



2023 ACP Emissions Benchmarking

Updated September 7, 2023



Photo: National Aquarium

Objectives



Benchmark aquariums on emissions and energy usage



Leverage data to inform climate action



Interpreting the Data

01

Big picture

02

By the numbers

03

Analysis per aquarium

04

Beyond scope 1 & 2



Photo: National Aquarium

Highlights



25 aquariums benchmarked



78,847 MtCO₂e total emissions



9 aquariums set a Net Zero target



Average EUI of 203 kBtu/sqft

How to use the benchmark



Submit data annually to track your progress



Meet internally with key stakeholders to debrief results



Reach out to your peers to talk best practices



Reach out to Verdis with questions / comments

01

Big Picture

2023 IPCC Update

1. Earth is on track to cross the critical 1.5°C threshold sometime in the 2030s
2. Warming is 'unequivocally' due to human activity
3. We can still prevent the most dire climate hazards, but the window is closing

How to Cap Warming at 1.5°C

1. Reduce by 50% by 2030

Reduce by 60% by 2035*

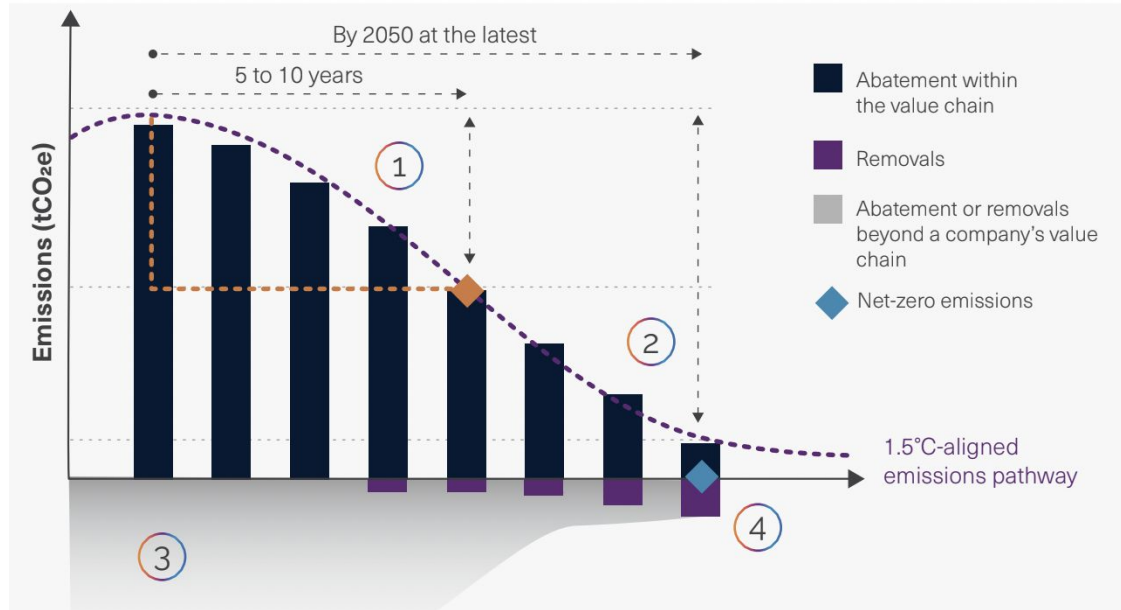
3. Reduce by 90% by 2050

4. Offset while you reduce

5. Offset residual emissions

*New IPCC target as of 3/20/23
Reduction based on comparison with 2019

Figure 2 Key elements of the Net-Zero Standard



Source: SBTi Corporate Net-Zero Standard - October 2021

Milestones

1

April 2022

ACP announced commitment to address greenhouse gas emissions

2

April 2023

Aquariums baselined their Scope 1 & 2 emissions

First ACP benchmarking report completed

3

April 2024

Aquariums encouraged to

1. Have an updated GHG inventory including Scope 3s
2. Build an emission reduction plan and set a target

Moving Forward

4

Track

Measure your emissions annually to track your progress and keep the benchmark report updated

Scope 3s can be measured every other year if preferred

5

Act

Implement strategies that reduce impact from your operations and remove emissions from the atmosphere

6

Share your story

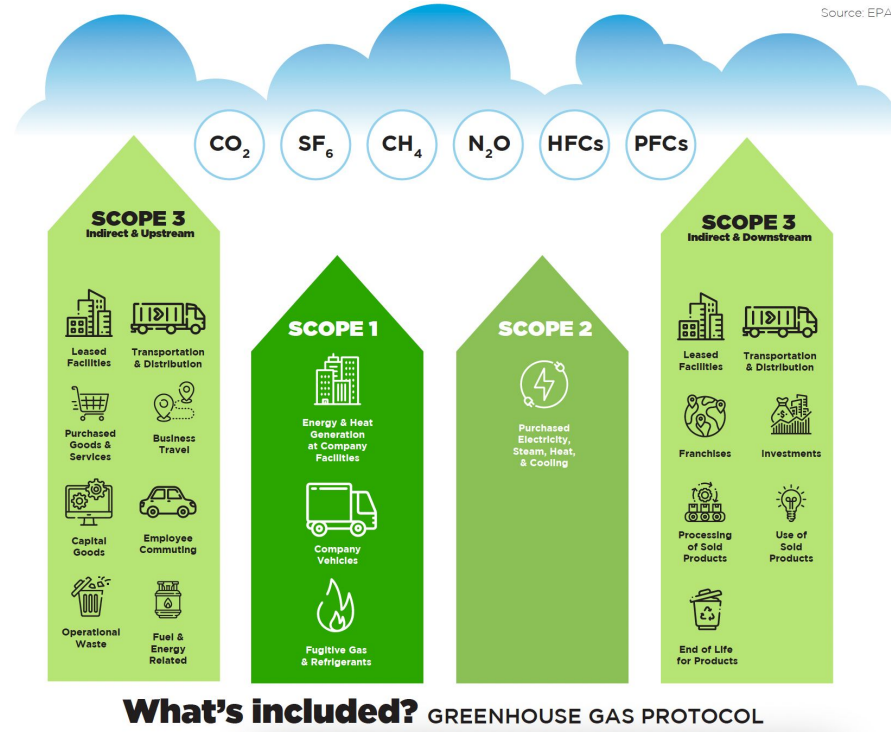
Communicate your journey to Net Zero emissions with your audiences

