



Greenhouse Gas Assessment

- Technical difficulties? Email info.EQB@state.mn.us or call 651-757-2873.
- Please note, this meeting will be recorded.

Today's Agenda

- Welcome
- Introductions
- Greenhouse Gas Assessment Presentation
- Q & A

* This session is being recorded and will be posted on the EQB website

Climate Change and Environmental Review Pilot Program

Through 2022:

- Speaker Series
- Cohort
- Surveys

March Speaker Session: Introduction to the MNDOT Minnesota Infrastructure Carbon Estimator tool – stay tuned!

Speaker Series suggestions? Let us know! (e-mail address in the chat)

Introductions



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Developing a carbon footprint

Step 1: Identify sources of GHG emissions

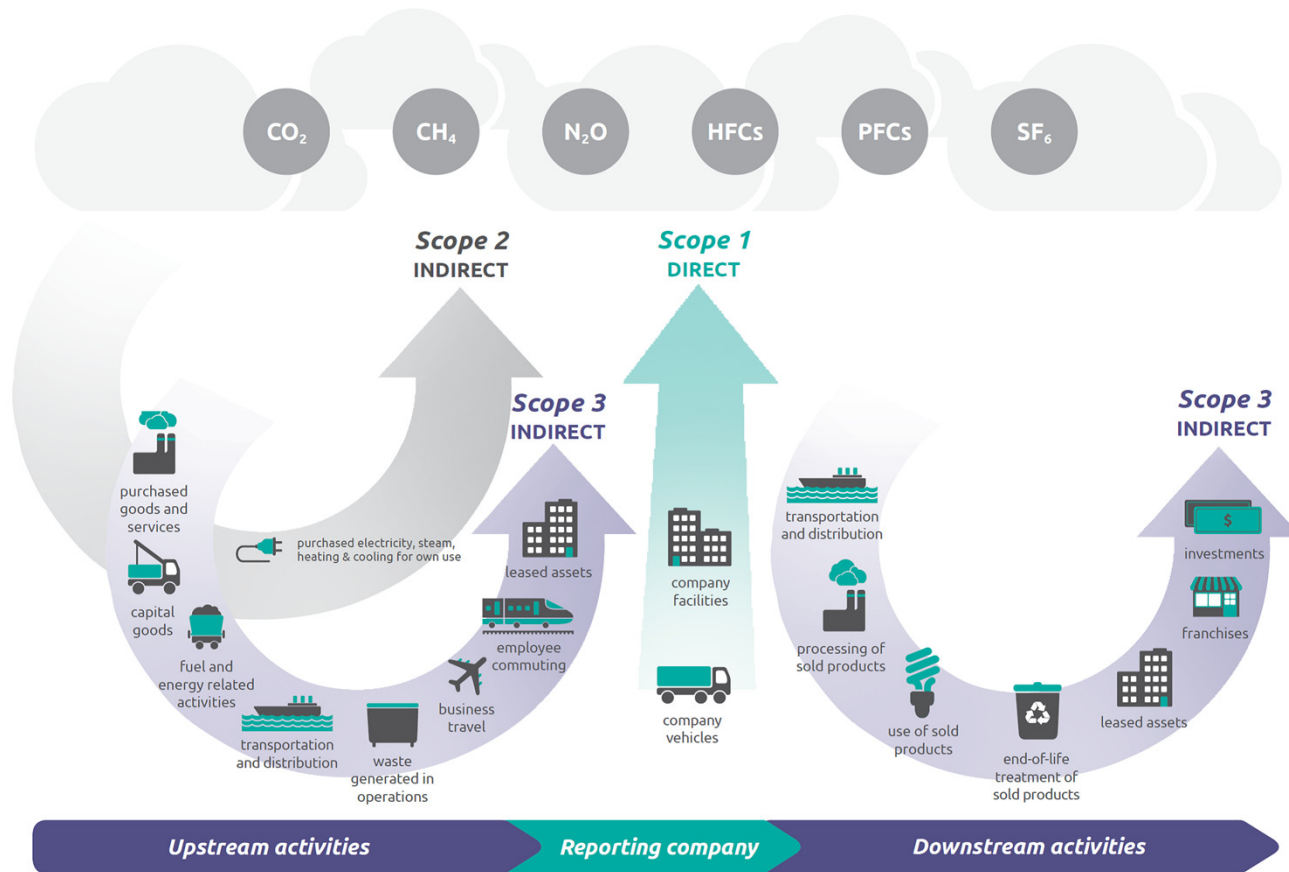
Step 2: Identify types of GHG emitted

Step 3: How to report GHG emissions

Step 4: How to quantify GHG emissions

Step 5: How to identify and assess mitigation

Step 1: Identify sources of GHG emissions



WRI, Greenhouse Gas Protocol.

