

MAZZETTI



Lucile Packard
Children's Hospital
Stanford

2021 GREENHOUSE GAS INVENTORY

Lucile Packard Children's Hospital Stanford
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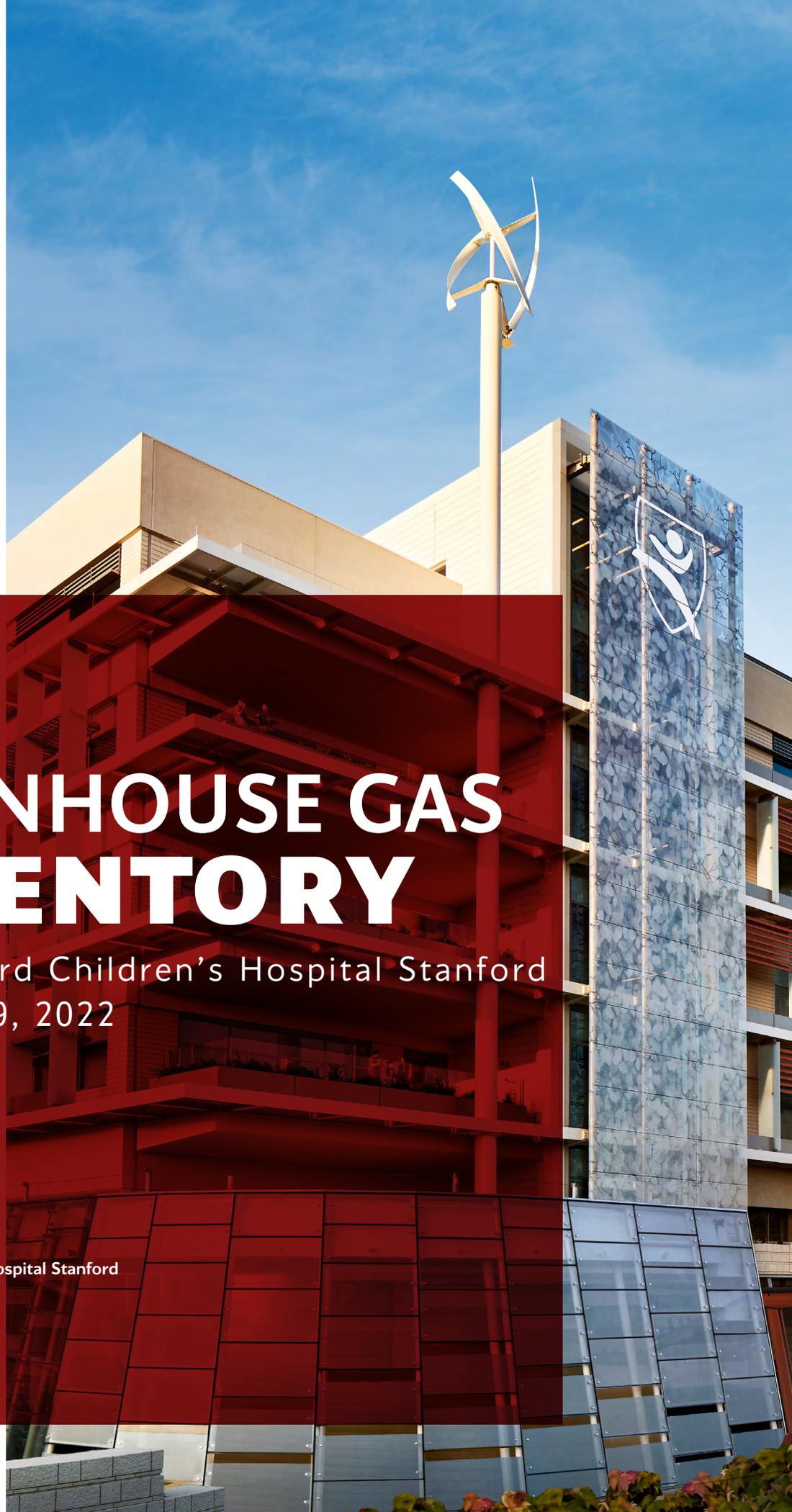


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EXECUTIVE SUMMARY

The following Greenhouse Gas (GHG) inventory was prepared for Lucile Packard Children’s Hospital Stanford by Mazzetti, following the GHG Protocol Corporate Accounting and Reporting Standard. Data was collected on a wide variety of emissions sources and is compiled herein. Mazzetti was also engaged in calculating Scope 3 emissions from Capital Goods and Purchased Goods and services activities which were previously calculated jointly as Supply Chain for preceding years, causing a revision to prior year inventories. Also new for 2021, is the addition of Scope 3 Energy Transmission and Distribution to the scope of LPCH’s inventory. A correction to 2019 and 2020 fleet and solid waste emissions and 2019 refrigerant emissions was made as a result of improved data clarity. This work required the support of numerous stakeholders within LPCH, and Mazzetti is grateful for their time, effort, creativity, and contributions.

Annual Emissions per Scope	2019 (MT CO ₂ e)	2020 (MT CO ₂ e)	2021 (MT CO ₂ e)
Scope 1	2,498	1,142	1,245
Scope 2	3,875	3,728	3,877
Scope 3	135,857	122,277	130,018
TOTAL	142,230	128,157	135,140

METHODOLOGY

The following Greenhouse Gas (GHG) inventory was prepared for Lucile Packard Children’s Hospital Stanford by Mazzetti, following the [GHG Protocol Corporate Accounting and Reporting Standard](#). It includes Scope 1 (direct emissions from owned or controlled sources), Scope 2 (indirect emissions from the generation of purchased energy), and Scope 3 (all other indirect emissions that occur upstream and downstream in the value chain).

Facilities Included in Inventory

- Lucile Packard Children’s Hospital Stanford – Main (New), 725 Welch Road
- Lucile Packard Children’s Hospital Stanford – West, 725 Welch Road

Consolidation Approach

Equity Share

Financial Control

Operational Control

Equity Share: The equity share approach reflects economic interest, which is the extent of rights a company has to the risks and rewards flowing from an operation. Typically, the share of economic risks and rewards in an operation is aligned with the company’s percentage ownership of that operation, and the equity share will normally be the same as the ownership percentage. Under the equity share approach, a company accounts for GHG emissions from operations according to its share of equity in the operation.

Financial Control: Financial control is defined as the ability to direct the financial and operating policies of an operation to gain economic benefits. A company is considered to financially control an operation if it retains the majority risks and rewards of ownership of the operation’s assets.

Operational Control: Operational Control is defined as the authority to introduce and implement operating policies. Based on this definition, it was determined that LPCH has operational control over its facilities. Under the operational control approach, a complete inventory accounts for 100% of emissions from operations under the organization’s control, including owned and leased assets. As a result, this constitutes a partial inventory due to its limitation to the facilities listed above.

Reporting Period Covered by this Inventory:

This inventory spans 01/01/2021 to 12/31/2021. Fiscal year data was annualized to align with calendar year data.

Emissions Sources

Scope 1 emissions sources included in this inventory are On-site Natural Gas, Fleet Vehicles, Generator Fuel, Medical Gas, and Refrigerants.

Scope 2 emissions sources included in this inventory are Purchased Electricity, Central Energy Facility: Electricity for Heating and Cooling, and Central Energy Facility: Natural Gas for Heating.

Scope 3 emissions sources included in this inventory are Capital goods, Purchased Goods and Services, Fuel and Energy Related Activities (not included in scope 1 or 2), Employee Commute, Business Travel, Solid Waste, Wastewater, Patient Transport, and Helicopter Service Fuel.

Scope 3 emissions sources excluded from this inventory are: Upstream transportation and distribution, Upstream leased assets, Processing and use of sold products, End-of-life treatment of sold products, Downstream leased assets, Franchises, and Investments.



