



# Product Environmental Report

## Mac mini

Date introduced  
October 29, 2024

### Carbon neutral

**More than 50%** recycled content<sup>1</sup>

**100%** of manufacturing electricity sourced from renewable energy<sup>2</sup>

**100%** of Apple suppliers manufacturing parts and components for Mac mini have committed to Apple's Supplier Clean Energy Program

**50% or more** non-air shipping<sup>3</sup>

### Packaging

**100%** fiber-based, due to our work to remove plastic in packaging<sup>4</sup>

**100%** recycled or responsibly sourced wood fibers<sup>5</sup>

### Supplier Code of Conduct

Through the Apple Supplier Code of Conduct, we set strict standards for safeguarding people and the environment in our supply chain.



### Smarter chemistry<sup>6</sup>

- Mercury-free
- Brominated flame retardant-free
- PVC-free

### Longevity

We assessed Mac mini in our Reliability Testing Lab using rigorous testing methods that simulate customers' experiences.

### Recovery

Return your device through Apple Trade In—at a retail store or online—and we'll give it a new life or recycle it for free.



## Mac mini is carbon neutral

This report includes data current as of product launch. Product evaluations are based on U.S. configuration of Mac mini with M4 Pro (64GB memory, 8TB SSD). Product carbon footprint calculations include in-box accessories as well as packaging.



# Our carbon neutrality strategy for Mac mini

Our goal is to achieve carbon neutrality for our entire carbon footprint by 2030, reducing our total carbon emissions to no more than 9.6 million metric tons—at least a 75 percent reduction against our 2015 baseline. To reach this ambitious goal, we must substantially decarbonize our products.

Our rigorous strategy to decarbonize products focuses on transitioning to low-carbon electricity, designing with recycled and renewable materials, and prioritizing lower-carbon ways of shipping products, like with ocean freight. Only after we've substantially reduced emissions will we apply carbon credits from high-quality projects to achieve carbon neutrality.

Here is our approach to drastically reduce carbon emissions from the design, production, and use of Mac mini.

## How we're reducing emissions

- **Using recycled and renewable materials:** To address emissions generated by using primary materials, we're increasing the recycled content in our products, maximizing material and manufacturing efficiencies, and improving yields. And where we've not yet fully transitioned to recycled content, we're prioritizing renewable and low-carbon materials, such as aluminum smelted with hydroelectricity. By 2025, we plan to use 100 percent recycled cobalt in all Apple-designed batteries,<sup>8</sup> 100 percent recycled tin solder and 100 percent recycled gold plating in all Apple-designed rigid and flexible printed circuit boards, and 100 percent recycled rare earth elements in all magnets. Mac mini has more than 50 percent total recycled content by weight.
- **Sourcing 100% renewable electricity for manufacturing:** To reduce emissions from the electricity used to make products, we're working to transition our entire supply chain to 100 percent renewable electricity and prioritizing energy efficiency in manufacturing. For Mac mini, 100 percent of manufacturing electricity is sourced from renewable energy.
- **Matching energy footprint use with 100% low-carbon electricity:** To negate emissions from the electricity our customers use to power their Apple products, we're investing in renewable energy projects around the world. We're also prioritizing energy efficiency so products use less electricity. For Mac mini, we are matching 100 percent of expected customer product use electricity with electricity from low-carbon sources.
- **Increasing non-air transportation:** To reduce emissions from transporting products, we're shifting from air shipping to lower-carbon modes, like ocean or rail. We're shipping 50 percent or more of Mac mini by weight via non-air modes from our final assembly sites to their next destination, primarily regional distribution hubs.

## How we reach carbon neutral for Mac mini

To address remaining emissions, we deploy nature-based solutions that generate high-quality carbon credits. Nature-based solutions play an important role in addressing the climate crisis, contributing to the health of ecosystems and removing carbon from the atmosphere. We are aligned with the scientific consensus that carbon credits should only be applied after aggressive efforts to reduce emissions and increase efficiency have been implemented. We created the [Restore Fund](#) to scale up high-quality, nature-based carbon removal projects around the world and also often originate our own projects with reputable partners. Apple uses credits from projects that align with international standards such as Verra and the Climate, Community & Biodiversity (CCB) Standard, which ensure projects are real, additional, measurable, quantified, and have systems in place to avoid double-counting and ensure permanence. Carbon credits are retired after the end of each fiscal year, to correspond to the remaining emissions from the total number of products sold in the prior fiscal year. Apple uses an independent third party to confirm that the correct number of credits has been retired.<sup>9</sup>

