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BioLite Environmental Sustainability Report 2022

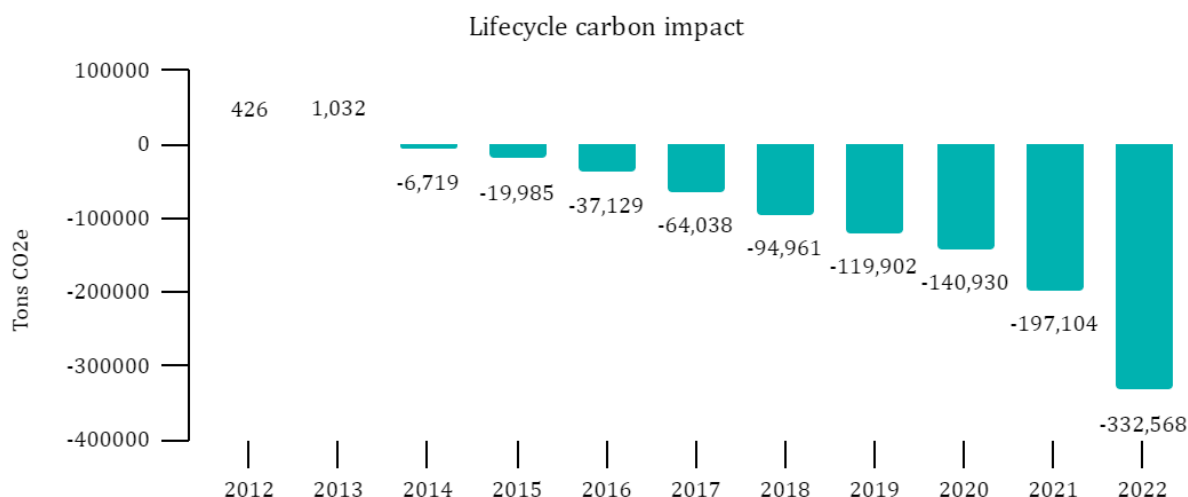
March 2023

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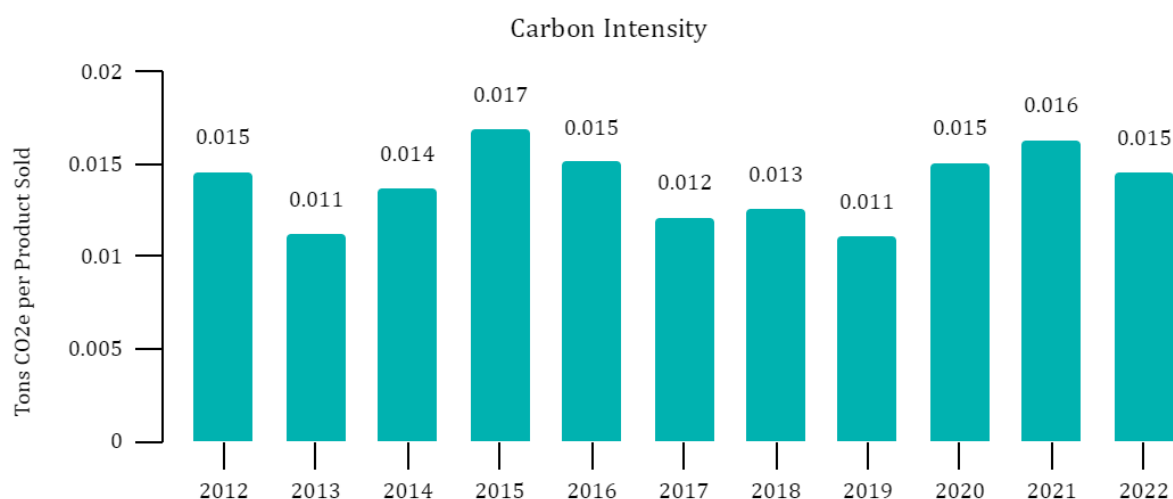
Executive Summary

BioLite’s 2022 carbon footprint analysis reveals some key conclusions and trends. First, use of BioLite’s products result in a significant reduction in greenhouse gas emissions compared to emissions produced from BioLite operations. This fact is evident from the graph presented, which is further explained in the “Lifecycle analysis” section. In fact, each ton of CO₂e released into the atmosphere from BioLite operations during 2012-2022 results in a reduction of approximately 21.3 tons CO₂e in emissions through 2021 from the use of cookstoves sold in emerging markets.



In 2022, BioLite emitted a total of 12,965 tCO₂e as per our internal model calculations, a ~15% increase year-on-year in spite of the pandemic and the resulting wide-spread adjustments in operations. The primary driver of this year’s increase was an increase in sales compared to 2021.