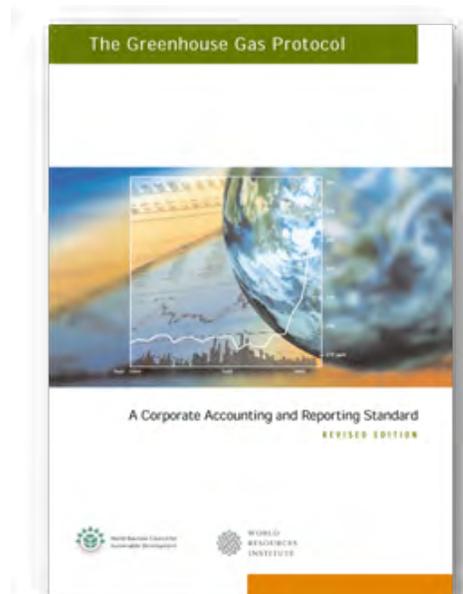
Data Collected

The following data types were collected and analyzed to complete this inventory:

- Building type, size, and age
- Utilities: Utility providers (electricity and gas) and utility bills (annual) for all buildings
 - » Electricity - City of Palo Alto Utility (CPAU)
 - » Natural gas - City of Palo Alto Utility (CPAU) and Pacific Gas and Electric (PG&E)
 - » Chilled water - Stanford Central Energy Facility (CEF)
 - » Heating water - Stanford Central Energy Facility (CEF)
- Electricity: Municipal utility renewable energy certificate information (2021 information not yet available, 2020 information used for this report)
- Steam: Steam is purchased from SHC, and the usage data is collected and used to determine the steam allocation to LPCH buildings and to determine the allocation of the steam plant diesel generator
- Fleet vehicles: Fuel mileage and consumption records (gallons consumed) for all owned vehicles to include cars and any other fossil fuel-burning mobile equipment
- Helicopters (contracted): flight hours and fuel burn rate and estimated volume of trips to be associated with LPCH use
- Diesel generators: Fuel consumption records (annual) for emergency diesel generators
- Anesthetic gases: Anesthetic gas purchase records (annual) and recovery records
- Refrigerants: Refrigerant recharge logs
- Patient Travel: Anonymized patient in-person encounter data with zip codes
- Employee Travel: Annual transportation survey results
- Waste: Waste volumes by type, treatment method, hauling distance, and frequency
- Wastewater: Wastewater volume, municipal utility greenhouse gas reporting, municipal utility total volume treated
- Business Travel: Dollars spent on various transportation modes
- Capital Goods: General ledger reporting for capital procurement expenses
- Supply Chain: General ledger reporting for non-personnel expenses
- Fuel and Energy Related Emissions: Central Energy Facility reporting on transmission losses

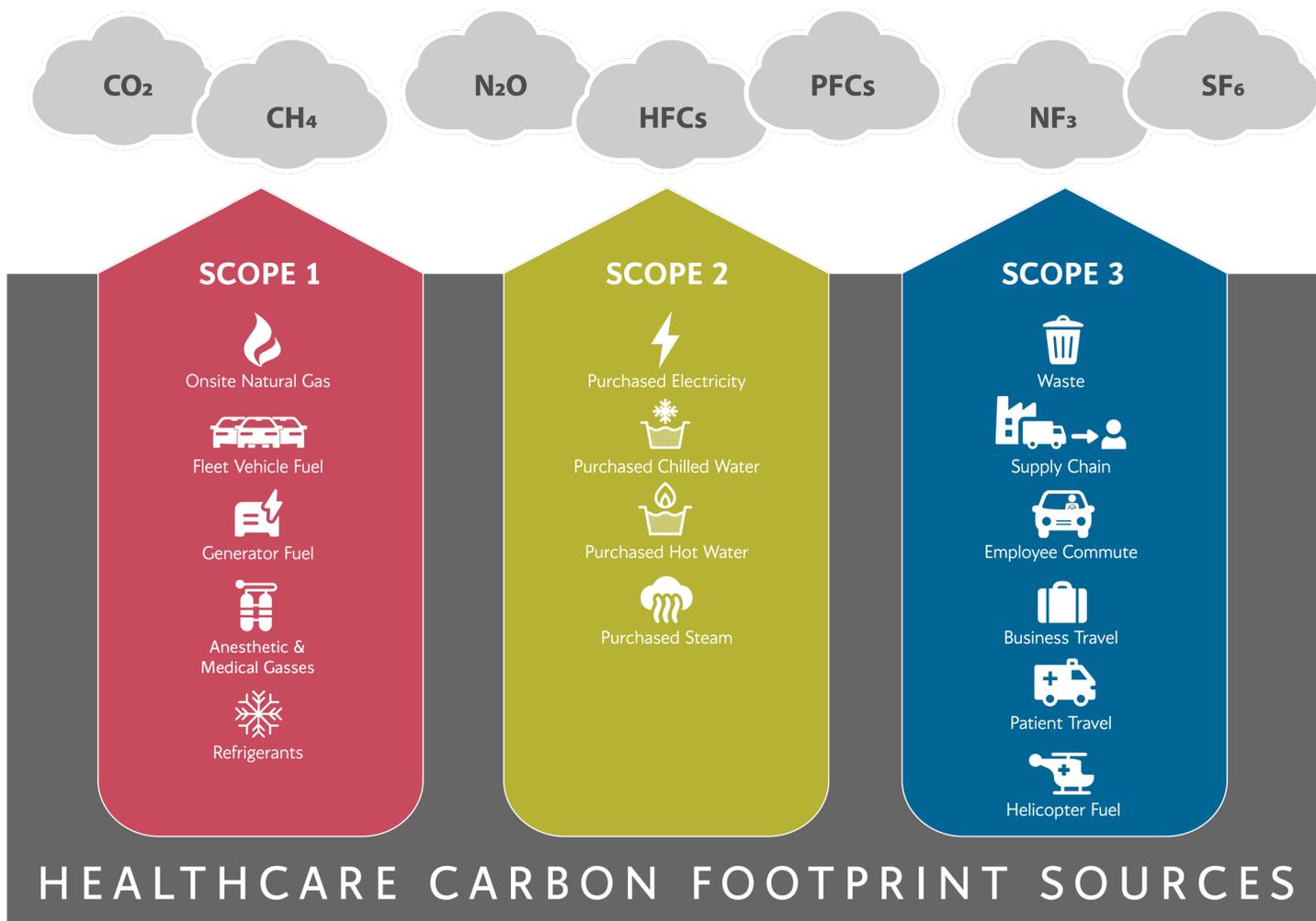
Standards Applied

This GHG inventory was compiled following the GHG Protocol Corporate Accounting and Reporting Standard, revised edition, published by the World Resource Institute in 2015.



Background on Scope 1, 2, & 3 Emissions

Emissions are categorized into three scopes. Scope 1 emissions are direct emissions from stationary sources such as natural gas boilers, mobile sources such as fleet vehicles, and fugitive unintentional emissions like refrigerant loss and anesthetic gas use. Scope 2 is reserved for purchased energy such as electricity or chilled water and hot water supplied from an outside source. Scope 3 sources are indirect emissions that are both upstream and downstream from the reporting entity. Examples of Scope 3 emissions are employee commuting and the disposal of waste products. Scope 3 emissions are another entity's Scope 1 or 2 emissions that support the reporting entity's operations.



Global Warming Potential (GWP)

GWP values from the Intergovernmental Panel on Climate Change (IPCC) fifth assessment report (AR5) are used when calculating metric tons of CO₂e.

Greenhouse Gas	GWP
CO ₂	1
CH ₄	28
N ₂ O	265
HFC's	1,300 - 4,000
Desflurane	2540
Isoflurane	510
Sevoflurane	130

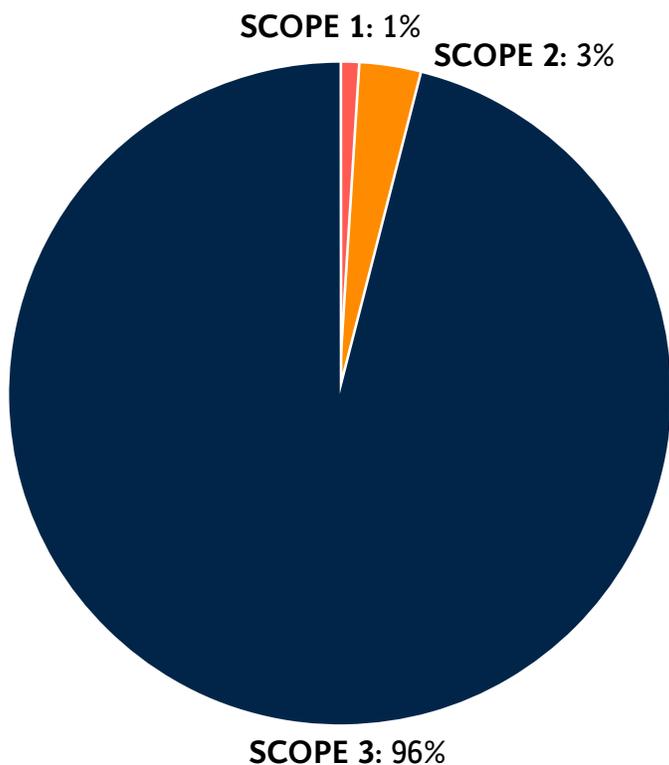
EMISSIONS SUMMARY

2021 Emissions Summary

EMISSIONS	TOTAL* (mtCO ₂ e)	CO ₂ (mt)	CH ₄ (mt)	N ₂ O (mt)	HFCs (mt)	PFCs (mt)	SF ₆ (mt)
SCOPE 1	1,245	854.91	0.07	1.41	14.00	0.00	0.00
SCOPE 2	3,877	3,847.89	0.37	0.07	0.00	0.00	0.00
SCOPE 3	130,018						
TOTAL SCOPE 1,2,3 EMISSIONS	135,140						

