Annual Sustainability Report and 2019 Greenhouse Gas Emissions Inventory

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About this report

This report gives an overview of EDF's efforts to improve organizational sustainability, and it details EDF's 2019 greenhouse gas (GHG) emissions. Researchers around the world continually review and improve emissions factors and best practices for calculating environmental impacts. There are different approaches for calculating emissions; which one is "best" for an organization to use depends on data availability, simplifying assumptions, and other factors. This report uses emissions factors and methodologies that are most appropriate for EDF's organizational context, and it should not be viewed as a recommendation of best or only practice.

Environmental Defense Fund

Environmental Defense Fund is dedicated to protecting the environmental rights of all people, including the right to clean air, clean water, healthy food and flourishing ecosystems. Guided by science, we work to create practical solutions that win lasting political, economic and social support because they are nonpartisan, cost-effective and fair.

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Executive Summary

Environmental Defense Fund (EDF) is dedicated to protecting the environmental rights of all people, including the rights to clean air and water, healthy food and flourishing ecosystems. In 2019, we won important victories for people and the environment around the world on issues as wide-ranging as water conservation in the American West, sustainable fisheries in South America, air pollution in London and climate action in China.

Since 2007, EDF has estimated the greenhouse gas (GHG) emissions from our operations, and we have supported private sector investments in emissions reduction projects. In 2019, EDF's Office of the Chief Scientist (OCS) and Corporate Services department chartered a staff Sustainability Council focused on increasing EDF's organizational sustainability.

As a result of a comprehensive effort led by the Sustainability Council to evaluate and update our approach, the 2019 GHG emissions inventory features several improvements from past reports. For example, this is EDF's first GHG inventory to report emissions with a Global Warming Potential (GWP) of 100-year and 20-year time horizons – an emerging best practice that conveys the climate impacts of emissions over multiple timescales. Additionally, a review of methodologies revealed that our previous reports underestimated the GHG emissions associated with the large amount of paper we mail to current and prospective members. For this report, we adopted a new methodology to ensure we accurately capture the emissions associated with EDF's paper use.

EDF's 2019 emissions were significantly higher than in previous years for two main reasons. The first is air travel. EDF employees flew nearly 2.2 million more miles in 2019 than in 2018, and unlike previous years, the 2019 inventory includes air travel by EDF trustees. The second reason for the marked increase in total GHG emissions was the improved method we used to calculate paper-related emissions. Due to a new emissions factor, the emissions from paper use reported here are more than double what we reported in the 2018 inventory. However, our actual paper use increased by only 10% from 2018 to 2019.

To mitigate our 2019 GHG emissions, we purchased carbon credits (commonly referred to as "carbon offsets") from a landfill gas-to-energy project in Massachusetts and a clean cookstoves project in Kenya.

In late 2020, members of the Sustainability Council gathered lessons learned from COVID-19-related travel restrictions and office closures and began reviewing a wide variety of data, policies and practices related to sustainability. These efforts will help us identify how EDF could further reduce environmental impacts from business travel, membership mailings and general operations moving forward. As we work to implement our ideas, we will continue to produce publicly available sustainability reports and GHG emissions inventories that describe our progress. Each year we will strive to reduce our emissions, improve the quality of our data, identify and adopt the best available methodologies, purchase high-quality carbon credits and work with other organizations to share best practices.

Introduction

When EDF produced its first internal sustainability report in 2007, we were a U.S.-based nonprofit with fewer than 350 staff. Over the next decade, EDF grew into a global organization with more than 700 employees dedicated to protecting the environmental rights of all people, including the rights to clean air and water, healthy food and flourishing ecosystems.

Our accomplishments in 2019 included helping achieve climate action at the local, state, corporate and international levels. We advised the design of China's carbon market, mapped hyperlocal air pollution in Houston and London and harnessed the purchasing power of the world's biggest retailers to drive the removal of toxic ingredients from consumer products. In our work to build a climate-resilient future, EDF helped broker a pact on water conservation in the American West and a tri-national scientific vision for fisheries management in the Humboldt Current region. We formed partnerships with farmers and food companies to improve agricultural practices on millions of acres in the U.S., and we worked to rebuild Louisiana's coastal wetlands.

EDF aims to meet ambitious goals while accounting for, reducing and mitigating the negative social, economic and environmental impacts associated with our operations. We have been estimating our greenhouse gas (GHG) emissions and supporting emissions reductions projects for many years, and in 2019, EDF's Office of the Chief Scientist (OCS) and Corporate Services department chartered a new staff Sustainability Council dedicated to increasing our organizational sustainability.

