biofuel production plant	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Waste treatment at the raw material production plant(s)	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Transport of biofuel to the mixing facility	CO ₂	YES	May be a significant source, sink, or reservoir of emissions

		CH ₄	NO	Excluded for simplification. CH ₄ and N ₂ O emissions are assumed to be very small. No systematic difference with the project activity
		N ₂ O	NO	
	Transport of mixed fuel to the service station and energy consumption at the service station	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Land use change	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	NO	Excluded for simplification. CH ₄ emissions are assumed to be very small
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Improved agricultural management / best practices leading to increased soil carbon	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	NO	Excluded for simplification. CH ₄ emissions are assumed to be very small
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Carbon sequestration of CO ₂ whose carbon originates from biomass and is used to replace fossil-derived CO ₂ used in commercial products and services	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	NO	Excluded for simplification. CH ₄ and N ₂ O emissions are assumed to be very small. No systematic difference with the project activity
		N ₂ O	NO	
	Capture and sequestration of CO ₂ emitted directly related to the extraction, transport, processing and distribution of fuel under the authority	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	NO	Excluded for simplification. CH ₄ and N ₂ O emissions are

	of the economic operator in the supply chain	N ₂ O	NO	assumed to be very small. No systematic difference with the project activity
	Capture and sequestration of directly emitted CO ₂ related to the extraction, transport, processing and distribution of fuel under the authority of an external operator	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	NO	Excluded for simplification. CH ₄ and N ₂ O emissions are assumed to be very small. No systematic difference with the project activity
		N ₂ O	NO	

Table 10. Gases to be taken into account from the baseline sources, sinks and reservoirs and their justification.

All sources, sinks and reservoirs detected and identified previously will be monitored for each review and annual report. All SSR are considered relevant and, due to the possibility of calculating these, it is proposed to review them in annual periods.

Sources, sinks and reservoirs		Gas	Included	Justification / Explanation
Project activity	Biomass cultivation in a dedicated plantation	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Production and management of residues of fertilisers, pesticides and other chemical products in the crop	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Raw material transportation	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	NO	Excluded for simplification. CH ₄ and N ₂ O emissions are assumed to be very small. No systematic difference with the project activity
		N ₂ O	NO	

	On-site energy consumption at the biofuel production plant	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	On-site energy consumption at raw material production plant(s)	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Production and management of chemical acid and base waste, process water, lubricants, catalysts and other chemicals in the biofuel production plant and the raw material production plant(s)	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Combustion of fossil fuel derived methanol in biodiesel ester	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Anaerobic treatment of wastewater in the production of raw materials	CO ₂	NO	Excluded for simplification. CO ₂ emissions are assumed to be very small
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	NO	Excluded for simplification. N ₂ O emissions are assumed to be very small
	Waste treatment in biofuel production plant	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions

		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Waste treatment at the raw material production plant(s)	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Transport of biofuel to the mixing facility	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	NO	Excluded for simplification. CH ₄ and N ₂ O emissions are assumed to be very small. No systematic difference with the project activity
		N ₂ O	NO	
	Transport of mixed fuel to the service station and energy consumption at the service station	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	YES	May be a significant source, sink, or reservoir of emissions
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Land use change	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	NO	Excluded for simplification. CH ₄ emissions are assumed to be very small
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions
	Improved agricultural management / best practices leading to increased soil carbon	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	NO	Excluded for simplification. CH ₄ emissions are assumed to be very small
		N ₂ O	YES	May be a significant source, sink, or reservoir of emissions

	Carbon sequestration of CO ₂ whose carbon originates from biomass and is used to replace fossil-derived CO ₂ used in commercial products and services	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	NO	Excluded for simplification. CH ₄ and N ₂ O emissions are assumed to be very small. No systematic difference with the project activity
		N ₂ O	NO	
	Capture and sequestration of CO ₂ emitted directly related to the extraction, transport, processing and distribution of fuel under the authority of the economic operator in the supply chain	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	NO	Excluded for simplification. CH ₄ and N ₂ O emissions are assumed to be very small. No systematic difference with the project activity
		N ₂ O	NO	
	Capture and sequestration of directly emitted CO ₂ related to the extraction, transport, processing and distribution of fuel under the authority of an external operator	CO ₂	YES	May be a significant source, sink, or reservoir of emissions
		CH ₄	NO	Excluded for simplification. CH ₄ emissions are assumed to be very small
		N ₂ O	NO	Excluded for simplification. N ₂ O emissions are assumed to be very small

Table 11. Gases to be taken into account from the sources, sinks and reservoirs of the project activity and their justification.

The SSR identification methodology used for this project is comprehensive and open. This indicates that not all the identified SSR will be involved in the emissions calculations because some of them will have a default value of zero, as they do not participate in the project in question. These values, by default null, will be subject to future modifications, as it is possible that at some point they will cease to be so. For this reason, a consistent methodology (of the same comprehensive and open nature) is defined in this report and described.

The participation of each GHG in the calculation of emissions will be taken into account through the use of CO₂ eq emission factors. Said equivalence between CH₄ and N₂O, in order to quantify its polluting effect in terms of CO₂ eq, is calculated taking into account the GWP (Global Warming Potentials) of each of them. These are 23 and 296 g CO₂ eq / g for CH₄ and N₂O respectively.

4.7 Baseline and Projection

Baseline Scenario			
Source, sink or reservoir	GHGs	Methodology term	Amount (t CO ₂ -eq)
Carbon sequestration of CO ₂ whose carbon originates from biomass and is used to replace fossil-derived CO ₂ used in commercial products and services	CO ₂	E_B	2020: 110.347,37 2021: 117.063,02 2022 and following: 123.778,68
Capture and sequestration of CO ₂ emitted directly related to the extraction, transport, processing and distribution of fuel under the authority of the economic operator in the supply chain	CO ₂		
Biomass cultivation in a dedicated plantation	CO ₂		
	CH ₄		
	N ₂ O		
Production and management of residues of fertilizers, pesticides and other chemical products in the crop	CO ₂		
	CH ₄		
	N ₂ O		
Anaerobic treatment of wastewater in the production of raw materials	CH ₄		
Land use change	CO ₂		
	N ₂ O		
On-site energy consumption at the biofuel production plant	CO ₂		
	CH ₄		
	N ₂ O		
On-site energy consumption at raw material production plant(s)	CO ₂		
	CH ₄		
	N ₂ O		
Production and management of waste chemical acids and bases, process water, lubricants, catalysts and other chemicals in the biofuel production plant and the raw material production plant(s)	CO ₂		
	CH ₄		
	N ₂ O		
	CO ₂		

Combustion of fossil fuel derived methanol in biodiesel ester	CH ₄		
	N ₂ O		
Waste treatment in biofuel production plant	CO ₂		
	CH ₄		
	N ₂ O		
Waste treatment at the raw material production plant(s)	CO ₂		
	CH ₄		
	N ₂ O		
Improved agricultural management / best practices leading to increased soil carbon	CO ₂		
	N ₂ O		
Transport of mixed fuel to the service station and energy consumption at the service station	CO ₂		
	CH ₄		
	N ₂ O		
Raw material transportation	CO ₂		
Final vehicles consuming fossil fuel	CO ₂		
Transport of biofuel to the mixing facility	CO ₂		
Final vehicles consuming fuel	CO ₂		

Project Scenario

Source, sink or reservoir	GHGs	Methodology term	Amount (t CO ₂ -eq)
Carbon sequestration of CO ₂ whose carbon originates from biomass and is used to replace fossil-derived CO ₂ used in commercial products and services	CO ₂	e_{ccr}	0
Capture and sequestration of CO ₂ emitted directly related to the extraction, transport, processing and distribution of fuel under the authority of the economic operator in the supply chain	CO ₂	e_{ccs}	0
	CO ₂		0

