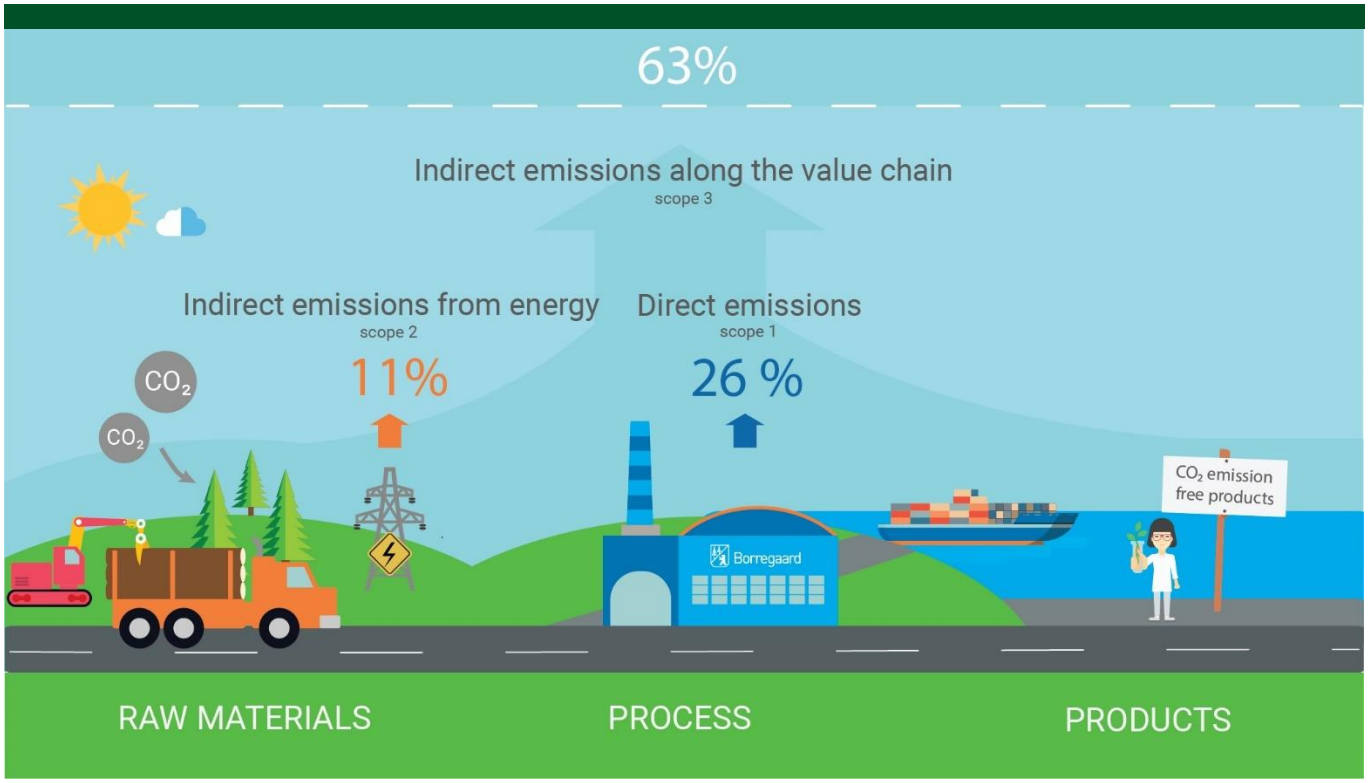
NORSUS
Norwegian Institute for Sustainability Research

GHG protocol Scope 3 reporting – Borregaard 2021



AUTHOR
ELLEN SOLDAL

REPORT NO.
OR.06.22

YEAR
2022

ISBN NO.
978-82-7520-886-4

ISSN NO.
2703-8610

REPORT TYPE
Commissioned

CONFIDENTIALITY
Open

NORSUS

PROJECT NUMBER
3337

PROJECT TITLE
Greenhouse gas protocol Scope 3 reporting – Borregaard 2021

COMMISSIONED BY
Borregaard

COMPANY CONTACT
Hilde Fredheim

APPROVED
Ingunn Saur Modahl

FRONT PAGE ILLUSTRATION
Borregaard

Sample Scope 3 GHG Inventory Reporting Template

This greenhouse gas reporting has been calculated in alignment with the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard

Part 1: Descriptive information

Descriptive information	Company response
Company name	Borregaard
Description of the company	Borregaard is a biorefinery that produces advanced biochemicals that can replace oil-based products. Borregaard employs 1100 man-years in plants and sales offices in 16 countries throughout Europe, Asia and the Americas.
Chosen consolidation approach (equity share, operational control or financial control)	Operations under full control of Borregaard are included.
Description of the businesses and operations included in the company's organizational boundary	Operations in Norway, UK, USA, Czech Republic and Germany are included.
The reporting period covered	01/01/2021 -12/31/2021
A list of scope 3 activities included in the report	Category 1: Purchased goods & services Category 2: Capital goods Category 3: Fuel- and energy-related activities (not incl. in Scope 1 or 2) Category 4: Upstream transportation and distribution Category 5: Waste generated in operations Category 6: Business travel Category 7: Employee commuting Category 9: Downstream transportation and distribution Category 10: Processing of sold products Category 11: Use of sold products

