Lane County, Oregon

CLIMATE ACTION PLAN | PHASE 1:

Operational Greenhouse Gas Inventory

FISCAL YEAR 2019

Prepared by Good Company
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ACKNOWLEDGEMENTS

LANE COUNTY PROJECT TEAM:

Alex Cuyler, Intergovernmental Relations Manager
Angie Marzano, Waste Reduction Specialist
Austin Ramirez, Economic Development Manager
Clayton Stilwell, Purchasing Manager
Dan Hurley, Public Works Director
Jocelyn Warren, Public Health Manager
Mark Nystrom, Climate Strategist
Michael Johns, General Services Manager
Mike Penwell, Capital Projects Manager

DATA COLLECTION SUPPORT:

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CONSULTING TEAM:

Good Company, a sustainability consulting firm based in Eugene, OR supported Lane County's work on this project. Aaron Toneys of Good Company provided training and data gathering assistance to Lane County staff and facilitated the use of Good Company's Carbon Calculator (G3C), a proprietary GHG inventory tool. He is the primary author of this report. Claudia Denton provided data collection support, data analysis and is a supporting author of the report.

CONTACT INFORMATION

Lane County Climate Action Plan & Process
Mark Nystrom
Climate Strategist
Mark.Nystrom@lanecountyor.gov

FY19 Operational Inventory Process
Angie Marzano
Waste Reduction Specialist
Angie.Marzano@lanecountyor.gov

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1. EXECUTIVE SUMMARY

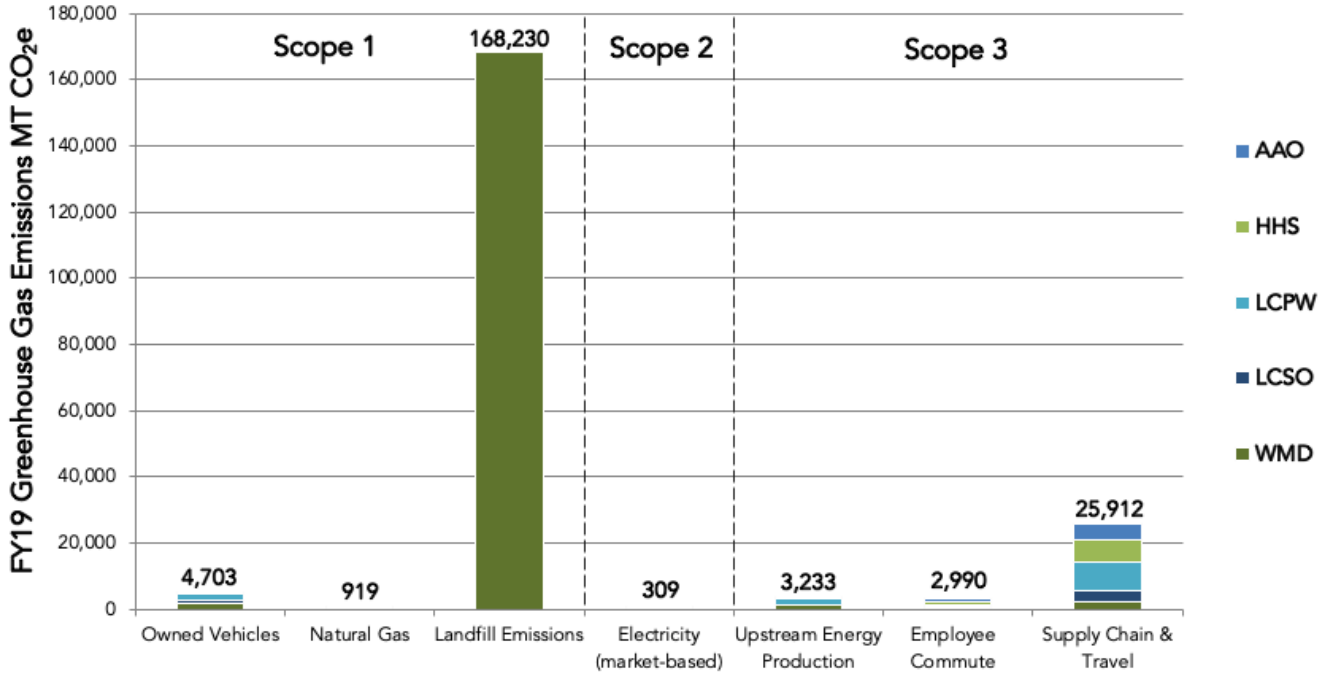
FISCAL YEAR 2019 GREENHOUSE GAS (GHG) EMISSIONS BY FUNCTIONAL AREA

In FY19, Lane County operations generated an estimated **6,270 MT CO_2e** of scope 1 and 2 emissions[1] when excluding non-operational waste fugitive landfill emissions, and a total of **174,160 MT CO_2e** when landfill emissions are included. When also including scope 3 emissions[2] from the supply chain & business travel, employee commute, and upstream energy production, this total increases by an additional **32,135 MT CO_2e**. This is an estimated total of **206,295 MT CO_2e** for the fiscal year for all direct and indirect activities. The largest source of emissions in FY19 after landfill emissions from Short Mountain Landfill was the supply chain & business travel. Other significant sources of emissions included: owned vehicles, employee commute, and upstream energy production.

Functional area legend:

- AAO — Administration & All Other[3]
- HHS — Health & Human Services
- LCPW — Lane County Public Works
- LCSO — Lane County Sheriff's Office
- WMD — Waste Management Division

Figure ES-1: Lane County operational emissions by functional area

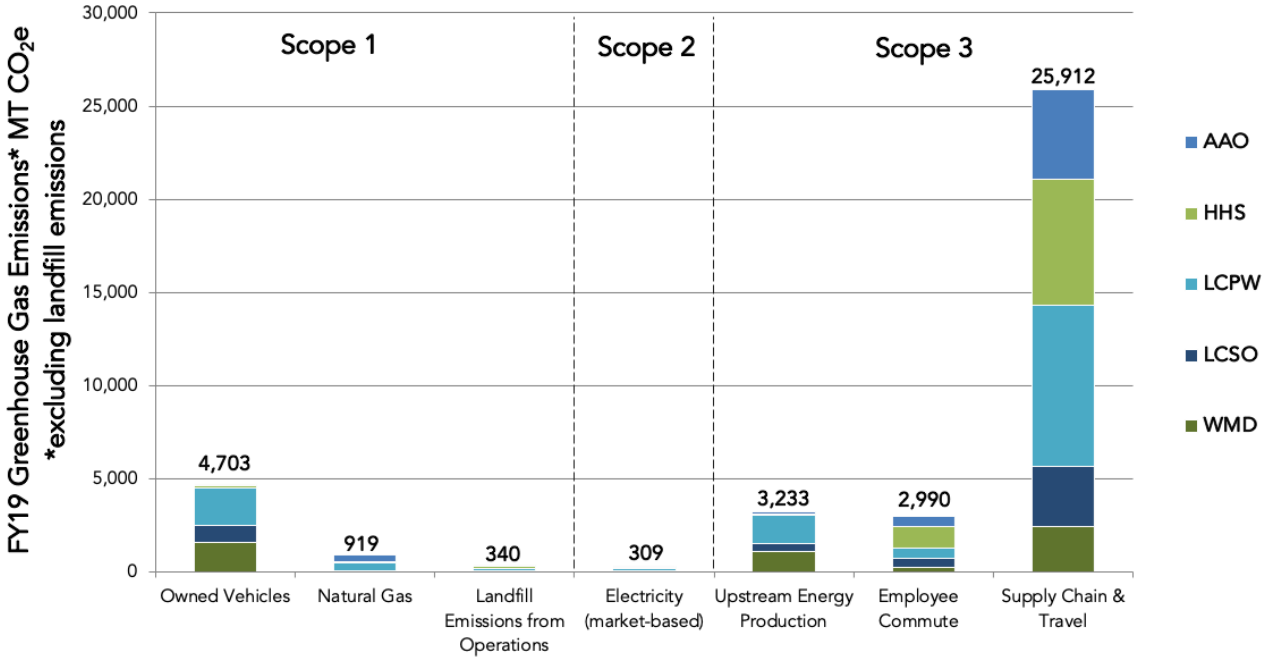


[1]**Scope 1:** All direct GHG emissions from equipment and facilities owned and/or operated by Lane County. **Scope 2:** Indirect GHG emissions from purchased electricity.

[2]**Scope 3:** All other indirect emissions sources that result from Lane County activities but occur from sources owned or controlled by another company or entity. See full report for additional details.

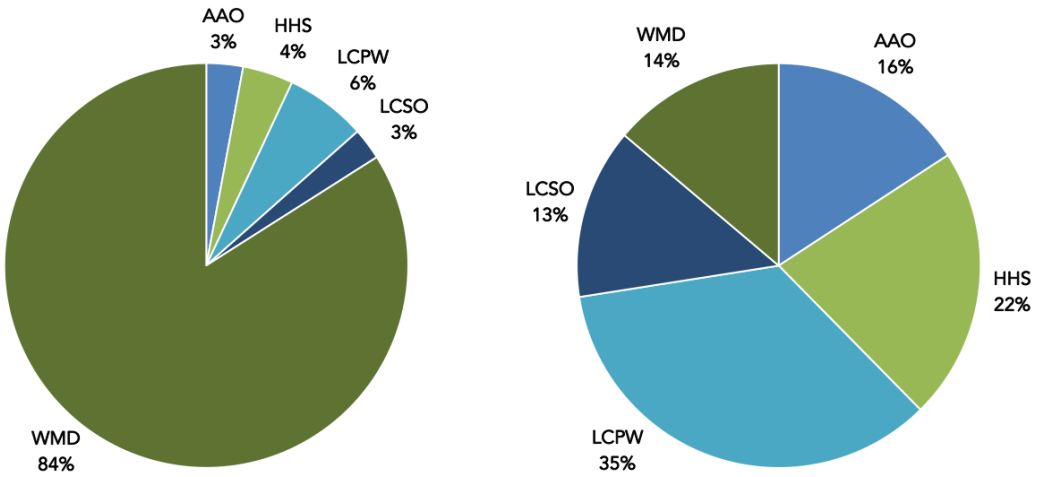
[3] Includes Assessment & Taxation, Board of County Commissioners, County Administration, Counsel, Performance Auditor, District Attorney's Office, Emergency Management, Human Resources, Technology Services.

Figure ES-2: Lane County operational emissions by functional area, excluding Short Mountain Landfill emissions



Emissions in **Figures ES-1 through ES-3** are broken down by functional area: Administration & All Other[4] (AAO), Health & Human Services (HHS), Public Works (LCPW – excluding Waste Management activities), Sheriff's Office (LCSO), and the Waste Management Division (WMD) which resides in Public Works but is broken out separately due to the its comparatively high magnitude of emissions. **Figure ES-2** shows that the Waste Management Division emits **84%** of the County's emissions almost entirely from fugitive methane loss at Short Mountain Landfill. Excluding landfill emissions, LCPW is responsible for **35%** of total emissions, HHS **22%**, and AAO, LCSO, and WMD at **13-16%** respectively. Emissions are also split by scope in **Figure ES-3**.

Figure ES-3: Lane County operational emissions by functional area with (left) and without (right) landfill emissions



[4] AAO – comprised of 10 County departments/offices including the Board of County Commissioners, County Administration, County Operations, Assessment & Taxation, County Counsel, the Performance Auditor, the District Attorney's Office, Emergency Management, Human Resources, and Technology Services

SUMMARY OF FINDINGS

- **Landfill emissions and energy opportunity**. Fugitive methane from decomposition of organic waste at Short Mountain Landfill dominates the emissions sources under the County's direct control (i.e., Scope 1 and Scope 2). Fortunately, this source of emission may also present an opportunity to collect more of the methane as an economic development opportunity. This low-impact energy source can be further used as a direct substitute for fossil fuels while at the same time mitigating the largest source of County operational emissions.
- **County-owned vehicle and equipment fuel use represents the second largest emissions source under the County's control.** The County has already taken significant climate action by substituting renewable diesel (a plant-based fuel) for conventional diesel. This action reduced Scope 1 fuel emissions by **11%** compared to FY14. Further action may be taken by continuing to purchase fuels with low life-cycle emissions (mostly plant and waste inputs) and to electrify as much of the County's vehicles and equipment as is operationally feasible. Electricity is by far the lowest impact vehicle fuel type available in Lane County because the majority of County's electricity supply from low-GHG generation sources.
- **County buildings (natural gas and electricity) represents the next largest source of emissions under direct County control.** Building emissions are dominated by use of natural gas. Emissions from County electricity use are 14 times less than the regional average as County electric utilities are predominately supplied by Bonneville Power Administration's low-GHG electricity from hydro- and nuclear-generation sources.
- Within Scope 3 emissions (sources outside of the County's direct control)
    - **Supply chain emissions are the largest source of Scope 3 emissions.** These emissions are generated during production of goods, food, and services purchased by the County for operational needs and community-directed services. Largest sources of emissions in the County's supply chain include:
        - Embodied emissions in major materials and fuel in construction and maintenance of County infrastructure such as roads, bridges, and buildings
        - Production of fuels combusted in County vehicles and equipment
        - Production of County vehicles and equipment
        - Financial support to provide community-directed services
        - Professional and business services
        - IT equipment & service
    - **Employee commute is a significant source of emissions** totaling more than twice that of building energy (electricity and natural gas use). While the County does not have direct control of this source of emissions, it is important given that transportation is a large source of community GHG emissions.

2. INTRODUCTION

In FY19, Lane County provided services to 379,611 residents, through the work of 1,750 staff and an adopted budget of over $680 million. Lane County has 13 incorporated cities and is home to Eugene-Springfield metro, the third largest metro area in Oregon.

Lane County has launched a Climate Action process – started by conducting this greenhouse gas (GHG) inventory – to track progress over time, understand trends, and manage emissions from specific sources and activities.

A GHG inventory quantifies the GHG emissions associated with a specific boundary, such as internal operations, for a specific period of time. This inventory report presents data and emissions for fiscal year 2019 under Lane County's operational control, with select data comparisons with fiscal year 2014 as data is available. Emissions are reported in metric tons of carbon dioxide equivalent (MT CO_2e).