Benchmark Boundary

2023 analysis focused on building a baseline for Scope 1 and 2 emissions

Scope 3s are being measured by members and they tend to account for the largest share of emissions

All values presented in the benchmark reflect a baseline year that vary based on the institution between 2019 and 2022



02

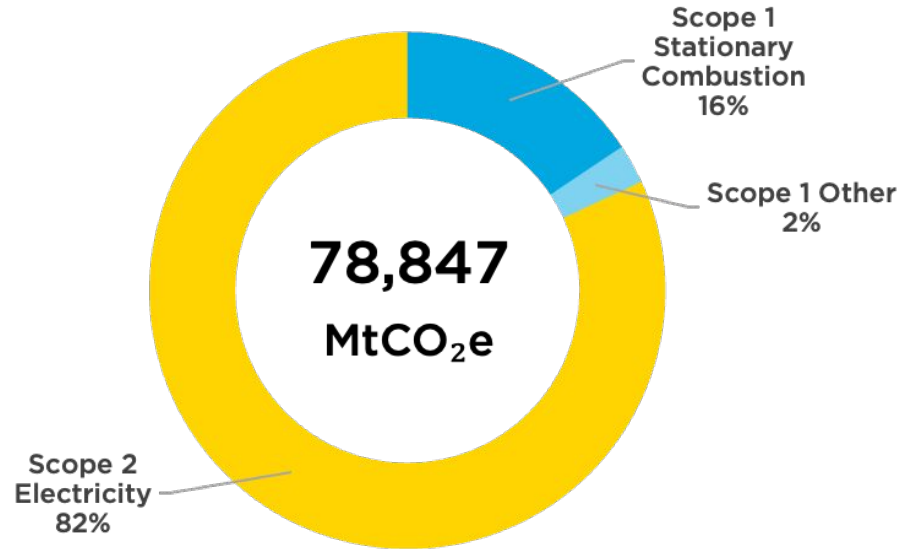
By the Numbers

ACP Emissions Impact

Scopes 1 & 2 from 25 aquariums

Equivalent to:

- 15,000 cars driving for a year
- 8,700 homes using energy for a year
- Carbon sequestered by 584 acres of mangrove during their growing period



Interpreting the Data

1

Emissions per SQFT

4

Heating fuel consumption

2

Energy use intensity (EUI)

