



Boise Unitarian Universalist Fellowship's Carbon Footprint

Finding the carbon footprint of Boise Unitarian Universalist Fellowship (BUUF) is one of the first tasks for getting to a carbon neutral congregation.

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Preliminaries

A [carbon footprint](#) is the total amount of greenhouse gasses (GHG) (including carbon dioxide and methane) that are generated by our actions. Figure 1 shows the major components of a carbon footprint

[Interfaith Power and Light](#) and [Cool Congregations](#) provide carbon footprint calculators for both congregations and individual households. The initial carbon footprint calculations will be using 2019 pre-pandemic data and 2023 outdoor sanctuary data.

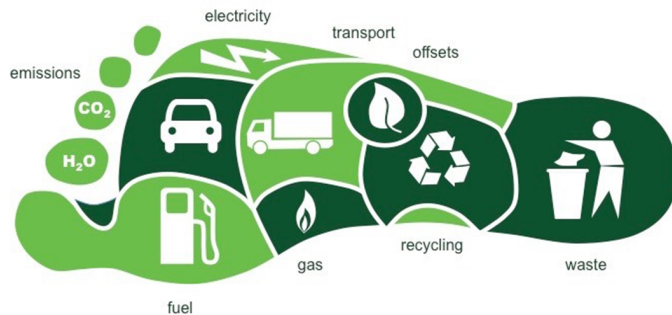


Figure 1. Carbon Footprint

Congregational Carbon Footprint

A Congregation has three distinct carbon footprints:

1. The building and its outdoor area
2. Transportation: The carbon footprint of people traveling to congregation's facility
3. Households : The household carbon footprint of an average congregation member or friend

BUUF Footprint: The carbon footprint of the building and grounds.



Figure 2 - The Building and grounds of the Boise Unitarian Universalist Fellowship

The [Cool Congregation's Congregational Carbon Footprint Calculator](#) uses the following information to calculate the congregation's carbon footprint, the amount of greenhouse gasses emitted (CO₂e) yearly, measured in metric tons (mt/yr)

- Location: The physical location of the building, its size, number of visitors and staff,
- Facility: The amount of fuel used to heat, cool, and power your buildings, plus water, waste and recycling and the greenhouse gas emissions from the materials in the building (Construction)
- Transportation: The staff work-related miles and travel by congregants to worship
- Food: The frequency various types of animal products, grain, produce, and drinks are served at congregational meals each week
- Procurement: The dollars spent on printing, supplies, maintenance, and everything else you purchase
- Carbon Offsets: The amount of carbon captured by recycling, landscaping and purchased offsets.

For this carbon footprint we'll only consider the greenhouse gas emissions of the BUUF's building and grounds. The carbon footprint made by the people coming to BUUF services is considered in the Transportation footprint.

Table 1 and Figure 3 show that BUUF's carbon footprint is 32.26 metric tons (mt) of CO₂e/year. The largest portion of the footprint is 23.8 mt of CO₂ from natural gas heating. See [BUUF](#)

[HVAC & Carbon Neutral](#) for a detailed discussion of how to reduce this amount to meet our 2030 and 2050 goals

BUUF's Outdoor Sanctuary

There are several factors to consider when calculating the carbon emissions and capture of landscaping:

- Emissions:
 - How much and how often fertilizer is applied
 - How often the area is watered
 - How often the area is mowed and the mower emissions
- Sequestration:
 - The size and composition of the lawn areas
 - The species, height and circumference of the trees.

On BUUF's 4.75 acre building and grounds (see Figure 2) the factors are:

- Fertilizing:
 - No fertilizer applied = 0 mt/yr
- Irrigation:
 - Water is pumped the 6ft deep water table and when applied returns to the water table - 0 emissions
 - The electricity for the pump is considered in the building carbon footprint
- Lawn mowing
 - 17 - 20 gallons per year
 - Produces 332.4 lb GHG to 391 lb GHG = .18 mt/year
- Lawn:
 - For the 3/4 acre, at 1 mt/year/acre = 0.75 mt/year
- Trees:
 - 221 trees have been inventoried
 - 68% of these trees measured for size, height and species
 - Using the [calculations provided the Univ of New Mexico](#) these trees capture 7.32 mt Co2/yr

Maintaining the Outdoor Landscaping emits 0.18 mt/yr and 68% of the trees and ¾ of an acre of grass captures 8.07mt/yr. Balancing the emissions and carbon capture gives 7.89 mt/yr

Initial Guess: Our first try at a carbon footprint for the Outdoor Sanctuary is discussed in detail in [Toward a Carbon Neutral Outdoor Sanctuary](#). The Outdoor Sanctuary's footprint is -8.56 mt/year because the landscaping captures carbon."