Step 1: Identify sources of GHG emissions

Table 3. Emission Categories for Project Carbon Footprint

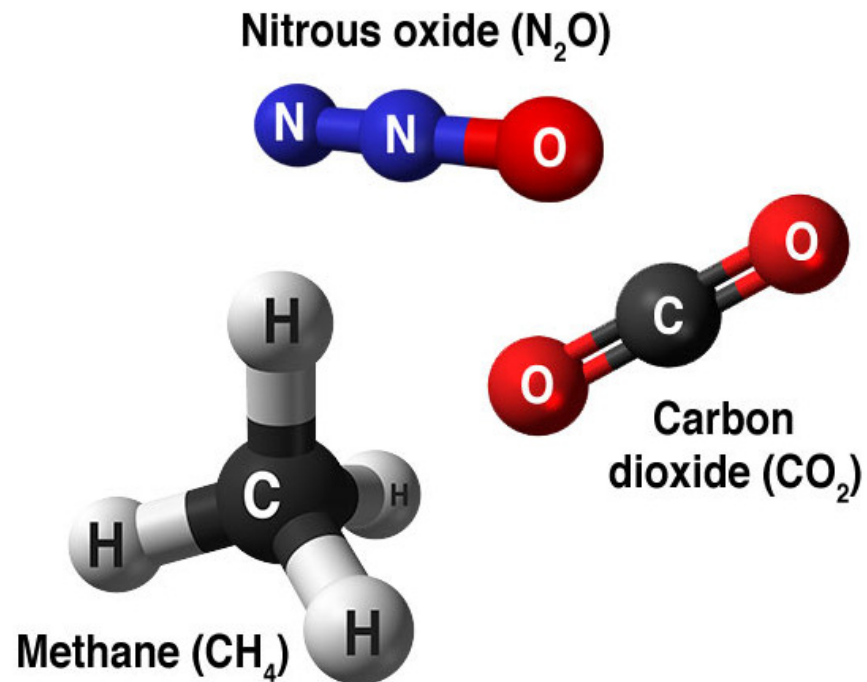
Category	Scope	Project phase	Type of emission	Emissions Sub-type	Emitant
Direct emissions	Scope 1-emissions	Operations	combustion	stationary; area; mobile	CO ₂ , ^e N ₂ O, CH ₄
	Scope 1-emissions	Operations	non-combustion process ^f	stationary ^g	CO ₂ , ^e CH ₄ , N ₂ O, HFCs, PFCs, other fully fluorinated GHGs
	Scope 1-emissions	Construction	combustion	mobile	CO ₂ , ^e N ₂ O, CH ₄
	Scope 1-emissions	Construction	land-use	area	CO ₂ , ^e N ₂ O, CH ₄
Indirect Emissions	Scope 2-emissions	Operations	off-site electricity/steam production	grid-based	CO ₂ , CH ₄ , N ₂ O ^e
	Scope 3-emissions	Operations	off-site waste management	stationary; area	CO ₂ , ^e CH ₄
Atmospheric Removals of GHGs	Scope 1-sinks	Construction/operations	land-use	area	CO ₂ removals to terrestrial storage

Total Emissions plus Sinks = Direct Emissions + Indirect Emissions + Sinks

Step 2: Identify types of GHG emitted

The GHGs most commonly included in project GHG reporting are:

- carbon dioxide (CO₂)
- nitrous oxide (N₂O)
- methane (CH₄)



Step 3: How to report GHG emissions

GHG emissions are reported as:

- Average annual basis
- Source type and project phase (i.e. construction, operations)
- tons of carbon dioxide equivalence (CO₂e), using global warming potentials (GWP)

Table 2. Greenhouse Gas Global Warming Potentials

Greenhouse Gas	Chemical Formula	Global Warming Potential
Carbon dioxide	CO ₂	1
Methane	CH ₄	25
Nitrous oxide	N ₂ O	298
Sulfur hexafluoride	SF ₆	22,800
Nitrogen trifluoride	NF ₃	17,200
Hydrofluorocarbons		
HFC-23	CHF ₃	14,800
HFC-32	CH ₂ F ₂	675
HFC-125	C ₂ HF ₅	3,500
HFC-134a	CH ₂ FCF ₃	1,430
HFC-143a	C ₂ H ₃ F ₃	4,470
HFC-152a	CH ₃ CHF ₂	124
HFC-227ea	C ₃ HF ₇	3,220
HFC-236fa	C ₃ H ₂ F ₆	9,810
HFC-245fa	C ₃ H ₃ F ₅	1,030
HFC-365mfc	C ₄ H ₅ F ₅	794
HFC-4310mee	CF ₃ CFHCFHCF ₂ CF ₃	1,640
Perfluorocarbons		
PFC-14 (Perfluoromethane)	CF ₄	7,390
PFC-116 (Perfluoroethane)	C ₂ F ₆	12,200
PFC-218 (Perfluoropropane)	C ₃ F ₈	8,830
PFC-31-10 (Perfluorobutane)	C ₄ F ₁₀	8,860
PFC-51-14 (Perfluorohexane, FC-72)	C ₆ F ₁₄	9,300

MN EQB, Revised EAW Guidance, 2022.

