



# **BioLite Environmental Sustainability Report 2021**

March 2022

Contents

**Contents** ..... 2

**Executive Summary** ..... 3

**Introduction** ..... 6

**Summary**..... 7

*Historical Performance* ..... 7

*Breakdown of Emissions by Function* ..... 9

**Methods, Approach, and Function-Specific Results** ..... 9

*Scope 1 Emissions* ..... 10

*Scope 2 Emissions* ..... 10

        Building Emissions ..... 10

*Scope 3 Emissions* ..... 11

        Corporate Travel ..... 11

        Commuting ..... 12

        Product Manufacturing..... 13

        Shipping ..... 14

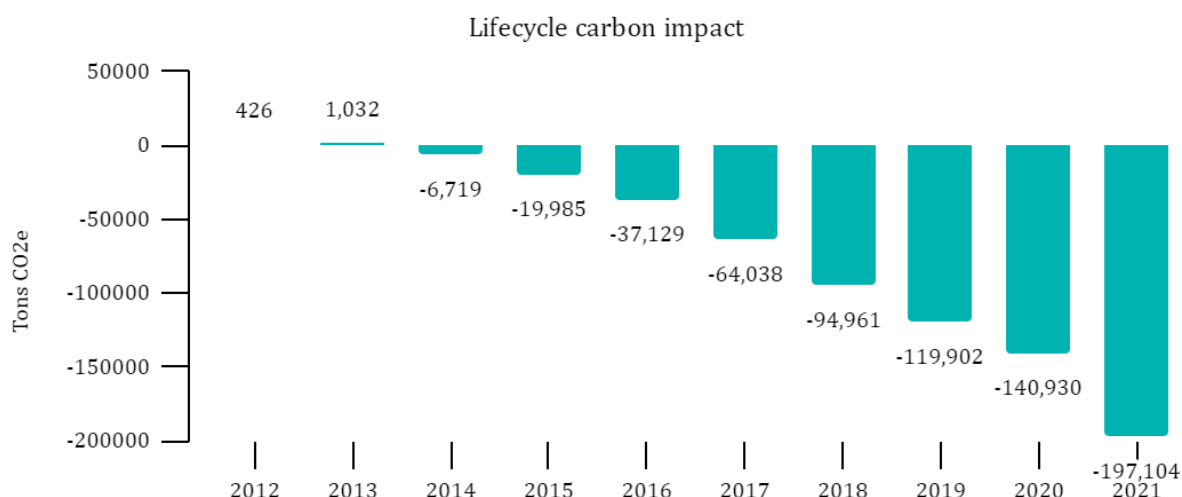
        Lifecycle Analysis ..... 15

**Emissions Mitigation** ..... 16

**Annex I: Climate Neutral** ..... 19

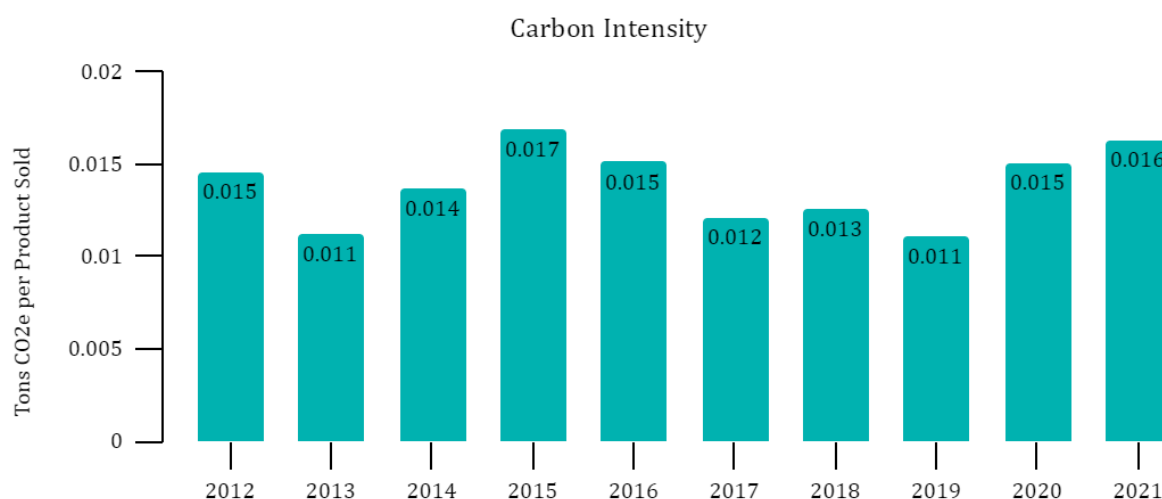
## Executive Summary

BioLite's 2021 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 CO<sub>2</sub>e released into the atmosphere from BioLite operations during 2012-2021 results in a reduction of approximately 19.4 tons CO<sub>2</sub>e in emissions through 2021 from the use of cookstoves sold in emerging markets.



In 2021, BioLite emitted a total of 11,344 tCO<sub>2</sub>e as per our internal model calculations, a 49% 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 2020.

While our growth enabled us to continue increasing our impact, now reaching over 3.5 million people with access to clean energy (a 2 million increase from 2020), it was primarily driven by sales of the most resource-intensive and thus higher-emitting products. As a result, BioLite's 2021 carbon intensity, as defined by emissions per product manufactured, increased to a high close to that of 2015:



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 2021. As referred to above, we are currently impacting well over three 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 88% in 2021 compared to 2020. In addition, we also continued to expand our cookstove business, with an increase in efficient charcoal stoves sales, 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
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
Watt Hours 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

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

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 2021, 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,”<sup>1</sup> 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 HomeStove, 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.<sup>2</sup> 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.

---

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

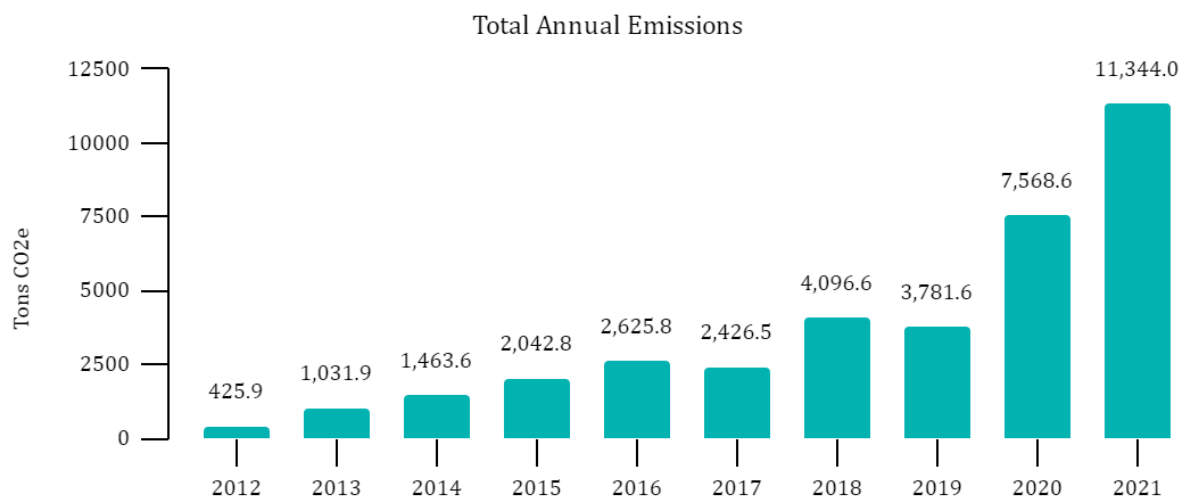
<sup>2</sup> “Our Purpose.” *Gold Standard*. <https://www.goldstandard.org/our-story/who-we-are>.

## Summary

### Historical Performance

BioLite has cumulatively emitted 37,232 metric tons of carbon dioxide equivalent (tCO<sub>2</sub>e) since 2012. During the nine-year period from 2012 to 2021, every ton of CO<sub>2</sub>e emitted by BioLite has generated a savings of about 19 tons of CO<sub>2</sub>e.