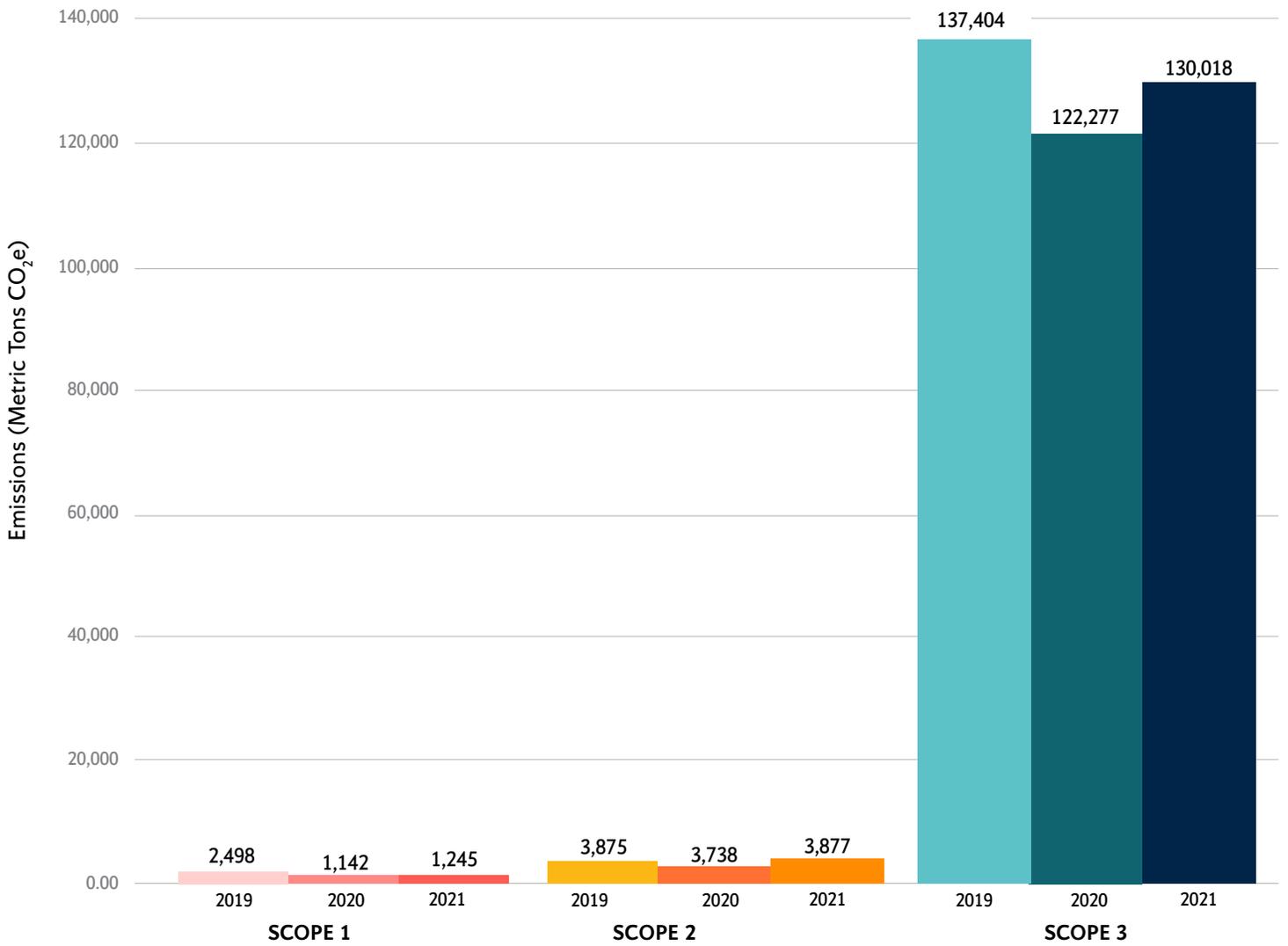
*The total metric tons of CO₂e is calculated by multiplying each greenhouse gas by its GWP

2021 TOTAL EMISSIONS BREAKDOWN (METRIC TONS OF CO₂e)

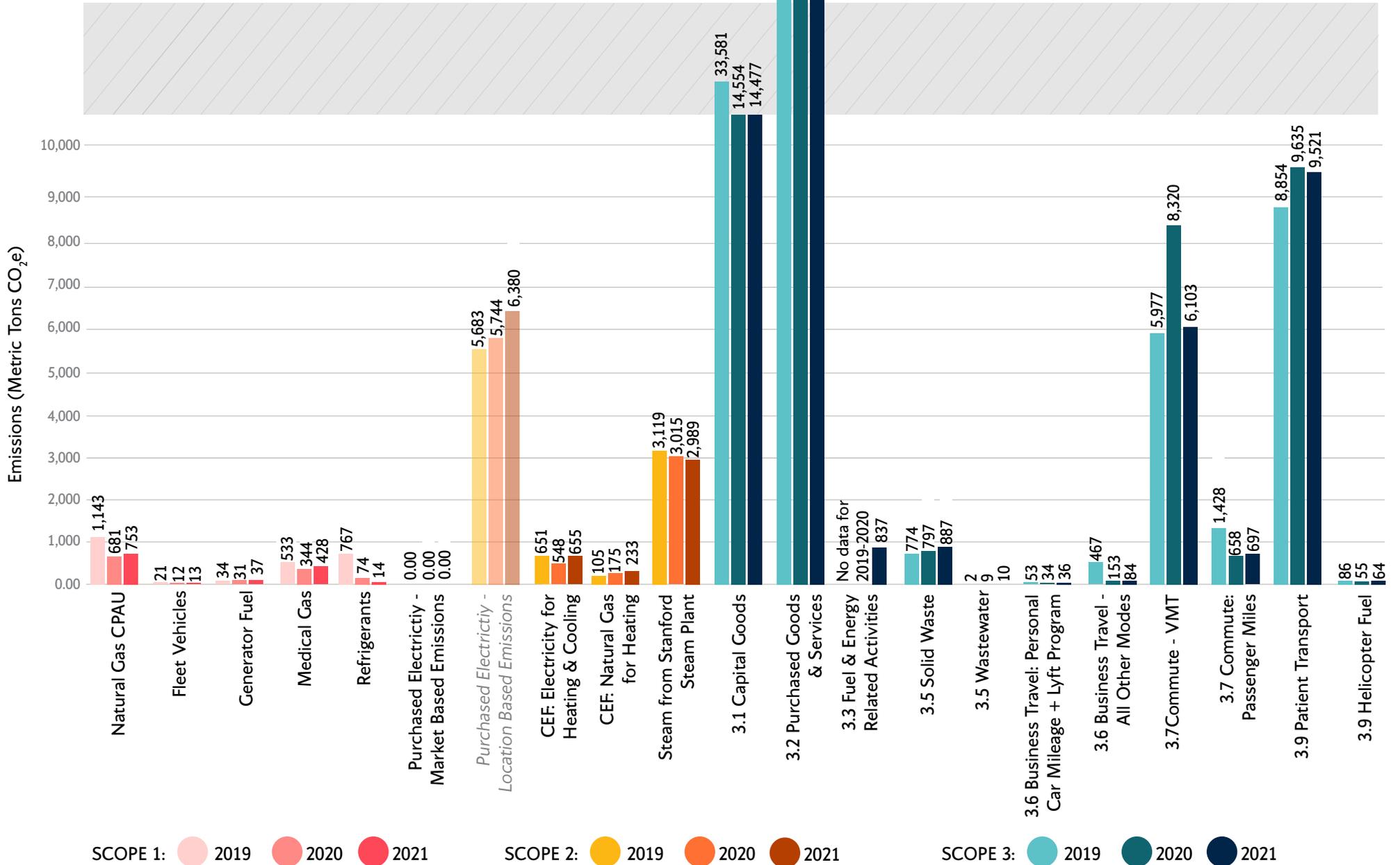


YEAR OVER YEAR COMPARISON

2019 - 2021 EMISSIONS COMPARISON BY SCOPE



2019 - 2021 EMISSIONS COMPARISON BY SOURCE



EMISSIONS DETAIL

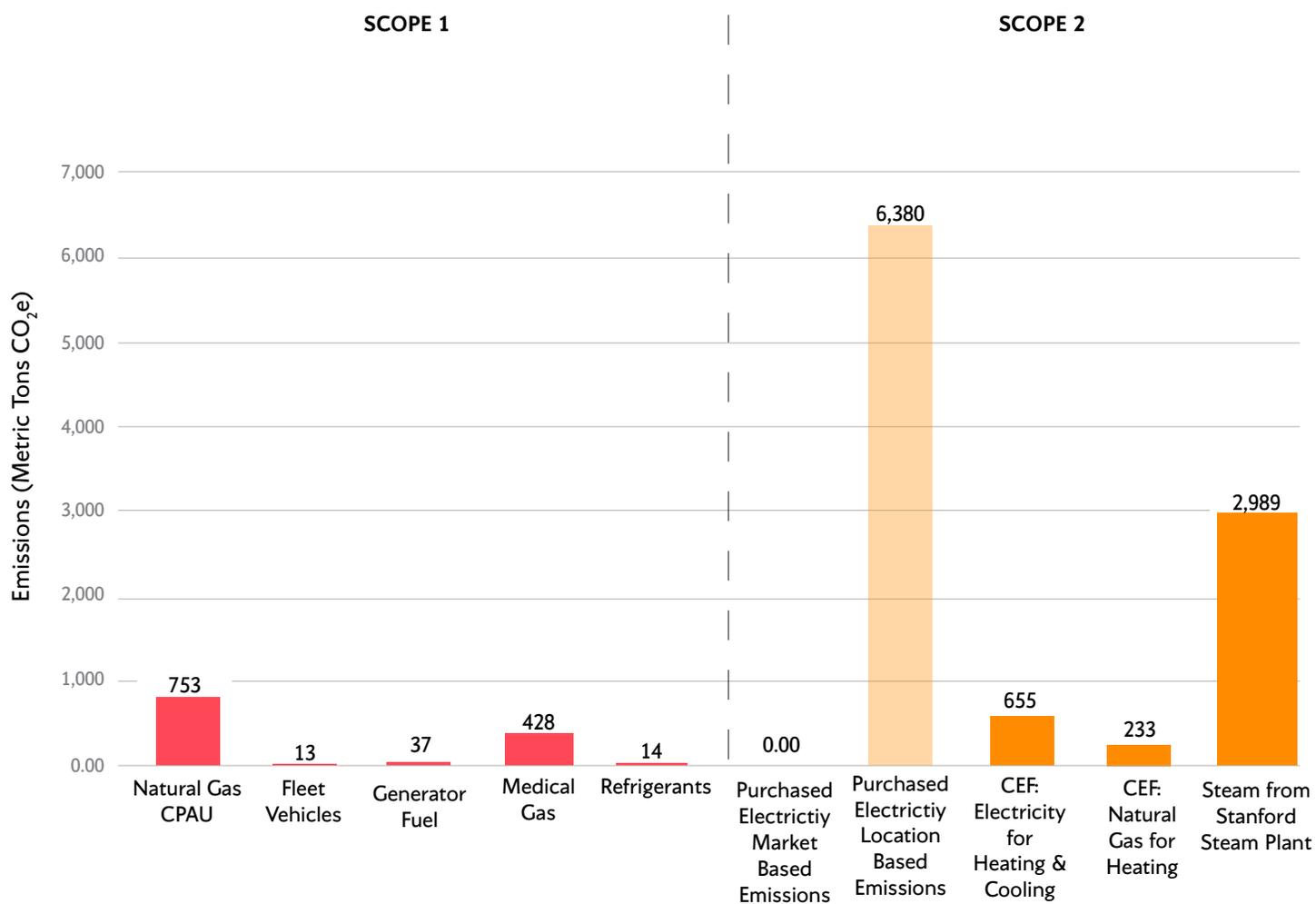
2021 EMISSIONS DETAIL

EMISSIONS	TOTAL* (mtCO ₂ e)	CO ₂ (mt)	CH ₄ (mt)	N ₂ O (mt)	HFCs (mt)	PFCs (mt)	SF ₆ (mt)
SCOPE 1:	1,245	854.91	0.07	1.41	14.00	0.00	0.00
On-site Natural Gas	753	747.57	0.07	0.01	0.00	0.00	0.00
Fleet Vehicles	13	12.90	0.00	0.00	0.00	0.00	0.00
Generator Fuel	37	36.54	0.001	0.002	0.00	0.00	0.00
Medical Gas	428	57.90	0.00	1.39	0.00	0.00	0.00
Refrigerants	14	0.00	0.00	0.00	14.00	0.00	0.00
SCOPE 2:	3,877	3,847.89	0.37	0.07	0.00	0.00	0.00
Purchased Electricity - Market Based Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Purchased Electricity - Location Based Emissions**</i>	6,380	6,352.09	0.46	0.06	0.00	0.00	0.00
CEF: Electricity for Heating and Cooling	655	649.50	0.09	0.01	0.00	0.00	0.00
CEF: Natural Gas for Heating	233	231.98	0.02	0.0004	0.00	0.00	0.00
Steam from Stanford Steam Plant	2,989	2,966.41	0.26	0.0559	0.00	0.00	0.00
SCOPE 3:	130,018						
3.1 Capital Goods	14,477						
3.2 Purchased Goods and Services	97,302						
3.3 Fuel and Energy Related Activities	837						
3.5 Waste	887						
3.5 Wastewater	10						
3.6 Business Travel- Personal Vehicle Mileage	36						
3.6 Business Travel- All Other Modes	84						
3.7 Employee Commuting- Vehicle Miles Traveled	6,103						
3.7 Employee Commuting- Other Modes	697						
3.9 Patient Transport	9,521						
3.9 Helicopter Fuel	64						
Total Scope 1,2,3 Emissions	135,140						

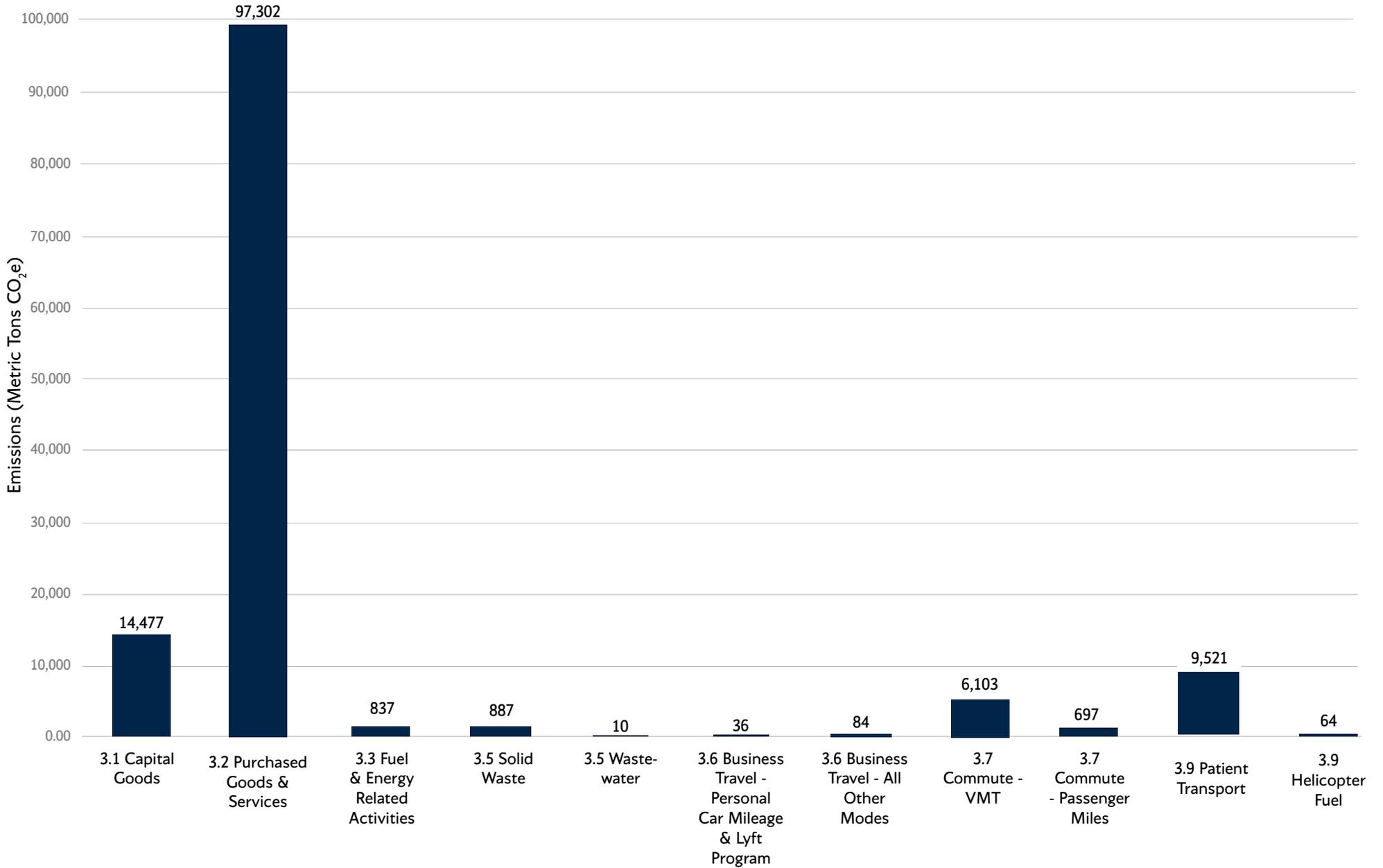
*The total metric tons of CO₂e is calculated by multiplying each greenhouse gas by its GWP. Table totals inclusive of rounding margin.

