

BRIDGING THE GAP: HOW GHG ACCOUNTING TOOLS CAN SUPPORT BEER COMPANIES IN THE IMPLEMENTATION OF CIRCULAR ECONOMY STRATEGIES

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APPENDIX

Table A 1: Default emission sources (ES) included in the GHG accounting tool

		Natural gas	Biomass	Biodiesel (animal fat)	Compressed biomethane	
Scope 1	Fixed combustion	LPG	Biodiesel (methyl ester)	Biodiesel HVO	Liquefied biomethane	
		Diesel	Biodiesel (spent cooking oil)	Bioethanol		
	Mobile combustion	Diesel car	Petrol car	LPG car	Hybrid diesel car	Hybrid petrol car
		Methane car	Diesel van	Petrol van	Hybrid/electric van	Methane van
		LPG van	Diesel lorry	Other diesel machineries		
	Leakage of refrigerants	R-134a	R-407a	R-417a	R-422d	R-507a
		R-22	R-407c	R-417b	R-448a	R-717 ammonia
		R-404a	R-410a	R-422a	R-449a	
	Other direct emissions from industrial process	Biogenic CO2 (fermentation)	Fossil CO2	CO	N2O	CH4

Scope 2	Imported energy	Electric energy for operations	GO certificates	Thermal energy	Steam	Electric energy for means of transport
	Goods and services procurement	Raw materials	Ingredients	Packaging	POP products	Refillable packaging washing
Capital goods		Water	Canteen service			
	Appliances	Production machineries	Energy production facilities	Plant components		
Energy upstream	Natural gas	Electric energy	Biomass	Biodiesel fuel	Diesel fuel	
	Petrol fuel	Methane	Thermal energy			
Upstream transport	Goods inbound transport	Packaging inbound transport	Product outbound transport			
	Wastes	Wastewater	Process wastes			
Business travel	Employee commuting	External visitors				
Leasing goods	Cars	Commercial vehicles	Appliances	Production machineries	Energy production facilities	
Downstream transport	Product outbound transport	Consumer transport				
Products use phase	Products end of life					

Table A 2: Default emission factors for Scope 1 included in the GHG accounting tool

Emission Factors (kg CO _{2e} /unit)						
Process	Unit	Climate change - Total	CO _{2e} /unit of CO ₂	CO _{2e} /unit of CH ₄	CO _{2e} /unit of N ₂ O	Source
FIXED COMBUSTION						
Natural gas	Smc	2,0183933	2,00396	0,00475	0,00968	ISPRA
LPG	l	1,56	1,55491	0,00136	0,00086	
Diesel	l	2,51	2,47887	0,00029	0,03290	
Biomass (wood chips)	ton	40,58				
Biodiesel (Methyl ester)	ME l	0,17				DEFRA
Biodiesel (spent cooking oil)	ME l	0,17				
Biodiesel	ME l	0,17				

Emission Factors (kg CO ₂ e /unit)						
Process	Unit	Climate change - Total	CO ₂ e/unit of CO ₂	CO ₂ e/unit of CH ₄	CO ₂ e/unit of N ₂ O	Source
(animal fat)						
Biodiesel HVO	l	0,04				
Bioethanol	l	0,01				
Compressed biomethane	kg	0,01				
Liquified biomethane	kg	0,01				
MOBILE COMBUSTION						
Diesel car	l	2,5	2,47887	0,00029	0,03290	
Hybrid diesel car	l	2,5	2,47887	0,00029	0,03290	
Hybrid petrol car	l	2,1	2,08354	0,00806	0,00587	
Petrol car	l	2,1	2,08354	0,00806	0,00587	
LPG car	l	1,56	1,55491	0,00136	0,00086	
Methane car	l	0,45	0,44757	0,00067	0,0002	
Diesel van	l	2,51	2,47887	0,00029	0,0329	DEFRA
Petrol van	l	2,1	2,08354	0,00806	0,00587	
Hybrid/electric van	l	2,1	2,08354	0,00806	0,00587	
LPG van	l	1,56	1,55491	0,00136	0,00086	
Methane van	l	0,45	0,44757	0,00067	0,0002	
Diesel lorry	l	2,51	2,47887	0,00029	0,0329	
Other diesel	l	2,66	2,626	0,00029	0,03308	
REFRIGERANTS						
R-134a	kg	1526				
R-22	kg	1960				
R-404a	kg	5277,2				
R-407a	kg	2260,6				
R-407c	kg	1905,85				
R-410a	kg	2255,5				
R-417a	kg	2505,84				
R-417b	kg	3275,06				Ecoinvent 3.10
R-422a	kg	3358,23				
R-422d	kg	2915,43				
R-448a	kg	1493,52				
R-449a	kg	1503,44				
R-507a	kg	4775				
R-717	kg	0				
ammonia						
PROCESS EMISSIONS						
Biogenic CO ₂	kg	1				
Fossil CO ₂	kg	1				DEFRA
N ₂ O	kg	265				
CH ₄	kg	28				

Emission Factors (kg CO₂e /unit)						
Process	Unit	Climate change - Total	CO₂e/unit of CO₂	CO₂e/unit of CH₄	CO₂e/unit of N₂O	Source
Steam	kg	0,18				

Table A 3: Default emission factors for Scope 2 included in the GHG accounting tool

Emission Factors (kg CO₂e /kWh)			
	Location-based	Market-based	Source
Electricity from the grid	0,27363 (production mix)	0,5005 (residual mix)	AIB
Renewable energy	0,00	0,00	
Thermal energy from the grid	0,17965		DEFRA
Steam from the grid	0,17965		DEFRA