



Second Nature

Greenhouse Gas Inventory Report and Carbon Offset Plan FY 2019 & FY 2020

Introduction

Second Nature is a non-profit based in Boston, MA that is committed to accelerating climate action in, and through, higher education. We do this by mobilizing a diverse array of higher education institutions to act on bold climate commitments, to scale campus climate initiatives, and to create innovative climate solutions. We align, amplify, and bridge the sector's efforts with other global leaders to advance urgent climate priorities. Since 1993, Second Nature has worked with over 4,000 faculty and administrators at hundreds of colleges and universities to help make the principles of sustainability fundamental to every aspect of higher education.

Second Nature is led by both a Board of Directors and a Climate Steering Committee. The Board of Directors serves to provide strategic oversight and hold fiduciary responsibility for Second Nature. The Climate Steering Committee is the chief oversight body of the Climate Leadership Network, responsible for advising on its policy and direction.

The greenhouse gas emissions considered within Second Nature's organizational boundary include the office facility and the operations. The operational emissions include staff commuting to the office and staff travel associated with outreach to others, as well as staff travel and participant travel associated with events and meetings that Second Nature has hosted.

Second Nature has decided to not include any emissions associated with teleworking after the onset of the pandemic. Looking at FY 2020, only about a quarter of the year took place during the pandemic and therefore did not have a significant impact on the Scope 2 emissions. The building still needed heating/cooling and some appliances to be plugged in even when employees were not coming in to work. You will see in the data that the Scope 2 emissions from 2019 to 2020 actually slightly increased, but it represents only a very small fraction of the overall emissions. Therefore, teleworking emissions were not considered for these two years. However, as the pandemic continues into the 2020/2021 FY and Second Nature looks towards eliminating its lease with the office building in the years to come, teleworking emissions should be reconsidered as part of Second Nature's greenhouse gas (GHG) footprint.

Second Nature has decided to include the emissions associated with the travel of participants to in-person events hosted by Second Nature with the thinking that these emissions would not have happened without the leading role played by Second Nature. Second Nature provides educational services to campus leaders and just like a college that provides in-person and online educational services, some Second Nature offerings are also given virtually (such as webinars) as well as in-person (such as the annual Summit). When college campuses calculate their carbon footprint, the emissions associated with commuting and bringing the learners to in-person sessions are often counted as Scope 3

emissions (see, for example, [Yañez, Sinha, and Vásquez, 2020](#) or [Vásquez, Iriarte, Almeida, and Villalobos, 2015](#)). Therefore, for the purposes of calculating Second Nature's emissions, the car and air travel emissions associated with bringing the learners to in-person sessions were included in the calculation of Scope 3 emissions. Second Nature did not include emissions associated with hotels or overnight accommodations that are used during staff or event participant travel. Some entities include such emissions in their estimates while others do not. We decided not to consider them because of the difficulty of the calculation and because these are activities (eating, water use, electricity use, etc.) that likely would have been occurring even if the staff member or event participant wasn't traveling for business. Second Nature may wish to revisit this issue in future years. These travel emissions are reflected in Scope 3 under the category 'Business Travel (event participants).'

This Greenhouse Gas Inventory was initially thought to be a way to understand the organization's own impact and emissions, something that through the nature of our work, we are asking other institutions to do yet have never done ourselves except for offsetting the travel of a previous key employee. Our hope is that by taking the initiative to reflect on our own impact, Second Nature is setting the precedent for other institutions and organizations to do the same.

Several ways that the information in this report might be shared more broadly were considered, and it was thought that a stand-alone report was probably not the best way. Instead, the idea was to prepare a one-page flier that might live on the Second Nature webpage and/or dedicate one page in Second Nature's annual Impact Report to this topic. Assuming that Second Nature is able to do an analysis for its 2020-2021 fiscal year following the same methodology, it will then be able to have a three-year time series to present to campuses and other audiences.

About This Report

In this report we examined the two recently-completed fiscal years covering the periods July 1st 2018 - June 30th 2019 (FY2019) and July 1st 2019-June 30th 2020 (FY2020). As this is Second Nature's first attempt to calculate emissions, we examined two fiscal years and we also examined many components that are part of calculations carried out for larger entities. The outcomes of the report suggest that certain activities play a very small role in Second Nature's emissions, and they might be ignored in future years.

The standardized [GRI/WRI Greenhouse Gas Protocol](#) was used to guide this report.

The methodology for calculation of each source of emissions is as follows:

Scope 1:

"Scope 1 emissions are direct greenhouse (GHG) emissions that occur from sources that are controlled or owned by an organization (e.g., emissions associated with fuel combustion in boilers, furnaces, vehicles)" ([EPA Scope 1 and 2 Inventory Guidance](#)). Second Nature does not have any Scope 1 emissions.

