Wikimedia Foundation

Environmental Sustainability Report 2022

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About This Report

The Wikimedia Foundation is committed to seeking ways to reduce the impact of our activities on the environment. We aim to act as responsibly and sustainably as possible, including favoring renewable energy for our operations. We believe that a long-term commitment to sustainability is an essential component of our work towards the Wikimedia mission and vision – and our 2030 Movement Strategy goals.

This Environmental Sustainability (formerly Carbon Footprint) Report, which covers calendar year 2022, is part of an ongoing series of annual reports. The first report was initiated by a 2017 Wikimedia Board of Trustees resolution, and was published in 2019 for calendar year 2018. In June 2022, the Board updated its Environmental Sustainability Commitments by passing a resolution committing to "regular assessment and transparency regarding the Foundation's environmental impact through the publication of periodic environmental sustainability (carbon footprint) reports."

The Wikimedia Foundation's greenhouse gas (GHG) inventory includes emissions related to our day to day working environments (e.g., the San Francisco, USA office, commuting, and remote employees' estimated home energy use), running the data centers that power our sites, and sponsoring travel for staff and volunteers. It was developed according to the WRI/WBCSD Greenhouse Gas Protocol. Our 2022 GHG inventory includes our scope 1, scope 2, and all of our relevant scope 3 emissions, as defined below:

Scope 1: Direct greenhouse gas emissions that occur from sources controlled or owned by the Wikimedia Foundation. This includes natural gas and refrigerant consumption at our San Francisco office.

Scope 2: Indirect emissions associated with the purchase of electricity, steam, heat, or cooling. This includes electricity and steam used at the San Francisco office.

Scope 3: Indirect emissions resulting from activities from assets not owned or controlled by the Wikimedia Foundation, but that we indirectly impact through our operations. Scope 3 emissions include all sources not within our scope 1 and 2 boundary. These include water usage and waste (landfill, recycling, compost) at the San Francisco office; electricity used by our data center vendors across the globe; WMF-sponsored staff and volunteer business travel; commuting; and new this year: energy related to remote work.

2022 Data Highlights

2,955

Metric tons CO2-eq

In 2022, our emissions totaled 2,955 mtCO2-eq, primarily attributed to air miles and electricity usage at our data centers.

346M

Pageviews on climate change

In 2022, Wikipedia recorded 346M pageviews[1] on 31,000+ climate change-related articles across all language wikis.

74%

Renewable

In 2022, 74% of our 3,697 MWh of data center electricity consumption was covered by renewable energy purchases (by our vendors).

1.43

Average Annual PUE

In 2022, the average annual Power Usage Effectiveness of our data centers was 1.43, compared to a global industry average of 1.57.

US$50

Internal fee on every mtCO2-eq

In 2022, we started charging ourselves a fee of US$50 on every metric ton of carbon we emit, with the revenue being reinvested in activities focused on improving and expanding climate content across our sites.

4.18

kgCO2-eq/1M pageviews

In 2022, our data centers generated 4.18kg CO2-eq for every million pageviews on Wikimedia projects (including Wikipedia), less than 1% of the industry average.

Executive Summary

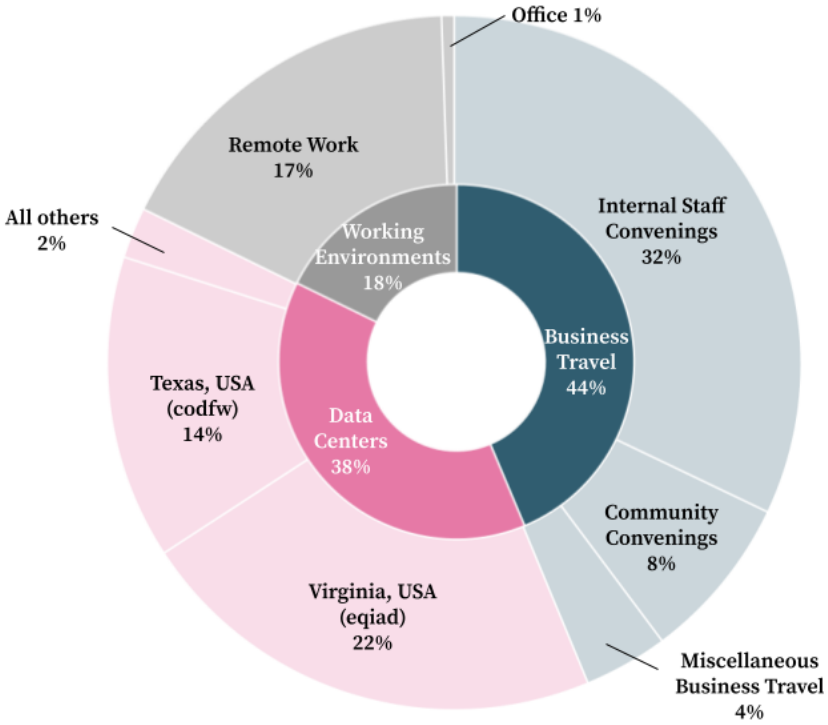
In calendar year 2022, the Wikimedia Foundation's scope 1, 2, and 3 emissions totaled 2,955 metric tons of CO_2-equivalent – less than 1% of other top 10 website platforms like Google and Meta.

As part of our commitment to sustainability, we continue to look for ways to improve the accuracy of our greenhouse gas inventory, and in this year's report, we expanded our scope 3 emissions to include remote work impacts (e.g., remote employees' estimated home energy use and their commutes to alternative workspaces).

Our two largest sources of emissions in 2022 were WMF-sponsored business travel for staff and volunteers, and the data centers that support our sites. These two functional areas were responsible for 44% and 38% of 2022 emissions respectively, with the remaining 18% of our emissions attributable to Working Environments (which includes our San Francisco, USA office and new as of this year: remote work impacts).