In its first year, the Sustainability Council focused on compiling a rigorous GHG emissions inventory for calendar year 2019. The process included a comprehensive compilation of relevant data and a review of methodologies, conversion factors and reporting standards. The result is EDF's most robust GHG inventory to-date, and a useful starting point for identifying opportunities to reduce our environmental impacts.

Sustainability is a journey, not a destination. As a science-based organization, EDF is committed to continually improving its analyses, reporting and sustainability efforts over time. While developing this emissions inventory, staff identified important data gaps and methodological issues that merit further investigation in order to produce an even better report next year.

Overview of Methods

The inventory includes emissions from staff travel, office energy use and paper use, and it covers only those facilities and activities over which EDF has operational control. Following the GHG Protocol, the inventory includes emissions from the following scopes:

- Scope 1: Direct GHG emissions from stationary combustion of natural gas.
- Scope 2: Indirect GHG emissions resulting from the consumption of electricity and steam.
- Scope 3: Indirect GHG emissions resulting from copy paper, membership mailings, business travel and staff commutes.

We collected activity data for Scope 1 and Scope 2 emissions from property managers and energy providers. For Scope 3 emissions, we gathered activity data from EDF's corporate travel provider, surveys of staff and trustees, mileage reimbursement records, print management software and internal purchase records. We used methodologies and emissions factors (*i.e.*, the coefficients that convert activity data into GHG emissions) from the GHG Protocol, the United States Environmental Protection Agency (EPA), the United Kingdom Department of Environment, Food and Rural Affairs (DEFRA), the Intergovernmental Panel on Climate Change (IPCC), the Environmental Paper Network, Enerdata and Mexico's Registro Nacional de Emisiones. Details on data sources, assumptions, emissions factors and calculation methods are available in the appendix.

All emissions factors included carbon dioxide (CO_2) emissions, and most included the powerful non-CO_2 greenhouse gases methane (CH_4) and nitrous oxide (N_2O). The emissions factor for paper included non-GHG pollutants such as black carbon, nitrogen oxides, particulate matter and sulfur dioxide, which have a range of harmful effects on the environment and human health. We did not include these pollutants in the GHG inventory, but we have reported their emissions in the appendix.

It is important to note that there are different ways to calculate emissions; which one is "best" for an organization depends on data availability and other factors. This report uses emissions factors and methodologies that were most appropriate for EDF's organizational context in 2019. We are committed to continually reviewing and improving our approach, and therefore, it may change in the future.

We calculated emissions using a Global Warming Potential (GWP) with a 20-year time horizon (GWP-20) and a GWP with a 100-year time horizon (GWP-100). GWP is a measure of how much energy a pulse of emissions of a gas will trap over a given time period, relative to the same amount of emissions of carbon dioxide (CO_2). It provides a common unit of measure, and it allows comparisons of the global warming impacts of different gases over a select timescale. The larger the GWP, the more that a given gas warms the Earth compared to CO_2 over that time period.

The GWP-100 is based on the energy trapped by a gas over the following 100 years after it is emitted and can be considered a proxy for the long-term climate impact of the gas. GWP-20 is based on the energy trapped over the following 20 years after emission and can be considered a proxy for the near-term climate impact of the gas. For gases with short atmospheric lifetimes, such as methane (CH_4), GWP-20 will elevate their impact compared to CO_2 because it captures the period when the gas traps the most heat and omits impacts after 20 years, when CO_2 is still trapping heat but the other gas is not. Conversely, when non-CO_2 emissions are negligible, CO_2e will be similar regardless of the time horizon because it is essentially all CO_2. It is best practice to report GHG emissions over both timescales (20 and 100 years) because the two combined convey climate impacts over all timescales – both in the near- and the long-term.[1]

[1] Ocko, IB, et al. 2017. Unmask temporal trade-offs in climate policy debates. *Science* 356 (6337):492-493.

According to the emissions factors used in this report, flights, ground travel and office energy use produced minimal emissions of non-CO_2 pollutants. As a result, in most cases GWP-20 emissions were identical to GWP-100 emissions for these sources. For ease of reading, we report these emissions as tCO_2e and note any exceptions.