Step 4: How to quantify GHG emissions

Table 5. Summary of Recommended Reporting Elements for Carbon Footprint

Reporting element	Detail
Units to report in:	CO ₂ -equivalent (CO ₂ -e) short tons
Greenhouse gas (GHG) emissions to report:	CO ₂ , CH ₄ , N ₂ O, SF ₆ , HFCs, PFCs (see Table 2 above)
How to calculate CO ₂ -e tons:	nominal tons * global warming potential (GWP)
Version of IPCC gwps to use in calculating CO ₂ -e emissions:	2007 Fourth IPCC Assessment version
What to report:	Total project emissions and emissions disaggregated by source and project phase and totaled
Averaging period for emissions estimate:	One-year, e.g., average annual emissions
Project phases over which to report emissions:	Operating phase, construction phase
How to include construction emissions in annual totals:	Annualize by spreading construction emissions over project projected life or design service life
Types of emissions to report	Stationary, mobile, and area sources, including land-use
Specific sources to report	See Table 1 above
Project boundaries for emissions estimation:	<ul style="list-style-type: none"> • All sources within project fence-line or under contractual control of project proposer • Emissions from purchased electricity/steam • Off-site emissions from purchased waste disposal services
How to treat emissions of CO ₂ from wood burning, and the combustion of other solid, liquid or gaseous biofuels:	Exclude all CO ₂ emissions from biomass sources except those from permanent forest clearing, or wetlands or grasslands conversion to other uses
Treatment of sequestration removals of atmospheric CO ₂ :	Recommended but optional

MN EQB, Revised EAW Guidance, 2022.

Step 4: How to quantify GHG emissions

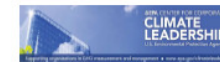
- Simplified methods to calculating GHG emissions usually take the form of linear equations involving emission factors and activity factors
- EPA's Center for Corporate Climate Leadership (CCCL) provides easy-to-use default emission factors for creating GHG inventories on the GHG Emission Factors Hub.

Example for mobile combustion sources:

$\text{tons CO}_2 = \text{fuel use in physical units} * \text{CO}_2 \text{ Emission}$

$\text{Factor (kg CO}_2/\text{physical unit of fuel use)} *$

$\text{Conversion of kg to tons}$



Emission Factors for Greenhouse Gas Inventories

Red text indicates an update from the 2020 version of this document.

Typically, greenhouse gas emissions are reported in units of carbon dioxide equivalent (CO₂e). Gases are converted to CO₂e by multiplying by their global warming potential (GWP). The emission factors listed in this document have not been converted to CO₂e. To do so, multiply the emissions by the corresponding GWP listed in the table below.

Gas	100-Year GWP
CH ₄	25
N ₂ O	298

Source: Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment Report (AR4), 2007. See the source note to Table 1 for further explanation.

Table 1 Stationary Combustion

Fuel Type	Heat Content (Btu/lb)	CO ₂ Factor	CH ₄ Factor	N ₂ O Factor	CO ₂ Factor	CH ₄ Factor	N ₂ O Factor
	mmBtu per short ton	kg CO ₂ per mmBtu	g CH ₄ per mmBtu	g N ₂ O per mmBtu	kg CO ₂ per short ton	g CH ₄ per short ton	g N ₂ O per short ton
Coal and Coke							
Anthracite Coal	25.00	109.80	11	1.6	2.502	268	40
Bituminous Coal	24.93	95.28	11	1.6	2.525	274	40
Subbituminous Coal	17.25	67.17	11	1.6	1.876	190	28
Lignite Coal	14.21	57.72	11	1.6	1.580	166	23
Mixed (Commercial Sector)	21.39	84.27	11	1.6	2.038	235	34
Mixed (Electric Power Sector)	19.73	76.32	11	1.6	1.885	217	32
Mixed (Industrial Sector)	20.28	80.90	11	1.6	2.004	260	42
Mixed (Industrial Sector)	22.35	94.67	11	1.6	2.118	280	46
Coke (Coke)	24.80	113.07	11	1.6	2.678	273	40
Other Fuels - Solid							
Marine Fuel Oil	0.00	60.70	32	4.2	3.072	918	128
Marine Fuel Oil (Light)	30.00	102.41	32	4.2	3.072	960	128
Marine Fuel Oil (Heavy)	38.00	75.00	32	4.2	2.850	1,218	180
Typical	28.00	85.07	32	4.2	2.407	896	116
Biomass Fuels - Solid							
Agricultural Residues	8.20	118.17	32	4.2	875	264	35
Wood	8.00	111.84	32	4.2	869	256	34
Solid Residues	10.36	106.51	32	4.2	1.096	332	44
Wood and Wood Residues	17.48	95.80	32	4.2	1.580	450	63
Natural Gas							
Natural Gas	0.001000	53.06	1.0	0.10	0.05444	0.00103	0.00010
Other Fuels - Gaseous							
Blas Furnace Gas	0.000002	274.92	0.022	0.10	0.02504	0.000002	0.000000
Coal Oven Gas	0.000006	48.85	0.48	0.10	0.02806	0.000006	0.000000
Fuel Gas	0.001000	48.00	1.0	0.10	0.08184	0.001000	0.000010
Propane Gas	0.002000	81.48	1.0	0.10	0.14883	0.002000	0.000100