After almost two years working fully remote, we resumed travel and in person convenings in 2022. Travel-related emissions in 2022, however, remained 25% below 2019 levels (our last full year of travel before the COVID-19 pandemic), despite a 60% increase in staff, from 445 to 711, over that time period.

Wikimedia Foundation 2022 Emissions



Our data center emissions increased marginally in 2022, due to an expansion at our Ashburn, Virginia, USA (eqiad) data center and the addition of a fifth caching center (drmrs) in Marseille, France. While the Marseille data center's physical hardware footprint is small - making its relative emissions impact minor - environmental impact was still a major consideration in selecting the new location. The site utilizes a river water cooling system and is located on a low carbon electricity grid.

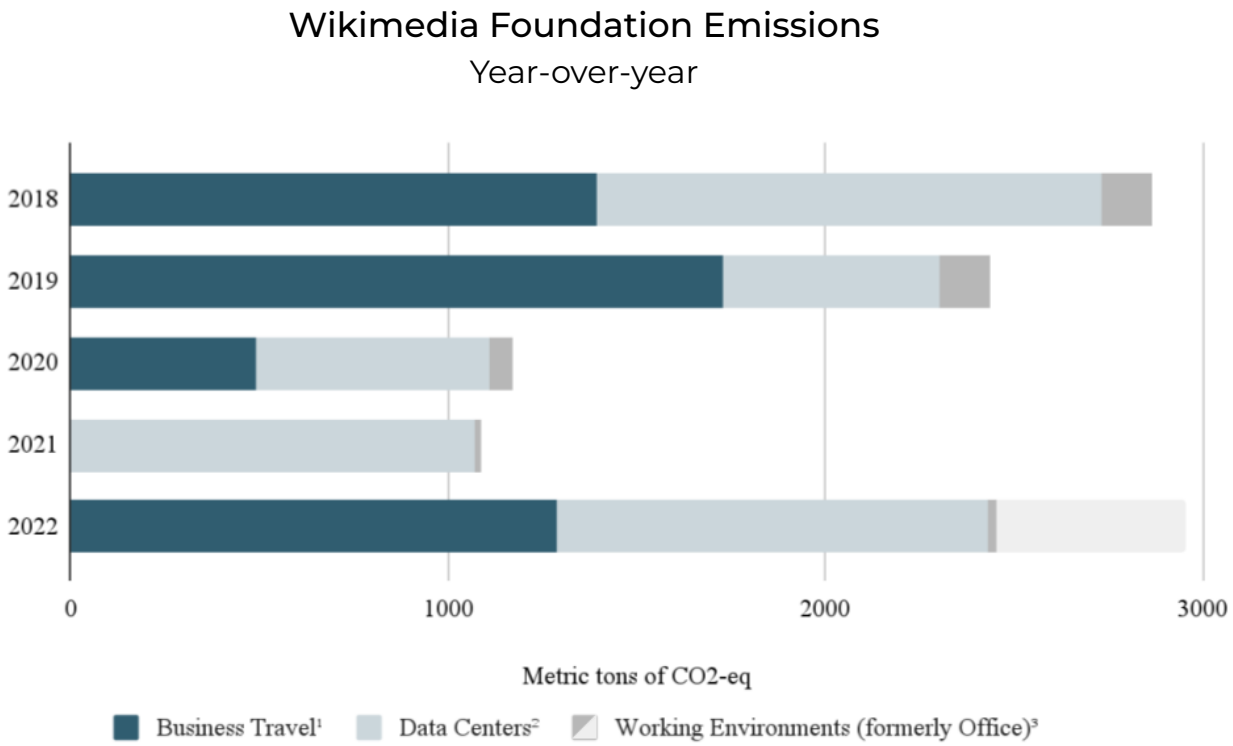
In addition, we are looking beyond our GHG inventory to explore how we can leverage our influence as a top 10 internet platform to help address the climate crisis. Wikipedia recorded 346 million pageviews[1] across more than 31,000 articles about climate change in 2022, with billions more pageviews on other sustainability-related topics. Through campaigns like #WikiforHumanRights: Right to a Health Environment, we are supporting community efforts to both improve the content and increase the number of these articles. Our newly established carbon fund, which is funded through a US$50/ton internal fee, or "tax", on our scope 1, 2 and 3 emissions, will be used to support new projects aimed at implementing the Movement Strategy initiatives related to environmental sustainability.

Emissions (mtCO2-eq)	2018	2019	2020	2021	2022
Scope 1	2.81	2.18	0.47	0.47	0.63
Scope 2[1]	*details not available*[2]	86.44	57.23	15.73	16.26
Scope 3	*details not available*[2]	2,344.72	1,111.74	1,074.18	**2,433.23** (2,938.23 incl. remote impact)[3]
Total	**2,867.86**	**2,433.34**	**1,169.44**	**1,090.38**	**2,450.12** (2,955.12 incl. remote impact)[3]

1. Because the electricity consumed at our colocated data center sites is purchased by our data center vendors directly (and therefore included in their scope 2 emissions), data center electricity emissions were moved from our scope 2 to scope 3 category in our 2021 report. Following guidance outlined in the GHG protocol, we subsequently updated our data center emissions methodology in the same year to reflect the emissions factors of the grids where our data centers operate rather than the procurement decisions of our vendors (i.e.. PPAs, RECs etc). This resulted in a 75% increase in data center-related emissions between 2020 and 2021. Please see our 2021 report for more information.

2. Electricity-specific emissions data for each of our data centers is not available for 2018, as data center electricity and water emissions were consolidated in our 2018 report and we do not have access to more detailed information.

