Monterey Bay Aquarium Greenhouse Gas Inventory Report

August 2025

verdis GROUP

Overview

Verdis Group completed a greenhouse gas (GHG) emissions inventory for the Monterey Bay Aquarium covering Scope One (direct, onsite), Scope Two (indirect emissions from owned sources), and selected Scope Three (employee commute, business travel, upstream fuel, waste, and water) emissions sources. The Monterey Bay Aquarium provided all necessary data and Verdis Group analyzed the data using proprietary tools. This report outlines the results of the inventory.

Verdis Group calculated that the Monterey Bay Aquarium produced 1,321 metric tons of carbon dioxide equivalent ($MtCO_2e$) greenhouse gas emissions in 2024 (see Figure 1) when accounting for Renewable Energy Certificates (RECs) purchased through the utility. The primary source of emissions is stationary combustion operations (35%) followed by emissions from business travel (23%). Figure 2 shows what the emissions portfolio for Monterey Bay Aquarium would look like without the aquarium's REC purchases. Table 1 (p. 4) shows total emissions broken out by source.

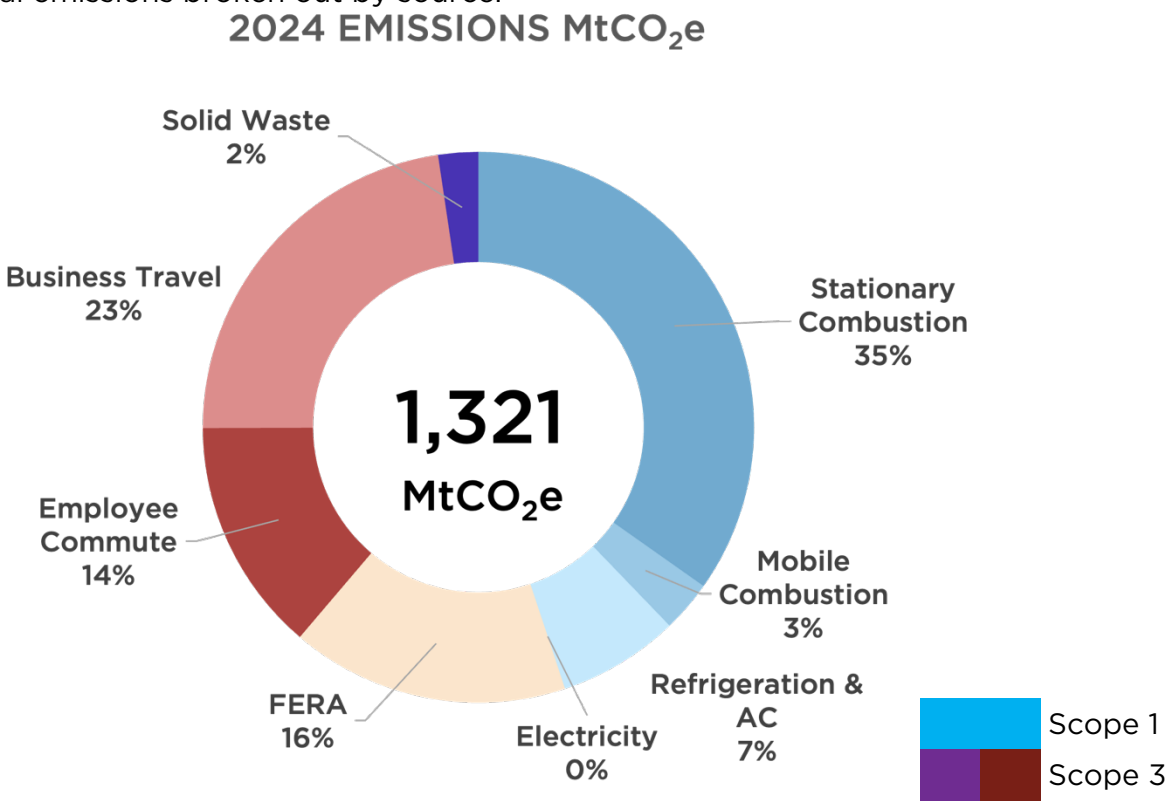

Figure 1: Monterey Bay Aquarium annual GHG emissions by scope, 2024 (with RECs)