## How we're demonstrating progress

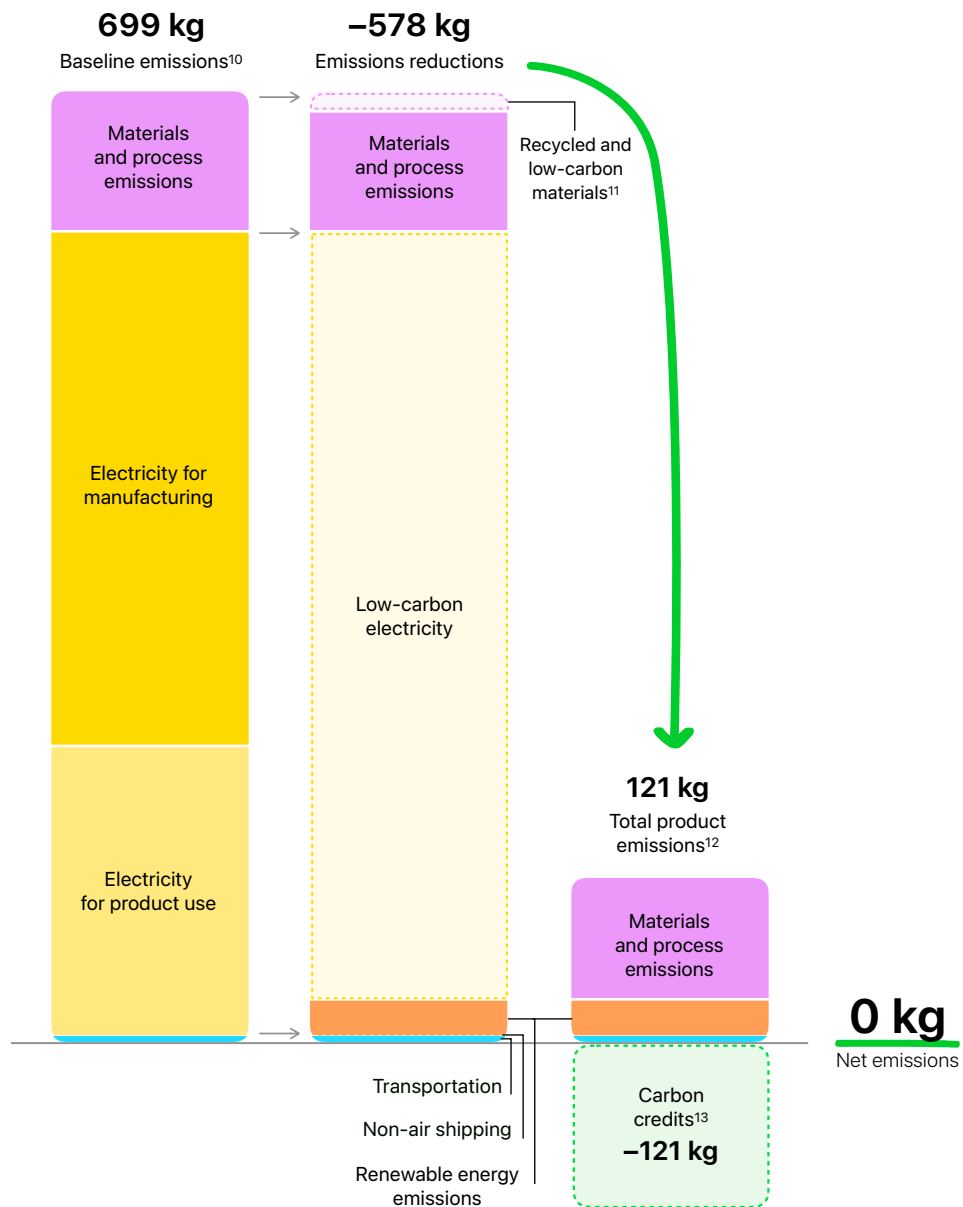
We first calculate the carbon footprint of the product using a life cycle carbon analysis approach, in accordance with international standards. To help ensure our work is translating to real reductions, we consider what emissions would have been without our actions. We apply the following assumptions to create this product-specific business-as-usual scenario as modeled by Apple:

- No use of low-carbon electricity for manufacturing or product use, beyond what is already available on the latest modeled grid (based on regional emissions factors).
- Apple's carbon intensity of key materials as of 2015. Carbon intensity of materials reflects use of recycled content and production technology.
- Apple's average mix of transportation modes (air, rail, ocean, ground) by product line across three years (fiscal years 2017 to 2019) to best capture the baseline transportation emissions of our products.

# How we reach carbon neutral for Mac mini with M4 Pro (64GB memory, 8TB SSD)

We've reduced emissions for Mac mini with M4 Pro (64GB memory, 8TB SSD) by more than 80 percent against our business-as-usual scenario as modeled by Apple.<sup>10</sup> This product contains over 50 percent recycled content, including 100 percent recycled aluminum in the enclosure, which reduced total product emissions for this configuration by about 2 percent. A hundred percent of manufacturing electricity is covered by renewable electricity, and we are sourcing low-carbon energy projects to match 100 percent of our customer product use with low-carbon electricity. In our carbon footprint calculations, we also account for the emissions necessary to generate renewable electricity, specifically to manufacture and maintain renewable energy infrastructure, like wind and solar farms. We've reduced transportation-related emissions with a logistics plan that prioritizes non-air shipping over the lifetime of Mac mini. Only after these efforts do we cover residual emissions through high-quality carbon credits that are real, additional, measurable, quantified, and have systems in place to avoid double-counting and ensure permanence.<sup>9</sup>

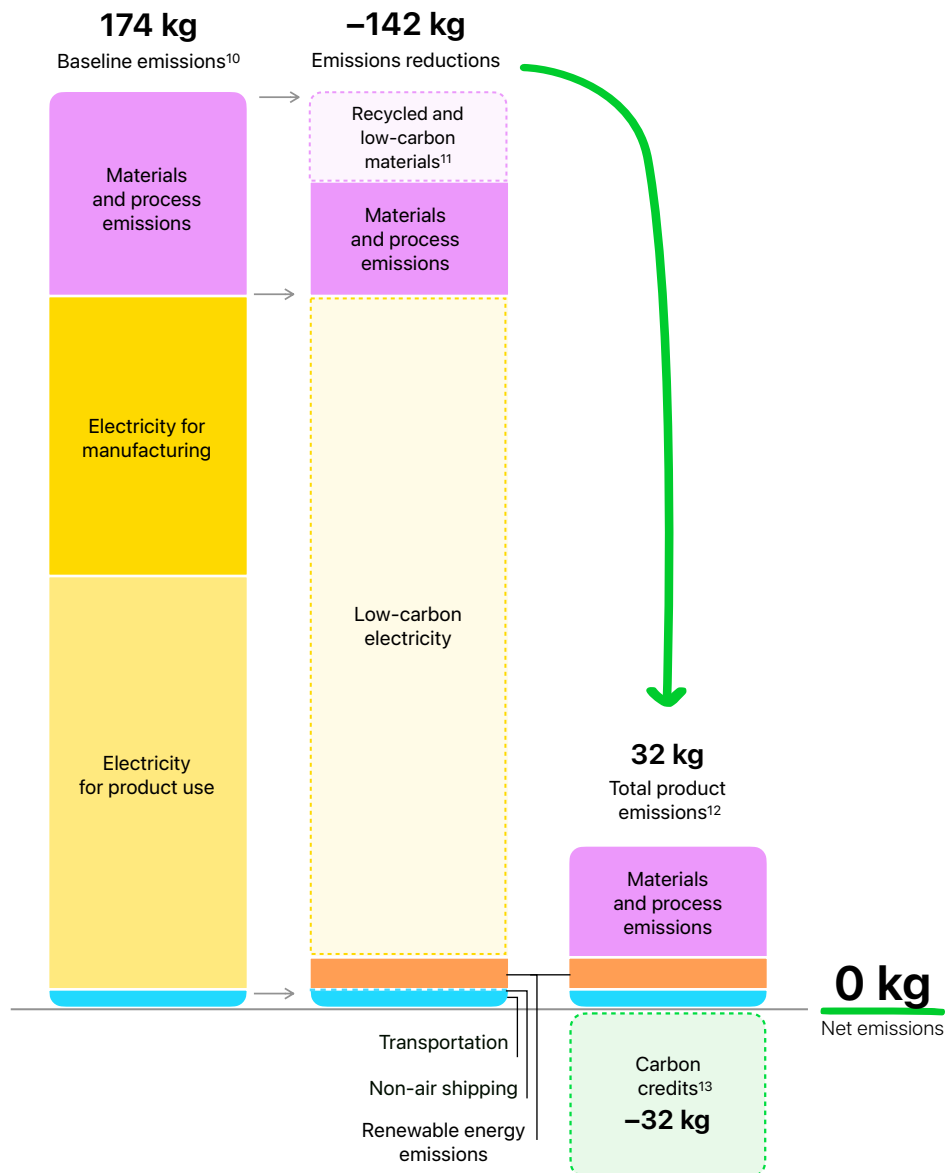
For the product carbon footprint of alternate configurations, please see the Carbon Footprint section of the report.



