

Appendix A: Implementation versions of GWP CO₂ Equivalency Factors

These lists are all implementations of global warming potential (GWP) equivalency factors for 100 year integration. They were chosen to compare values used by different data providers and versions of lists of the GWP CO₂ equivalency factors released by the IPCC.

1995 IPCC (AR2)

Intergovernmental Panel on Climate Change (IPCC) 1995 Second Assessment Report equivalency factors, compiled manually from table 2.14(errata) in the “Physical Science Basis” section of the Fourth Assessment 2007 IPCC report. This list was not available in SimaPro software and not used in the sensitivity analysis for this thesis. It is here for reference since it is still used for country greenhouse gas reporting under the United Nations Framework Convention on Climate Change (UNFCCC). The IPCC equivalency factor lists do not differentiate between biogenic and fossil emissions.

Ecoinvent IPCC 2001 V1.03 (AR3)

Exported from Ecoinvent Data V2.1 implemented in SimaPro, categorized as a “superseded” method by SimaPro, based on IPCC data from Third Assessment Report released in 2001

Ecoinvent IPCC 2007 V1.0 (AR4)

Exported from Ecoinvent Data V2.1 implemented in SimaPro, released in 2009 and based on the IPCC 2007 Fourth Assessment Report with updated 2008 factors . Ecoinvent data v2.1, based on the original 2007 report, was released in 2009 notes in mint green for discrepancies between some of the values.

Ecoinvent IPCC 2007 V1.0_Mod (AR4)

Exported from Ecoinvent Data V2.1 implemented in SimaPro, custom method created by copying and altering V.1.0 using SimaPro by case study food product Carbon Footprint researchers. Biogenic carbon uptake from air and biogenic emissions from agricultural products adjusted to zero according to PAS 2050 standard.

EPA TRACI V2.01 (2005) and EPA TRACI2 V3.00 (2008) (AR4)

Climate Change component of TRACI methods exported from SimaPro software, TRACI V2.01 is listed under “superseded” methods. The US EPA refers to the IPCC’s list but a comparison with the Global Warming Potential values in their Tool for the Reduction and Assessment of Chemical and other Environmental Impacts (TRACI) shows discrepancies. Data exported from SimaPro software.

Implementation versions of Global Warming Potential CO₂ Equivalency Factors

NOTE: For comparison purposes, null values were replaced with "0" values, this is justified by the fact that these gases would not be included in Carbon Footprint calculations and would thus function as "0" values

all values in kg CO₂ eq / kg of the substance

note	No CAS
same CAS different isomers/different values	Zero values customized by researcher from V1.0
same CAS different biogenic/fossil/in air designation	

