

Local Government Operations (LGO) Protocol Training

California Climate Action Registry March 11, 2009

Training Objectives

- Delineate differences between LGOP and GRP
- Review LGO guidance (e.g., ports, airports, special districts)
- Review methodologies for solid waste and wastewater facilities
- Review California Registry program requirements
- Demonstrate CARROT and the LGO report

Introductions



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> The LGOP is designed to provide a standardized set of guidelines to assist local governments in quantifying and reporting GHG emissions associated with their government operations. (LGOP pg. 3)

Definition of Local Government

Local Government: a general purpose government at the village, town, city or county level. (LGOP pg. 147)

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Purpose of LGOP

- Develop to international standards with local government context
- Advance consistent quantification of emissions
- Measure progress towards climate goals
- Harmonize inventories reported to multiple programs
- NOT designed to measure GHG mitigation projects or offsets

Protocol Development

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- Based on WRI/WBCSD GHG Protocol
- Developed by CARB, the California Registry, The Climate Registry and ICLEI
- Ongoing work group process
- August 2008 adopted by California Registry Board
- June 2009 expected adoption by TCR Board

Implementation Timeline

- Available for use immediately
- EY 2009 all local government members must use the LGOP to report 2009 emissions in 2010

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Protocol Structure

- 1. Program neutral
 - Part I Part IV
- 2. Program guidance
 - Appendices A D
- 3. GHG factors & resources
 - Appendices E H

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California Registry Reporting Requirements

Appendix B (pg. 146 - 157)

What does my inventory include?

- Geographic scope
- Operational and organizational boundaries
- Total significant direct GHG emissions
- Total significant indirect GHG emissions
- Total de minimis emissions

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Which GHGs do I report?

- First three years: CO₂
- Fourth year and beyond:
 - $-CO_2$
 - $-CH_4$
 - $-N_2O$
 - HFCs
 - PFCs

$$-SF_6$$

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Which calculation methodology do I use?

- Alternate vs. Recommended
 - Recommended activity data meets California Registry standards
 - Look for 🗹 icon
 - Table B.1 lists acceptable data and emission factors (pg. 149)

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Which data is acceptable?

Table B.1 A	ctivity Data and Emission F	actors Accepted by CCAR		
Sector	Emission Source	CCAR Accepted Activity Data	CCAR Accepted Emission Factors	
	Stationary Combustion (6.1)	Known fuel use (recommended)	Default by fuel type (recommended)	
		Known electricity use (recommended)	Verified utility-specific emission factor (recommended)	
Facilities	Electricity Use (6.2)	Estimated electricity use (alternate)	eGRID subregion	
		Estimated electricity use based on comparable facilities and square footage (alternate)	emission factor (recommended)	
	Eugitive Emissions (6.6)	Mass balance method (recommended)	n/a	
		Simplified mass balance method (alternate)	- 100	
	Mobile Combustion -	Known fuel use (recommended)	Published emission facto by fuel type, state- or region-specific (recommended)	
Vehicle	CO_2 Emissions (7.1.1)	Fuel estimates based on detailed annual mileage and vehicle fuel economy (alternate)	Default by fuel type (alternate)	
rieel	Mobile Combustion - CH ₄ and N ₂ O Emissions (7.2.1)	Annual mileage by vehicle type, model year and fuel type (recommended) Fuel Use by vehicle type, model	Default by vehicle type, model year and fuel type (alternate)	
	Fugitive Emissions (7.4)	Mass balance method	n/a	

What do I submit to CARROT?

- 1. CARROT Report
- 2. LGO Standard Inventory Report
 - Complete offline and upload to CARROT
 - Required: Sections 1 2
 - Optional: Sections 3 4 (but recommended!)
 - Available in Chapter 13 (pg. 120)

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Reporting and Verification Deadlines

- June 30 Reporting Deadline
- October 31 Verification Deadline



Setting Organizational Boundaries

Control Approach

- Control approach
 - Operational control *recommended*
 - Required under AB 32
 - Financial control
 - Joint control
 - Determined by contractual agreement
- Chosen approach must be applied consistently

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Financial vs. Operational Control

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Table 3.1 Reporting Based on Financial Versus Operational Control

