2021-2022 Student Research Team

UCLA Institute of the Environment & Sustainability

Carbon & Waste Management

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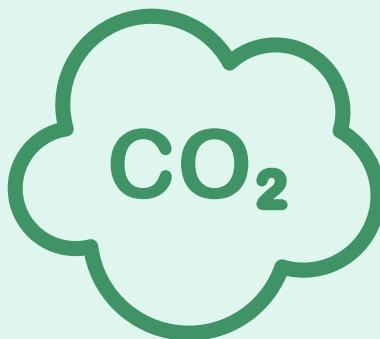AQUARIUM OF THE PACIFIC ®

A non-profit institution

Introduction

The objective of this analysis is to assist the Aquarium of the Pacific in its commitment to sustainability by reducing its greenhouse gas emissions and improving its waste management. This report focuses on three areas for improvement:

Waste Management

Scope 3 Emissions

Event Sustainability

The convenience and cost of measures are factored into our recommendations for future best practices.

Waste Management

A critical component of sustainable waste practices is proper waste sorting, as it plays a key role in diverting waste from landfills.

Our team has discovered that the current waste bin signage at the AoP does not encourage maximum diversion of waste from landfill. Employees and visitors alike require more guidance for proper waste sorting.

Current signage

Minimal signage provides visitors with inadequate guidance.

Sample improved signage

Detailed signage including images provides visitors with clear guidance.


Source: UCLA

Bin Signage Research

To test the efficacy of waste bin signage, we observed AoP visitors disposing of waste with current bin signage and with alternative bin signage. Alternative signage had a significant impact on sorting behavior, with a **58% increase in correct waste sorting**. Other factors such as bin location, date, age, gender, and presence of children had negligible impacts.

Current AoP Signage

Incorrect
47.5%

Correct
52.5%

Alternative Signage
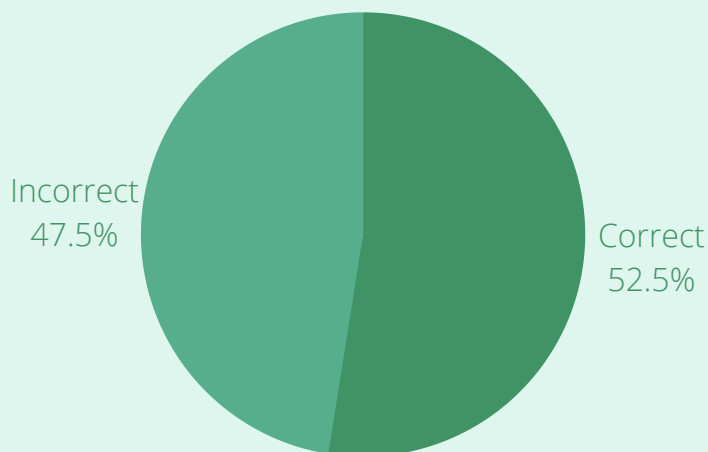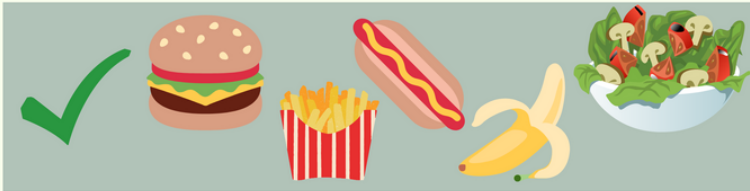
Incorrect
25%
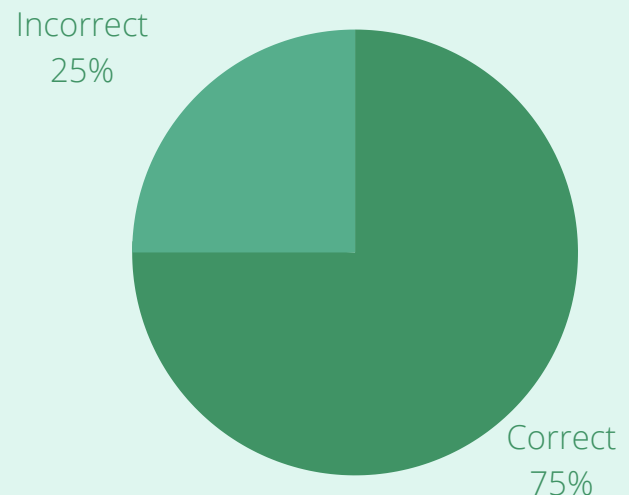
Correct
75%

Bin Signage

The results of our research show that clear and detailed signage effectively increases correct waste sorting practices. The following are designs generated by our team specifically for the Aquarium to improve sorting.

Compost
Please ONLY discard food waste here

Do NOT discard...