** The GHG Corporate Protocol requires reporting of both location and market-based emissions. Purchased Electricity – Location Based Emissions shows the estimated emissions for purchased electricity based on the listed emissions factor for the EPA’s CAMX eGrid subregion which averages the electricity emissions factors for most of the state of California. Purchased Electricity - Market-Based Emissions use emission factors from the specific utility providing the power to LPCH. These are shown as zero due to [CPAU’s 100% renewable power generation](#).

2021 SCOPE 1 & 2 EMISSIONS BREAKDOWN

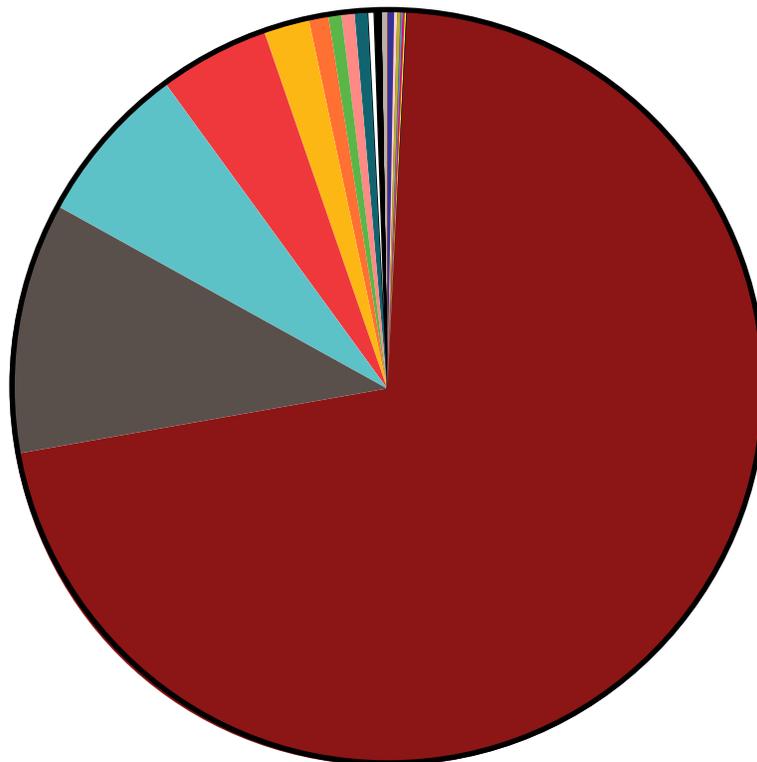


2021 SCOPE 3 EMISSIONS BREAKDOWN



The following table lists emissions sources from highest percentage of total emissions to lowest. This list should be used to prioritize action, tackling larger emissions sources first.

2021 EMISSIONS	% OF TOTAL EMISSIONS
Scope 3.2: Purchased Goods and Services	72.00% ●
Scope 3.1: Capital Goods	10.71% ●
Scope 3.9: Patient Transport - All Modes	7.05% ●
Scope 3.7: Employee Commuting- Vehicle Miles Traveled	4.52% ●
Scope 2: Steam from Stanford Steam Plant	2.21% ●
Scope 3.5: Waste	0.66% ●
Scope 3.3: Fuel and Energy Related Activities	0.62% ●
Scope 1: On-site Natural Gas	0.56% ●
Scope 3.7: Employee Commuting - Other Modes	0.52% ●
Scope 2: CEF: Electricity for Heating and Cooling	0.52% ○
Scope 1: Medical Gas	0.32% ●
Scope 2: CEF: Natural Gas for Heating	0.17% ●
Scope 3.6: Business Travel - All Other Modes	0.06% ●
Scope 3.9: Helicopter Fuel	0.05% ●
Scope 1: Generator Fuel	0.03% ●
Scope 3.6: Business Travel - Personal Vehicle Mileage	0.03% ●
Scope 1: Refrigerants	0.01% ●
Scope 1: Fleet Vehicles	0.01% ●
Scope 3.5: Wastewater	0.01% ●
Scope 2: Purchased Electricity - Market-Based Emissions	0.00% —



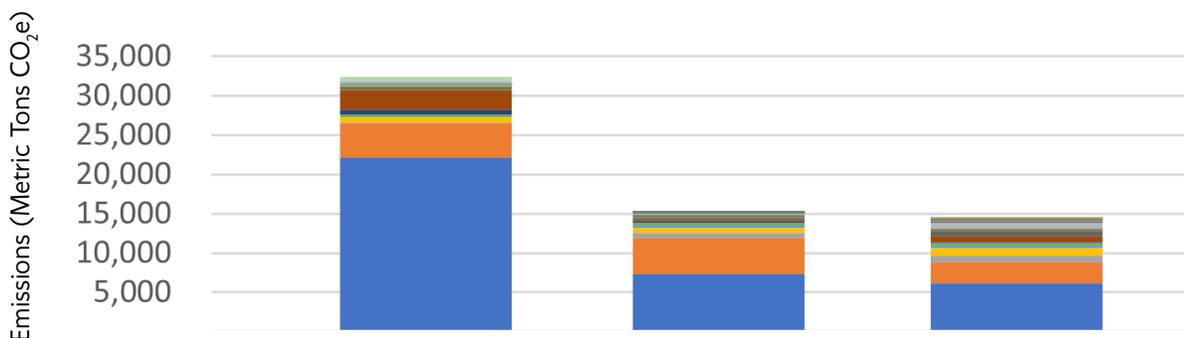
Scope 3: Capital Goods and Purchased Goods and Services Summary

Scope 3.1 Capital Goods and Scope 3.2 Purchased Goods and Services were analyzed separately for the first time in this year's inventory cycle, assessing both the current year as well as 2019 and 2020.

Scope 3.1 Capital Goods Summary

The capital expenditure data was provided in fiscal year but was annualized to align with calendar year. Capital expenditures in 2019 were significantly higher than in subsequent years as a result of the increase in construction projects and the increase in the purchase of medical equipment. 2020 and 2021 are likely atypical years due to the Covid-19 pandemic. To ensure accuracy and to avoid double counting, categories labeled discount, medical gas, and LPCH expenditures were excluded.