Step 4: How to quantify GHG emissions

Indirect Off-site Energy GHG Emissions

- Regional emission factors published by the EPA's Emission & Generation Resource Integrated Database (eGRID) for off-site electrical generation

- For off-site purchased electricity, the formula is:

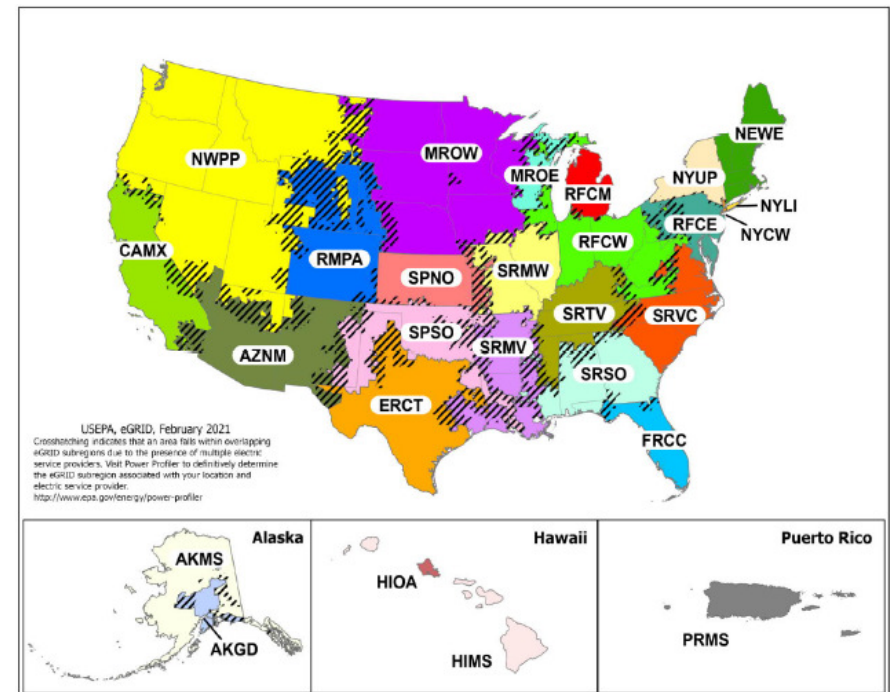
$$\text{tons CO}_2\text{-e} = \text{purchased electricity}$$

$$\text{consumption (MWh)} * \text{Emission Factor (lb/MWh)} *$$

GWP

- Emission Factors can be found in Table 7 of EPA's CCCL GHG Emission Factor Hub or on EPA eGRID website

EPA eGRID Sub-Regions 2019



Step 4: How to quantify GHG emissions

Table 6. Pre-existing Tools for Estimating GHG Emissions from Different Sources

Tool Name	GHG sources covered
SGEC Tool	Stationary source combustion, mobile source combustion, biomass and biofuels combustion, refrigerant and cooling, fire suppression, electricity and steam purchases, off-site solid waste management
MPCA feedlot tool	Feedlot livestock, manure storage and treatment, manure land application
Minnesota Infrastructure Carbon Estimator (MICE)	Highway mobile combustion sources, highway construction
Federal HFC Emissions Accounting Tool	Refrigeration and space cooling
Clear Path: Local Government Action Climate Tool	Stationary source combustion, mobile source combustion, electricity purchases, solid waste management, biosolids land application, natural gas distribution and services
Cool Farm Tool	On-farm mobile source combustion, cropland nutrient management, livestock, manure storage and treatment, land use change
COMET-Planner	Conservation and nutrient management practices in crop production and grazing
EPA Waste Reduction Model (WARM)	Solid waste recycling, composting, incineration and landfilling

MN EQB, Revised EAW Guidance, 2022.

Step 5: How to identify and assess mitigation

Common Mitigation Measures for Greenhouse Gas Reduction (MN EQB Pilot Program)

- Energy end-use efficient appliances and equipment
- Energy efficient lighting
- Energy efficient building shells
- Waste heat utilization
- Petroleum-to-natural gas and coal-to-natural gas fuel substitution
- Alternative mobile fuels
- Biogas production and use
- Enhanced use of biomass-based waste fuels
- Grid-based wind and solar power purchases
- On-site solar PV installations
- Off-site community solar gardens
- Electric vehicles
- HFC substitution to lower or zero GWP-refrigerants in cooling and refrigeration equipment
- HFC substitution in other applications
- Enhanced HFC recycling in cooling and refrigerant equipment
- Enhanced materials recycling
 - Improved materials and nutrient use efficiency
- On-site terrestrial biogenic carbon sequestration
- Purchased off-site sequestration credits
- Best practices in cropland and other land-use management
- Other run-off control for nutrients and sediments
- Wetland mitigation