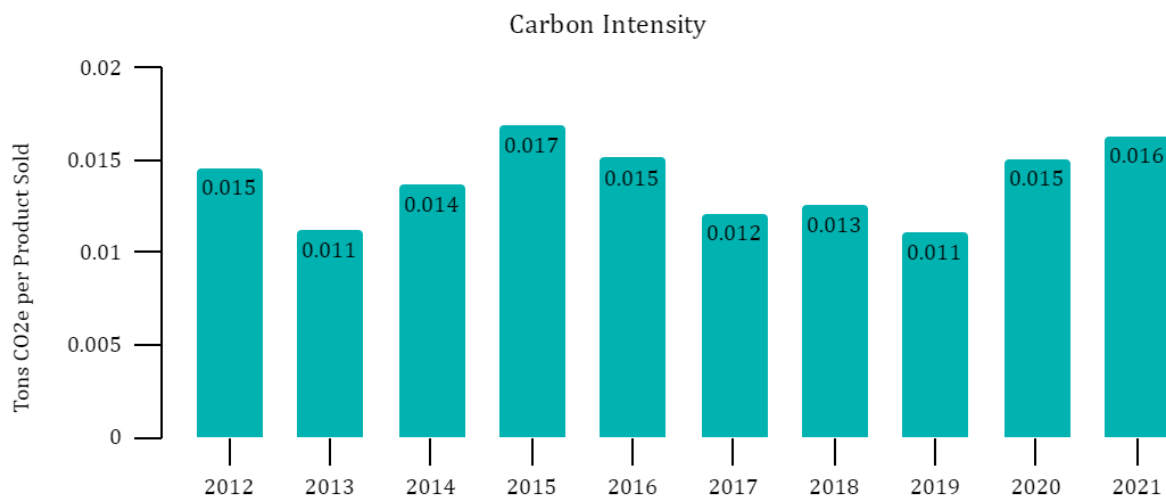
In 2021, BioLite emitted a total of 11,344 tCO<sub>2</sub>e per our internal model and 12,260 according to Climate Neutral's model (see annex I for explanation). We offset the higher emissions figure with third-party-verified credits purchased from trusted partners.



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 2021 while the pandemic kept forcing BioLite to shift the way we operate- working remotely and avoiding international travel- sales nonetheless increased around 38% compared to 2020. This included growth in some especially among raw-material intensive products, such as the SolarHome 5000, a 50-watt solar system with a 24" television.

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 tCO<sub>2</sub>e. In 2021, BioLite's growth and product expansion resulted in an increase in carbon intensity from 2020 to 0.016 tCO<sub>2</sub>, a figure close to that of 2015.

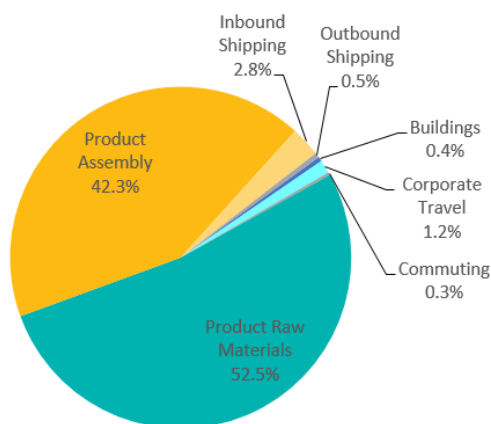


While most categories remained stable year on year – with scope 3 raw materials and product assembly emissions accounting for the vast majority of BioLite's carbon footprint- the largest change compared with 2020 was observed in inbound shipping, which accounted for 5% of the company's emissions for 2021 vs. 2.8% in 2020. This is partly a result of the logistics crisis that affected our supply chain as a whole. We elaborate further on this in the sections below.