BUUF Carbon Footprint

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Table 1 and Figure 3 show that BUUF's carbon footprint is 32.26 metric tons (mt) of CO₂e/year. The largest portion of the footprint is 23.8 mt of CO₂ from natural gas heating. See [BUUF Non-GHG HVAC project](#) for a detailed discussion of how to reduce this amount to meet our 2030 and 2050 goals

Table 1 - Data for BUUF 2019 Footprint 1 - 32.26 mt/yr of CO₂e

Location	Staff	4
	Weekly visitors	250
	Size (sq ft)	12,970 = 6.5 mt/yr
	State	Idaho
	County	Ada
Facilities	Electricity	23,280 KWh = 2.5 mt/yr
	% renewable	74
	Natural Gas	434,500 cu ft = 23.8 mt/yr
	Other fuel	13
	Water & Wastewater	1780 = 5.8 mt/yr
	Waste	3.6 tons = 2.5 mt/yr
	Recycling	2.6 mt/yr
Staff Transportation		0
Service Attendees	Average distance	6.2
	% Responsibility	0
Food	Event meals/week	0
Procurement	Print services	\$0
	Supplies	\$1,400 = 1.2 mt/yr

	Facilities Maintain	\$1,468 = 0.8 mt/yr
Carbon Offsets	Outdoor Sanctuary	8.57 mt/yr

2019: 32.26 MT/yr of CO₂e

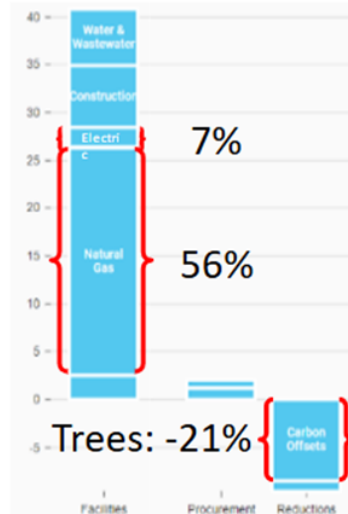


Figure 3 - BUUF's 2019 Carbon Footprint: 32.26 mt/yr of CO₂e

BUUF Footprint: 2030 Goal for Greenhouse Gas Reductions

The goal for 2030 is to reduce our GHG emissions by 45%.

Given the carbon footprint for 2019 is 32.26 mt/year (see Figure 3) the 2030 goal is 14.97 mt/year.

BUUF Footprint: Greenhouse Gas Mitigations

1. Switch to [Idaho Power's Green Power Program](#) which provides electricity from 100% [renewable energy sources which emit little or no GHGs](#) using a system of [Renewable Energy Credits](#).
 - a. This decreases the carbon footprint to 30.77
2. Replace Natural Gas HVAC units with alternatives
 - a. There are 8 HVAC units, Figure 4 shows the results of replacing units of BUUF's carbon footprint, assuming that the 434,500 cu ft/yr(23.8 mt/yr) is distributed equally between the units..
 - b. Alternatives
 - i. Minimum is to replace 4 to reduce the carbon footprint to 12.94 mt/yr
 - ii. Replace all 8 to get to 7 mt/yr