Paper bags Napkins Utensils Paper cups Liquids

Landfill
Please compost and recycle first when possible

Recycle

Clean and Empty Aluminum Cans Clean and Empty Glass Containers Unsoiled paper products Clean and Empty Thick Plastic Containers Clean and Empty Plastic Bottles and Cups

Food scraps or liquids Plastic cutlery and straws Thin Plastics Flexible / Foil-lined Packaging

Liquid Dump Station

Empty all LIQUIDS including ice

Water Other Beverages Ice

Bin Signage

The following are additional designs for Aquarium use.

WHAT CAN BE RECYCLED?

YES ✓	NO ✗
Clean and Empty Aluminum Cans	Food scraps or liquids
Clean and Empty Glass Containers	Plastic cutlery and straws
Unsoiled paper products	Thin Plastics
Clean and Empty Thick Plastic Containers	Flexible / Foil-lined Packaging
Clean and Empty Plastic Bottles and Cups	Styrofoam

WHAT CAN YOU COMPOST AT THE AQUARIUM?

YES ✓	NO ✗
Leftover Fruits and Vegetables	Cups or Liquids
Food Scraps	Tissues, Napkins, or Brown Paper Bags
Meats	Plastics, Utensils, or Masks

Scope 3 Emissions

Scope 3 Emissions are the result of activities that are not controlled by the AoP, but are indirectly caused by its value chain.

There are 15 categories under Scope 3 emissions. Our project focuses on the following:

- **Category 1:** purchased goods and services, for events only
- **Category 6:** business travel
- **Category 7:** employee commute

Following EPA guidance, we used primary data where available and secondary data such as industry averages and proxies to fill in any gaps.

Data were obtained primarily from the EPA's regularly updated GHG emissions database. Additional data were obtained from other credible sources. In all cases the sources of the data are provided.

Category 1: Event Procurement

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Goal: develop an emissions calculator for AoP event staff that facilitates easy calculation of emissions for any given event.

Approach taken: estimate the emissions associated with the production of a single item used during events, utilizing data from trustworthy sources.
- Finding CO2e/item (i.e. CO2e/plate) allows for the calculation of event-wide emissions on a per-person basis.

Key Findings

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Food	• What food we eat, and how that food is produced are more important than local versus non-local food when it comes to emissions • Proteins contribute the greatest emissions for any given meal ○ **Impact of: Beef > Pork > Chicken > Fish**
Drink	• Drink production generates significantly fewer GHG than food production. • **Impact of: Beer > Wine >> Hard Liquor** ○ On a per-drink basis

Cutlery	• **Impact of: Single-Use Cutlery >> Reusable Cutlery**
	• Single-Use Cutlery:
	  ○ **Impact of: Plastic > Compostable**
	    ■ Only if compostable cutlery is properly disposed of, otherwise the impacts are roughly equivalent.
	    ■ No current means for AoP to properly dispose of cutlery

Category 6: Business Travel

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Flight emissions significantly outweigh any other mode of business travel.

- Possible to retroactively calculate from existing AoP travel receipts, but incredibly time–consuming and inefficient.

The **continued tracking** of these emissions is crucial for AoP's climate neutrality goals → we recommend the **creation of Excel database** for this purpose.

- Employees could be responsible for entering data into the EXCEL database following each trip. Emissions data can be obtained from the ICAO Flight Emissions Calculator, and input the value **(kgCO2/journey).**
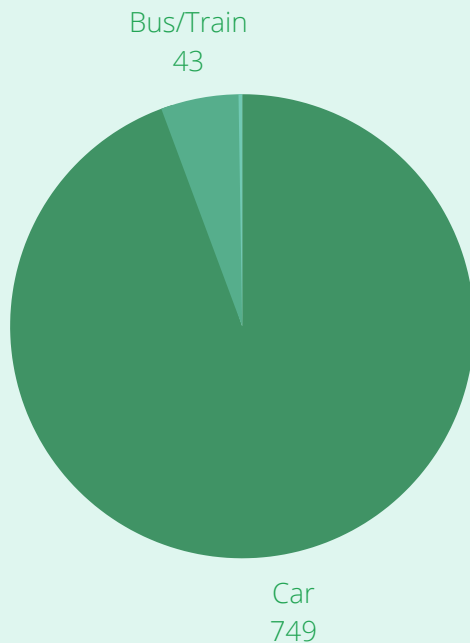
Category 7: Employee Commute

To quantify these emissions, our team surveyed 70 (~10%) of AoP employees.

Questions asked:
- How did you get to work today?
- How far did you travel?