# How we reach carbon neutral for Mac mini with M4 (16GB memory, 256GB SSD)

We've reduced emissions for Mac mini with M4 (16GB memory, 256GB SSD) by more than 80 percent against our business-as-usual scenario as modeled by Apple.<sup>10</sup> This product contains over 50 percent recycled content, including 100 percent recycled aluminum in the enclosure, which reduced total product emissions for this configuration by about 10 percent. A hundred percent of manufacturing electricity is covered by renewable electricity, and we are sourcing low-carbon energy projects to match 100 percent of our customer product use with low-carbon electricity. In our carbon footprint calculations, we also account for the emissions necessary to generate renewable electricity, specifically to manufacture and maintain renewable energy infrastructure, like wind and solar farms. We've reduced transportation-related emissions with a logistics plan that prioritizes non-air shipping over the lifetime of Mac mini. Only after these efforts do we cover residual emissions through high-quality carbon credits that are real, additional, measurable, quantified, and have systems in place to avoid double-counting and ensure permanence.<sup>9</sup>

For the product carbon footprint of alternate configurations, please see the Carbon Footprint section of the report.

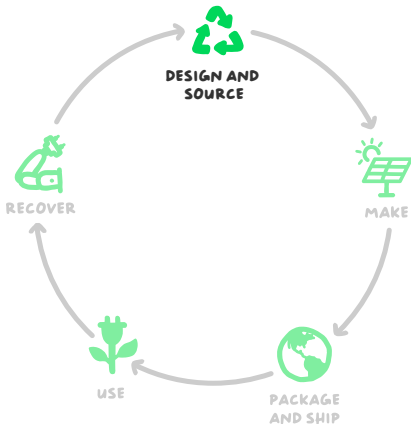


# Taking responsibility for our products at every stage

We take responsibility for our products throughout their life cycles—including the materials they are made of, the people who assemble them, and how they are recycled at end of life. And we focus on the areas where we can make the biggest difference for our planet: reducing our impact on climate change, conserving important resources, and using safer materials.

**We sell millions of products. So making even small adjustments can have a meaningful impact.**





# Design and Source

Mac mini contains more than 50 percent recycled content.<sup>1</sup>

To conserve important resources, we work to reduce the material we use and aim to one day source only recycled or renewable materials for our products. And as we make this transition, we remain committed to the responsible sourcing of primary materials. We're proud to be recognized as a worldwide leader in the responsible sourcing of minerals in our products. We map many materials, some to the mineral source, and establish the strictest standards for smelters and refiners. Apple also requires all identified tin, tantalum, tungsten, gold, cobalt, and lithium smelters and refiners to participate in third-party audits.<sup>14</sup> By 2025, we plan to use 100 percent recycled cobalt in all Apple-designed batteries,<sup>8</sup> 100 percent recycled tin solder and 100 percent recycled gold plating in all Apple-designed rigid and flexible printed circuit boards, and 100 percent recycled rare earth elements in all magnets. Our product designs also consider the safety of those who make, use, and recycle our products, restricting the use of hundreds of harmful substances. Our standards go beyond what's required by law to protect people and the environment.



**Aluminum.** We use 100 percent recycled aluminum in the thermal module stage<sup>15</sup> and enclosure, which is made with a high-precision forging process that uses over 85 percent less aluminum than its predecessor.<sup>16</sup>



**Copper.** We use 100 percent recycled copper in multiple printed circuit boards, multiple thermal module components,<sup>17</sup> AC inlet prongs, and multiple small parts.



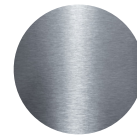
**Gold.** We use 100 percent recycled gold in the plating of all Apple-designed printed circuit boards.



**Plastic.** We use 20 percent or more recycled plastic in 25 components.



**Rare earth elements.** We use 100 percent recycled rare earth elements in all magnets, representing 96 percent of the total rare earth elements in the device.



**Steel.** We use 80 percent or more recycled steel in multiple components, including the logo, connector ports, and brackets.



**Tin.** We use 100 percent recycled tin in the solder of multiple printed circuit boards.



**Zinc.** We use 100 percent recycled zinc in the AC inlet prongs and multiple small parts.

## Smarter chemistry

Mac mini is free of harmful substances like brominated flame retardants, PVC, phthalates, and mercury.<sup>6</sup> And 100 percent of the materials in Mac mini are covered by our [Regulated Substances Specification](#). We go beyond what's required by aiming to understand the non-regulated substances in every part of every product—an effort that requires an industry-leading level of transparency through the entire supply chain. We consistently identify the makeup of over 80 percent by mass of Mac devices.