3. In 2022, to strengthen our focus on sustainability, **we expanded our Working Environments (formerly Office) category to include remote work impacts** (e.g., remote employees' estimated home energy use and commuting to alternative workspaces), which increased our emissions by 505 mtCO2e.



1. In 2022, travel-related emissions remained 25% below 2019 levels (our last full year of travel before the COVID-19 pandemic) despite a 60% increase in our workforce, from 445 to 711, over that time period.

2. Because the electricity consumed at our colocated data center sites is purchased by our data center vendors directly (and therefore included in their scope 2 emissions), data center electricity emissions were moved from our scope 2 to scope 3 category in our 2021 report. Following guidance outlined in the GHG protocol, we subsequently updated our data center emissions methodology in the same year to reflect the emissions factors of the grids where our data centers operate rather than the procurement decisions of our vendors (i.e.. PPAs, RECs etc). This resulted in a 75% increase in data center-related emissions between 2020 and 2021. Please see our 2021 report for more information.

3. In 2022, we expanded our Working Environments (formerly Office) category to include remote work impacts for the first time (e.g., remote employees' estimated home energy use and commuting to alternative workspaces). These are pictured here in light gray.

2022 Impacts

Business Travel

Business travel was responsible for 1,291 metric tons of CO_2-eq, or 44% of our emissions, in 2022. Overall, travel emissions were still 25% lower than 2019 levels (our last full year of travel pre-pandemic), despite growing our staff from 445 to 711 over that same time period. This was due to the continuing impacts of the COVID-19 pandemic and an organizational effort to be more intentional about travel. Our annual staff All Hands event was held virtually in 2022 and we plan to hold it virtually in 2023.

Travel emissions per employee decreased from 3.88 tons in 2019 to 1.82 tons in 2022. Travel emissions per trip, however, increased from 1.03 to 1.30 tons. Because half of our 700+ staff now reside outside of the United States, teams are **traveling further** but **less often** in order to meet and collaborate in person.

And after almost two years working fully remote, we see tremendous value in in-person meetings, not only as an opportunity to onboard new staff and foster connection, but to establish a shared vision and align on our strategic goals.

1,131 mtCO2-eq air	160 mtCO2-eq hotel stays	1.82 mtCO2-eq/ employee	1.30 mtCO2-eq/ trip
↓29% from 2019	comparison unavailable**	↓53% from 2019	↑26% from 2019

**2019 was used as a baseline for comparison purposes as it was the last full year of travel before the COVID-19 pandemic.*

***Although **actual hotel nights decreased** 38% between 2019 and 2022, **our calculated hotel emissions increased** 29% because of an update to our methodology. We are now using an average emissions factor for all hotel nights (based on a worldwide average for 3-4 star hotels) rather than attempting to account for every locality, which is time-intensive and doesn't result in a significant change to overall emissions.*

Travel to team offsites and other **internal staff convenings**[2] represented a majority of our travel-related emissions in 2022, though these were still far below 2019 on a per staff basis.

Travel to **community convenings**[3] also resumed in 2022 with the exception of two large conferences: the Wikimedia Hackathon and Wikimania – the Wikimedia Movement's annual conference. Both conferences were held remotely in 2022. Wikimedia Summit, the CEE Meeting, WikiArabia, WikiIndaba, ESEAP and WikiConvention Francophone conferences were all held in person in 2022. WMF-sponsored travel (including both staff and volunteers) to these events was responsible for a relatively small share (18%) of travel-related emissions, half as much as in prior years. This was partially due to an effort to prioritize the participation of local or regional staff at these events, rather than those who may be based further away. We do expect these emissions to increase in 2023, as Wikimania is scheduled to be held as an in-person event in Singapore in August.

Miscellaneous business travel[4], which includes staff travel to professional conferences, fundraisers, partnership meetings etc., represented a minor share (9%) of travel-related emissions.

Image: Wikimedia Summit in Berlin, Germany, September 2022. Source: CC BY-SA 4.0, Jason Krüger

2022 Impacts

Data Centers

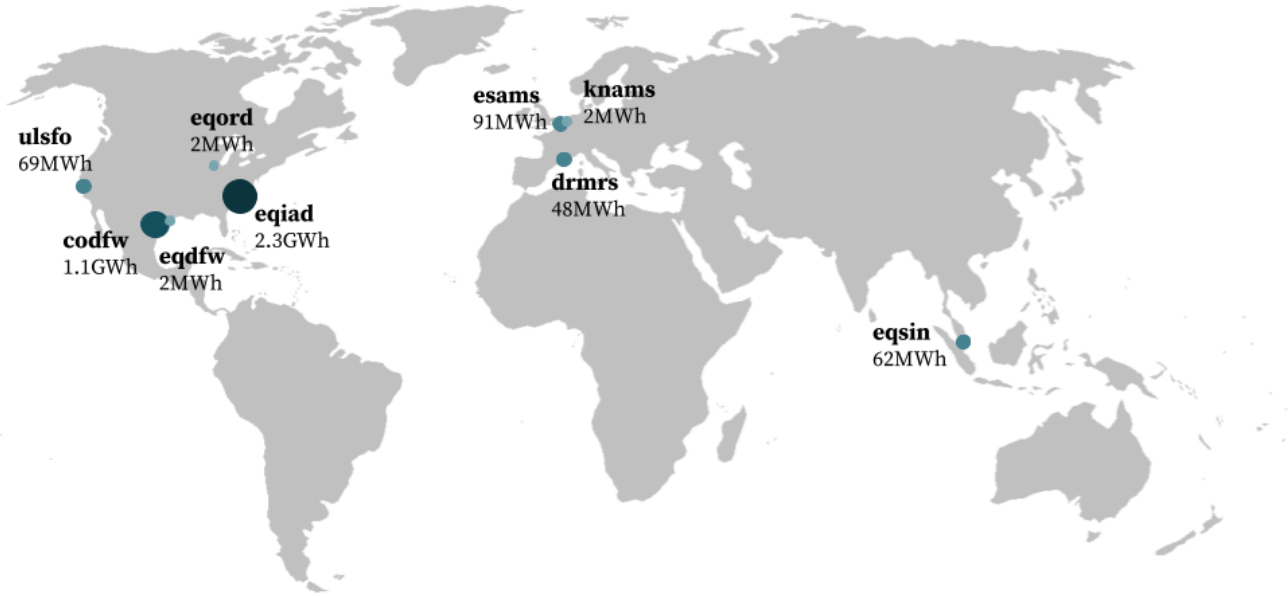


Image: Data centers by 2022 electricity consumption, underlying map public domain