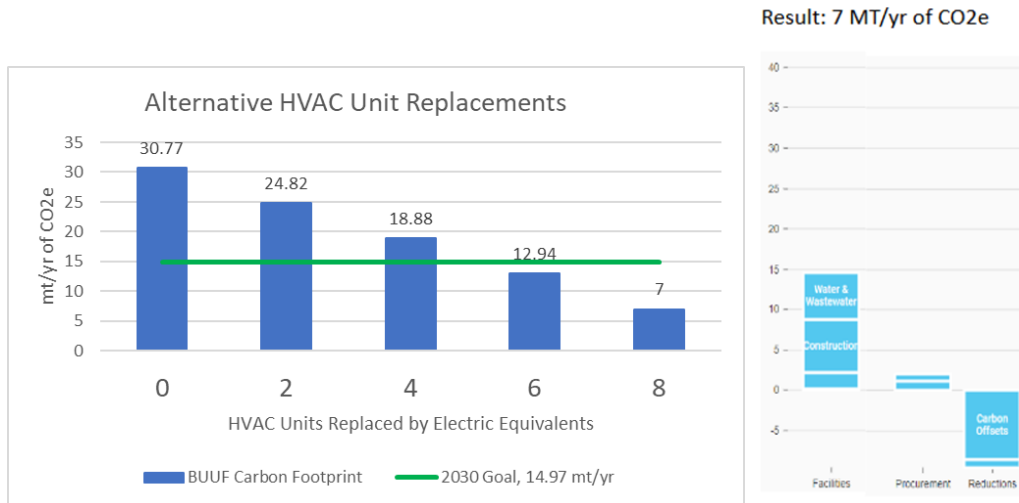


Figure 4 - Effects of switching natural gas HVAC units to electric equivalents

Transportation Footprint: The carbon footprint of travel to BUUF

This footprint is the carbon footprint for visitors to BUUF, both for weekly services and meetings. I estimated the 2019 number of weekly visitors at 250 to account for the 2 services and meetings:

- 200 for the 2 service and religious exploration
- 50 people in meetings throughout the week

Table 3. 2019 Transportation Footprint Input Data

Location	Staff	4
	Weekly visitors	250
Business AirTravel	Air Travel	0
Staff Commute	Gasoline commute	0
Service Attendees	Average distance	6.2
	People/Vehicle	2
	% Responsibility	100

Transportation Footprint: Carbon Footprint Reduction Goal

Our goal is 45% reduction of 2019 carbon footprint of 15.8 mt/yr to 7.11 mt/yr by 2030

Table 4. Transportation carbon footprints

Year	Footprint	2030 Goal	Notes
2019	15.8	7.11	250 visitors/week
2020	3.95	7.11	¼ of 2019, pandemic shutdown April 2020
2021	0	7.11	Building shutdown
2022	2.9	7.11	25-40/week with increase less than 65 Sept - Dec
2023	7.3	7.11	Extrapolate from Jan-March data

The pandemic closed the building, which caused the immediate drop in the carbon footprint shown in Table 4 above and Figure 5 below. This caused a switch to 100% remote attendance to services and meetings via zoom for ¾ of 2020 and all of 2021. As the pandemic has eased, in-person attendance has increased in 2022 and 2023 while keeping a remote component that decreases the transportation carbon footprint.