5

Renewable energy strategy

3

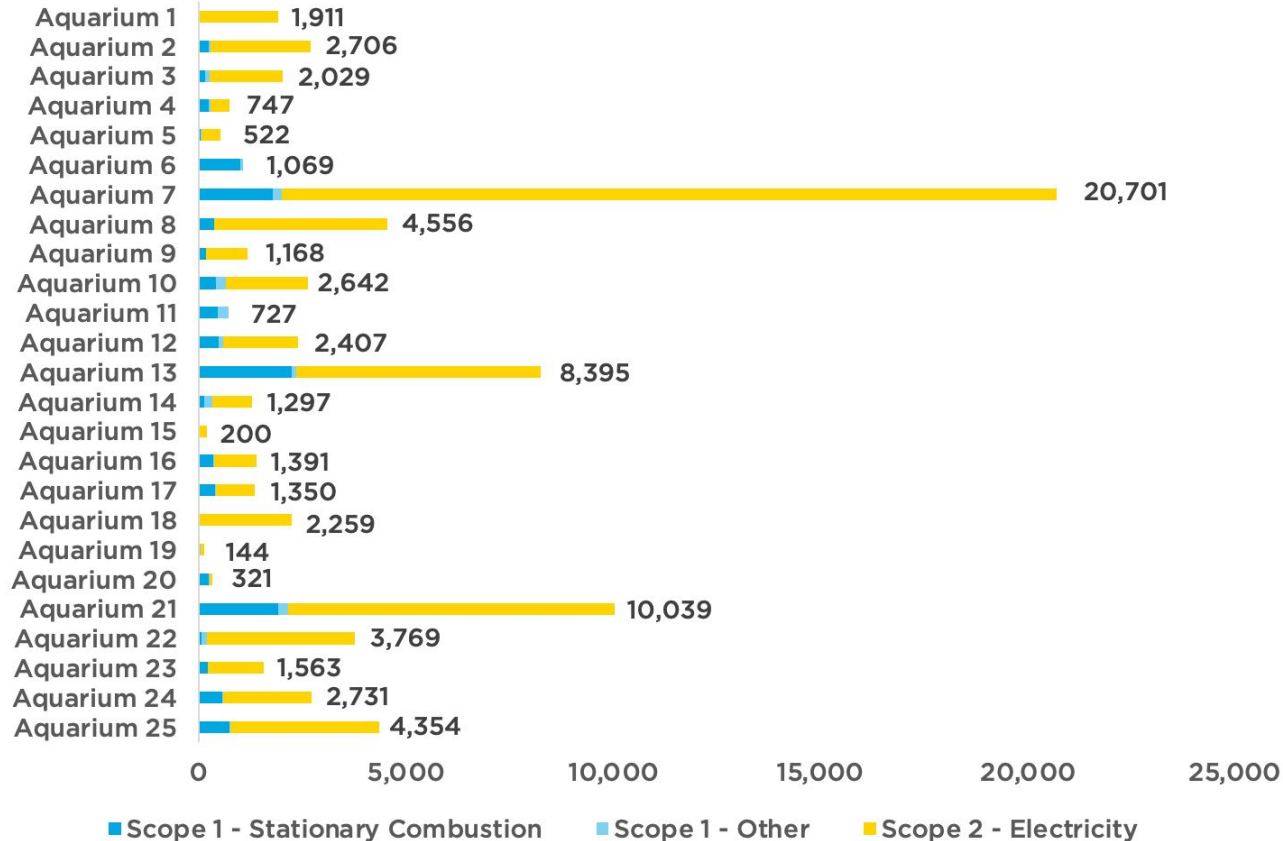
Water use impact on electricity usage

6

Impact of energy mix

Emissions Impact by Aquarium

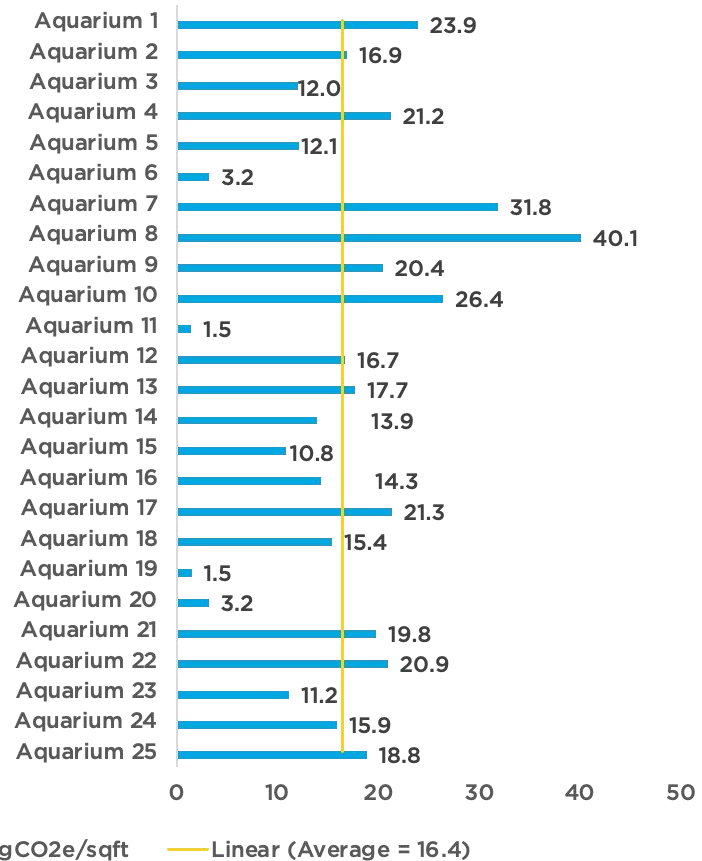