Our growth enabled us to continue increasing our impact, now reaching over 5 million people with access to clean energy (a 1.5 million increase from 2021), primarily driven by sales of less resource-intensive products, such as cookstoves and lanterns. As a result, BioLite’s 2022 carbon intensity, as defined by emissions per product manufactured, decreased slightly from 2021:



Lastly, BioLite continues to implement and explore new means of greenhouse gas mitigation within its operations, as outlined in the Emissions Mitigation section, and we will continue to offset BioLite’s entire carbon footprint, including scopes 1, 2 and 3.

Overall, BioLite continued to drive impact across a number of metrics in 2022. As referred to above, we are currently impacting well over five million people, and this also resulted in increases in watt hours generated and installed energy capacity, primarily driven by the continued success of our SolarHome systems, the Solar Home 620 and the SolarHome 5000. These products increased in sales volume by 18% in 2022 compared to 2021. In addition, we also continued to expand our cookstove business, with an increase in efficient charcoal stoves sales by 92% in 2022, resulting in a significant gain in fuelwood savings and tons of wood avoided. A comprehensive overview of impact metrics is detailed below:

	2014	2015	2016	2017	2018	2019	2020	2021	2022
People Accessing Cleaner Energy	20,975 (breathing cleaner air)	41,085 (breathing cleaner air)	100,000 (breathing cleaner air)	127,235	468,420	797,242	1,785,509	3,612,951	5,533,846
MWh of Electricity Generated by the BioLite Ecosystem	7.8	27.5	69.3	123.1	347.0	897.6	1,971.7	4,812.6	9,984.4

Tons of CO ₂ e Offset by BioLite Cookstoves	8,316	30,583	75,253	137,300	206,285	307,053	457,846	718,964	1,320,582
Installed Energy Capacity	n/a	n/a	n/a	33KW	434KW	650KW	1,760KW	4,368KW	7437KW
Staff members on Emerging Markets teams	10	25	55	30	47	46	46	38	39
Fuel Savings by BioLite Customers (\$)	\$1.7M	\$4.9M	\$12.7M	\$25.5M	\$41.4M	\$59.1M	\$84.3M	\$176.86M	\$341.23M
Tons of Wood Avoided	3,539	11,262	31,895	65,792	99,992	151,547	243,499	441,484	882,149

These key findings result from the exhaustive analysis of BioLite's operations, which is outlined in detail in the following report.

Introduction

BioLite is dedicated to creating positive environmental, health, and social impact through the development and distribution of safe, affordable, and desirable clean energy technologies for households living in energy poverty in the developing world.

We at BioLite seek to minimize our resource consumption and create products that have a net benefit to humanity and to the planet. Monitoring our carbon footprint is the first step in understanding whether we are achieving this goal. To that end, we have been measuring our carbon footprint since 2012 and offsetting our entire footprint each year. This process has been particularly important recently, since BioLite has been experiencing significant growth, which we aim to achieve in both a financially and environmentally sustainable way. This report covers BioLite's carbon footprint during the calendar year 2022, while also citing results from previous years in order to identify trends over time.

We serve two distinct markets: 1) “emerging market” families living in energy poverty, and 2) outdoor recreation users seeking fuel-independent cooking, charging, and lighting. Through a process of “parallel innovation,”¹ BioLite incubates core technologies for both markets; BioLite reinvests near-term revenue from our outdoor recreation business to support the emerging markets businesses in Africa until they are commercially self-sufficient.

BioLite generates a carbon credit for every metric ton of greenhouse gas (measured in carbon dioxide equivalent) reduced through the use of its products in emerging markets. For instance, when a household in Kenya cooks on the BioLite Jiko Malkia, they emit fewer greenhouse gases compared to the smoky, open fire which they would otherwise use. These savings are independently verified by Gold Standard Foundation, one of the leading carbon accreditation bodies.² We sell these credits on the open market. We reinvest carbon revenues into our emerging markets business, to lower our prices and enable poorer and more remote households to purchase BioLite clean energy products. We offset our company footprint through the purchase of high-quality, independently verified carbon credits from strategic partners.

¹ Hu, Ray. “BioLite Shares the Case for Parallel Innovation.” *Impact Design Hub*. August 5, 2015. <https://impactdesignhub.org/2015/08/05/biolite-parallel-innovation/>.