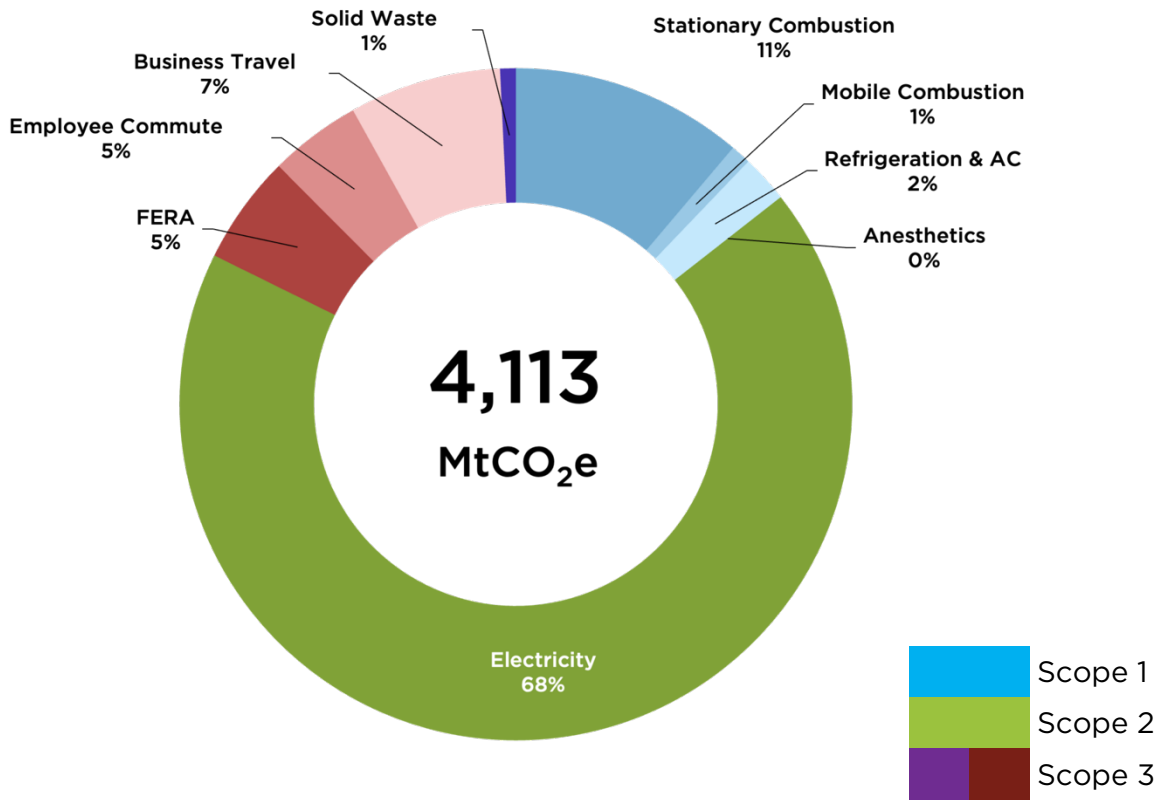

Figure 2: Monterey Bay Aquarium annual GHG emissions by scope, 2024 (without RECs)

Methods and Assumptions

Monterey Bay Aquarium provided all relevant and available information. Verdis Group analyzed the data using proprietary tools to measure and report greenhouse gas emissions from the aquarium's operations. All assumptions that were made throughout the analysis are listed below.

Verdis Group accounted for emissions from four gases: carbon dioxide, methane, nitrous oxide, and refrigerants, which constitute the vast majority of emissions for most organizations. Methane and nitrous oxide are more potent greenhouse gases than carbon dioxide. To compare them equally, Verdis Group converted these gases into carbon dioxide equivalents. For example, methane is approximately 25 times more powerful than carbon dioxide, so methane emissions are multiplied by approximately 25 to produce the carbon dioxide equivalent.

Emissions factors were sourced from the Environmental Protection Agency (EPA), the Energy Information Administration (EIA), and Central Coast Community Energy, which report emissions factors annually[1].

[1] An emissions factor represents an amount of CO_2e per unit measure (e.g., kWh, gallons, dollars) and is used to calculate the CO_2e emissions attributable to a given activity.

Other Relevant Information

- **Applicable framework:** Greenhouse Gas Protocol
- **Reporting lead:** Corbin Delgado for Verdis Group
- **Reporting period covered:** January 1, 2024 to December 31, 2024
- **Organizational boundary:** the inventory applies the consolidation approach of operational control. We are not aware of any other owned and operated facilities not included by Monterey Bay Aquarium for the boundary.
- **Operational boundary:** emissions sources included in this inventory are Scope 1, Scope 2, and selected Scope 3 (business travel, employee commute, upstream fuel & energy, and solid waste).

Assumptions

Refrigerants

- AR5 Global Warming Potentials were used to estimate carbon dioxide equivalent emissions from fugitive refrigerant emissions. Fugitive emissions refer to gases that leak from systems over time.

Electricity

- The Monterey Bay Aquarium acquired Renewable Energy Certificates (RECs) from their utility, Central Coast Community Energy, equal to their total MWh usage starting in 2018 and continuing through 2024. 14,892 RECs were retired in 2024 and are reflected in this inventory.

Employee Commute

- Verdis Group conducted a survey to understand current travel habits of MBA employees in 2023. This survey received a 43% response rate, and the results of the survey were applied to estimate the emissions produced by the remaining 57% of employees.