Example Subp 14: Industrial, Commercial, and Institutional Facilities Analysis

Hospital Redevelopment Project

Key Assumptions

- The project is proposed to be constructed and operated in an urban, developed setting.
- There is no land-use change related to the project.
- The construction phase of the project is anticipated to last for 36 months.
- The total project area is 34 acres with a multi-story tower of 920,000 square feet, for a total of 2,401,776.00 square feet.
- The proposed project will add 250 hospital beds to the existing 139 beds, for a total of 389 bed facility.
- The new facility plans to implement waste best management practices and to recycle and compost appropriate material when applicable.
- The anticipated life of the project is 50 years.

Example Subp 14: Industrial, Commercial, and Institutional Facilities Analysis

Summary of GHG Emissions

Source Type ID	Emission Source	CO ₂ (tons/year)	CH ₄ (tons/year)	N ₂ O (tons/year)	SF ₆ (tons/year) ¹	PFCs (tons/year) ¹	HFCs (tons/year) ¹	CO ₂ e (tons/year) ²
Direct Emissions								
DE-1	Operations - stationary combustion - natural gas	7,292.63	0.14	0.01	-	-	-	7,300.17
DE-1	Operations - stationary combustion - diesel	21.07	8.55E-04	1.71E-04	-	-	-	21.14
DE-1	Operations - stationary combustion - kerosene	87.09	3.47E-03	6.95E-04	-	-	-	87.38
DE-1	Operations - diesel mobile sources	17.56	0.00	0.00	-	-	-	17.82
DE-1	Operations - gasoline mobile sources	4,761.36	0.00	0.00	-	-	-	4,762.38
DE-3	Construction - diesel mobile sources	371.14	0.01	0.02	-	-	-	376.68
DE-3	Construction - gasoline mobile sources	89.32	0.13	0.00	-	-	-	92.68
Subtotal								12,658.26
Indirect Emissions								
IE-1	Off-site - electricity	38,384.51	4.16	0.59	-	-	-	38,665.51
IE-2	Off-site - waste - landfill	-	-	-	-	-	-	511.53
IE-2	Off-site - waste - recycling	-	-	-	-	-	-	76.59
IE-2	Off-site - waste - combustion	-	-	-	-	-	-	73.19
IE-2	Off-site - waste - compost	-	-	-	-	-	-	40.85
Subtotal								39,253.63
TOTAL		51,024.68	4.44	0.63	-	-	-	52,025.93

Example Subp 14: Industrial, Commercial, and Institutional Facilities Analysis

Summary of Estimated Stationary Combustion GHG Emissions

1 kg = 0.00110231 short tons

Source Type ID	Emission Source	Average Fuel Usage ²	Unit	Fuel Type	Heat Content (HHV) ¹		CO ₂ Emission Factor ¹		CH ₄ Emission Factor ¹		N ₂ O Emission Factor ¹		CO ₂ (tons/year)	CH ₄ (tons/year)	N ₂ O (tons/year)	CO ₂ e (tons/year)
					Value	Unit	Value	Unit	Value	Unit	Value	Unit				
DE-1	Boilers	121,308,517.65	scf/yr	Natural Gas	0.001026	mmBtu/scf	53.06	kg CO ₂ /MMBtu	1.0	g CH ₄ /MMBtu	0.1	g N ₂ O/MMBtu	7,279.64	0.14	0.01	7,287.15
DE-1	Generators - Diesel	1,873.00	gal/yr	Diesel	0.138	mmBtu/gal	73.96	kg CO ₂ /MMBtu	3.0	g CH ₄ /MMBtu	0.6	g N ₂ O/MMBtu	21.07	8.55E-04	1.71E-04	21.14
DE-1	Generators - Kerosene	7,782.00	gal/yr	Kerosene	0.135	mmBtu/gal	75.2	kg CO ₂ /MMBtu	3.0	g CH ₄ /MMBtu	0.6	g N ₂ O/MMBtu	87.09	3.47E-03	6.95E-04	87.38
DE-1	Comfort Heaters	216,618.00	scf/yr	Natural Gas	0.001026	mmBtu/scf	53.06	kg CO ₂ /MMBtu	1.0	g CH ₄ /MMBtu	0.1	g N ₂ O/MMBtu	13.00	2.45E-04	2.45E-05	13.01
TOTAL													7,400.79	0.14	0.01	7,408.69

Notes:

(1) Table 1, Stationary Combustion. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. April, 2021. <https://www.epa.gov/climateleadership/ghg-emission-factors-hub>

(2) Fuel usage estimates are based off a similar and recent hospital EAW example.