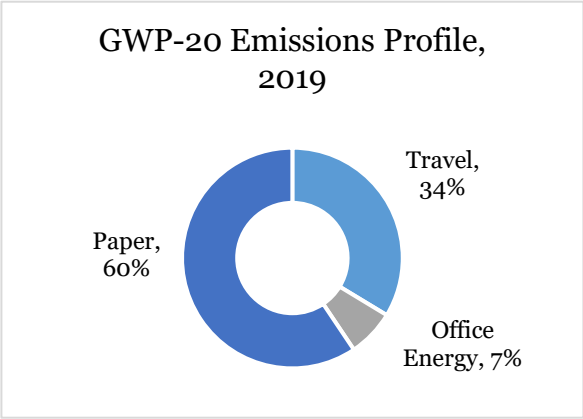
Throughout this report, we use two significant figures for all calculated values. Reported totals may differ from the sum of their terms due to rounding.

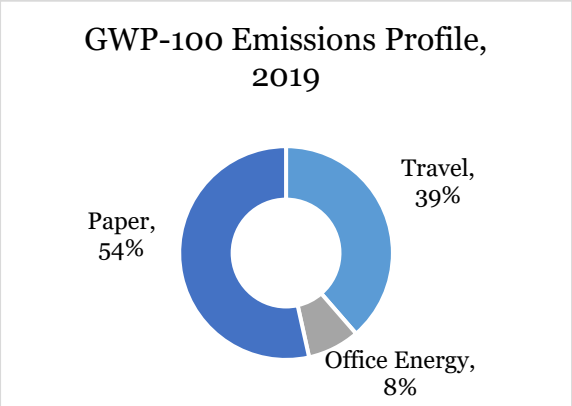
Greenhouse Gas Inventory

EDF's total emissions for the 2019 calendar year were 7,800 (GWP-20) / 6,800 (GWP-100) metric tons of carbon dioxide equivalent (tCO_2e), and the emissions intensity per full-time employee (FTE) in 2019 was 11 (GWP-20) / 9.4 (GWP-100) tCO_2e.

EDF GHG Emissions, 2019 (tCO_2e)		
	GWP-20	**GWP-100**
Travel Total	**2,600**	**2,600**
Air	2,000	2,000
Rail	27	27
Vehicles	60	60
Hotel Stays[2]	100	100
Employee Commutes	440	440
Office Energy Total	**510**	**510**
Electricity	350	350
Natural Gas	130	130
District Steam	26	26
Paper Use Total	**4,700**	**3,600**
Office Copy Paper	3	3
Membership Mailings	4,700	3,600
Contracted Projects	18	11
Grand Total (tCO_2e)	**7,800**	**6,800**
Full-Time Equivalent Employees (FTEs)	718	718
Emission Intensity tCO_2e per FTE	11	9.4

Approximately 34% (GWP-20) / 39% (GWP-100), 7% (GWP-20) / 8% (GWP-100), and 60% (GWP-20) / 54% (GWP-100) of EDF's 2019 emissions were from travel, office energy and paper use, respectively.





[2] The emissions factor used for hotel stays converts nights to tCO_2e (GWP-100) and does not provide data to calculate the GWP of those emissions on a 20-year time scale. In the absence of such data, we assumed that GWP-20 emissions for hotel stays were the same as GWP-100, since non-CO_2 GHG emissions are very small for building energy use.

The vast majority of our 2019 GHG emissions came from Scope 3 emissions (air travel, rail travel, rental cars, hotel stays, employee commutes, office paper use, membership mailings and contracted print projects).

Total Emissions by Scope, 2019 (tCO_2e)		
	GWP-20	**GWP-100**
Scope 1 Emissions: Natural Gas	130	130
Scope 2 Emissions: Electricity & Steam	380	380
Scope 3 Emissions: Travel & Paper	7,300	6,300

Business Travel

According to the emissions factors used in this report, air and ground travel produced minimal emissions of non-CO_2 pollutants. As a result, GWP-20 emissions were nearly identical to GWP-100 emissions for these sources. For ease of reading, we report these emissions as tCO_2e.

Air Travel

EDF staff and trustees flew more than 10 million miles in 2019, generating 2,000 tCO_2e (1,800 tCO_2e by staff and 230 tCO_2e by trustees).

Air travel is consistently one of the largest components of EDF's carbon footprint. In 2019, it accounted for nearly 26% (GWP-20) / 30% (GWP-100) of total emissions.

