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# Case Study – Environment Impact Assessment from E&P Operations

# Developing a GHG Protocol Template for E&P Industry



Our Team has customized a GHG protocol template for the Oil & Gas industry which is still not available yet as a sector specific tool

Next Step – This customized template is getting migrated into an app using a no-code platform



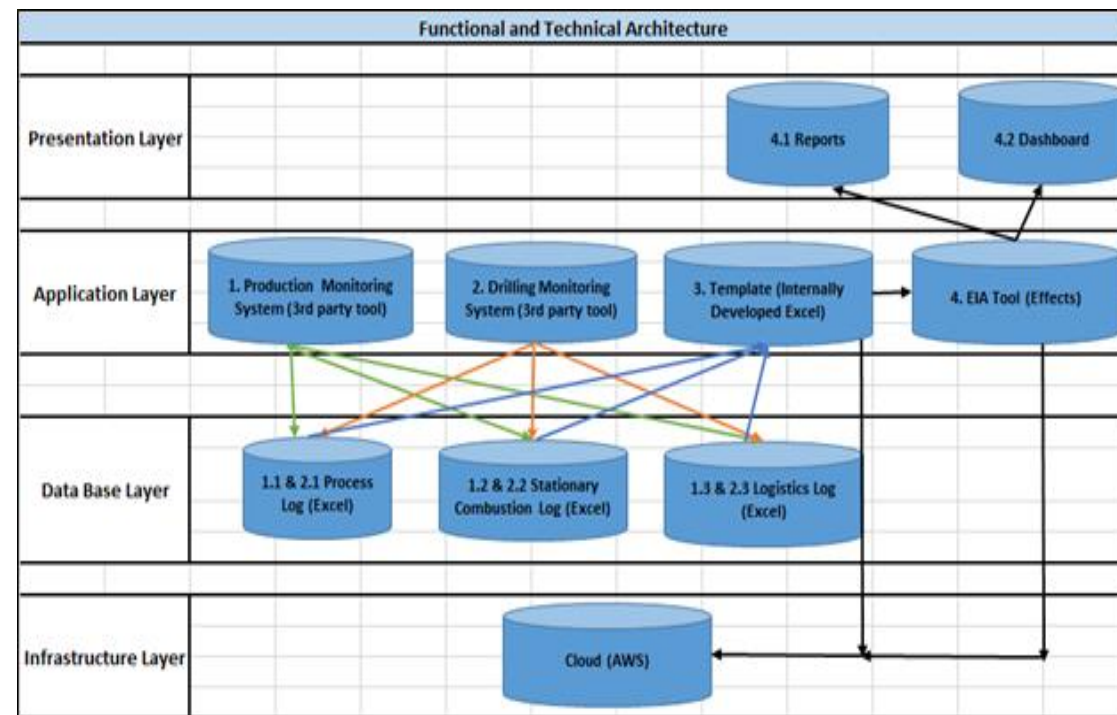
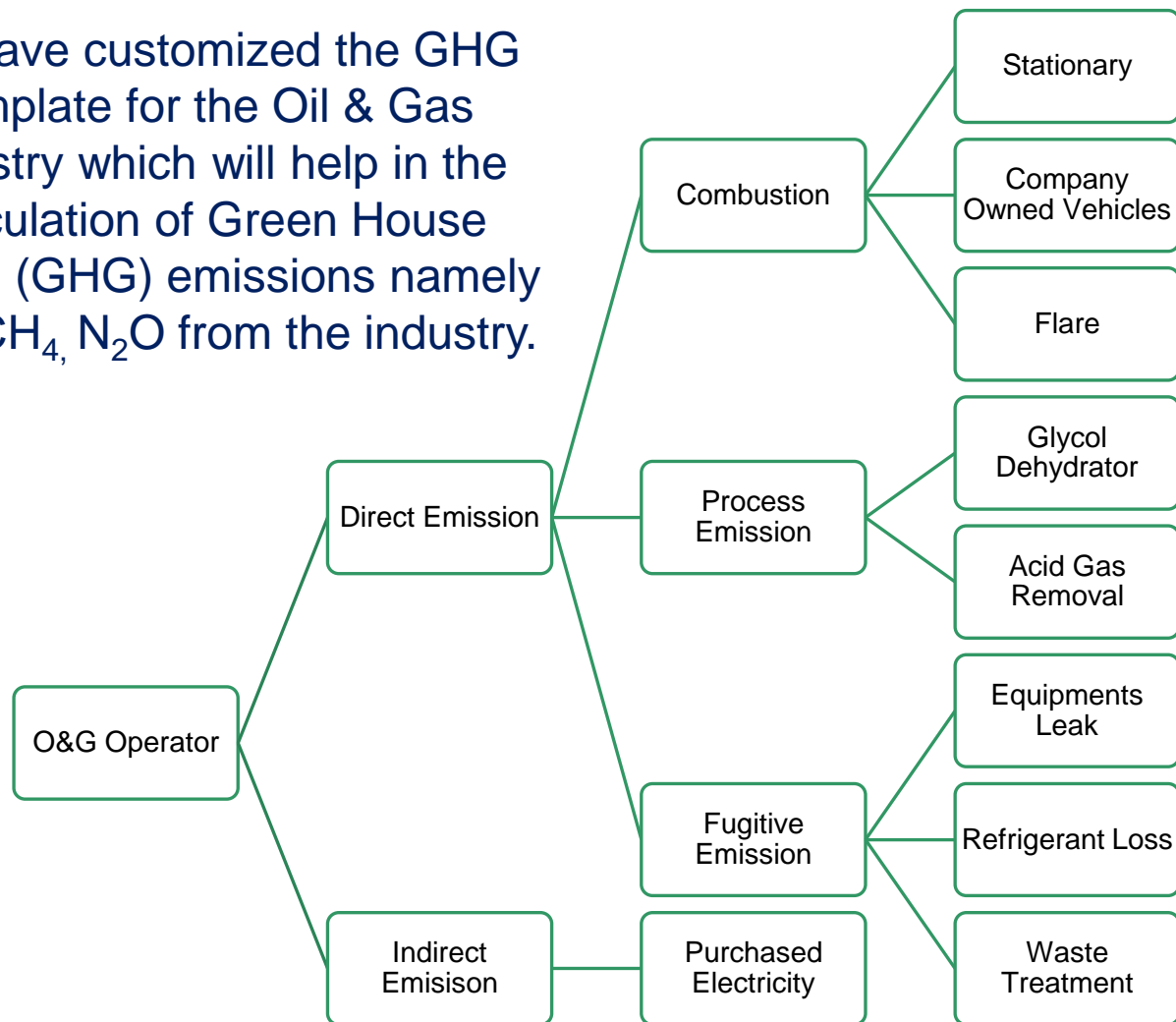
# Typical Emission Sources from E&P operations