Colors on the left correspond with line colors in Figure 3

Substance	CAS Number	Ecoinvent IPCC 2001 V1.03		Ecoinvent IPCC 2007 V1.0		EPA TRACI V2.01 (2005)		EPA TRACI2 V3.00 (2008)	
1 Carbon dioxide, in air	000124-38-9	0	-1	-1	0	0	0	0	
2 Methane, dibromo-	000074-95-3	0	0	0	0	1	1		
3 Ether, 2,2,3,3,3-Pentafluoropropyl methyl-, HFE-365mcf3	000378-16-5	0	0	0	0	11	11		
4 Ether, 1,2,2-trifluoroethyl trifluoromethyl-, HFE-236fb2	084011-06-3	0	0	0	0	11	11		
5 Ethane, fluoro-, HFC-161	000353-36-6	0	0	0	0	12	12		
6 Propane, 1,1,1,3,3,3-hexafluoro-2-methoxy-(9CI)	N/A	0	0	0	0	26	26		
7 Propanol, pentafluoro-1-	000422-05-9	0	0	0	0	40	40		
8 Ethane, 1,2-difluoro-, HFC-152	000624-72-6	0	0	0	0	52	52		
9 1H,1H,2H,2H-Perfluorohexan-1-ol, HFE-7200	002043-47-2	0	0	0	0	56	56		
10 Ethanol, 2,2,2-trifluoro-	000075-89-8	0	0	0	0	57	57		
11 1H,5H-Octafluoropentanal	002648-47-7	0	0	0	0	71	71		
12 Ether, 1,1,2,3,3,3-Hexafluoropropyl methyl-, HFE-356mec3	000382-34-3	0	0	0	0	99	99		
13 Ether, 1,1,2,3,3,3-Hexafluoropropyl methyl-, HFE-356pcc3	000382-34-3	0	0	0	0	108	108		
14 Propanol, 1,1,1,3,3,3-hexafluoro-2-	000920-66-1	0	0	0	0	214	214		
15 Ether, 1,1,2,3,3,3-Hexafluoropropyl methyl-, HFE-356pcf2	000382-34-3	0	0	0	0	260	260		
16 Ether, difluoromethyl 2,2,2-trifluoroethyl-, HFE-245fa1	001885-48-9	0	0	0	0	282	282		
17 Propane, 1,1,1,3,3,3-hexafluoro-2-(fluoromethoxy)-	N/A	0	0	0	0	338	338		
18 Propane, 1,1,1,3,3,3-Hexafluoro-2-(difluoromethoxy)	026103-08-2	0	0	0	0	373	373		
19 1-Propanol, 3,3,3-trifluoro-2,2-bis(trifluoromethyl)-, HFE-7100	014117-17-0	0	0	0	0	397	397		
20 Ether, 1,2,2-trifluoroethyl trifluoromethyl-, HFE-236fa	084011-06-3	0	0	0	0	480	480		
21 Ether, 1,1,2,3,3,3-Hexafluoropropyl methyl-, HFE-356pcf3	000382-34-3	0	0	0	0	494	494		
22 Ether, ethyl 1,1,2,2-tetrafluoroethyl-, HFE-374pc2	000512-51-6	0	0	0	0	540	540		
23 Propane, 1,1,1,3,3,3-Hexafluoro-2-(difluoromethoxy)-, HFE-338mcf2	026103-08-2	0	0	0	0	543	543		
24 Ether, 1,1,2,2-Tetrafluoroethyl 2,2,2-trifluoroethyl-, HFE-347mcc3	000406-78-0	0	0	0	0	566	566		
25 Ethane, chlorotetrafluoro-	063938-10-3	0	0	0	0	599	599		
26 Ether, difluoromethyl 2,2,2-trifluoroethyl-, HFE-245fa2	001885-48-9	0	0	0	0	649	649		
27 Ether, difluoromethyl 2,2,2-trifluoroethyl-, HFE-245cb2	001885-48-9	0	0	0	0	697	697		