Just over half of total miles flown were on long-haul flight segments (2,300 miles or longer). Short-haul flights (fewer than 300 miles) produce more emissions per mile flown, but these segments accounted for only 3% of total miles traveled.

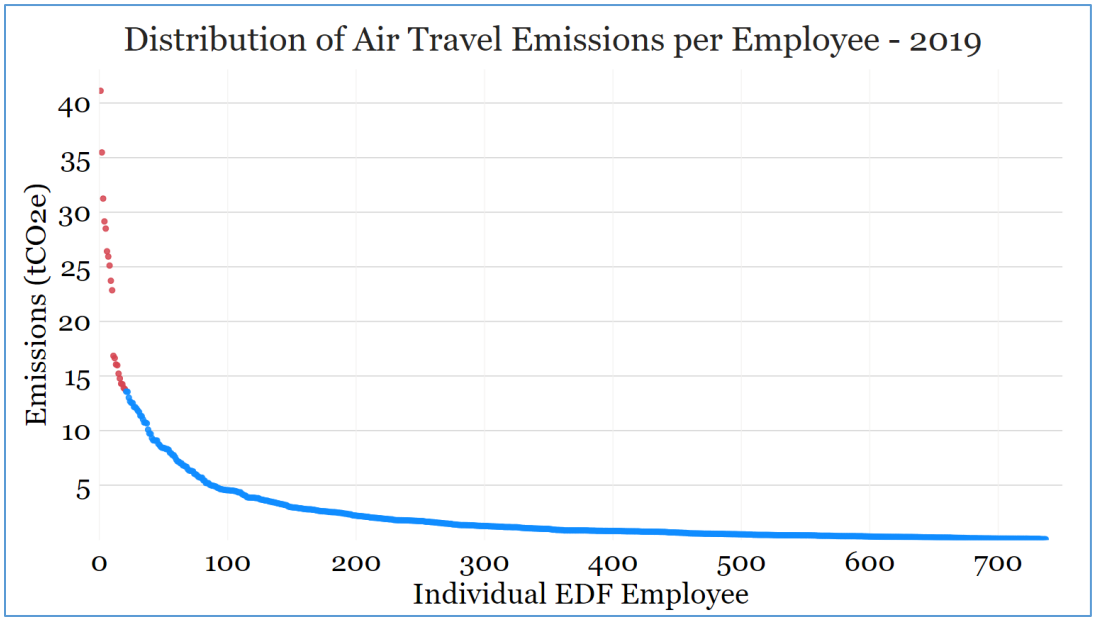
Percent of Total Miles Flown by Flight Segment and Seat Class, 2019				
Flight Type	**Economy**	**Business**	**First**	**Total**
Short-haul (<300 miles)	3%	< 1%	0	3%
Medium-haul (≥300 miles, <2300 miles)	45%	< 1%	< 1%	45%
Long-haul (≥2300 miles)	43%	8%	1%	52%
Total	**91%**	**8%**	**1%**	**100%**

Flying first or business class accounted for 25% of total air travel emissions. If every passenger who flew first or business class in 2019 had flown economy instead, total air travel emissions would have been 17% lower.

Three EDF Programs (Oceans, Climate and Energy) collectively accounted for nearly half of EDF's air travel footprint, with the Oceans Program being the top emitter. These programs also accounted for about half of the increase in air travel emissions between 2018 and 2019.

Program/Department	tCO_2e	% of Total Air Travel Emissions
Oceans	440	25%
Energy	220	12%
Climate	210	12%
Ecosystems	140	8%
Development	140	8%
Office of the Chief Scientist	130	7%
EDF+Business	110	6%
Executive Office	74	4%
Political Affairs	69	4%
Marketing & Communications	65	4%
Human Resources	53	3%
Environmental Health	32	2%
Global Strategy	28	2%
Office of the Chief Economist	27	2%
Corporate Services	16	1%
Finance	10	1%
IT Operations	8	< 1%
Internal Audit	8	< 1%
Legal & Compliance	4	< 1%
Diversity	4	< 1%
Global Operations	1	< 1%
Grand Total	**1,800**	**100%**

Twelve percent of travelers accounted for 50% of miles flown and 48% of corresponding emissions. Of the 739 unique airline passengers in 2019, the top 20 individuals (shown in red below) accounted for 23% of EDF's overall air travel emissions.



Amtrak

In 2019, EDF staff traveled approximately 194,000 miles on Amtrak, generating 27 tCO_2e (~1%) of EDF's total travel emissions.