PLANNING FOR CLIMATE ACTION

This GHG inventory is the first phase of a three-phased approach to the development of the Climate Action Plan. The Climate Action Plan will encompass:

- Conducting this greenhouse gas emissions inventory and developing an internal plan (Operational Climate Action Plan – Phase 1) to establish greenhouse gas reduction targets for County operations and implementation plans to meet County targets.
- Developing a comprehensive county-wide plan (Community Climate Action Plan – Phase 2) with community engagement to outline aggressive goals and strategies, aligned in partnership with city climate actions, to establish countywide community targets and high priority areas of action.
- Developing a resiliency plan (Climate Action Plan – Phase 3) to identify adaptation strategies to mitigate the risks and impacts of climate change anticipated for Lane County.
- Developing Action Initiatives supporting green jobs, clean energy projects, and climate-friendly industries in Lane County.
- Providing open and transparent public communications to monitor and evaluate progress toward climate action goals.
- Establishing a Climate Advisory Committee to provide recommendations and advise the Board of Commissioners on the County's ongoing climate action work.

3. METHODOLOGY

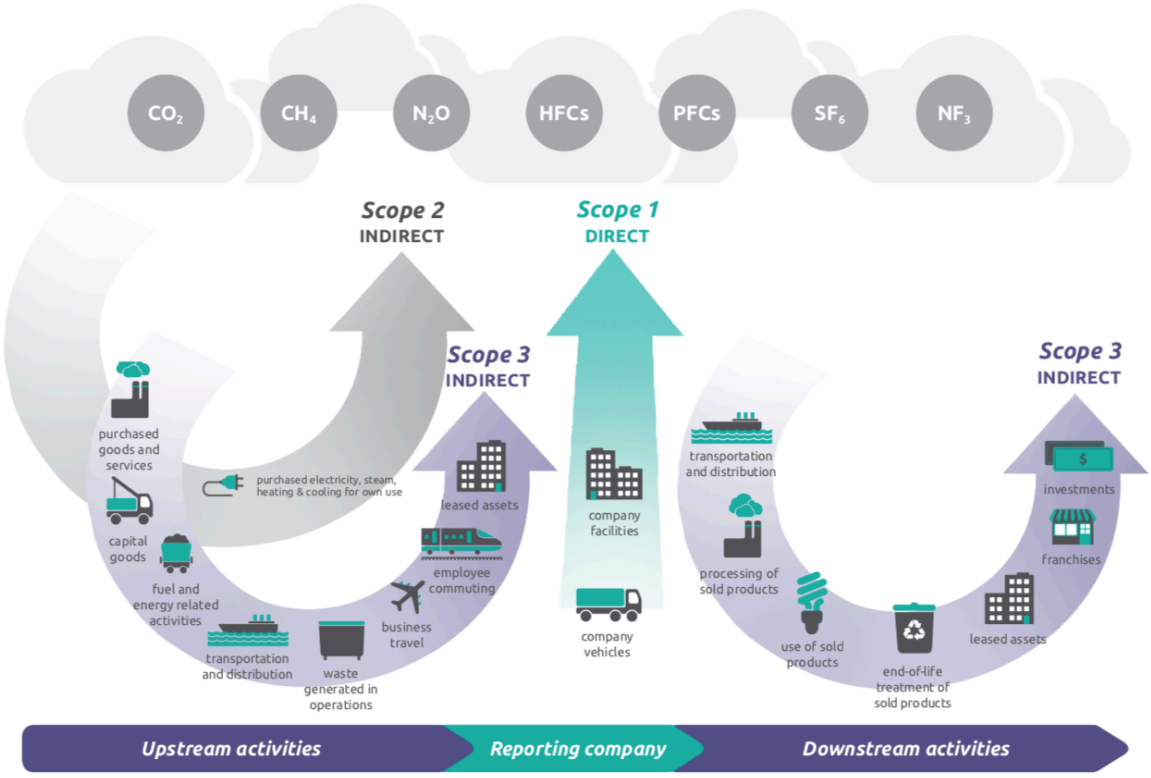
Lane County included all available emission sources and facilities following standard GHG inventory protocols. These longstanding and internationally agreed-upon protocols define emissions as either direct (owned) or indirect (shared). This inventory captures all direct and indirect emissions associated with Lane County's operations for which data was available.

Direct emissions are from sources owned or controlled by a particular organization. Organizations are in direct control of selecting vehicle and equipment types and the related efficiency and fuel types used by the equipment. Indirect emissions occur because of the organization's actions, but sources of indirect emissions are controlled by a separate entity. Organizations can influence these emissions through their purchasing power. To distinguish direct from indirect emissions sources, three "scopes" are defined for GHG accounting and reporting.[5]

Figure 1 illustrates the three emissions scopes.

- **Scope 1:** All direct GHGs from equipment and facilities operated by Lane County. Emissions include those from fossil fuel combustion and process emissions such as landfill methane.
- **Scope 2:** Indirect GHG emissions from electricity purchased for operational needs.
- **Scope 3:** All other indirect emissions sources that result from Lane County activities but occur from sources owned or controlled by another company or entity, including: business travel, embodied emissions in material goods purchased and services contracted by Lane County, upstream emissions from energy production (vehicle fuels, electricity, natural gas), and emissions associated with Lane County employee commute behavior.

Figure 1: Greenhouse gases accounting and reporting scopes[6,7]



[5] Source: WRI/WBSCD Greenhouse Gas Protocol, Corporate Accounting & Reporting Standard (Revised Edition), Chapter 4.
[6] Source: WRI/WBSCD Greenhouse Gas Protocol, Corporate Value Chain (Scope 3) Accounting and Reporting Standard
[7] Explanation of Greenhouse Gas chemical formulas: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), nitrogen trifluoride (NF_3), and sulfur hexafluoride (SF_6).

Organizational goals and reporting are often focused on the mitigation of Scope 1 and Scope 2 emissions, as the sources are under an organization's direct control. For example, an organization may specify more energy efficient building appliances and vehicles made to use lower-impact fuels. Similarly, an organization may also be more efficient in the use of equipment – such as implementing and monitoring idle times and routes. The County is in control of these emissions and therefore has greatest responsibility for these emissions. Scope 3 emissions, while outside of direct control, are often large in scale and therefore represent an opportunity for reductions through partnerships with suppliers. Most often for County governments mitigation opportunities include specifying lower-impact materials such as concrete and asphalt for County projects; requiring lower-impact equipment and fuels by County contractors; purchasing lower life-cycle impact fuels; and assisting community partners that provide critical community-directed services to use lower impact practices.

INVENTORY BOUNDARIES

This inventory was conducted using FY19 data for all County. Data was also collected for FY14, but due to changes in data management and record-keeping this data set is not complete or compatible with FY19. The FY14 data set is primarily used in the report to show year-over-year trends in energy use for Scope 1 and Scope 2 emissions. In an effort to organize the emissions from Lane County's diverse operations, all departments were grouped into five "functional areas" by County staff. **Table 1** includes the name of each of the five functional areas and what departments are included. Note that due to the high emissions from Short Mountain Landfill, Waste Management was separated from the rest of Public Works. **Table 2** (next page) describes the emissions sources included in the inventory.

Table 1: GHG Inventory Functional Area Boundaries

Lane County Functional Area	What's Included
Administration & All Other	Board of County Commissioners, County Administration, County Counsel, Assessment & Taxation, Performance Auditor, District Attorney's Office, Emergency Management, Human Resources, and Technology Services.
Health & Human Services	Whole department, including Behavioral Health, Community Health Centers, Developmental Disabilities Services, Human Services, Public Health, LaneCare, and Youth Services.
Lane County Public Works	Whole department except Waste Management Division, including Administrative Services, Engineering and Construction, General Services, Land Management, Lane Events Center (Lane County Fair), Parks, and Road Maintenance.
Lane County Sheriff's Office	Whole department: Office of the Sheriff, Administration, Corrections, and Police Services.
Waste Management Division	Whole division, including all transfer stations, Short Mountain Landfill, and Bethel-Danebo Landfill (closed).

Table 2: Description of Lane County's operational FY19 GHG emissions sources

SCOPE	EMISSIONS SOURCE	EMISSIONS SOURCE DESCRIPTION
Scope 1 (Direct Emissions)	Owned Vehicles & Mobile Equipment	Lane County owns vehicles and pieces of off-road equipment that consume gasoline and diesel fuel blends. Fuel data was provided split by fuel type, including gasoline, E10 gasoline, B5 diesel, R20 diesel, R50 diesel, and R99 diesel. Purchasing data also allowed for an estimate of propane used for smaller equipment including forklifts; it was assumed that all propane was used in mobile equipment. Emissions accounted for here represent "tailpipe" emissions only, per GHG reporting standards. *Upstream emissions from the extraction and transportation of fuels to the point of purchase are included in scope 3.*
	Stationary Fuels	Lane County consumes natural gas for space and water heating. Lane County consumes a small quantity of diesel fuel in back-up electricity generators at many facilities. **Data for other stationary energy use is not readily unavailable and therefore excluded from FY19 inventory.** *Appropriate data systems should be implemented to support future GHG inventories.*
	Solid Waste	This category includes landfilled solid waste from Lane County operations as well as emissions from landfills managed by Lane County. For operational waste, volumes do not include recyclables, yard debris or food scraps going to compost. Community-generated solid waste from Lane County residences and businesses that is processed and landfilled are also included. Short Mountain Landfill is located south of Eugene-Springfield along Interstate 5, which generates landfill gas (LFG) from decaying solid waste. Emerald People's Utility District (EPUD) purchases electricity generated from captured LFG at Short Mountain Landfill, considered a renewable source of local electricity. The remaining LFG escapes into the atmosphere as "fugitive" gases before gas capture is underway. Fugitive methane released from both Short Mountain Landfill and Bethel-Danebo Landfill are calculated and included in this inventory. As a Title V air pollution permit holder, Lane County must meet ODEQ reporting requirements related to the methane management practices at this landfill.
	Refrigerants	Refrigerants are used in heating, ventilation, air conditioning and commercial food refrigeration systems at Lane County facilities. **Data for refrigerant use was unavailable and therefore excluded from this inventory.** *Appropriate data systems should be implemented to support future GHG inventories.*
Scope 2	Electricity	Lane County calculated emissions from electricity consumption from all facilities included in the inventory boundary. Following Greenhouse Gas Protocol's Scope 2 Guidance, emissions from electricity were calculated using both the market-based and location-based methodologies for all seven electric utility providers. *Results are primarily shown using market-based calculations for convenience.*
Scope 3 (Indirect Emissions)	Upstream Energy	Upstream emissions from the extraction and transportation of fuels to the point of retail purchase. These emissions are calculated using ODEQ life-cycle emissions factors.
	Commute	In FY19, Lane County employed 1,750 employees. Commute survey information provided data on the percentage of trips by mode and average one-way trip mileage.
	Supply Chain & Business Travel	This category provides an estimate of the embodied GHG emissions in the manufacture of goods, food, energy and fuel products, and services (including travel) purchased by Lane County. These emissions are estimated using Lane County financial expenditure data and ODEQ's 2010 purchaser price consumption-based emissions model.

4. AGENCY RESULTS

In FY19, Lane County direct operations and indirect activities generated an estimated **206,635 MT CO_2e**. As can be seen in **Table 3** and **Figure 2**, Solid Waste was by far the largest source of emissions, primarily from fugitive methane from Short Mountain Landfill with approximately **168,230 MT CO_2e**. Supply chain emissions was second at **25,912 MT CO_2e** with emission from owned fleet vehicles and equipment at **4,703 MT CO_2e**. With landfill emissions included, Waste Management Division is responsible for **84%** of emissions.

Lane County's FY19 emissions are roughly equivalent to any one of the following:

- Energy use of **24,000** homes in 1 year
- Driving **45,000** cars for 1 year
- Amount of CO_2 sequestered by **270,000** acres of US forest

Calculated with https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

Table 3 is useful in that it identifies "hot spots" for each emission source, by functional area. This provides a means to prioritize climate action efforts between emissions sources and functional areas. The color red indicates a relatively larger GHG emissions impact, while green indicates smaller impacts.