	Category 12: End-of-life treatment of sold products
A list of scope 1, scope 2, and scope 3 activities excluded from the report with justification for their exclusion	Category 8 (Upstream leased assets), Category 13 (Downstream leased assets), Category 14 (Franchises), and Category 15 (Operation of investments) are excluded because they are not relevant to Borregaard.
The year chosen as base year and rationale for choosing the base year	2017
Once a base year has been established, the chosen base year emissions recalculation policy. If base year emissions have been recalculated, the context for any significant emissions changes that triggered the recalculation.	

Part 2: Greenhouse gas emissions data

Scopes and categories	Metric tons CO_2e
Scope 1: Direct emissions from owned/controlled operations	153 285
Scope 2: Indirect emissions from the use of purchased electricity, steam, heating, and cooling	64 818
Upstream scope 3 emissions	
Category 1: Purchased goods and services	135 429
Category 2: Capital goods	1 928
Category 3: Fuel- and energy-related activities (not included in scope 1 or scope 2)	9 750
Category 4: Upstream transportation and distribution	10 533
Category 5: Waste generated in operations	1 937
Category 6: Business travel	136
Category 7: Employee commuting	1 165
Category 8: Upstream leased assets	-
Downstream scope 3 emissions	
Category 9: Downstream transportation and distribution	126 369
Category 10: Processing of sold products	69 598
Category 11: Use of sold products	0
Category 12: End-of-life treatment of sold products	7 400
Category 13: Downstream leased assets	-
Category 14: Franchises	-
Category 15: Investments	-

Part 3: Biogenic CO_2 emissions data

Scopes and categories	Metric tons biogenic CO_2
Direct biogenic CO_2 emissions from owned/controlled operations	150 748
Indirect biogenic CO_2 emissions from the use of purchased electricity, steam, heating, and cooling	70 214
Indirect biogenic CO_2 emissions - Upstream	
Purchased goods and services	45 055
Capital goods	113
Fuel- and energy-related activities (not included in scope 1 or scope 2)	622
Upstream transportation and distribution	137
Waste generated in operations	7 603
Business travel	0.4
Employee commuting	60
Upstream leased assets	-
Indirect biogenic CO_2 emissions - Downstream	
Downstream transportation and distribution	940
Processing of sold products	47 652
Use of sold products	104 379
End-of-life treatment of sold products	819 833
Downstream leased assets	-
Franchises	-
Investments	-

Part 4: Description of methodologies and data used

Scope and category	Description of the types and sources of data used to calculate emissions	Description of the data quality of reported emissions	Description of the methodologies, allocation methods, and assumptions used to calculate emissions	Percentage of emissions calculated using data obtained from suppliers or other value chain partners
Upstream scope 3 emissions				
Category 1: Purchased goods and services	Activity data (primary data) obtained from Borregaard and one supplier. Secondary data obtained as cradle-to-gate emissions factors from the commercially and publicly available database ecoinvent ver. 3.7.1 (Wernet et al. 2016).	Good	Hybrid method. For characterization of the GHG emissions and emissions of biogenic CO_2, the IPCC 2013 GWP100a (incl. CO_2 uptake), v.1.0, as implemented in SimaPro v. 9.2 has been used.	1%
Category 2: Capital goods	Activity data (primary data) obtained from Borregaard. Secondary data obtained as cradle-to-gate emissions	Fair	Hybrid method. For characterization of the GHG emissions and emissions of biogenic CO_2, the IPCC 2013 GWP100a	0%

	factors from the commercially and publicly available database ecoinvent ver. 3.7.1 (Wernet et al., 2016).		(incl. CO_2 uptake), v.1.0, as implemented in SimaPro v. 9.2 has been used.	
Category 3: Fuel- and energy-related activities (not included in scope 1 or scope 2)	Activity data (primary data) obtained from Borregaard. Secondary data for fuels obtained as cradle-to-gate emissions factors, not included in Scope 1 and 2, from the commercially and publicly available database ecoinvent ver. 3.7.1 (Wernet et al. 2016).	Good	Hybrid method. For characterization of the GHG emissions and emissions of biogenic CO_2, the IPCC 2013 GWP100a (incl. CO_2 uptake), v.1.0, as implemented in SimaPro v. 9.2 has been used.	0%
Category 4: Upstream transportation and distribution	Activity data, transport mode and distances (primary data) obtained from Borregaard. Secondary data (emissions factors) obtained from the commercially and publicly available database ecoinvent	Good	Hybrid method. Assume that road transport is performed by lorry Euro V. This class is the most dominant in Norway (2016). For characterization of the GHG emissions and emissions of biogenic CO_2, the	0%