28 Ether, 1,1,1-trifluoromethyl methyl-, HFE-143a	000421-14-7	0	0	0	0	744	744		
29 Propanol, hexafluoro-2-trifluoromethyl-2-, HFE-329mcc2	002378-02-1	0	0	0	0	904	904		
30 Ether, 1,2,2-trifluoroethyl trifluoromethyl-, HFE-236ea2	084011-06-3	0	0	0	0	973	973		
31 Propane, 1,1,1,3,3,3-pentafluoro-, HFC-245fa	000460-73-1	0	0	0	0	1020	1020		
32 Propane, 1,1,1,2,2,3-hexafluoro-, HFC-236cb	000677-56-5	0	0	0	0	1320	1320		
33 Propane, 1,1,1,2,3,3-hexafluoro-, HFC-236ea	000431-63-0	0	0	0	0	1350	1350		
34 Propane, 1,1,1,3,3,3-Hexafluoro-2-(difluoromethoxy)-, HFE-338pcc13	026103-08-2	0	0	0	0	1480	1480		
35 HG-01	N/A	0	0	0	0	1500	1500		
36 HFE-227EA	N/A	0	0	0	0	1520	1520		
37 Ethane, 1,2-dibromotetrafluoro-, Halon 2402	000124-73-2	0	0	0	0	1620	1620		
38 H-Galden 1040x	N/A	0	0	0	0	1840	1840		
39 HG-10	N/A	0	0	0	0	2700	2700		
40 Hexafluoroacetone hydrate, HFE-236CA12	034202-69-2	0	0	0	0	2780	2780		
41 Ether, di(difluoromethyl), HFE-134	001691-17-4	0	0	0	0	6220	6220		
42 Ether, pentafluoromethyl-, HFE-125	003822-68-2	0	0	0	0	14670	14670		
43 Propane, perfluorocyclo-	N/A	0	0	0	0	17070	17070		
44 Trifluoromethylsulfur pentafluoride	000373-80-8	0	0	0	0	17500	17500		
45 Dimethyl ether	000115-10-6	0	0	1	1	1	1		
46 Butane, nonafluoroethoxy, HFE-569sf2	163702-05-4	0	0	59	59	0	0		
47 Propane, 1,1,2,2,3,3, hexafluoromethoxy- HFE-356pcc3	N/A	0	0	110	110	0	0		
48 Butane, nonafluoromethoxy, HFE-7100	163702-07-6	0	0	297	297	0	0		
49 Ethane, 1-chloro-2,2,2-trifluoro-(difluoromethoxy)-, HCFE-235da2	026675-46-7	0	0	350	350	343	343		
50 Ether, 1,1,2,2-Tetrafluoroethyl methyl-, HFE-254cb2	000425-88-7	0	0	359	359	353	353		
51 Ether, 1,1,2,2-Tetrafluoroethyl 2,2,2-trifluoroethyl-, HFE-347mcf2	000406-78-0	0	0	575	575	368	368		
52 HFE-347pcf2	N/A	0	0	580	580	0	0		
53 Ethane, 2,2,2-trifluoromethoxy-, HFE245fa2	N/A	0	0	659	659	0	0		
54 Ethane, 1,1,2,2-tetrafluoromethoxy-, HFE245cb2	N/A	0	0	708	708	0	0		
55 Methane, trifluoro-methoxy-, HFE-143a	N/A	0	0	756	756	0	0		
56 Butane, 1,1,1,3,3,3-pentafluoro-, HFC-365mfc	000406-58-6	0	0	794	794	782	782		
57 Propane, 1,1,3,3-tetrafluoro-, HFC-245fa	004556-24-5	0	0	1030	1030	0	0		
58 HFE-338pcc13 (HG-01)	N/A	0	0	1500	1500	0	0		
59 HFE-43-10pccc124 (H-Galden1040x)	N/A	0	0	1870	1870	0	0		
60 HFE-236ca12 (HG-10)	N/A	0	0	2800	2800	0	0		