Oil & Gas	Process	Well drilling	CO <sub>2</sub> ,CH <sub>4</sub> ,N <sub>2</sub> O
		Flares	CO <sub>2</sub> ,CH <sub>4</sub> ,N <sub>2</sub> O
		Incinerators	CO <sub>2</sub> ,CH <sub>4</sub> ,N <sub>2</sub> O
		Dehydration processes	CH <sub>4</sub>
		Gas sweetening processes	CO <sub>2</sub> ,CH <sub>4</sub>
		Process Heat	CO <sub>2</sub> ,CH <sub>4</sub> ,N <sub>2</sub> O
		Exploratory Drilling	CO <sub>2</sub> ,CH <sub>4</sub>
		Gas sampling and analysis	CO <sub>2</sub> ,CH <sub>4</sub>
		Mud degassing	CO <sub>2</sub> ,CH <sub>4</sub>
		Low pressure gas well casing	CO <sub>2</sub> ,CH <sub>4</sub>
		Well completions	CO <sub>2</sub> ,CH <sub>4</sub>
		Wastewater treatment	CO <sub>2</sub> ,CH <sub>4</sub>
		Air Conditioning/Refrigeration	CO <sub>2</sub> , CH <sub>4</sub>
		Site preparation, construction, and excavation	CO <sub>2</sub> ,CH <sub>4</sub> ,N <sub>2</sub> O
		Stationary	Boilers
	Dehydrator reboilers		CO <sub>2</sub> ,CH <sub>4</sub> ,N <sub>2</sub> O
	Heaters		CO <sub>2</sub> ,CH <sub>4</sub> ,N <sub>2</sub> O
	Internal Combustion(IC) engine generators		CO <sub>2</sub> ,CH <sub>4</sub> ,N <sub>2</sub> O
	Reciprocating Compressor Drives		CO <sub>2</sub> ,CH <sub>4</sub> ,N <sub>2</sub> O
	Fire Pumps		CO <sub>2</sub> ,CH <sub>4</sub> ,N <sub>2</sub> O
	Turbine Electric Generators		CO <sub>2</sub> ,CH <sub>4</sub> ,N <sub>2</sub> O
	Turbine/centrifugal compressor drivers		CO <sub>2</sub> ,CH <sub>4</sub> ,N <sub>2</sub> O
	Electricity imports		CO <sub>2</sub>
	Cogeneration		CO <sub>2</sub>
	Dehydrator Kimray pumps		CH <sub>4</sub>
	Storage tanks and drain vessels		CO <sub>2</sub> , CH <sub>4</sub>
	Chemical injection pumps		CO <sub>2</sub> , CH <sub>4</sub>
	Equipment component leaks		CO <sub>2</sub> , CH <sub>4</sub>
	Mobile		Mobile drilling equipment
		Company vehicles(Petrol, Diesel)	CO <sub>2</sub> ,CH <sub>4</sub> ,N <sub>2</sub> O
Planes/helicopters(In Case Of Offshore)		CO <sub>2</sub> ,CH <sub>4</sub> ,N <sub>2</sub> O	
Supply boats, barges		CO <sub>2</sub> ,CH <sub>4</sub> ,N <sub>2</sub> O	