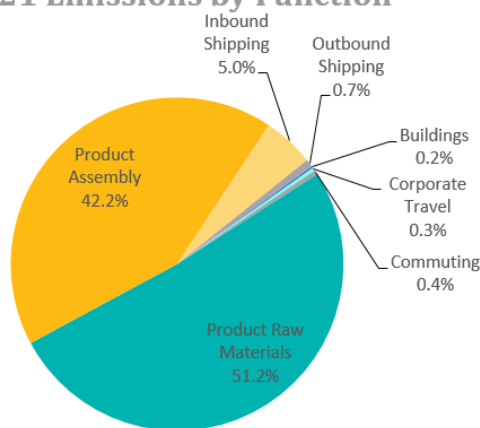


## Breakdown of Emissions by Function

2020 Emissions by Function



2021 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,<sup>3</sup> 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.<sup>4</sup>

This report was compiled by BioLite staff from January 2022 to March 2022. 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.

<sup>3</sup> *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>.

<sup>4</sup> *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](http://www.ghgprotocol.org/sites/default/files/ghgp/standards/Corporate-Value-Chain-Accounting-Reporting-Standard_041613_2.pdf).

## **Scope 1 Emissions**

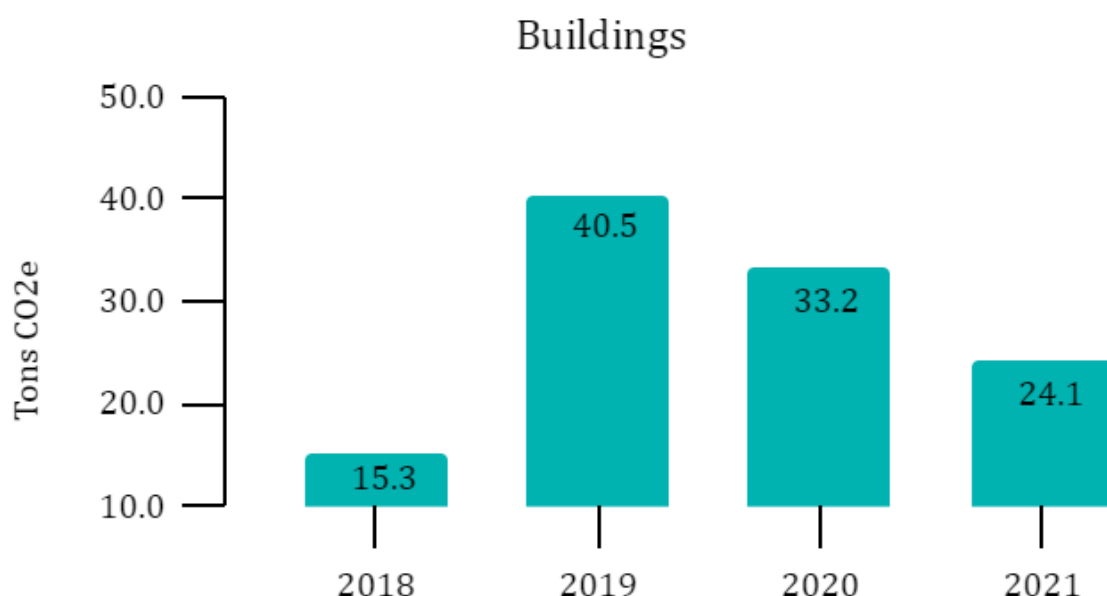
Scope 1 emissions are defined as those originating from emissions sources directly controlled and owned by BioLite. Since BioLite uses an external manufacturing facility to fulfill our manufacturing needs, there are no sources of emissions within operations over which we have direct control. For that reason, scope 1 emissions are zero, while all manufacturing emissions are included in scope 3 below.

## **Scope 2 Emissions**

Scope 2 emissions include those from purchased or acquired electricity, steam, heat and cooling.

### ***Building Emissions***

Building emissions are 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 and natural gas for heating at only our headquarters office; in the Nairobi office, gas is purchased only for cooking. 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 2021, BioLite switched to a solar energy provider in order to fulfill its electricity needs in the headquarters office starting October 2021, 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.