Scope 2:

"Scope 2 emissions are indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling. Although scope 2 emissions physically occur at the facility where they are generated, they are

accounted for in an organization's GHG inventory because they are a result of the organization's energy use" ([EPA Scope 1 and 2 Inventory Guidance](#)). Second Nature leases office space in Boston and the purchased electricity and heat for their office space are part of their Scope 2 emissions.

- Electricity (~0.6 tons/year of total CO2 emissions)
 - Bills from the electricity company were gathered from the specified time period.
 - The average monthly usage (kWh) was taken for each month from the bills and added together.
- Cooling (~0.3 tons/year of total CO2 emissions)
 - The GHG Protocol for Scope 2 provides a methodology for determining the Emission Factor for purchased cooling where electricity is the source fuel
 - "An emission factor for purchased cooling that is generated by an electric chiller is equal to the emission factor for the electricity consumed in the chiller divided by the chiller's coefficient of performance (COP)" ([Scope 2 Guidance, Accounting for Steam, Heat, and Cooling](#)).
 - The following assumptions were used:
 - Energy Use Intensity (EUI) for Cooling = **2.6 kWh/GSF** (EIE Commercial Building Survey data)
 - Coefficient of Performance for air-source heat pumps = 3.25
 - eGrid for Boston
 - Emission Factor = **77.08 kg CO2e/Mwh.**
- Heat (~0.4 tons/year of total CO2 emissions)
 - The heating operating system in the office building is steam heat. Second Nature does not pay for heat directly, the landlord does. For this reason, the heat operates as a whole in the office building and therefore it is nearly impossible to determine how much heat just the Second Nature office space consumes. Since we could not determine the exact amount of heat used in the Second Nature office, we had to do an estimate.
 - The calculations are as follows:
 - To calculate the estimation for the amount of steam in millions of BTUs (MMBTU) we can Energy Use Intensity (EUI) estimate from Commercial Building Energy Consumption Survey (CBECS) here: <https://www.eia.gov/consumption/commercial/data/2012/c&e/cfm/c38.php>
 - For office buildings, the national average Energy Use Intensity (EUI) for district heating is **42.3 kBTU/square foot/year.**
 - Second Nature's lease in the office building is for 1,391 square feet.
 - Finally, we used the EPA's Emission Factor for steam heat (which assumes that natural gas is the fuel for the steam generation). This emission factor is **66.398 kg CO2e/MMBTU.**

Scope 3:

"Scope 3 emissions are the result of activities from assets not owned or controlled by the reporting organization, but that the organization indirectly impacts in its value chain." This includes upstream transportation and distribution, downstream transportation and distribution, waste generated in operations, end-of-life treatment and distribution, business travel, employee commuting, upstream

leased assets, processing of sold products, downstream leased assets, franchises, and investments ([EPA Scope 1 and 2 Inventory Guidance](#)).

Second Nature's Scope 3 emissions include employee commuting, business travel (including staff and event participant travel), waste generated in operations, and electricity transmission and distribution losses.

- Employee commuting (~4.9 tons/year of total CO2 emissions)
 - We first consulted with the operations manager to ensure we had complete information about who worked during these fiscal years. If someone worked during that year, but no longer does, we consulted with the operations manager to help fill in the information for them.
 - Initially created a short [survey](#) with Google Forms to collect the commuter information from the staff.
 - Ensured that all travel information was collected from staff members (i.e. some drive 2 miles and then take the MBTA for 5 miles, so need to capture both modes of transportation).
 - Considered how many days per week a staff member would commute to the office, and how many weeks per year (taking into consideration travel, vacation, holidays, etc.).
 - Considered what day a staff member began their employment within the specified fiscal years, if applicable.
 - Calculated the total number of days each staff member commuted into the office each year (number of days went into office per week x the number of weeks went into the office per year) and multiplied that by the number of miles traveled.
 - Totaled these amounts in Google sheets for each type of travel (car, bus, train, subway, walk/bike).
 - *note that Second Nature employs multiple staff that work from home and we did not calculate any commuter emissions for them. Telecommuting was something we discussed but ultimately decided not to include in this report.
 - *note that Andy DeMeo has been working on a way to collect and calculate commuter information with researchers from UNH. Upon completion of this project, this will likely be a more efficient way to collect commuter information and could be adapted for this purpose.
 - *note that the staff commuting for FY2020 looked different because of the onset of the pandemic. We assumed after March 1st, 2020 there was no longer any staff commuting happening to the office.