# Emission Calculation for O&G Clients

We have customized the GHG template for the Oil & Gas industry which will help in the calculation of Green House Gases (GHG) emissions namely CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O from the industry.



# Emission Sources Calculation for O&G Clients

User Input		Emission Factor and Heating Values if not known refer to Sheet Emission Factors for the Tables					
Calculated Values							
GHG gases from Combustion Sources(Stationary & Mobile)		Emission Factors & Heating Values from Tables 1,2,3,4,15					
CO2	From Stationary Devices	Fuel Type	Unit(kg/t)	Quantity	Emission Factor/Heat Value	Carbon content factor	CO2 emitted
		Boilers/steam Generators	Coal	tonnes	40	0.1036	0.73
Dehydrator reboilers	Coal	tonnes	50	0.1036	0.73	13.86513	
Heaters/Treaters	Diesel	tonnes	2	0.0742	0.87	0.47340	
Internal Combustion(IC) engine generators	Diesel	tonnes	1.5	0.0742	0.87	0.35505	
Fire Pumps	0	0	0	0	0	0.00000	
Reciprocating Compressor Drives	0	0	0	0	0	0.00000	
Turbine Electric Generators	Coal	tonnes	10	0.1036	0.73	2.77303	
Turbine/centrifugal compressor drivers	0	0	0	0	0	0.00000	
Well drilling	Diesel	tonnes	10	0.0742	0.73	1.98609	
Flares	0	0	0	0	0	0.00000	
Incinerators	0	0	0	0	0	0.00000	
<b>TOTAL</b>						<b>30.5448</b>	
CO2	From Mobile Sources	Fuel Type	Unit(kg/t)	Quantity	Emission Factor	Carbon Content factor	CO2 emitted
		Mobile drilling equipment	Diesel	tonnes	10	0.0742	0.87
Company vehicles(Petrol)	Petrol	tonnes	1	0.0709	0.84	0.2184	
Company vehicles(Diesel)	Diesel	tonnes	1.5	0.0742	0.87	0.3550	
Planes/helicopters(In Case Of Offshore)	0	0	0	0	0	0.0000	
Supply boats, barges	0	0	0	0	0	0.0000	
Site preparation, construction, and excavation	Diesel	tonnes	2	0.0742	0.87	0.4734	
<b>Total</b>						<b>3.4118</b>	
CH4	From Stationary Devices	Fuel Type	Unit(kg/t)	Quantity	Emission Factor	CH4 emitted	
		Boilers/steam Generators	Coal	tonnes	40	0.000001	0.000040
Dehydrator reboilers	Coal	tonnes	50	0.000001	0.000050		
Heaters/Treaters	Diesel	tonnes	2	0.000003	0.000006		
Internal Combustion(IC) engine generators	Diesel	tonnes	1.5	0.000003	0.000005		
Fire Pumps	0	0	0	0	0.000000		
Reciprocating Compressor Drives	0	0	0	0	0.000000		
Turbine Electric Generators	Coal	tonnes	10	0.000001	0.000010		
Turbine/centrifugal compressor drivers	0	0	0	0	0.000000		
Well drilling	Diesel	tonnes	10	0.000001	0.000010		
Flares	0	0	0	0	0.000000		
Incinerators	0	0	0	0	0.000000		
<b>Total</b>						<b>0.0001</b>	
CH4	From Mobile Sources	Fuel Type	Unit(kg/t)	Quantity	Emission Factor	CH4 emitted	
		Mobile drilling equipment	Diesel	tonnes	10	0.000003	0.0000
Company vehicles(Petrol)	Petrol	tonnes	1	0.000003	0.0000		
Company vehicles(Diesel)	Diesel	tonnes	1.5	0.000003	0.0000		
Planes/helicopters(In Case Of Offshore)	0	0	0	0	0.0000		
Supply boats, barges	0	0	0	0	0.0000		
Site preparation, construction, and excavation	Diesel	tonnes	2	0.000003	0.0000		
<b>Total</b>						<b>0.000044</b>	
N2O	From Stationary Devices	Fuel Type	Unit(kg/t)	Quantity	Emission Factor	N2O emitted	
		Boilers/steam Generators	Coal	tonnes	40	0.000015	0.000600
Dehydrator reboilers	Coal	tonnes	50	0.000015	0.000750		
Heaters/Treaters	Diesel	tonnes	2	0.00000600	0.000012		
Internal Combustion(IC) engine generators	Diesel	tonnes	1.5	0.00000600	0.000009		
Fire Pumps	0	0	0	0	0.000000		
Reciprocating Compressor Drives	0	0	0	0	0.000000		
Turbine Electric Generators	Coal	tonnes	10	0.000015	0.000150		
Turbine/centrifugal compressor drivers	0	0	0	0	0.000000		
Well drilling	Diesel	tonnes	10	0.00000600	0.000006		
Flares	0	0	0	0	0.000000		
Incinerators	0	0	0	0	0.000000		
<b>Total</b>						<b>0.00150810</b>	
N2O	From Mobile Sources	Fuel Type	Unit(kg/t)	Quantity	Emission Factor	N2O emitted	
		Mobile drilling equipment	Diesel	tonnes	10	0.00000600	0.00000600
Company vehicles(Petrol)	Petrol	tonnes	1	0.00000600	0.00000600		
Company vehicles(Diesel)	Diesel	tonnes	1.5	0.00000600	0.00000900		
Planes/helicopters(In Case Of Offshore)	0	0	0	0	0.0000		
Supply boats, barges	0	0	0	0	0.0000		
Site preparation, construction, and excavation	Diesel	tonnes	2	0.00000600	0.0000120		
<b>Total</b>						<b>0.0000870</b>	
		Stationary Devices	Mobile Sources	Total			
CO2		30.5448	3.4118	33.9566			
CH4		0.0001	0.0000	0.0002			
N2O		0.0015	0.0001	0.0015			