Example Subp 14: Industrial, Commercial, and Institutional Facilities Analysis

Summary of Estimated Mobile GHG Emissions

1 gram =	1.1023E-06	short ton
Life of Project =	50	years
Time of construction =	36	months

Source Type ID	Emission Source	Number of Units	Hours of Operation/ year ⁸	Vehicle Type ¹⁰	Estimated Vehicle Year ⁹	Fuel Type	MPG	VMT (per day)	hp if applicable	hp-hr if applicable	Fuel Amount		CO2 Emission Factors ¹		CH4 Emission Factors		N2O Emission Factors		CO2 (tons/year)	CH4 (tons/year)	N2O (tons/year)	CO2e (tons/year)
											Value ⁷	Unit	Value	Unit	Value	Unit	Value	Unit				
DE-1	Operations - diesel mobile sources - Nonroad	2	260	Construction Equipment ⁵	N/A	Diesel	N/A	N/A	60	31,200	1,560	gallon/year	10.21	kg CO2/gallon	0.28	g CH4/gallon ²	0.49	g N2O/gallon ²	17.56	0.00	0.00	17.82
DE-1	Operations - gasoline mobile sources ⁶	510	3650	Passenger Cars	2007	Gasoline	20	14	N/A	N/A	265,929	gallon/year	8.78	kg CO2/gallon	0.0072	g CH4/mile ³	0.0052	g N2O/mile ³	2,573.71	0.00	0.00	2,574.22
DE-1	Operations - gasoline mobile sources ⁶	510	3650	Passenger Cars (Light-Duty)	2007	Gasoline	17	14	N/A	N/A	226,039	gallon/year	8.78	kg CO2/gallon	0.0103	g CH4/mile ³	0.0061	g N2O/mile ³	2,187.65	0.00	0.00	2,188.17
DE-3	Construction - gasoline mobile sources - Nonroad	50	3650	Construction Equipment ⁵	N/A	Gasoline (2 stroke)	N/A	N/A	7	1,277,500	459,900	total gallons	8.78	kg CO2/gallon	12.42	g CH4/gallon ²	0.07	g N2O/gallon ²	89.02	0.13	0.00	92.38
DE-3	Construction - gasoline mobile sources	100	3650	Passenger Cars	2007	Gasoline	20	14	N/A	N/A	1,564	total gallons	8.78	kg CO2/gallon	0.0072	g CH4/mile ³	0.0052	g N2O/mile ³	0.30	0.00	0.00	0.30
DE-3	Construction - diesel mobile sources - Nonroad	30	3650	Construction Equipment ⁵	N/A	Diesel	N/A	N/A	100	10,950,000	1,642,500	total gallons	10.21	kg CO2/gallon	0.28	g CH4/gallon ²	0.49	g N2O/gallon ²	369.71	0.01	0.02	375.25
DE-3	Construction - diesel mobile sources - On-Road	10	3650	Medium- and Heavy-Duty Trucks	2007-2018	Diesel	15	5	N/A	N/A	3,285	total gallons	10.21	kg CO2/gallon	0.0095	g CH4/mile ⁴	0.0431	g N2O/mile ⁴	0.74	0.00	0.00	0.74
DE-3	Construction - diesel mobile sources - On-Road	10	3650	Light Trucks	2007-2018	Diesel	14	5	N/A	N/A	3,066	total gallons	10.21	kg CO2/gallon	0.029	g CH4/mile ⁴	0.0214	g N2O/mile ⁴	0.69	0.00	0.00	0.69
TOTAL																			5,239.38	0.14	0.02	5,249.57

Notes:

(1) Table 2, Mobile Combustion CO2. Emission Factors for Greenhouse Gas Inventories, EPA CCCL April, 2021. <https://www.epa.gov/climateleadership/ghg-emission-factors-hub>

(2) Table 5, Mobile Combustion CH4 and N2O for Non-Road Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL April, 2021. <https://www.epa.gov/climateleadership/ghg-emission-factors-hub>

(3) Table 3, Mobile Combustion CH4 and N2O for On-Road Gasoline Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL April, 2021. <https://www.epa.gov/climateleadership/ghg-emission-factors-hub>

(4) Table 4, Mobile Combustion CH4 and N2O for On-Road Diesel and Alternative Fuel Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL April, 2021. <https://www.epa.gov/climateleadership/ghg-emission-factors-hub>

(5) Includes equipment, such as cranes, dumpers, and excavators, as well as fuel consumption from trucks that are used off-road in construction.

(6) Based off 2019 total number of hospital workers in MN (132,474 people) and the number of hospitals in MN (130 hospitals) divided by two to split between cars and SUVs.

(7) For nonroad sources, fuel amount is calculated based on fuel usage estimates per horsepower-hour (0.05 gallons for diesel, 0.12 gallons for gasoline) from Table A9-3E in SCAQMD CEQA Air Quality Handbook (<https://www.cvwrd.org/ArchiveCenter/ViewFile/Item/608>).

(8) Based on 10 hrs/day, 6 days/week for 1 year, except for nonroad diesel operational source which is 5hrs/week for 1 year.