# Make

Apple suppliers manufacturing parts and components for Mac mini have committed to Apple's Supplier Clean Energy Program, an integral part of our efforts to address climate change by transitioning suppliers to renewable energy around the world. These efforts are helping to reduce product-related carbon emissions, create a more resilient supply chain, and contribute to healthier communities—while offering a model for others to follow.

The Apple Supplier Code of Conduct sets strict standards for safeguarding people and the environment in our supply chain. Every year, we assess our suppliers' performance in upholding the standards required by our Code.

We work closely with our suppliers to provide safe and healthy workplaces where people are treated with dignity and respect, and to reduce suppliers' environmental impact. Our requirements apply across our global supply chain and include the responsible sourcing of materials. From the strong foundation set by our Code, we go further—from helping suppliers transition to low-carbon electricity, to providing educational opportunities, to supporting suppliers in reducing waste. For more information, see [apple.com/supplychain](https://apple.com/supplychain).

## Smarter chemicals

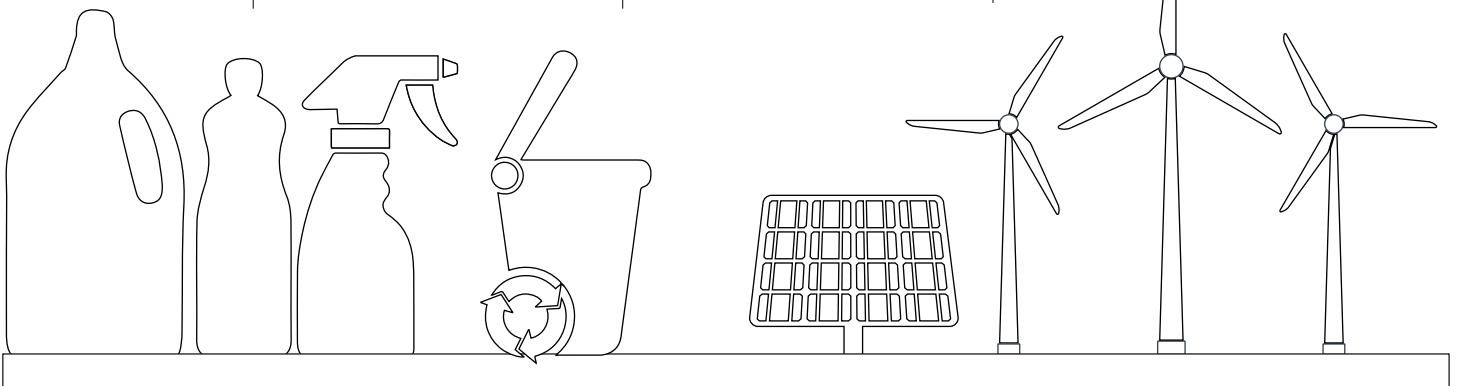
All established Mac mini final assembly supplier sites use safer cleaners and degreasers in their manufacturing processes, as determined by methodologies like the GreenScreen® assessment.<sup>18</sup>

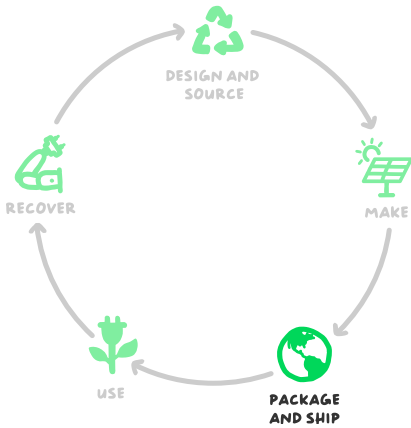
## Zero Waste to Landfill

No established Mac mini final assembly supplier sites generate any waste sent to landfill.<sup>19</sup>

## Supplier energy use

A hundred percent of manufacturing electricity for Mac mini is sourced from renewable electricity.





## Package and Ship

Mac mini packaging is 100 percent fiber-based and contains no plastic except for inks, coatings, and adhesives, a milestone toward our commitment to remove plastic from packaging by 2025.<sup>4</sup>

We are working to improve our packaging across all products, including removing plastics, increasing recycled content, and reducing the volume of our packaging. Our packaging for Mac mini contains 42 percent recycled content, and we have protected or established enough responsibly managed forests to cover all the new wood fiber we use in our packaging.<sup>5</sup> This ensures working forests are able to regrow and continue to clean our air and purify our water.

As we transport our products from our manufacturers to their next destination, we're also prioritizing less carbon-intensive shipping modes than air transport, such as rail and ocean. We will ship 50 percent or more of Mac mini by weight using non-air modes over the lifetime of the products.

**100%**

of the packaging<sup>4</sup> is fiber-based, as part of our commitment to remove plastic from packaging by 2025

**42%**

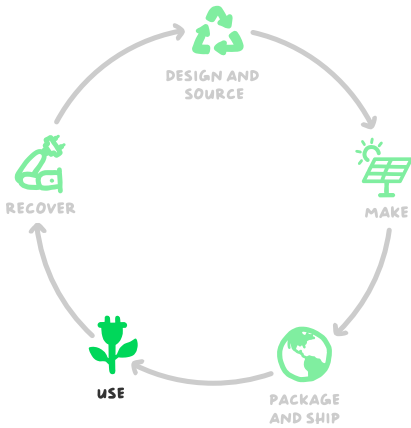
recycled content in fiber-based packaging

**100%**

of the virgin wood fiber in the packaging is responsibly sourced<sup>20</sup>







# Use

Mac mini uses 79 percent less energy than the requirement for ENERGY STAR.<sup>21</sup>

We design our products to be energy efficient, long-lasting, and safe. Mac mini uses software and power-efficient components that intelligently manage power consumption. We also run our own Reliability and Environmental Testing Labs, where our products go through rigorous testing before they leave our doors. Our support continues throughout each product’s life cycle, with regular software updates to keep devices current. We have also expanded access to safe, reliable, and secure repairs by increasing the number of Apple Authorized Service Providers (AASPs).