Our Data Centers were responsible for 1,141 metric tons of CO_2-eq, or 38% of our emissions, in 2022 – wholly from electricity consumption. Due to data collection limitations with our vendors, we no longer account for emissions related to water use. However, most of our nine colocated data centers, including our highest impact sites (eqiad and codfw), utilize water-free or closed loop cooling systems.

Data center electricity consumption increased 18% year-over-year, while emissions increased only 6%, a trend indicating that the electricity grids on which we operate continue to decarbonize.

Our Ashburn, Virginia, USA (eqiad) and Carrollton, Texas, USA (codfw) sites, which host most of our hardware, continue to be the largest source of our data center-related emissions. The electricity grid mixes in Virginia and Texas are 48% zero-carbon (mainly nuclear) and 35% zero-carbon (mainly wind and nuclear) respectively.

All of our data center vendors, with the exception of CyrusOne, which hosts our codfw site, procure enough renewable energy to cover 100% of their clients' electricity consumption. Portfolio-wide, CyrusOne currently covers about 15% of its

clients' electricity consumption with renewable energy purchases, but that percentage is closer to 30% in North Texas. They are working towards procuring 100% renewable electricity for their Texas sites with wind and solar contracts, including a 67MW solar+storage project in Haskell County, which is expected to cover 70% of Carrollton's electricity needs once it is fully generating.

In 2022, our data centers generated roughly 0.004gCO_2-eq per pageview on all Wikimedia projects, including Wikipedia. This is **less than one 1%** of an average webpage.

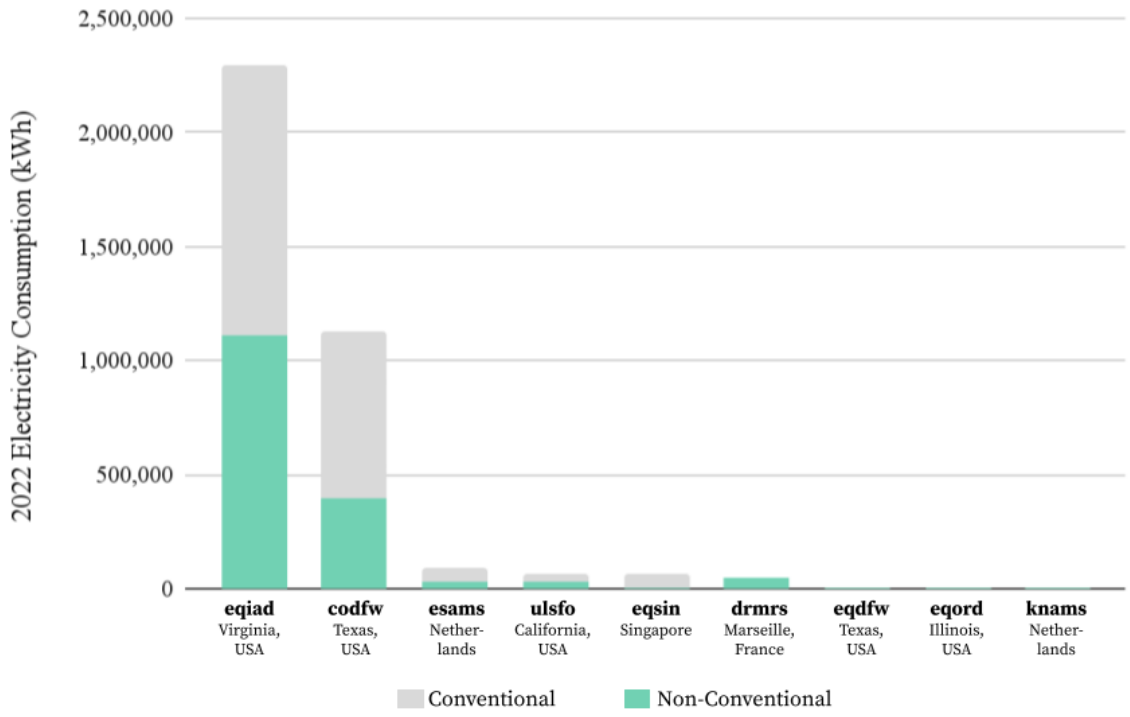


Image: Data Centers by local electricity grid mix. Source: U.S. EPA, Statista, Singapore Energy Market Authority

Eqiad's electricity consumption increases with new cage usage

At the end of 2021, we expanded our infrastructure at our largest data center site in Ashburn, Virginia (eqiad) in order to accommodate needs for future hardware growth. In 2022, we started utilizing this additional space by ramping up with new server installations. As a result, energy consumption at our eqiad site increased 19% in 2022.

New caching site in operation

Wikimedia's newest caching center in Marseille, France (drmrs) – which was added in 2021 as a much-needed alternative to our Amsterdam, Netherlands caching center (esams) – started serving Wikipedia traffic from parts of Europe, Africa and the Middle-East in April 2022. Because drmrs' hardware footprint is small, it consumes little electricity relative to our other data center sites, and its impact on the Foundation's emissions in 2022 was therefore minor.