Car Rentals & Mileage Reimbursement

EDF employees rented vehicles for 799 days, with most of those (494) in intermediate, full, standard or premium-size cars and minivans/SUVs. This compares to 295 rental days in compact and economy cars and 10 rental days in hybrid cars. Car rentals generated 10 tCO_2e.

EDF staff drove approximately 144,000 miles in personal vehicles for EDF business, emitting approximately 50 tCO_2e.

Hotel Stays

EDF staff and trustees stayed 4,236 nights in hotels throughout the world, with most of those nights (3,657) spent in the U.S. Emissions from hotel stays in 2019 were 100 (GWP-100) tCO_2e. DEFRA, the source of the emissions factor for hotel stays, converts nights to tCO_2e (GWP-100) and does not provide data to calculate the GWP of those emissions on a 20-year time scale.

Employee Commutes

In 2019, nearly one-third of employees commuted via transit rail. Fourteen percent used a zero-emissions mode of transportation and, depending on the day of the week, between 15 and 32% of employees worked from home. Other modes of transportation included personal vehicles, intercity rail, buses and ferries. Altogether, employee commutes generated 440 tCO_2e in 2019.

Employees reported that the top three factors they considered when choosing the mode of transportation for their commute were convenience, cost and time.

Office Energy Use

Based on the emissions factors used in this report, office energy use produced minimal emissions of non-CO_2 pollutants. As a result, GWP-20 emissions were nearly identical to GWP-100 emissions for these sources. For ease of reading, we report office energy emissions as tCO_2e and note those few instances where GWP-20 and GWP-100 emissions differ.

EDF operates 13 offices in five countries. In 2019, EDF office energy use generated 510 tCO_2e. Scope 1 (natural gas), Scope 2 (electricity) and Scope 3 (steam) emissions were responsible for 26%, 69% and 5% of total office energy emissions, respectively.

Emissions by Office Energy Source (tCO_2e)	
Natural Gas	130
Electricity	350
Steam	26
Total Emissions	**510**

Office energy emissions varied due to differences in square footage and regional emissions factors. The energy use reported for the Washington, DC office was very low for a space of its size; we are investigating whether it is accurate.

Emissions by Office, 2019 (GWP-100)			
Office	**Total tCO_2e**	**kg CO_2e Per Square Foot**	**tCO_2e Per FTE**
Austin, Texas	4	0.24	0.09
Beijing, China	15	1.9	0.69
Bentonville, Arkansas[a]	2	1.6	0.49
Boston, Massachusetts	33	3.2	1.2
Boulder, Colorado[b]	27	4.8	1.0
Jakarta, Indonesia	13	5.5	1.3
La Paz, Mexico	6	4.0	0.82
London, England[c]	6	3.6	0.48
New York, New York	300	5.6	1.6
Raleigh, North Carolina	69	5.9	3.2
Sacramento, California	3	1.1	0.24
San Francisco, California	25	0.88	0.38
Washington, DC	4	0.10	0.02

GWP-20 and GWP-100 emissions differed in five cases: (a) Bentonville: 1.7 (GWP-20) kg CO_2e/sq. ft. (b) Boulder: 4.9 (GWP-20) kg CO_2e/sq. ft. (c) London: total emissions, emissions per sq. ft., and emissions per FTE = 7 (GWP-20) tCO_2e, 3.8 (GWP-20) kg CO_2e/sq. ft. and 0.51 (GWP-20) tCO_2e/FTE, respectively.

Paper Use

Paper-related GHG emissions accounted for 60% (GWP-20) / 54% (GWP-100) of EDF's total emissions in 2019. EDF mailed 754 metric tons of paper to existing, former, and prospective members, generating approximately 99% of all paper-related emissions. The remaining emissions came from office paper use.

Nearly half of the paper used by Membership, and therefore almost half of the department's paper-related emissions, was for acquisitions. The remaining emissions came from paper used for EDF's *Solutions* newsletter and mailings for reinstatements, appeals, conversions, renewals and cultivation.

EDF's paper use in 2019 (754 metric tons) was 10% higher than in 2018 (684 metric tons). However, the GHG emissions associated with that paper ((4,700 (GWP-20) / 3,600 (GWP-100) tCO_2e in 2019) was more than double what we reported in our 2018 inventory (1,700 (GWP-100) tCO_2e). The enormous increase in apparent impact was driven by the new emissions factor developed by the Environmental Paper Network. The improved emissions factor accounts for carbon lost during logging, fossil CO_2, CH_4 and N_2O, as well as end-of-life emissions. In other words, previous reports underestimated emissions associated with paper production and use.