- Business travel (staff) (~19.4 tons/year of total CO2 emissions)
 - Accessed the Second Nature Expensify account and went through all expenses submitted within the specified fiscal years, looking specifically at the expenses submitted for transportation.

- From most receipts we were able to determine a starting point and a destination and therefore calculate the number of miles traveled. Some submissions included the miles traveled in the memo line or included the miles traveled on the receipt (Uber/Lyft/Taxis often lists this in their receipts).
- To determine the number of miles traveled between two points, the two locations were put into Google maps and the mileage from the most direct route was used. If it was a flight, the two airports were put into <https://www.airmilescalculator.com> to determine the amount of miles traveled. This is necessary because the distance traveled by a car and a plane to the same destination is not equivalent.
- If there was no receipt attached to the submission and no indication of where the staff member went, we consulted with the staff member who submitted the expense to get an estimation on the number of miles traveled.
- We added all miles together in a Google sheet for each type of travel (car, bus, train, subway, air [short, medium, long])
- *note that all Lyft rides that staff members took were not included in the emissions calculation because during these fiscal years Lyft was offsetting their emissions. The offsetting took place domestically and had additionality. See <https://medium.com/@johnzimmer/all-lyft-rides-are-now-carbon-neutral-55693af04f36> for more information. Lyft recently stopped their offsetting program in June 2020 to focus on changing their fleet of vehicles into EVs.
- *note again that FY2020 might look different than past years because staff travel was limited after the onset of the pandemic.
- *Many staff utilized metro/subway systems in cities when traveling. In order to determine the miles traveled from a single ticket purchased, the assumption was that they went from one end of the rail system to the other to ensure we were overestimating how far they could have traveled with the purchase of one ticket. We referenced either a city's metro system page online, or the Wikipedia page dedicated to the city's metro system. The following are the ones referenced:
 - LA metro: <https://media.metro.net/documents/a5e11b4f-11ac-4807-8cd2-0e7cff6aa94e.pdf>, http://media.metro.net/riding_metro/maps/images/4_17-3071_BLT_BusRailOverview.pdf
 - BART: https://en.wikipedia.org/wiki/Antioch-SFO/Millbrae_line, <https://www.bart.gov/system-map>, https://en.wikipedia.org/wiki/Bay_Area_Rapid_Transit
 - MBTA: [https://en.wikipedia.org/wiki/Red_Line_\(MBTA\)](https://en.wikipedia.org/wiki/Red_Line_(MBTA))
 - MARTA: <https://www.itsmarta.com/common-questions.aspx>
 - WMATA: <https://www.wmata.com/about/history.cfm>
 - Madrid Metro System: https://en.wikipedia.org/wiki/Madrid_Metro
 - St. Louis Metro System: [https://en.wikipedia.org/wiki/MetroLink_\(St._Louis\)](https://en.wikipedia.org/wiki/MetroLink_(St._Louis))
 - Maryland (MTA): https://en.wikipedia.org/wiki/Baltimore_Metro_SubwayLink