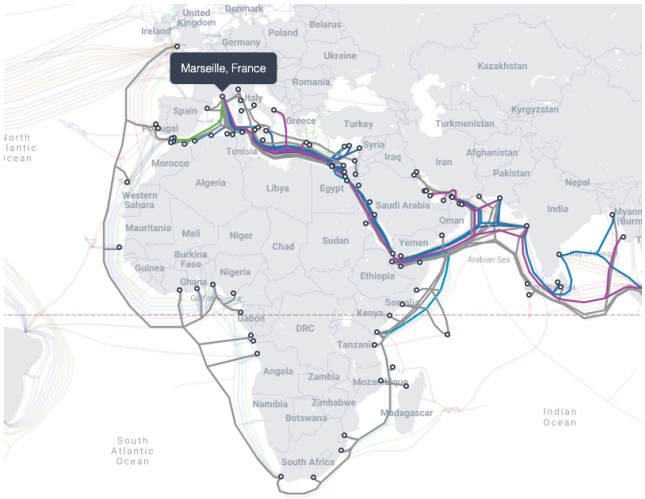


Image: World map representing all the oceanic cables, highlighting the ones in relation to Marseille. Source: submarinecablemap.com CC BY-NC-SA 3.0

2022 Impacts

Working Environments

To better reflect the remote-first nature of our organization and the many ways in which we work on a daily basis, we have renamed the Office category to Working Environments and have expanded it beyond office-related commuting, energy, waste, and water to include remote workers' estimated home energy use and commuting to alternative workspaces. **Working Environments was responsible for 523 metric tons of CO_2-eq, or 18% of our emissions, in 2022.**

San Francisco Office

The Wikimedia Foundation leases office space in a certified LEED Platinum building in San Francisco, California, USA. In 2022, this space generated **17 mtCo2-eq**.

All Covid-related restrictions were lifted at the San Francisco office on March 1, 2022. Due to the changing distribution of our workforce and increased flexibility around working from home, however, few staff members regularly commuted into the office in 2022. Commuting emissions were therefore negligible and have been omitted from our calculations due to their relative insignificance.

Electricity usage at the office increased slightly year over year, due to the lifting of covid restrictions; otherwise, there were no significant changes in office-related emissions.

Remote Work

Employee home energy use was responsible for an estimated **465 mtCo2-eq** in 2022. Because the GHG protocol provides limited guidance on how to calculate emissions related to remote work, we used per-person emission factors published for the first time in 2022 by the UK's Department for Environment, Food & Rural Affairs (DEFRA). The factors provided by DEFRA are imperfect (i.e. they don't capture the variation in heating/cooling demand and the types of fuels used across different countries and climates), but we felt they provided a good enough approximation. With more companies adopting a remote-first model, we expect more precise methodology to be published in the years ahead and will review those standards for application in future reports.

Travel to alternative workspaces outside of staff members' homes was responsible for an estimated **40 mtCo2-eq.**

Movement Campaigns

As a top 10 internet platform with over 270 billion annual pageviews and 346 million pageviews[1] on climate change-related articles alone, Wikimedia is well positioned to impact the conversation around climate change, especially given the well understood correlation between climate change education, climate communication, and action. This content also has an outsized impact in the global south and non-English language context, as much of the scientific literature related to climate is published in English and in formats that do not reach the broader public.

During the 2030 movement strategy process, the movement prioritized environmental sustainability, and we know that our global readers are concerned about climate change and related environmental issues. The Wikimedia Foundation and its affiliates support a number of campaigns and events to increase and improve content about the climate crisis, including the #WikiForHumanRights campaign and a pilot Organizer Lab on the topic.

#WikiForHumanRights

Since 2020, the Wikimedia Foundation has partnered with UN Human Rights to host an annual #WikiForHumanRights campaign that offers an opportunity for members from the Wikimedia Movement and the larger open knowledge ecosystem to host activities and events documenting the intersection of human rights and a healthy environment. During the 2022 campaign, more than **700 participants** created **4,000 articles** over the course of **30 hosted events.**

In coordination with this campaign, the Foundation also hosted our fourth annual Earth Day Editathon on April 22, 2022 for staff and contractors in their volunteer capacities.

Organizer Lab

In the last 3 months of 2022, we implemented an Organizer Lab (beta) focused on the theme of Climate and Sustainability. The organizer lab included 35 organizers from around the world, with a focus on teaching organizers how to design editing events connected to the theme. Graduates were able to apply for funding from our Internal Carbon Fund to help organize their own climate and sustainability campaigns.

Internal Carbon Fee

Recognizing that we, as a Foundation, cannot achieve carbon neutrality through emission cuts alone, and not wanting to purchase carbon offsets due to concerns around their effectiveness, **we have begun charging ourselves a US$50 internal fee on every ton of carbon we emit.**

This US$50/ton fee was determined in 2022 based on a review of other carbon pricing schemes around the world and will be re-evaluated periodically for updates. This fee is assessed annually on our scope 1, 2, and 3 emissions, with the revenue being earmarked in the next fiscal year's budget for new work aimed at implementing the Movement Strategy initiatives related to environmental sustainability.

In year one, this fee was assessed on both our 2020 and 2021 emissions, and the resulting US$130,000 was reinvested in our fiscal year 2023 (July 1, 2022 - June 30, 2023) budget under a dedicated fund. We are currently using these funds to invest in the first experimental pilot focused on movement organizing on the theme. Year 1 included a 9-week online learning experience that ran from November 2022 to January 2023.