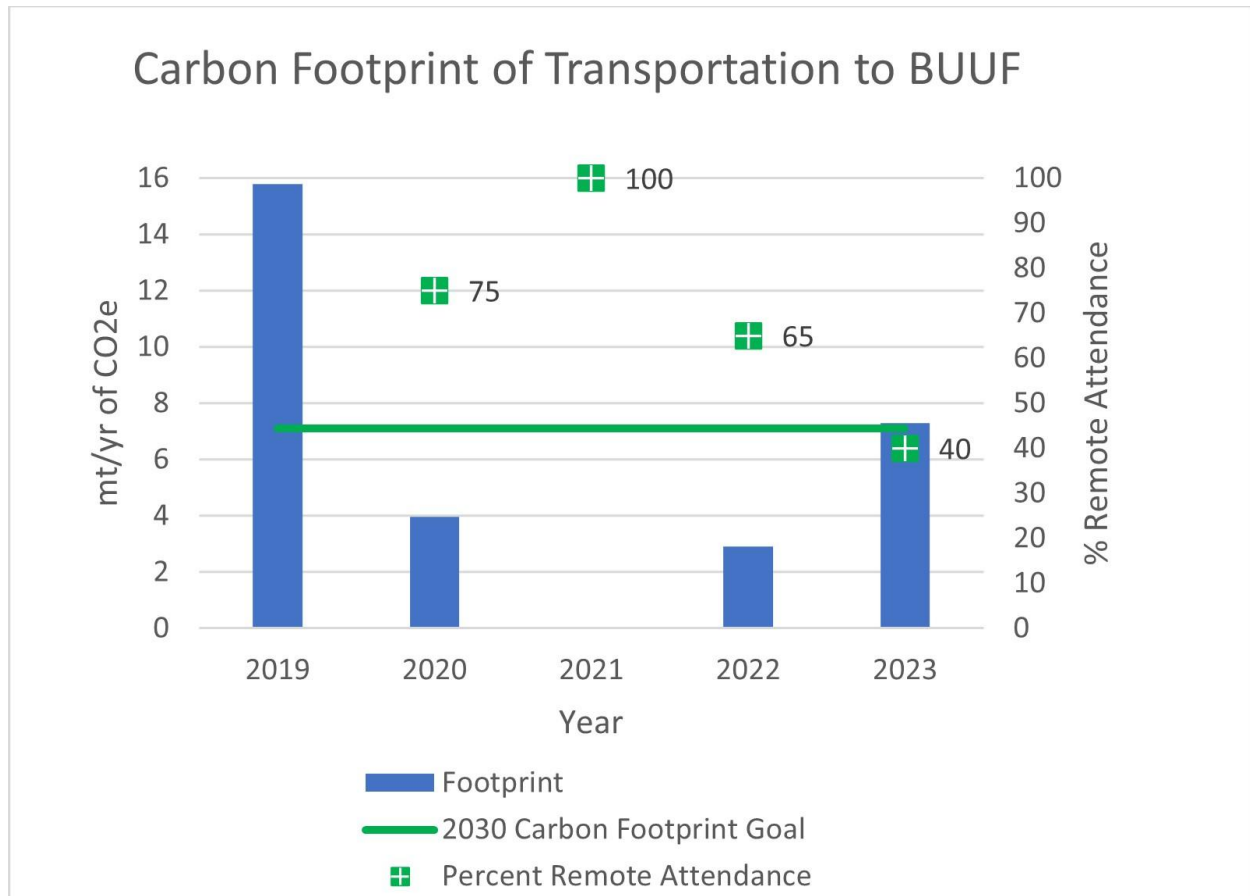


Figure 5. Transportation carbon footprints with 2 people/vehicle

Household Footprint: The household carbon footprint of BUUF members and friends

The average household carbon footprint

Assumptions from 2019:

- [Idaho average price of gasoline](#): \$2.66
- [Electricity price per kWh](#): \$6.25
- [Natural gas price per therm](#): \$0.52
- [Average number of people per household](#): 2.37 - use 2.5
- Average household income: \$72,295 - snaps to \$60,000
- Average number of miles driven per 2 person household: 15,000
- [Average gas mileage](#): 24.9
- Assume no public transport miles
- [Assume 1.5 - 2 Airline trips per year](#)
- [Average number of miles flown per household](#): take the default 4,100

- [Electricity](#) 10,175 kWh/yr, 74% from Renewable Energy Certificates (REC)
- [Natural gas](#) 377 therms/yr
- Living space: default
- Water usage: default
- Food: defaults
- Shopping: defaults

The [Cool Congregations household calculator](#) gives an average footprint for Boise households of 47 mt/yr of CO₂e when adjusted for Idaho Power's 74% renewable energy sources. [this result may vary]