SCOPE 3.1 CAPITAL GOODS EMISSIONS



	2019	2020	2021
● Accounts Payable invoices	513	(653)	59
● Fixed Equip. - External charges	4	(10)	(42)
● Signage operating exp.	-	(4)	-
● Software - Purchases	5	(0)	-
● Misc. capital - equipment	2	-	21
● Misc. capital - building	194	-	44
● Testing & Bal Capt-Bldg	-	-	(0)
● Software - consultants	7	-	(20)
● Other permit fees oper exp	-	-	(0)
● Office supplies	-	-	0
● Medical products	-	-	2
● Medical equipment storage	-	-	2
● IT support capital - building	-	-	24
● Furnishings	94	-	-
● FixedEquip - Internal charges	7	-	-
● External assistance staff	19	-	(31)
● Engineer & Maint support exp	-	-	5
● Shipping	-	0	1
● Subscription	-	0	-
● Security Equip Capital	10	1	-
● Computer hardware	12	1	95

● External labor costs	17	2	38
● Vehicles	-	2	-
● Electronics	6	2	12
● Contingency capital	-	2	-
● Purchasing - cards	-	2	-
● Inspector of record capt. Bldg.	2	2	-
● Misc. operating expenses	13	5	1
● Internal payroll	-	8	-
● Internal labor costs	9	9	16
● Comm equipment hardware	37	10	87
● Architect capital - building	39	14	47
● Construction capital	66	18	-
● Software - Internal labor costs	51	19	51
● Furniture capital	27	25	163
● Internal charges	(25)	32	62
● Misc. external charges	127	35	1
● Hardware implementtion internal labor costs	(8)	35	70
● Prof. services consultants exp	-	38	-
● External charges	24	43	701
● Conversion capital	(185)	44	-
● Software capital	36	50	80
● Comm. equipment - software	4	94	-
● Capital costs	185	136	11
● Software - External labor cost	205	139	162
● Medical furniture & fixtures	13	187	633
● Medical equipment	2,375	201	817
● Hardware implementation ext. labor costs	680	232	76
● Bldg. - Internal charges	310	258	309
● Office furniture & fixtures	(143)	343	383
● Construction contracts - Bldg.	685	620	938
● Equipment capital	112	664	834
● Hardware infrastructure capital	4,368	4,561	2,623
● Bldg. - External charges	22,135	7,388	6,202

Scope 3.2 Purchased Goods and Services

Mazzetti received LPCH purchasing data that summarized the hospital's non-labor expenses for 2019 -2021. Each line item was matched with a summary level or detail level category from the [EPA Supply Chain Greenhouse Gas Emissions Factors for US Industries and Commodities' Dataset v1.1](#). Expenses such as Medical Waste Processing, Travel expenses, and Utilities data were excluded because they are covered in Scope 3.5: Waste Treatment, Scope 3.6 Business Travel, and Scope 1 and 2 Energy Emissions.



	2019	2020	2021
● Soap & Cleaning Compounds	139	(18)	(19)
● Vaccines and other biological products	0	0	(1)
● Other textiles	10	11	2
● Clothing	(13)	16	14
● Investment advice, portfolio management, & other financial advising services	42	44	48
● Educational Services	58	56	33
● Printing & related support activities	94	69	52
● Funds, trusts, & other financial vehicles	24	77	117
● Grantmaking, giving, & social advocacy orgs.	121	93	71
● Food services & drinking places	264	97	82
● Legal services	156	181	169
● Misc. professional, scientific, & technical services	(40)	244	110
● Administrative & support services	312	273	171
● Insurance carriers & related activities	280	353	339
● Management Consulting	743	354	411
● Postal Service	385	408	431
● Computer & electronic products	534	532	323
● Marketing reserach & all other misc. professional, scientific, & technical services	737	568	677
● Civic, social, professional & similar orgs.	575	573	685
● Telecommunications	598	590	604
● Software	907	1,123	1,095
● Employment services	1,495	1,399	1,197
● Surgical appliance & supplies	1,465	1,610	2,258
● Office supplies (not paper)	2,068	1,932	1,824
● Social assistance	2,009	2,088	2,473
● Food, beverage, & tobacco products	3,491	3,075	2,738
● Compressed gases	3,783	4,329	2,735
● Nonresidential building repair & maintenance	9,439	7,698	9,196
● Pharmaceutical products (pills, powders, solutions, etc.)	9,334	12,051	15,789
● Other real estate	11,031	13,115	13,245
● Hospitals	36,043	35,131	40,431

METHODOLOGY DETAIL

Scope 1

Scope 1 Emission Sources	Description of the types, sources, and quality of data used to calculate emissions	Description of the methodologies, allocation methods, and assumptions used to calculate emissions
 <p>On-site Natural Gas</p>	<p>Natural gas data was pulled from Key Green Solutions. LPCH Main gets its On-site Natural gas from CPAU (City of Palo Alto Utilities).</p>	<p>Natural gas emissions factors came from the Climate Registry 2021 Default Emissions Factor Document. However, CPAU provides 100% carbon neutral natural gas to their customers and offers the ability to claim zero CO₂e emissions for all of their usage. They achieve this by purchasing carbon offsets to balance the emissions from natural gas usage in Palo Alto. Since it is still on-site combustion, LPCH treats it as if there are no offsets in place so it can focus on reduction. All natural gas emissions are shown in the 2021 GHG Inventory.</p>
 <p>Fleet Vehicles</p>	<p>Fleet vehicle data included in this report only includes the fleet vehicles owned by LPCH. It is understood that LPCH also uses fleet vehicles owned by LPCH but those have been included in LPCH's GHG Inventory and will not be accounted for in this report. The fleet vehicle data collected for LPCH includes the amount spent data (2019 -2020) and fuel usage data (2021) for diesel and unleaded vehicles.</p>	<p>2019 and 2020 fleet vehicles data were provided in dollar amount spent and were converted to gallons using the EIA 2019 and 2020 average retail price for gasoline and diesel. This change in data methodology resulted in corrections to 2019 and 2020 data. The emission factor used for the converted 2019-2020 data and the 2021 fuel usage data came from the GHG Protocol Mobile Combustion tool version 2.6. The emissions factors in the tool are aligned with the 2014 IPCC Fifth Assessment Report (AR5).</p>
 <p>Generator Fuel</p>	<p>Diesel fuel data was provided by LPCH and the Bay Area Air Quality Management District (BAAQMD) Report. For shared LPCH/LPCH generators (12KV and Steam Plant), a 70/30% split percentage was applied to the diesel fuel used.</p>	<p>The diesel fuel emission factors came from the EPA GHG emission factors hub.</p>
 <p>Medical Gas</p>	<p>Medical nitrous oxide and carbon dioxide data was provided by Praxair Healthcare Services. Desflurane, sevoflurane, and isoflurane data were pulled from Stanford Supply Chain and only deliveries to LPCH were included.</p>	<p>Weights per purchased quantities were used to calculate total weight for nitrous oxide and carbon dioxide. 100-year Global Warming Potentials for desflurane, sevoflurane, and isoflurane came from: Assessing the Impact on Global Climate from General Anesthetic Gases. LPCH Main does employ a WAGD medical gas capture system but specific data for that system is still being researched for accounting purposes. It was assumed that 90% of the emitted medical gases (95% of the total) in LPCH Main were captured by the WAGD system.</p>

 <p>Refrigerants</p>	<p>Refrigerant data was provided by the LPCH Engineering and Maintenance team using the refrigerant usage records.</p>	<p>The GHG Protocol Approach 2: Lifecycle Stage Approach was used to calculate emissions. From the equipment owner and operator’s standpoint, refrigerants are being used to recharge equipment and it is assumed that the value of refrigerants being added is equal to that that is being lost through leakage. According to GHG Protocol, CFCs and HCFCs may be omitted since they are being phased out by the Montreal Protocol. They were omitted in this inventory.</p>
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Scope 2

Scope 2 Emission Sources	Description of the types, sources, and quality of data used to calculate emissions	Description of the methodologies, allocation methods, and assumptions used to calculate emissions
 <p>Purchased Electricity - Market Based Emissions</p>	<p>Electricity data is from Key Green Solutions. Electricity for LPCH Main and West is sourced from CPAU (City of Palo Alto Utilities).</p>	<p>Annual market-based emissions factors are provided by the utility, CPAU. However, CPAU provides 100% carbon neutral electricity by matching electricity demand with carbon free supply on an annual basis. This offers their customers the ability to claim zero CO2e emissions for all their usage.</p>
 <p>Purchased Electricity - Location Based Emissions</p>	<p>Electricity data is from Key Green Solutions. Electricity is sourced from CPAU (City of Palo Alto Utilities).</p>	<p>Annual location-based emissions factor was found using the EPA’s eGrid Explorer tool on their website. The emissions factor is based on the CAMX region for 2020, which was the most current date available.</p>
 <p>CEF: Electricity for Heating and Cooling</p>	<p>LPCH Main receives chilled water and heating hot water, and LPCH West receives chilled water from Stanford University’s (SU) CEF plant. Stanford University provided a breakdown for LPCH buildings in terms of electricity consumption for chilled water and heating water.</p>	<p>Stanford University’s Office of Sustainability & Energy calculated emissions from the CEF plant and provided a breakdown for all LPCH buildings.</p>
 <p>CEF: Natural Gas for Heating</p>	<p>Energy data for the steam plant and the steam consumption breakdown per building were pulled from Key Green Solutions. Steam is provided to LPCH West from SHC’s steam plant located at 901 Quarry. At LPCH West, the steam produces heating hot water for building heating, domestic hot water, and direct steam for humidification.</p>	<p>The emissions for the steam plant were calculated using electricity (CPAU) and natural gas (PG&E) that is supplied to the steam plant. The steam plant serves Stanford Health Care, LPCH West, and the School of Medicine. A breakdown percentage based on the steam meters was used to determine the energy and emissions for each facility. Based on the breakdown from 2019, LPCH is responsible for a 25.8% share. The steam meters had reporting errors in 2020 and 2021 causing the steam use breakdown to be inaccurate. A decision was made by the client to continue using the steam breakdown from 2019 in the 2020 and 2021 GHG Inventories.</p>