Total Scope 1 & 2 Emissions in MtCO₂e



1

Emissions per SQFT

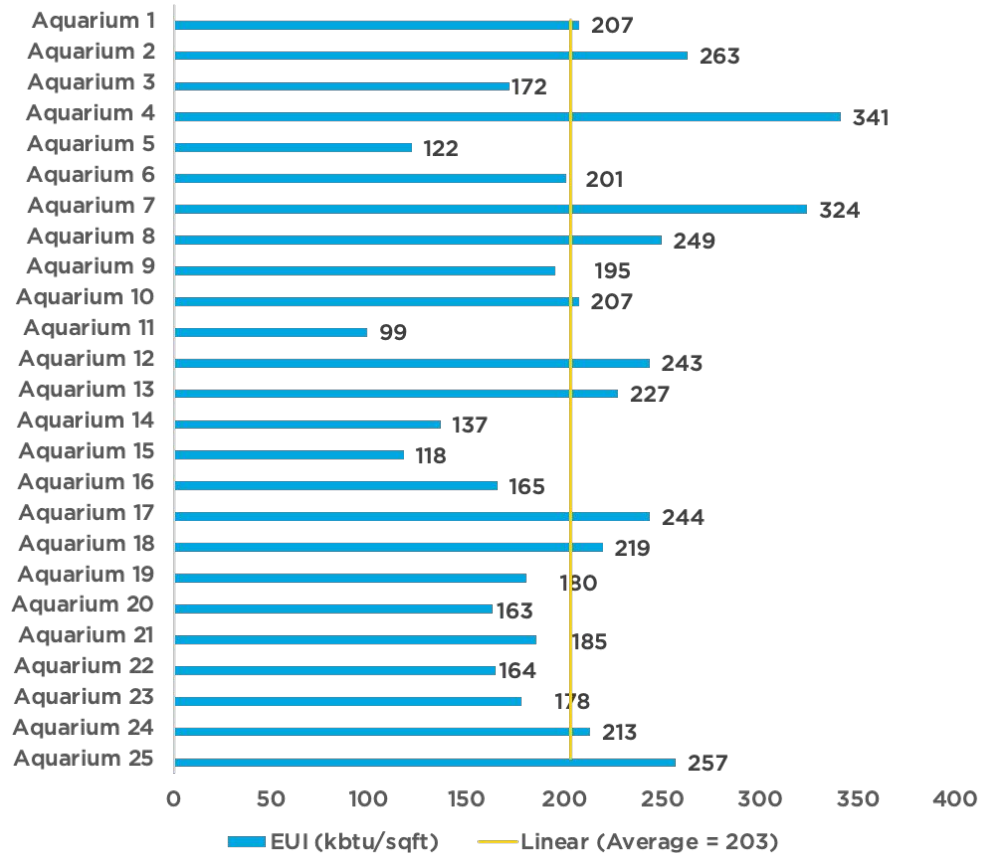
Average kgCO₂e/SQFT: 16.4



2

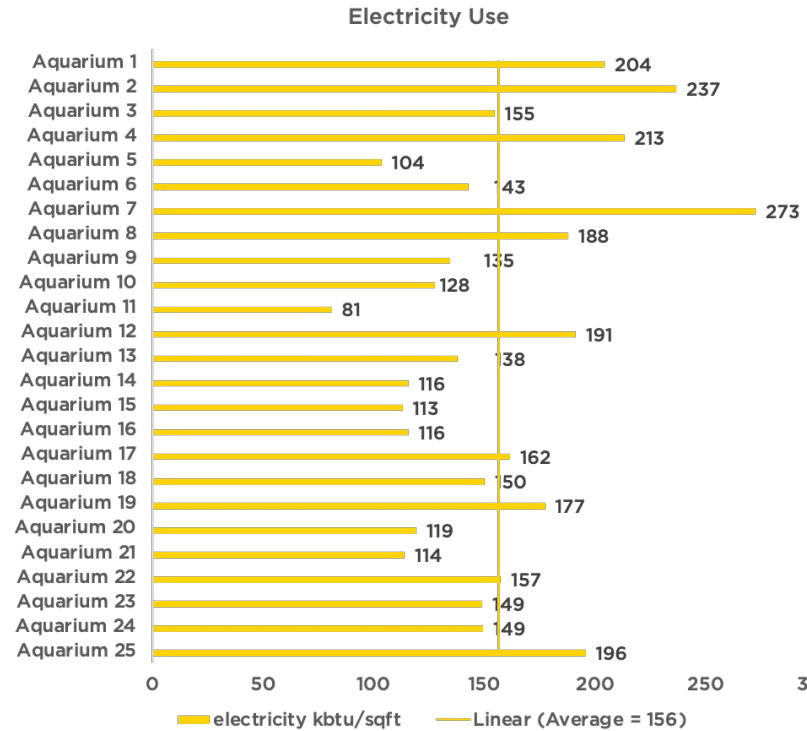
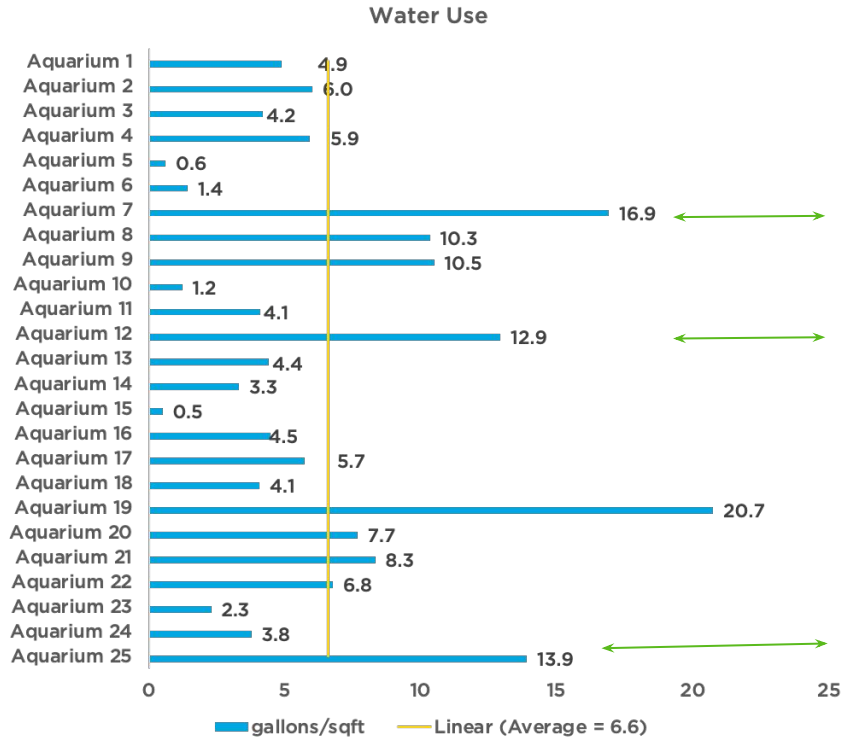
Energy Use Intensity (EUI)

Average site EUI: 203 kbtu/SQFT



3

Water Use Impact on Electricity Usage

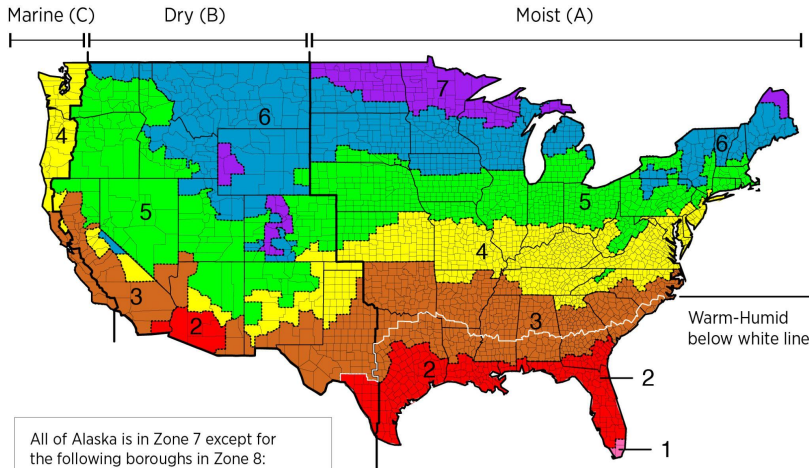


In some cases, a higher EUI can be linked to a higher volume of water per SQFT requiring more electricity for the pumps

4

Heating Fuel Consumption

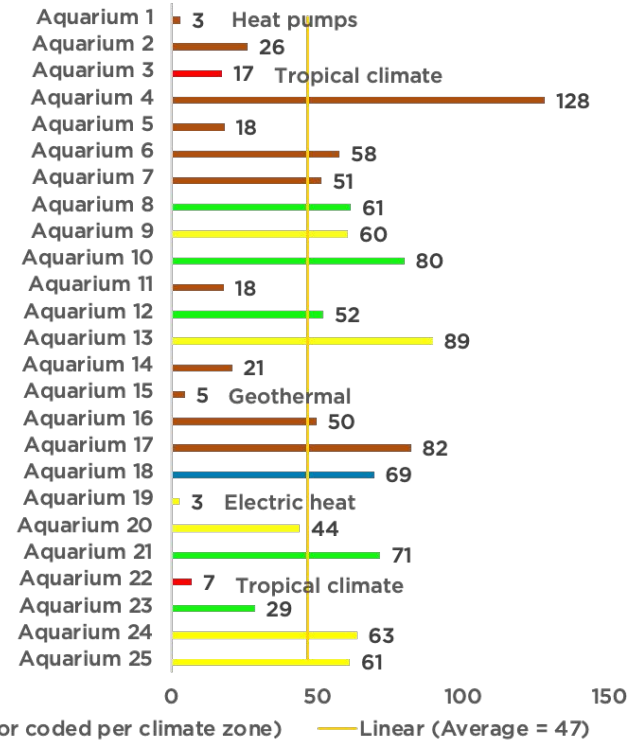
Some aquariums perform better on heating demand, regardless of climate zone



All of Alaska is in Zone 7 except for the following boroughs in Zone 8:
Bethel, Northwest Arctic, Dellingham, Southeast Fairbanks, Fairbanks N. Star, Wade Hampton, Nome, Yukon-Koyukuk, North Slope

Zone 1 includes Hawaii, Guam, Puerto Rico, and the Virgin Islands

Heating Demand Intensity



5

Renewable Energy Strategy

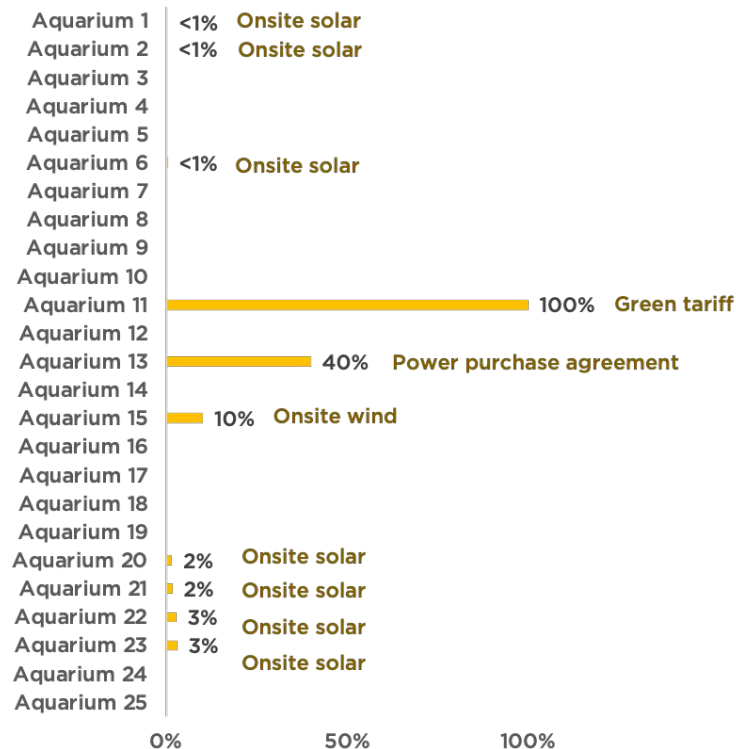
Onsite solar or wind

- Demonstrates commitment and leadership
- Limited potential on overall usage
- Not suitable for some buildings