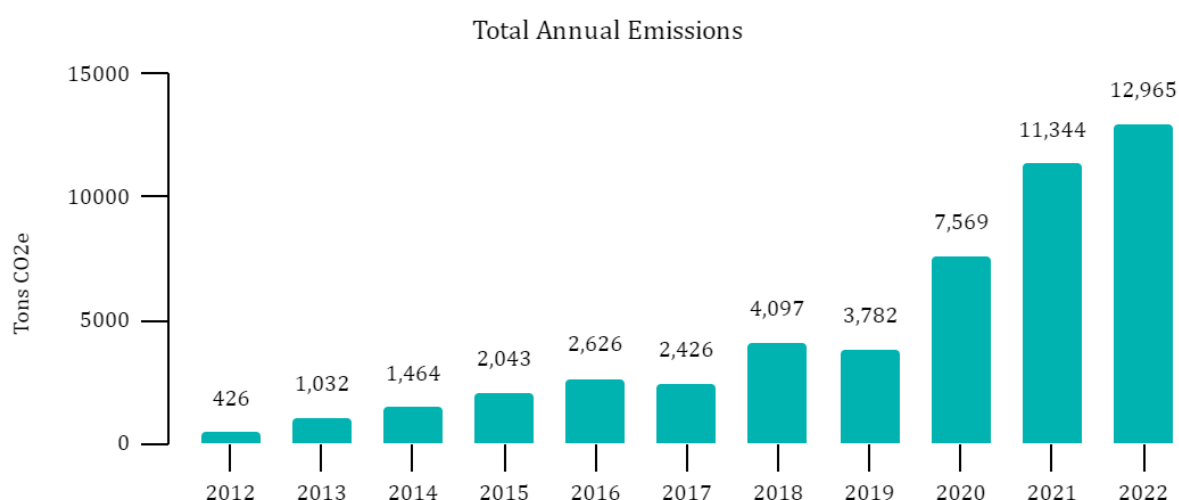
² “Our Purpose.” *Gold Standard*. <https://www.goldstandard.org/our-story/who-we-are>.

Summary

Historical Performance

BioLite has cumulatively emitted 49,772 metric tons of carbon dioxide equivalent (tCO₂e) since 2012. During the ten-year period from 2012 to 2022, every ton of CO₂e emitted by BioLite has generated a savings of about 20 tons of CO₂e.

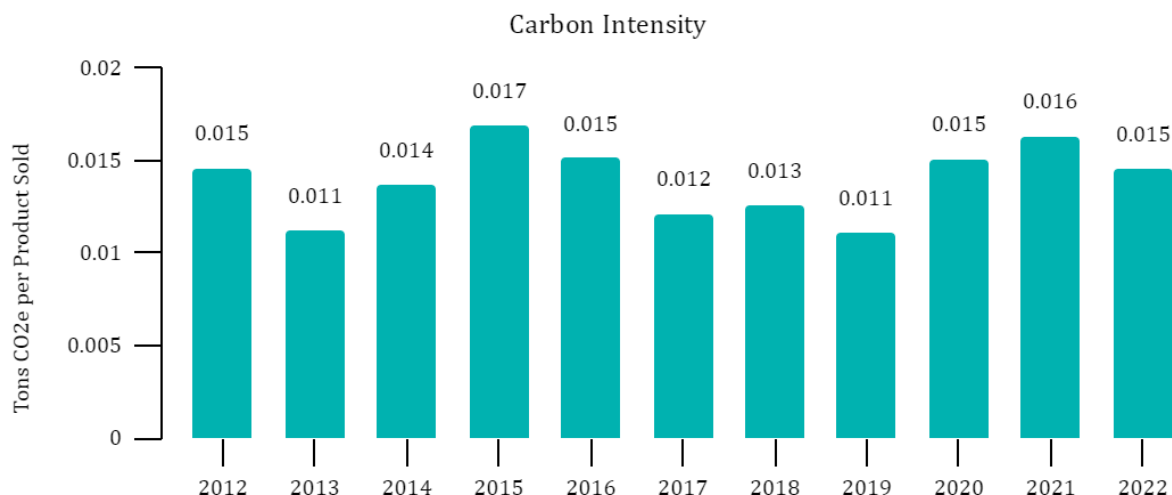
In 2022, BioLite emitted a total of 12,965 tCO₂e per our internal model. We offset the higher emissions figure with third-party-verified credits purchased from trusted partners.



Across the 2012-2016 timeframe, we observed a steady increase in emissions that is roughly proportional to the growth of BioLite's operational scale. This trend continued until 2017, when we observed a slight decrease in carbon footprint, due to a shift towards less-carbon intensive products, in a pattern similar to the one we observed for 2019. In 2018, the release of the Firepit resulted in high demand for this resource-intensive product, which in addition to increased sales in the SolarHome 620, impacted the carbon footprint for the year.

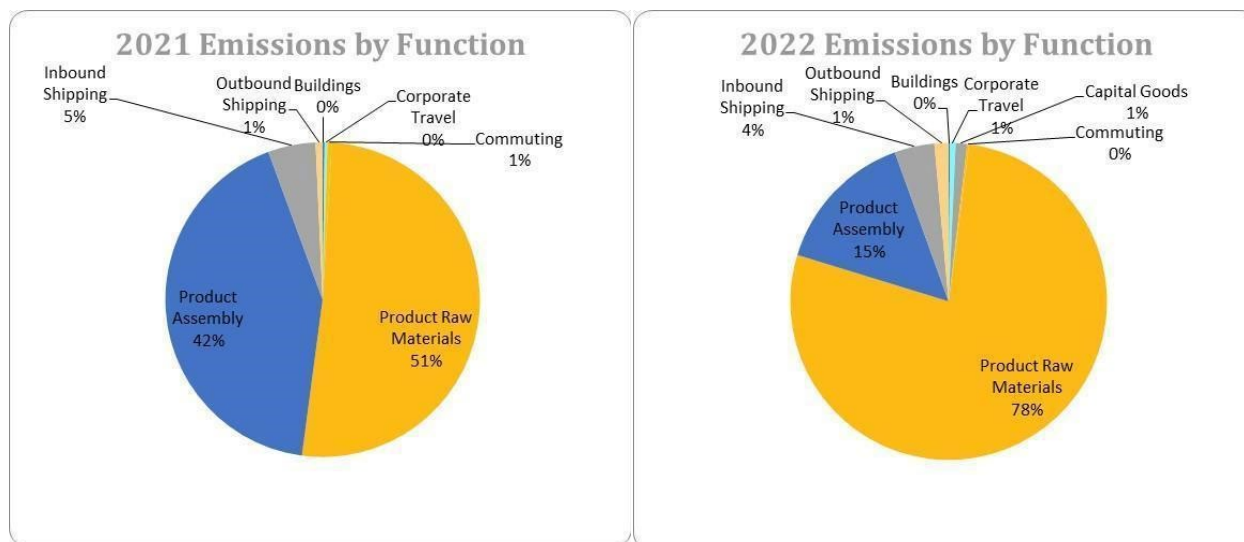
In 2022, BioLite started to return to pre-pandemic operations, including working from the office and conducting international travel. Sales increased around 28% compared to 2021. This growth was primarily driven by charcoal cookstoves, which are less resource intensive than other key BioLite products, such as the SolarHome 5000 and the Firepit. This is further reflected in the carbon intensity metric; when the data are normalized for total annual sales to calculate carbon intensity per product, we see that on a per-product basis, emissions range from about 0.011 to 0.017 tCO₂e. In 2022, BioLite's growth was primarily driven by less resource-intensive

products (e.g., charcoal stoves, EM lanterns) and resulted in a decrease in carbon intensity from 2021 to 0.015 tCO₂, a figure close to that of 2020.



While most categories remained stable year on year – with scope 3 raw materials and product assembly emissions accounting for the vast majority of BioLite’s carbon footprint- the largest change compared with 2021 was observed in product raw materials , which accounted for 78% of the company’s emissions in 2022 vs. 54% in 2021. This is a result of a change in methodology for how we incorporated printed circuit board (PCB) emissions. We elaborate further on this in the sections below.

Breakdown of Emissions by Function



Methods, Approach, and Function-Specific Results

As with previous years in which BioLite quantified its carbon footprint, we applied the World Resources Institute's Greenhouse Gas Protocol,³ taking into consideration resource and data constraints and using best efforts to arrive at reasonable and conservative conclusions, i.e. overestimating emissions where uncertainty exists. In this analysis, we quantified all material sources of greenhouse gas emissions throughout our business functions and value chain, as defined in the Greenhouse Gas Protocol.⁴

This report was compiled by BioLite staff from January 2023 to March 2023. Due to resource constraints, an external auditor was not engaged to verify the results of this analysis. All of the numbers and claims in this report can be supported by a detailed Microsoft Excel model and references to authoritative third-party documentation for all conversion factors and calculations. However, this model is not publicly available.

Scope 1 Emissions

Building Emissions - Natural Gas

Scope 1 emissions are defined as those originating from emissions sources directly controlled and owned by BioLite, which is only our BioLite offices. BioLite purchases natural gas for heating at our own headquarters office, and purchases natural gas for cooking in our Nairobi office. BioLite uses an external manufacturing facility to fulfill our manufacturing needs, so there are no sources of emissions within manufacturing operations over which we have direct control. For that reason, all manufacturing emissions are included in scope 3 below.

Scope 2 Emissions

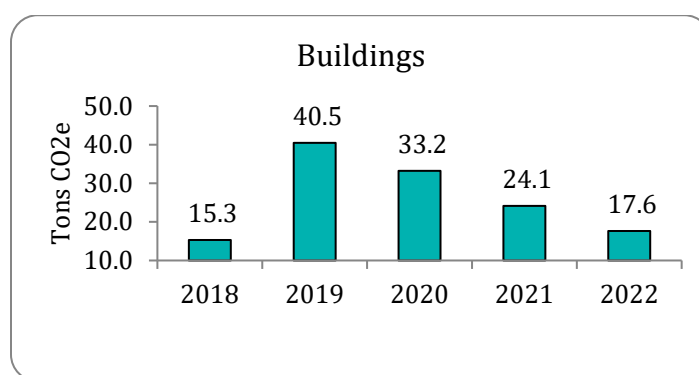
Scope 2 emissions include those from purchased or acquired electricity.