	ver. 3.7.1 (Wernet et al. 2016).		IPCC 2013 GWP100a (incl. CO_2 uptake), v.1.0, as implemented in SimaPro v. 9.2 has been used.	
Category 5: Waste generated in operations	Activity data (primary data) obtained from Borregaard. Secondary data obtained from the commercially and publicly available database ecoinvent ver. 3.7.1 (Wernet et al. 2016).	Good	Hybrid method. For characterization of the GHG emissions and emissions of biogenic CO_2, the IPCC 2013 GWP100a (incl. CO_2 uptake), v.1.0, as implemented in SimaPro v. 9.2 has been used.	0%
Category 6: Business travel	Activity data (hotel nights and km travelled by each mode of transport) obtained from Borregaard. Emissions factors for air travels (secondary data) obtained from the publicly available emissions factors from (DEFRA, 2017) and from Brekke et al. (2018). For other modes of transport (road, rail),	Good	Information on air travel is a mix between information on distances and calculated CO_2/passenger km. Emissions factor for hotel night: 9.6 kg CO_2-eq/night (Brekke et al. 2018). For characterization of the GHG emissions and emissions of biogenic CO_2, the IPCC 2013 GWP100a (incl. CO_2 uptake), v.1.0, as implemented	35%

	emissions factors are obtained from the commercially and publicly available database ecoinvent ver. 3.7.1 (Wernet et al. 2016).		in SimaPro v. 9.2 has been used.	
Category 7: Employee commuting	Number of employees and postal address obtained from Borregaard. National statistic on work travel habits assumed to be relevant for Borregaard Norway (Epiniom 2019). Emissions factors for commuting by car, is based on the average Norwegian passenger car in 2018 (SSB, 2018). Emissions factors (secondary data) obtained from the commercially and publicly available database ecoinvent ver. 3.7.1 (Wernet et al. 2016).	Good	Combination of distance from home of employees to Borregaard Sarpsborg and national statics on work travel habits, were the basis for calculation of person km (pkm) travelled by different modes of transport: on feet (0 g CO_2-eq/pkm), bike (11 g CO_2-eq/pkm), car (273 g CO_2-eq/pkm), bus (99,5 g CO_2-eq/pkm), train (11 g CO_2-eq/pkm), and air (121,8 g CO_2-eq/pkm). For characterization of the GHG emissions and emissions of biogenic CO_2, the IPCC 2013 GWP100a (incl. CO_2 uptake),	0%

			v.1.0, as implemented in SimaPro v. 9.2 has been used.	
Category 8: Upstream leased assets	-	-	-	-

Part 4: Description of scope 3 methodologies and data used (continued)

Scope and category	Description of the types and sources of data used to calculate emissions	Description of the data quality of reported emissions	Description of the methodologies, allocation methods, and assumptions used to calculate emissions	Percentage of emissions calculated using data obtained from suppliers or other value chain partners
Downstream scope 3 emissions				
Category 9: Downstream transportation and distribution	Specific transport volumes and modes of transport given by Borregaard. Emissions factors (secondary data) obtained from the commercially and publicly available database ecoinvent ver. 3.7.1 (Wernet et al. 2016).	Good	Hybrid method. For characterization of the GHG emissions and emissions of biogenic CO_2, the IPCC 2013 GWP100a (incl. CO_2 uptake), v.1.0, as implemented in SimaPro v. 9.2 has been used.	0%
Category 10: Processing of sold products	Data on amount of sold products obtained from Borregaard. Emissions factors (secondary data) obtained from the commercially and	Fair	For several of the products, there is no processing, or the processing is marginal. The two largest products are cellulose and lignin. Lignin is mostly used in construction, and	0%

	publicly available database ecoinvent ver. 3.7.1 (Wernet et al. 2016).		energy consumed during mixing with cement is used. For cellulose, it is assumed that 1/4 of the sold cellulose goes into viscose production, half in China and half in Spain. For the rest, it is assumed that dispersing of cellulose consumes the same amount of energy as dispersing of microfibrillated cellulose. For mixing of fine chemicals, the energy used is obtained from Borregaard. Twigs are sold for fluting. ecoivent process for processing of wood chips to fluting is used for this amount. For characterization of the GHG emissions and emissions of biogenic CO_2, the IPCC 2013 GWP100a (incl. CO_2 uptake), v.1.0, as implemented	

			in SimaPro v. 9.2 has been used.	
Category 11: Use of sold products	Data on amounts of sold products and carbon content obtained from Borregaard.	Good	There are no direct emissions in the use phase of all products except ethanol, alvamix, twigs and bark which are combusted and lead to emissions of biogenic CO_2. The amount of biogenic CO_2 is calculated based on carbon content of the products multiplied with the molecular weight ratio carbon to CO_2.	100%
Category 12: End-of-life treatment of sold products	Specific information on carbon content and amount of sold products obtained from Borregaard. Sodium hypochlorite and hydrochloric acid are treated as hazardous waste at end of life. Data on the amount of sodium hypochlorite and hydrochloric acid	Good	Hybrid. Due to biological origin, the sold products are assumed to not cause emissions of GHG in end-of-life treatment. Emissions of biogenic CO_2 from end-of-life treatment calculated based on carbon content of sold products multiplied with the molecular weight ratio carbon to CO_2.	99% of biogenic CO_2 emissions, 0% of fossil emissions