PPA and Green tariff

- Largest impact
- Implementation is unique to each aquarium

Share of Renewable Electricity



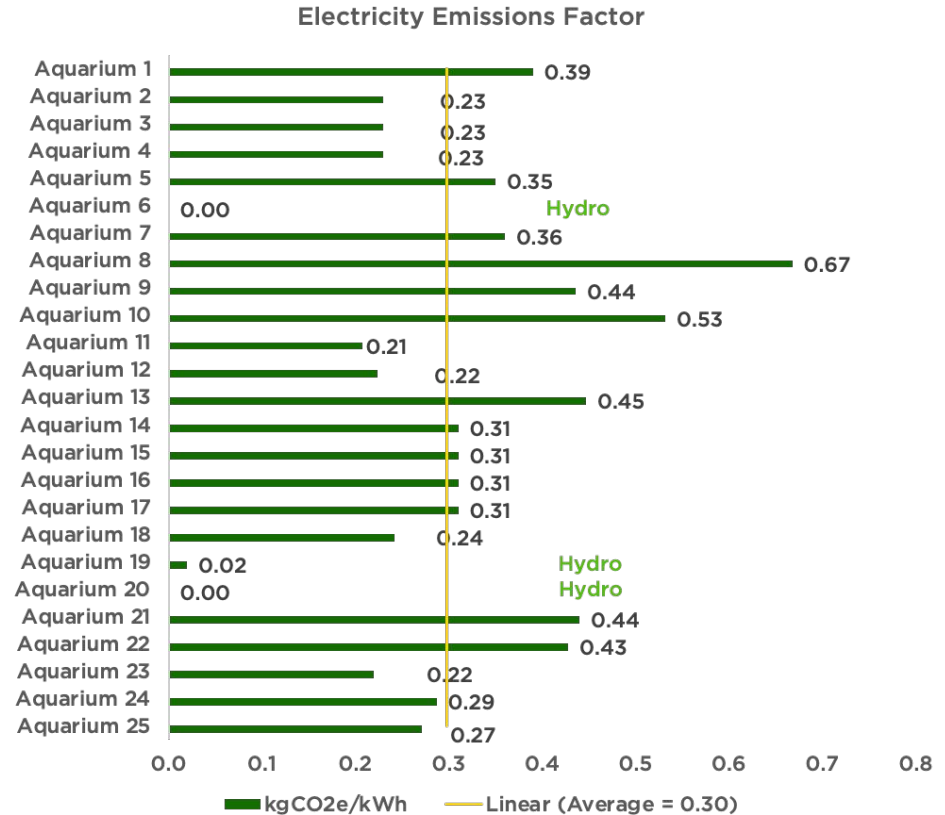
6

Impact of Energy Mix

Emission factor: value that reflects the mix of energy sources used by the utility to generate electricity (i.e., fossil fuels vs. renewables).

Takeaways

- High impact considering electricity represents 83% of total emissions for ACP
- Expected to improve over time and positively impact aquariums
- Importance of relationship with utility



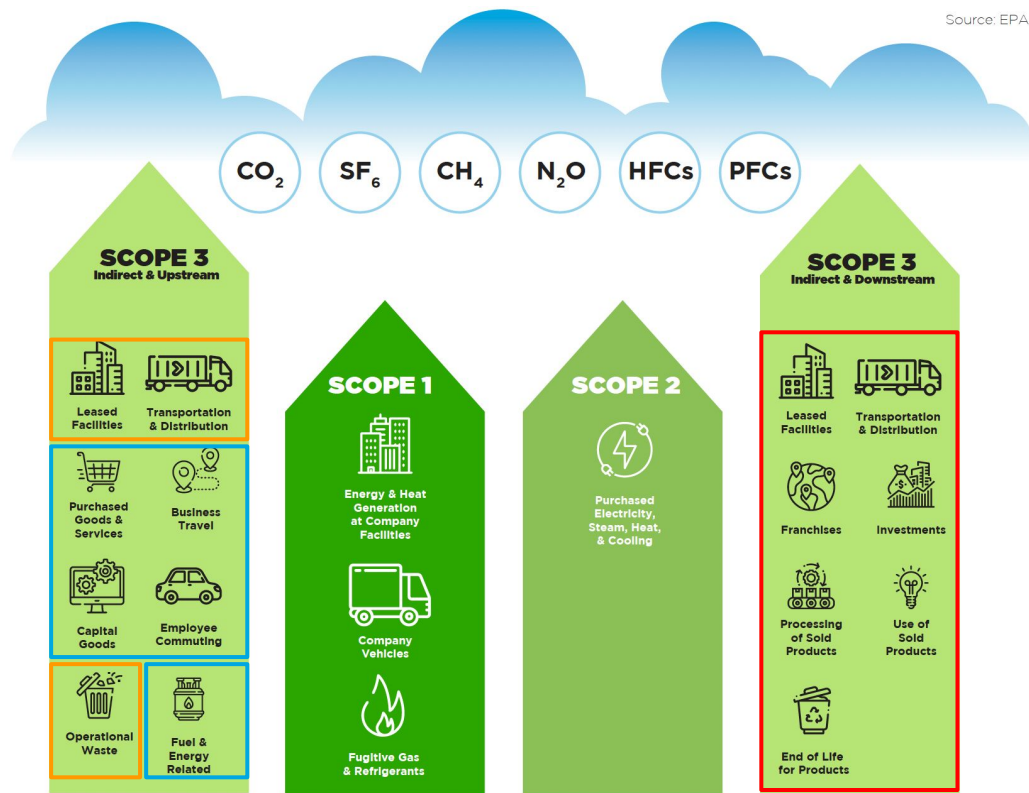
03

Beyond Scope 1 & 2

Importance of Scope 3

Source: EPA

- Likely accounts for more emissions than the combined Scope 1 + 2
- Only select categories should be considered
 - Relevant
 - Expected to be minimal
 - Not relevant