Biomass cultivation in a dedicated plantation	CH ₄	e_{ec}	
	N ₂ O		
Production and management of residues of fertilizers, pesticides and other chemical products in the crop	CO ₂		
	CH ₄		
	N ₂ O		
Anaerobic treatment of wastewater in the production of raw materials	CH ₄		
Land use change	CO ₂	e_l	0
	N ₂ O		
On-site energy consumption at the biofuel production plant	CO ₂	e_p	25.922,99
	CH ₄		
	N ₂ O		
On-site energy consumption at raw material production plant(s)	CO ₂		
	CH ₄		
	N ₂ O		
Production and management of waste chemical acids and bases, process water, lubricants, catalysts and other chemicals in the biofuel production plant and the raw material production plant(s)	CO ₂		
	CH ₄		
	N ₂ O		
Combustion of fossil fuel derived methanol in biodiesel ester	CO ₂		
	CH ₄		
	N ₂ O		
Waste treatment in biofuel production plant	CO ₂		
	CH ₄		
	N ₂ O		
Waste treatment at the raw material production plant(s)	CO ₂		
	CH ₄		
	N ₂ O		
	CO ₂		

Improved agricultural management / best practices leading to increased soil carbon	N ₂ O	e_{sca}	0
Transport of mixed fuel to the service station and energy consumption at the service station	CO ₂	e_{td}	2.633,59
	CH ₄		
	N ₂ O		
Raw material transportation	CO ₂		
Final vehicles consuming fossil fuel	CO ₂		
Transport of biofuel to the mixing facility	CO ₂		
Final vehicles consuming fuel	CO ₂	e_u	0
Total	t CO₂-eq		28.556,58

4.8 Leakage

Leakage is accounted for in the calculation methodology because of the comparison of the SSR defined both for the baseline scenario and the project activity. This is a modification of the methodology ACM0017 to better fit the proposed project and its activity.

4.9 Net GHG Emission Mitigations

When carrying out a complex and extensive project, Green Fuel Extremadura S.A. will not carry out all the GHG emissions calculations, but rather much of the information will be received in the sustainability declarations.

Green Fuel Extremadura S.A. will receive sustainability documentation for each of the input batches (lots). These documents are called "sustainability declarations" (SD).

This sustainability documentation must comply with the requirements of the application standard (ISCC, other schemes recognized by the European Commission for compliance with the requirements of RED I or RED II, or other national schemes that follow the same methodology).

This is essential, as the fact that every economic agent in the traceability chain has to be certified and audited by an independent entity is what makes this method robust.

This documentation will include the GHG emissions information for the batch, in units of kilograms of carbon dioxide equivalent per unit of dry mass of the product, for each of the terms of the sum of emissions.

In addition to this, the statement will report the distance in kilometers traveled by the material from the previous processing plant (or point of origin or plantation in the absence of an intermediate plant),

since it is the responsibility of the processing units to calculate the upstream emissions according to the ISCC-EU methodology.

The information reflected in this sustainability document is assumed to be true and correct, as it has been issued from an element of the traceability chain that has been certified by an independent entity and with adequate accreditation for that scope.

Due to this, the emissions and information reflected in this sustainability document (which represent only related and affected sources) are assumed to be correctly calculated under the same methodology.

As explained above, it is possible to use standard values validated by the European Commission for any of the terms. These values are called "Default Values". The procedure for calculating each of the terms of the sum of emissions will be defined in detail in the appropied point. In case of using default values, the procedure is described in the following sections, but it must be applied only for that specific term.

- Calculation procedure

Green Fuel Extremadura S.A. will carry out the following procedure:

- Upstream transportation. Calculation in wet tonnes
The transport emissions per wet tonne of material will be calculated with the information of the distances traveled from the last processing plant (or point of origin if it does not exist) in the SD.
- Upstream transportation. Calculation in dry tonnes.
These transport emissions will be converted to dry tonnes for consistency in the units.
- Plant processing emissions
Emissions from the plant itself will be calculated and associated with the main product and co-products.
- Transformation of raw material emissions
The emissions of the raw material will be associated to the main product.
- Calculation of downstream emissions. Total transport emisisions
It is the responsibility of the last processing plant to calculate these emissions.
- Upstream transportation. Calculation in wet tonnes

The kilometer data indicated in the Sustainability Declaration will be used.

$$e_{td;uw} = e_{td;u-S} + e_{td;u-T} + e_{td;u-R} \left[\frac{kg \ CO_{2-eq}}{T_{wet}} \right] \quad (38)$$

Where:

$e_{td(m-S)}$: Emissions associated with transport by ship from the previous processing plant to Green Fuel Extremadura S.A. in wet tonnes.

$e_{td(m-T)}$: Emissions associated with transport by train from the previous processing plant to Green Fuel Extremadura S.A. in wet tonnes.

$e_{td(m-R)}$: Emissions associated with road transport from the previous processing plant to Green Fuel Extremadura S.A. in wet tonnes.

- Transport by boat

$$e_{td;u-S} \left[\frac{kg CO_2-eq}{T_{wet}} \right] = SX [km] \cdot EF_{SXj} \left[\frac{kg CO_2-eq}{t-km} \right] \quad (39)$$

Where "SX" is the distance in kilometers that appears in the SD for transport by ship, and " EF_{SXj} " is the emission factor in $\left[\frac{kg CO_2-eq}{t-km} \right]$ corresponding to:

EF_{SXT} : Transoceanic

EF_{SXE} : In Europe

EF_{SXROW} : Rest of the world

- Train transportation

$$e_{td;u-T} \left[\frac{kg CO_2-eq}{T_{wet}} \right] = TX [km] \cdot EF_{TXj} \left[\frac{kg CO_2-eq}{t-km} \right] \quad (40)$$

Where "TX" is the distance in kilometers that appears in the SD for transport by train, and " EF_{TXj} " is the emission factor in $\left[\frac{kg CO_2-eq}{t-km} \right]$ corresponding to:

EF_{TXE} : In Europe without Switzerland

EF_{TXROW} : Rest of the world

EF_{TXE} : Electric train. This is calculated as:

$$EF_{TXE} \left[\frac{kg CO_2-eq}{t-km} \right] = EF_{TXEE} \left[\frac{kWh}{t-km} \right] \cdot EF_{ECj} \left[\frac{kg CO_2-eq}{kWh} \right] \quad (41)$$

Where " EF_{TXEE} " is the emission factor in $\left[\frac{kWh}{t-km} \right]$ for the electric train, and " EF_{Elecj} " is the emission factor of electricity, depending on the geographical area where it has been transported.

- Road transport

Two options are proposed:

Option 1.

$$e_{td;u-R} \left[\frac{kg CO_2-eq}{T_{húmeda}} \right] = RX [km] \cdot EF_{RXj} \left[\frac{kg CO_2-eq}{t-km} \right] \quad (42)$$

Where "RX" is the distance in kilometers that appears in the SD for road transport, and " EF_{RXj} " is the emission factor in $\left[\frac{kg CO_2-eq}{t-km} \right]$ corresponding to:

$EF_{RX\ EU}$: In Europe

$EF_{RX\ ROW}$: Rest of the world

Option 2.

$$e_{td;u-R} \left[\frac{kg\ CO_2-eq}{T_{wet}} \right] = \frac{RX\ [km] \cdot \left(K_L \left[\frac{l}{km} \right] + K_E \left[\frac{l}{km} \right] \right) \cdot EF_F \left[\frac{kg\ CO_2-eq}{l} \right]}{IM_{wet} [T_{wet}]} \quad (43)$$

Where " K_L " is the consumption of the loaded means of transport, " K_E " is the consumption of the empty means of transport, " EF_F " is the fuel emission factor (diesel) and " IM_{wet} " are the wet tonnes of the batch.

- Upstream transportation. Calculation in dry tonnes

Once these emissions per wet tonne are obtained, they will be transformed to dry tonne and will be added to the emissions indicated in the SD:

$$e_{td;up} \left[\frac{kg\ CO_2-eq}{T_{dry}} \right] = \frac{e_{td;uw} \left[\frac{kg\ CO_2-eq}{T_{wet}} \right]}{(1 - m_{in})} + e_{td;in} \left[\frac{kg\ CO_2-eq}{T_{dry}} \right] \quad (44)$$

Where " $e_{td;up}$ " are the transport emissions upstream of the final processing plant for the batch in question, " m_{in} " is the moisture content from 0 to 1 of the batch, and " $e_{td;in}$ " are the transport emissions reflected in the batch. SD (up to the previous processing plant).

- Plant processing emissions

Own emissions are calculated with annual data.