Emissions from Paper Use by Category, 2019 (tCO_2e)		
	GWP-20	**GWP-100**
Membership Mailings	4,700	3,600
External Print Projects	18	11
Office Copy Paper	3	3
Total Emissions	**4,700**	**3,600**

EDF uses software that requires employees to log in to a printer to release a print job. If the job is not released by the user within four hours, it is deleted. In 2019, this feature saved over 30,000 sheets of paper.

Looking Forward

EDF's organizational values of Results, Respect, Innovation, Optimism and Integrity drive us to create solutions, welcome diverse perspectives, design problem-solving tools, embrace ambitious goals and uphold a commitment to science, rigorous analysis, intellectual honesty and ethical action. We strive for our sustainability efforts to reflect these values and goals, via regular reviews of our methodology, transparent reporting of our impacts and determined efforts to reduce our operations' negative environmental impacts. In short, we want to ensure EDF is "walking the talk."

EDF will continue to produce annual, publicly available sustainability reports and GHG emissions inventories. Each year we will strive to improve the quality of our data, identify and adopt the best available methodologies, and work with other organizations to share best practices in calculating environmental impacts.

In the future, EDF will develop science-based targets to reduce GHG emissions from travel and general operations. In late 2020, a task force led by the Sustainability Council began a deep analysis of travel patterns, policies, practices and lessons learned from COVID-19-related travel restrictions. The group will develop recommendations for reducing impacts from business travel. Other working groups are examining how EDF can modify its operations, policies, practices and staff behavior to reduce resource use and waste.

EDF supports private sector investments in emissions reduction projects (commonly referred to as "carbon offsets"). We mitigated our 2019 GHG emissions by purchasing carbon credits from the following projects:

- New Bedford, Massachusetts Landfill Methane Project**:** This project collects gas from a landfill to fuel generators that produce approximately 3.3 MWh of electricity. In doing so, the project reduces the amount of methane released into the atmosphere.
- Paradigm Kenya Clean Cookstoves Project**:** This project distributes locally appropriate, efficient cooking technologies. It creates economic, environmental, and social benefits including positive impacts on women and girls and reduced dependence on natural resource consumption.

Appendix

GHG Emissions from Previous Years

This table shows EDF's past emissions, as reported in previous years. We have not adjusted them using the emissions factors for 2019.

2014-2018 GHG Emissions (tCO_2e)					
	2014	**2015**	**2016**	**2017**	**2018**
Travel Total	**1800**	**1500**	**1800**	**1600**	**1800**
Air	1400	1100	1400	1100	1300
Rail	21	18	21	22	25
Rental Car	48	16	16	16	14
Hotel Stays	120	100	120	120	89
Employee Commutes	230	240	250	300	420
Office Energy Total	**800**	**630**	**500**	**450**	**440**
Electricity	530	520	400	380	390
Natural Gas	170	20	20	21	12
District Steam	89	89	80	48	38
Paper Use Total	**780**	**1000**	**1300**	**1800**	**1700**
Office Copy Paper	6	6	4	6	12
Membership Mailing	770	1000	1300	1800	1700
Contracted Projects	8	4	9	5	7
Grand Total (tCO_2e)	**3400**	**3100**	**3600**	**3900**	**4000**
Full-Time Equivalent **Employees (FTEs)**	460	510	560	640	780
Emission Intensity tCO_2e per FTE	7.6	6.1	6.4	5.9	5.1

Defining Full-Time Employees

We calculated FTEs as an employee's scheduled hours divided by the number of hours for a full-time workweek. To account for new hires and departures in 2019, we calculated FTEs on a monthly basis and used the annual average.

Reports from prior years included regular and temporary contingent staff members, so FTE numbers (and therefore emissions intensity per FTE) are not fully comparable across years.

Calculating Emissions from Travel

EDF's Travel Policy requires employees to book travel through a corporate travel provider, which is the source of much of our travel activity data. This report does not include any business-related travel that EDF staff may have arranged via other providers. We also surveyed EDF trustees about their travel arrangements to attend EDF board meetings, and we conducted a survey of EDF staff to gather data on employee commutes.