	are given by Borregaard. Emissions factors (secondary data) obtained from the commercially and publicly available database ecoinvent ver. 3.7.1 (Wernet et al. 2016).		For characterization of the GHG emissions and emissions of biogenic CO_2, the IPCC 2013 GWP100a (incl. CO_2 uptake), v.1.0, as implemented in SimaPro v. 9.2 has been used.	
Category 13: Downstream leased assets	-	-	-	-
Category 14: Franchises	-	-	-	-
Category 15: Investments	-	-	-	-

Part 5: Greenhouse gas emissions in the base year

Please state your base year emissions here. If base year emissions were recalculated, note the year the recalculation occurred.

Scopes and categories[1]	Metric tons CO_2e
Scope 1: Direct emissions from owned/controlled operations	128 414
Scope 2: Indirect emissions from the use of purchased electricity, steam, heating, and cooling	58 213
Upstream scope 3 emissions	
Category 1: Purchased goods and services	150 405
Category 2: Capital goods	1 797
Category 3: Fuel- and energy-related activities (not included in scope 1 or scope 2)	7 279
Category 4: Upstream transportation and distribution	13 875
Category 5: Waste generated in operations	786
Category 6: Business travel	1 175
Category 7: Employee commuting	1 104
Category 8: Upstream leased assets	-
Other	-
Downstream scope 3 emissions	
Category 9: Downstream transportation and distribution	34 851
Category 10: Processing of sold products	56 102
Category 11: Use of sold products	0
Category 12: End-of-life treatment of sold products	8686
Category 13: Downstream leased assets	-
Category 14: Franchises	-
Category 15: Investments[2]	58 899
Other	-

Part 6: Optional Information

[1] Further disaggregation of certain categories may be necessary. Additionally, if categorization of scope 3 activities is not followed as prescribed in the standard, indicate where they are included.

[2] If the reporting company is an initial sponsor or lender of a project, also account for the projected lifetime emissions of relevant projects financed during the reporting year and report those emissions separately from scope 3.

Method

Name IPCC 2013 GWP100a (incl. CO_2 uptake), v.1.0

Table 1 and 2 give the characterization factors used in this reporting, fossil and biogenic CO_2 respectively.

Table 1 Characterization factors for substances contributing to emissions of fossil CO2-equivalents. The unit is kg CO2-eq./kg substance.

Substances	Characterization factor	Unit
(E)-1-Chloro-3,3,3-trifluoroprop-1-ene	1	kg CO2 eq / kg
(E)-1,2,3,3,3-Pentafluoroprop-1-ene	0,079	kg CO2 eq / kg
(Perfluorobutyl)ethylene	0,136	kg CO2 eq / kg
(Perfluorooctyl)ethylene	0,0929	kg CO2 eq / kg
(Perfluorohexyl)ethylene	0,108	kg CO2 eq / kg
(Z)-1,1,1,4,4,4-Hexafluorobut-2-ene	2	kg CO2 eq / kg
(Z)-1,2,3,3,3-Pentafluoroprop-1-ene	0,233	kg CO2 eq / kg
(Z)-1,3,3,3-Tetrafluoroprop-1-ene	0,285	kg CO2 eq / kg
1-Propanol, 3,3,3-trifluoro-2,2-bis(trifluoromethyl)-, HFE-7100	421	kg CO2 eq / kg
1-Propanol, i-3,3,3-trifluoro-2,2-bis(trifluoromethyl)-, i-HFE-7100	407	kg CO2 eq / kg
1-Propanol, n-3,3,3-trifluoro-2,2-bis(trifluoromethyl)-, n-HFE-7100	486	kg CO2 eq / kg
1-Undecanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,11-nonadecafluoro-	0,69	kg CO2 eq / kg
1,1,1,3,3,3-Hexafluoropropan-2-ol	182	kg CO2 eq / kg
1,2,2-Trichloro-1,1-difluoroethane	59	kg CO2 eq / kg
2,3,3,3-Tetrafluoropropene	0,352	kg CO2 eq / kg
Acetate, 1,1-difluoroethyl 2,2,2-trifluoro-	31	kg CO2 eq / kg
Acetate, 2,2,2-trifluoroethyl 2,2,2-trifluoro-	7	kg CO2 eq / kg
Acetate, difluoromethyl 2,2,2-trifluoro-	27	kg CO2 eq / kg
Acetate, methyl 2,2-difluoro-	3	kg CO2 eq / kg
Acetate, methyl 2,2,2-trifluoro-	52	kg CO2 eq / kg
Acetate, perfluorobutyl-	2	kg CO2 eq / kg
Acetate, perfluoroethyl-	2	kg CO2 eq / kg
Acetate, perfluoropropyl-	2	kg CO2 eq / kg
Acetate, trifluoromethyl-	2	kg CO2 eq / kg
Butane, 1,1,1,2,2,3,3,4,4-nonafluoro-, HFC-329p	2360	kg CO2 eq / kg
Butane, 1,1,1,3,3-pentafluoro-, HFC-365mfc	804	kg CO2 eq / kg
Butane, perfluoro-	9200	kg CO2 eq / kg