Total plant processing emissions

$$E_{p;p} [kg\ CO_2-eq] = \sum_i EM_i [kg\ CO_2-eq] \quad (45)$$

Where " $E_{p;p}$ " are the total emissions of the plant and " EM_i " are the emissions associated with each input. These inputs can be:

$$EM_{EC} [kg\ CO_2-eq] = EC [kWh] \cdot EF_{EC,SP} \left[\frac{kg\ CO_2-eq}{kWh} \right] \quad (46)$$

$$EM_{HS} [kg\ CO_2-eq] = HS [T] \cdot EF_{HS} \left[\frac{kg\ CO_2-eq}{T} \right] \quad (47)$$

$$EM_{HCl} [kg\ CO_2-eq] = HCl [T] \cdot EF_{HCl} \left[\frac{kg\ CO_2-eq}{T} \right] \quad (48)$$

$$EM_{HP}[kg CO_{2-eq}] = HP[T] \cdot EF_{HP} \left[\frac{kg CO_{2-eq}}{T} \right] \quad (49)$$

$$EM_{MetOH}[kg CO_{2-eq}] = MetOH[T] \cdot EF_{MetOH} \left[\frac{kg CO_{2-eq}}{T} \right] \quad (50)$$

$$EM_{pw}[kg CO_{2-eq}] = pw[T] \cdot EF_{pw} \left[\frac{kg CO_{2-eq}}{T} \right] \quad (51)$$

$$EM_{wwt}[kg CO_{2-eq}] = wwt[T] \cdot EF_{wwt} \left[\frac{kg CO_{2-eq}}{T} \right] \quad (52)$$

$$EM_{NaOH}[kg CO_{2-eq}] = NaOH[T] \cdot EF_{NaOH} \left[\frac{kg CO_{2-eq}}{T} \right] \quad (53)$$

$$EM_{NG}[kg CO_{2-eq}] = NG[MJ] \cdot EF_{NG} \left[\frac{kg CO_{2-eq}}{MJ} \right] \quad (54)$$

Where:

- " *EC* " Is the electrical energy consumed in the plant in the 12 months period.
- " *HS* " Is the sulfuric acid consumed in the plant in the 12 months period.
- " *HCl* " Is the hydrochloric acid consumed in the plant in the 12 months period.
- " *HP* " Is the phosphoric acid consumed in the plant in the 12 months period.
- " *MetOH* " Is the methanol consumed at the plant in the 12 months period.
- " *pw* " Is the process water consumed in the plant in a period of 12 months.
- " *wwt* " Is the wastewater sent to treatment by the plant in a 12 months period.
- " *NG* " Is the natural gas consumed at the plant in a 12 months period.
- " *NaOH* " Is the sodium hydroxide consumed in the plant in a period of 12 months.
- " *EF_i* " Are the emission factors of each of the inputs¹.
- Feedstock factor

$$FF \left[\frac{MJ(mat. prima)}{MJ(producto)} \right] = \frac{LHV_{in} \left[\frac{MJ}{kg} \right] \cdot AIN_{dry}[T_{dry}]}{LHV_{mp} \left[\frac{MJ}{kg} \right] \cdot AOMP_{dry}[T_{dry}]} \quad (55)$$

Where "*LHV_i*" is the lower calorific value of the main product (mp) and raw material (in), "*AOMP_{dry}*" is the amount of main product (biodiesel) in the 12 months in dry tonnes, and "*AIN_{dry}*" is the amount of raw material in the 12 months in dry tonnes, calculated as:

$$AOMP_{dry}[T_{dry}] = AOMP_{wet}[T_{wet}] \cdot (1 - M_{mp}) \quad (56)$$

¹ "*EF_{EC,SP}*" is the factor of electricity for Spain, and "*EF_{MetOH}*" takes into account the emissions from the combustion of methanol in the final vehicle.

Where " $AOMP_{wet}$ " is the amount of main product (biodiesel) in the 12 months in wet tonnes and " M_{mp} " is the average of the humidity of the main product from 0 to 1.

$$AIN_{dry}[T_{dry}] = AIN_{wet}[T_{wet}] \cdot (1 - M_{in}) \quad (57)$$

Where " AIN_{wet} " is the amount of raw material in the 12 months in humid tonnes and " M_{in} " is the average of the humidity of the raw material from 0 to 1.

- Allocation factor

$$AF = \frac{LHV_{mp} \left[\frac{MJ}{kg} \right] \cdot AOMP_{dry}[T_{dry}]}{LHV_{mp} \left[\frac{MJ}{kg} \right] \cdot AOMP_{dry}[T_{dry}] + LHV_{cp} \left[\frac{MJ}{kg} \right] \cdot AOCp_{dry}[T_{dry}]} \quad (58)$$

Where " LHV_{cp} " is the lower calorific value of the co-product (glycerin) and " $AOCp_{dry}$ " is the quantity of co-product in the 12 months in dry tonnes, calculated as:

$$AOCp_{dry}[T_{dry}] = AOCp_{wet}[T_{wet}] \cdot (1 - M_{cp}) \quad (59)$$

Where " $AOCp_{wet}$ " is the amount of co-product in the 12 months in wet tonnes and " M_{cp} " is the average of the humidity of the co-product from 0 to 1.

- Distribution of emissions

The plant processing emissions associated with biofuel will be calculated as:

$$e_{p;p} \left[\frac{g \text{ CO}_2\text{-eq}}{MJ} \right] = \frac{E_{p;p} [kg \text{ CO}_2\text{-eq}] \cdot AF}{LHV_{mp} \left[\frac{MJ}{kg} \right] \cdot AOMP_{dry}[T_{dry}]} \quad (60)$$

- Transformation of raw material emissions

The emissions associated with the raw material must be transferred to the final product according to the following formula:

$$e_{i,out} \left[\frac{g \text{ CO}_2\text{-eq}}{MJ} \right] = \frac{e_{i,in} \left[\frac{kg \text{ CO}_2\text{-eq}}{T_{dry}} \right]}{LHV_{in} \left[\frac{MJ}{kg} \right]} \cdot AF \cdot FF \left[\frac{MJ(\text{raw material})}{MJ(\text{product})} \right] \quad (61)$$

Where the index "i" refers to the different emission terms of the batches:

e_{ec} : Cultivation. Typically zero in Green Fuel Extremadura activity

e_l : Land-use change. Typically zero in Green Fuel Extremadura activity

e_p : Process. Typically zero in Green Fuel Extremadura activity

e_u : Use. Always null

e_{sca} : Improvement of agricultural management. Typically zero in Green Fuel Extremadura activity

e_{ccs} : Geological storage. Typically zero in Green Fuel Extremadura activity

e_{ccr} : Carbon substitution. Typically zero in Green Fuel Extremadura activity

So, usually, this step will not be necessary to apply.

However, it will have to be applied to transport emissions:

$$e_{td;p} \left[\frac{g \text{ CO}_2\text{-eq}}{MJ} \right] = \frac{e_{td;up} \left[\frac{kg \text{ CO}_2\text{-eq}}{T_{seco}} \right]}{LHV_{in} \left[\frac{MJ}{kg} \right]} \cdot AF \cdot FF \quad (62)$$

Where " $e_{td;p}$ " represents the transport emissions just outside the plant. Where default values are not used.

- Calculation of downstream emissions. Total transport calculation

As it is the last processing plant, Green Fuel Extremadura S.A. must calculate (or estimate) downstream emissions, emissions from energy consumption at the gas station will be added, and emissions up to the plant will also be added to the final emissions. A conservative approach will always be applied.

They will be calculated as:

$$e_{td;d} \left[\frac{g \text{ CO}_2\text{-eq}}{MJ} \right] = \frac{(e_{td;d-s} + e_{td;d-T} + e_{td;d-R}) \left[\frac{kg \text{ CO}_2\text{-eq}}{T_{wet}} \right]}{LHV_{mp} \left[\frac{MJ}{kg} \right] \cdot (1 - m_{out})} \quad (63)$$

Where " $e_{td;d}$ " are the downstream transport emissions, " $e_{td;d-i}$ " are the different terms of each of the transports and " m_{out} " is the moisture content of the final product output batch.

The terms " $e_{td;d-i}$ " are calculated in the same way as in section above. Distances will have the subscript "d".