For Mac mini, we have matched 100 percent of expected customer product use with low-carbon electricity. We’re also engaging with our customers to educate and provide opportunities to support the decarbonization of the grid.

## Energy consumption of ENERGY STAR–rated products

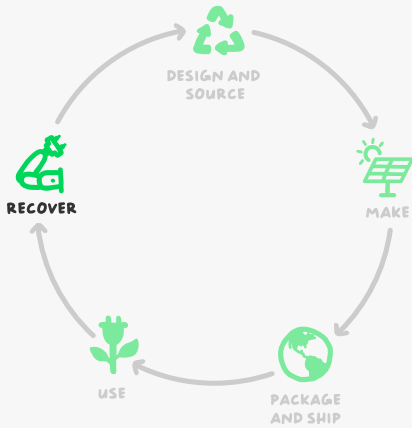
Apple devices consistently rank among the high-performing products rated by ENERGY STAR, which sets specifications that typically reflect the 25 percent most energy-efficient devices on the market. Mac mini consumes 79 percent less energy than the requirement for ENERGY STAR.<sup>21</sup>

## Designed to last

We assessed Mac mini in our Reliability Testing Lab using rigorous testing methods that simulate customers’ experiences.

## Made with smarter chemistry

We apply rigorous controls for materials users touch—all based on recommendations from toxicologists and dermatologists.



# Recover

Return your product with Apple Trade In, in store or online, and we'll ensure it has a long life or recycle it for free.

We design our products to be durable so they are used longer. And we want the materials in our products to live on in other products. That's why we launched Apple Trade In—it provides customers with product end-of-life options. With Apple Trade In, you can get a great value for your current device and apply it toward a new one or get an Apple Store Gift Card. If your device isn't eligible for credit, we'll recycle it for free through [product take-back and recycling collection programs](#).<sup>22</sup> And even after a product reaches the end of its life, the materials within it can serve the next generation of products. We provide or participate in product take-back and recycling collection programs in 99 percent of the countries where we sell products. We work with best-in-class recyclers to maximize the potential of the recycling materials stream and drive our efforts to close the loop on key materials. We define best-in-class recyclers as those capable of recovering materials at high rates and doing so with better environmental and safety performance.

## Apple Trade In

For more information on how to recycle your products at end of life, visit:

[apple.com/recycle](http://apple.com/recycle)

We're also creating [Apple Recycler Guides](#) to provide guidance for professional electronics recyclers on how to safely disassemble Apple products to maximize recovery of resources. The guides provide valuable insight into the steps for recycling and locations of materials in the products.



# Definitions

**Bio-based plastics:** Bio-based plastics are made from biological sources rather than from fossil-fuel sources. Bio-based plastics allow us to reduce reliance on fossil fuels.

**Carbon footprint:** Estimated emissions are calculated in accordance with guidelines and requirements as specified by ISO 14040, ISO 14044, and ISO 14067. There is inherent uncertainty in modeling carbon emissions due primarily to data limitations. For the top component contributors to Apple's carbon emissions, Apple addresses this uncertainty by developing detailed process-based environmental models with Apple-specific parameters. For the remaining elements of Apple's carbon footprint, we rely on industry average data and assumptions. We calculate carbon emissions using the 100-year time horizon global warming potentials (GWP100) from the IPCC Sixth Assessment Report (AR6), including biogenic carbon. Our carbon footprint calculation includes emissions for the following life cycle phases in CO<sub>2</sub> equivalency (CO<sub>2</sub>e):

- **Production:** Includes the extraction, production, and transportation of raw materials, as well as the manufacture, transport, and assembly of all parts and product packaging.
- **Transport:** Includes ground, air, and sea transportation of the finished product and its associated packaging from manufacturing site directly to customers or regional distribution hubs. Regional transport is modeled using average distances.
- **Use:** Apple assumes a three-year period for power use by first owners for iOS and watchOS devices and a four-year period for macOS, iPadOS, and tvOS devices. Product use scenarios are based on historical customer use data for similar products. Energy use is simulated in various ways; for example, by modeling daily battery drain or through performing activities like movie and music playback. Geographic differences in the power grid mix have been accounted for at a regional level.
- **End-of-life processing:** Includes transportation from collection hubs to recycling centers and the energy used in mechanical separation and shredding of parts.

For more information on our product carbon footprint methodology, visit [apple.com/environment/answers](https://apple.com/environment/answers).

**Carbon neutral:** Refers to the state where the net carbon footprint reaches zero through gross emissions reductions and, where necessary to counterbalance residual emissions, through the retirement of an equivalent quantity of carbon credits. For an Apple product to be carbon neutral, we require the gross footprint to have been substantially reduced first before carbon credits are applied, through the use of low-carbon design and recycled and renewable materials, matching all electricity impacts with low-carbon electricity, and prioritizing low-carbon modes of transportation.

**Low-carbon electricity:** Refers to both renewable electricity as well as other fossil-free projects that Apple considers "low-carbon" but not "renewable," like nuclear and large-impact hydroelectricity projects, which may be included as a result of low-carbon electricity provided by the grid. Apple accounts for the carbon impact of building and operating these projects, and so considers them to be low-carbon but not zero-carbon.

**Low-carbon materials:** Refers to materials created using production techniques with reduced carbon impact, such as Elysis (a patented technology that eliminates direct greenhouse gas emissions from the traditional aluminum smelting process) or aluminum smelted using hydroelectricity instead of coal.

**Recycled materials:** Recycling makes better use of finite resources by sourcing from recovered rather than mined materials. Recycled content claims for materials used in our products have been verified by an independent third party to a recycled content standard that conforms to ISO 14021.

# Definitions

**Renewable materials:** We define bio-materials as those that can be regenerated in a human lifespan, like wood fibers or sugarcane. Bio-materials can help us use fewer finite resources. But even though bio-materials have the ability to regrow, they are not always managed responsibly. Renewable materials are a type of bio-material managed in a way that enables continuous production without depleting the earth's resources. That's why we focus on sources that are certified for their management practices.

**Supplier Clean Energy Program:** Since the electricity used to make our products is the largest contributor to our overall carbon footprint, we're helping our suppliers decarbonize their Apple production, including by transitioning electricity use to 100 percent renewable sources.