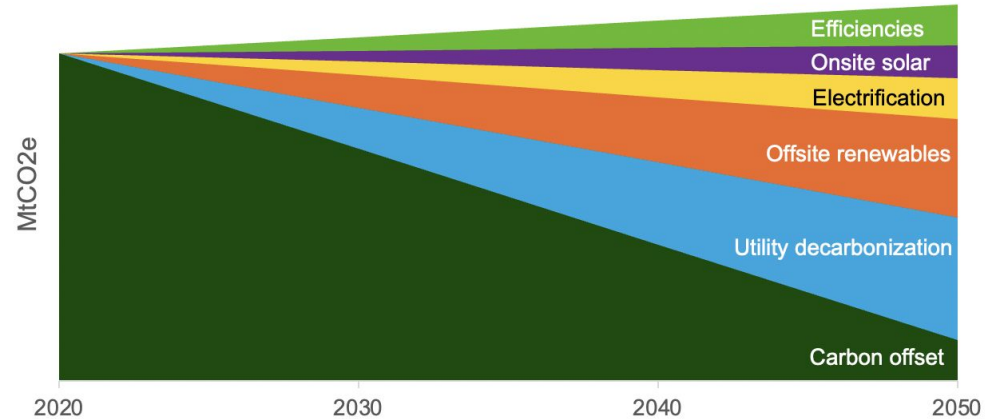
What's included? GREENHOUSE GAS PROTOCOL

Decarbonization

Reducing emissions to achieve Net Zero is key

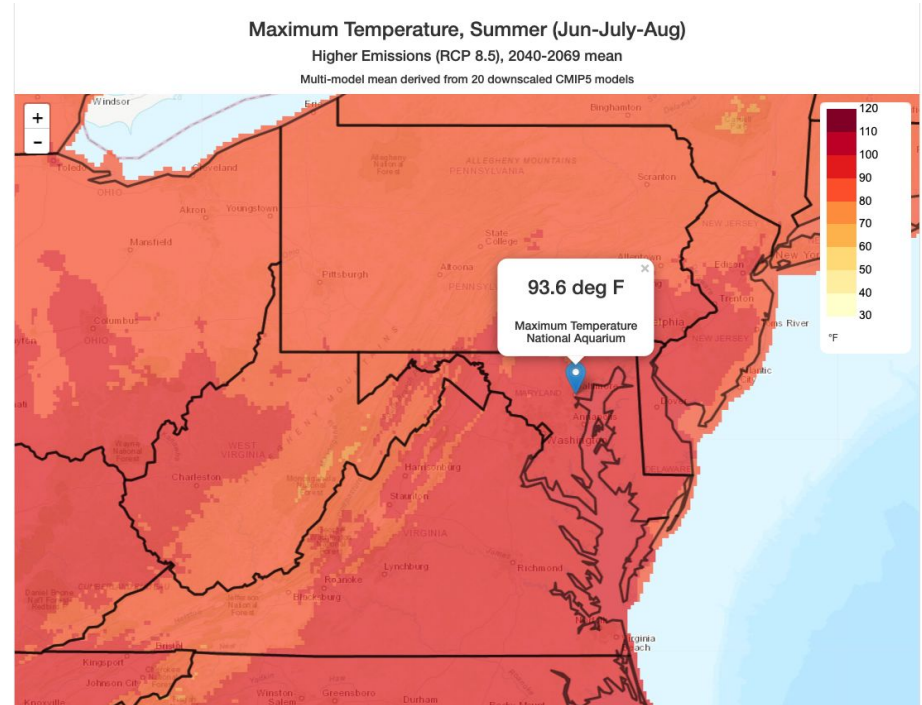
The path to get there is unique for each aquarium

Net Zero Pathway



Climate Action Planning

- Climate Vulnerability Assessment
- Broader look at mitigation strategies beyond emissions
 - Water
 - Waste
 - Engagement
 - Leadership
- Adaptation and resilience strategies



Source: Climate Toolbox, for National Aquarium CVA



APPENDIX: Methodology and Additional Results

Methodology

The foundation for the benchmark was a request to all members to measure their greenhouse gas emissions for scope 1 and 2 in accordance with the Greenhouse Gas Protocol Framework. As such, the data collection and analysis focused on the following sources of emissions:

- Stationary combustion: from combustion of fuels in stationary sources such as boilers and furnaces.
- Mobile combustion: from the fuel consumption of owned vehicles.
- Refrigerants: from the use of refrigeration and air conditioning equipment.
- Electricity: from the generation of purchased electricity that is consumed onsite.
- Steam and chilled water: from the energy generated by a third party for heating and cooling purposes.

Along with the results, members disclosed related information such as conditioned space (sqft) for their organization, onsite consumption of fuels (natural gas, propane, diesel, gasoline), and electricity usage.