(9) Values based off of the most conservative year (2007) for the most recent year average for medium- and heavy-duty trucks and light trucks (2007-2018). <https://www.epa.gov/climateleadership/ghg-emission-factors-hub>

(10) Numbers are based on a hypothetical assessment and not from a specific source.

Example Subp 14: Industrial, Commercial, and Institutional Facilities Analysis

Source Type ID	Emission Source	Number of Units	Hours of Operation/ year ⁸	Vehicle Type ¹⁰	Estimated Vehicle Year ⁹
DE-1	Operations - diesel mobile sources - Nonroad	2	260	Construction Equipment ⁵	N/A
DE-1	Operations - gasoline mobile sources ⁶	510	3650	Passenger Cars	2007
DE-1	Operations - gasoline mobile sources ⁶	510	3650	Passenger Cars (Light-Duty)	2007
DE-3	Construction - gasoline mobile sources - Nonroad	50	3650	Construction Equipment ⁵	N/A
DE-3	Construction - gasoline mobile sources	100	3650	Passenger Cars	2007
DE-3	Construction - diesel mobile sources - Nonroad	30	3650	Construction Equipment ⁵	N/A
DE-3	Construction - diesel mobile sources - On-Road	10	3650	Medium- and Heavy-Duty Trucks	2007-2018
DE-3	Construction - diesel mobile sources - On-Road	10	3650	Light Trucks	2007-2018

Notes:

Table 5 Mobile Combustion CH₄ and N₂O for Non-Road Vehicles

Vehicle Type	Fuel Type	CH ₄ Factor (g / gallon)	N ₂ O Factor (g / gallon)
Ships and Boats	Residual Fuel Oil	0.55	0.55
	Gasoline (2 stroke)	9.54	0.06
	Gasoline (4 stroke)	4.88	0.23
	Diesel	0.31	0.50
Locomotives	Diesel	0.80	0.26
Aircraft	Jet Fuel	0	0.30
	Aviation Gasoline	7.06	0.11
Agricultural Equipment ^A	Gasoline (2 stroke)	12.96	0.06
	Gasoline (4 stroke)	7.24	0.21
	Diesel	0.28	0.49
	LPG	2.19	0.39
Agricultural Offroad Trucks	Gasoline	7.24	0.21
	Diesel	0.13	0.49
	Gasoline (2 stroke)	12.42	0.07
	Gasoline (4 stroke)	5.58	0.20
Construction/Mining Equipment ^B	Diesel	0.20	0.47
	LPG	1.05	0.41
	Gasoline	5.58	0.20
Construction/Mining Offroad Trucks	Gasoline	5.58	0.20
	Diesel	0.13	0.49

EPA CCCL Emission Factor Hub, 2021.

Table 4 Mobile Combustion CH₄ and N₂O for On-Road Diesel and Alternative Fuel Vehicles

Vehicle Type	Fuel Type	Vehicle Year	CH ₄ Factor (g / mile)	N ₂ O Factor (g / mile)
Passenger Cars	Diesel	1960-1982	0.0006	0.0012
		1983-1995	0.0005	0.0010
		1996-2006	0.0005	0.0010
		2007-2018	0.0302	0.0192
Light-Duty Trucks	Diesel	1960-1982	0.0011	0.0017
		1983-1995	0.0009	0.0014
		1996-2006	0.0010	0.0015
		2007-2018	0.0290	0.0214
Medium- and Heavy-Duty Vehicles	Diesel	1960-2006	0.0051	0.0048
		2007-2018	0.0095	0.0431

EPA CCCL Emission Factor Hub, 2021.

Example Subp 14: Industrial, Commercial, and Institutional Facilities Analysis

Summary of Estimated Indirect GHG Emissions

1lb =	0.0005	short tons
1 metric tons =	1.10231	short tons
Total Project Area =	2,401,776.00	square feet
Total Operational Waste ⁴ =	2,058.78	short tons

Source Type ID	Emission Source	Value	Unit	CO2 Emission Factor		CH4 Emission Factor		N2O Emission Factor		CO2e Emission Factors		CO2 (tons/year)	CH4 (tons/year)	N2O (tons/year)	CO2e (tons/year)
				Value	Unit	Value	Unit	Value	Unit	Value	Unit				
IE-1	Off-site - electricity ¹	29.1	kWh/ft ²	1098.4	lb/MWh ¹	0.119	lb/MWh ¹	0.017	lb/MWh ¹	N/A	N/A	38,384.51	4.16	0.59	38,665.51
IE-2	Off-site - waste - landfill (MSW) ⁵	823.51	short tons	N/A	N/A	N/A	N/A	N/A	N/A	0.52	metric tons CO2e/short tons material ²	N/A	N/A	N/A	472.04
IE-2	Off-site - waste - recycling (Mixed Recyclables) ⁵	772.04	short tons	N/A	N/A	N/A	N/A	N/A	N/A	0.09	metric tons CO2e/short tons material ²	N/A	N/A	N/A	76.59
IE-2	Off-site - waste - MSW combustion (medical/hazardous waste) ⁵	154.41	short tons	N/A	N/A	N/A	N/A	N/A	N/A	0.43	metric tons CO2e/short tons material ²	N/A	N/A	N/A	73.19
IE-2	Off-site - waste - Food waste (compost, non-meat) ⁵	247.05	short tons	N/A	N/A	N/A	N/A	N/A	N/A	0.15	metric tons CO2e/short tons material ²	N/A	N/A	N/A	40.85
IE-2	Off-site - waste - Food waste (landfill, meat only) ⁵	61.76	short tons	N/A	N/A	N/A	N/A	N/A	N/A	0.58	metric tons CO2e/short tons material ²	N/A	N/A	N/A	39.49
TOTAL												38,384.51	4.16	0.59	39,367.67