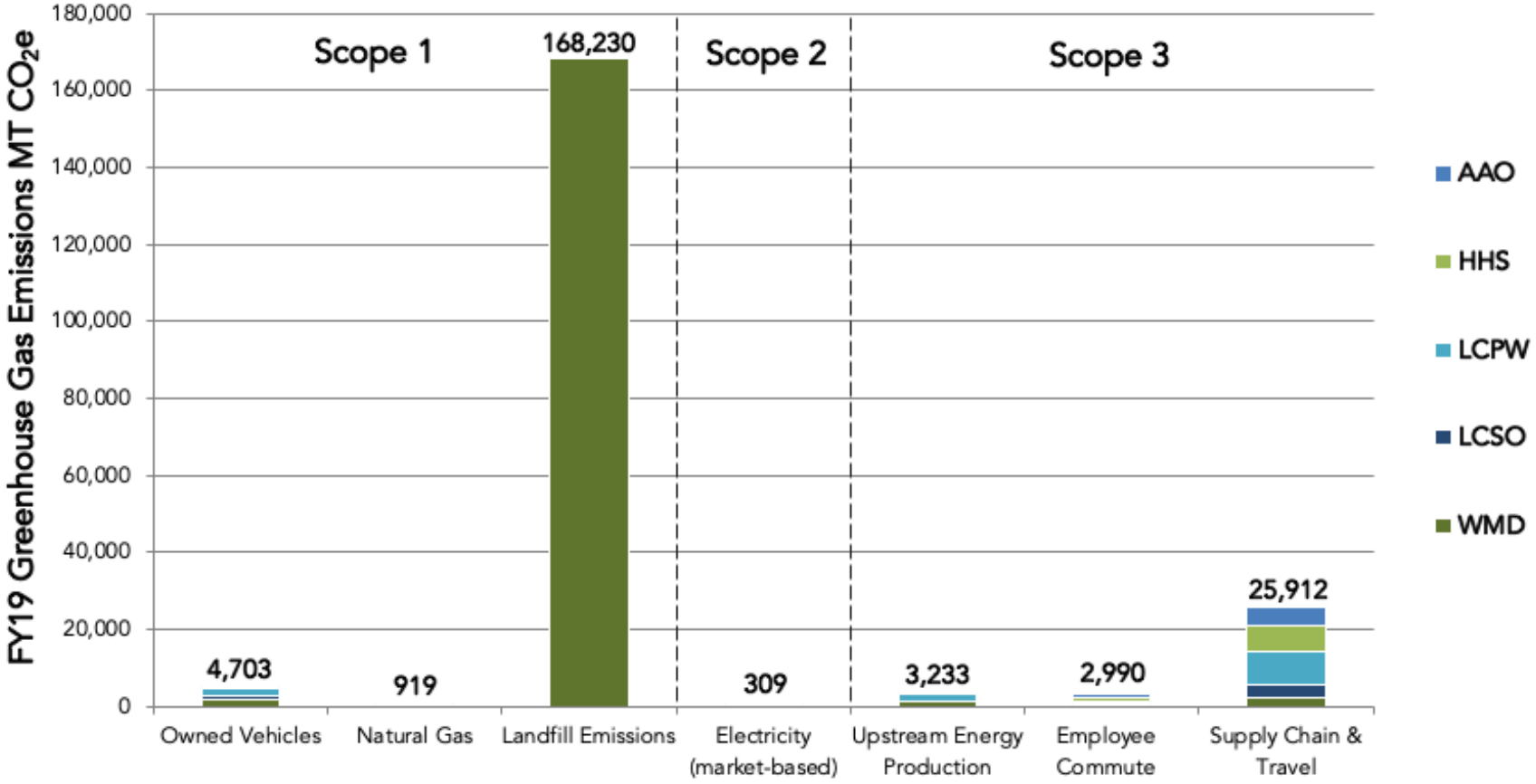
Table 3. Lane County emissions ($MTCO_2e$) by emissions source and functional area – hot spots table[8,9]

FY18/19 by functional area	SCOPE 1			SCOPE 2	SCOPE 3			
Functional Area	Owned Vehicles	Natural Gas	Landfill Emissions	Electricity (market-based)	Upstream Energy Production	Employee Commute	Supply Chain & Travel	Total Emissions (Scopes 1 - 3)
	MT CO_2e	MT CO_2e	MT CO_2e	MT CO_2e	MT CO_2e	MT CO_2e	MT CO_2e	MT CO_2e
AAO	65	386	43	74	114	570	4,819	6,071
HHS	123	52	125	65	57	1,148	6,806	8,375
LCPW	2,017	425	127	141	1,560	540	8,599	13,409
LCSO	950	55	45	12	424	508	3,241	5,236
WMD	1,548	0	168,230	17	1,078	224	2,446	173,544
Totals:	4,703	919	168,230	309	3,233	2,990	25,912	206,295

[8] AAO – Administration & All Other, HHS – Health & Human Services, LCPW – Lane County Public Works, LCSO – Lane County Sheriff's Office, WMD – Waste Management Division

[9] WMD, Landfill Emissions & totals: because all functional area operational solid waste is sent to Short Mountain Landfill, the total Landfill emissions for the County are not cumulative and are instead equal to WMD's Solid Waste emissions. Similarly, the right column will not sum to the same total as the bottom row.

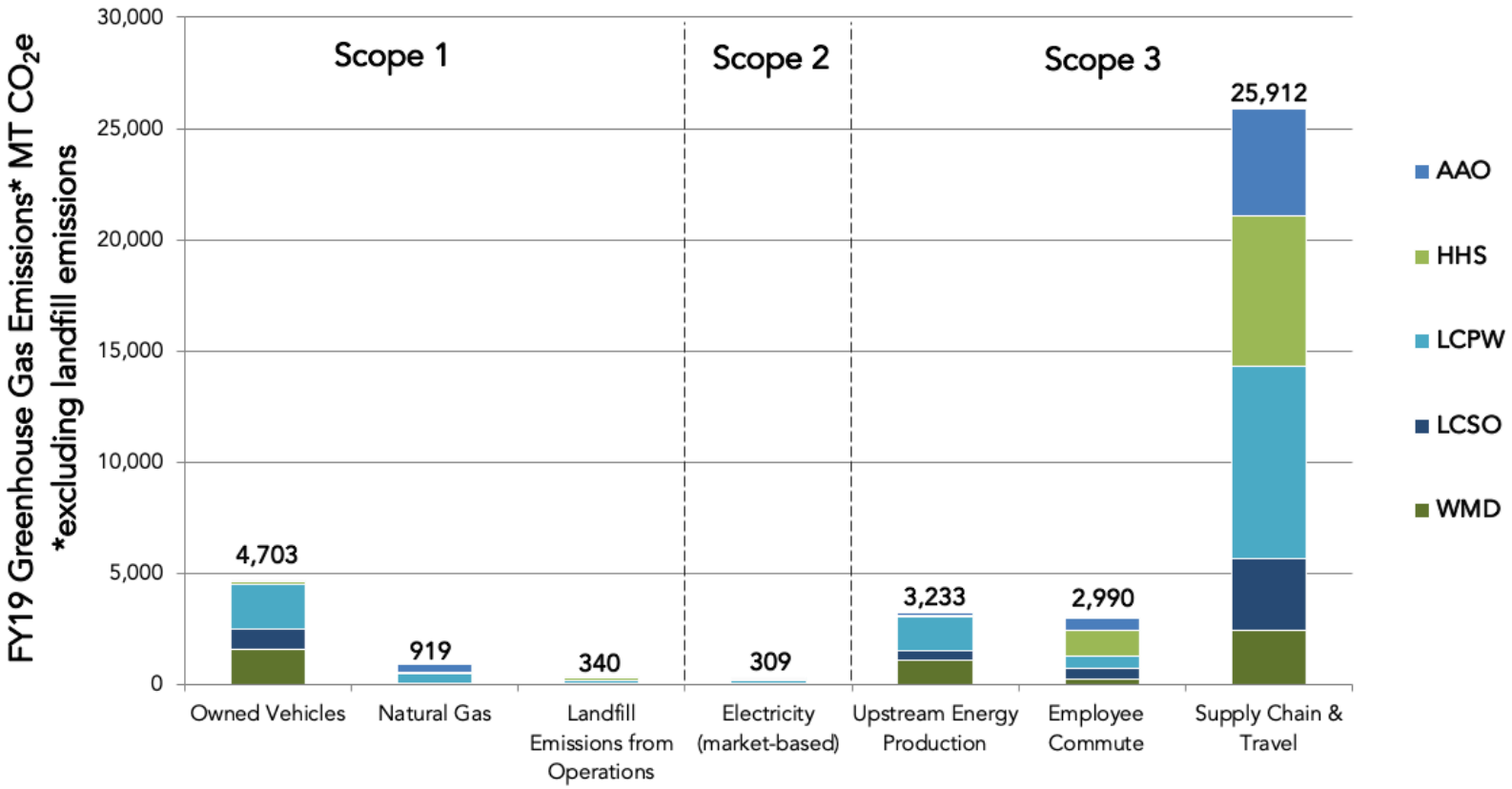
Figure 2: Lane County emissions by emissions source and functional area, illustrating the significance of Landfill emissions[10]



[10] AAO – Administration & All Other, HHS – Health & Human Services, LCPW – Lane County Public Works, LCSO – Lane County Sheriff's Office, WMD – Waste Management Division

Figure 3 excludes Scope 1 emissions from Short Mountain Landfill other than those that come directly from Lane County's operational solid waste. This graphic allows for a reset of the y-axis to more clearly compare the scale for all other sources of County emissions. As can be seen, the largest source of emissions under the County's direct control is fleet fuel use (both direct Scope 1 emissions and upstream emissions for fuel production), followed by natural gas. Supply chain emissions are the largest source from this group, which is the same as for most other local government operational inventories. See the *Highlight: Supply Chain* section of the report for additional details.

Figure 3: Lane County emissions by emissions source and functional area, excluding non-operational Landfill emissions[11]

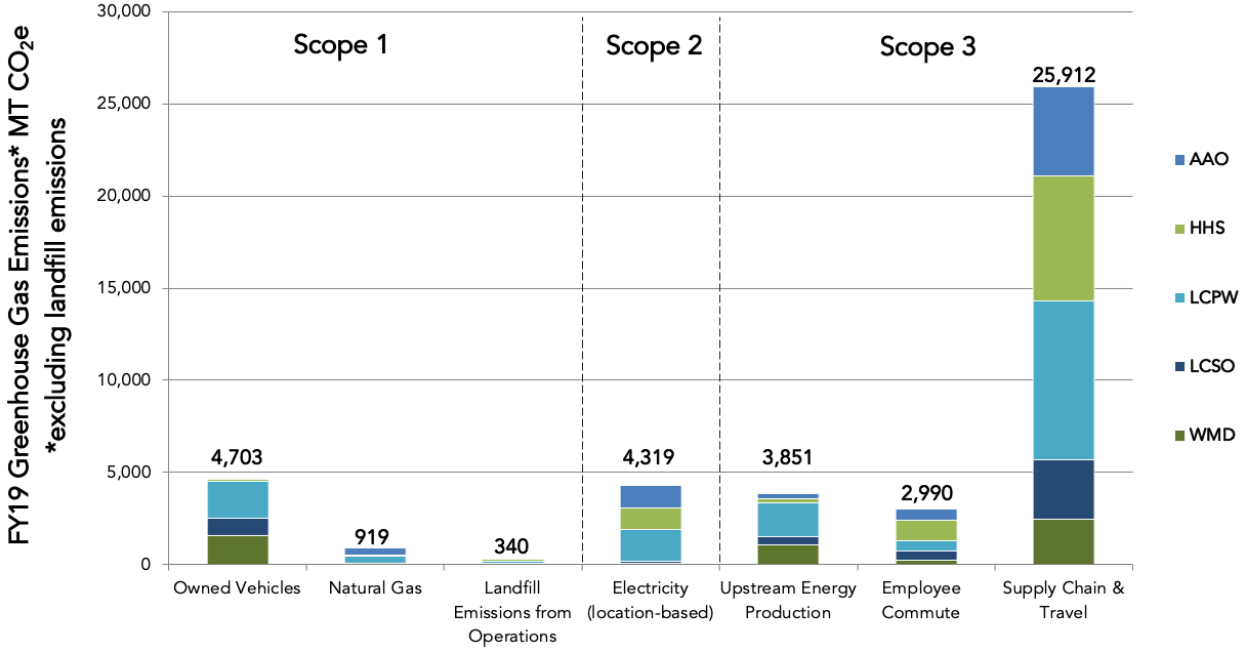


[11] AAO – Administration & All Other, HHS – Health & Human Services, LCPW – Lane County Public Works, LCSO – Lane County Sheriff's Office, WMD – Waste Management Division

Two methodologies are required by GHG inventory protocol for calculation of emissions from electricity:

- **Market-based method (or utility-specific)** represents emissions from the electricity procurement contracts that an organization has purposefully chosen. For many, these contracts are with the local electric utility that provides service. Other choices could include selection of a specific electricity utility (in markets with more than one); contracting with a specific supplier (in a Power Purchase Agreement); or the purchase of renewable energy certificates. *The market-based method is used to calculate emissions in all graphics shown in the report to this point.*
- **Location-based method (or regional grid)** multiplies an organization's electricity use by the average emissions intensity of a specific regional electricity grid that is published by the Environmental Protection Agency (eGRID 2018). **Figure 4** shows that County electricity emissions, using Location-based accounting, are 14 times greater than market-based emissions.

Figure 4: Lane County emissions by emissions source and functional area, excluding non-operational landfilled emissions, using location-based methodology for electricity (also impacting upstream energy production)[12]



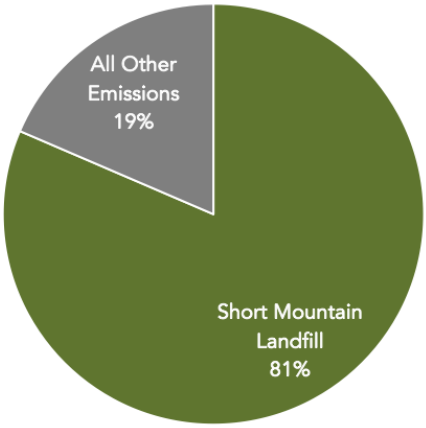
[12] AAO – Administration & All Other, HHS – Health & Human Services, LCPW – Lane County Public Works, LCSO – Lane County Sheriff's Office, WMD – Waste Management Division

Eugene and Lane County are fortunate to have existing contracts for low-GHG impact electricity. Many other communities in Oregon do not have access to BPA electricity and have much larger emissions-intensities (GHG emissions per unit of energy). In order to reach their climate goals – they must first procure low-carbon electricity. **Figure 4** also shows the importance of using this low-carbon resource efficiently and focusing it towards electrifying the fleet over time that result in the largest emissions reductions.

INVENTORY HIGHLIGHT – SHORT MOUNTAIN LANDFILL

The largest source of Lane County operational emissions is operation of Short Mountain Landfill. This modern landfill is the only licensed facility in Lane County and serves the disposal needs of Lane County. Landfill gas (LFG) is generated as organic materials (e.g. food, paper, yard wastes) in mixed solid waste decompose, which is a mix of carbon dioxide and methane. Both are greenhouse gases, but it's the methane that is the primary gas of concern.

Figure 5: Landfill vs. All Other Sources



Modern landfills, like Short Mountain, collect landfill gas and the methane is combusted to generate electricity. In calendar year 2018, approximately 4,663 metric tons of methane were captured, enough to power 1,200 homes for a year.

LFG collection systems are not able to collect 100% of the gas and a fraction of the methane escapes into the atmosphere before the landfill sections are capped and gas is collected. This fugitive methane is what is being accounted for in Lane County's inventory. While Lane County has operational control over Short Mountain Landfill, and therefore includes these emissions in its GHG inventory, it is important to note that these emissions are the result of community-at-large activity. The scale of this source of emissions should serve to highlight the importance of related community-at-large climate actions that divert organic materials from the landfill. Examples include avoiding the wasting of edible food, implementing county-wide food-waste collection, developing anaerobic digestion systems, and encouraging at-home composting systems.