Finally, the final transport emissions will be calculated:

$$e_{td;out} = e_{td;d} + e_{td;p} + EC_{gs} \quad (64)$$

All in $\left[\frac{g \text{ CO}_2\text{-eq}}{MJ} \right]$.

Where " EC_{gs} " are the emissions associated with energy consumption at the gas station.



Figure 7. Weight bridge scale of the Green Fuel Extremadura S.A. facilities.

- Default values

In the event that any of the default values had been applied by any of the members of the upstream traceability chain, this will be indicated in the SD.

Thus, Green Fuel Extremadura S.A. must apply these values, whether for processing, transportation or cultivation. These values are defined in RED I or RED II and are applied to the final product (with units of grams of carbon dioxide equivalent per unit of energy of the final biofuel). They refer to " $e_{i,out}$ " in the nomenclature of this project.

Typically:

- Cultivation. It will not apply.
- Transport. They are easily used when the raw material is used cooking oil (UCO).
- Processing. Its use will not be common.
- Final emission savings calculation

Once all the information has been obtained in the defined twelve-month period for all the batches, the total emission reduction calculation will be carried out with respect to the baseline:

$$E^i = e_{ec,out}^i + e_{l,out}^i + e_{p,out}^i + e_{td,out}^i + e_{u,out}^i - e_{sca,out}^i - e_{ccs,out}^i - e_{ccr,out}^i - e_{ee,out}^i \quad (65)$$

All in $\left[\frac{g \text{ CO}_2\text{-eq}}{MJ} \right]$. Where " E^i " represents the total emissions of each of the batch " i ".

The saving of each batch is calculated

$$S^i = E_B^i - E^i \quad (66)$$

Where " S^i " is the saving of the batch " i ", and " E_B^i " is the comparator of the project baseline.

Once the emission savings of each batch are known (in grams of carbon dioxide equivalent per unit of energy of the final biofuel) the total emission savings in tonnes of carbon dioxide are calculated:

$$R_T [T \text{ CO}_{2-eq}] = \frac{1}{10^6} \sum_i S^i \left[\frac{g \text{ CO}_{2-eq}}{MJ} \right] \cdot LHV_{mp}^i \left[\frac{MJ}{kg} \right] \cdot \rho^i \left[\frac{kg}{m^3} \right] \cdot V^i [m^3] \quad (67)$$

Where:

R_T : Total emission reduction in the period

V^i : Volume measured at 15 °C of the batch " i "

ρ^i : Density measured at 15 °C of the batch " i "

Year	Baseline scenario (tCO ₂ e)	Estimated project mitigations (tCO ₂ e)	Estimated leakage (tCO ₂ e)	Estimated net GHG emission mitigations (tCO ₂ e)
2020	110.347,37	81.790,79	-	81.790,79
2021	117.063,02	88.506,45	-	88.506,45
2022 and following	123.778,68	95.222,10	-	95.222,10

5. Monitoring

5.1 Monitoring Plan

- Data quality management

In order to reduce the uncertainty related to the quantification of GHG emission reductions or removal increases, Green Fuel Extremadura S.A. applies procedures, instructions and data and information quality management formats. Among them, the following stand out:

- Internal audit procedures in annual periods.
- External audit procedures in annual periods.

- Verifications of the correct operation of instrumentation in the plant on a regular basis.

Calibration of instruments by third parties and in regular periods.

- Data selection hierarchy

The quantitative data used is always obtained under one of the following requirements. The order of election will be carried out hierarchically:

1. Direct measurement using instruments calibrated to an ISO standard
2. Amounts stipulated in invoices or other business relationship documents
3. Estimates of maximum consumption indicated by the manufacturer



Figure 8. Laboratory of the Green Fuel Extremadura S.A. plant.

- Clarifications regarding the methodology

Assessment of non-significant sources

In the case in which a source relative to an element of the total sum of emissions represents less than 0.5% of the total value of the element of the sum, this may not be taken into account if an emission factor, that fits correctly, is not found.

E.g., there is no specific emission factor available for the management of a particular waste in the calculation of processing emissions from the biodiesel manufacturing plant. Using an emission factor for the management of similar waste, it is observed that it represents less than 0.5% of the value of processing emissions for that plant. In this case, it might not be taken into account.

Non-significant deviations

If, during the verification / validation process, deviations are detected between the stock quantities in mass balances and incoming and outgoing material documentation or internal company documentation (production reports, warehouse, etc.), their impact will be studied.

As a general rule, any deviation of less than 0.5% on the total amount will be understood as not representative and will not imply any justifying. In the event that this deviation exceeds such value, in order to ensure the quality of the data, it must be duly justified to the validator / verifier.

Percentage of moisture of the batches

The percentage of humidity is a critical factor for the calculation of emissions, since during the calculation and transfer of information between operators of the traceability chain, units of equivalent carbon dioxide emissions per unit of mass or energy in dry content will be used.

Therefore, the percentages of moisture before and after the processing units must be known.

Seeking a conservative approach, the procedure for calculating or estimating these values will be:

1. Measurement under an instrument calibrated under an ISO standard
2. Use of the highest humidity factor allowed by contract
3. Use of a conservative factor recognized in the market for this product.

Aggregation of emissions from different batches

Although it is not essential under the ISO 14064-2 scheme, the realization of averages with the emission of the different material batches will not be allowed. Mass balance requirements under ISCC (or other schemes) will be followed.

In cases where there is a large number of batches at a given time and the traceability chain operator does not have sufficient resources (human, technological, etc) to differentiate these batches, the most conservative value can be used: All batches will have the highest value of all.

Emission factors

In addition to the above procedure for carrying out the emission calculation itself, emission factors may be used to quantify GHG emissions from different energy or material inputs.

These emission factors will be calculated under the same scope and boundaries described in the previous methodology and will come from recognized sources.

The choice of these factors will be made hierarchically:

1. ISCC EU 205 - Greenhouse Gas Emissions
2. List of emission factors and lower calorific values (LHV). European Commission
3. Internationally recognized databases: Ecoinvent, Biograce, etc.
4. Scientific or statistical publications
5. Specific calculation of emissions certified under an ISO, provided that it can be verified during validation / verification

Both databases and publications should be based on the most up-to-date sources, as well as applied in the most concrete way possible to the indicated process.

- Purpose of monitoring

Control, revision and possible modification of the critical points of the system:

- Definition of the project baseline
- Current regulations that affect the baseline
- Product destination countries
- Compliance with the requirements of the schemes in which it is certified in order to comply with the Renewable energies directive in force.
- SSR
- Project boundaries
- Metrology
- Inbound and outbound sustainability documentation
- Calculation methodology

5.2 Data and Parameters Monitored

Although some of these points do not require a specific measurement, they are of vital importance for the project's baseline and, therefore, they must be monitored:

- Renewable Energy Directive
- Transposition of the directive in the different member states
- National, regional or local legislation of destination of the batches
- External report on the taxation of biofuels
- Report signed by the final trader indicating the destination country
- ISCC system documents or other schemes recognized by the European Commission for compliance with the RED in force
- Contracts and other business documents
- Amount of raw material entering the process
- Moisture content of raw material entering the process
- Quantity of final product produced
- Moisture content of the finished product
- Amount of co-products produced
- Moisture content of the co-products produced

- Consumption of methanol
- Phosphoric acid consumption
- Hydrochloric acid consumption
- Sulfuric acid consumption
- Consumption of electricity from the electricity grid
- Process water consumption
- Wastewater treatment management
- Natural gas consumption
- Consumption of sodium hydroxide
- Consumption of other chemicals, catalysts, etc.
- Lower calorific value of the raw material entering the process
- Lower calorific value of the finished product
- Inbound and outbound Sustainability Declarations



Figure 9. Green Fuel Extremadura S.A.

- Types of data and information to communicate

Below, each one of the data or parameter necessary to carry out the emission calculation according to the methodology are shown.

In these tables, it shows:

- The abbreviation used in the methodology for that data or parameter
- The units of the data or parameter
- Description of the data or parameter
- Origin or source of the data or parameter
- Value (or an estimate value) of the data or parameter
- Justification of the choice of data or parameter
- Monitoring frequency
- Purpose of the data or parameter
- Certainty of the control and quality of the data or parameter

Green Fuel Extremadura S.A. is responsible for the correct collection, use and control of these data and parameters.