 <p>Steam from Stanford Steam Plant</p>	<p>Energy data for the steam plant and the steam consumption breakdown per building were pulled from Key Green Solutions. Steam is provided to LPCH West from LPCH’s steam plant located at 901 Quarry. At LPCH West, the steam produces heating hot water for building heating, domestic hot water, and direct steam for humidification.</p>	<p>The emissions for the steam plant were calculated using electricity (CPAU) and natural gas (PG&E) that is supplied to the steam plant. The steam plant serves Stanford Health Care, LPCH West, and the School of Medicine. A breakdown percentage based on the steam meters was used to determine the energy and emissions for each facility. Based on the breakdown from 2019, LPCH is responsible for a 25.8% share. The steam meters had reporting errors in 2020 and 2021 causing the steam use breakdown to be inaccurate. A decision was made by the client to continue using the steam breakdown from 2019 in the 2020 and 2021 GHG Inventories.</p>
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Scope 3

Scope 3 Emission Sources	Description of the types, sources, and quality of data used to calculate emissions	Description of the methodologies, allocation methods, and assumptions used to calculate emissions
 <p>1. Capital Goods</p>	<p>Expense data was provided by LPCH via general ledger reporting.</p>	<p>Expenses were matched with the categories and emissions factors from the EPA Supply Chain Greenhouse Gas Emissions Factors for US Industries and Commodities’ Dataset v1.1</p>
 <p>2. Purchased Goods & Services</p>	<p>Expense data was provided by LPCH via general ledger reporting.</p>	<p>Expenses were matched with the categories and emissions factors from the EPA Supply Chain Greenhouse Gas Emissions Factors for US Industries and Commodities’ Dataset v1.1. Expenses such as Medical Waste Processing, Travel expenses, and Utilities data were excluded because they are covered in Scope 3.5: Waste Treatment, Scope 3.6 Business Travel, and Scope 1 and 2 Energy Emissions.</p>

 <p>3. Fuel and Energy Related Activities</p>	<p>Electricity data is from Key Green Solutions. Electricity is sourced from CPAU (City of Palo Alto Utilities). Stanford Central Energy Facility (CEF) plant provides chilled water and heating hot water for LPCH. The CEF provided thermal distribution losses for chilled and hot water systems, as well as in-plant electricity losses.</p>	<p>Upstream Emissions of Purchased Fuels: The emissions associated with the extraction, production, and transportation of natural gas, diesel, and gasoline are reported in Scope 1 emissions using emissions factors from the UK Department for Business, Energy, and Industrial Strategy’s 2022 Greenhouse Gas Reporting Conversion Factors. US-based factors are not available via the EPA or other trusted US sources.</p> <p>Upstream Emissions of Purchased Electricity: Directly purchased electricity has no extraction, production, or transportation emissions, however indirectly purchased electricity (PG&E- supplied electricity used at CEF) does result in emissions. Emissions were calculated using the UK factors for overseas US electricity production.</p> <p>Transmission and Distribution (T&D) Losses: Because directly purchased electricity is 100% renewable, there are no resulting T&D loss emissions. There are, however, T&D losses for indirectly purchased electricity, CEF plant losses, and thermal energy losses that occur. Grid losses were calculated at 5.3% per the EPA eGrid Western region grid losses, the CEF reports that 2% of electricity is lost in production at CEF and that the hot water thermal loss is 4% and is 6% for chilled water.</p>
 <p>4. Solid Waste</p>	<p>Waste tonnage data is from Key Green Solutions. A 21% allocation for LPCH landfill, biohazardous waste, municipal recycling, and compost is applied in Key Green Solutions. Hauling distance and frequency came from the LPCH Waste Index spreadsheet.</p>	<p>Emission factors came from the EPA GHG emission factors hub. Assumptions include diesel as the hauling fuel and to-and-from hauling distances. “Average” hauling distances are included in the EPA emissions factors, but this distance is not disclosed and, although requested, has not been received as of the time of writing. Without this data point, Mazzetti took the conservative approach of including all estimated miles traveled in calculations. Compacted waste hauling distances were calculated using round trip miles as the compactor is returned to campus after each service. Other wastes were calculated using one-way trip distances.</p>
 <p>5. Wastewater</p>	<p>Wastewater data is from Key Green Solutions and estimated at 95% of total water consumption.</p>	<p>A revision was made to 2019-2020 inventory to include wastewater emissions, and emission factor calculation is based on CPAU’s reported wastewater emissions/volume of wastewater treated.</p> <p>At the time of writing, CPAU had yet to publish its 2021 wastewater emissions. As a result, 2021 emissions factors were calculated based on CPAU’s 2020 reported wastewater emissions/ volume of wastewater treated in 2021.</p>

 <p>6. Business Travel - Personal Car Mileage</p>	<p>Business travel data (personal Car) was provided by Account Payable, in the form of dollars spent. If mileage can be collected in the future, this will provide for more accurate emissions estimates.</p>	<p>The spend-based method was used to estimate emissions, using secondary EEIO (environmentally extended input-output) factors from the EPA GHG emission factors hub</p>
 <p>6. Business Travel - All Other Modes</p>	<p>Business travel data (all other modes) was provided by Account Payable, in the form of dollars spent.</p>	<p>The spend-based method was used to estimate emissions, using secondary EEIO (environmentally extended input-output) factors from the EPA Supply Chain GHG Emission Factors for US Industries and Commodities. Transportation modes were aligned with the best available emission factors e.g. “Rail” emissions factors were used for train/subway spending).</p>
 <p>7. Employee Commute - Vehicle Miles Traveled (VMT)</p>	<p>The VMT from the 2019 report to the City of Palo Alto was scaled to 24.52% (percentage of LPCH Population excluding LPCH) to include LPCH employees who work 20 hrs/wk or more. The VMT includes mileage from survey responses: drive alone, vanpools, and carpools. Distances were estimated using the NBER Code Distance Database.</p>	<p>The Passenger Car (fuel unknown) emission factors were used from the EPA GHG emission factors hub. Assumptions include 48 work weeks per year, 2 trips per day, 2 persons per carpool, and 5 persons per vanpool.</p>
 <p>7. Employee Commute - Passenger Miles</p>	<p>Commute data for other transportation modes came from the 2021-2022 Commuter Survey Extract spreadsheets. A full survey was not conducted in fall 2020, rather, an abbreviated survey was conducted in Spring 2021 that informed the mode split. Because the survey was abbreviated, it did not include distances, distance data was culled from the Fall 2021 full survey (2022 data) to inform this inventory. Distances were estimated using the NBER Zip Code Distance database.</p>	<p>Annual miles traveled were scaled based on the percentage of survey responses for each transportation mode and the LPCH population. Assumptions include 48 work weeks per year, 2 trips per day, 2 persons per carpool, and 5 persons per vanpool. The appropriate emission factors for each transportation mode were used from the EPA GHG emission factors hub. The Marguerite shuttle emission factor is zero, as the fleet serving LPCH is all electric and on CPAU power. Survey responses for “Other” primarily involve the use of personal auto, so the category was calculated using passenger vehicle emissions factors.</p>
 <p>8. Patient Transport</p>	<p>Patient travel data was provided by IS Analytics & Reporting. Distances were estimated using the NBER Zip Code Distance Database. There-and-back travel was assumed for each entry.</p>	<p>The distance-based method was used to estimate emissions, using Air Travel (Medium Haul) and Passenger Car (fuel unknown) emission factors from the EPA GHG emission factors hub. As transportation modes were not available for in-person visits, trips of 250 miles or less were assumed to be vehicular travel, while distances over 250 miles were assumed to be air travel. At the time of writing, patient transport data had not been validated and could be modified in subsequent reports.</p>
 <p>9. Helicopter Fuel</p>	<p>Jet fuel data came from Stanford Life Flight. Gallons of fuel were estimated based on total flight hours and a fuel burn rate of 80 gal/hr. Flights associated with LPCH were estimated by accounting for the flight volume of PIC/NICU/OB patients going to LPCH.</p>	<p>The jet fuel (jet A fuel) emission factors came from the Climate Registry 2021 Default Emission Factor Document.</p>

CONCLUSION

In 2021, Lucile Packard Children’s Hospital Stanford emitted 135,140 Metric Tons of CO₂e from Scope 1,2 and 3 emissions. This is a 5% decrease from 2019 (baseline year) and a 6% increase from 2020. The reduction in emissions from the baseline year was primarily derived from the decline in capital goods expenditure and the reduction in the use of on-site natural gas supplied by CPAU. Emissions categories such as Capital Goods, Purchased Goods and Services, and Fuel and Energy Related Activities were added to the 2021 inventory, and 2019-2020 inventories were modified to reflect these categories.