Substance	CAS Number	Ecoinvent IPCC 2001 V1.03		EPA TRAC1 V2.01 (2005)		EPA TRAC2 V3.00 (2008)	
		1995 IPCC (AR2)	2007 V1.0	2007 V1.0	2007 V1.0	2007 V1.0	2008 V1.0
61 Methane, pentafluoromethoxy-, HFE-134	N/A	0	0	6320	6320	0	0
62 PFC-9-1-18	N/A	0	0	7500	7500	0	0
63 PFPME	N/A	0	0	10300	10300	0	0
64 Methane, trifluoro-(difluoromethoxy)-, HFE-125	N/A	0	0	14900	14900	0	0
65 Nitrogen fluoride	007783-54-2	0	0	17200	17200	10970	10970
66 Sulphur, trifluoromethyl pentafluoride	N/A	0	0	17700	17700	0	0
67 Carbon dioxide, biogenic	000124-38-9	0	1	1	0	0	1
68 Carbon dioxide, fossil	000124-38-9	0	1	1	0	0	1
69 Carbon monoxide	000630-08-0	0	1.57	0	0	0	1.57
70 Carbon monoxide, biogenic	000630-08-0	0	1.57	0	0	0	1.57
71 Carbon monoxide, fossil	000630-08-0	0	1.57	0	0	0	1.57
72 Methane, bromo-, Halon 1001	000074-83-9	0	5	5	5	5	5
73 Methane, monochloro-, R-40	000074-87-3	0	16	13	13	16	16
74 Methane, biogenic	000074-82-8	0	23	25	25	0	23
75 Methane, fossil	000074-82-8	0	23	25	25	0	23
76 Propane, 3,3-dichloro-1,1,1,2,2-pentafluoro-, HCFC-225ca	000422-56-0	0	180	122	122	120	120
77 Methane, dichlorofluoro-, HCFC-21	000075-43-4	0	210	0	0	148	148
78 Methane, bromodifluoro-, Halon 1201	001511-62-2	0	470	0	0	470	470
79 Propane, 1,3-dichloro-1,1,2,2,3-pentafluoro-, HCFC-225cb	000507-55-1	0	620	595	595	586	586
80 Methane, bromochlorodifluoro-, Halon 1211	000353-59-3	0	1300	1890	1890	1860	1860
81 Ethane, chloropentafluoro-, CFC-115	000076-15-3	0	7200	7370	7370	7250	7250
82 Ethane, 1,2-dichloro-1,1,2,2-tetrafluoro-, CFC-114	000076-14-2	0	9800	10000	10000	9880	9880
83 Butane, perfluorocyclo-, PFC-318	000115-25-3	0	10000	10300	10300	10090	10090
84 Methane, chlorotrifluoro-, CFC-13	000075-72-9	0	14000	14400	14400	14190	14190
85 trifluoroiodomethane	N/A	1	0	0.4	0.4	0	0
86 Methane, iodotrifluoro-	002314-97-8	1	1	0	0	1	1
87 Carbon dioxide	000124-38-9	1	1	1	1	1	1
88 Methane, dichloro-, HCC-30	000075-09-2	9	10	8.7	8.7	10	10
89 Methane	000074-82-8	21	23	25	25	23	23
90 Ethane, 2,2-dichloro-1,1,1-trifluoro-, HCFC-123	000306-83-2	90	120	77	77	76	76
91 Ethane, 1,1,1-trichloro-, HCFC-140	000071-55-6	100	140	146	146	144	144
92 Chloroform	000067-66-3	108	30	756	756	30	30
93 Ethane, 1,1-difluoro-, HFC-152a	000075-37-6	140	120	124	124	122	122
94 Methane, fluoro-, HFC-41	000593-53-3	150	97	0	0	90	90
95 Ethane, 1,1,2-trifluoro-, HFC-143	000430-66-0	300	330	0	0	347	347
96 Dinitrogen monoxide	010024-97-2	310	296	298	298	300	300
97 Ethane, 2-chloro-1,1,1,2-tetrafluoro-, HCFC-124	002837-89-0	470	620	609	609	0	0
98 Propane, 1,1,2,2,3-pentafluoro-, HFC-245ca	000679-86-7	560	640	0	0	682	682
99 Ethane, 1,1-dichloro-1-fluoro-, HCFC-141b	001717-00-6	600	700	725	725	713	713
100 Methane, difluoro-, HFC-32	000075-10-5	650	550	675	675	670	670
101 Ethane, 1,1,2,2-tetrafluoro-, HFC-134	000359-35-3	1000	1100	1430	1430	1090	1090
102 Ethane, 1,1,1,2-tetrafluoro-, HFC-134a	000811-97-2	1300	1300	1430	1430	1410	1410
103 Pentane, 2,3-dihydroperfluoro-, HFC-4310mee	138495-42-8	1300	1500	1640	1640	1610	1610
104 Methane, tetrachloro-, CFC-10	000056-23-5	1400	1800	1400	1400	1380	1380
105 Methane, chlorodifluoro-, HCFC-22	000075-45-6	1500	1700	1810	1810	1780	1780
106 Ethane, 1-chloro-1,1-difluoro-, HCFC-142b	000075-68-3	1800	2400	2310	2310	2270	2270
107 Ethane, pentafluoro-, HFC-125	000354-33-6	2800	3400	3500	3500	3450	3450
108 Propane, 1,1,1,2,3,3,3-heptafluoro-, HFC-227ea	000431-89-0	2900	3500	3220	3220	3140	3140
109 Ethane, 1,1,1-trifluoro-, HFC-143a	000420-46-2	3800	4300	4470	4470	4400	4400
110 Methane, trichlorofluoro-, CFC-11	000075-69-4	3800	4600	4750	4750	4680	4680
111 Ethane, 1,1,2-trichloro-1,2,2-trifluoro-, CFC-113	000076-13-1	4800	6000	6130	6130	6030	6030
112 Methane, bromotrifluoro-, Halon 1301	000075-63-8	5400	6900	7140	7140	7030	7030
113 Propane, 1,1,1,3,3,3-hexafluoro-, HCFC-236fa	000690-39-1	6300	9400	9810	9810	9500	9500
114 Methane, tetrafluoro-, CFC-14	000075-73-0	6500	5700	7390	7390	5820	5820
115 Propane, perfluoro-	000076-19-7	7000	8600	8830	8830	8690	8690
116 Butane, perfluoro-	000355-25-9	7000	8600	8860	8860	8710	8710
117 Hexane, perfluoro-	000355-42-0	7400	9000	9300	9300	9140	9140
118 Pentane, perfluoro-	000678-26-2	7500	8900	9160	9160	9010	9010
119 Methane, dichlorodifluoro-, CFC-12	000075-71-8	8100	10600	10900	10900	10720	10720
120 Ethane, hexafluoro-, HFC-116	000076-16-4	9200	11900	12200	12200	12010	12010
121 Methane, trifluoro-, HFC-23	000075-46-7	11700	12000	14800	14800	14310	14310
122 Sulfur hexafluoride	002551-62-4	23900	22200	22800	22800	22450	22450

IPCC show PFC-318, with 8700 (AR2), CAS would be 115253

1995 From IPCC list, <1 changed to 1 for visualization

IPCC AR4 shows 0.4 value for 1995 list

Compound in SAR (Table 2.8) was erroneously listed as CH3Cl3.

IPCC AR4 lists 31

IPCC AR4 shows 92 value for 2007

IPCC AR4 shows 353 value for 2007

IPCC AR4 shows 693 value for 2007

IPCC AR4 shows 1000 value for 1995 and 1100 for 2007

Ecoinvent uses twice the same value for HFC 134 (row 101) and HFC 134a for 2007 while these are different substances