All the data recorded will be the responsibility of the person in charge of the ISCC system, in accordance with the organization chart of the company.

This will distribute responsibilities according to the control of the data (for example, the control of inputs to the process will be the responsibility of the production department, the accounting of electricity bills will be in charge of the billing department, etc.), but it is their responsibility the review and revision of them.

Intermediate calculations terms

Transport emissions

Data / Parameter	m_{in}
Unit	%
Description	Moisture content of the material input in percentage 0-100% of each batch of raw material
Data source	Measurement of moisture content
Applied value	Approx. 2%
Justification of the decision on the data or description of the measurement method and procedures applied	Results of laboratory tests carried out by professionals
Monitoring frequency	Measured for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	Instrumentation calibration according to the protocol

Upstream

Data / Parameter	$e_{td,uw}$
Unit	$kg\ CO_{2-eq}/T_{wet}$
Description	Transport emissions from the previous processing plant (or point of origin in the absence of such a plant) to the final processing plant per unit mass of wet raw material
Data source	calculation
Applied value	Approx. $100\ kg\ CO_{2-eq}/T_{wet}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{td,up}$
Unit	$kg\ CO_{2-eq}/T_{dry}$
Description	Emissions from transport to the entrance of the final processing plant per unit mass of dry raw material
Data source	Calculation
Applied value	Approx. $100\ kg\ CO_{2-eq}/T_{dry}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{td,p}$
Unit	$g\ CO_{2-eq}/MJ$
Description	Emissions from transport upstream of the final treatment plant per unit of energy of the final fuel
Data source	Calculation
Applied value	Approx. $0,5\ g\ CO_{2-eq}/MJ$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{td;u-s}$
Unit	$kg\ CO_{2-eq}/T_{wet}$
Description	Shipment emissions from the previous processing plant (or point of origin in the absence of such a plant) to the final processing plant per unit of wet mass
Data source	Calculation
Applied value	Approx. $100\ kg\ CO_{2-eq}/T_{wet}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{td;u-T}$
Unit	$kg\ CO_{2-eq}/T_{wet}$
Description	Emissions of transport by train from the previous processing plant (or point of origin in the absence of such a plant) to the final processing plant per unit of wet mass
Data source	Calculation
Applied value	Approx. $100\ kg\ CO_{2-eq}/T_{wet}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{td;u-R}$
Unit	$kg\ CO_{2-eq}/T_{wet}$
Description	Road transport emissions from the previous processing plant (or point of origin in the absence of such a plant) to the final processing plant per unit wet mass
Data source	Calculation
Applied value	Approx. $100\ kg\ CO_{2-eq}/T_{wet}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Downstream

Data / Parameter	$e_{td;d}$
Unit	$g\ CO_{2-eq}/MJ$
Description	Transportation emissions from the final processing plant to the gas station
Data source	Calculation
Applied value	Approx $0.5\ g\ CO_{2-eq}/MJ$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{td;d-s}$
Unit	$kg\ CO_{2-eq}/T_{wet}$
Description	Emissions from transport by ship from the final processing plant to the gas station per unit wet mass of biofuel
Data source	Calculation
Applied value	Approx. $100\ kg\ CO_{2-eq}/T_{wet}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{td;d-T}$
Unit	$kg\ CO_{2-eq}/T_{wet}$
Description	Rail transport emissions from the final processing plant to the gas station per unit wet mass of biofuel
Data source	Calculation
Applied value	Approx. $100\ kg\ CO_{2-eq}/T_{wet}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{td;d-R}$
Unit	$kg\ CO_{2-eq}/T_{wet}$
Description	Road transport emissions from the final processing plant to the gas station per unit wet mass of biofuel
Data source	Calculation
Applied value	Approx. $100\ kg\ CO_{2-eq}/T_{wet}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	SX_d
Unit	km
Description	Distance traveled by ship from the processing plant to the gas station
Data source	Estimation or calculation
Applied value	Approx. $0\ km$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	TX_d
Unit	km
Description	Distance traveled by train from the processing plant to the gas station
Data source	Estimation or calculation
Applied value	Approx. $0\ km$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	RX_d
Unit	km
Description	Distance traveled by road from the processing plant to the gas station
Data source	Estimation or calculation
Applied value	Approx. 500 km
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Processing emissions

Data / Parameter	$e_{p;p}$
Unit	$kg\ CO_{2-eq}$
Description	Total emissions from the plant according to the methodology
Data source	Calculation
Applied value	Approx. $3 \cdot 10^7\ kg\ CO_{2-eq}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated annually
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EM_{EC}
Unit	$kg\ CO_{2-eq}$
Description	Emissions associated with the use of electrical energy
Data source	Calculation
Applied value	Approx $2 \cdot 10^6\ kg\ CO_{2-eq}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated annually
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EM_{HS}
Unit	$kg\ CO_{2-eq}$
Description	Emissions associated with the production and transport of sulfuric acid used in the plant
Data source	Calculation
Applied value	Approx $5 \cdot 10^4\ kg\ CO_{2-eq}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated annually
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EM_{NaOH}
Unit	$kg\ CO_{2-eq}$
Description	Emissions associated with the production and transport of sodium hydroxide used in the plant
Data source	Calculation
Applied value	Approx. $5 \cdot 10^5\ kg\ CO_{2-eq}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated annually
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EM_{HP}
Unit	$kg\ CO_{2-eq}$
Description	Emissions associated with the production and transport of phosphoric acid used in the plant
Data source	Calculation
Applied value	Approx. $2 \cdot 10^5\ kg\ CO_{2-eq}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated annually
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EM_{MetOH}
Unit	$kg\ CO_{2-eq}$
Description	Emissions associated with the production, transportation and emissions in the combustion of the methanol used in the plant
Data source	Calculation
Applied value	Approx. $2 \cdot 10^7\ kg\ CO_{2-eq}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated annually
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EM_{NG}
Unit	$kg\ CO_{2-eq}$
Description	Emissions associated with the consumption of natural gas at the plant
Data source	Calculation
Applied value	Approx. $5 \cdot 10^6\ kg\ CO_{2-eq}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated annually
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EM_{HCL}
Unit	$kg\ CO_{2-eq}$
Description	Emissions associated with the production and transport of hydrochloric acid used in the plant
Data source	Calculation
Applied value	Approx. $7 \cdot 10^5\ kg\ CO_{2-eq}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated annually
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EM_{PW}
Unit	$kg\ CO_{2-eq}$
Description	Emissions associated with the production and transport of the process water used in the plant
Data source	Calculation
Applied value	Approx $3 \cdot 10^4\ kg\ CO_{2-eq}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated annually
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EM_{WWT}
Unit	$kg\ CO_{2-eq}$
Description	Emissions associated with the management of wastewater generated at the plant
Data source	Calculation
Applied value	Approx. $4 \cdot 10^3\ kg\ CO_{2-eq}$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated annually
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	FF
Unit	$MJ\ raw\ material / MJ\ product$
Description	Relationship between the energy of the raw material entering a process and the product obtained: "feedstock factor".
Data source	Calculation
Applied value	Approx. $1\ MJ\ raw\ material / MJ\ product$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated annually
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	<i>AF</i>
Unit	(dimensionless)
Description	Relationship between the energy of the main product and the rest of the co-products
Data source	Calculation
Applied value	Approx. 0,99
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated annually
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	<i>AOMP_{dry}</i>
Unit	T_{dry}
Description	Annual main product outputs from the final process plant measured on a dry basis
Data source	Calculation
Applied value	Approx. 87.000 T_{dry}
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated annually
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	<i>AOCP_{dry}</i>
Unit	T_{dry}
Description	Annual co-product outputs from the final process plant measured on a dry basis
Data source	Calculation
Applied value	Approx. 12.000 T_{dry}
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated annually
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	AIM_{dry}
Unit	T_{dry}
Description	Annual material inputs to the final process plant measured on a dry basis
Data source	Calculation
Applied value	Approx. 88.000 T_{dry}
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated annually
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	AIM_{wet}
Unit	T_{wet}
Description	Annual material inputs to the final process plant measured on a wet basis
Data source	Scale measurement in the final process plant
Applied value	Approx. 88.000 T_{wet}
Justification of the decision on the data or description of the measurement method and procedures applied	Result of the total sum of material inputs in a period of 12 months, weighed in the final processing plant, with a calibrated scale following the appropriate protocols
Monitoring frequency	Annual
Data purpose	Baseline calculation and project emission reduction
Quality control and safety	Scale calibration according to protocol