³ *Corporate Accounting and Reporting Standard*, Greenhouse Gas Protocol, World Resources Institute and World Business Council for Sustainable Development, March 2004.
<http://www.ghgprotocol.org/sites/default/files/ghgp/standards/ghg-protocol-revised.pdf>.

⁴ *Corporate Value Chain (Scope 3) Accounting and Reporting Standard*, Greenhouse Gas Protocol, World Resources Institute and World Business Council for Sustainable Development, September 2011. http://www.ghgprotocol.org/sites/default/files/ghgp/standards/Corporate-Value-Chain-Accounting-Reporting-Standard_041613_2.pdf.

Building Emissions - Electricity

Building electricity is typically the smallest source of emissions, particularly this year, given the pandemic and the adjustment to continue operations on a remote basis since the end of the first quarter of 2020, throughout 2021. BioLite purchases electricity for two offices. In 2020, BioLite expanded its Brooklyn headquarters, increasing the office space from 2019, although given the relocation of staff to remote working, this had little impact on the overall emissions. Nevertheless, in October 2021, BioLite switched to a solar energy provider in order to fulfill its electricity needs in the headquarters office, which also helped reduce these building emissions. Standard conversion factors were applied to calculate total emissions from the consumption of electricity and natural gas to arrive at the final values.



Note: Scope 1 (11.7 tons CO2e) and Scope 2 (5.9 tons CO2e) Building Emissions combined in the above graph for 2022

Scope 3 Emissions

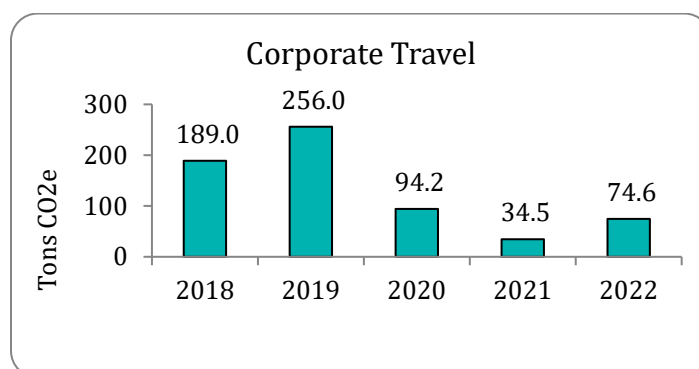
Scope 3 emissions include indirect emissions throughout our value chain, such as corporate travel, employee commuting, purchased goods and services, and transportation and distribution. Similar to most businesses, the overwhelming majority of our emissions are included under scope 3.

The vast majority of our scope 3 emissions are normally weighted toward purchase of goods and services, as we rely on third parties for the manufacturing of our products; this was particularly true in 2022, given a significant increase in sales. As BioLite resumes operations following the pandemic, our teams in Brooklyn and Nairobi have returned to office and international travel, causing an increase in the travel and commuting categories.

Corporate Travel

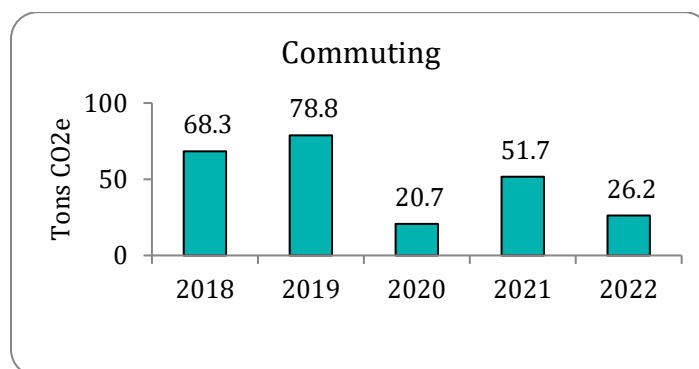
The majority of miles traveled and greenhouse gas emissions originated from commercial aircraft.

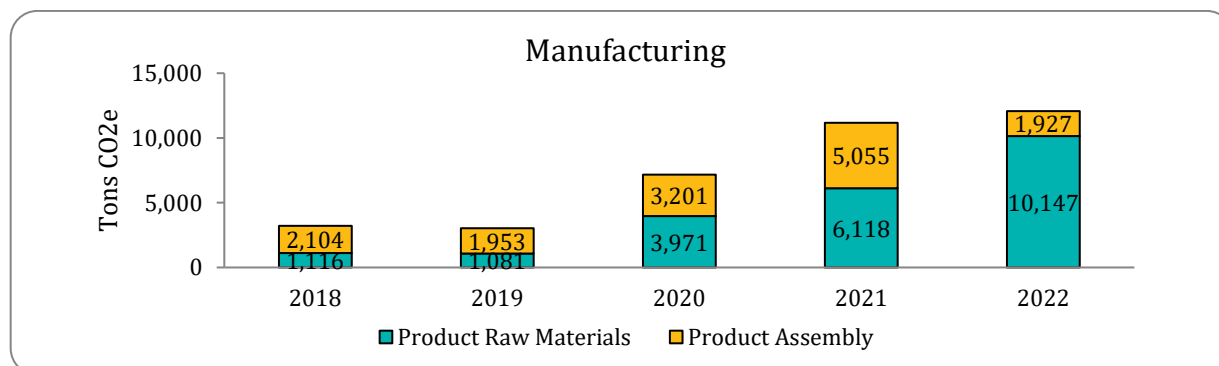
Corporate travel emissions were quantified by examining records of all company travel for the periods in question and calculating the distance traveled for each trip. These distances were then multiplied by industry standard conversion factors based on the type of transport. Where imperfect travel records existed, we compared travel records with accounting records (which are maintained much more closely) and added a commensurate amount of travel to ensure that no underreporting took place.