# Carbon footprint

Greenhouse gas emissions were calculated using a life cycle assessment (LCA) methodology in accordance with ISO 14040, 14044, and 14067 standards and based on Mac mini with M4 Pro (8TB SSD).<sup>23</sup> The LCA boundary for this product includes the physical product and all of its components, as well as all in-box accessories (such as power cords).

Greenhouse gas emissions	Mac mini with M4 Pro (64GB memory, 8TB SSD)
Apple emissions from utility-purchased electricity (scope 2)	0 kg CO <sub>2</sub> e
Life cycle product emissions (scope 3)	121 kg CO <sub>2</sub> e
· Production	87%
• Emissions from renewable energy production	13%
· Transportation	3%
· Product use (emissions from renewable energy production)	9%
· End-of-life processing	<1%
GHG reductions achieved <sup>10</sup>	↓80%
Carbon footprint in effect on sales	2 kg CO <sub>2</sub> e
Carbon credits applied (per product)	121 kg CO <sub>2</sub> e
<b>Total product footprint after carbon credits</b>	<b>0 kg CO<sub>2</sub>e</b>

Note: Percentages may not total 100 due to rounding.

We've also calculated the product carbon footprint for different configurations:

Greenhouse gas emissions	Mac mini with M4 (16GB memory, 256GB SSD)
Apple emissions from utility-purchased electricity (scope 2)	0 kg CO <sub>2</sub> e
Life cycle product emissions (scope 3)	32 kg CO <sub>2</sub> e
· Production	74%
• Emissions from renewable energy production	7%
· Transportation	12%
· Product use (emissions from renewable energy production)	13%
· End-of-life processing	1%
GHG reductions achieved <sup>10</sup>	↓80%
Carbon footprint in effect on sales	32 kg CO <sub>2</sub> e
Carbon credits applied (per product)	32 kg CO <sub>2</sub> e
<b>Total product footprint after carbon credits</b>	<b>0 kg CO<sub>2</sub>e</b>

Note: Percentages may not total 100 due to rounding.

# Carbon footprint

Greenhouse gas emissions	Mac mini with M4 (16GB memory, 512GB SSD)
Apple emissions from utility-purchased electricity (scope 2)	0 kg CO <sub>2</sub> e
Life cycle product emissions (scope 3)	35 kg CO <sub>2</sub> e
<ul style="list-style-type: none"> <li>· Production               <ul style="list-style-type: none"> <li>• Emissions from renewable energy production</li> </ul> </li> <li>· Transportation</li> <li>· Product use (emissions from renewable energy production)</li> <li>· End-of-life processing</li> </ul>	76% 8% 11% 12% 1%
GHG reductions achieved <sup>10</sup>	↓80%
Apple emissions from utility-purchased electricity (scope 2)	0 kg CO <sub>2</sub> e
Life cycle product emissions (scope 3)	35 kg CO <sub>2</sub> e
<b>Total product footprint after carbon credits</b>	<b>0 kg CO<sub>2</sub>e</b>

Note: Percentages may not total 100 due to rounding.

Greenhouse gas emissions	Mac mini with M4 Pro (24GB memory, 512GB SSD)
Apple emissions from utility-purchased electricity (scope 2)	0 kg CO <sub>2</sub> e
Life cycle product emissions (scope 3)	50 kg CO <sub>2</sub> e
<ul style="list-style-type: none"> <li>· Production               <ul style="list-style-type: none"> <li>• Emissions from renewable energy production</li> </ul> </li> <li>· Transportation</li> <li>· Product use (emissions from renewable energy production)</li> <li>· End-of-life processing</li> </ul>	69% 7% 8% 23% <1%
GHG reductions achieved <sup>10</sup>	↓80%
Apple emissions from utility-purchased electricity (scope 2)	0 kg CO <sub>2</sub> e
Life cycle product emissions (scope 3)	50 kg CO <sub>2</sub> e
Carbon credits applied (per product)	50 kg CO <sub>2</sub> e
<b>Total product footprint after carbon credits</b>	<b>0 kg CO<sub>2</sub>e</b>

Note: Percentages may not total 100 due to rounding.

We model different configurations of our products to show the potential range of carbon emissions. This carbon footprint data is accurate as of launch. There is inherent uncertainty in modeling carbon emissions due primarily to data limitations. For the top component contributors to Apple’s carbon emissions, Apple addresses this uncertainty by developing detailed process-based environmental models with Apple-specific parameters. For the remaining elements of Apple’s carbon footprint, we rely on industry-average data and assumptions.

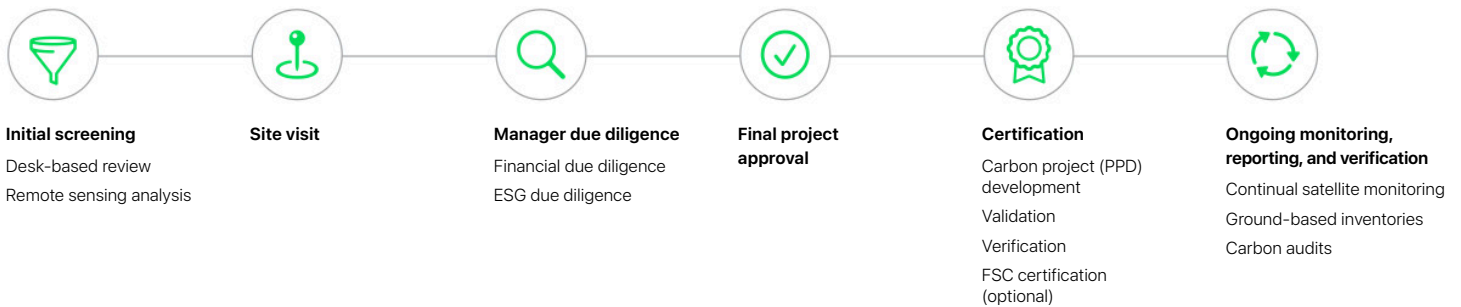
For more information on our product carbon footprint methodology, visit [apple.com/environment/answers](https://apple.com/environment/answers).