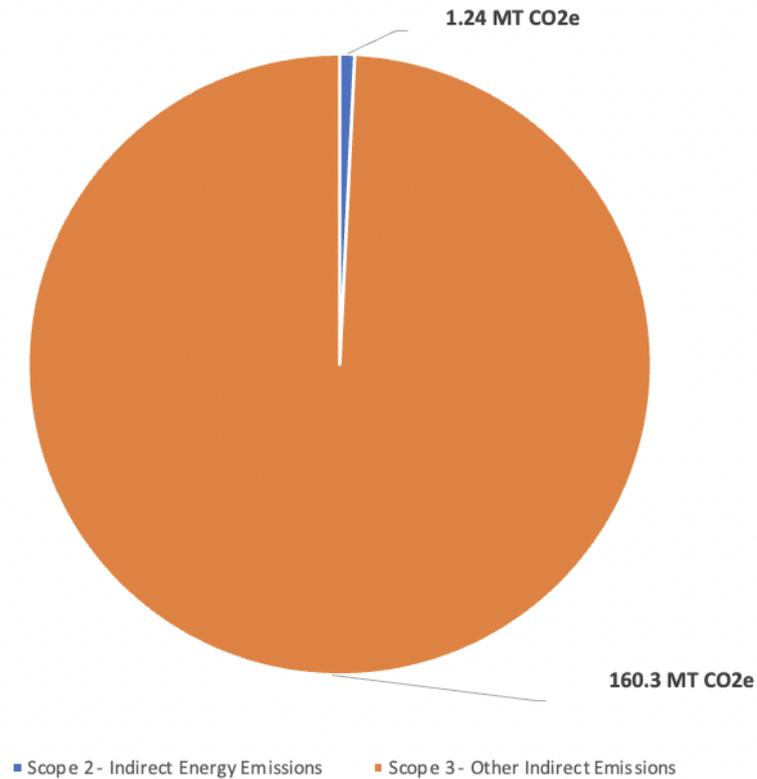
- Chicago: https://en.wikipedia.org/wiki/Chicago_%22L%22
 - NYC: https://en.wikipedia.org/wiki/New_York_City_Subway
- Business travel (event participants) (~125.5 tons/year of total CO2 emissions)
 - Gathered a list of all participants who attended a Second Nature sponsored event within the specified time period.
 - Using Google maps, we entered the home address of the attendee and the event location to see how far of a drive it would've been. If the most direct route between the two locations was less than 4 hours, then it was assumed that the person drove a car to the event. We made sure to account for the round trip by multiplying the distance by 2.
 - If it was more than a 4 hour drive, then it was assumed that they took a plane to the event. We first looked at their home town and found the closest airport to it. However far the airport was from their home, I entered this number of miles into the car miles category (and multiplied by 2 for round trip).
 - We also ensured the chosen closest airport flew to the destination even if this meant they had to have a layover. There was no feasible way to account for layovers we found, so we decided to omit them as a factor. We just assumed that if they could get to the destination from their closest airport via a layover or not, it was only the one flight they took from point A to point B.
 - We again used <https://www.airmilescalculator.com> to determine how many miles were traveled during a flight and ensured to account for the roundtrip.
 - *Note that staff travel to these events was not included under the event travel but included in the staff travel.
 - *If the person lived in the same town/city as the event they were attending or as the airport they were flying from, then we made the assumption that they traveled 20 miles round trip via car.
 - *Because air miles are divided into the short, medium, and long categories, we did not consider a round trip to be one flight, we separated it into distinct flights. For example, if a round trip flight was 350 miles, that would be considered a medium flight. However, since that is actually two separate flights (going there and coming back) the flights would be 175 miles each which is considered a short flight.
- Waste generated in operations (~0.000032 tons [essentially zero]/year of total CO2 emissions)
 - Consulted with the operations manager to estimate how much waste is produced each week in the office facility. She estimated one bag of trash a week.
 - An average bag of garbage can be at the most 40 lbs, or 0.02 tons.
 - 0.02 x 52 weeks in a year is at most 1.04 tons/year of garbage.
 - The [EPA's "WARM"](#) model was used to find the emission factor.

The Data

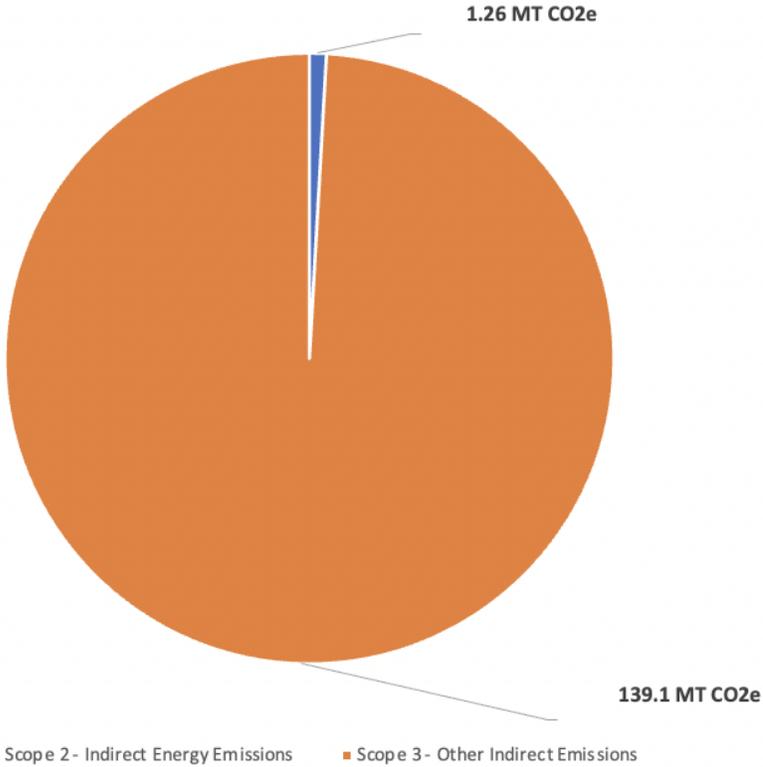
The data from this process of collection will be stored in the Second Nature Google Drive in a folder titled 'SN Climate Action Plan.'