Data / Parameter	M_{in}
Unit	%
Description	Moisture content of material inputs in percentage 0-100% for annual calculations
Data source	Measurement of moisture content
Applied value	Approx. 2%
Justification of the decision on the data or description of the measurement method and procedures applied	Results of laboratory tests carried out by professionals
Monitoring frequency	Annual
Data purpose	Baseline calculation and project emission reduction
Quality control and safety	Instrumentation calibration according to the protocol

Data / Parameter	M_{mp}
Unit	%
Description	Moisture content of main product outlets in percentage 0-100% for annual calculations
Data source	Measurement of moisture content
Applied value	Approx. 0,025%
Justification of the decision on the data or description of the measurement method and procedures applied	Results of laboratory tests carried out by professionals
Monitoring frequency	Annual
Data purpose	Baseline calculation and project emission reduction
Quality control and safety	Instrumentation calibration according to the protocol

Data / Parameter	$AOMP_{wet}$
Unit	T_{wet}
Description	Annual major product outputs from the final process plant measured on a wet basis
Data source	Scale measurement in the final process plant
Applied value	Approx. $87.000T_{wet}$
Justification of the decision on the data or description of the measurement method and procedures applied	Result of the total sum of outputs of the main product in a period of 12 months, weighed in the final processing plant, with a calibrated scale following the appropriate protocols
Monitoring frequency	Annual
Data purpose	Baseline calculation and project emission reduction
Quality control and safety	Scale calibration according to protocol

Data / Parameter	$AOCP_{wet}$
Unit	T_{wet}
Description	Annual co-product outputs from the final process plant measured on a wet basis
Data source	Scale measurement in the final process plant
Applied value	Approx. $12.000T_{wet}$
Justification of the decision on the data or description of the measurement method and procedures applied	Result of the total sum of co-product outputs in a period of 12 months, weighed in the final processing plant, with a calibrated scale following the appropriate protocols
Monitoring frequency	Annual
Data purpose	Baseline calculation and project emission reduction
Quality control and safety	N.a.

Data / Parameter	M_{cp}
Unit	%
Description	Moisture content of co-product outlets in percentage 0-100% for annual calculations
Data source	Measurement of moisture content
Applied value	Approx. 15%
Justification of the decision on the data or description of the measurement method and procedures applied	Results of laboratory tests carried out by professionals
Monitoring frequency	Annual
Data purpose	Baseline calculation and project emission reduction
Quality control and safety	Instrumentation calibration according to the protocol

Data / Parameter	HP
Unit	kg
Description	Annual phosphoric acid inputs used for production in the final process plant
Data source	Measured in the final process plant
Applied value	Approx. 67,000 kg
Justification of the decision on the data or description of the measurement method and procedures applied	Result of the total sum of annual phosphoric acid inputs consumed in a 12 months period
Monitoring frequency	Annual
Data purpose	Baseline calculation and project emission reduction
Quality control and safety	Instrumentation calibration according to the protocol

Data / Parameter	HCL
Unit	kg
Description	Annual hydrochloric acid inputs used for production in the final process plant
Data source	Measured in the final process plant
Applied value	Approx. 935.000 kg
Justification of the decision on the data or description of the measurement method and procedures applied	Result of the total sum of annual hydrochloric acid inputs consumed in a 12 months period
Monitoring frequency	Annual
Data purpose	Baseline calculation and project emission reduction
Quality control and safety	Instrumentation calibration according to the protocol

Data / Parameter	HS
Unit	<i>kg</i>
Description	Annual Sulfuric Acid Inputs (PTSA) Used for Final Process Plant Production
Data source	Measured in the final process plant
Applied value	Approx. 260.000 kg
Justification of the decision on the data or description of the measurement method and procedures applied	Result of the total sum of annual sulfuric acid inputs (PTSA) consumed in a 12 months period
Monitoring frequency	Annual
Data purpose	Baseline calculation and project emission reduction
Quality control and safety	Instrumentation calibration according to the protocol

Data / Parameter	EC
Unit	<i>kWh</i>
Description	Annual electricity consumption in the final process plant
Data source	Electric bill
Applied value	Approx. 5.525.000 kWh
Justification of the decision on the data or description of the measurement method and procedures applied	Result of the total sum of electricity consumed in a period of 12 months, according to the billing of the corresponding electricity company
Monitoring frequency	Annual
Data purpose	Baseline calculation and project emission reduction
Quality control and safety	N.a.

Data / Parameter	PW
Unit	<i>kg</i>
Description	Annual process water consumption in the final process plant
Data source	Measurement in the plant
Applied value	Approx. 0 kg
Justification of the decision on the data or description of the measurement method and procedures applied	Result of the total sum of process water used in a period of 12 months, according to the measurements carried out in the final process plant
Monitoring frequency	Annual
Data purpose	Baseline calculation and project emission reduction
Quality control and safety	Instrumentation calibration according to the protocol

Data / Parameter	WWT
Unit	<i>kg</i>
Description	Amount of wastewater sent to treatment by the final processing plant
Data source	Measurement in the plant
Applied value	Approx. $2 \cdot 10^3$ kg
Justification of the decision on the data or description of the measurement method and procedures applied	Result of the total sum of wastewater sent to treatment in a period of 12 months, according to the measurements carried out in the final process plant
Monitoring frequency	Annual
Data purpose	Baseline calculation and project emission reduction
Quality control and safety	Instrumentation calibration according to the protocol

Data / Parameter	NG
Unit	<i>kWh</i>
Description	Total natural gas consumption for steam generation in the final process plant
Data source	Natural Gas Bills
Applied value	Approx. $3 \cdot 10^7$ kWh
Justification of the decision on the data or description of the measurement method and procedures applied	Result of the total sum of natural gas consumed in a 12 months period, according to the billing of the corresponding natural gas company
Monitoring frequency	Annual
Data purpose	Baseline calculation and project emission reduction
Quality control and safety	N.a.

Data / Parameter	NaOH
Unit	<i>kg</i>
Description	Annual sodium hydroxide inputs used for production at the final process plant
Data source	Measured in the final process plant
Applied value	Approx. 10^6 kg
Justification of the decision on the data or description of the measurement method and procedures applied	Result of the total sum of annual sodium hydroxide inputs consumed in a 12 months period
Monitoring frequency	Annual
Data purpose	Baseline calculation and project emission reduction
Quality control and safety	Instrumentation calibration according to the protocol

SD data

Data / Parameter	IM_{wet}
Unit	T_{wet}
Description	Material inputs to the final process plant measured on a wet basis for each batch
Data source	Sustainability Declaration and measurement in the plant
Applied value	Approx. 30 T_{wet}
Justification of the decision on the data or description of the measurement method and procedures applied	Mass of the input batch
Monitoring frequency	Measured for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	Scale calibration according to protocol