22 out of the 25 aquariums hired Verdis Group to complete their greenhouse gas inventory and the remaining aquariums disclosed their information via a data request form. In the cases where Verdis Group conducted the inventory, we worked with aquarium staff to gather all the necessary data that would comply with the framework requirements. This work included working with aquarium staff to provide bills or summary reports with the information needed. Approved data included:

- Stationary combustion: quantity of fuel used, type of fuel, and unit of measure
- Mobile combustion: quantity of fuel used, type of fuel, and unit of measure or miles driven combined with an estimated average miles per gallon efficiency
- Refrigerants: volume and type of refrigerant added in operation or total capacity of HVAC units combined with an estimated leakage rate
- Electricity: quantity of kWh used

Methodology

The data collected, also referred to as activity data, was then converted into metric tons of carbon dioxide equivalent with the emission factors provided by the EPA. Considering the framework for scope 1 and 2 emissions, tables 1, 2, 6, 7, and 12 from the EPA GHG Emission Factor Hub were used most frequently for the conversions. 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.

The year used for this baseline varied across organizations between 2019, 2021 and 2022. Each aquarium decided on an appropriate baseline year for their organization based on the most recently available data that was also representative of their normal operations, considering the impact of COVID-19. Each organization submitted data for a full calendar year.

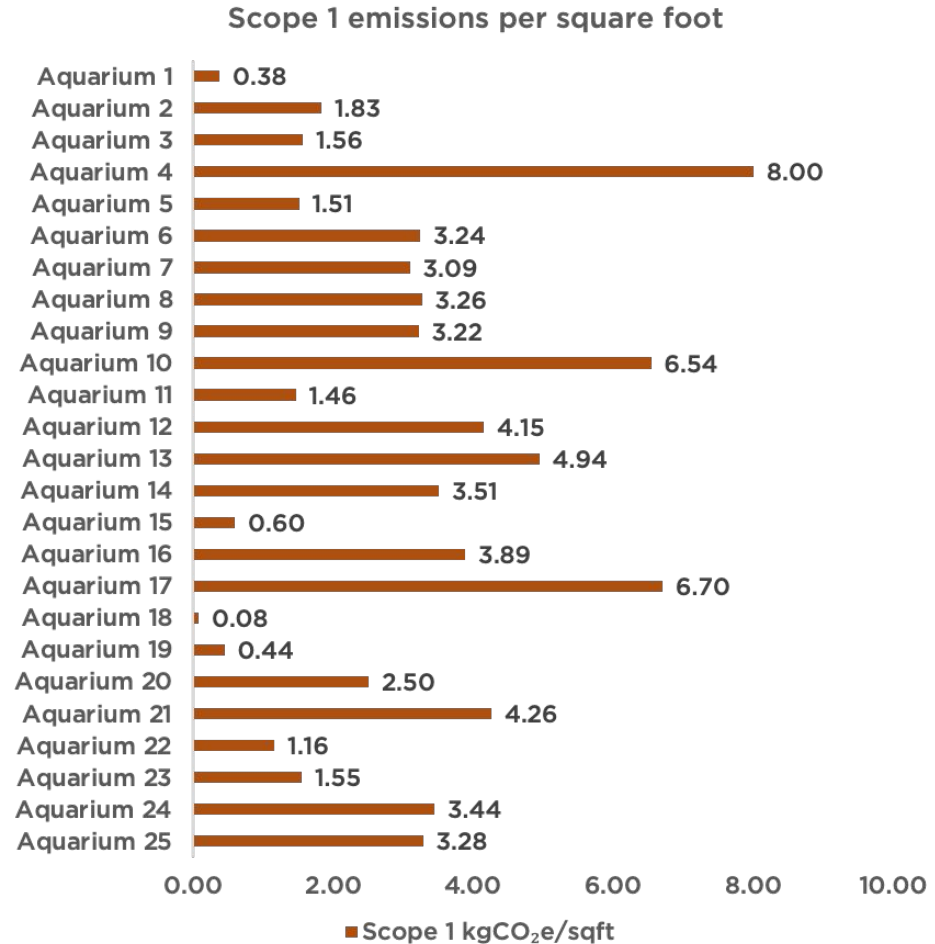
Additional Results

The below list includes key takeaways from this work:

- 82% of the total emissions across the 25 aquariums were generated from electricity consumption.
- 16% of the total emissions across the 25 aquariums were generated from the combustion of fuels onsite for heating purposes.
- 2% of the total emissions across the 25 aquariums were generated from the mobile fleet fuel consumption and refrigerant leakage.
- For onsite heating fuels, 18 aquariums use natural gas, 4 use other fossil fuels (fuel oil and propane), 1 uses district steam. Two aquariums do not use fossil fuels for heating and are fully electrified (water-source heat pump and geothermal). Generator fuel data was also collected when available and represents a negligible source of emissions (<0.5% of total emissions).
- The average conditioned space for an aquarium is 188,104 sqft.
- The average energy usage intensity for an aquarium is 203 kbtu/sqft, of which 156 kbtu/sqft can be attributed to electricity usage and 47 kbtu/sqft can be attributed to onsite heating.
- On average, aquariums emit 16.4 kgCO₂e/sqft, of which 13.45 kgCO₂e/sqft can be attributed to electricity usage, 2.49 kgCO₂e/sqft to onsite heating, and 0.49 kgCO₂e/sqft to other scope 1 sources (refrigerants and mobile fleet).

Additional Results

- Emissions and energy per square foot associated with onsite heating can vary based on the aquarium's location in the country with reduced heating needs in temperate and tropical climates, as well as the use of technologies like geothermal, heat pumps and steam that impact the scope 2 emissions. This graph shows the scope 1 emissions per square foot for each organization and the variability of this data point.



Thank you!



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