Distance Traveled (mi)

Bus/Train
43

Car
749

Total: 784 miles

Emissions (kgCO2e)

Bus/Train
9

Car
293
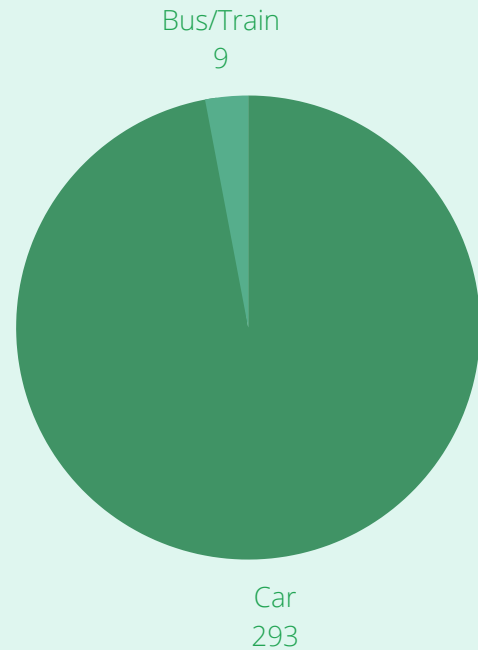
Total: 302 kgCO2e

Scaling this data up to AoP's full staff provides a Category 7 estimate of:

810 MTCO2e emitted per year

Category 7, expanded: Visitor Commute

Category 7 does not technically include **visitor** commute emissions, however, it is important that the AoP is aware of visitor emissions.

Data was collected from 200 visitor groups (~1000 visitors total) using the survey methodology outlined above.

Key Metrics:

- 96% of visitor groups travel by car
- Average group size: 3.77
- Average trip length: 21.4 miles
- Average trip emissions: 8.65 kgCO2e

Scaling this data up to AoP's **1.6 million** annual visitors provides an emissions estimate of:

5560 MTCO2e per year

Equivalent to driving 11 million miles in a standard passenger vehicle (21.6 mpg)

Recommendations: Emission Reduction

Short–term:

- Transition back to **reusable cutlery**, as soon as feasibly possible
- Encourage event planners to serve **less meat**, and **more fish/vegetables**
- **Offset emissions** from individual events, opening the door for "carbon neutral" marketing
- Include "**carbon cost**" on foodservice menus to inform visitor selection and potentially decrease demand for items with higher carbon emissions
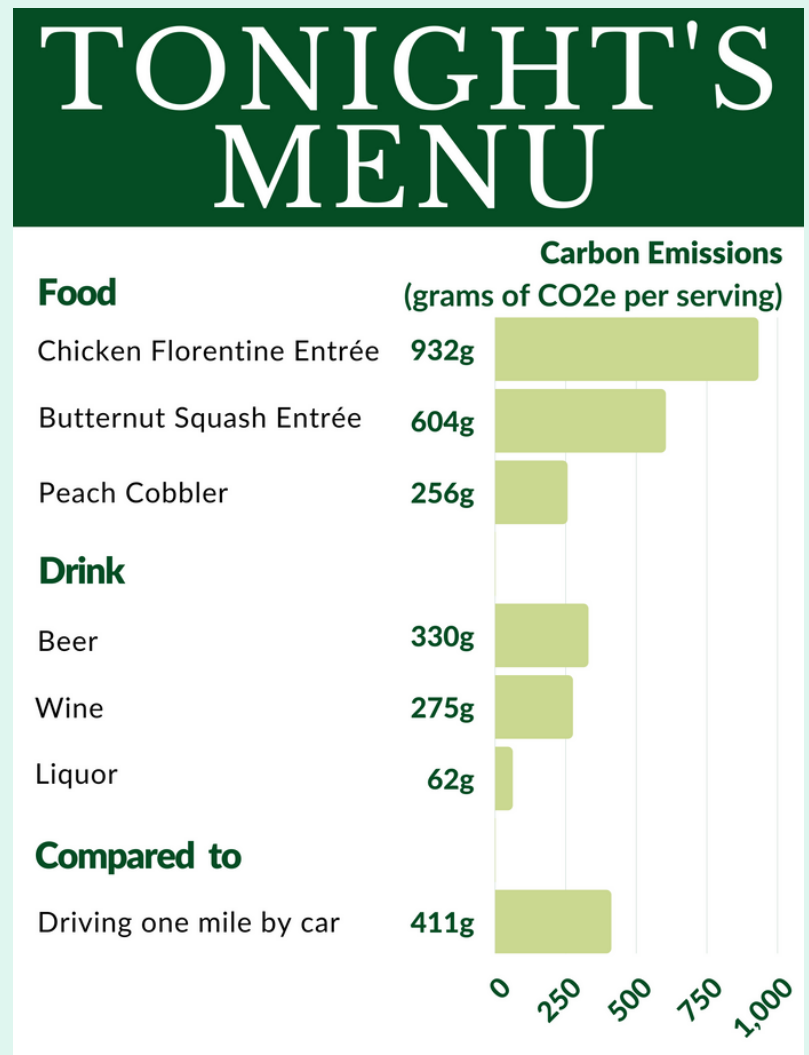
Long–term:

- Implement **continued tracking** of business travel flight emissions
- Perform **annual employee commute survey** to keep up to date information
- Implement **incentive programs** to encourage employees (and visitors) to commute more sustainably
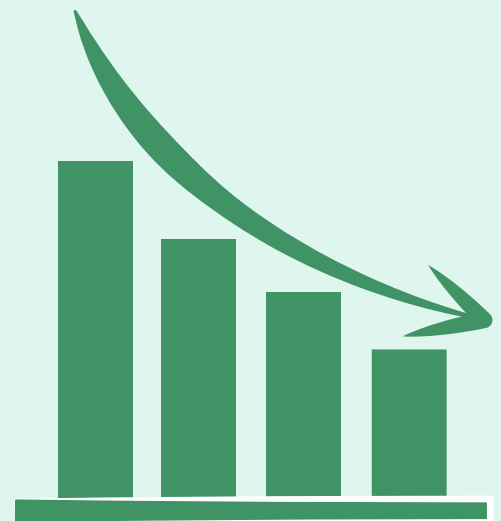
Event Sustainability

After observing AoP events and interviewing industry experts, our team has compiled the following recommendations regarding the handling of waste from events with food and drinks:

- **Scale bins to event size** to make accumulation of trash concentrated and disposal more efficient. Bins that collect the least waste should be removed to consolidate waste.
- **Make 3–bin sorting stations more accessible** by placing them in visible, high–traffic areas.
- **No coverings** should block signage on bins during events.
- **Bar stations** should have recycling bins and liquid dump stations to divert recyclables from landfill.
- Only provide **disposable utensils upon request** but do not allow guests to self–serve.
- **Minimize garnishes** to reduce unrecoverable, non–compostable food waste.
- Accurately **predict event attendance** to prevent food waste.
- Provide a **"carbon emissions menu"** at events.

TONIGHT'S MENU

Carbon Emissions
(grams of CO2e per serving)

Food

Chicken Florentine Entrée	932g
Butternut Squash Entrée	604g
Peach Cobbler	256g

Drink

Beer	330g
Wine	275g
Liquor	62g

Compared to

| Driving one mile by car | 411g |

0   250   500   750   1,000

Event Sustainability: Food Waste

Surplus food recovery is not only an essential part of **event waste reduction**, but will also be **required by January 2024**.

As a **Tier 2** organization under **Senate Bill 1383**, the AoP must:
- **Donate** edible food
- Be in **contract** with their food recovery organization,
- **Record** the type, frequency, and amount of food recovered each month

To streamline the food donation process, we have compiled a list of food donation centers near the Aquarium:

Name	Address	Contact	Hours	Website
Help Me Help You	1301 W 12th St Long Beach, CA 90813	(562) 612-5001	9am–4pm (M,T,W,F)	https://www.helpmehelpu.org
Long Beach Rescue Mission	1430 Pacific Ave Long Beach, CA 90813	(562) 591-1292	9am–2pm (Th)	https://lbrm.org
ASI Beach Pantry	1212 N Bellflower Blvd Long Beach, CA 90815	(562) 985-5264	9am–5pm (M–F)	https://www.asicsulb.org/corporate/discover/beach–pantry
Catholic Charities Of LA Long Beach Community Services Center	123 E 14th St Long Beach, CA 90813	(213) 251-3432	10am–7pm (M–F)	https://catholiccharitiesla.org/program–directory–by–city/
CityHeART	2201 E. Willow St. Suite D #301 Signal Hill, CA 90755	(562) 270-4481	9:30am–12:30pm 1–3pm (T, Th)	https://ourcityheart.org/heart–of–the–city/

Future Steps

The following suggestions align with the AoP's commitment to sustainability, but are long–term and out of the scope of our project.

- **Buy a composter that can process varied materials.**
  - With such a machine, AoP food containers could be updated to compostables. This could divert the disposable food containers that are currently going to landfill.

- **Ideas for Next Year's Practicum Group:**
  - Design an exhibit specifically about waste or incorporate knowledge–based learning into existing exhibits. This could be a fascinating project for a group of artistically inclined IoES seniors to research successful exhibits and brainstorm a unique one for the AoP.
  - Design a game that educates people on sustainable waste practices. Visitors (young and old) could practice sorting waste items in bins in a fun and interactive way, which can expose previous wrongdoings. This could take the form of electronic sorting games or even as preview in the movie theater.

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Scope 3 Emissions Sources:

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