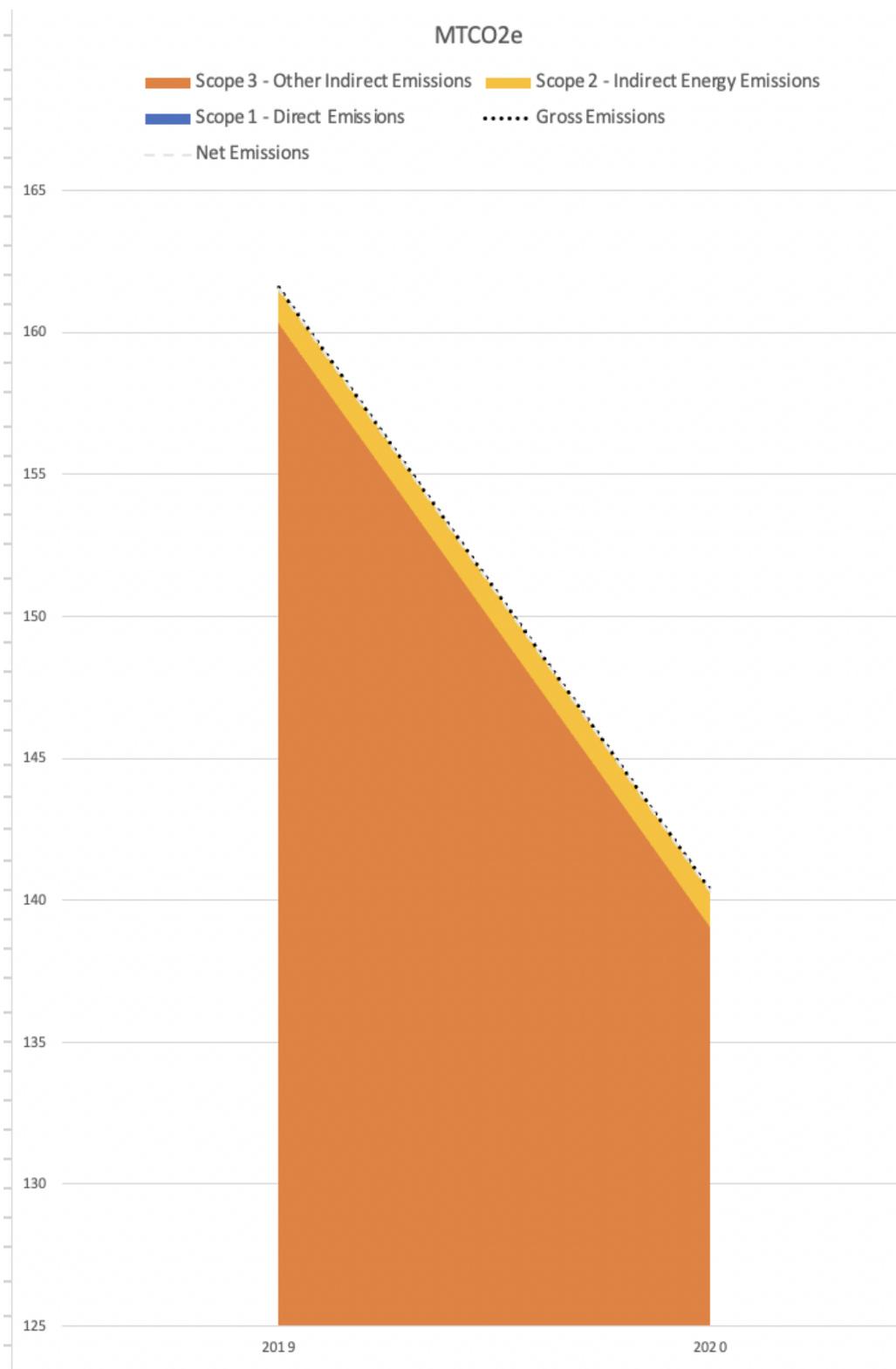
This data was calculated using the "GHG Inventory Summary Workbook v1.3.0" Copyright © 2018 provided by Brailsford & Dunlavy. The workbook is licensed under a [Creative Commons Attribution-ShareAlike 4.0 International License](#) by Fovea LLC, Riverstone Sustainability, and other individual contributors.