In addition, the scale of emissions from Short Mountain Landfill highlights a potential opportunity to increase LFG collection efficiency in order to generate energy for more local homes or use the gas locally as a low-GHG impact vehicle fuel.

INVENTORY HIGHLIGHT – SUPPLY CHAIN PURCHASES AND BUSINESS TRAVEL

Lane County's FY19 supply chain and business travel emissions, organization-wide, are estimated at **25,912 MT CO_2e**, an amount more than double the rest of Lane County's emissions combined *when excluding landfill emissions*. These emissions primarily represent the upstream GHG impacts generated during raw material extraction, energy use during production, and transportation for the goods and services.

In FY19, Lane County's total budget totaled slightly more than $200 million, about $100 million of that total is included in the supply chain analysis. The other 50% of the budget is excluded from the supply chain analysis to avoid double counting of emissions accounted for elsewhere in the inventory and for purchases that are large financial transfers that don't represent a "purchase" by the County, such as paying County payroll or funds transferred to other originations for intergovernmental agreements. **The greenhouse gas impacts associated with the $100 million included in this analysis are summarized into the following categories:**

Purchasing Categories

- **Construction & Maintenance (23%):** Includes the labor and materials in construction, renovation and maintenance services. For Lane County this primarily includes construction and maintenance of public works infrastructure such as roads, bridges, and building facilities.
- **Vehicles and Equipment (18%):** Includes the purchase, rental, and maintenance of vehicles and equipment. This does not include fuel use.
- **Community Directed Services (18%):** This category includes organizations providing services to the community on behalf of, or subsidized by, the County, such as medical, dental, counseling, and childcare services.
- **Business Services (17%):** Includes various professional services such as accounting, advertising, legal, consulting, employment, education, postal, real estate, & insurance.
- **IT Equipment & Supplies (14%):** Includes hardware, software, and telecommunications services.
- **Office Supplies and Printing (5%):** Includes paper and printing, all other supplies commonly found in office settings.
- **Business Travel, Food, and Lodging (3%):** Includes local and out-of-town travel purchasing including airfare, other transportation, lodging, and restaurants.
- **Other Goods – Health Care (2%):** Includes surgical, medical and dental instruments, related supplies, and pharmaceuticals.
- **Clothing (1%):** Includes textile and clothing production and laundry services.

- **Food (<1%):** Includes food purchased for County staff and committee events. Note: A fraction of Community Directed Services is also for food, but the data set does not allow for separation and therefore is accounted for in Community Directed Services.
- **Other Goods – Administration (<1%):** Includes "all other" goods and services not included in the other categories that are not large enough to be grouped into a separate category.

Business travel is typically reported as a distinct source of Scope 3 emissions in an operational greenhouse gas inventory. Data to support business travel (air and ground) accounting, such as annual reporting of air travel passenger miles or costs for specific types of travel services, was not available for the inventory. Cost data for a group of business travel services (transport, food, lodging, etc.) is available. Emissions for these costs are estimated using the supply chain methodology for this year's inventory. For future inventories it is recommended that data systems are established to capture data for business travel.

Figure 6 illustrates that three purchasing categories make up **60%** of Lane County's supply chain impacts. These include Construction and Maintenance (**23%**) of County roads and other infrastructure (such as buildings); production and maintenance of County Vehicles and Equipment (**18%**); and Community Directed Services (**18%**). **Figure 6** shows the impacts by County department. Purchases by Public Works and Health & Human Services make up the majority of supply chain impacts at nearly 60% combined.

Figure 6: Lane County Supply Chain Emissions by Purchasing Category and Functional Area

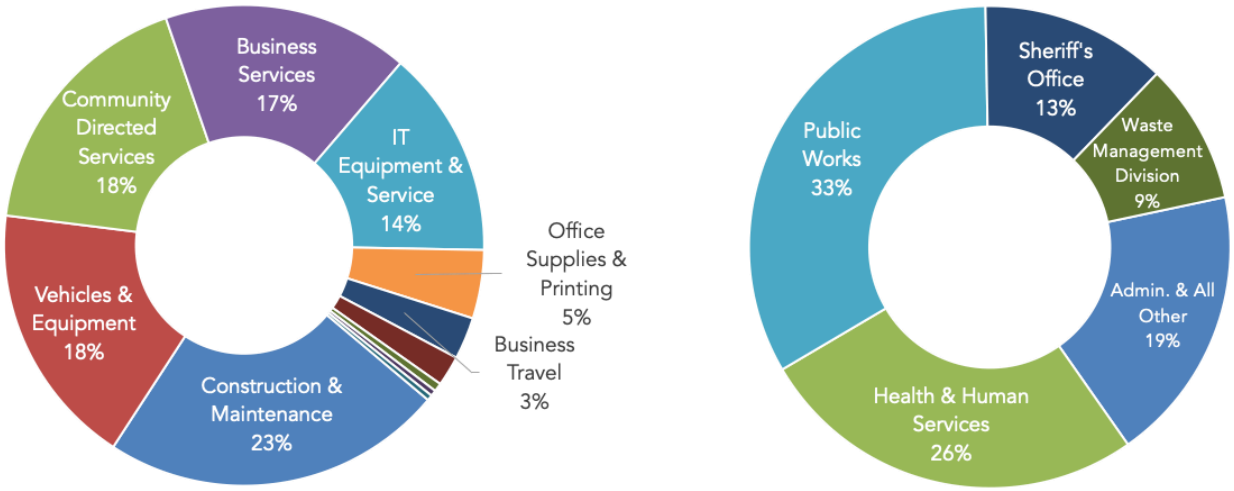


Table 4 shows the full details of the supply chain analysis and the crosswalk between County departments (columns) and purchasing categories (rows). The values in the middle of the table represent the GHGs (MT CO_2e) associated with each Department's purchases in various purchasing categories. The color red indicates a relatively larger GHG emissions impact, while green indicates smaller impacts. As can be seen, Public Works purchases in Construction and Maintenance and Vehicles and Equipment; Health and Human Services purchase of Community Directed Services; and Administration's purchase of Business Services and IT Equipment & Services are the sources of the largest impacts.

Table 4: Lane County Supply Chain Emissions by Purchasing Category and Functional Area

Purchasing Categories	Admin. & All Other	Health & Human Services	Public Works	Sheriff's Office	Waste Management Division	Grand Total	% of Category
Construction & Maintenance	671	139	4,489	193	485	5,976	23%
Vehicles & Equipment	78	123	2,762	716	936	4,616	18%
Community Directed Services	760	3,648	54	119	13	4,593	18%
Business Services	1,492	725	342	918	822	4,299	17%
IT Equipment & Service	1,165	849	612	928	74	3,628	14%
Office Supplies & Printing	452	363	214	105	61	1,194	5%
Business Travel	183	345	60	107	37	732	3%
Other Goods - Health Care	6	519		4		529	2%
Clothing	3	29	25	86	4	147	1%
Food	6	62	9	27	0	103	0.4%
Other Goods - Admin	6	3	33	39	14	94	0.4%
Grand Total	4,819	6,806	8,599	3,241	2,446	25,912	
	19%	26%	33%	13%	9%		

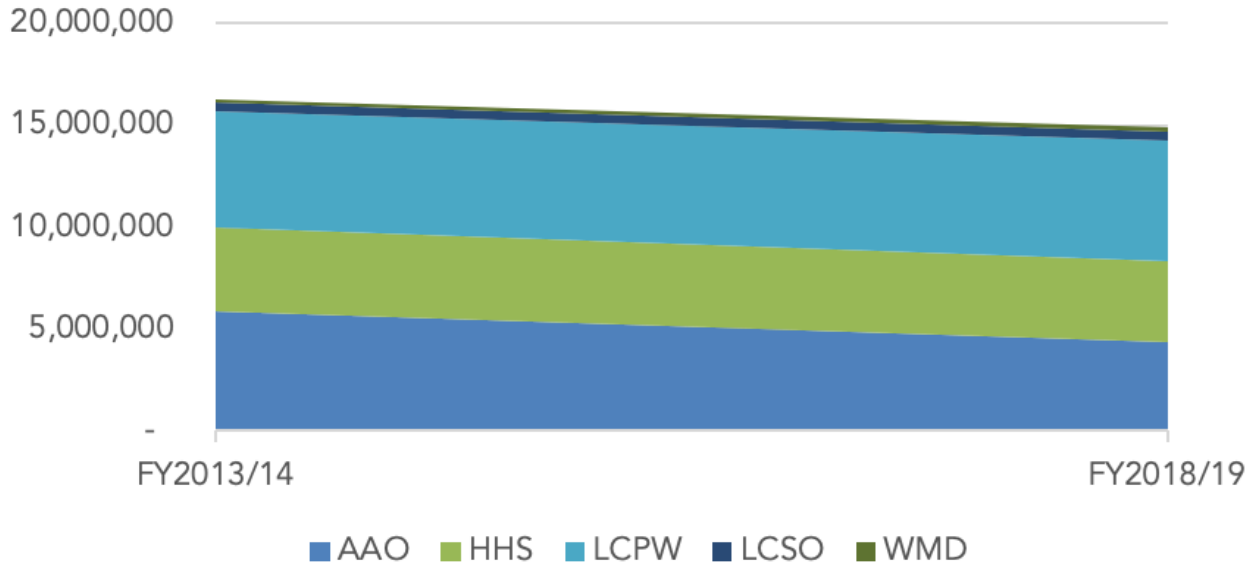
HISTORIC FUEL AND ENERGY USE

Select activity data was also available for FY14, including electricity use, natural gas use, and vehicle/equipment fuel use. The consumption quantities and percent change over time are outlined below. Notably, Lane County's direct fossil fuel consumption for FY19 compared to FY14 showed a reduction for both electricity and natural gas use but an increase in equipment and vehicle fuels (gasoline and diesel blends).

Electricity Use

Electricity use decreased by **9%** between FY14 and FY19, primarily from a **26%** decrease from the Administration & All Other functional area. For FY19, Public Works consumed the most electricity of any functional area, or about **40%** of total. Note that the Lane Events Center is part of Public Works, and all energy use occuring there will be part of LCPW's total.

Figure 7. Lane County Electricity Use (in kWh) by Functional Area, Change from FY14 to FY19[13]

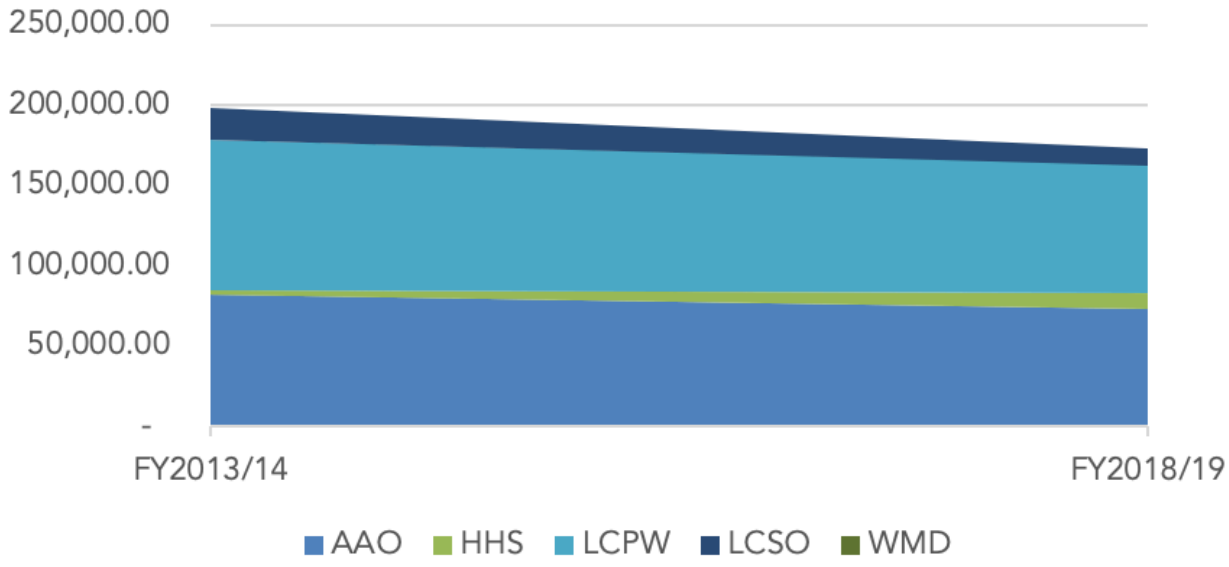


Natural Gas Use

Natural gas use decreased by **13%**, primarily from a **15%** reduction in use by Public Works, as well as a notable **47%** decrease by the Sheriff's Office and **11%** decrease by Administration & All Other. For FY19, Public Works consumed the most natural gas, or about **46%** of County total followed by Administration & All Other at **42%**. Note again that the Lane Events Center is part of Public Works, and all energy use occuring there will be part of LCPW's total.