Level of Control of Facility	% of Emissions to Report Under Financial Control	% of Emissions to Report Under Operational Control
Wholly owned	100%	100%
Partially owned with financial and operational control	100%	100%
Partially owned with financial control; no operational control	100%	0%
Partially owned with operational control; no financial control	0%	100%
Joint financial control with operational control	Based on % ownership	100%
Joint financial control; no operational control	Based on % ownership	0%
Associated entity (not consolidated in financial accounts) with operational control	0%	100%
Associated entity (not consolidated in financial accounts); no operational control	0%	0%
Fixed asset investments	0%	0%
Not owned but have a capital or financial lease	100%	100%
Not owned but have an operating lease	0%	100%

Autonomous Departments, Municipal Utilities, Ports and Airports

- Operational control
 - LG officials appoint / oversee the board
 - Include emissions from tenants' activities
- Financial control
 - Assets are not part of LG's financial report
 - Exclude emissions from tenants' activities
 - Report tenants' electricity use as Scope 2
- Never report emissions from tenant-owned equipment (e.g., trucks, ships, etc)

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Leased Facilities / Vehicles and Landlord / Tenant Arrangements

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- Account for emissions according to the type of lease
 - Financial or capital lease
 - Wholly-owned and controlled
 - Financial and operational control Scope 1 and 2
 - Operating lease
 - Operational control Scope 1 and 2
 - Financial control Scope 3

JPAs, Special Districts and Community Choice Aggregation

- Joint Powers Authorities
 Do not include in LG inventory
- Special Districts
 - Do not report as Scope 1 or 2 emissions
 - May report optionally as Scope 3
- Community Choice Aggregation
 - CCAs with two or more participants are treated as JPAs

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Setting Organizational Boundaries: Lessee Registry

Figure 3.1 Organizational Boundary Decision Tree from a Lessee's Perspective



Setting Organizational Boundaries: Lessor

Figure 3.2 Organizational Boundary Decision Tree from a Lessor's Perspective



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Setting Operational Boundaries

GHG Emission Scopes



Scope 1: Direct Emissions (Required)

- Sources within organizational boundaries, owned / controlled by LG
 - 1. Stationary combustion
 - Electricity, steam, heat or power
 - 2. Mobile combustion
 - Vehicle fleet, off-road equipment
 - 3. Process emissions
 - Manufacturing cement, aluminum, ammonia
 - 4. Fugitive emissions
 - HFCs from refrigeration leaks, CH₄ from landfills

Scope 2: Indirect Emissions (Required)

- Consequence of activities w/in organizational boundary, occur elsewhere
 - e.g., consumption of electricity, steam, heat or cooling
- Largest source of emissions for most LGs
- Significant opportunity for reductions

Biogenic Emissions from Combustion



- Calculate CO₂ from biomass separately from fossil fuel (e.g., B20 = 20% biomass, 80% fossil fuel)
 - Biomass optionally reported
 - Fossil fuel Scope 1
- Biomass tracked separately
 - Information Item in LG Standard Inventory Report
- CH₄ and N₂O are reported as Scope 1

Scope 3 Emissions (Recommended)

- Related to LG operations, but no financial or operational control
- Policy relevant
- Examples:
 - Waste generated by LGs, but disposed of elsewhere
 - Employee commuting
 - Employee business travel

Local Government Sectors

- Buildings and other facilities
- Streetlights and traffic signals
- Water delivery facilities
- Port facilities
- Airport facilities
- Vehicle fleet
- Transit fleet
- Power generation facilities
- Solid waste facilities
- Wastewater facilities
- Other process and fugitive emissions

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How do I Quantify Emissions?