Notes:

(1) Table 6, Electricity. MROW (MRO West) Subregion. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. April, 2021. <https://www.epa.gov/climateleadership/ghg-emission-factors-hub>

(2) Table 9, Scope 3 Category 5: Waste Generated in Operations and Category 12: End-of-Life Treatment of Sold Products. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. April, 2021. <https://www.epa.gov/climateleadership/ghg-emission-factors-hub>

(3) Based on information from the U.S. Energy Information Administration. 2007 values. <https://www.eia.gov/consumption/commercial/reports/2007/large-hospital.php>

(4) Value based on 29 lbs of waste per hospital bed per day (<https://practicegreenhealth.org/topics/waste/waste-0#:~:text=Hospitals%20generate%20over%2029%20pounds,Recycling%20isn't%20enough.>) and 139 current number beds in the hospital (https://www.ahd.com/states/hospital_MN.html) plus the addition of 250 beds from project.

(5) Landfill MSW waste is 40% of total (solid waste), landfill food waste is 3% of total (meat only food waste), recyclable waste is 37.5% of total (including half of all hazardous waste, 7.5%), compost waste is 12% of total (all non-meat food waste), combusted waste is 7.5% of total (half of hazardous waste). Percentages were broken down from Practice Greenhealth (<https://practicegreenhealth.org/topics/waste/waste-0#:~:text=Hospitals%20generate%20over%2029%20pounds,Recycling%20isn't%20enough.>).

Contact Information

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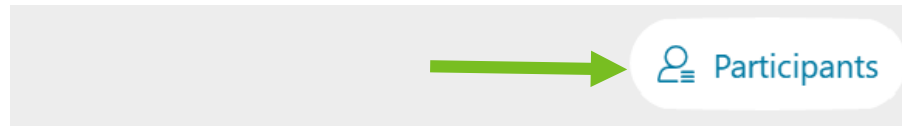
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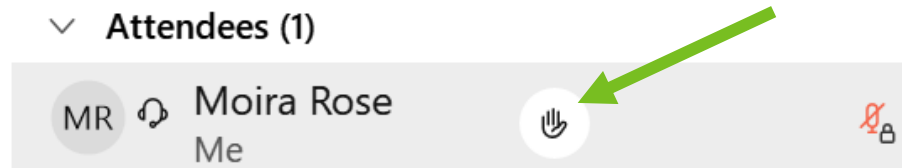
How to raise your hand in Webex

From your computer:

1. Click on Participants in lower left corner.



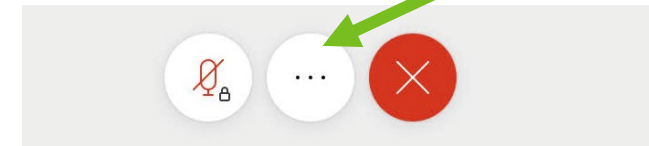
2. Find and click on your name on the Participant list.



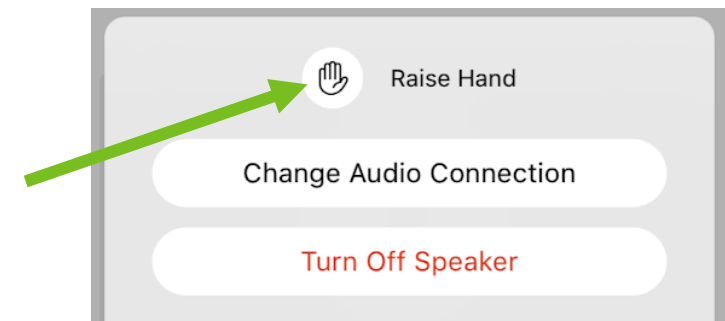
3. Click on the Raise Hand icon.

From your phone:

1. Click on the three dots at the bottom of your screen.



2. Click on Raise Hand.



Thank You

- More information about the Pilot Program can be found on EQB project webpage. (Recording of this meeting will be posted on this page)
- Questions & Comments? (e-mail address in the chat)
- Stay tuned for March
- Cohort meeting for registered governmental units and consultants will begin shortly – check your calendar invite for link