Data / Parameter	$e_{ec,in}$
Unit	$kg\ CO_{2-eq}/T_{dry}$
Description	Emissions from the extraction or cultivation of raw materials, determined in the Sustainability Declaration received by the final process plant
Data source	Sustainability Declaration
Applied value	Typically 0 $kg\ CO_{2-eq}/T_{dry}$
Justification of the decision on the data or description of the measurement method and procedures applied	Value of upstream emissions, calculated according to the methodology.
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{l,in}$
Unit	$kg\ CO_{2-eq}/T_{dry}$
Description	Annualized emissions from changes in carbon stocks caused by land use change, determined in the Sustainability Declaration received by the final processing plant
Data source	Sustainability Declaration
Applied value	Typically 0 $kg\ CO_{2-eq}/T_{dry}$
Justification of the decision on the data or description of the measurement method and procedures applied	Value of upstream emissions, calculated according to the methodology.
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{p,in}$
Unit	$kg\ CO_{2-eq}/T_{dry}$
Description	Process emissions, determined in the Sustainability Declaration received by the final process plant
Data source	Sustainability Declaration
Applied value	Typically 0 $kg\ CO_{2-eq}/T_{dry}$
Justification of the decision on the data or description of the measurement method and procedures applied	Value of upstream emissions, calculated according to the methodology.
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{td,in}$
Unit	$kg\ CO_{2-eq}/T_{dry}$
Description	Emissions from transportation and distribution, determined in the Sustainability Declaration received by the final processing plant
Data source	Sustainability Declaration
Applied value	Typically 0 $kg\ CO_{2-eq}/T_{dry}$
Justification of the decision on the data or description of the measurement method and procedures applied	Value of upstream emissions, calculated according to the methodology
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{u,in}$
Unit	$kg\ CO_{2-eq}/T_{dry}$
Description	Emissions from fuel in use
Data source	Sustainability Declaration
Applied value	0 $kg\ CO_{2-eq}/T_{dry}$
Justification of the decision on the data or description of the measurement method and procedures applied	Value of upstream emissions, calculated according to the methodology.
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{sca;in}$
Unit	$kg\ CO_{2-eq}/T_{dry}$
Description	Savings of GHG emissions derived from carbon accumulation due to change in land use, determined in the Sustainability Declaration received by the final process plant
Data source	Sustainability Declaration
Applied value	Typically 0 $kg\ CO_{2-eq}/T_{dry}$
Justification of the decision on the data or description of the measurement method and procedures applied	Value of upstream emissions, calculated according to the methodology.
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{ccs;in}$
Unit	$kg\ CO_{2-eq}/T_{dry}$
Description	Savings in GHG emissions derived from geological capture and storage, determined in the Sustainability Declaration received by the final processing plant
Data source	Sustainability Declaration
Applied value	Typically 0 $kg\ CO_{2-eq}/T_{dry}$
Justification of the decision on the data or description of the measurement method and procedures applied	Value of upstream emissions, calculated according to the methodology.
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{ccr;in}$
Unit	$kg\ CO_{2-eq}/T_{dry}$
Description	Savings in GHG emissions derived from carbon capture and replacement, determined in the Sustainability Declaration received by the final processing plant
Data source	Sustainability Declaration
Applied value	Typically 0 $kg\ CO_{2-eq}/T_{dry}$
Justification of the decision on the data or description of the measurement method and procedures applied	Value of upstream emissions, calculated according to the methodology.
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	<i>SX</i>
Unit	<i>km</i>
Description	Distance traveled by ship from the previous processing plant (or point of origin of generation of the waste) to the final processing plant
Data source	Sustainability Declaration
Applied value	Typically 0 <i>km</i>
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	<i>TX</i>
Unit	<i>km</i>
Description	Distance traveled by ship from the previous processing plant (or point of origin of generation of the waste) to the final processing plant
Data source	Sustainability Declaration
Applied value	Typically 0 <i>km</i>
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	<i>RX</i>
Unit	<i>km</i>
Description	Distance traveled by road from the previous processing plant (or point of origin of generation of the waste) to the final processing plant
Data source	Sustainability Declaration
Applied value	Approx. 500 <i>km</i>
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Final savings

Data / Parameter	$e_{ec,out}$
Unit	$g\ CO_{2-eq}/MJ$
Description	Emissions from the extraction or cultivation of final raw materials from the biofuel batch
Data source	Sustainability Declaration
Applied value	Typically $0\ g\ CO_{2-eq}/MJ$
Justification of the decision on the data or description of the measurement method and procedures applied	Value of upstream emissions, calculated according to the methodology.
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{t,out}$
Unit	$g\ CO_{2-eq}/MJ$
Description	Annualized emissions from changes in carbon stocks caused by changes in land use at the end of the biofuel batch
Data source	Sustainability Declaration
Applied value	Typically $0\ g\ CO_{2-eq}/MJ$
Justification of the decision on the data or description of the measurement method and procedures applied	Value of upstream emissions, calculated according to the methodology.
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{p,out}$
Unit	$g\ CO_{2-eq}/MJ$
Description	Final process emissions from the biofuel batch
Data source	Sustainability Declaration
Applied value	Approx. $10\ g\ CO_{2-eq}/MJ$
Justification of the decision on the data or description of the measurement method and procedures applied	Value of upstream emissions, calculated according to the methodology.
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{td,out}$
Unit	$g\ CO_{2-eq}/MJ$
Description	Final transport and distribution emissions of the biofuel batch
Data source	Sustainability Declaration
Applied value	Approx. $1\ g\ CO_{2-eq}/MJ$
Justification of the decision on the data or description of the measurement method and procedures applied	Value of upstream emissions, calculated according to the methodology
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{u,out}$
Unit	$g\ CO_{2-eq}/MJ$
Description	End-of-use fuel emissions from the biofuel batch
Data source	Sustainability Declaration
Applied value	$0\ g\ CO_{2-eq}/MJ$
Justification of the decision on the data or description of the measurement method and procedures applied	Value of upstream emissions, calculated according to the methodology.
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{sca,out}$
Unit	$g\ CO_{2-eq}/MJ$
Description	Savings in GHG emissions derived from carbon accumulation due to change in land use at the end of the biofuel batch
Data source	Sustainability Declaration
Applied value	Typically $0\ g\ CO_{2-eq}/MJ$
Justification of the decision on the data or description of the measurement method and procedures applied	Value of upstream emissions, calculated according to the methodology.
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{ccs;out}$
Unit	$g\ CO_{2-eq}/MJ$
Description	Savings in GHG emissions derived from final geological capture and storage of the biofuel batch
Data source	Sustainability Declaration
Applied value	Typically 0 $g\ CO_{2-eq}/MJ$
Justification of the decision on the data or description of the measurement method and procedures applied	Value of upstream emissions, calculated according to the methodology.
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$e_{ccr;out}$
Unit	$g\ CO_{2-eq}/MJ$
Description	Savings in GHG emissions derived from final carbon capture and replacement of the biofuel batch
Data source	Sustainability Declaration
Applied value	Typically 0 $g\ CO_{2-eq}/MJ$
Justification of the decision on the data or description of the measurement method and procedures applied	Value of upstream emissions, calculated according to the methodology.
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	E_B
Unit	$g\ CO_{2-eq}/MJ$
Description	Project baseline emissions
Data source	Calculation
Applied value	RED I: 41.9 $g\ CO_{2-eq}/MJ$ RED II: 47 $g\ CO_{2-eq}/MJ$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Baseline calculation
Quality control and safety	N.a.

Data / Parameter	E_f
Unit	$g\ CO_{2-eq}/MJ$
Description	Fossil fuel comparator according to the renewable energy directive
Data source	RED I and RED II directives
Applied value	RED I: $83.8\ g\ CO_{2-eq}/MJ$ RED II: $94\ g\ CO_{2-eq}/MJ$
Justification of the decision on the data or description of the measurement method and procedures applied	Standard value for the reference fossil comparator. It is the total emissions in the environmental life cycle of a standard fossil fuel.
Monitoring frequency	Annual bibliographic review
Data purpose	Baseline calculation
Quality control and safety	N.a.

Data / Parameter	S
Unit	$g\ CO_{2-eq}/MJ$
Description	Saving emissions from a batch
Data source	Calculation
Applied value	Approx $30\ g\ CO_{2-eq}/MJ$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Baseline calculation
Quality control and safety	N.a.