[13] AAO – Administration & All Other, HHS – Health & Human Services, LCPW – Lane County Public Works, LCSO – Lane County Sheriff's Office, WMD – Waste Management Division

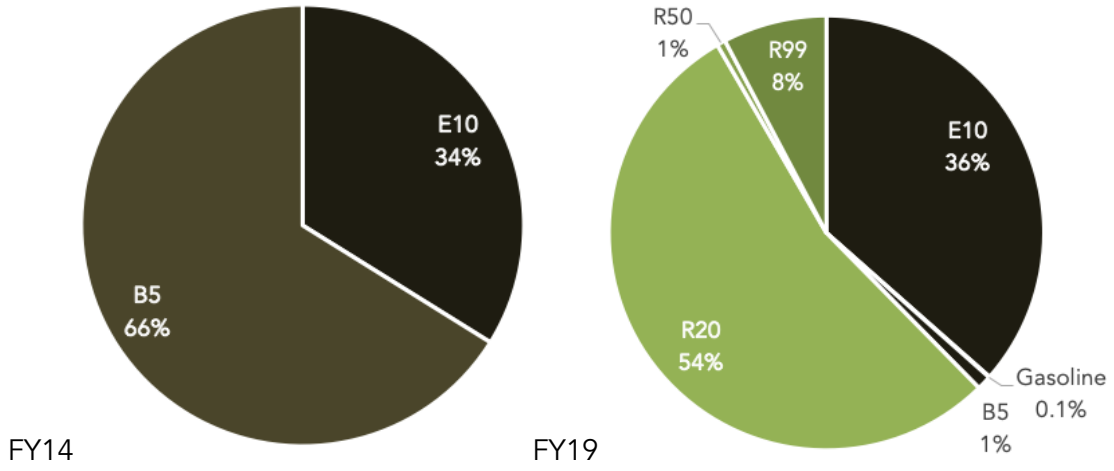
Figure 8. Lane County Natural Gas Use (therms) by Functional Area, Change from FY14 to FY19[14]



Equipment and Vehicle Fuels[15]

While total gallons of fuel increased by **9%**, the fuel types used in large equipment and vehicles have changed drastically. Purchasing decisions to switch from B5 diesel blend to R20, R50, and R99 blends created a **10%** decrease in fossil fuel use despite the increase in total fuel consumed. To reduce fossil gasoline use, four electric vehicles were added in FY19 with more EVs planned for the fleet. EV substitutions have a minimal effect on current fuel use but are anticipated to bring greater reductions as EV prices are reduced, battery range is increased, and more model types (especially pick-up trucks) become available.

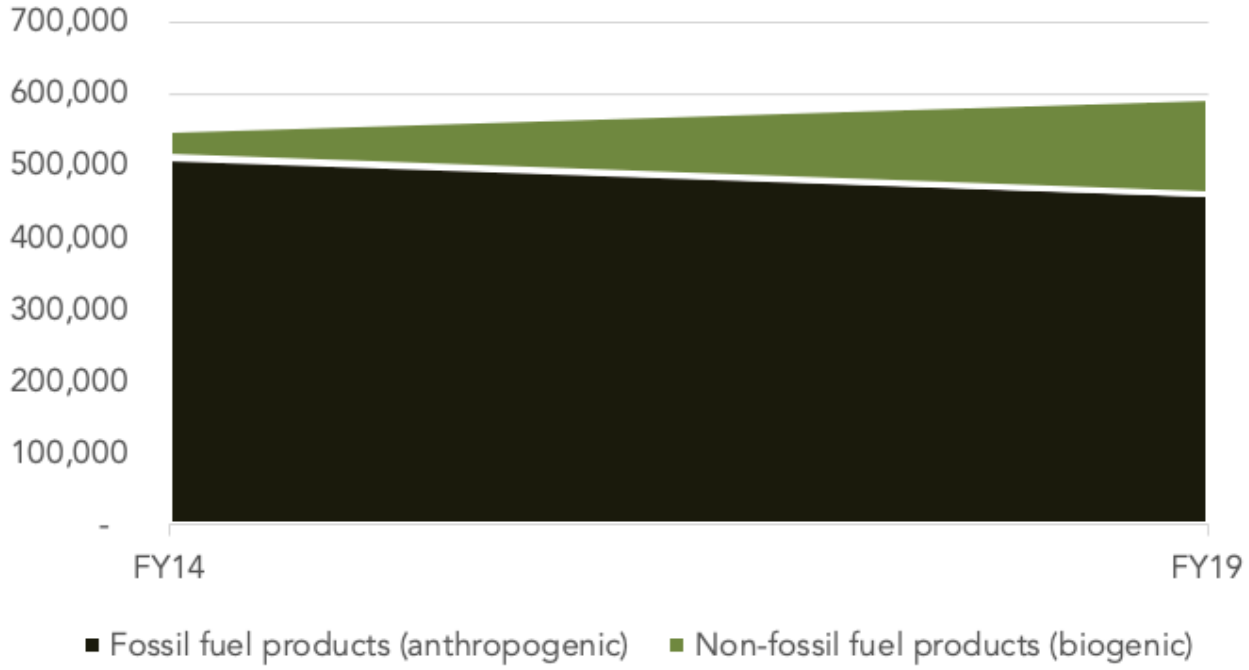
Figure 9. Lane County Vehicle & Mobile Equipment Fuel Use by Type, FY14 (left) & FY19 (right)



[14] AAO – Administration & All Other, HHS – Health & Human Services, LCPW – Lane County Public Works, LCSO – Lane County Sheriff's Office, WMD – Waste Management Division

[15] Propane data for equipment including forklifts was not available for comparison but is relatively small.

Figure 10. Lane County Anthropogenic vs. Biogenic Fuel Use (gallons), Change from FY14 to FY19



The increase in non-fossil based fuels has decreased Scope 1 emissions by **11%** despite the **9%** increase in fuel use.

Figure 11. Lane County Vehicle & Mobile Equipment Scope 1 Emissions (MT CO_2e), Change from FY14 to FY19

5. FUNCTIONAL AREA RESULTS

The majority of Lane County's emissions (**84%**) are due to fugitive landfill gas from Short Mountain Landfill. With landfill emissions excluded, two functional areas generated **57%** of remaining Lane County total emissions: Public Works and Health & Human Services. These emissions are due to County activities serving the community. The emissions attributed to each of Lane County's five functional areas are described in the following pages.

Figure 12. Lane County operational emissions by functional area with (left) and without (right) non-operational landfill emissions

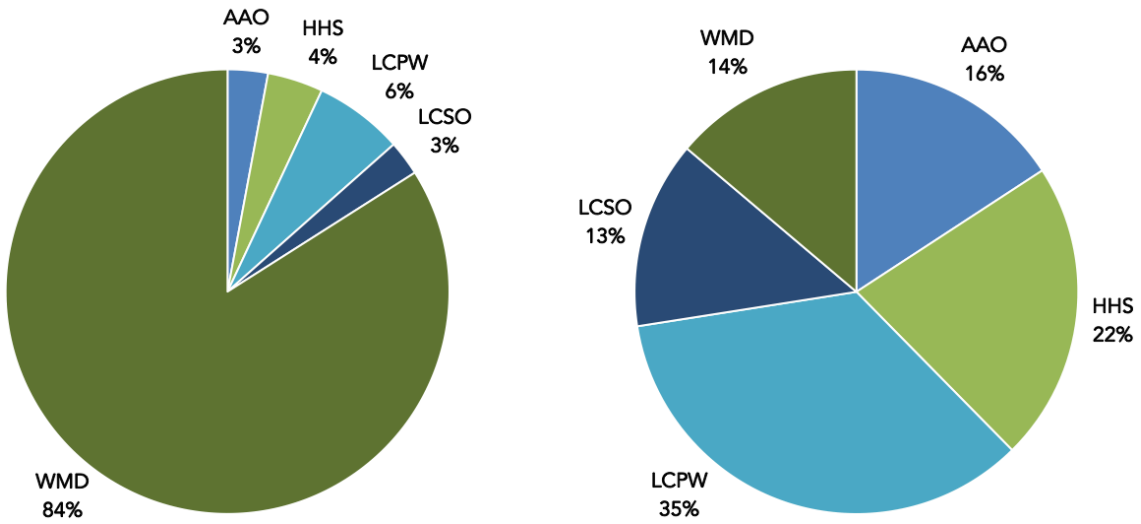


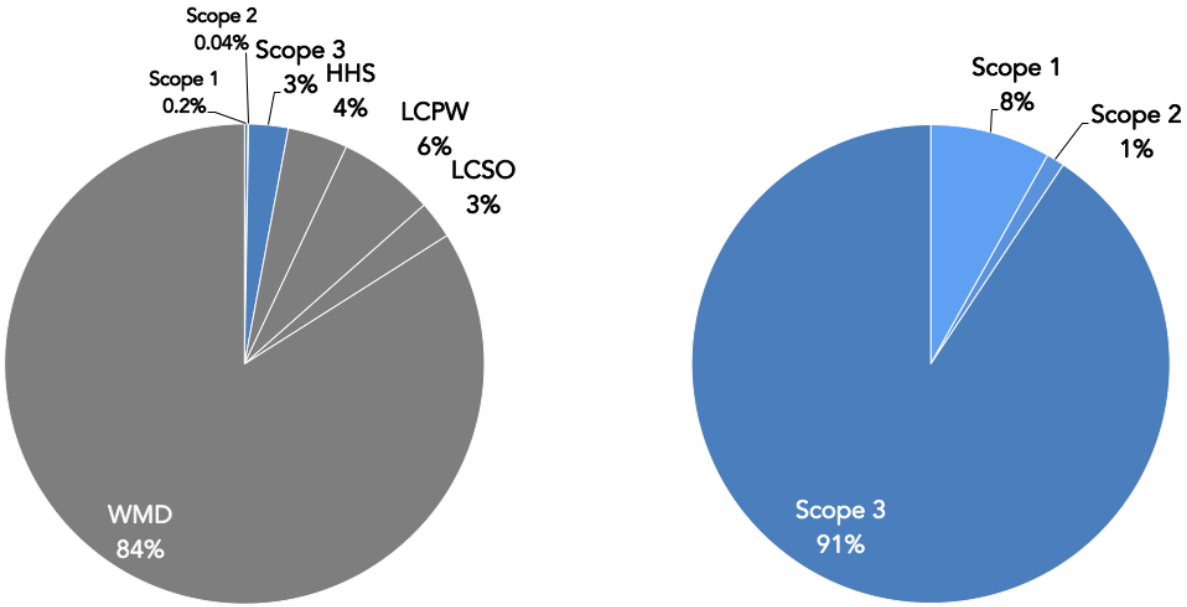
Table 5: GHG Inventory Functional Area Boundaries

Functional Area	What's Included
Administration & All Other	Board of County Commissioners, County Administration, County Counsel, Assessment & Taxation, Performance Auditor, District Attorney's Office, Emergency Management, Human Resources, and Technology Services.
Health & Human Services	Whole department, including Behavioral Health, Community Health Centers, Developmental Disabilities Services, Human Services, Public Health, LaneCare, and Youth Services.
Lane County Public Works	Whole department except Waste Management Division, including Administrative Services, Engineering and Construction, General Services, Land Management, Lane Events Center (Lane County Fair), Parks, and Road Maintenance.
Lane County Sheriff's Office	Whole department: Office of the Sheriff, Administration, Corrections, and Police Services.
Waste Management Division	Whole division, including all transfer stations, Short Mountain Landfill, and Bethel-Danebo Landfill (closed).

Administration & All Other (AAO)

In FY19, the departments and offices[16] making up the Administration & All Other functional area generated an estimated **568 MT CO_2e** of scope 1 and 2 emissions and approximately **6,071 MT CO_2e** when including scope 3. This amounts to roughly **3% of Lane County's total emissions – or 16% when excluding fugitive Landfill emissions**. The majority of emissions came from Scope 3 sources as shown in **Figure 13**. The three largest emissions sources for AAO were embodied emissions within purchased goods and services in the supply chain **(79%)**, employee commute, and electricity. Within supply chain, the largest sources of emissions were associated with purchases related to purchase of business services **(31%)** and IT equipment and services **(24%)**.

Figure 13: AAO GHG Emissions as a Share of Total (left) Emissions and by Scope (right) for FY19



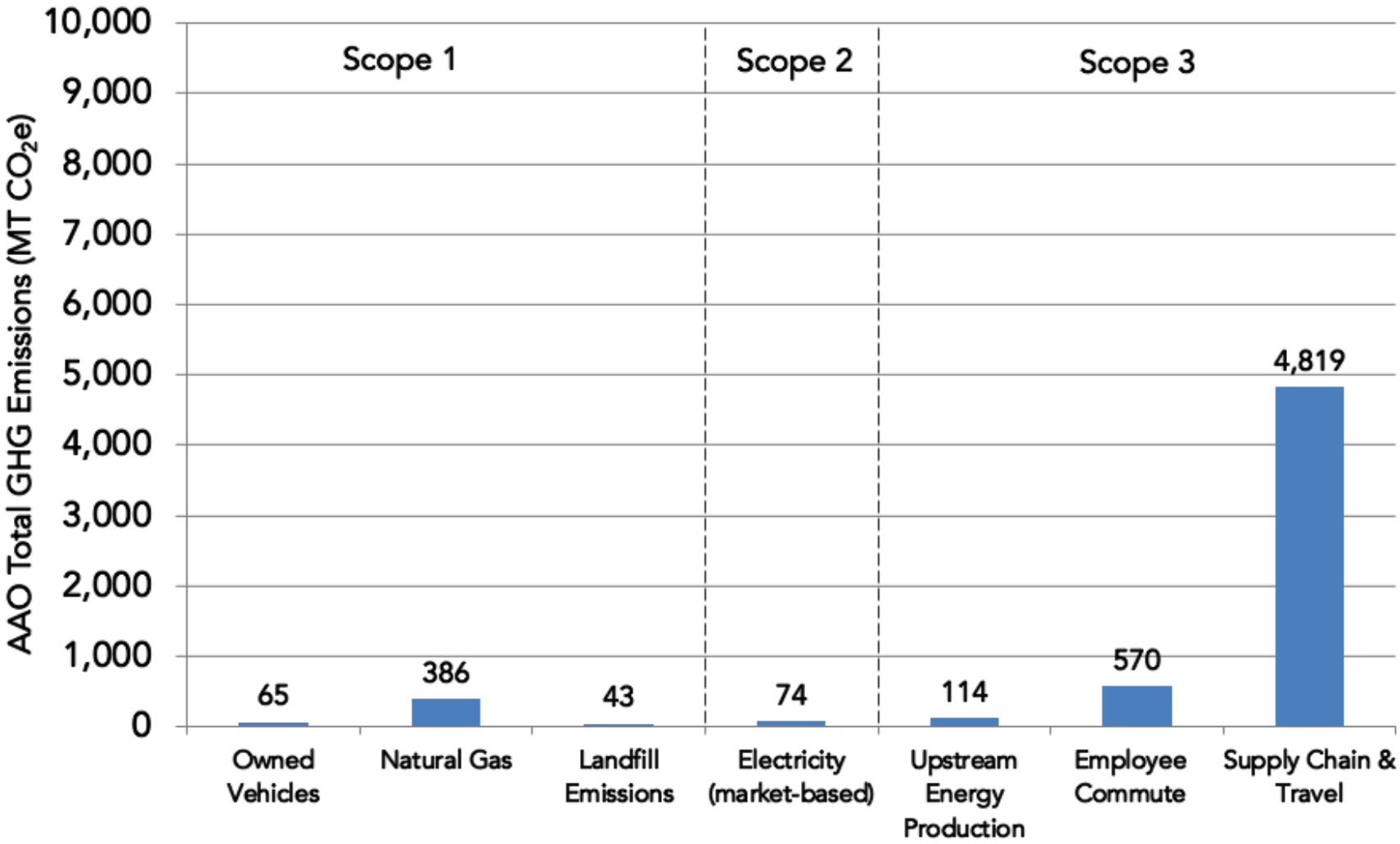
Functional Area Stats:
343 employees
202,500 sq. ft.