Butane, perfluorocyclo-, PFC-318	9540	kg CO2 eq / kg
Butanol, 2,2,3,3,4,4,4-heptafluoro-	34	kg CO2 eq / kg
Butanol, 2,2,3,3,4,4,4-heptafluoro-1-	16	kg CO2 eq / kg
Butanol, 2,2,3,4,4,4-hexafluoro-1-	17	kg CO2 eq / kg
Carbon dioxide	1	kg CO2 eq / kg
Carbon dioxide, fossil	1	kg CO2 eq / kg
Carbon dioxide, to soil or biomass stock	-1	kg CO2 eq / kg
Chloroform	16	kg CO2 eq / kg
Cis-perfluorodecalin	7240	kg CO2 eq / kg
Decane, 1,1,...,15,15-eicosafluoro-2,5,8,11,14-Pentaoxapenta-	3630	kg CO2 eq / kg
Decane, 1,1,3,3,4,4,6,6,7,7,9,9,10,10,12,12-hexadecafluoro-2,5,8,11-tetraoxado-	4490	kg CO2 eq / kg
Decane, 1,1,3,3,5,5,7,7,8,8,10,10-dodecafluoro-2,4,6,9-tetraoxa-	3890	kg CO2 eq / kg
Decane, 1,1,3,3,5,5,7,7,9,9-decafluoro-2,4,6,8-tetraoxanonane-	7330	kg CO2 eq / kg
Decane, 3,3,4,4,6,6,7,7,9,9,10,10-dodecafluoro-2,5,8,11-tetraoxado-	221	kg CO2 eq / kg
Dinitrogen monoxide	265	kg CO2 eq / kg
EPTE-furan	56	kg CO2 eq / kg
Ethane, 1-(difluoromethoxy)-1,1,2,2-tetrafluoro-	4240	kg CO2 eq / kg
Ethane, 1-chloro-1,1-difluoro-, HCFC-142b	1980	kg CO2 eq / kg
Ethane, 1-chloro-2,2,2-trifluoro-(difluoromethoxy)-, HCFE-235da2	491	kg CO2 eq / kg
Ethane, 1-ethoxy-1,1,2,2,2-pentafluoro-	58	kg CO2 eq / kg
Ethane, 1,1'-oxybis[2-(difluoromethoxy)-1,1,2,2-tetrafluoro-	4920	kg CO2 eq / kg
Ethane, 1,1-dichloro-1-fluoro-, HCFC-141b	782	kg CO2 eq / kg
Ethane, 1,1-dichloro-1,2-difluoro-, HCFC-132c	338	kg CO2 eq / kg
Ethane, 1,1-difluoro-, HFC-152a	138	kg CO2 eq / kg
Ethane, 1,1,1-trichloro-, HCFC-140	160	kg CO2 eq / kg
Ethane, 1,1,1-trifluoro-, HFC-143a	4800	kg CO2 eq / kg
Ethane, 1,1,1-trifluoro-2-bromo-	173	kg CO2 eq / kg
Ethane, 1,1,1,2-tetrafluoro-, HFC-134a	1300	kg CO2 eq / kg
Ethane, 1,1,1,2-tetrafluoro-2-bromo-, Halon 2401	184	kg CO2 eq / kg
Ethane, 1,1,2-trichloro-1,2-difluoro-, HCFC-122a	258	kg CO2 eq / kg
Ethane, 1,1,2-trichloro-1,2,2-trifluoro-, CFC-113	5820	kg CO2 eq / kg
Ethane, 1,1,2-trifluoro-, HFC-143	328	kg CO2 eq / kg
Ethane, 1,1,2,2-tetrafluoro-, HFC-134	1120	kg CO2 eq / kg
Ethane, 1,1,2,2-tetrafluoro-1-(fluoromethoxy)-	871	kg CO2 eq / kg
Ethane, 1,1,2,2-tetrafluoro-1-methoxy-2-(1,1,2,2-tetrafluoro-2-methoxyethoxy)-	236	kg CO2 eq / kg
Ethane, 1,1,2,2-tetrafluoro-1,2-dimethoxy-	222	kg CO2 eq / kg
Ethane, 1,2-dibromotetrafluoro-, Halon 2402	1470	kg CO2 eq / kg
Ethane, 1,2-dichloro-	0,898	kg CO2 eq / kg
Ethane, 1,2-dichloro-1,1,2-trifluoro-, HCFC-123a	370	kg CO2 eq / kg