- 1. Determine fuel / energy consumption
 - Identify all fuel / energy used at facility
 - Refer to LGOP for preferred measurement method
 - Refer to Table B.1 (pg. 149) for preferred activity data
- 2. Determine emission factor
 - Refer to Appendix G
- 3. Calculate emissions (use CARROT)
 - Multiply (energy x emission factor)
 - Refer to Appendix F for conversion factors
- 4. Convert emissions to CO_{2e} (built into CARROT)
 - Use IPCC GWP in Appendix E



Quantifying Emissions

Solid Waste Facilities Chapter 9

Solid Waste Methodologies

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- Guidance for *fugitive CH₄ emissions* from landfills that accept organic waste
 - No widely-accepted methodology, will change as guidance becomes available
- For related emissions:

GHG type/source	Protocol Reference				
CO_2 , CH_4 and N_2O from fuel-combusting equipment	Chapter 6, Section 6.1				
CO_2 , CH_4 and N_2O from purchased electricity	Chapter 6, Section 6.2				
CO ₂ , CH ₄ and N ₂ O from waste-hauling fleet vehicles	Chapter 7				
CO_2 , CH_4 and N_2O from bulldozers, forklifts, etc.	Chapter 7				
CO ₂ , CH ₄ and N ₂ O from power generated and consumed	Chapter 8				
at solid waste facility					

Table 9.1 Protocol References for Solid Waste-Related Emission Sources

Tricky Solid Waste Emissions

- Electricity / heat consumed on site
 - Scope 1 stationary emissions, Solid Waste Facility sector
- Fossil-based CO₂, CH₄ and N₂O
 - Scope 1
- Biogenic CO2
 - Biogenic emissions from biomass combustion

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Organizational Boundary Issues

- Same as guidance in chapter 3
- Contracted service refer to contract details
- Emissions you do not own or control, reported as Scope 3

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If you have a landfill...

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Figure 9.1 Methodology Decision Tree for CH₄ Emissions from Landfills



IPCC FOD Model

- No LFG collection system
- Excel-based tool
 - www.arb.ca.gov/cc/protocols/localgov/localgov.htm
 - Default values provided in tool and LGOP if you don't have facility-specific data
- Follow these steps:
 - 1. Determine annual waste
 - 2. Input data into tool
 - 3. Calculate emissions

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Step 1: Determine Annual Waste

Include all waste deposited since opening

- If unknown, assume 60 years
- If missing data,
 - state waste board may have data
 - *or* estimate using this guidance:

Box 9.1 How to Estimate Annual Waste in Place (WIP)

1. Obtain population estimates from the U.S. Census Bureau for the jurisdiction(s) depositing waste in your landfill for all years for which you have missing waste data.

2. Use the known waste deposition data for the year closest to the missing year and multiply this by the ratio of population for the year you want to estimate divided by the population for the known waste deposition year. Repeat this to estimate annual WIP for all of the missing years.

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Step 2: Input Data into Tool

- You will need this data:
 - Annual waste from Step 1 (tons)
 - Annual greenwaste, compost, biosolids used for daily cover (tons)
 - Landfill's open year
 - Landfill's close year (if applicable)
 - Fraction of CH₄ in LFG (default available)
 - Average annual rainfall (inches / year)

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ARB's FOD Model Tool: Input

Landfill Specific Data					Waste Deposit Data							
				Waste Deposited		Greenwaste & Cor	Sludge: D	Sludge: Daily Cover				
Landfill Name:			Year	Tons	% ANDOC	Tons	% ANDOC	Tons	% ANDOC			
State:	СА	•	1900									
City/County:			1901									
Year Opened:			1902									
If Closed, Year Closed:			1903									
			1904									
k Value:	0.02		1905									
			1906									
			1907									
			1908									
			1909									
			1910									

Step 3: Calculate Fugitive Emissions ARB's FOD Model Tool: Output

		Total CH4	Total CO2
		Emitted	Emitted
Landfill Name:	Year	(MTCO2E)	(MTCO2)
	1900		
	1901		
	1902		
	1903		
	1904		
	1905		
	1906		

Landfills w/ Comprehensive LFG Collection Systems



- US EPA's New Source Performance Standards (NSPS), or more stringent system
- You will need this data:
 - Annual landfill gas collected
 - Fraction of CH₄ in LFG (default available)
- Use guidance on pgs. 92-94 and this equation:

```
      Equation 9.1
      Landfills with Comprehensive LFG Collection Systems

      CH<sub>4</sub> emitted (metric tons CO<sub>2</sub>e) =

      LFG collected x CH<sub>4</sub>% x {(1 - DE) + [((1 - CE) / CE) x (1 - OX)]} x unit conversion x GWP
```