User Input Value		Emission Factor and Heating Values if not known Sheet Emission Factors for the Tables			
Calculated Values					
GHG from Indirect Sources					
CO2	Units Consumed	CO2 Emission Factor	CO2 emission		
Electricity imports(in kWh)	10,000.00	0.4000	4.0000	tonnes CO2/year	
Process heat/steam imports(fuel)	0.0000	0.0000	0.0000	Emission Factor from Table 5	
Cogeneration	50,000.0000	0.5800	29000.0000		
<b>Total</b>			<b>29004.0000</b>		
CH4	Units Consumed	CH4 Emission Factor	CH4 emission		
Electricity imports(in kWh)	10000.00	0.0000680	0.0006800	tonnes CH4/year	
Process heat/steam imports(fuel)	0.0000	0.0000000	0.0000000		
Cogeneration	50000.0000	0.0002760	1.3800000		
<b>Total</b>			<b>1.3801</b>		
N2O	Units Consumed	N2O Emission Factor	N2O emission		
Electricity imports(in kWh)	10,000.00	0.0002860	0.0028600	tonnes N2O/year	
Process heat/steam imports(fuel)	0.0000	0.0000000	0.0000000		
Cogeneration	50,000.0000	0.0010900	5.4500000		
<b>Total</b>			<b>5.450286</b>		
		CO2	CH4	N2O	
Indirect Source		29004.0000	1.3801	5.450286	