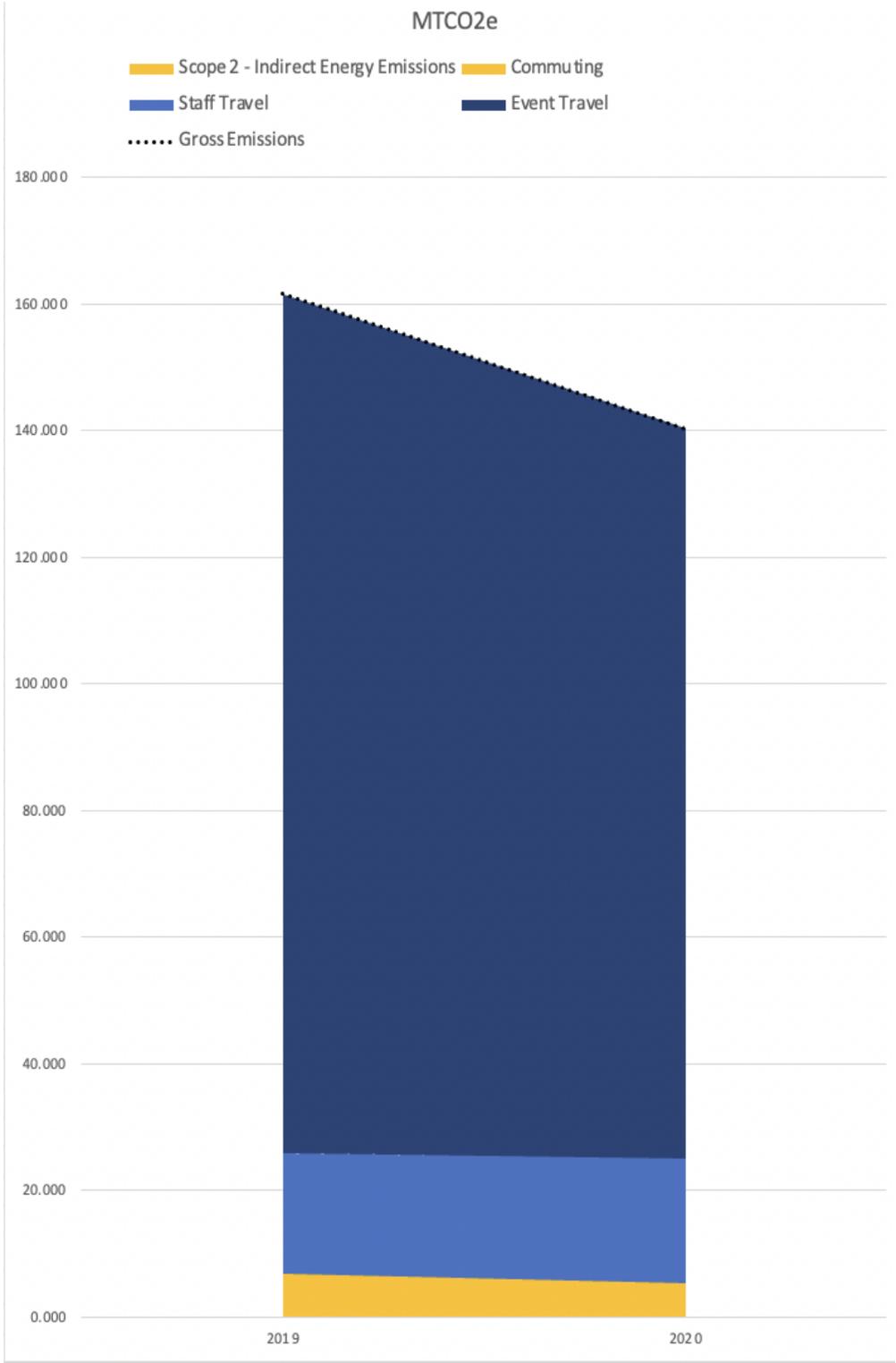
Scope 2 and 3 Emissions - 2019



Scope 2 and 3 Emissions - 2020







Reporting Year		2019	2020
Scope 1 - Direct Emissions		0	0
Stationary Combustion	MTCO2e	0	0
Natural Gas	MTCO2e	0	0
Distillate Oil (#1-4)	MTCO2e	0	0
Propane	MTCO2e	0	0
Biodiesel	MTCO2e	0	0
Mobile Combustion	MTCO2e	0	0
Gasoline Fleet	MTCO2e	0	0
Diesel Fleet	MTCO2e	0	0
Agricultural Emissions	MTCO2e	0	0
Refrigerants	MTCO2e	0	0
Other Scope 1	MTCO2e	0	0
Scope 2 - Indirect Energy Emissions		1.244	1.258
Purchased Electricity	MTCO2e	0.57	0.59
Purchased Steam	MTCO2e	0.39	0.39
Purchased Cooling	MTCO2e	0.28	0.28
Other Scope 2	MTCO2e	0.0	0.0
Scope 3 - Other Indirect Emissions		160	139
Commuting	MTCO2e	5.7	4.1
Car	MTCO2e	0.99	0.76
Bus	MTCO2e	0.23	0.14
MBTA	MTCO2e	2.70	2.05
Commuter Rail	MTCO2e	1.78	1.12
Staff Travel	MTCO2e	18.9	19.8
Car	MTCO2e	0.83	0.89
Subway	MTCO2e	0.05	0.15
Train	MTCO2e	0.02	0.13
Bus	MTCO2e	0.14	0.61
Air - Short Haul	MTCO2e	0.21	0.37
Air - Medium Haul	MTCO2e	13.28	8.50
Air - Long Haul	MTCO2e	4.43	9.12
Event Travel	MTCO2e	135.7	115.2
Car	MTCO2e	6.96	7.78
Train	MTCO2e	0.00	0.09
Air - Short Haul	MTCO2e	0.00	0.96
Air - Medium Haul	MTCO2e	119.36	95.43
Air - Long Haul	MTCO2e	9.32	10.92
Waste Generated in Operations	MTCO2e	0.00032	0.00032
Waste Water	MTCO2e	0.00	0.00
Electricity T&D Losses	MTCO2e	0.029	0.029
Gross Emissions		162	140

The exact quantities and emissions factors are as follows:

	Quantity (2019)	Quantity (2020)	Units	Emission Factor (kg CO2e / Unit)
Scope 1 - Direct Emissions				
Stationary Combustion				
Natural Gas	0	0	MMBtu	53.110
Distillate Oil (#1-4)	0	0	Gallons	10.313
Propane	0	0	Gallons	5.760
Biodiesel	0	0	Gallons	0.000
Mobile Combustion				
Gasoline Fleet	0	0	Gallons	8.810
Diesel Fleet	0	0	Gallons	10.21
Scope 2 - Indirect Energy Emissions				
Purchased Electricity	2.29	2.35	MWh	250.521
Purchased Steam	5.9	5.9	MMBTU	66.3980
Purchased Cooling	3,616.0	3,616.0	kWh	0.0771
Scope 3 - Other Indirect Emissions				