Calculating Emissions from Air Travel

For trustees who did not respond to the travel survey, we estimated air travel using their city or state of residence as the point of origin.

Trip lengths (short-haul, medium-haul, long-haul) and associated emission factors were defined by the EPA's Emission Factors for 2018.

Flight Type	$kgCO_2$/Mile
Short-haul (< 300 miles)	0.225
Medium-haul (≥ 300 miles,< 2300 miles)	0.136
Long-haul (≥ 2300 miles)	0.166

First and business class seats take up considerably more room in an aircraft than economy seating and therefore reduce the total number of passengers that can be carried. This in turn raises the average GHG emissions per passenger mile. Seat numbers were based on the UK's Department of Environment Food and Rural Affairs (DEFRA) 2018 methodology paper for emission factors.

Flight Type	Cabin Seating Class	# of Economy Seats
Short-haul	Economy	1.0
	First/Business	1.5
Medium-haul	Economy	1.0
	First/Business	1.5
Long-haul	Economy	1.0
	Economy+	1.6
	Business	2.9
	First	4.0

Aviation has additional climate impacts from the radiative forcing of contrails.[3] We purchased additional carbon offsets to account for this effect. We will continue to monitor this area of research.

Calculating Emissions from Rail Travel

We collected rail travel data from EDF's corporate travel provider, and we used an emissions factor of 0.140 $kgCO_2$/mile, as defined by the U.S. EPA.

Calculating Emissions from Vehicle Travel

For miles driven in personal vehicles for business purposes, we used data from EDF's expense reimbursement records. In the absence of actual data on miles driven in rental vehicles, we assumed that rental cars were driven an average of 36.92 miles per day, based on the US Department of Transportation Federal Highway Administration estimate that the average American's annual mileage is 13,476 per year. We used emissions factors from the U.S. EPA.

[3] Lee et al. 2009. Aviation and global climate change in the 21st century. *Atmospheric Environment* 43: 3520-3537, https://doi.org/10.1016/j.atmosenv.2009.04.024

Calculating Emissions from Hotel Stays

We collected data from EDF's corporate travel provider as well as a survey of EDF trustees regarding their travel arrangements for attending EDF board meetings. For trustees who did not respond to the survey, we assumed that they stayed two nights in a hotel at the board meeting location.

We used DEFRA's country-specific emissions factors. For the four countries in which EDF staff stayed, but for which DEFRA did not provide an emissions factor, we used 46.0 $kgCO_2$/night, which is the average of all the countries on DEFRA's list.

Calculating Emissions from Employee Commutes

We conducted an anonymous staff survey in April 2020 to gather commuting data, including mode of transportation, distance traveled, time spent commuting and decision-making factors. The survey received a 62% response rate, with proportional representation of offices and programs. We assumed the survey responses were representative of all staff. We used emissions factors defined by the US EPA.

Transportation Type	$kgCO_2$/Mile
Car - Driving alone	0.343
Carpool	0.1176
Ferry	0.0297
Intercity/commuter rail	0.14
Transit Rail	0.119
Bus	0.056

Calculating Emissions from Office Energy Use

We collected data from property managers and energy providers, and we used emissions factors from the following sources:

- For Austin, Bentonville (electricity), Boston (electricity), Boulder, New York, Raleigh, Sacramento, San Francisco (electricity), and Washington, DC we used conversion factors from the EPA's eGRID output rates.
- For Beijing and natural gas for Bentonville, New York and San Francisco, we used emission factors from WRI's GHG protocol and the IPCC.
- For Boston (district steam), we used the EPA's 2018 emission factors.
- For Jakarta, we used conversion factors from Enerdata.
- For La Paz, we used emissions factors from Registro Nacional de Emisiones.
- For London we used emissions factors from DEFRA .

Office energy emissions include CO_2, CH_4 and N_2O. However, the emissions of non-CO_2 gases are so small relative to CO_2 emissions that GWP-20 and GWP-100 are nearly identical.