### 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.

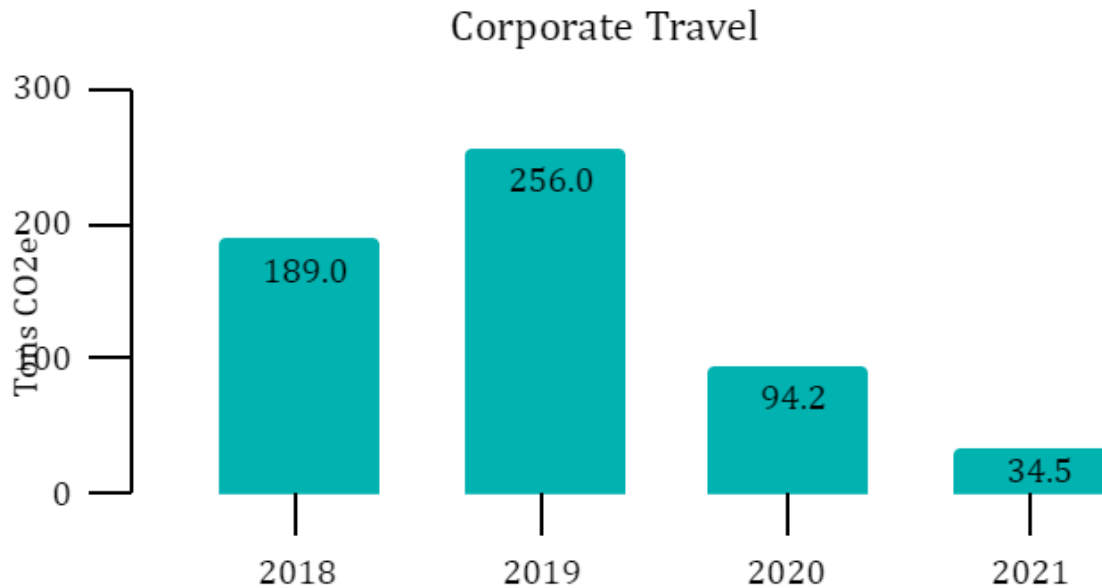
The vast majority of our scope 3 emissions are normally weighted toward purchase of goods and services, as we rely on third parties for the manufacturing of our products; this was particularly true in 2021, given a significant increase in sales. Further, due to the pandemic, our teams both in the Brooklyn and Nairobi offices worked remotely starting in the end of the first quarter of 2020 and throughout 2021, causing a drop in the travel and commuting categories.

#### *Corporate Travel*

The majority of miles traveled and greenhouse gas emissions originated from commercial aircraft. We do not expect this drop to be the trend going forward, however as the pandemic recedes.

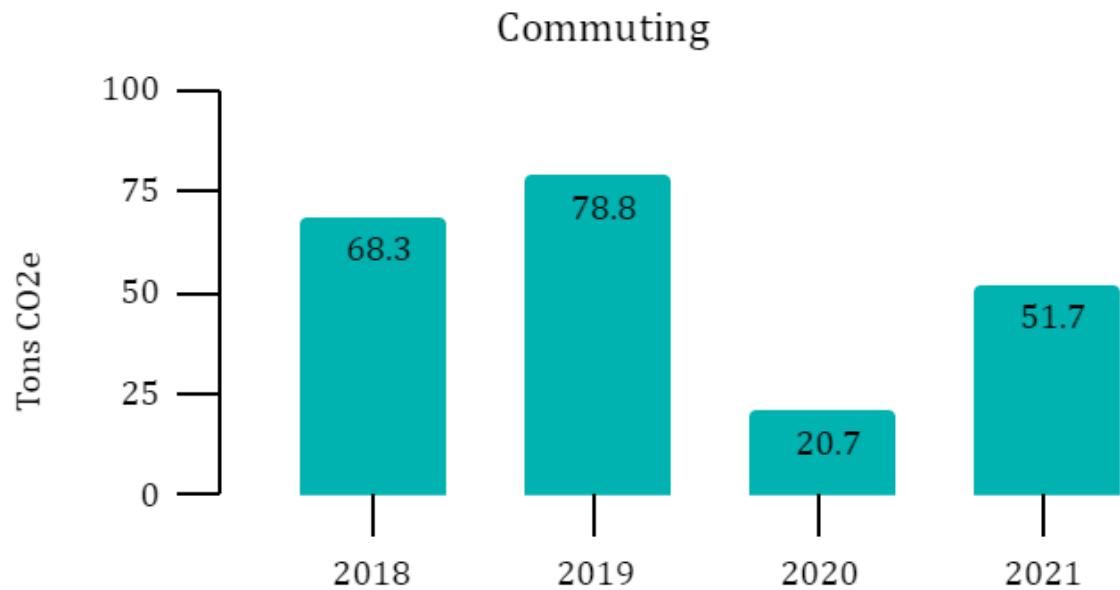
Corporate travel emissions were quantified by examining records of all company travel for the periods in question and calculating the distance traveled for each trip. These distances were then multiplied by industry standard conversion factors based on the type of transport. Where imperfect travel records 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.