Commuting				
Car	2,852	2,194	Miles	0.3468
Bus	475.2	297	Miles	0.4778
MBTA	18,089	13,697	Miles	0.1495
Commuter Rail	10,880	6,840	Miles	0.1637
Staff Travel				
Car	2,386	2,558	Miles	0.3468
Subway	309	1,029	Miles	0.1495
Train	112	926	Miles	0.1411
Bus	288	1,285	Miles	0.4778
Air - Short Haul	930	1,640	Miles	0.2272
Air - Medium Haul	96,765	61,943	Miles	0.1373
Air - Long Haul	26,424	54,393	Miles	0.1676
Event Travel				
Car	20,065	22,440	Miles	0.3468
Train	0	670	Miles	0.1411
Air - Short Haul	0	4,234	Miles	0.2272
Air - Medium Haul	869,547	695,236	Miles	0.1373
Air - Long Haul	55,627	65,138	Miles	0.1676
Waste Generated in Operations	1.04	1.04	Tons	0.3100
Waste Water	0.00	0.00	Gallons	0.0000
Electricity T&D Losses	0.11	0.12	MWh	250.521

Mitigation, Reduction, and Goals

As Second Nature wishes to mitigate or offset all its emissions going forward, some strategies that they could employ include:

- o Purchasing domestic offsets and offsets with additionality for staff travel, staff commuting, and emissions associated with the facility.
- o Encourage participants of Second Nature in-person events to purchase offsets for their travel.
- o Encourage staff to walk/bike to work more often and use public transportation when available.
- o Use more ride-sharing/carpooling when appropriate.
- o When using car services (such as Lyft, Uber, taxis) consider choosing the “green” car option or choose Lyft over Uber who is actively reflecting on the emissions associated with their business and trying to offset them or turn toward electric vehicles.
- o Shutting off or unplugging things in the office and better utilizing natural light to reduce electricity consumption.
- o Changing light bulbs to more energy efficient ones such as LEDs or CFLs.
- o Being conscious of the amount of waste the office and events are contributing, reducing and reusing when possible.
- o Consider the possibilities and extension of virtual events/spaces and work-from-home opportunities.