GHGs are primarily from:
Business services
IT equipment & services
Community Directed Services

[16] Board of County Commissioners, County Administration, County Counsel, Assessment & Taxation, County Performance Auditor, District Attorney's Office, Emergency Management, Human Resources, Technology Services.

AAO's direct GHG emissions are predominantly from building energy use (about 460 MT CO_2e). Indirect emissions are largely from supply chain purchases of Business and Professional Services (1,492 MT CO_2e) as well as other IT equipment and related services (1,165 MT CO_2e) and Community Directed Services (760 MT CO_2e).

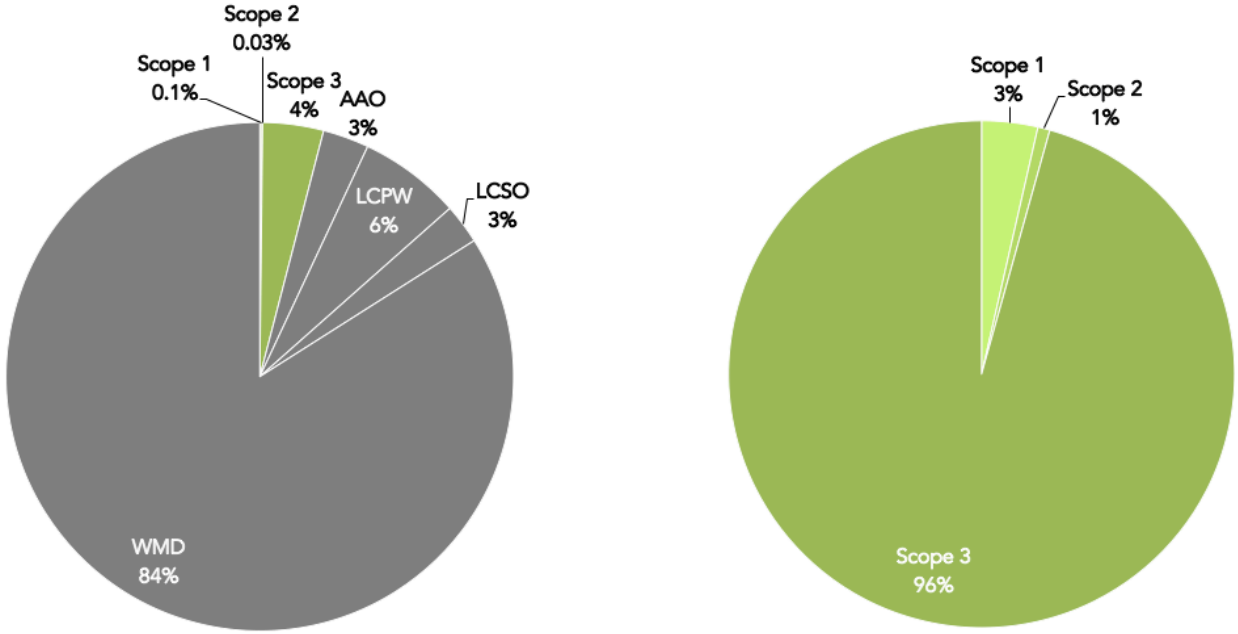
Figure 14: AAO Detailed GHG Emissions Results by Source and Scope for FY19



Health & Human Services (HHS)

In FY19, Lane County Health & Human Services generated an estimated **365 MT CO_2e** of scope 1 and 2 emissions and approximately **8,375 MT CO_2e** when including scope 3. This amounts to roughly **4% of Lane County's total operational emissions – or 22% when excluding fugitive Landfill emissions**. The majority of emissions came from Scope 3 sources as shown in **Figure 15**. The largest emissions sources for HHS were embodied emissions within purchased goods and services in the supply chain **(81%)** and employee commute. Supply chain emissions were dominated by Community Directed Services provided to the community **(54%)** followed by IT equipment and services **(12%)** and business services **(11%)**.

Figure 15: HGHG Emissions as a Share of Total (left) Emissions and by Scope (right) for FY19

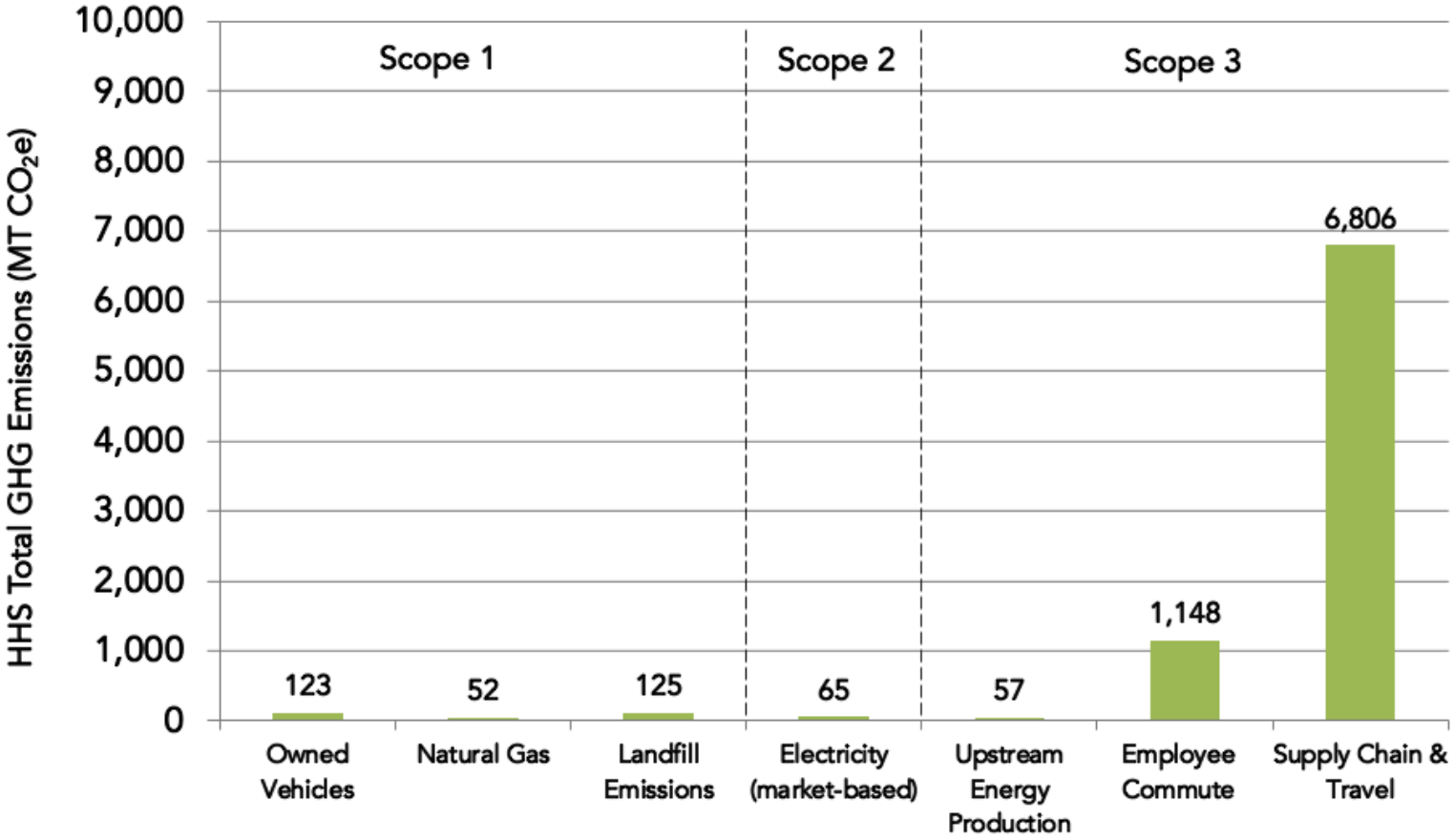


Functional Area Stats:
691 employees
1,050,000 sq. ft.

GHGs are primarily from:
Community Directed Services
Employee commute
IT equipment & services

HHS's GHG emissions are predominantly indirect emissions from supply chain purchases of purchase of Community Directed Services such as physical health, mental health, and social services (3,648 MT CO_2e). These services fulfill the County's critical role as the social safety net provider for the community. These Scope 3 emissions represent the Scope 1 and Scope 2 building energy use and vehicle fuel use by Lane County vendors and partner agencies. Clearly these emissions are not "owned" or directly controlled by the County. These emissions are estimated here to highlight opportunities for partnership between groups toward common climate goals. Other large impact supply chain purchases include Business Services and IT Equipment & Service. Employee commute is also a significant source of emissions as HHS employs more than any of the functional areas.

Figure 16: HHS Detailed GHG Emissions Results by Source and Scope for FY19

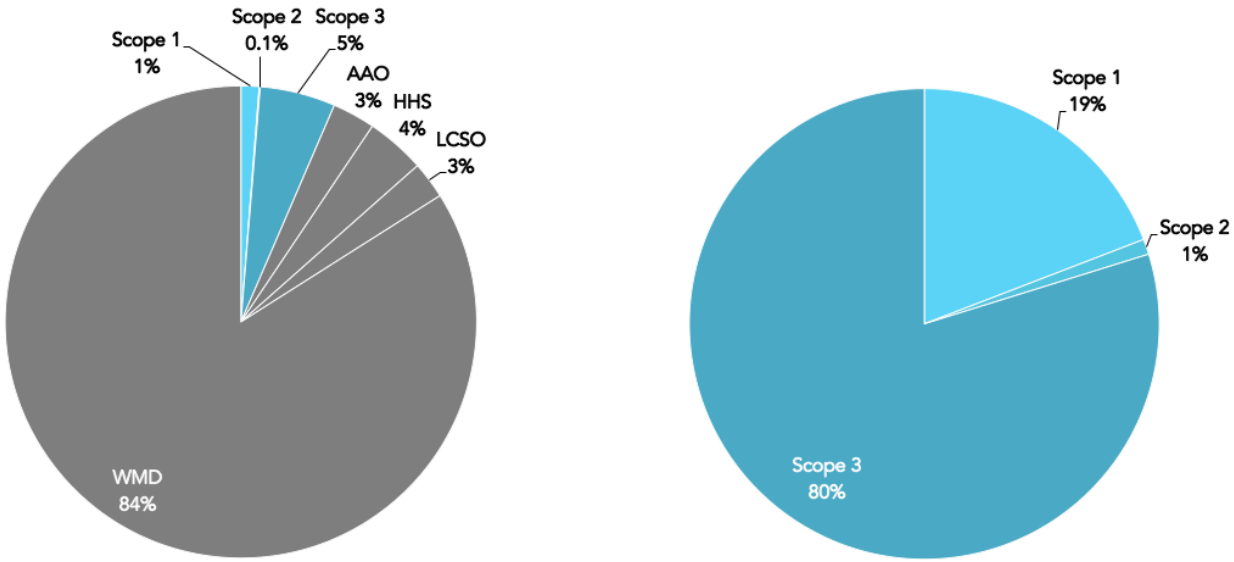


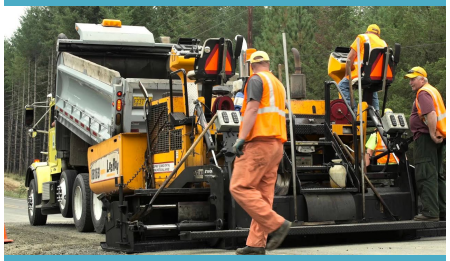
Public Works (LCPW) – *excluding WMD*

In FY19, Public Works generated an estimated **2,710 MT CO_2e** of scope 1 and 2 emissions and approximately **13,409 MT CO_2e** when including scope 3. This amounts to roughly **7% of Lane County's total emissions – or 35% when excluding fugitive Landfill emissions**. Note again that the Waste Management Division is excluded from Public Works for the purposes of this report.

The majority of emissions came from Scope 3 sources as shown in **Figure 17**. The three largest emissions sources for LCPW were embodied emissions within purchased goods and services in the supply chain **(64%)**, followed by owned vehicles & equipment and upstream energy production. Within supply chain the largest category was construction & maintenance **(52%)** followed by vehicles & equipment **(32%)**.