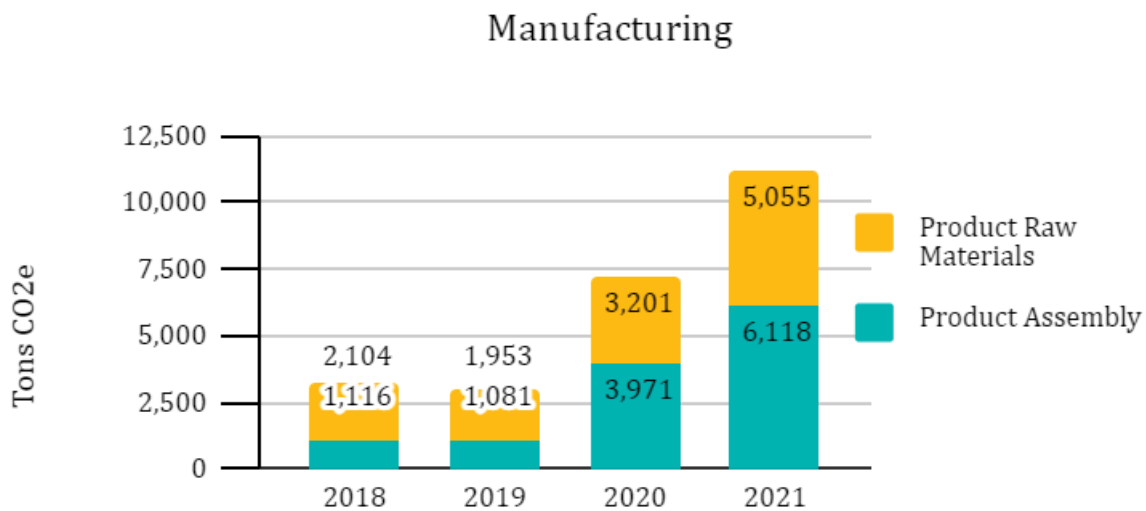


### ***Commuting***

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 2021. 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 2021, 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.

Each BioLite product was catalogued 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.<sup>5</sup> This was then multiplied by the total number of products sold in 2021 to arrive at a total figure for raw materials.

In calculating emissions from product assembly, 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 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.

Changes in our modeling resulting from further clarity on the treatment of Printed Circuit Boards (PCBs)- a key component in electronics- explains the sharp increase in this category. Understanding among experts about the total embedded emissions in PCBs has changed significantly in recent years, and our calculations this year and last year reflect this reality. In earlier years, we had based our estimates on internal assumptions such as the amount of the materials used for the manufacturing of the PCBs. At that time there was limited third party data available on this subject. As further research was recently published, and in consultation with our colleagues at Climate Neutral, we modified the way we measure the emissions resulting from the manufacturing of these components using a combination of the cost of BioLite PCBs and an emissions factor linking cost to total emissions, provided by Climate Neutral. We have 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.