In line with the organizational mission to encourage and support higher educational institutions to reach carbon neutrality or net zero emissions, Second Nature is also setting a goal for net zero emissions in 2022. We are proposing to set aside enough money in the 2021/2022 budget to purchase offsets in order to offset the emissions from the last three fiscal years (2019, 2020, and 2021). Based on the fiscal years 2018/2019 and 2019/2020’s emissions, Second Nature would need approximately \$1,500 per year built into its annual budget to offset its emissions if the offsets are bought at \$8/ton (looking at [local](#) offset projects). We want to ensure that in this endeavor we are avoiding greenwashing and purchasing offsets that are local to the Northeastern United States and have additionality.

It is also a possibility that Second Nature could offset its emissions that have accrued since the beginning of its operation using these two years as a baseline estimation of how many tons of GHG emissions would need to be offset to achieve that. Depending on the quality of the credits, the estimated cost of doing this likely would be \$5,000 - \$20,000. The source of funds for such offsets could be corporate donations, gifts from individuals, or general operating funds.

As an alternative, Second Nature could contract with (or secure a sponsorship from) one of the many entities that provide carbon offset calculations associated with meetings and conferences and the procurement of the appropriate level of offsets. Firms active in this area include Terrapass, Trip Zero, and Meet Green.

Suggestions

In addition to the suggestions to reduce Second Nature's emissions, there are also ways the internal operations could be improved to better facilitate the reporting of the organization's GHG emissions. These suggestions include:

- When participants register for any in-person event that Second Nature hosts, as part of the registration process participants should be asked where they are traveling from (town and state, no need for full address) and their mode(s) of transportation to and from the event. Layover flights should be taken into consideration. They should also be asked if they individually or their employer purchases any offsets for their travel.
 - Questions asked could include:
 - What town/state did you travel from to this event?
 - Did you drive or fly to this event?
 - If you flew, what airport did you fly out of and land in?
 - If you flew, how many miles did you have to drive to/from the airport?
 - If you flew, did you have any layovers and if so where did they stop?
 - Did you personally or through your employer have any offsets purchased for your travel to this event?
- Upon hire with Second Nature, each new employee or intern could fill out a form about their commuting habits (address, mode(s) of transportation, estimated number of miles traveled to the office for each mode of transportation [i.e. walk 1 mile, MBTA for 5 miles]). For employees who work from home this may not be necessary unless going forward the organization decides they want to include telecommuting emissions in which a different form/survey would be necessary. There is potential to adapt the commuting survey that Andy DeMeo and others from UNH have been working on for this purpose.
- Staff use of the finance application Expensify:
 - Staff should ensure they are uploading copies of the receipts when able.
 - Staff should ensure they are submitting each expense under the correct category. Perhaps more defined rules about what kinds of expenses go into each category would be productive. This helps to ensure that all emissions from staff travel would be captured under the transportation category.
 - In each memo line of a transportation expense, staff should include the number of miles traveled (roundtrip if applicable). Ex. "Lyft - Transpo from home to LAX airport (10 miles)" or "American Airlines - JFK to ATL (400 miles)."

- On many Uber or Lyft online receipts the number of miles traveled during your trip is included.
 - An estimation for metro/subway trips is acceptable as long as it is erring on the side of overestimation.
 - The air mile calculator can be used for flights ensuring that layover flights are considered as individual flights: <https://www.airmilescalculator.com>
 - If two or more staff are sharing a cab/Uber/Lyft then only one person should submit the number of miles in their expense.
- Each year review the standard protocol and operational boundaries that Second Nature wants to adhere to when inventorying emissions (i.e. do we want to include event participant travel or teleworking emissions? Are we following a control or equity protocol? [See, for example the GHG Protocol.org](#)).
- Ensure that the GHG Inventory Report and any other distributions of its information, is adhering to the Universal Design Principles to ensure inclusivity. The 7 principles of Universal Design are:
 - 1. Equitable use
 - 2. Flexibility in use
 - 3. Simple and intuitive use
 - 4. Perceptible information
 - 5. Tolerance for error
 - 6. Low physical effort
 - 7. Size and shape for approach and use

Some ways that these principles can be included in this report and others include using easy to read fonts and colors, spelling out acronyms and overall not gatekeeping information so anyone could easily understand the report, and drawing on visual representations when possible so someone with little to no knowledge of English would still be able to understand the findings in the report. To take these principles a step further, potentially offering the report in multiple languages would be a great feature to include.

Background

This document was prepared by Gretchen Gilbert, a Spring 2021 Fellow from the College for Social Innovation, with support from Kevin Laycock from Brailsford & Dunlavy (B&D) and Eric Howard from Second Nature. B&D's assistance was an in-kind contribution to Second Nature. All HTML links were accessed and active in March 2021.

Related References & Studies

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