Commuting

Company employees completed a survey in late 2016 in which they self-reported their commuting patterns, revealing the frequency with which employees commute via public transportation, bicycle, car or by walking. The results of this survey were then scaled to correspond with the average number of BioLite employees in 2022. Approximately 37% of BioLite employees that work in its Brooklyn headquarters either walk, bike or work from home the majority of the week. Less than 2% of BioLite employees at HQ drive at least some of the time, with the balance taking some form of public transportation. Throughout 2022, BioLite employees began gradually coming back to the office in both of our offices, though both offices remain at less than full capacity. To factor this in, we calculated what percentage of employees and how frequently they went to the office, adjusting our assumptions accordingly.



Product Manufacturing

Emissions from raw materials and product assembly increased significantly compared to 2020 due to increased sales. Product raw materials increased significantly compared to previous years, due to our new method of modeling printed circuit boards (PCBs), a key component in electronics. Previously, we measured PCB emissions by applying a conversion factor to the cost of PCBs. We then assumed an equal split of emissions resulting from raw materials and assembly, since the emissions factor applied includes emissions from both raw materials and assembly combined. This year we applied an emissions factor to the total mass of all PCBs used, and was totaled as part of the figure for raw materials.

Each BioLite product was cataloged by its component parts, their material type and respective masses. Widely accepted embodied energy conversion factors for each material were then applied to calculate a per-unit embodied energy value for each product.⁵ This was then multiplied by the total number of products sold in 2022 to arrive at a total figure for raw materials.

In calculating emissions from product assembly, BioLite attained direct energy consumption data from our third-party factory in China, a change from previous years. Standard conversion factors were applied to calculate total emissions from the consumption of electricity in China and fuel (e.g., natural gas, diesel) to arrive at the final values. Previously, BioLite was unable to attain direct energy consumption data from our third-party factory in China. Instead, we used publicly available benchmarks from the automotive industry and made minor adjustments to be

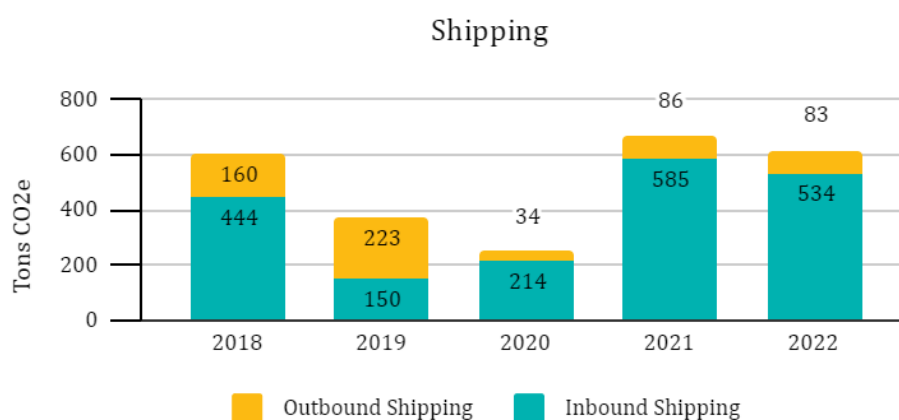
⁵ Inventory of Carbon & Energy by Sustainable Research Team, University of Bath, United Kingdom, 2011.

<http://www.organicexplorer.co.nz/site/organicexplore/files/ICE%20Version%201.6a.pdf>.

more applicable to BioLite’s products. We accounted for all processes involved in manufacturing each BioLite product to arrive at the values in the graph above.

Shipping

Shipping emissions within BioLite are broken into two categories: inbound and outbound. “Inbound” shipments are from BioLite’s manufacturing facility in China to one of several BioLite warehouse and distribution hubs throughout the world by sea or air. Conversely, “outbound” shipments consist of wholesale shipments to resellers by sea or air, or e-commerce shipments directly to customers by sea, air, or ground freight.

