



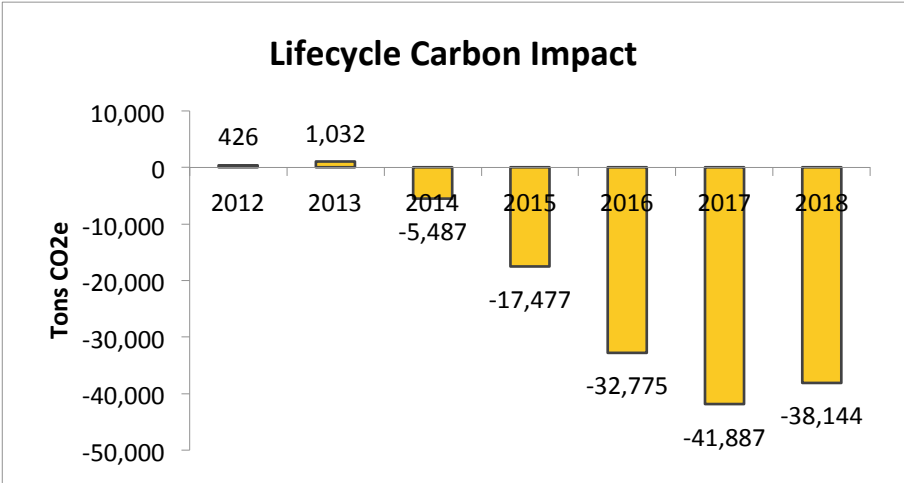
BioLite Environmental Sustainability Report 2018

March 2019

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Executive Summary

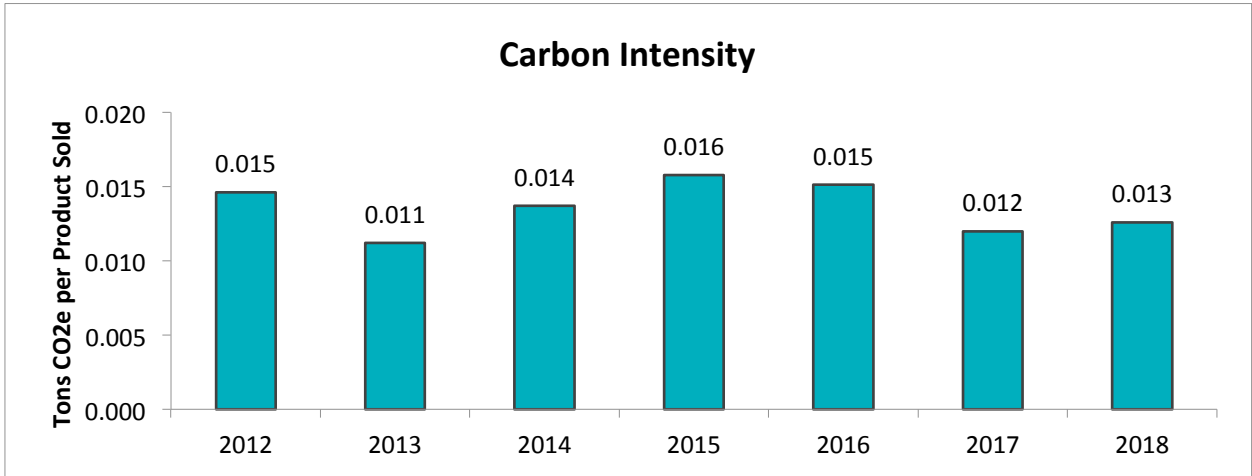


BioLite’s 2018 carbon footprint analysis reveals some key conclusions and trends. First, BioLite’s products result in a significant reduction in greenhouse gas emissions compared to emissions produced from BioLite operations. This fact is evident from

the graph above, which is further explained in the “Lifecycle analysis” section.

In 2018, BioLite emitted a total of 4,097 tCO2e. This carbon footprint is up markedly from years past, driven primarily by greatly expanded sales and the introduction of more carbon intensive products. BioLite continues to implement and explore new means of greenhouse gas mitigation within its operations, as outlined in the Emissions Mitigation section. In addition to greenhouse gas mitigation, BioLite will continue to offset its entire carbon footprint, including scopes 1, 2 and 3, through a combination of BioLite carbon credits and third-party-verified credits purchased from trusted partners.

Second, as BioLite grew in 2018, the company’s carbon intensity, as defined by emissions per product manufactured, remained relatively constant, as BioLite saw increased sales volume of both low and high emission products. Variability in this trend exists over time, as pictured



below:

Overall, BioLite continued to drive impact across a number of metrics in 2018. We saw major increases in terms of number of people impacted, watt hours generated, and installed energy capacity, primarily driven by the success of our SolarHome 620 product. We also continued to expand our HomeStove business, resulting in a significant gain in fuelwood savings and tonnes of wood avoided. To facilitate this growth, we scaled up the size of our emerging markets team headquartered in Nairobi. A comprehensive overview of impact metrics is detailed below:

	2014	2015	2016	2017	2018
People Accessing Cleaner Energy	20,975 (breathing cleaner air)	41,085 (breathing cleaner air)	100,000 (breathing cleaner air)	127,235	515,262
Watt Hours of Electricity Generated by the BioLite Ecosystem	7,755,425	27,517,028	69,314,508	123,141,204	347,011,663
Tons of CO2e Offset by HomeStove	8,316	30,583	75,253	137,300	206,285
Installed Energy Capacity Through the Sale and Installation of SolarHome 620 + HomeStove	n/a	n/a	n/a	32.68KW	433.55KW
Staff members on Emerging Markets teams Across US, Kenya, Uganda	10	25	55	30	47
Net Promoter Score Across Kenya & Uganda	94.82%	94.71%	95.45%	97.85%	98.52%
Fuelwood Savings by BioLite Customers (\$)	\$1.72M	\$4.86M	\$12.72M	\$25.53M	\$41.38M
Tonnes of Wood Avoided	3,539	11,262	31,895	65,792	99,992

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 offset 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 2018, 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,"ⁱ 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.

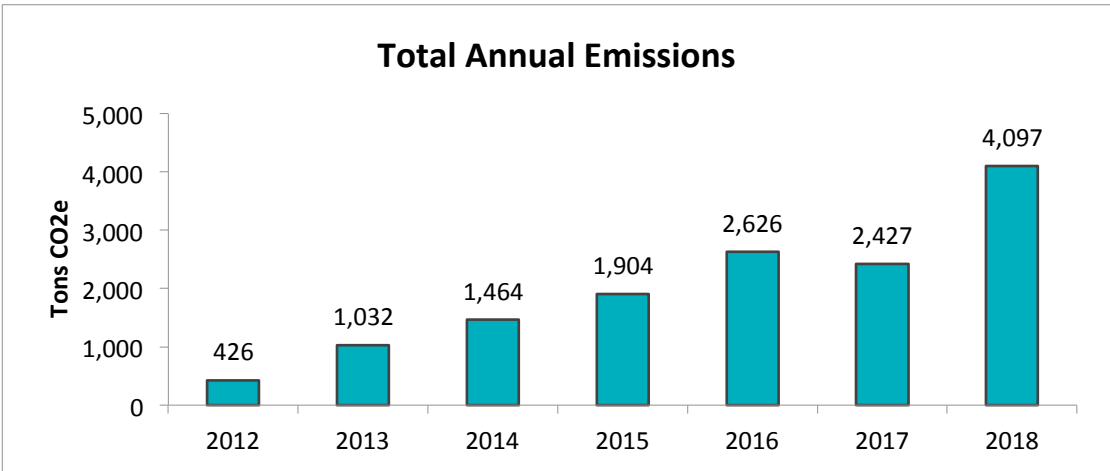
BioLite generates a carbon credit for every metric ton of greenhouse gas (measured in carbon dioxide equivalent) reduced through the use of its products in emerging markets. For instance, when a household in Kenya cooks on the BioLite HomeStove, they emit fewer greenhouse gases compared to the smoky,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

Summary

Historical Performance

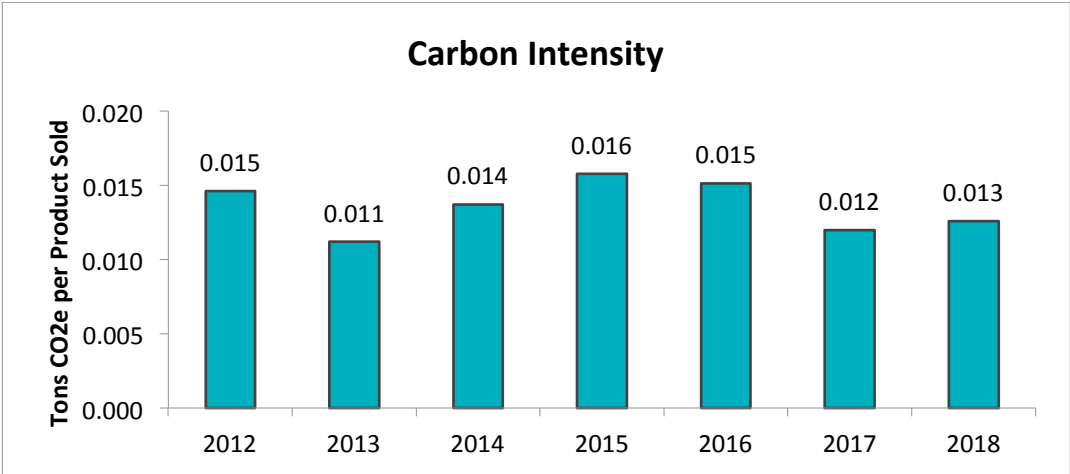
BioLite has cumulatively emitted 13,974 metric tons of carbon dioxide equivalent (tCO₂e) since 2012. During the six-year period from 2012 to 2018, every ton of CO₂e emitted by BioLite has generated a savings of 10.6 tons of CO₂e.

In 2018, BioLite emitted a total of 4,097 tCO₂e, and will continue to offset these emissions through a combination of BioLite carbon credits and third-party-verified credits purchased from trusted partners.

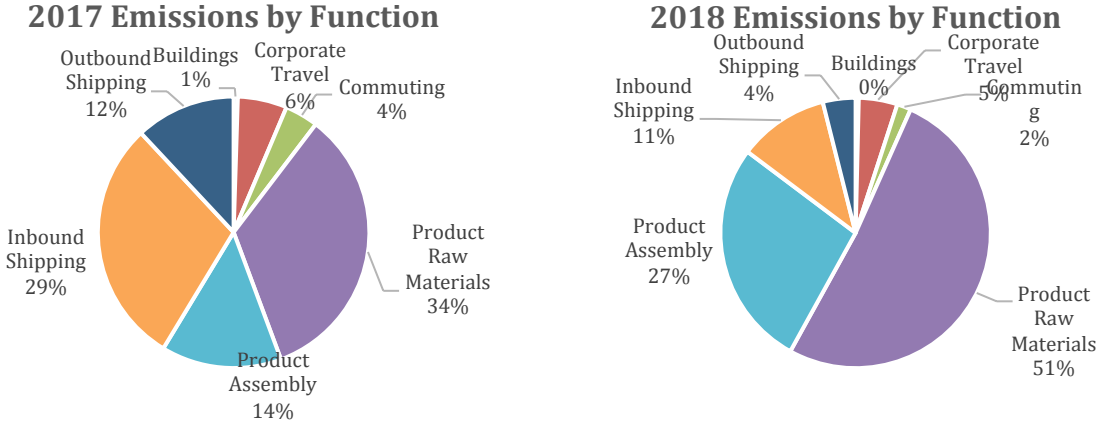


Across the 2012-2016 timeframe, we observed a steady increase in emissions that is roughly proportional to the growth of BioLite’s operational scale. This trend continued until 2017, when we observed a slight decrease in carbon footprint, due to a shift towards less-carbon intensive products. In 2018, the growth trajectory continued as BioLite released the FirePit product and saw significant SolarHome 620 sales, two relatively high-emission products. Additionally, BioLite experienced large overall sales volume growth in 2018, resulting in higher emissions.

Carbon intensity remains an instructive indicator of whether BioLite is succeeding in its pursuit of environmentally sustainable growth. 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. Despite the overall increase in 2018 emissions, carbon intensity remained flat. That said, a minor methodological change regarding product classification likely reduced the overall carbon intensity in 2018.



As mentioned previously, BioLite’s products are becoming increasingly larger and more complex, and subsequently more carbon-intensive. 2018’s product mix was highly carbon-intensive, primarily due to the success of the FirePit and SolarHome 620 products. In 2018, raw materials accounted for more than half of BioLite’s carbon footprint (see chart below), versus roughly a third in 2017.



Breakdown of Emissions by Function

In 2018, the majority of BioLite’s carbon emissions can be attributed to product raw materials (51%) and product assembly (27%). Differences between 2017 and 2018 emissions are discussed in detail in the following section, but two major changes stand out: first, a shift towards less carbon-intensive shipping methods (e.g., ground vs. air) in 2018; and second, more carbon-intensive products comprised a larger proportion of our sales.

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,ⁱⁱⁱ 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.^{iv}

This report was compiled by BioLite staff and an extern from January 2019 to March 2019. 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 conversation factors and calculations. However, this model is not publicly available.

Scope 1 Emissions

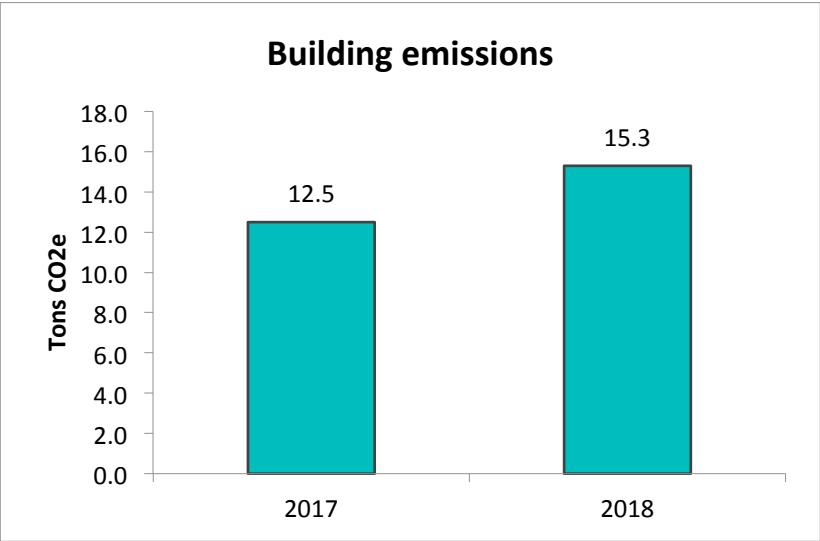
Scope 1 emissions are defined as those originating from emissions sources directly controlled and owned by BioLite. Since BioLite uses an external manufacturing facility to fulfill our manufacturing needs, there are no sources of emissions within operations over which we have direct control. For that 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, as they have never exceeded 16 tCO₂e since 2012. BioLite purchases electricity for two offices and natural gas for heating at only our headquarters office. In 2018, we moved into a larger office space in Kenya, explaining the emissions increase. Standard conversion factors were



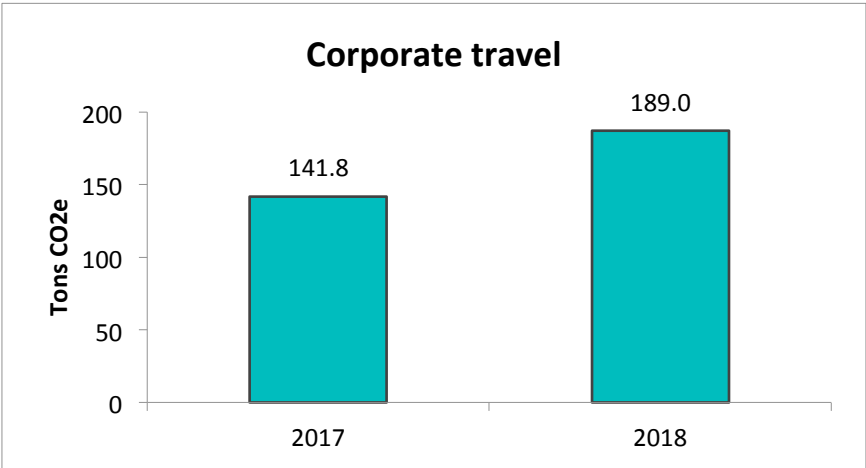
applied to calculate total emissions from the consumption of electricity and natural gas to arrive at the final values.

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.

Corporate Travel

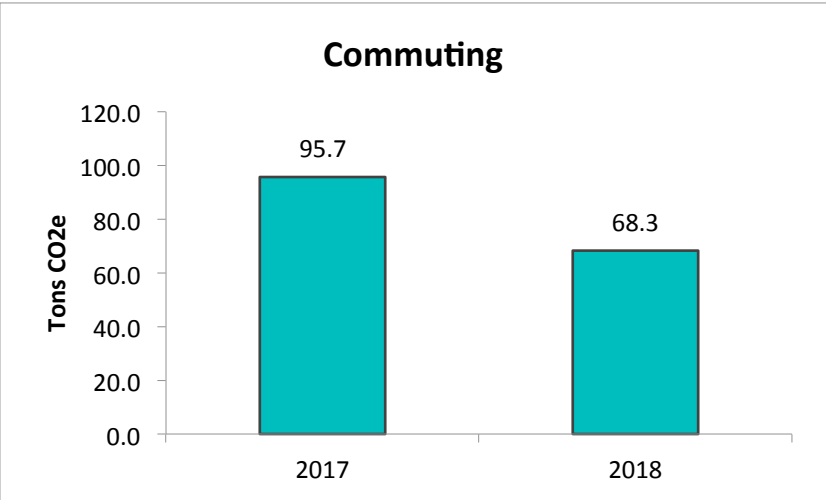
The majority of miles traveled and greenhouse gas emissions originated from commercial aircraft. Corporate travel accounted for a moderate increase in emissions from 2017 to 2018. This increase is primary due to an increase in air travel, including employees traveling to emerging markets.



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

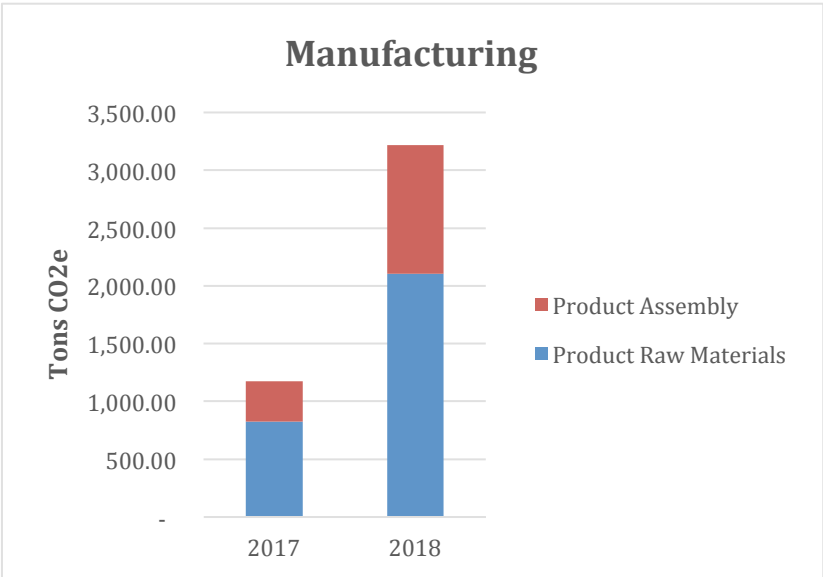
Company employees completed a survey in late 2016 in which they self-reported their commuting patterns, revealing the frequency with which employees commute via public transportation, bicycle, car or by walking. The results of this survey were then scaled to correspond with the average number of BioLite



employees in 2018. Approximately 60% of BioLite employees that work in its Brooklyn headquarters either walk, bike or work from home the majority of the week. Less than 10% of BioLite employees at HQ drive at least some of the time, with the balance taking some form of public transportation. Total emissions from employees commuting to Brooklyn did not exceeded 10 tCO_{2e} for either of the two years. The majority of carbon emissions from commuting is made up of BioLite’s Emerging Markets team because staff members have to travel a substantial distance to reach customers in rural areas. The decrease in emissions relative to 2017 can be explained by a lower full-time office-based headcount for the Emerging Markets team. BioLite did increase its number of in-field salespeople in Emerging Markets in 2018, whose emissions are calculated separately as part of corporate travel.

Product Manufacturing

Emissions from raw materials and product assembly increased significantly in 2018 due to two factors: first, a higher proportion of our sales in 2018 were of more carbon-intensive products, and second, because overall sales volume increased significantly. A large portion of our sales came from the FirePit and SolarHome 620 products, which have high embodied



emissions and are also quite heavy products in terms of weight, which results in greater emissions during product assembly.

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.^v This was then multiplied by the total number of products sold in 2018 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.

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.



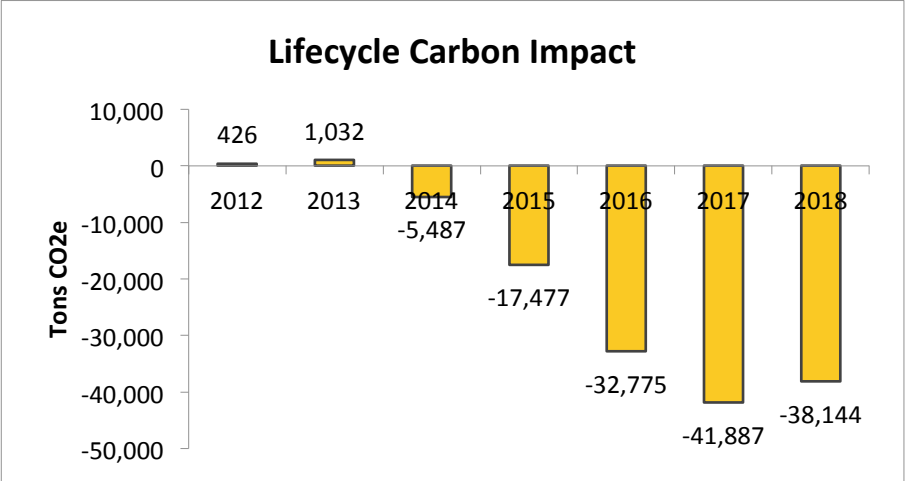
Despite the increase in volume and freight weight, shipping emissions declined significantly in 2018. In 2017, a product recall caused the need for an increased proportion of air freight, a more carbon intensive shipping method, versus sea / truck freight. In 2018, BioLite required very little air shipping, reducing shipping emissions overall.

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 the HomeStove in emerging markets, since this is the product that is being used by low-income households on a daily basis, thus saving material quantities of greenhouse gas emissions. We conservatively calculate that each HomeStove saves on average 2.61 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 requirements to calculate carbon credits. The above chart plots emissions released from all BioLite manufacturing during 2012-2018, combined with emissions savings resulting from the use of HomeStoves during 2014 through 2018 that were sold in 2012-2018. 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 2012-2018 period, we have measured an approximately 10.6 tons CO2e reduction in emissions through 2018 from the use of HomeStoves.

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. Going forward, we plan to conduct a review of raw materials used in new products to ensure that low-emission materials are used whenever possible. Furthermore, we plan to revisit our supply chain to evaluate opportunities to reduce our shipping and manufacturing emissions, such as by using natural gas-powered shipping carriers rather than oil-powered carriers.

References

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

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

ⁱⁱⁱ *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>.

^{iv} *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.

^v 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>.