This 35-person organizer lab was designed to prepare participants to design strategic calls to action around prioritized knowledge gaps, as well as more generalized Wikimedia organizing and campaign/event design skills, with a focus on sustainability. The participants' final project included a grant application, and out of the ten grant applications submitted, the Wikimedia Foundation has awarded six grants, ranging from US$10,000 - US$15,000.

The **US$147,750 in fees collected from the Wikimedia Foundation's 2022 emissions** will be reinvested into our FY24 (July 1, 2023 - June 30, 2024) budget, under the management of our community resources team, who will use the fees to support community-led sustainability campaigns and projects.

Internal Initiatives

Teams for a Better Planet

In February and March 2022, the Wikimedia Foundation partnered with Teams for a Better Planet to host five workshops addressing the global climate crisis.

The workshops included interactive, team-building sessions with educational content, discussions, and innovative approaches to problem-solving on topics ranging from climate 101 to risk/resilience to how every job can be a climate job. Two of the workshops - Action Starts with Community and Risk and Resilience were open to community members to attend. Overall, we had nearly **100 staff and community members** participate across the five workshops.

Get in Touch

For more information about the Wikimedia Foundation's sustainability efforts, including past reports, please visit our Sustainability Meta page. You can also ask us a question on the talk page at meta.wikimedia.org/wiki/Talk:Sustainability or email us at sustainability@wikimedia.org.

Appendix

Appendix A

Footnotes

1. **Climate Change Pageviews** were calculated on all articles in English Wikipedia belonging to WikiProject Climate change and their corresponding articles in all other language-versions of Wikipedia via its Wikidata item. This includes pageviews from all redirect-pages of an article.

2. **Internal Staff Convenings** include travel to internally-facing events such as All Hands, team offsites, onboarding sessions, and office visits. The need for this travel arises due to the distributed nature of our workforce and would be displaced by office-related emissions were we to maintain a larger headquarters.

3. **Community Convenings** include travel to community events such as Wikimania, Wikimedia Hackathon, Wikimedia Summit, WikiArabia, WikiIndaba, WikiCon Francophone, WikiCon North America, WikidataCon, and IberoConf. This category includes both staff bookings and volunteers or scholarship recipients who were booked by the Foundation.

4. **Miscellaneous Business Travel** includes any travel that doesn't fit the descriptions above and may include travel to professional conferences, fundraisers, speaking engagements, etc

Data Centers

Provider	Location	Server Name	Service Type	Date Opened	2022 PUE	kg Co2-eq / kWh
Equinix	Ashburn, Virginia, USA	eqiad	application services	Feb 2011	1.55	0.284
CyrusOne	Dallas, Texas, USA	codfw	application services	May 2014	1.41	0.373
Iron Mountain	Amsterdam, Netherlands	esams	caching	Dec 2008	1.4	0.283
Equinix	Singapore	eqsin	caching	Dec 2017	1.37	0.372
Digital Realty	San Francisco, California, USA	ulsfo	caching	June 2012	1.59	0.234
Interxion	Marseille, France	drmrs	caching	Dec 2021	1.3	0.057
Equinix	Chicago, Illinois, USA	eqord	networking	Feb 2015	1.25	0.449
Equinix	Dallas, Texas, USA	eqdfw	networking	Feb 2015	1.5	0.373
Interxion	Amsterdam, Netherlands	knams	networking	Jul 2005	1.54	0.283

Appendix B

Methodology

Scope	Activity	Functional Area	Activity Data	Emission Factor Source(s)	Changes
1	**Natural Gas & Refrigerants**	Working Environments	Total building consumption information prorated by WMF % of total building area	Emission Factors for GHG inventories, EPA (2022)	
2	**Purchased Electricity**	Working Environments	Electricity consumption from Wikimedia monthly utility billing statements	Emission Factors for GHG inventories, EPA (2022)	
	Purchased Steam	Working Environments	Total building consumption information prorated by WMF % of total building area	Emission Factors for GHG inventories, EPA (2022)	
3	**Waste to landfill, Recycling, Composting, EWaste**	Working Environments	Total building consumption information prorated for WMF % of total building area	Emission Factors for GHG inventories, EPA (2022)	
	Water Usage & Waste Water treatment			DEFRA (2022) (EPA does not publish water usage emission factors)	
	Commuting	Working Environments	2022 staff survey, 26% response rate. Data from respondents apportioned across non-respondents	Emission Factors for GHG inventories, EPA (2022)	
	Home Energy Use	Working Environments	Staff data provided by human resources department	DEFRA (2022)	New category.
	Electricity purchased by data center vendors	Data Centers	Energy consumption for Wikimedia application and caching sites provided by Grafana - eqiad data was partially missing in Grafana (from rows E and F) and supplemented by data from the data center provider for accuracy; data for networking sites captured directly from network routers. Local site-specific PUE information provided by data center vendors	Emission Factors for GHG inventories, EPA (2022); Google Cloud Platform data used for Singapore and Netherlands; Statista used for France	
	Business Travel - Air	Travel	Air miles provided by Wikimedia's travel agency	Emission Factors for GHG inventories, EPA (2021)	
	Business Travel - Lodging		Hotel emissions factors include estimates for natural gas, electricity, and steam consumption	Hotel Footprinting Tool, worldwide average for 3-4 star hotels	We are now using an average emissions factor for all hotel nights (based on a worldwide average for 3-4 star hotels) rather than attempting to account for every locality.