# High-quality carbon removal

We plan to reach our goal of becoming carbon neutral across our entire value chain by 2030, using a wide range of solutions at our disposal.

We are unequivocal in our priority: Emissions reductions take precedence over carbon removal. Achieving this requires urgent action within our own operations and partnership across our entire value chain. We are reducing direct greenhouse gas emissions in our facilities and supporting emissions reductions in our supply chain through process innovation, direct emissions abatement, and transitioning to renewable energy.<sup>24</sup>

In 2021, we partnered with Conservation International and Goldman Sachs to launch the Restore Fund—an innovative nature-based carbon removal investment strategy. In 2023, we doubled our commitment to nature-based restoration with a second fund in partnership with Climate Asset Management. Each of these funds aims to remove 1 million tonnes of carbon dioxide from the atmosphere at peak as well as provide important benefits for local communities and protect and enhance biodiversity. To ensure that every project that we invest in is high quality, the Restore Fund implements rigorous diligence processes, including project and manager-level diligence, site visits, and remote sensing analysis. Read more about our approach to drive scale and quality in our [Carbon Removal Strategy white paper](#).



The first phase of our innovative fund has focused on blending responsible forestry practices with carbon removal. We're working with forestry managers to create new, responsibly managed forests that are optimized for both carbon and wood production in order to create revenue from timber and generate high-quality carbon credits. The projects also seek to maximize positive environmental impact, including carbon, hydrology, and habitat restoration.

As the projects in the Restore Fund come online, we're also working to address difficult-to-avoid emissions in the short term. We're intentional about identifying projects that are of the highest standard and that achieve meaningful impact. We often originate our own projects working with a reputable partner, like Conservation International, or we carefully select projects from third-party certified registries. Apple uses credits from projects that align with international standards such as Verra and the Climate, Community & Biodiversity (CCB) Standard. These standards ensure that the projects generating credits are real, additional, measurable, and quantified and have systems in place to avoid double-counting and ensure permanence.<sup>9</sup>

Carbon credits applied are retired after the end of each fiscal year, to correspond to the remaining emissions from the total number of carbon neutral products sold in the prior fiscal year. Apple uses an independent third party to confirm that the correct number of credits has been retired.



# High-quality carbon removal

The high-quality carbon credit projects used to compensate the remaining emissions may include the following:

Project name	Project description	Accounting methodology used	Registry link
Forestal Apepu Carbon Project <i>(Part of the Restore Fund)</i>	<p>Forestal Apepu S.A. is a company established in 2019 by the Arbaro Fund to conduct sustainable reforestation in Eastern Paraguay. The aim of the company is the production of quality logs for solid timber uses, the sequestration of carbon, and the generation of qualified jobs in a highly deforested landscape. Forestal Apepu currently owns 8,256 ha in the Department of San Pedro. Prior to Forestal Apepu's acquisition, the land was used for agriculture and cattle grazing, and much of the natural forest had been removed. Currently, the company maintains around 30 percent of its area in natural forest cover and other conservation areas. The remnant natural forest is degraded due to the historical extraction of timber prior to Forestal Apepu ownership. Forestal Apepu is seeking to restore forest cover across its land holdings through a combination of commercial eucalyptus forest plantations, trials of native species for restoration purposes, and the strict protection of the remaining natural forest. The company has established 5,517 ha of commercial forest plantations to date and may expand in the future upon identification of potential expansion areas in the region.</p>	AR-ACM0003 Afforestation and reforestation of lands except wetlands	<a href="https://registry.terra.org/app/projectDetail/VCS/2369">registry.terra.org/app/projectDetail/VCS/2369</a>
Symbiosis Continuous Cover Forest Project	<p>The Symbiosis Continuous Cover Forest Project is a reforestation project, proposed by Symbiosis Investimentos e Participações S.A., a company focused on the restoration of degraded land through the sustainable commercial reforestation of the Atlantic Rainforest native species. The Atlantic Forest Biome (Mata Atlântica) is the most degraded in Brazil, with less than 12.4 percent left of its original area, and very fragmented. The degradation started in the 16th century in the State of Bahia. Today, the same pattern of destruction is seen in the Amazon Biome, which started in the 1970s after the Atlantic Rainforest resources were depleted. In addition, plant breeding with the Atlantic Forest native species has not been implemented before. The project is designed as a grouped project, with an initial instance at Fazenda Novo Horizonte, in Trancoso District of Porto Seguro municipality, Bahia State. It is in close proximity to Symbiosis headquarters, where seedlings are produced and where research and development activities take place. Novo Horizonte has a total area of 669.28 ha, from which 236.50 consist of the initial project area. Symbiosis expansion plans for the grouped project are focused on the South of Bahia, with projected 50,000 hectares of mixed species reforestation, in addition to 15,000 hectares of ecological restoration and 5,000 hectares of agroforestry with cocoa (also a relevant product of the region). The land use in the region is predominantly focused on pasture, which is also the prior condition of all of the regions where the grouped project is intended to occur. The project is designed for a 40-year crediting period, in which 27,499,184 tCO<sub>2</sub>e will be reduced/removed.</p>	AR-ACM0003 Afforestation and reforestation of lands except wetlands	<a href="https://registry.terra.org/app/projectDetail/VCS/2369">registry.terra.org/app/projectDetail/VCS/2369</a>