Ethane, 1,2-dichloro-1,1,2,2-tetrafluoro-, CFC-114	8590	kg CO2 eq / kg
Ethane, 1,2-difluoro-, HFC-152	16	kg CO2 eq / kg
Ethane, 2-chloro-1,1,1,2-tetrafluoro-, HCFC-124	527	kg CO2 eq / kg
Ethane, 2-chloro-1,1,2-trifluoro-1-methoxy-	122	kg CO2 eq / kg
Ethane, 2,2-dichloro-1,1,1-trifluoro-, HCFC-123	79	kg CO2 eq / kg
Ethane, chloropentafluoro-, CFC-115	7670	kg CO2 eq / kg
Ethane, fluoro-, HFC-161	4	kg CO2 eq / kg
Ethane, hexafluoro-, HFC-116	11100	kg CO2 eq / kg
Ethane, pentafluoro-, HFC-125	3170	kg CO2 eq / kg
Ethanol, 2-fluoro-	0,88	kg CO2 eq / kg
Ethanol, 2,2-difluoro-	3	kg CO2 eq / kg
Ethanol, 2,2,2-trifluoro-	20	kg CO2 eq / kg
Ethene, 1,1-difluoro-, HFC-1132a	0,0422	kg CO2 eq / kg
Ethene, 1,1,2-trifluoro-2-(trifluoromethoxy)-	0,209	kg CO2 eq / kg
Ether, 1,1,1-trifluoromethyl methyl-, HFE-143a	523	kg CO2 eq / kg
Ether, 1,1,2,2-Tetrafluoroethyl 2,2,2-trifluoroethyl-, HFE-347mcf2	854	kg CO2 eq / kg
Ether, 1,1,2,2-Tetrafluoroethyl 2,2,2-trifluoroethyl-, HFE-347pcf2	889	kg CO2 eq / kg
Ether, 1,1,2,2-Tetrafluoroethyl methyl-, HFE-254cb2	301	kg CO2 eq / kg
Ether, 1,1,2,3,3,3-Hexafluoropropyl methyl-, HFE-356mec3	387	kg CO2 eq / kg
Ether, 1,1,2,3,3,3-Hexafluoropropyl methyl-, HFE-356pcc3	413	kg CO2 eq / kg
Ether, 1,1,2,3,3,3-Hexafluoropropyl methyl-, HFE-356pcf2	719	kg CO2 eq / kg
Ether, 1,1,2,3,3,3-Hexafluoropropyl methyl-, HFE-356pcf3	446	kg CO2 eq / kg
Ether, 1,2,2-trifluoroethyl trifluoromethyl-, HFE-236ea2	1240	kg CO2 eq / kg
Ether, 1,2,2-trifluoroethyl trifluoromethyl-, HFE-236fa	979	kg CO2 eq / kg
Ether, 2-chloro-1,1,2-trifluoroethyl difluoromethyl-, HCFE-235ca2 (enflurane)	583	kg CO2 eq / kg
Ether, 2,2,3,3,3-Pentafluoropropyl methyl-, HFE-365mcf3	0,928	kg CO2 eq / kg
Ether, bis(2,2,2-trifluoroethyl)-	17	kg CO2 eq / kg
Ether, di(difluoromethyl), HFE-134	5560	kg CO2 eq / kg
Ether, difluoromethyl 1,2,2,2-tetrafluoroethyl-, HFE-236ea2 (desflurane)	1790	kg CO2 eq / kg
Ether, difluoromethyl 2,2,2-trifluoroethyl-, HFE-245cb2	654	kg CO2 eq / kg
Ether, difluoromethyl 2,2,2-trifluoroethyl-, HFE-245fa1	828	kg CO2 eq / kg
Ether, difluoromethyl 2,2,2-trifluoroethyl-, HFE-245fa2	812	kg CO2 eq / kg
Ether, ethyl 1,1,2,2-tetrafluoroethyl-, HFE-374pc2	627	kg CO2 eq / kg
Ether, ethyl trifluoromethyl-, HFE-263m1	29	kg CO2 eq / kg
Ether, i-nonafluorobutane ethyl-, HFE569sf2 (i-HFE-7200)	44	kg CO2 eq / kg
Ether, n-nonafluorobutane ethyl-, HFE569sf2 (n-HFE-7200)	65	kg CO2 eq / kg
Ether, nonafluorobutane ethyl-, HFE569sf2 (HFE-7200)	57	kg CO2 eq / kg
Ether, pentafluoromethyl-, HFE-125	12400	kg CO2 eq / kg
Fluoridate, 1,1-difluoroethyl carbono-	27	kg CO2 eq / kg
Fluoridate, methyl carbono-	95	kg CO2 eq / kg