Appendix C

Emissions by Functional Area

Emissions (tCO2-eq)	2018	2019	2020	2021	2022	% Change (YoY)
Data Center Operations[1]	**1,334.4766**	**576.2118**	**614.3248**	**1,072.7170**	**1,141.3402**	+ 6%
Server - eqiad	677.4179	166.5654	163.1974	589.1320	652.1399	+ 11%
Server - codfw	556.1300	389.59	437.3246	408.9160	418.9221	+ 2%
Server - esams	43.8937	0.1467	0.1525	35.5020	25.7926	-27%
Server - eqsin	22.3393	7.6778	7.7485	27.2490	23.2396	-15%
Server - ulsfo	24.8504	6.0610	0.0000	10.5030	16.1324	+ 54%
Server - drmrs[2]	*not online*	*not online*	*not online*	0.0620	2.7785	+ 4381%
Server - eqord[3]	1.5831	0.1911	0.1778	0.4730	0.8655	+ 83%
Server - eqdfw[3]	1.2787	0.1547	0.1414	0.4430	0.7979	+ 80%
Server - knams	1.1600	0.0019	0.0019	0.4370	0.6716	+ 54%
Server Room[4] - San Francisco Office	5.8234	5.8234	5.5807	*data not available*	*data not available*	
Working Environments	**138.0698**	**131.2813**	**62.0252**	**17.6656**	**522.8016**	+ 2859%
San Francisco Office	**138.0698**	**24.7648**	**10.4607**	**15.3550**	**17.8016**	+ 16%
Purchased Electricity[4]	*details not available*	61.1705	42.5593	2.3106	3.2465	+ 41%
Employee Commuting	*details not available*	45.3461	9.0051	0.0000	0.0000	
Energy - Natural Gas	*details not available*	2.1850	0.4735	0.4678	0.6253	+ 34%
Energy - Steam	*details not available*	19.4472	9.0866	13.4218	13.0114	-3%
Waste - composting	*details not available*	0.0551	0.0209	0.3244	0.0209	-94%
Waste - eWaste	*details not available*	0.0043	0.0011	0.0018	0.0003	-83%
Waste - landfill	*details not available*	2.2112	0.5544	0.8159	0.7422	-9%
Waste - mixed recycling	*details not available*	0.1057	0.0371	0.1153	0.0428	-63%
Water Management - Municipal Water	*details not available*	0.2473	0.0939	0.0674	0.0397	-41%
Water Management - WWT	*details not available*	0.5090	0.1932	0.1407	0.0725	-48%
Remote Work[5]	*data not available*	*data not available*	*data not available*	*data not available*	**505.0000**	
Home energy use	*data not available*	*data not available*	*data not available*	*data not available*	465.0000	
Employee Commuting	*data not available*	*data not available*	*data not available*	*data not available*	40.0000	
Business Travel	**1,395.3153**	**1,725.8553**	**493.0863**	**0.0000**	**1,290.9753**	
Internal Staff Convenings	**687.5470**	**817.6469**	**309.6826**	**0.0000**	**947.4461**	
Air	*details not available*	762.4984	288.1272	0.0000	827.9357	
Hotel	*details not available*	55.1485	21.5553	0.0000	119.5104	
Community Convenings	**707.7683**	**536.6478**	**98.4796**	**0.0000**	**227.6829**	
Air	*details not available*	489.0362	80.3018	0.0000	192.8363	
Hotel	*details not available*	47.6116	18.1778	0.0000	34.8467	
Miscellaneous Business Travel[6]	*details not available*	**371.5606**	**84.9241**	**0.0000**	**115.8462**	
Air	*details not available*	350.2828	74.5557	0.0000	109.9277	
Hotel	*details not available*	21.2778	10.3684	0.0000	5.9186	
Total Emissions (tCO2-eq)	**2,867.86**	**2,433.34[7]**	**1,169.44**	**1,090.38**	**2,955.12**	+ 171%

Notes

1. Due to data collection limitations, we stopped accounting for emissions related to water use in 2021.
2. Our drmrs data center site went online in November 2021 and did not fully start serving Wikipedia users until April 2022.
3. Electricity consumption at our eqdfw and eqord network routers was more fully captured in 2022.
4. Beginning in 2021, electricity-related emissions for the WMF server room are included in the San Francisco Office's electricity emissions. In 2022, we also began using data directly from the Foundation's metered billing statement, rather than prorating building-wide electricity usage.
5. In 2022, we expanded our scope 3 emissions to include remote work impacts (e.g. estimated home energy use & commuting to alternative workspaces).
6. Miscellaneous business travel was not tracked separately until 2019. In 2018, it was included under community convenings (previously "non-telecommuting").
7. While reviewing our emissions data for the 2021 report, we discovered a calculation error - 2019 emissions have been correctly restated here.

Appendix D

Emissions by Scope

Emissions (tCO2-eq)	2018	2019	2020	2021	2022	% Change (YoY)
Scope 1	**2.81**	**2.18**	**0.47**	**0.47**	**0.63**	+ 33%
Natural Gas	2.81	2.18	0.47	0.47	0.63	+ 33%
Scope 2	***details not available***	**86.44**	**57.23**	**15.73**	**16.26**	+ 3%
Electricity - San Francisco Office[1]	*details not available*	66.99	48.14	2.31	3.25	+ 41%
Steam - San Francisco Office	19.79	19.45	9.09	13.42	13.01	-3%
Scope 3	***details not available***	**2,344.72**	**1,111.74**	**1,074.18**	**2,938.23**	+ 174%
Electricity - Data Center -eqiad	*details not available*	163.44	159.87	589.13	652.14	+ 11%
Electricity - Data Center - codfw	*details not available*	389.59	437.32	408.92	418.92	+ 2%
Electricity - Data Center - esams	*details not available*	0.00	0.00	35.50	25.79	-27%
Electricity - Data Center - eqsin	*details not available*	7.59	7.66	27.25	23.24	-15%
Electricity - Data Center - ulsfo	*details not available*	6.06	0.00	10.50	16.13	+ 54%
Electricity - Data Center - drmrs	*not online*	*not online*	*not online*	0.06	2.78	+ 4381%
Electricity - Data Center - eqord	*details not available*	0.19	0.18	0.47	0.87	+ 83%
Electricity - Data Center - eqdfw	*details not available*	0.15	0.14	0.44	0.80	+ 80%
Electricity - Data Center - knams	*details not available*	0.00	0.00	0.44	0.67	+ 54%
Remote Employee Home Energy Use[3]	*data not available*	*data not available*	*data not available*	*data not available*	465.00	n/a
Waste	0.58	2.38	0.61	1.26	0.81	-36%
Water Management[4]	26.42	4.12	3.87	0.21	0.11	-46%
Business Travel - Air	1,122.23	1,601.82	442.98	0.00	1,130.70	n/a
Business Travel - Hotel	251.52	124.04	50.10	0.00	160.28	n/a
Employee Commuting to Office	56.22	45.35	9.01	0.00	0.00	n/a
Employee Commuting to Alternative Workspace	*data not available*	*data not available*	*data not available*	*data not available*	40.00	n/a
Total Emissions (tCO2-eq)	**2,867.86**	**2,433.34[5]**	**1,169.44**	**1,090.38**	**2,955.12**	+ 171%