Figure 17: LCPW GHG Emissions as a Share of Lane County Total (left) Emissions and by Scope (right) for FY19



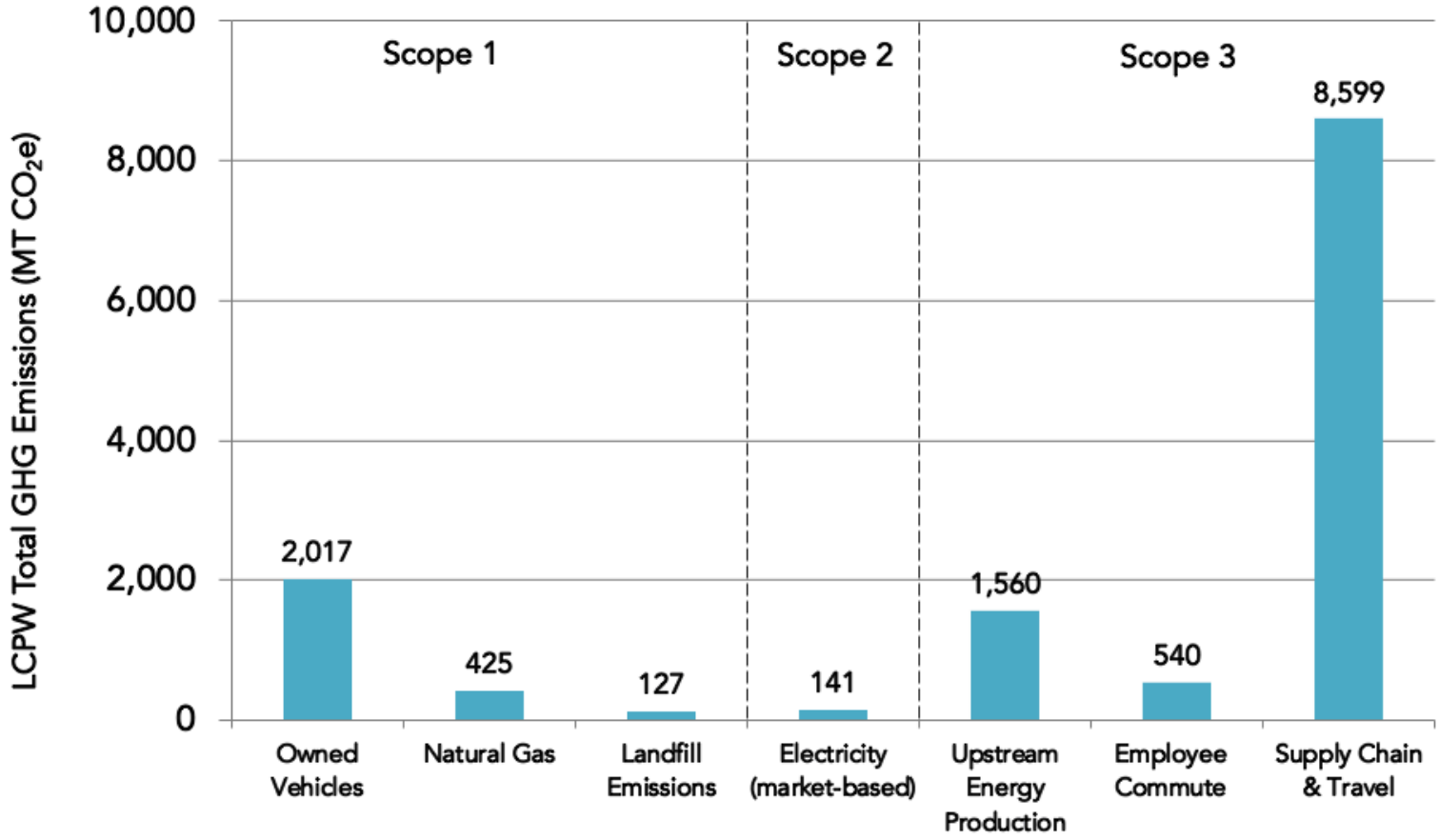


Functional Area Stats:
325 employees (excl. WMD)
41,500 sq. ft.

GHGs are primarily from:
Construction & maintenance
Vehicles & equipment (supply chain)
Vehicle fuel

LCPW's direct GHG emissions are predominantly for owned vehicles and less from owned buildings. Public Works is responsible for a large fraction of County vehicle fuel use and building energy. Indirect supply chain emissions are overwhelmingly from Public Works role in constructing and maintaining County roads and other infrastructure. These emissions are largely from production of the building materials (e.g. concrete and asphalt paving) and fuel use during construction. There are commercially available options to reduce these emissions, such as low impact substitutes for Portland cement. Production of vehicles and off-road equipment also are a significant source of emissions. These emissions are more difficult to manage so the focus for vehicles should be on the energy efficiency and fuel type used by the vehicles as opposed to the production emissions.

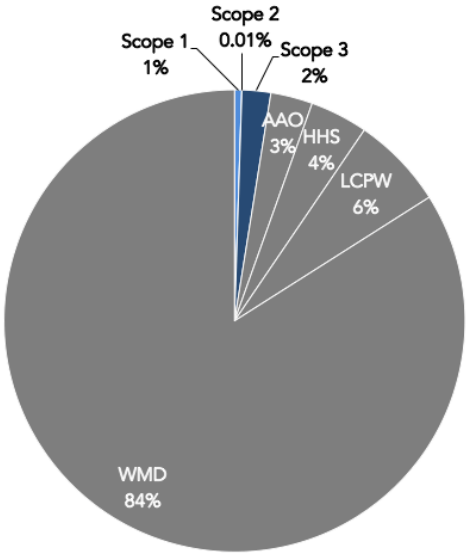
Figure 18: LCPW Detailed GHG Emissions Results by Source and Scope for FY19

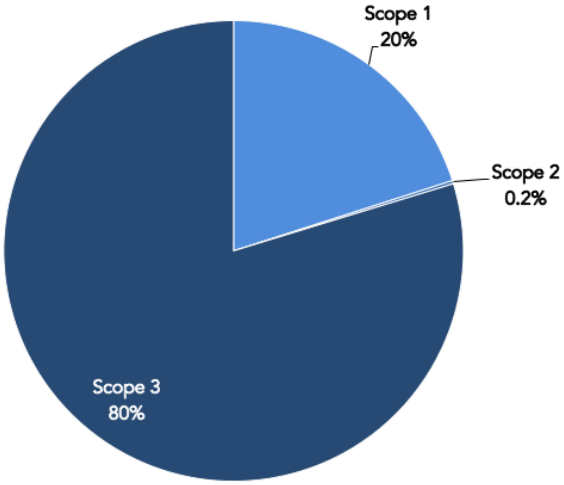


Lane County Sheriff's Office (LCSO)

In FY19, LCSO generated an estimated **1,064 MT CO_2e** of scope 1 and 2 emissions and approximately **5,236 MT CO_2e** when including scope 3. This amounts to roughly **3% of Lane County's total operational emissions – or 14% when excluding fugitive Landfill emissions.** The majority of emissions came from Scope 3 sources as shown in **Figure 19**. The three largest emissions sources for LCSO were embodied emissions within purchased goods and services in the supply chain **(62%)**, fuel for owned vehicles, and employee commute. Within supply chain the largest sources of emissions were associated with purchases related to IT equipment & service **(29%)**, business services **(28%)**, and vehicles & equipment **(22%)**.

Figure 19: LCSO GHG Emissions as a Share of Total (left) Emissions and by Scope (right) for FY19



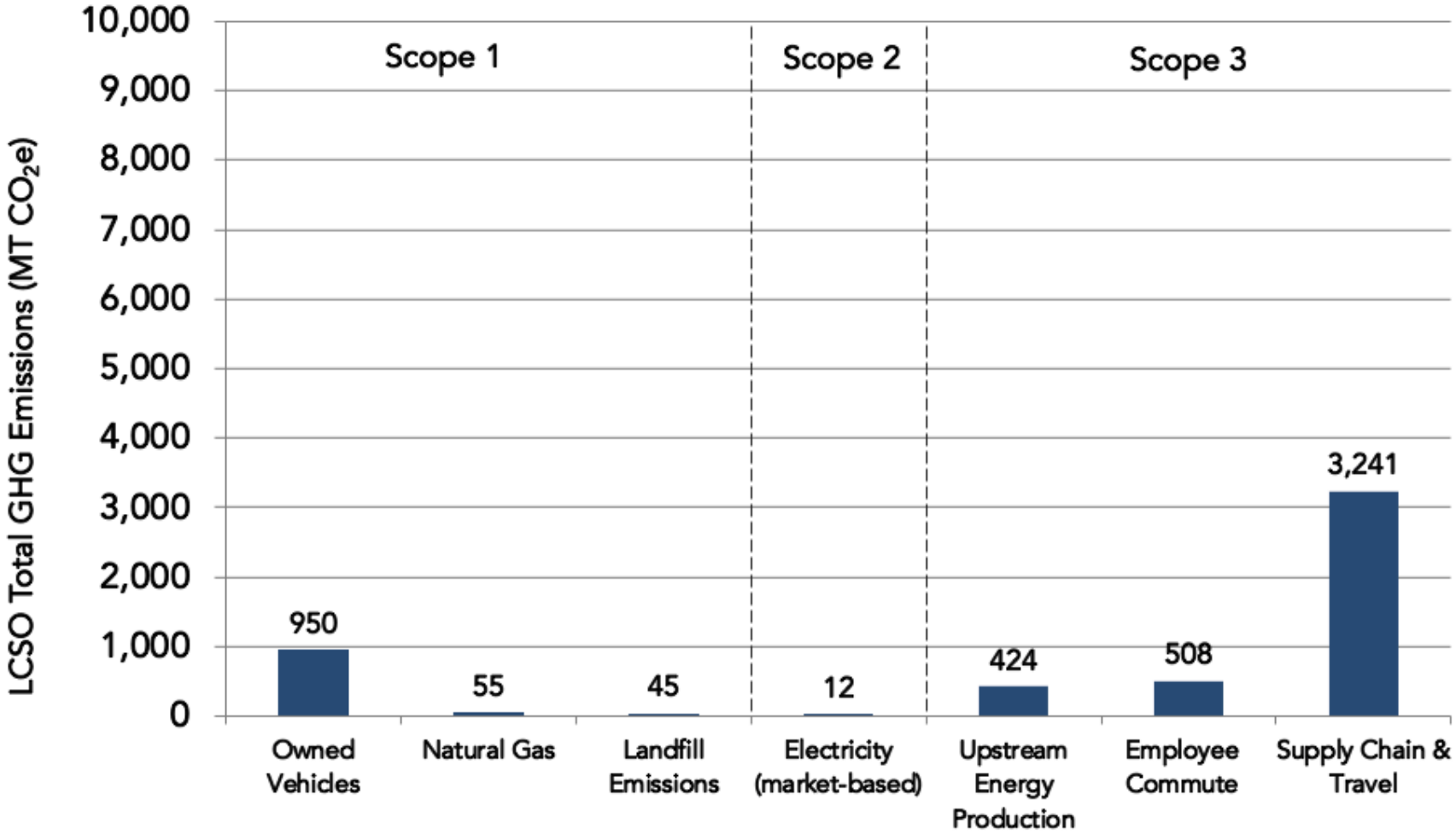


Functional Area Stats:
306 employees
165,000 sq. ft.

GHGs are primarily from:
Vehicle fuel
IT equipment & services
Business services

LCSO's direct GHG emissions are predominantly for owned vehicles. Indirect supply chain emissions are overwhelmingly from the purchase of IT Equipment & Service (928 MT CO_2e), Business & Professional Services (918 MT CO_2e), and the production of Vehicles & Equipment (716 MT CO_2e).

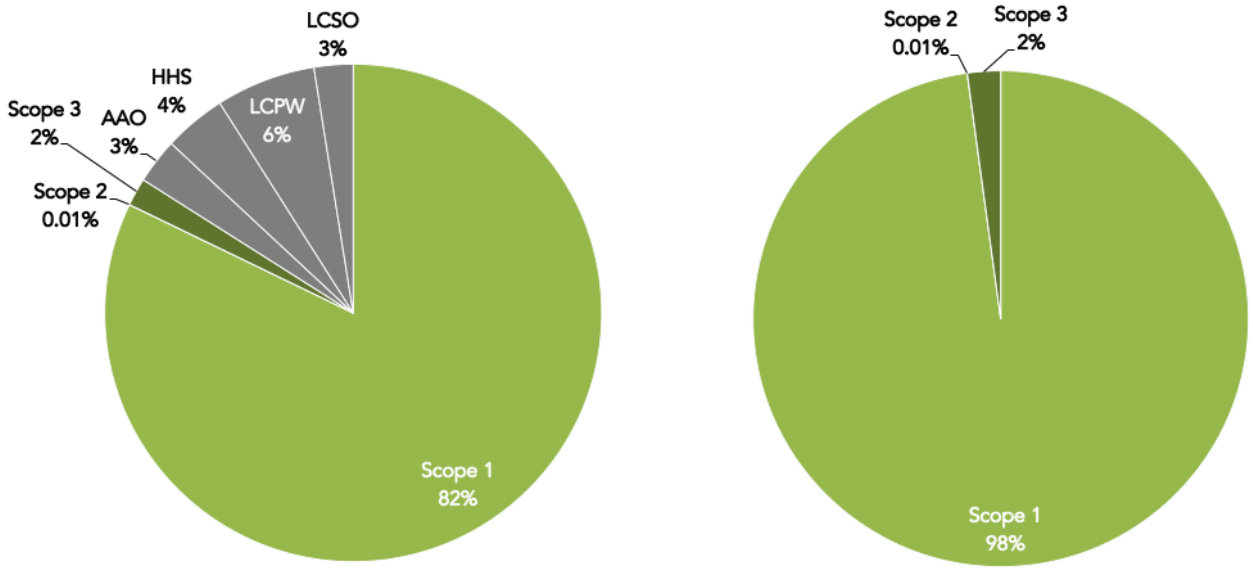
Figure 20: LCSO Detailed GHG Emissions Results by Source and Scope for FY19



Waste Management Division (WMD)

In FY19, WMD generated an estimated **169,455 MT CO_2e** of scope 1 and 2 emissions and approximately **173,544 MT CO_2e** when including scope 3. This amounts to roughly **84% of Lane County's total operational emissions – or 14% when excluding fugitive Landfill emissions**. The vast majority of WMD emissions came from Scope 1 sources as shown in **Figure 21**. This is primarily from Short Mountain Landfill operations **(97%)**. This is in contrast to all the other functional areas where the majority of emissions came from the supply chain. Within supply chain the largest sources of emissions were associated with purchases related to vehicles & equipment **(38%)**, business services **(34%)**, and construction & maintenance **(20%)**. **Figure 22** shows that other sources of Waste Management emissions include supply-chain purchases, use of County-owned vehicles & equipment, and upstream energy production.