Fluoroxene	0,0542	kg CO2 eq / kg
Formate, 1,1,1,3,3,3-hexafluoropropan-2-yl-	333	kg CO2 eq / kg
Formate, 1,2,2,2-tetrafluoroethyl-	470	kg CO2 eq / kg
Formate, 2,2,2-trifluoroethyl-	33	kg CO2 eq / kg
Formate, 3,3,3-trifluoropropyl-	17	kg CO2 eq / kg
Formate, perfluorobutyl-	392	kg CO2 eq / kg
Formate, perfluoroethyl-	580	kg CO2 eq / kg
Formate, perfluoropropyl-	376	kg CO2 eq / kg
Formate, trifluoromethyl-	588	kg CO2 eq / kg
Halothane	41	kg CO2 eq / kg
Heptanol, 3,3,4,4,5,5,6,6,7,7,7-undecafluoro-	0,426	kg CO2 eq / kg
Hexane, perfluoro-	7910	kg CO2 eq / kg
HFE-227EA	6450	kg CO2 eq / kg
HFE-236ca12 (HG-10)	5350	kg CO2 eq / kg
HFE-263fb2	1	kg CO2 eq / kg
HFE-329mcc2	3070	kg CO2 eq / kg
HFE-338mcf2	929	kg CO2 eq / kg
HFE-338pcc13 (HG-01)	2910	kg CO2 eq / kg
HFE-43-10pccc124 (H-Galden1040x)	2820	kg CO2 eq / kg
HG-02	2730	kg CO2 eq / kg
HG-03	2850	kg CO2 eq / kg
Methane	30,5	kg CO2 eq / kg
Methane, (difluoromethoxy)((difluoromethoxy)difluoromethoxy)difluoro-	5300	kg CO2 eq / kg
Methane, bromo-, Halon 1001	2	kg CO2 eq / kg
Methane, bromochlorodifluoro-, Halon 1211	1750	kg CO2 eq / kg
Methane, bromodifluoro-, Halon 1201	376	kg CO2 eq / kg
Methane, bromotrifluoro-, Halon 1301	6290	kg CO2 eq / kg
Methane, chlorodifluoro-, HCFC-22	1760	kg CO2 eq / kg
Methane, chlorotrifluoro-, CFC-13	13900	kg CO2 eq / kg
Methane, dibromo-	1	kg CO2 eq / kg
Methane, dibromodifluoro-, Halon 1202	231	kg CO2 eq / kg
Methane, dichloro-, HCC-30	9	kg CO2 eq / kg
Methane, dichlorodifluoro-, CFC-12	10200	kg CO2 eq / kg
Methane, dichlorofluoro-, HCFC-21	148	kg CO2 eq / kg
Methane, difluoro-, HFC-32	677	kg CO2 eq / kg
Methane, difluoro(fluoromethoxy)-	617	kg CO2 eq / kg
Methane, difluoro(methoxy)-	144	kg CO2 eq / kg
Methane, fluoro-, HFC-41	116	kg CO2 eq / kg
Methane, fluoro(fluoromethoxy)-	130	kg CO2 eq / kg
Methane, fluoro(methoxy)-	13	kg CO2 eq / kg
Methane, fossil	30,5	kg CO2 eq / kg
Methane, monochloro-, R-40	12	kg CO2 eq / kg

Methane, tetrachloro-, CFC-10	1730	kg CO2 eq / kg
Methane, tetrafluoro-, CFC-14	6630	kg CO2 eq / kg
Methane, trichlorofluoro-, CFC-11	4660	kg CO2 eq / kg
Methane, trifluoro-, HFC-23	12400	kg CO2 eq / kg
Methane, trifluoro(fluoromethoxy)-	751	kg CO2 eq / kg
Methyl perfluoroisopropyl ether	363	kg CO2 eq / kg
Nitrogen fluoride	16100	kg CO2 eq / kg
Nonanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-pentadecafluoro-	0,327	kg CO2 eq / kg
Octa deca fluoro octane	7620	kg CO2 eq / kg
Pentafluorobutene-1	0,126	kg CO2 eq / kg
Pentane, 2,3-dihydroperfluoro-, HFC-4310mee	1650	kg CO2 eq / kg
Pentane, perfluoro-	8550	kg CO2 eq / kg
Pentanol, 2,2,3,3,4,4,5,5-octafluorocyclo-	13	kg CO2 eq / kg
Pentanone, 1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-	0,0997	kg CO2 eq / kg
Perfluorobut-1-ene	0,0914	kg CO2 eq / kg
Perfluorobut-2-ene	2	kg CO2 eq / kg
Perfluorobuta-1,3-diene	0,00359	kg CO2 eq / kg
Perfluorocyclopentene	2	kg CO2 eq / kg
Perfluorodecalin (mixed)	7190	kg CO2 eq / kg
Perfluorodecalin (trans)	6290	kg CO2 eq / kg
Perfluoroheptane	7820	kg CO2 eq / kg
Perfluoropropene	0,07	kg CO2 eq / kg
PFPMIE	9710	kg CO2 eq / kg
Propanal, 3,3,3-trifluoro-	0,0108	kg CO2 eq / kg
Propane, 1-ethoxy-1,1,2,2,3,3,3-heptafluoro	61	kg CO2 eq / kg
Propane, 1-ethoxy-1,1,2,3,3,3-hexafluoro-	23	kg CO2 eq / kg
Propane, 1,1,1-trifluoro-, HFC-263fb	76	kg CO2 eq / kg
Propane, 1,1,1,2,2-pentafluoro-, HFC-245cb	4620	kg CO2 eq / kg
Propane, 1,1,1,2,2,3-hexafluoro-, HFC-236cb	1210	kg CO2 eq / kg
Propane, 1,1,1,2,2,3,3-heptafluoro-, HFC-227ca	2640	kg CO2 eq / kg
Propane, 1,1,1,2,2,3,3-heptafluoro-3-(1,2,2,2-tetrafluoroethoxy)-	6490	kg CO2 eq / kg
Propane, 1,1,1,2,3-pentafluoro-, HFC-245eb	290	kg CO2 eq / kg
Propane, 1,1,1,2,3,3-hexafluoro-, HFC-236ea	1330	kg CO2 eq / kg
Propane, 1,1,1,2,3,3-hexafluoro-3-(trifluoromethoxy)-, HFE-329me3	4550	kg CO2 eq / kg
Propane, 1,1,1,2,3,3,3-heptafluoro-, HFC-227ea	3350	kg CO2 eq / kg
Propane, 1,1,1,3,3-pentafluoro-, HFC-245fa	858	kg CO2 eq / kg
Propane, 1,1,1,3,3,3-hexafluoro-, HCFC-236fa	8060	kg CO2 eq / kg
Propane, 1,1,1,3,3,3-Hexafluoro-2-(difluoromethoxy)	2620	kg CO2 eq / kg
Propane, 1,1,1,3,3,3-hexafluoro-2-(fluoromethoxy)-	216	kg CO2 eq / kg
Propane, 1,1,1,3,3,3-hexafluoro-2-methoxy-(9CI)	14	kg CO2 eq / kg
Propane, 1,1,2,2-tetrafluoro-3-methoxy-	0,525	kg CO2 eq / kg
Propane, 1,1,2,2,3-pentafluoro-, HFC-245ca	716	kg CO2 eq / kg