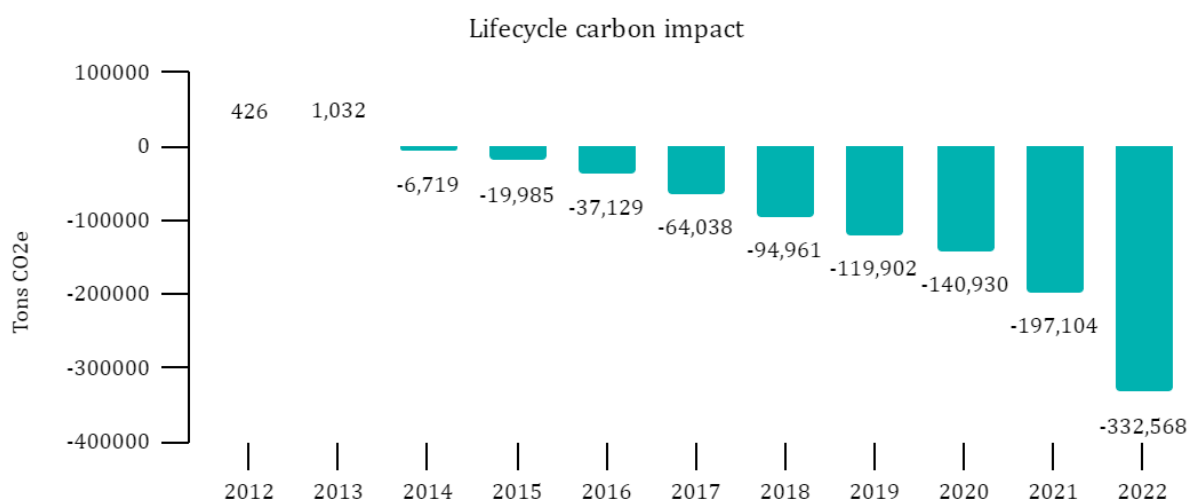


Outbound shipping decreased slightly, due to a change in our freight terms with certain factories, whereby we are not responsible for shipping contractually for orders. BioLite supports arranging and managing the shipment, but the customer is ultimately responsible for shipping. Inbound shipping remained at similar levels as demand remained high.

BioLite calculated the distance between the distribution hub and the final destination for each product or product lot. Air distances were calculated using an online calculator for the great-circle distances between two airport codes, sea and ground distances were calculated using Google Maps data. Every effort was made to be as specific as possible, but the level of detail for the final destination varied. For example, in some cases, the destination zip code was available, but in others, only the state or country was provided. Distances were multiplied by standard conversion factors for truck, sea, and airfreight as appropriate.

Lifecycle Analysis

Another approach to analyzing BioLite's carbon footprint is to take a lifecycle analysis and compare the total amount of emissions that result from producing BioLite's products vs. the total emissions saved by using these products. In order to do this, we first assume a baseline scenario in which BioLite customers did not purchase BioLite's energy saving devices and continued with business as usual. In calculating the emissions saved by using BioLite products, we include only the usage of BioLite's cooking products in emerging markets, since these are the product that are being used by low-income households on a daily basis, thus saving significant quantities of greenhouse gas emissions. We conservatively calculate that each stove saves on average 3 tons CO₂e per year and that the stoves gradually break due to normal wear and tear. These results are consistent with a series of rigorous efficiency, usage and durability tests we have conducted that comply with Gold Standard and United Nations requirements to calculate carbon credits. The below chart plots emissions released from all BioLite manufacturing during 2012-2022. As you can see from this chart, the results are overwhelmingly positive in terms of saving greenhouse gas emissions on a net basis.



Put another way, for each ton of CO₂e released into the atmosphere from BioLite operations during the 2012-2022 period, we have measured a 21.3 tons CO₂e reduction in emissions through 2022 from the use of cookstoves sold in emerging markets.

Emissions Mitigation

Given the steadily increasing amount of absolute emissions driven by BioLite's growth, we remain committed to exploring ways to mitigate our impact. To date, we work to minimize our shipping emissions by choosing sea or truck freight whenever possible over more emission-

heavy air freight. We also promote green forms of commuting by offering tax incentives for public transportation use and providing a bike rack in our Brooklyn office to accommodate bike commuters.

As part of BioLite's commitment to Climate Neutral standards (see annex I), we committed to two key action items to pursue during the course of 2021:

1. **Optimize container utilization** – We aim to fit more BioLite products in each shipping container, thus reducing the number of containers shipped and reducing greenhouse gas emissions from shipping. BioLite laid the foundation for this work in 2021 by securing additional storage space in China and building a freight optimization tool, but we were unable to test whether these measures led to improved container utilization due to the significant, pandemic-induced supply chain challenges. We were frequently forced to ship containers before they were full to avoid stockouts among our distributors. In 2022, BioLite aimed to take advantage of the 2021 innovations more effectively in order to realize a measurable improvement in container utilization, thereby reducing upstream shipping emissions. We will calculate the number of cubic meters (CBMs) of product shipped in 2022 and divide it by the CBMs of container capacity during the year in order to calculate the percentage utilization of our containers. We will also conduct an analysis to compare the 2022 value to past years and update targets accordingly. For our emerging markets business, the interim goal for 2023 is to have container utilization above 95%. For our outdoor recreational business, the 2022 goal is to have container utilization above 75%.