# Emission Sources Calculation for O&G Clients

User Input Value		Emission Factor and Heating Values if not known refer to Sheet Emission Factors for the Tables			
Calculated Values					
<b>GHG from Vented Sources</b>					
<b>Process Vents</b>					
	Volume of Gas/year	Sour Gas Concentration in %	Sweet Gas Concentration in %	Emission of CO2 in tonnes/year	
CO2	Gas sweetening processes	121	45	30	0.000955029
<b>Total</b>		<b>0.000955029</b>			
<b>CH4</b>					
	Volume of Gas treated/year	Emission Factor	Facility CH4 molar content	Emission of CH4 in tonnes/year	
CH4	Dehydration processes(MMSCF)	121	0.0052859	78.8	0.580645153
	Dehydrator Kimray pumps	121	0.0052859	78.8	0.580645153
	Gas sweetening processes	121	0.0185	78.8	2.385
<b>Total</b>		<b>3.399790307</b>			
<b>Other Venting</b>					
CO2	Value	Emission factor	tonnes CO2/year	<b>First Complete for CH4</b>	
	NA	NA	NA		
	Storage tanks and drain vessels Exploratory drilling & Well testing and completions(Vol. in MMSCF)	NA	NA	0	
	Pneumatic devices(no. of devices)	3	70	4.655701142	
	Chemical injection pumps(no. of pumps)	0	0	0	
<b>Total</b>		<b>4.655701142</b>			
CH4	Value	CH4 content in volume%/mole% default 70%	Emission factor	tonnes CH4/year	
	1500	70	0.000886	1.180583756	
	Exploratory drilling & Well testing and completions(vol. in MMSCF)	30	70	0.000886	0.000509151
	Pneumatic devices(no. of devices)	3	70	4.341	13.16769559
	Chemical injection pumps(no. of pumps)	0	0	0	
<b>Total</b>		<b>14.3487325</b>			
<b>Maintenance/Turnarounds</b>					
CO2	Value	CH4 content in volume%/mole% default 70%	Emission factor	tonnes CO2/year	
	4	70	0.2605	0.307567084	<b>EF from Table 10</b>
	Mud degassing(No. of days)	4	70	0.00206	0.000886
	Low pressure gas well casing(No. of wells)	5	70	0.07329	0.102308376
	Compressor blowdowns(No. of devices)	5	70	843	11785.91371
	Compressor starts(No. of devices)	5	70	0	0
	Gathering pipeline blowdowns(Miles)	4	70	0.0015	0.001675127
	Vessel blowdown(No. of vessels)	0	0	0	0
	Well workovers(No. well workovers/yr)	0	0	0	0
<b>Total</b>		<b>11787.2699</b>			
CH4	Value	CH4 content in volume%/mole% default 70%	Emission factor	tonnes CH4/year	
	5	70	0.2605	1.087358378	<b>EF from Table 10</b>
	Mud degassing	4	70	0.00206	0.000886
	Low pressure gas well casing(No. of wells)	5	70	0.07329	0.102308376
	Compressor blowdowns(No. of devices)	5	70	843	11785.91371
	Compressor starts(No. of devices)	5	70	0	0
	Gathering pipeline blowdowns(Miles)	4	70	0.0015	0.001675127
	Vessel blowdown(No. of vessels)	0	0	0	0
	Well workovers(No. well workovers/yr)	0	0	0	0
<b>Total</b>		<b>37504.71913</b>			
<b>Non Routine Activities</b>					
CO2	Value	CH4 content in volume%/mole% default 70%	Emission factor	tonnes CO2/year	
	4	70	0.00065	0.000725888	
	Emergency shutdown (ESD)/ emergency safety blowdown (ESB)(No. of platforms)	4	70	0.00065	0.000725888
	Pressure relief valves (PRVs)(No. of Valve)	None	None	None	None
	Fire Suppression	None	None	None	None
<b>Total</b>		<b>0.000725888</b>			
CH4	Value	CH4 content in volume%/mole% default 70%	Emission factor	tonnes CH4/year	
	0	0	0	0	
	Emergency shutdown (ESD)/ emergency safety blowdown (ESB)(No. of platforms)	4	70	0.00065	0.000309645
	Pressure relief valves (PRVs)	4	70	0.00065	0.000309645
	Fire Suppression	None	None	None	None
<b>Total</b>		<b>0.002309645</b>			
		CO2	CH4		
		0.000955029	3.399790307		
		4.655701142	14.3487325		
		11787.2699	37504.71913		
		0.000725888	0.002309645		
		11791.92728	37522.48956		

User Input Value		Emission Factor and Heating Values if not known refer to Sheet Emission Factors for the Tables				
Calculated Values						
<b>GHG from Fugitive Sources</b>						
	Value	CH4 content in volume%/mole%	Emission Factor	tonnes CO2 /yr	BOD(Biochemical Oxidation)mg /L	
CO2	Equipment component leaks(in m3/day)	1000	78.8	0.005903	348.5374265	NA
	Wastewater treatment(flow rate (10e6 gallons/yr))	15000	78.8	0.2	0.000167302	15
	Air Conditioning/Refrigeration	-	-	-	-	NA
<b>Total</b>				<b>348.5375938</b>		
CH4	Value	CH4 content in volume%/mole%	Emission Factor	tonnes CH4/yr		
	1000	78.8	0.005903	2154.595		<b>EF from Table 12</b>
	Equipment component leaks(in m3/day)	15000	78.8	0.2	0.9	<b>EF from Table 13 &amp; 14</b>
	Wastewater treatment(Vol. in m3/yr)	-	-	-	-	
	Air Conditioning/Refrigeration	-	-	-	-	
<b>Total</b>				<b>2155.495</b>		
				CO2	CH4	
<b>Fugitive Sources</b>				<b>348.5375938</b>	<b>2155.495</b>	





Applied Analytics for Digital Enterprises

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