Office	Use Type	Emission Factor ($kgCO_2e$/unit, GWP-100)	Unit
Austin, TX	Electricity	0.425	kWh
Beijing, China	Electricity	1.019	kWh
Bentonville, AR	Electricity	0.532	kWh
	Natural Gas	5.917	therm
Boston, MA	Electricity	0.239	kWh
	District Steam	6.633	therm
Boulder, CO	Electricity	0.581	kWh
Jakarta, Indonesia	Electricity	0.761	kWh
La Paz, Mexico	Electricity	0.582	kWh
London, England	Electricity	0.256	kWh
New York, NY	Electricity	0.271	kWh
	Natural Gas	5.917	therm
Raleigh, NC	Electricity	0.339	kWh
Sacramento, CA	Electricity	0.226	kWh
San Francisco, CA	Electricity	0.226	kWh
	Natural Gas	5.917	therm
Washington, DC	Electricity	0.327	kWh

Four US offices had missing or anomalous energy data.

- London: In the absence of data, we assumed the London office's energy use to be 10,000 kWh in 2019, the midpoint of the range of kWh used by micro businesses in the UK.
- New York City: Building management in the NY office does not provide natural gas usage data per tenant or floor. We assumed our use was a percentage of the building's total use, based on square footage.
- Raleigh: This office is not sub-metered. We estimated our energy use as a percentage of the building's total use, based on square footage.
- Washington, DC: This office's reported energy usage was abnormally low; we are investigating possible reasons for the anomaly.

Calculating Emissions from Paper Use

EDF's Development Department tracks the weight of membership mailings and contracted projects. EDF offices in the U.S. track paper use with PaperCut print management software. We used purchase records to estimate paper usage in the London office. Due to a lack of data on paper use, this report does not include emissions from office paper used in Beijing, Jakarta or La Paz. This is a data gap the Sustainability Council will work to fill in future reports.

U.S. offices use TreeZero paper. According to TreeZero, the production and distribution of their sugarcane waste-based paper generates 1 tCO_2 per ton of paper. The price of TreeZero paper includes the cost of carbon credit purchases, but we included the emissions in this inventory and purchased carbon credits for those emissions.

For external printing and membership mailings, we used emissions factors from the Environmental Paper Network Paper Calculator Version 4.0, except that for CH_4, we used a GWP-20 of 84, not the Paper Calculator's default of 102.[4] For more information visit www.papercalculator.org. The conversions were 4.04 tCO_2e (GWP-20) / 2.62 tCO_2e (GWP-100) per ton of paper with 100% recycled content and 6.18 tCO_2e (GWP-20) / 4.79 tCO_2e (GWP-100) per ton of paper with 30% recycled content. This calculation does not include emissions from shipping the materials from printers to recipients.

Emissions of Other Pollutants

GHG emissions from travel, office energy, and paper included CO_2, CH_4, and N_2O. The emissions factors for paper and office energy also included other pollutants that have a range of deleterious effects on human health and the environment. Most of these pollutants have atmospheric lifetimes on the order of hours to weeks, so including them in calculations of our overall climate impacts over decades-long time horizons is inappropriate. We report them separately here, and we did not include these in our calculations of how many carbon credits to purchase. We are considering how to mitigate the impact of such emissions in the future.

Other Pollutant Emissions from Paper			
	Mg (t)	tCO_2e (GWP-20)	tCO_2e (GWP-100)
Black carbon	0.3	970	260
Nitrogen oxides (NO_x)	2.7	330	-30
Organic carbon	1.5	-200	-100
Particulate matter (PM)	0.1	360	0
Sulfur dioxide (SO_2)	3.0	-840	-120
Sulfur hexafluoride (SF_6)	0.0001	1	1

GWPs are highly uncertain for aerosols. See section 3.6.2.1 of the Paper Calculator's methodology for the sources of the GWP-20 values used to calculate tCO_2e for paper.

Other Pollutant Emissions from Office Energy Use			
	Mg (t)	tCO_2e (GWP-20)	tCO_2e (GWP-100)
Nitrogen oxides (NO_x)	0.16	20	-2
Sulfur dioxide (SO_2)	0.05	-15	-2

We used the same GWP values as in the Paper Calculator. For SO_2 (GWP-20): Collins, et al. 2013. Global and regional temperature-change potentials for near-term climate forcers. Atmos. Chem. Phys. 13: 2471-2485. For NOx (GWP-20): Collins, et al. 2010. How vegetation impacts affect climate metrics for ozone precursors. J. Geophys. Res. Atmos. 115 (D23). For SO_2 and NOx (GWP-100): Fuglestvedt, et al. 2010. Transport impacts on atmosphere and climate: Metrics. Atmos. Environ. 44: 4648–4677.

[4] Myhre, et al. 2013. Anthropogenic and Natural Radiative Forcing. In: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, et al. (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.