With regards to Scope 1 emissions, emissions from fleet vehicles decreased by 38% from the baseline year, and the reduction could be a result of the change in calculation methodology and conversion differences as 2019-2020 data were presented in dollar amount while 2021 data was presented in gallons and miles. Generator Fuel usage experienced a 9% increase in 2021, while the use of anesthetic gas reduced by 20% from 2019. The decrease in the use of anesthetic gas emissions is mainly due to the reduction in the use of Medical Carbon dioxide.

With respect to Scope 2 emissions, emissions from CEF: Natural Gas for Heating doubled over the 2019 baseline and usage is up 122%. Annual heating degree days for 2019 are similar to that of 2021, so the weather is not a factor. The reason for the increase in usage is unknown. With respect to scope 3, emissions from Purchased Goods and Services increased by 13%, Solid Waste increased by 15%, and wastewater also increased. The increase in wastewater emissions is due to the lack of complete data for LPCH Main 2019 and 2020 wastewater calculations. Unlike previous years, 2021 wastewater data more accurately reflects LPCH annual water usage. Apart from capital goods, other Scope 3 emissions categories that witnessed reductions include – Business Travel (personal car), Business Travel (all other modes), Commute -VMT, Commute – Passenger Miles, and Helicopter Fuel.

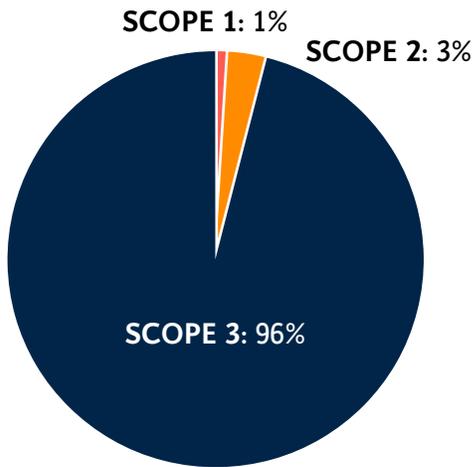
SUPPLY CHAIN: Currently, the healthcare supplier sector has not been challenged to disclose carbon emissions, making it difficult for procurement staff to evaluate choices. Without disclosure at a large scale, the spend-based method is the most accurate measure available. As a result of this methodology, pandemic-related cost pressures and other increases may be driving the apparent increase in emissions. With large-scale disclosure, more granular inventories can track improvement over time more effectively. As vendors work to reduce their scope 1 and emissions, LPCH can benefit from a reduction in its scope 3 emissions.

EMPLOYEE COMMUTE: The use of single occupancy vehicles increased in 2020 by 84% due to the influence of COVID-19 on public and shared transportation, but some recovery took place in 2021 with only 81% reporting that they commute in a single occupancy vehicle. Focused efforts on safe return to transit and ridesharing options will be necessary to see an improvement in these emissions

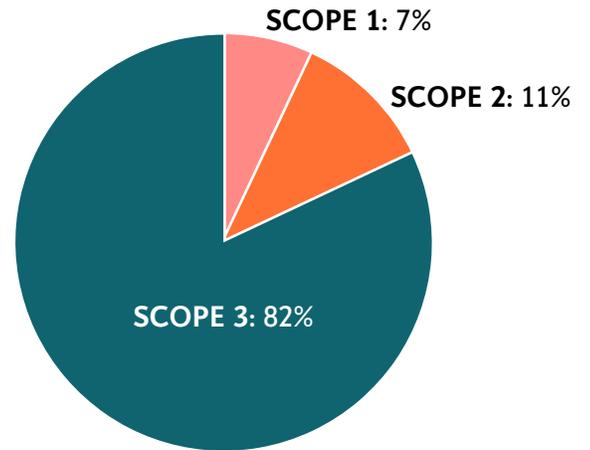


While some scope 3 emission sources were excluded from this inventory, the overall breakdown of scope 1, 2, and 3 emissions generally align with the US healthcare sector breakdown as seen in the pie chart below. At LPCH, scopes 1 and 2 represent an even smaller share, in part due to zero-emission energy sources.

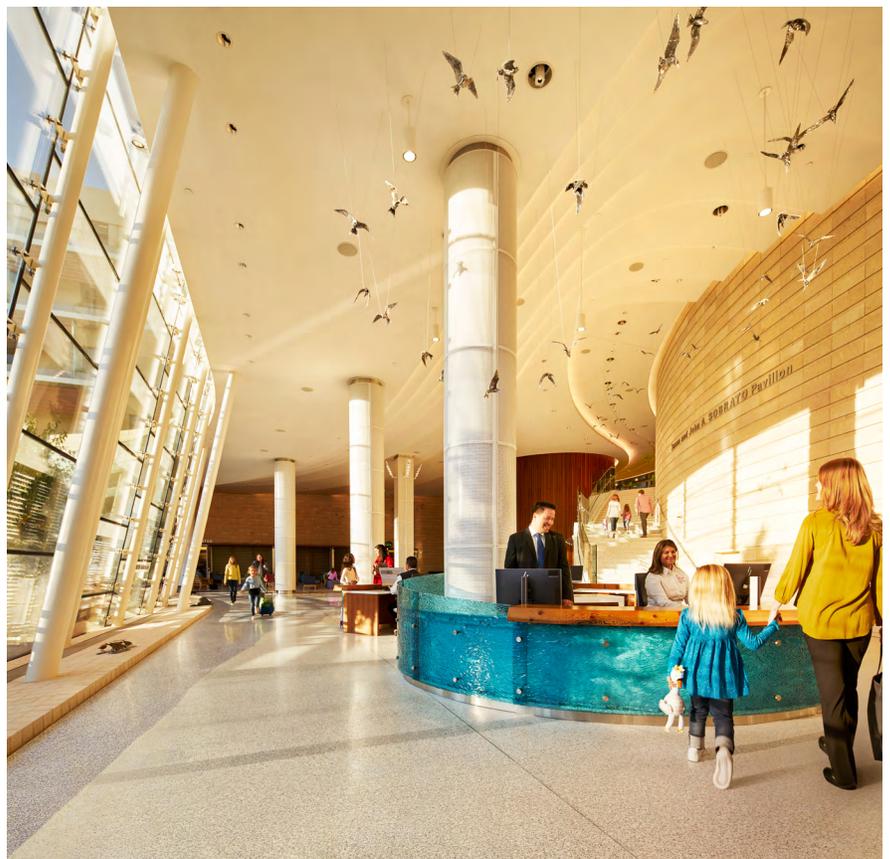
LPCH 2021 EMISSIONS BREAKDOWN



AVERAGE US HEALTHCARE EMISSIONS BREAKDOWN



Reference: <https://www.healthaffairs.org/doi/10.1377/hlthaff.2020.01247>



RECOMMENDATIONS:

- To comply with the GHG Protocol, a full entity-wide inventory is recommended for future year inventories, as well as revision to this inventory.
- It is important to note that 2020 and to an extent 2021 emissions were informed by the unique conditions resulting from the COVID-19 pandemic that impacted the operations of all health systems including LPCH.
- From 2019 -2021, the emissions sources with the largest carbon footprint were Scope 3-related supply chain and employee commuting which aligns with national data trends for health systems. It is important to prioritize these areas for reduction as they can offer the greatest impact and overall reductions.
- LPCH should consider tracking mileage data for all transportation modes of business travel in the future as the distance-based methodology is more accurate than amount spent, and gallons consumed.
- A better process needs to be put in place to effectively track and collect refrigerant data. This [GHG Protocol Online Calculator Tool](#) provides guidance on required data.



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