### ***Shipping***

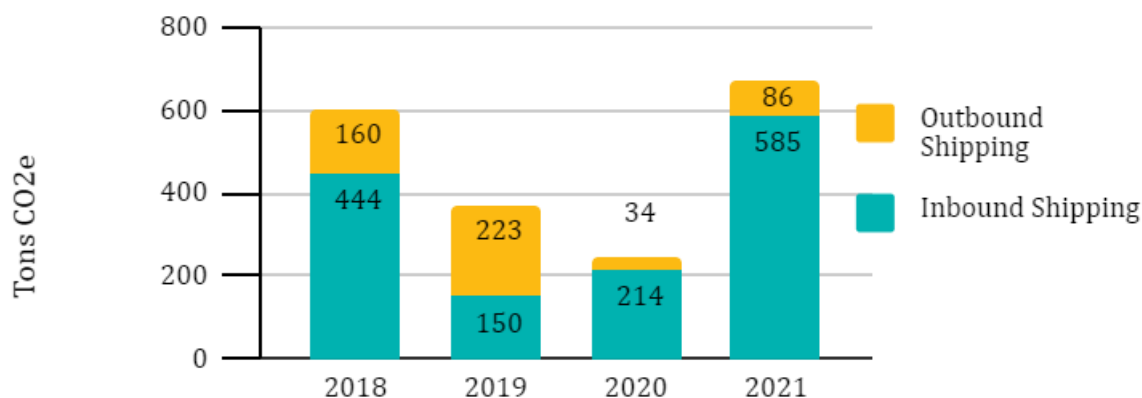
Shipping emissions within BioLite are broken into two categories: inbound and outbound. "Inbound" shipments are from BioLite's manufacturing facility in China to one of several BioLite warehouse and distribution hubs throughout the world by sea or air. Conversely, "outbound" shipments consist of wholesale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

---

<sup>5</sup> 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>.

## Shipping



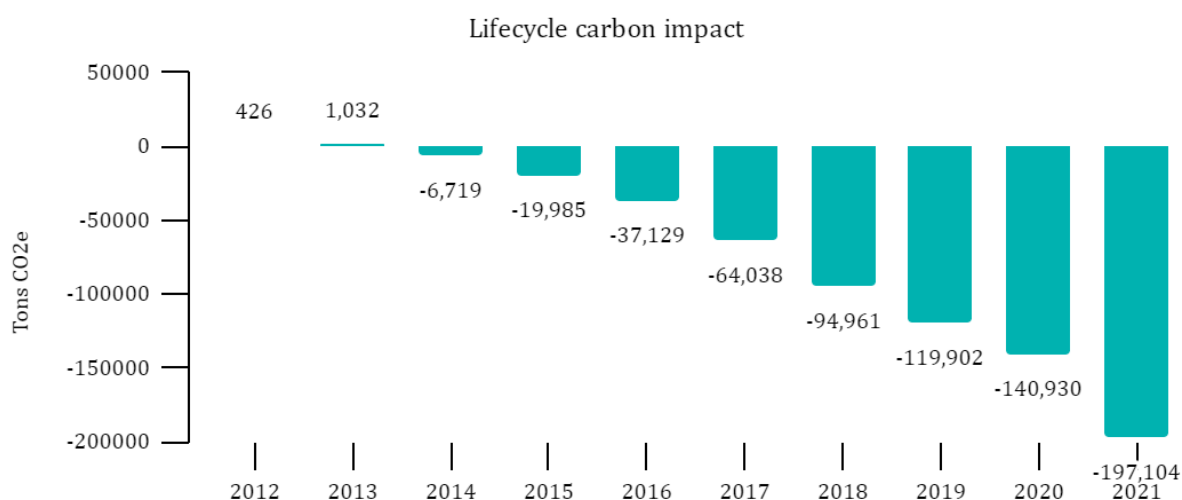
Outbound shipping increased commensurate with an increase in sales. Inbound shipping, however, increased more than would be expected from the year over year sales increase since 2020. We attribute this impact to pandemic-induced supply chain challenges experienced during the course of 2020 and 2021. Specifically, BioLite reduced production at the start of the pandemic, in 2020, and since demand remained high, BioLite spent a significant portion of 2020 selling through inventory in stock at warehouses. This resulted in less inbound shipments in 2020, thus underreporting 2020 compared to what would have been expected given the level of sales. Then the nearly or entirely depleted inventory levels at the start of 2021 meant that BioLite had to restock warehouses from a much lower level than we would have otherwise. The result was a significant jump in 2021 inbound shipments compared to 2020.

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 CO<sub>2</sub>e 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 2012-2021, combined with emissions savings resulting from the use of cookstoves during 2014 through 2021 that were sold in 2012-2021. 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 CO<sub>2</sub>e released into the atmosphere from BioLite operations during the 2012-2021 period, we have measured a 19.4 tons CO<sub>2</sub>e reduction in emissions through 2021 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. **Renewable electricity** - Purchase electricity from 100% renewable sources in our headquarters office, in Brooklyn, NY

Progress: BioLite transitioned to sourcing 100% of our electricity from solar energy in our headquarter offices starting in Q3/Q4 2021. We source the electricity from a community solar project managed by Arcadia (<https://www.arcadia.com/>).

2. **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. Things BioLite could do in order to implement this include: i) build a freight optimization tool to help consolidate shipments ii) plan shipments further in advance to allow for better container utilization and iii) use storage space at our factories to avoid intermediate product movement and only move products out of the factory in full containers and when they are needed.

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. On the outdoor recreational side of our business, 2021 was defined by pandemic-induced stockouts of many of our products; demand for camping equipment remained very high in 2021. This meant that BioLite was constantly rushing to ship product to Europe and North America, in some cases being forced to do so before containers were as efficiently packed as they could be. BioLite built the freight optimization tool that was described in the commitment. Unfortunately, it was not used as frequently as we had hoped due to the need to get products in market as soon as possible. BioLite still sees significant areas of improvement around container optimization that we could realize during the next 1-2 years.

Related to this commitment, BioLite also managed to further reduce air freight shipments in 2021, despite supply chain challenges. This is important since it is much more polluting than surface freight. In 2020 air freight made up about 16.5% of total customer shipments, while in 2021 this proportion dropped to about 6.5%.

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

1. **Continue efforts to optimize container utilization:** 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 aims to more effectively take advantage of the 2021 innovations 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 2022 is to have container utilization above 95%. For our outdoor recreational business, the 2022 goal is to have container utilization above 75%.
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 24 tons of CO<sub>2</sub>e that made up BioLite's scope 1 and 2 emissions in 2021 to no more than 12. 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 10 tons CO<sub>2</sub>e come from burning natural gas in our Brooklyn office and nearly seven tons come from electricity consumption. We have recently switched to renewable electricity in this office, which should eliminate the remaining seven 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 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.

BioLite will report back on progress on each of these commitments in our 2022 report, to be released in 2023.

## 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. These companies also take measures to reduce their footprint moving forward. Climate Neutral has developed a sophisticated carbon calculator that estimates scope I, II and III emissions. As part of BioLite's commitment to adhering to Climate Neutral's approach, BioLite calculated our footprint using Climate Neutral's calculator in addition to our typical, more manual internal calculations that we have conducted each year since 2012.

Based on the same raw data BioLite used to manually calculate our carbon footprint, the Climate Neutral Brand Emissions Estimator (BEE) calculated BioLite's 2021 carbon footprint to be 12,260 tons CO<sub>2</sub>e. We believe the difference between this figure and our internally calculated figure could be due to several factors, including a difference in conversion factors being applied to raw materials and manufacturing.

BioLite will therefore report this figure as its carbon footprint for purposes of its membership in Climate Neutral, and has offset its 2021 emissions from the higher number in order to be conservative. For purposes of analysis in this report, however, we refer in all previous sections to the internal calculations conducted by BioLite, totaling 11,344 tCO<sub>2</sub>e.