Progress: BioLite began storing products in a warehouse on premises at our largest contracting manufacturing facility (which serves our emerging markets customers) in order to reduce transport emissions and have the ability to optimize container loads. Prior to access to this storage space, BioLite needed to ship products shortly after they were manufactured. Now we can more readily wait until we have full containers before we ship products.

In the outdoor recreational business, BioLite was able to achieve container utilization of 74.3% compared to our goal of 75%. So while BioLite fell a bit short on the goal, we hope to be able to exceed this goal in 2023. For EM, BioLite was able to achieve container utilization of 92.7%, falling just short of the 95% goal. This was driven by the fact that one of our most shipped products comes up short on the total usable space in the container, such that when a container is completely filled with this product, the container can only be filled to 88% capacity.

2. **Investigate feasibility of and build a path to implementation to reducing natural gas use in HQ office:** BioLite's science-based target is to half scope 1 and 2 emissions by 2030, thus reducing the ~18 tons of CO₂e that made up BioLite's scope 1 and 2 emissions in 2022 to no more than ~9. To accomplish this, BioLite would have to reduce

or eliminate natural gas use in our HQ office, which provides heat and hot water to the building. About 12 tons CO₂e come from burning natural gas in our Brooklyn office and nearly six tons come from electricity consumption. We switched to renewable electricity in this office in October 2021, which eliminated the 7 tons from electricity, leaving at least 5 tons of reduction to be realized from burning natural gas. This reduction could take the form of upgrading to heat pumps, paying a premium above our metered natural gas for renewable natural gas, among other possible solutions. BioLite committed to assessing the feasibility of such changes, with the aim to implement these changes, if feasible, during the course of our science-based target commitments.

Progress: We have identified and narrowed down to two potential solutions to reduce natural gas usage in our HQ office: 1) Purchase locally produced green hydrogen credits to enable use of green hydrogen through the traditional natural gas grid or 2) Convert heating and cooling systems in the building to heat pumps powered by renewable electricity. The latter solution may be possible, it is more challenging since BioLite leases its facility and does not own it, so this capital expenditure will be lost should BioLite choose to move offices. There are some companies piloting projects in the New York City area in which they produce green hydrogen and feed it into the natural gas grid, and sell “green therm” credits to decouple the heat energy from green hydrogen’s clean energy attributes. This is a new industry though and there is no one doing it at commercial scale yet. However, BioLite has been in discussions with several startup providers and has entered into an MOU with a potential partner. We will continue to watch the market and assess the feasibility of pursuing the purchase of green therm credits .

Also as part of BioLite’s commitment to Climate Neutral standards, BioLite is committing to the following emission reduction action plan for 2022:

1. **In the absence of being able to purchase green hydrogen, explore contractual and technical feasibility of installing heat pumps in HQ office as a means to reduce natural gas use:** While we continue to assess the feasibility of purchasing green hydrogen, we will also build confidence in our ability to pursue other options, such as converting our current heating/cooling system to heat pumps powered by solar electricity. Our ability to switch to heat pumps hinges on our ability to install new hardware and equipment in a leased building. This is someone we will explore if the approach of purchasing “green therm” credits proves infeasible. BioLite commits to assessing the feasibility of such changes and reporting back on them with the aim to implement these changes, if feasible, during the course of our science-based target commitments.
2. **Implement a policy for remote work to reduce employee commuting emissions by 60% compared to pre-pandemic levels for headquarters (NYC) and Nairobi offices.** Throughout 2022, BioLite employees began resuming in person work in both of our offices. The goal is to allow for a flexible work model even after the pandemic, whereby

employees commute to the office, on average, a maximum of two days a week compared with pre-pandemic levels (five days per week).

BioLite will report back on progress on each of these commitments in our 2023 report, to be released in 2024 .

Annex I: Climate Neutral

In 2019, BioLite and a second company called Peak Design co-founded Climate Neutral, an independent non-profit organization working to accelerate the transition to a low-carbon economy. The organization grew quickly from around 130 companies in 2019, to over 300 measuring their 2021 emissions to offset 100% of that footprint, a total of 1.15M tonnes offset. These companies also take measures to reduce their footprint moving forward. This year, Climate Neutral has launched Open Certification, a streamlined path to achieve certification while still meeting Climate Neutral's requirements. We have verified our footprint with Carbon Neutral using our internal calculations that we have conducted each year since 2012, rather than using Climate Neutral's carbon calculator (Climate Neutral Brand Emissions Estimator). The Open Certification required brands to present their internal calculations for review and audit to Climate Neutral, with calculations required to be at least as comprehensive and conservative as those calculations conducted using the Climate Neutral Brand Emissions Estimator. BioLite's reported carbon footprint in 2022 is the result of this process.