Data / Parameter	V
Unit	m^3
Description	Volume of a batch
Data source	Measurement by automatic instruments
Applied value	Approx. $500\ m^3$
Justification of the decision on the data or description of the measurement method and procedures applied	Measurement by automatic and calibrated instruments
Monitoring frequency	Measured for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	Instrumentation calibration according to the protocol

Data / Parameter	m_{out}
Unit	%
Description	Moisture content of the material output in percentage 0-100% of each final output biofuel batch
Data source	Measurement of moisture content
Applied value	Approx. 0,025%
Justification of the decision on the data or description of the measurement method and procedures applied	Results of laboratory tests carried out by professionals
Monitoring frequency	Measured for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	Instrumentation calibration according to the protocol

Emission Factors and other data

Transport by boat

Data / Parameter	EF_{SXT}
Unit	$kg\ CO_{2-eq}/t - km$
Description	Emission factor for transoceanic transport one tonne of matter one kilometer
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	$0,0060571\ kg\ CO_{2-eq}/t - km$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for the calculation of transport emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EF_{SXEU}
Unit	$kg\ CO_{2-eq}/t - km$
Description	Emission factor for transport by ship in Europe (non-transoceanic) one tonne of matter one kilometer
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	$0,043458\ kg\ CO_{2-eq}/t - km$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for the calculation of transport emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$EF_{SX ROW}$
Unit	$kg\ CO_{2-eq}/t - km$
Description	Emission factor for transport by ship outside Europe (non-transoceanic) one tonne of matter one kilometer
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	$0,04435\ kg\ CO_{2-eq}/t - km$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for the calculation of transport emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Train transportation

Data / Parameter	$EF_{TX EU}$
Unit	$kg\ CO_{2-eq}/t - km$
Description	Emission factor for rail transport in Europe, except Switzerland (non-electric) one tonne of matter one kilometer
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	$0,045569\ kg\ CO_{2-eq}/t - km$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for the calculation of transport emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$EF_{TX ROW}$
Unit	$kg\ CO_{2-eq}/t - km$
Description	Emission factor for rail transport outside Europe, except Switzerland (non-electric) one tonne of matter one kilometer
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	$0,048276\ kg\ CO_{2-eq}/t - km$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for the calculation of transport emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EF_{TXE}
Unit	$kg\ CO_{2-eq}/t - km$
Description	Emission factor for transport by electric train one tonne of matter one kilometer
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	Approx. $0,05\ kg\ CO_{2-eq}/t - km$
Justification of the decision on the data or description of the measurement method and procedures applied	Intermediate calculation
Monitoring frequency	Calculated for each batch
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EF_{TXEC}
Unit	$kg\ CO_{2-eq}/kWh$
Description	Emission factor for electricity
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	EU: $0.383\ kg\ CO_{2-eq}/kWh$ Argentina: $0.51\ kg\ CO_{2-eq}/kWh$ Brazil: $0.11\ kg\ CO_{2-eq}/kWh$ Indonesia: $1.05\ kg\ CO_{2-eq}/kWh$ Malaysia: $0.88\ kg\ CO_{2-eq}/kWh$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for the calculation of transport emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EF_{TXEE}
Unit	$kWh/t - km$
Description	Electrical energy used by a train to transport a tonne of material one kilometer.
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	$0,06\ kWh/t - km$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for the calculation of transport emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$EF_{TX EE}$
Unit	$kWh/t - km$
Description	Electrical energy used by a train to transport a tonne of material one kilometer.
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	0,06kWh/t – km
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for the calculation of transport emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Road transport

Data / Parameter	$EF_{RX EU}$
Unit	$kg CO_{2-eq}/t - km$
Description	Emission factor for road transport in Europe for one tonne of matter one kilometer
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	0,13098 $kg CO_{2-eq}/t - km$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for the calculation of transport emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	$EF_{TX ROW}$
Unit	$kg CO_{2-eq}/t - km$
Description	Emission factor for road transport (outside Europe) for one tonne of matter one kilometer
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	0,13637 $kg CO_{2-eq}/t - km$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for the calculation of transport emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	K_L
Unit	l/km
Description	Consumption of a loaded truck
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	0,49 l/km
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for the calculation of transport emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	K_E
Unit	l/km
Description	Consumption of an empty truck
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	0,25 l/km
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for the calculation of transport emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EF_F
Unit	$kg\ CO_{2-eq}/l$
Description	Emission factor for diesel
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	3,14 $kg\ CO_{2-eq}/l$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for the calculation of transport emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EF_{HS}
Unit	$kg\ CO_{2-eq}/kg$
Description	Emission factor for sulfuric acid
Data source	Biograce v 4d, 2014
Applied value	0,2077 $kg\ CO_{2-eq}/kg$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for calculating processing emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EF_{NaOH}
Unit	$kg\ CO_{2-eq}/kg$
Description	Emission factor for sodium hydroxide
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	0,469 $kg\ CO_{2-eq}/kg$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for calculating processing emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EF_{HP}
Unit	$kg\ CO_{2-eq}/kg$
Description	Emission factor for phosphoric acid
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	3,01 $kg\ CO_{2-eq}/kg$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for calculating processing emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EF_{MetOH}
Unit	$kg\ CO_{2-eq}/kg$
Description	Emission factor for methanol
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	1,98 $kg\ CO_{2-eq}/kg$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for calculating processing emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EF_{NG}
Unit	$kg\ CO_{2-eq}/kWh$
Description	Emission factor for natural gas
Data source	Emission Factors. Ministry for the Ecological Transition and Demographic Challenge V.17, April 2021
Applied value	0,182 $kg\ CO_{2-eq}/kWh$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for calculating processing emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EF_{HCL}
Unit	$kg\ CO_{2-eq}/kg$
Description	Emission factor for hydrochloric acid
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	0,75 $kg\ CO_{2-eq}/kg$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for calculating processing emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EF_{PW}
Unit	$kg\ CO_{2-eq}/kg$
Description	Emission factor for process water
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	0,0003418 $kg\ CO_{2-eq}/kg$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for calculating processing emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	EF_{WWT}
Unit	$kg\ CO_{2-eq}/m^3$
Description	Emission factor for waste water
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	0,48077 $kg\ CO_{2-eq}/m^3$
Justification of the decision on the data or description of the measurement method and procedures applied	Emission factor for calculating processing emissions
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	ρ
Unit	kg/m^3
Description	Density of a batch of biofuel at 15 °C
Data source	ISCC EU. PoS format
Applied value	883 kg/m^3
Justification of the decision on the data or description of the measurement method and procedures applied	Converting volume to mass
Monitoring frequency	Annual review in the bibliography
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Data / Parameter	LHV_{in}
Unit	MJ/kg
Description	Lower calorific value of the material input
Data source	ISCC EU 205 - Greenhouse Gas Emissions (v4.0, 01 July 2021)
Applied value	37,1 MJ/kg
Justification of the decision on the data or description of the measurement method and procedures applied	Standard lower calorific value for vegetable / animal oil
Monitoring frequency	Annual bibliographic review
Data purpose	Baseline calculation and project emission reduction
Quality control and safety	N.a.

Data / Parameter	LHV_{mp}
Unit	MJ/kg
Description	Lower calorific value of main product input
Data source	Biograce v 4d, 2014
Applied value	37,2 MJ/kg
Justification of the decision on the data or description of the measurement method and procedures applied	Standard lower calorific value for biodiesel (FAME)
Monitoring frequency	Annual bibliographic review
Data purpose	Baseline calculation and project emission reduction
Quality control and safety	N.a.

Data / Parameter	LHV_{cp}
Unit	MJ/kg
Description	Lower calorific value of the by-product input
Data source	Biograce v 4d, 2014
Applied value	16 MJ/kg
Justification of the decision on the data or description of the measurement method and procedures applied	Standard lower calorific value for glycerol
Monitoring frequency	Annual bibliographic review
Data purpose	Baseline calculation and project emission reduction
Quality control and safety	N.a.

Data / Parameter	EC_{gs}
Unit	$g\ CO_{2-eq}/MJ$
Description	Energy consumption at the gas station for each batch
Data source	ISCC 205 - GHG emissions
Applied value	$0,44g\ CO_{2-eq}/MJ$
Justification of the decision on the data or description of the measurement method and procedures applied	Standard value for emissions at gas stations for energy consumption
Monitoring frequency	Annual bibliographic review
Data purpose	Project emission reduction calculation
Quality control and safety	N.a.

Appendix

- GHG project documentation

As annexed to this report, and to demonstrate the conformity of the GHG project with the requirements established in this document, they are presented below:

- Last certified under ISCC - EU standard or any other standard under RED or national scheme
- SAR of the latest ISCC – EU audit or any other standard under RED or national scheme
- Report on biofuels taxation 2021 carried out by an independent entity
- ISO 14064 – 2 project description
- Communication with interested parties

For declarations will be added:

- Trader's report indicating the countries of biofuel use
- ISCC – EU (or any other standard under RED or national scheme) SAR of the audited period
- Certificate in force during the audited period
- Process emissions

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