Figure 21: WMD GHG Emissions as a Share of Total (left) Emissions and by Scope (right) for FY19

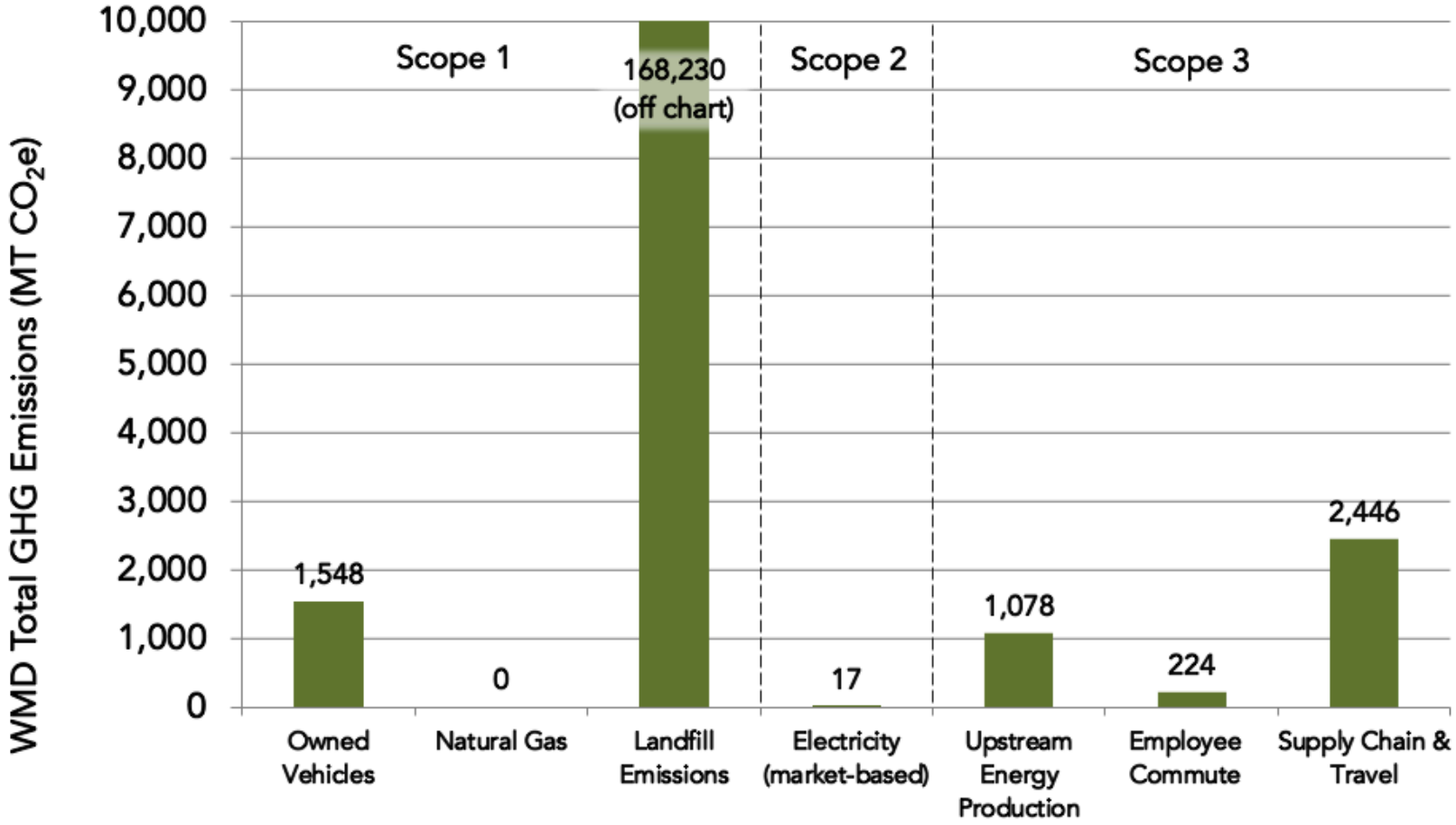


Functional Area Stats:
85 employees
8,500 sq. ft.

GHGs are primarily from:
Short Mountain Landfill fugitive methane
Vehicle fuel
Vehicles & equipment

WMD generates the majority of the County's owned Scope 1 emissions. Overwhelmingly these are the fugitive methane emissions from Short Mountain Landfill. The methane emissions from Short Mountain are more than 5 times greater than all other sources of Lane County total emissions combined. WMD is also a significant source of vehicle & equipment fuel use emission which generate Scope 1 and Scope 3 Upstream emissions from the production of fuels and energy. Indirect supply chain emissions are overwhelmingly from the production of Vehicles & Equipment, IT Equipment & Service, and support from Business & Professional Services. WMD is the only County functional area where direct, owned, Scope 1 emissions are larger than Scope 3, Supply Chain.

Figure 22: WMD Detailed GHG Emissions Results by Source and Scope for FY19



APPENDIX A: METHODS, DATA PROTOCOLS, AND SENSITIVITY ANALYSIS

Methods and data used in the inventory are documented in electronic files of Good Company's Carbon Calculator (G3C) and the FY19 Inventory Audit Trail. A version of G3C was created for each of Lane County's functional areas, which contains detailed data and emissions results beyond what is included in the report. The Audit Trail is a cataloged folder containing all the raw data and related calculation files used in the inventory. Combined, these data sources provide detailed documentation for the inventory and provide guidance for conducting future inventories.

PROTOCOLS AND TOOLS

Lane County's operational GHG inventory follows the Local Government Operations Protocol v1.1 (LGOP)[17] for Scope 1 and Scope 2 emissions sources, as well as guidance, best practices, tools and models from a variety of other sources including: World Resource Institute's (WRI) Scope 2 Guidance, EPA's Climate Leaders, EPA's Waste Reduction Model (WARM), and Oregon Department of Environmental Quality's (DEQ) Purchaser Price Model.

Good Company's Carbon Calculator v4.2 (G3C) was used to calculate all GHG emissions for Lane County's operations. G3C follows the standards set by the LGOP Protocol in its methodology and calculation of emissions. Calculations in G3C are fully transparent and include an audit trail that includes all data and resources used in the inventory.

This inventory includes the "Kyoto gases:" carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), perfluorocarbons (PFCs), nitrogen trifluoride (NF_3) and hydrofluorocarbons (HFCs). HFCs, such as refrigerants were not able to be estimated as data was not readily available, but emissions are expected to be relatively small compared to other emissions sources. Lane County does not use PFCs, NF_3 or SF_6; therefore, those gases are not included. All operational GHG emissions presented in this report are represented in metric tons of carbon dioxide equivalent (MT CO_2e). Quantities of individual GHGs are accounted for in the G3C files used to calculate emissions for this GHG inventory. The GHG calculations use the global warming potentials (GWP) as defined in the International Panel on Climate Change's 5th Assessment Report (IPCC AR5).

[17] For details visit:
https://www.theclimateregistry.org/tools-resources/reporting-protocols/local-goverment-operations-protocol/

METHODS

The following sections briefly describe the data sources and methodology used to calculate emissions. Interested parties should also reference the LGOP protocol which provides method details. The following focuses on noting data sources and details not contained in the protocol.

OWNED VEHICLES AND EQUIPMENT

Data was collected for diesel and gasoline blend fuels using a combination of Fleet Services reporting and sales reports from contracted fuel distributor Carson. Reports provide activity data in gallons of pure gasoline, E10 gasoline, B5 diesel, R20 renewable diesel, R50 renewable diesel, and R99 renewable diesel fuels. The two reports were inconsistent with each other showing different totals by fuel type and functional area. Estimates to fill data gaps were used and reviewed with staff; the higher quantity indicated between the two reports was used for each fuel type and functional area. Due to this data inconsistency, staff indicated that reporting may not be comprehensive.

Propane consumption was estimated using spend analysis, filtered for propane vendors. Activity data in kWh for four electric vehicles was also provided by Fleet Services. Current electricity use for vehicles is small but has potential to grow significantly in the future.

NATURAL GAS

Data was collected using invoices with detailed therm consumption by facility address from sole utility provider Northwest Natural Gas. No offsets are purchased.

LANDFILL OPERATIONS

Short Mountain Landfill emissions reporting is aligned with public reporting by U.S. EPA's Facility Level Information on Greenhouse Gas Tool (FLIGHT) with one modification. The FLIGHT tool uses an older AR4 Global Warming Potential factor for methane while G3C uses the updated AR5 factor; for consistency and accuracy, the methane emissions were converted to reflect the AR5 GWP value for methane.

Bethel-Danebo Landfill data was provided in MT CO_2e by County staff as part of an annual emissions report.

LANE COUNTY OPERATIONS LANDFILLED SOLID WASTE

Data was collected for both operational waste and community landfill waste emissions. Operational waste was calculated in two ways: using invoiced activity data from Sanipac-serviced facilities and by identifying dollars paid to five waste-hauling services (Garten Services, County Transfer & Recycling, Ecosystems Transfer & Recycling, McKenzie Disposal, and Royal

Refuse). Dollars paid to waste services other than Sanipac were multiplied by the Oregon DEQ Purchaser Price Model factor for Waste Management services, adjusted for inflation.

Note that in a number of graphics used in this report Scope 1 landfill emissions includes waste generated in Lane County operations and disposed of in Short Mountain Landfill. It is unusual in an inventory to have an organization with direct control over management of its own solid waste emissions. Most often solid waste from operations is reported as a Scope 3 emissions sources as it is a distinct party managing landfill operation.

ELECTRICITY

Activity data was collected from seven electric utilities: Eugene Water & Electric Board, Springfield Utility Board, Emerald People's Utility District, Blachly-Lane Electric Cooperative, Lane Electric Cooperative, Central Lincoln PUD, and Pacific Power. Data was collected in multiple ways including activity data reports in kWh from utilities (EWEB and SUB), spend data reports from the County with kWh manually entered by staff filtering out LIEAP and OEAP payments to the community (EPUD, Blachly-Lane, Lane Electric, and Central Lincoln), and as spend data estimating kWh filtering out LIEAP and OEAP payments (Pacific Power).

Scope 2 Guidance[18] for electric purchases recommends using two distinct accounting methodologies to calculate electricity-related emissions.

- **Location-based method** (or regional grid) multiplies an organization's electricity use by the average emissions intensity of a specific regional electricity grid that is published by the Environmental Protection Agency (eGRID 2018). Note that over time there may be differences in emissions results for inventory years due to the use of an updated eGRID emissions factor (typically released every two years).

- **Market-based method** (or utility-specific) represents emissions from the electricity procurement contracts that an organization has purposefully chosen. For many, these contracts are with the local electric utility that provides service. Other choices could include selection of a specific electricity utility (in markets with more than one); contracting with a specific supplier (in a Power Purchase Agreement); or the purchase of renewable energy certificates. This accounting method multiplies electric purchases by the emissions factors for specific "contractual instruments" that convey the "environmental attributes" from a specific electricity supplier to the purchaser. This method allows organizations to account for the benefit associated with renewable electricity purchases.

[18] For details visit http://www.ghgprotocol.org/scope_2_guidance.

The Scope 2 Guidance recommends using the Market-based Method for goal tracking. For sensitivity analysis, **Figure 4** is provided to compare location-based results to market-based results (**Figure 3**).

UPSTREAM ENERGY PRODUCTION

Upstream emissions are calculated using Scope 1 and Scope 2 activity data and lifecycle emissions factors calculated to support ODEQ's Clean Fuels Program. Emissions presented here are the difference between Scope 1 emissions and total life-cycle emissions.

EMPLOYEE COMMUTE

Commute emissions were calculated using an online survey sent to all staff. Survey questions included annual number of workdays, commute distance, mode, and reason for mode. Averages were created and entered into G3C based on FY19 staff numbers.

SUPPLY CHAIN: EMBODIED EMISSIONS IN PURCHASED GOODS AND SERVICES, INCLUDING BUSINESS TRAVEL

A life-cycle GHG analysis using Lane County financial data combined with emissions coefficients from ODEQ's *Purchaser Price Model* was conducted for all Lane County purchases, including goods, food, and services. This analysis estimated the upstream GHG emissions generated by raw material extraction, production, and transportation of goods and services, and associated waste disposal, up to the point of product purchase.

RECOMMENDATIONS FOR FUTURE GHG INVENTORIES

- **Establish a building energy tracking system** that tracks electricity and natural gas use by facility. Building energy data was extremely challenging for LC staff to acquire due to the scale of the County's building portfolio and distinct electric utility vendors. A building energy management system would save significant time in the future for GHG and energy use reporting and will also provide a means to identify energy savings and climate action opportunities for County operations. Such a system monitors and controls all energy-related systems from mechanical and electrical equipment in buildings to help realize energy savings and reduce electricity costs.

- **Updated existing fleet fuel accounting system to capture fuel use by fuel type and blend.** There were significant differences between Fleet Services reporting and Carson reporting, and while Fleet Services' was more comprehensive, neither was complete and data did not align. Data is possible to capture in full. Reviewing data collection methodology for gaps and adherence to protocols is recommended, possibly to include staff trainings due to diverse data entry origins.

- **Include other stationary fuels in future inventories,** such as diesel use in backup generators and accurate activity data for propane use. These emissions are anticipated to be small in relative scale to other sources of County emissions. The data is likely available, but available time and resources for the FY19 were prioritized towards collection of electricity and natural gas data and therefore not available for this source.
- **Establish facility and equipment refrigerant data system.** In future inventories work with County staff and equipment service vendors to track refrigerant loss from cooling system by refrigerant type. This data was unavailable for this inventory but should be included in the future to determine the scale of these emissions. It is expected to be a relatively small impact, but this source is organization dependent and therefore should be accounted for accurately as needed to determine scale. Once the scale is understood an appropriate tracking system may be developed given the scale of the emissions.
- **Establish an air travel data system** if the County is interested in actively managing this emissions source. More accurate data is always better in an inventory, but only if the data accuracy matches interest in managing the emissions source. In other words, implementing an accurate data tracking system, if staff time intensive, is only worth the investment if equal time and resource can go towards managing the emissions source.
- **Solid Waste from operations was challenging to collect and relied heavily on estimations from spend data.** Sanipac invoices listed container volume or weight, but this data was not available from other haulers. The County should explore convenient ways to note activity data, such as noting collection volumes and schedules, potentially through contracting language requiring better reporting of waste quantities, or by utilizing the payment voucher system. Waste Management Division data was not available but is transferred to Short Mountain Landfill within their operational control.