Propane, 1,1,2,3,3-pentafluoro-, HFC-245ea	235	kg CO2 eq / kg
Propane, 1,3-dichloro-1,1,2,2,3-pentafluoro-, HCFC-225cb	525	kg CO2 eq / kg
Propane, 2,2-difluoro-, HFC-272ca	144	kg CO2 eq / kg
Propane, 3,3-dichloro-1,1,1,2,2-pentafluoro-, HCFC-225ca	127	kg CO2 eq / kg
Propane, perfluoro-	8900	kg CO2 eq / kg
Propane, perfluorocyclo-	9200	kg CO2 eq / kg
Propane,1,1,1,2,2,3,3-heptafluoro-3-methoxy-, HFE-347mcc3 (HFE-7000)	530	kg CO2 eq / kg
Propanol, 2,2,3,3-tetrafluoro-1-	13	kg CO2 eq / kg
Propanol, 3,3,3-trifluoro-1-	0,39	kg CO2 eq / kg
Propanol, pentafluoro-1-	19	kg CO2 eq / kg
Sulfur hexafluoride	23500	kg CO2 eq / kg
Sulfuryl fluoride	4090	kg CO2 eq / kg
Tetrafluoroethylene	0,00292	kg CO2 eq / kg
trans-1,3,3,3-Tetrafluoropropene	0,953	kg CO2 eq / kg
Trifluorobutanol	0,0189	kg CO2 eq / kg
Trifluoroethyl acetate	1	kg CO2 eq / kg
Trifluoromethylsulfur pentafluoride	17400	kg CO2 eq / kg
Trifluoropropene, HFC-1243zf	0,149	kg CO2 eq / kg
Vinylfluoride	0,0168	kg CO2 eq / kg

Table 2 Characterization factors for substances contributing to emissions of biogenic CO2-equivalents. The unit is kg CO2-eq./kg substance.

Substances	Characterization factor	Unit
Carbon dioxide, biogenic	1	kg CO2 eq / kg
Methane, biogenic	30,5	kg CO2 eq / kg

Litterature

Brekke, A., Saxegård, S., Nilsen, M. and Tellnes, L. G. 2018. Hvor klimavennlig er det å ta med seg hytta på ferie? Et klimaregnskap for bobiler. OR.25.18. Østfoldforskning. Fredrikstad, Norway.

Epinion, 2019. Nasjonal reisevaneundersøkelse 2018. Hovedrapport, revidert. https://www.vegvesen.no/_attachment/2674990/binary/1361215?fast_title=N%C3%B8kkelrapport+Reisevaneunders%C3%B8kelsen+2018+-+november+2019.PDF

Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., and Weidema, B., 2016. The ecoinvent database version 3 (part I): overview and methodology. The International Journal of Life Cycle Assessment, [online] 21(9), pp.1218–1230. Available at: <http://link.springer.com/10.1007/s11367-016-1087

NORSUS
Norwegian Institute for Sustainability Research

NETTSIDE
www.norsus.no

E-POST
post@norsus.no

ORG. NR.:
989 861 751 MVA

ADRESSE
Stadion 4, 1671 Kråkerøy