Notes

1. In our 2021 report, we began using data directly from the Foundation's metered billing statement, rather than prorating building-wide electricity usage, which led to a large decrease in these calculated emissions.

2. Because the electricity consumed at our colocated data center sites is purchased by our data center vendors directly (and therefore included in their scope 2 emissions), data center electricity emissions were moved from our scope 2 to scope 3 category in our 2021 report. Electricity-specific emissions data for each of our data centers is not available for

3. In 2022, we expanded our scope 3 emissions to include remote worker impacts (e.g. home energy use & commuting to alternative workspaces).

4. Due to data collection limitations, we stopped accounting for emissions related to data center water use in 2021. From 2021 onward, water management emissions include water used at our San Francisco office space only.

5. While reviewing our emissions data for the 2021 report, we discovered a calculation error - 2019 emissions have been correctly restated here.

Appendix E

Activity Data

Activity Data	Unit	2018	2019	2020	2021	2022	% Change (YoY)
Energy							
Total Electricity Consumption	**kWh**	**3,449,865**	**3,294,359**	**3,212,519**	**3,154,197**	**3,710,680**	+ 18%
Data Center - eqiad	kWh	1,821,449	1,636,018	1,741,488	1,912,500	2,295,476	+ 20%
Data Center - codfw	kWh	1,203,974	1,220,794	1,096,052	1,033,530	1,123,770	+ 9%
Data Center - esams	kWh	73,584	76,738	79,786	86,591	91,140	+ 5%
Data Center - eqsin	kWh	47,059	45,867	47,830	55,272	62,472	+ 13%
Data Center - ulsfo[1]	kWh	33,358	32,377	34,634	50,876	69,006	+ 36%
Data Center - drmrs	kWh	*not online*	*not online*	*not online*	1,079	48,490	+ 4394%
Data Center - eqord	kWh	2,768	1,226	1,226	971	1,926	+ 98%
Data Center - eqdfw	kWh	2,768	1,226	1,226	1,120	2,141	+ 91%
Data Center - knams	kWh	1,945	972.4	972	1,066	2,373	+ 123%
WMF Server Room	kWh	24,264	24,264	24,264	*data not available*	*data not available*	
San Francisco Office[2]	kWh	238,695	254,877	185,041	11,192	13,887	+ 24%
Remote Work[3]		*data not available*	*data not available*	*data not available*	*data not available*	*data not available*	
Total Stationary Combustion	**mmBtu**	**339**	**337**	**146**	**211**	**208**	-2%
San Francisco Office - Natural Gas	mmBtu	40.89	43.68	9.42	8.76	11.77	+ 34%
San Francisco Office - Steam	mmBtu	298.10	292.89	136.85	202.14	195.96	-3%
Water[4]							
Municipal Water Use	m3	21,854	3,921	3,675	198	266	+ 34%
Wastewater Treatment	m3	21,854	3,921	3,675	198	266	+ 34%
Waste							
Total Waste Generated	**t**	**14.10**	**14.32**	**5.05**	**5.10**	**5.96**	+ 17%
Landfill	t	4.34	3.77	1.21	1.57	1.59	+ 1%
Recycled	t	4.62	4.95	1.74	1.28	2.01	+ 57%
Compost	t	4.65	5.40	2.05	2.16	2.34	+ 9%
eWaste	t	0.49	0.20	0.05	0.09	0.01	-84%
Business Travel							
Air Travel	km	15,715,522	16,165,236	4,484,151	0	10,470,203	
Hotel stays	nights	6,025	8,145	2,592	0	5,063	
Commuting to San Francisco Office[5]	km	594,115	575,651	114,098	0	0	
Commuting to Alternative Workspace	km	*data not available*	*data not available*	*data not available*	*data not available*	505,521	

Notes

1. The ulsfo data center electricity consumption for the years 2018-2020 was calculated using a PUE of 1.12. In 2022, Digital Realty provided a site-specific PUE of 1.58, which led to a significant increase in calculated electricity consumption in 2021.
2. Beginning in 2021, electricity usage for the WMF Server Room is included in the San Francisco Office's electricity consumption. In 2022, we also began using data directly from the Foundation's metered billing statement, rather than prorating building-wide electricity usage, which led to a large decrease in these calculated emissions.
3. Energy consumption data from remote work was not collected; we instead used per person emission factors published in 2022 by DEFRA. We will explore the feasibility of collecting this data for future reports.
4. Due to data collection limitations, we stopped accounting for emissions related to data center water use in 2021. From 2021, water management emissions include water used at our San Francisco Office space only.
5. Office-related commuting emissions were negligible in 2021 and 2022 and have been omitted from our calculations due to their relative insignificance.