# Endnotes

- <sup>1</sup> Product recycled or renewable content is the mass of certified recycled material relative to the overall mass of the device, not including packaging or in-box accessories.
- <sup>2</sup> Our manufacturing electricity is sourced from clean electricity, including a mix of supplier and Apple clean energy projects.
- <sup>3</sup> We're shipping 50 percent or more of Mac mini by weight via non-air modes from our final assembly sites to their next destination, primarily regional distribution hubs.
- <sup>4</sup> Breakdown of U.S. retail packaging by weight. Adhesives, inks, and coatings are excluded from our calculations of plastic content and packaging weight.
- <sup>5</sup> For more information about our work to protect and create responsibly managed forests, please read our [Environmental Progress Report](#).
- <sup>6</sup> [Apple's Regulated Substances Specification](#) describes Apple's restrictions on the use of certain chemical substances in materials in Apple products, accessories, manufacturing processes, and packaging used for shipping products to Apple's end customers. Restrictions are derived from international laws or directives, regulatory agencies, eco-label requirements, environmental standards, and Apple policies. Every Apple product is free of PVC and phthalates except for AC power cords in India, Thailand (for 2-prong AC power cords), and South Korea, where we continue to seek government approval for our PVC and phthalates replacement. Apple products comply with the European Union Directive 2011/65/EU and its amendments, including exemptions for the use of lead such as high-temperature solder. Apple is working to phase out the use of these exempted substances for new products where technically possible.
- <sup>7</sup> Mac mini achieved a Gold rating in the United States and Canada, in accordance with IEEE 1680.1 or UL 110, and is listed as such on the Electronic Product Environmental Assessment Tool (EPEAT) Registry. EPEAT registers computers, displays, and mobile phones based on environmental requirements in these standards. For more information, visit [www.epeat.net](http://www.epeat.net).
- <sup>8</sup> All cobalt in the battery claims or references use mass balance allocation.
- <sup>9</sup> Read more about our approach in [Apple's Carbon Removal Strategy white paper](#).
- <sup>10</sup> Carbon reductions are calculated against a product-specific business-as-usual scenario as modeled by Apple: 1) No use of clean electricity for manufacturing or product use, beyond what is already available on the latest modeled grid (based on regional emissions factors). 2) Apple's carbon intensity of key materials as of 2015 (our baseline year for our 2030 product carbon neutrality goal). Carbon intensity of materials reflects use of recycled content and production technology. 3) Apple's average mix of transportation modes (air, rail, ocean, ground) by product line across three years (fiscal years 2017 to 2019) to best capture the baseline transportation emissions of our products.
- <sup>11</sup> We calculate emissions savings from the use of recycled or low-carbon materials in our products by comparing the carbon intensity of key materials today with their 2015 baseline for Apple products or using industry average data. We currently only quantify the carbon savings from the use of recycled aluminum, titanium, and stainless steel in the enclosure, as well as recycled lithium, cobalt, tungsten, and gold in select parts for select products. This means the actual emissions avoided from recycled materials are likely larger. We plan to improve our accounting of recycled content over time.
- <sup>12</sup> Greenhouse gas emissions were calculated using a life cycle assessment methodology in accordance with ISO 14040, 14044, and 14067 standards and based on Mac mini. The life cycle assessment boundary for this product includes the physical product and all of its components and packaging, as well as all in-box accessories.
- <sup>13</sup> Apple uses credits from projects that align with international standards such as Verra and the Climate, Community & Biodiversity (CCB) Standard. These standards ensure that the projects generating credits are real, additional, measurable, quantified, and have measures in place to avoid double-counting and ensure permanence.
- <sup>14</sup> We map materials in our supply chain and publish a list of identified tin, tantalum, tungsten, gold (3TG), cobalt, and lithium smelters and refiners in our supply chain. Third-party assessments seek to confirm sourcing practices and are part of our responsible sourcing program. In addition, our efforts consider a broad range of risks, including social, environmental, human rights, and governance risks.
- <sup>15</sup> Recycled aluminum in the thermal module applies to M4 chip only.
- <sup>16</sup> We compared the aluminum required to make the enclosure of Mac mini to Mac mini (2023).
- <sup>17</sup> Recycled copper in the thermal module applies to M4 Pro chip only.
- <sup>18</sup> Chemicals that meet GreenScreen® benchmark 3 or 4 or other equivalent methodologies like U.S. EPA Safer Choice are considered safer and preferred for use. GreenScreen® is a comprehensive hazard assessment tool that evaluates substances against 18 different criteria. For more information, visit [www.greenscreenchemicals.org](http://www.greenscreenchemicals.org).

# Endnotes

<sup>19</sup> All established final assembly supplier sites—those that have been Apple suppliers for more than one year—for Mac mini are third-party verified as Zero Waste by UL LLC (UL 2799 Standard). UL requires at least 90 percent diversion through methods other than waste to energy to achieve Zero Waste to Landfill (Silver 90–94 percent, Gold 95–99 percent, and Platinum 100 percent) designations.

<sup>20</sup> Responsible sourcing of wood fiber is defined in [Apple's Responsible Fiber Specification](#). We consider wood fibers to include bamboo.

<sup>21</sup> Energy consumption and energy efficiency values are based on the ENERGY STAR Program Requirements for Computers, including the max energy allowance for Mac mini. For more information, visit [www.energystar.gov](http://www.energystar.gov). ENERGY STAR and the ENERGY STAR mark are registered trademarks owned by the U.S. Environmental Protection Agency.

- Off: Lowest power mode of the system when Mac mini is shut down. Also referred to as Standby.
- Sleep: Low power state that is entered automatically after 10 minutes of inactivity (default), or by selecting Sleep from the Apple menu. Wake for network access enabled. Connected to Ethernet.
- Idle—Display on: System is on and has completed loading macOS. Connected to Ethernet.
- Power supply efficiency: Average of the power supply's measured efficiency when tested at 100 percent, 50 percent, and 20 percent of the power supply's rated output power.

Mode	Power consumption for Mac mini		
	100V	115V	230V
Off	0.08W	0.10W	0.11W
Sleep	0.55W	0.50W	0.51W
Idle—Display On	3.92W	3.96W	4.01W
Power supply efficiency	91.3%	91.8%	92.6%

<sup>22</sup> Trade-in values vary based on the condition, year, and configuration of your trade-in device, and may also vary between online and in-store trade-in. You must be at least 18 years old. In-store trade-in requires presentation of a valid, government-issued photo ID (local law may require saving this information). Additional terms from Apple or Apple's trade-in partners may apply.

<sup>23</sup> This is the highest configuration available of Mac mini. We modeled the product carbon footprint to show the high end of the expected carbon emissions. There is inherent uncertainty in modeling carbon emissions, and this product carbon footprint is accurate as of product launch.

<sup>24</sup> For more information on Apple 2030, visit [apple.com/2030](http://apple.com/2030).