Landfills w/ *Partial* LGF Collection Systems

- Not subject to NSPS
- You will need this data:
 - Annual gas collected
 - Fraction of CH₄ in LFG (default available)
 - Factor for emissions from uncollected area
- Use guidance on pgs. 94-95 and this equation:

Equation 9.2	Landfills with Partial LFG Collection Systems
CH ₄ emitted (me	tric tons CO_2e) =
LFG Collected x	CH ₄ % x {(1-DE) + [(1/CE) x (1-OX)] x [AF + (1-CE)]} x unit conversion x GWP

Optional Reporting: Surface Measurement Data

- Report optionally, verification not required
- Take care not to sum estimated and optionally reported
- Use this equation:

Equation 9.3 Landfills with Surface Emissions Data

 CH_4 emitted (metric tons CO_2e) =

[LFG Collected x CH₄ % x (1 - DE) x (unit conversion)] + [CH₄ surface emissions x (unit conversion)] x GWP

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Composting



- Not included because of lack of existing data and guidance
- Additional guidance will be provided once the state of the science improves



Quantifying Emissions

Wastewater Treatment Facilities Chapter 10

Wastewater Treatment Methodologies

- Calculation of CH₄ and N₂O emissions from septic systems and centralized wastewater treatment
- For related emissions:

Table 10.11 Totocol References for Wastewater- Related Emission Gources					
GHG type/source	Protocol Reference				
CO ₂ , CH ₄ and N ₂ O from fuel-combusting equipment	Chapter 6, Section 6.1				
CO ₂ , CH ₄ and N ₂ O from purchased electricity	Chapter 6, Section 6.2				
CO ₂ , CH ₄ and N ₂ O from power generated and consumed	Chapter 8				
at wastewater facility					

Table 10.1 Protocol References for Wastewater- Related Emission Sources

Organizational Boundary Issues

- Same as guidance in chapter 3
- Apply control approach consistently
- Emissions you do not own or control, reported as Scope 3

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Wastewater Treatment Emission Sources

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Table 10.2 Summary of Wastewater Treatment Process and Fugitive Emission Sources

GHG type	GHG source	Data Available	Equation	
Stationary CH ₄ emissions	Incomplete combustion of digester gas at a centralized WWTP with anaerobic	 Digester gas (ft³/day) Fraction of CH₄ in biogas 	Equation 10.1	
	digestion of biosolids	Population served	Equation 10.2	
Process CH ₄ emissions	Anaerobic and facultative treatment lagoons	 BOD₅ load (kg BOD₅/day) Fraction of overall BOD₅ removal performance 	Equation 10.3	
		Population served	Equation 10.4	
Fugitive CH₄ emissions	Septic systems	BOD ₅ load (kg BOD ₅ /person/day)	Equation 10.5	
		Population served	Equation 10.6	
Process N ₂ O emissions	Centralized WWTP with nitrification/denitrification	Population served	Equation 10.7	



Capturing Your Data

LGO Standard Inventory Report

LGO Inventory Report

- Section 1 local government profile
- Section 2 greenhouse gas inventory
- Section 3 activity data disclosure
- Section 4 methodology / emission factors disclosure

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Section 1 – (pg. 114 – 115) Local Government Profile

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1. Local Government Profile

Jurisdiction Name: Street Address: City, State ZIP Country: Website Address:

Size (sq. miles): Population: Annual Budget: Employees (Full Time Equivalent): Climate Zone: Annual Heating Degree Days: Annual Cooling Degree Days:

Contact person: Name: email: Phone number:

Section 1 – continued

Services Provided:		
Water treatment	Mass transit (buses)	□ Airport
Water distribution	Mass transit (light rail)	Seaport/shipping terminal
Wastewater	Mass transit (ferries)	🛛 Marina
treatment	Schools (primary/secondary)	Stadiums/sports venues
Wastewater	Schools (colleges and	Convention center
collection	universities	Street lighting and traffic signals
Electric utility	Solid waste collection	Natural gas utility
Fire Protection	Solid waste disposal	□ Other
Police	Hospitals	AND SECURIC
Local Government Description	on:	

Section 2 – (pg. 115 – 118) GHG Inventory Details

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2. GHG Inventory Details

Reporting Year: Protocol Used: Control Approach:

GHG Emissions Summary (All Units in Metric Tons Unless Stated Otherwise)

BUILDINGS & OTHER FACILITIES (Chapter 6)							
SCOPE 1 Stationary Combustion Fugitive Emissions Total Direct Emissions from Buildings & Facilities	CO2e	CO2	CH₄	N₂O	HFCs	PFCs	SF₅
SCOPE 2 Purchased Electricity Purchased Steam District Heating & Cooling Total Indirect Emissions from Buildings & Facilities	CO ₂ e	CO2	СН₄	N ₂ O			
SCOPE 3 See list at bottom for some examples	CO ₂ e						
INDICATORS							

Section 2 – continued

OTHER PROCESS & FUGITIVE EMISSIONS (Chapter 11)							
SCOPE 1 Process Emissions Fugitive Emissions Total Direct Emissions from Other Process & Eugitive Emissions	CO ₂ e	CO2	сн₄	N₂O	HFCs	PFCs	SF ₆
Total Direct Emissions nom Other Process a Pagave Emissions	CO2e						
SCOPE 3 See list at bottom for some examples							
Total Emissions							
SCOPE 1 SCOPE 2 SCOPE 3	CO2e	CO2	СН₄	N₂O	HFCs	PFCs	SF6

Section 2 – continued

INFORMATION ITEMS		
CO ₂ from Biomass Combustion	CO ₂ e	
Carbon Offsets Retired	CO ₂ e	
Carbon Offset Generated and Sold	CO ₂ e	
Renewable Energy Certificates (Green Power) Retired	MWH:	CO ₂ e
Percentage of Total electricity use offset by Green Power	%	
Renewable Energy Certificates (Green Power) Generated and Sold	MWH:	CO ₂ e

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Section 2 – continued

POSSIBLE SOURCES OF OPTIONAL SCOPE 3 EMISSIONS

Employee Commute Employee Business Travel Emissions From Contracted Services Upstream Production of Materials and Fuels Upstream and Downstream Transportation of Materials and Fuels Waste Related Scope 3 Emissions Purchase of Electricity Sold to an End User Transmission and Distribution Losses from Consumed Electricity Other Scope 3

Section 3 – (pg. 118 – 119) Activity Data Disclosure

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3. Activity Data Disclosure

Buildings & Other Facilities

Scope 1 Stationary Combustion

Description	□ Recommended or □ Alternate Method Name:	
References		

Scope 1 Fugitive Emissions

Description	□ Recommended or □ Alternate Method Name:	
References		

Scope 2 Purchased Electricity

□ Recommended or □ Alternate Method Name:	

Section 3 – example

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Example A

Scope 2 Purchased Electricity

Description (EXAMPLE)

☑ Primary or ☑ Alternate Method Name: ___Recommended methodology and Installed Wattage Methodology_____

Scope 2 emissions from Streetlights and Traffic Signals were determined based on meter readings provided by the Streets Division in its Annual Streets Division Report. Twenty street lighting accounts were not metered according to the report (see page 35) and so, for each wattage class, it was assumed they operate 11 hours / day. Unmetered streetlights account for 15% of the emissions in Streetlights and Traffic Signals sector.

References: Cityville Streets Division Report, Vol. 4, 2006. (http://cityville.gov/pwd/reports)

Section 4 – (pg. 119) Methodology / Emission Factors Disclosure

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4. Calculation Methodology Disclosure

Please report the methods you used to convert the activity data disclosed above into emissions reported. This may include formulas, emission factors, and other methods.

Scope 1 Stationary Combustion

Description of computational method	□ Recommended or □ Alternate Method Name:	
References		

Scope 1 Process Emissions

Description of computational method

References

Scope 1 Fugitive

Description of computational methods

 References

Scope 2 Purchased Electricity

Description of computational method	□ Recommended or □ Alternate Method Name:	
References		

Local Governments and AB 32

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- Note: You are subject to ARB's mandatory reporting if you operate cogeneration / power generation with:
 - 1 MW or more of cogeneration or power generation
 - Over 25,000 metric tons of CO₂ / year
- Please refer to Appendix A and download the mandatory reporting requirements

- <u>http://www.arb.ca.gov/cc/reporting/ghg-rep/ghg-rep.htm</u>

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