Business Travel

- The data provided covering business travel by car was measured in miles traveled for the year. Verdis Group used a national average value to estimate the fuel economy of light duty vehicles to determine emissions related to business travel by car. It was also assumed that cars used for business travel purposes were all gasoline-powered vehicles.

Waste

- Waste data was based on the completion of a sitewide waster audit of the aquarium in 2024. Weights for each waster stream were provided as part of the completed audit. These weights were totaled and then used to account the whole year of waste data.

Methodology

Scope 1 Stationary Combustion

- Total operational usage data is gathered by MBA and then delivered to Verdis Group for analysis and GHG calculation. Verdis Group calculated the aquarium's Scope 1 stationary combustion emissions from original invoices for natural gas usage as well as sum diesel purchases for generator use.

Scope 2 Electricity

- Total operational usage data is gathered by MBA and then delivered to Verdis Group for analysis and GHG calculation. Verdis Group calculated the aquarium's Scope 2 electricity emissions from original invoices for electricity consumption. MBA has been enrolled to receive RECs through their utility's 3CPrime program since March 2018. This program from Central Coast Community Energy claims to provide 100% renewable electricity for members. This would apply to the whole of MBA's 2024 accounting reducing market-based electricity emissions for the aquarium to zero.

Scope 3 Upstream Fuel

- Operational use data for electricity and natural gas is gathered by MBA and then delivered to Verdis Group for analysis and GHG calculation. Verdis Group calculated the aquarium's Scope 3 emissions from transmission and distribution losses from original invoices for electricity and natural gas consumption. Well-to-tank emissions factors, regional grid generation mix and the grid loss factor applied in the calculations were sources from the most recent available U.S. Environmental Protection Agency (EPA) and UK Department of Environment, Food, and Rural Affairs (DEFRA) data.

Scope 3 Employee Commute

- Verdis Group conducted a survey in 2023 to understand current travel habits of MBA employees. This survey received a 43% response rate and the results of the survey were applied to estimate the emissions produced by the remaining 57% of employees.
- Employee travel emissions for mode of transit were split into component percentages which would then be multiplied by the average miles traveled each day for work (round trip), the total number of MBA employees, and the average number of days worked each week to get the assumed miles per mode. The miles per mode would then be multiplied by each mode of transport's emissions factor.

Scope 3 Business Travel

- Total business travel mileage data is gathered by MBA and then delivered to Verdis Group for analysis and GHG calculation. Verdis Group calculated the aquarium's Scope 3 business travel emissions from original invoices for ride share mileage and third party vendor reports for air travel.

Scope 3 Waste

- Waste total weights were calculated from an internal waste audit completed by Stanford students in March of 2024. Weights for each stream from the audit were totaled and multiplied to account for a full year of waste data.

Results

The majority of the Monterey Bay Aquarium's GHG emissions are from electricity use followed by the use of natural gas for heating (Table 1).

Table 1: Sources of Monterey Bay Aquarium GHG emissions

Scope	Source	Description	$MtCO_2e$
1	Stationary Combustion	From combustion of fuels in stationary sources (e.g., boilers, furnaces).	460
1	Mobile Combustion	From the fuel consumption of owned vehicles	40
1	Refrigerants	From the use of refrigeration and air conditioning equipment.	94
2	Electricity (market-based)	From the generation of purchased electricity that is consumed onsite. Based on the most refined data available and used in inventory totals.	0
2	Electricity (location-based)	From the generation of purchased electricity that is consumed onsite. Based on grid average data and disclosed per reporting requirements.	2,792
3	Upstream Fuel & Energy	From the extraction, transportation, and processing of fuels and the production and transmission of energy.	215
3	Employee Commute	From the fuel consumption of the various modes of transportation used by employees to commute to work. Also includes work-from-home relayed emissions.	181
3	Business Travel	From air and car travel conducted for business purposes.	300
3	Waste	From the treatment and decay of solid waste produced by the aquarium.	31
Total			1,321

The Monterey Bay Aquarium's total emissions for 2023 are equivalent to any of the following[2]:

308	passenger vehicles driven for one year
177	homes' energy use for one year
1,321	acres of US forests sequestering carbon for one year
3,073	barrels of oil consumed

Recommendations

Monterey Bay Aquarium is a leader in the aquarium and ACP world with commitments to and progress towards sustainability and carbon reduction goals. Because Monterey Bay Aquarium has been able to reduce GHG emissions from electricity due to their continued partnership with their utility, which is typically the largest source of emissions for an organization, MBA's Scope 3 emissions account for a large portion of the organization's GHG inventory. Therefore, MBA could continue to serve as a leader within the aquarium and ACP world by further accounting for and increasing tracking for Scope 3 emissions, including:

- Upstream procurement
- Transportation of animals
- Water

[2] https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator