

ALLBIRDS PRODUCT CARBON FOOTPRINT METHODOLOGY

APRIL 2020

Methodology Document Purpose

The Allbirds Sustainability team developed a life cycle assessment (LCA) tool to estimate the carbon footprint of our products, identify hotspots, and drive emissions reductions. The LCA tool was created in collaboration with Clean Agency, a third-party environmental consulting firm.

Carbon emissions data enables the Allbirds product team to make informed decisions in design and development, as well as track both product-level and company carbon footprints - which we offset to fulfil our commitment as a carbon neutral business.

The purpose of this methodology document is to share additional detail behind the product carbon footprint calculations by providing an overview of current methodology and assumptions, data sources, and future improvements. The Allbirds LCA tool, and resulting product carbon footprints, will continue to evolve and improve over time with updated assumptions and methodology. Beginning in April 2020, Allbirds is publishing the carbon footprint for every product in our permanent collection. New figures will be published on our website and printed on product annually.

Characteristics of Allbirds Products

Allbirds is developing a new category of footwear inspired by natural materials, with the mission to create better things in a better way. The following practices are important to our product development and often result in a lower carbon footprint:

- We prioritize the use of natural materials such as tree fibers, sugarcane, and castor bean oil, as well as recycled materials.
 - We believe that natural materials, in contrast to petroleum-based materials, have the potential to act as carbon sinks through improved practices such as regenerative agriculture. Although natural materials, like wool, are not always low carbon from the start, they have the potential to be and Allbirds is committed to supporting research and development to realize this potential.
- We require supply chain certifications such as FSC for tree products and packaging, ZQ Merino for wool, and Bonsucro for sugarcane (full supply chain certification in progress) to ensure responsible sourcing.
- We prefer manufacturing facilities located in regions with a low carbon electricity grid.
- We minimize packaging through design and use 100% recycled content.
- We prioritize shipping via ocean versus air.

As we work to reduce our carbon footprint over time, we believe that we should be held accountable for our emissions today. **We offset the carbon footprint of Allbirds' entire business through an internal carbon tax and the purchase of verified, additional, permanent carbon offsets.**

System Boundaries

The Allbirds LCA tool calculates the kilograms of carbon dioxide equivalent (CO₂e) emitted to make an Allbirds product. That means in addition to calculating carbon dioxide emissions, we measure other greenhouse gases, like methane, and convert them to CO₂. We use global warming potential values provided by the Intergovernmental Panel on Climate Change (IPCC).

The product carbon footprint includes all emissions associated with materials (raw material production/extraction as well as materials processing), manufacturing, use, and end of life. **Transportation is reported separately (see excluded scope) and currently contributes an estimated 1-3 kgs CO₂e to the carbon footprint of each footwear product.**

	Life Cycle Stage	Overview
Included in product carbon footprint	Materials	<ul style="list-style-type: none"> • Production/extraction of raw materials • Material processing, including yarn formation, textile formation, preparation, coloration • Packaging raw materials
	Manufacturing	<ul style="list-style-type: none"> • Emissions from manufacturing that occur at Tier 1 assembly factories, including but not limited to, flat knitting, molding, cutting, stitching, and product assembly
	Use	<ul style="list-style-type: none"> • Footwear: emissions associated with washing product over lifetime (3 cycles) • Socks: emissions associated with washing and drying product over lifetime (26 cycles)
	End of Life	<ul style="list-style-type: none"> • Emissions associated with final disposal of the footwear and socks after use, assuming US municipal waste averages (80% landfill, 20% incineration)
Not included in product carbon footprint	Transportation	<ul style="list-style-type: none"> • [Upstream transportation of raw materials is included in material emissions] • Emissions associated with transportation of primary textiles/materials to Tier 1 factory • Emissions associated with transportation from Tier 1 factory to distribution centers (model includes US, New Zealand, and Canada) • Emissions associated with delivery from distribution centers to customers • Emissions from reverse logistics are not currently included

Excluded Scope

- The product carbon footprint is meant to represent the impact of decisions that are standard to a given product. Transportation is reported separately from product carbon footprints due to variability of emissions based on customer location (transportation to a customer near factory location is much smaller than to a customer overseas). According to a MIT [transportation analysis](#), "long-haul air freight generates 47 times as much emissions per ton-mile as ocean freight", so we prioritize ocean shipments whenever possible. In 2019, we sent about 80% of shipments by ocean freight and 20% by air.
- Emissions associated with brick and mortar retail are not currently included in the product carbon footprint. Allbirds began as an online retailer and ecommerce continues to be the predominant sales channel. As the number of brick and mortar retail stores increases, Allbirds will reevaluate methodology.
- Emissions associated with the electricity use of personal computers and the online shopping platform are not currently included in the product carbon footprint.

Functional Unit and Average Product Carbon Footprint

Functional Unit

The carbon footprint is calculated for all adult footwear and sock products, using the following sizes:

- Footwear (except Tree Breezer): Men's 9
- Tree Breezer: Women's 8
- Socks: Large (W11, M9-12)

Our functional unit represents the most produced size across men's and women's footwear (women's sizes were normalized to men's sizes, excluding the Tree Breezer). The Tree Breezer is only available in Women's sizing and size 8 is the most-produced size. A size Large is the functional unit selected for all sock products to correspond with the footwear size.

Allbirds Average Product Carbon Footprint

An Allbirds average footprint is calculated by weighting the carbon footprint for each product by units produced in 2019. Footwear and apparel are calculated separately due to dramatic differences in product weights and manufacturing processes.

Literature Review of Footwear LCAs

Limited research exists on the environmental impact of footwear production - there are few LCAs to begin with and even fewer are transparent about detailed methodology and assumptions. Footwear comes in a variety of styles for different functions, so it is difficult to arrive at the carbon footprint of a "standard sneaker". We compiled a range of carbon footprints from approximately 5 kg CO₂e/pair to 30+ kg CO₂e/pair within the footwear industry.

The [academic LCA](#) of a running shoe, performed by MIT, “estimated that the carbon footprint of a typical pair of running shoes made of synthetic materials is 14 ± 2.7 kg CO₂e/pair”. The report was published in 2012, but remains the most comprehensive and transparent footwear LCA that is publicly available.

As we calculate our product carbon footprints, we think it is helpful to have a reference point. When making comparisons, it is important to ensure consistent methodology and assumptions (i.e., same boundaries, functional unit), so we developed a set of assumptions for a “standard sneaker”, based on the MIT study, to run through our own LCA tool. The resulting carbon footprint is 12.5 kg CO₂e/pair (not including transportation), with the following assumptions:

Life Cycle Stage	Standard Sneaker Assumptions
Functional Unit	<ul style="list-style-type: none"> Men’s 9 shoe: weighs 674 grams
Materials	<ul style="list-style-type: none"> 100% virgin synthetics: 32% polyurethane (PU), 29% polyester, 11% polypropylene (PP), 10% ethylene-vinyl acetate (EVA) foam, 10% rubber, 4% nylon, 4% thermoplastic polyurethane (TPU) Assumes similar rates of material waste to our production Shoebox weighs 178 g and is 100% virgin cardboard
Manufacturing	<ul style="list-style-type: none"> 6.39 kWh of electricity consumption - on-site coal combustion reported in the MIT LCA is excluded from Allbirds standard sneaker analysis Made in China
Use	<ul style="list-style-type: none"> None
End of Life	<ul style="list-style-type: none"> Fate of average US municipal waste (80% landfill, 20% incineration)

Data Sources

Data sources used to calculate the carbon footprint include a mix of primary and secondary data, including other life cycle assessments, material databases, and scientific literature reviews. Primary data is used when available and is triangulated with reputable, industry-specific data. A summary of key data sources by life cycle stage is listed below:

Life Cycle Stage	Data Sources
Materials	<ul style="list-style-type: none"> Carbon intensities from supplier LCAs, LCA databases, and Higg Material Sustainability Index
Manufacturing	<ul style="list-style-type: none"> Primary energy consumption data from Allbirds factories Energy grid intensities at country level from secondary data (GREET, EPA, EIA)

Use	<ul style="list-style-type: none"> • EPA Energy Star appliance energy factors • Energy grid intensities at country level from secondary data (GREET, EPA, EIA)
End of Life	<ul style="list-style-type: none"> • EPA WARM Model

Limitations & Future Improvements

While our LCA tool will always be evolving and improving, we have to start somewhere. We will continue to update our methodology based on improvements to underlying data, as well as in-line product changes. In the meantime, here are the main limitations we see:

- While we strive to make our materials and manufacturing assumptions as specific to our supply chain as possible, in some cases (due to lack of data) we use global industry averages.
- When we use a range of data sources, there can be discrepancies in the scope and methodology. We do our best to ensure that values from different sources are comparable, though sometimes we are unable to confirm. In these instances we choose conservative assumptions.
- Our model currently only measures global warming potential, CO₂e, but we are working to incorporate other indicators (e.g., water, waste).

Allbirds is committed to working with LCA experts to continuously improve our approach to carbon footprinting as our business grows to reflect the current state of our operations.