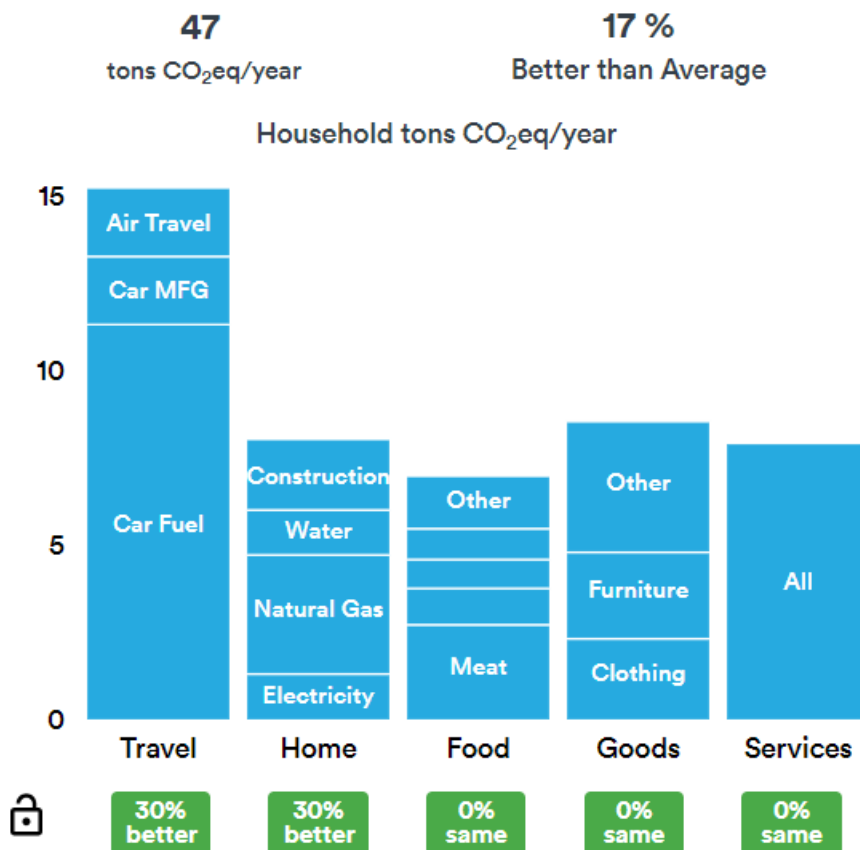


Figure 6 - Average Boise Household Carbon Footprint - 47 mt/yr

A closer look at the footprint

While the single footprint number allows the easy comparison of footprints, it's not enough information to know how to reduce a footprint.

Carbon Footprint Categories

The carbon footprint calculator categorizes emission to the the categories shown in Figure 6:

- Travel: emissions generated by your travel, broken down by transportation methods

- Home: emissions from home's use of items such as electricity, natural gas, and water
- Food: emissions based on the things you eat
- Shopping: emissions from the production and delivery of the goods and services you purchase

Types of Carbon Emissions

GHG Protocol (ghgprotocol.org) establishes comprehensive global standardized frameworks to measure and manage greenhouse gas (GHG) emissions and categorizes emissions into 3 scopes:

- Scope 1 emissions: Emission sources a person owns. Our cars, homes, furnaces, and mowers for example:
- Scope 2 emissions: Emissions that a person causes indirectly by purchasing energy. These emissions from energy producers: Intermountain Gas and Idaho Power
- Scope 3 emissions: All the indirect emissions that occur in the production and use of the things we buy. Examples: food, clothing, household goods and services.

Household Emissions by Category and Scope

The footprint calculator is interactive and can show you the emissions for each of the items in the footprint by moving a mouse/cursor over the item.

Table 5. Average Boise household carbon emissions for each item

Category	Item	tons CO ₂ e/yr	Scope	2023 Goal
Travel	Car Fuel	11.28	1	5.64
Travel	Air Travel	1.96	1	0.98
Travel	Car MFG	1.95	3	1.95
Home	Natural Gas	3.42	1	1.71
Home	Construction	2.03	3	2.03
Home	Water	1.29	1	0.645
Home	Electricity	1.23	1	0
Food	Meat	2.74	3	1.37
Food	Other	1.5	3	0.75
Food	Dairy	1.04	3	0.52
Food	Cereals	0.89	3	0.445
Food	Fruits & Veg	0.83	3	0.415
Goods	Other	3.75	3	1.875
Goods	Furniture	2.48	3	1.24
Goods	Clothing	2.34	3	1.17
Services	All	7.94	3	3.97
		46.67		24.71

Table 6 - Scope 1 and 3 Household Emissions

Scope 1 Emissions			Scope 3 Emissions		
Category	Item	tons CO2e/yr	Category	Item	tons CO2e/yr
Travel	Car Fuel	11.28	Travel	Car MFG	1.95
Travel	Air Travel	1.96	Home	Constructi on	2.03
Travel	Public Transport	0	Food	Meat	2.74
Home	Natural Gas	3.42	Food	Other	1.5
Home	Water	1.29	Food	Dairy	1.04
Home	Electricity	1.23	Food	Cereals	0.89
				Fruits & Veg	0.83
			Goods	Other	3.75
			Goods	Furniture	2.48
			Goods	Clothing	2.34
			Services	All	7.94
total		19.18	total		27.49

The top three scope 1 household emissions are highlighted in Table 6: Car Fuel, Air Travel, and Natural Gas.

BUUF Household Carbon Footprint

The BUUF household carbon footprint of BUUF members and friends, assuming 324 households, is 15,275 mt/yr.

BUUF Household Carbon Footprint Reduction Goals

The reduction goal is 45% reduction by 2030 and 100% (net-zero) by 2050

Household Carbon Footprint Class

Please see the presentation for a household carbon footprint class that we can use to help reduce the congregation's household footprint: [Household Carbon Footprint Class](#).

Potential Mitigations

1. Stop burning natural gas
2. Use 100% electricity from renewable source

3. Stop using gas/diesel powered transportation (cars & trucks) or increase car pooling

	BUUF (mt/yr)	250 Trips (mt/yr)	Household (mt/yr)	200 Households (mt/yr)
Status Quo	33.26	19.59	33	6,600
Renewable Electricity	30.77	19.59	32	6,400
No Natural gas	7	19.59	29	5,800
Electric vehicles	7	0	19	3,800