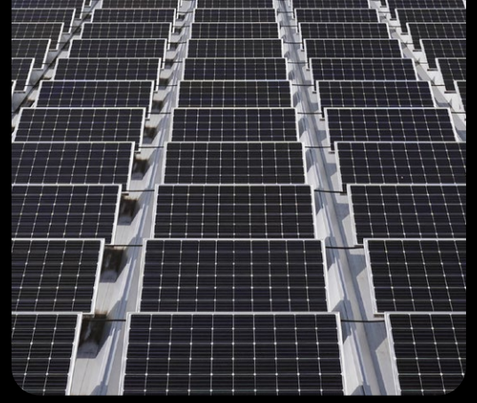
# Environmental Progress Report




Covering fiscal year 2024

# Contents



# Reflections

**At Apple, we are constantly innovating to make the world's best technology while reducing our impact on the environment. That means taking urgent steps to fight climate change and working collaboratively with our suppliers and local communities.**

Every year, teams across our company find new and innovative ways to make our technology better for people and the planet. That progress has brought us closer than ever to Apple 2030: our goal to become carbon neutral for our global footprint, including our supply chain and the energy our customers use to power their devices.

Thanks to these efforts, I'm proud to share that Apple has now cut our overall emissions by more than 60 percent since 2015. This report covers the work that makes a milestone like that possible. It describes in detail how we continue to dramatically reduce our climate impact, while helping accelerate a global transition toward recycled materials and renewable energy.

Since 2018, we've powered every Apple facility with renewable energy — including our offices, retail stores, and data centers. That progress is quickly making its way across our global supply chain, and today, our suppliers now support more than 17.8 gigawatts of clean energy around the world.

But our commitment doesn't end there. We're also investing in clean energy projects to match the energy our customers use to charge their devices. And with our Power for Impact program, we've launched renewable energy projects in countries including the Philippines, Thailand, and South Africa. By expanding access to safe, reliable electricity, we can protect the planet and support the communities most significantly impacted by climate change.

To drive down carbon emissions even further, we're using more recycled materials than ever before. We now use 99 percent recycled rare earth elements in the magnets across our products. We've also continued to scale the use of recycled materials like tungsten, aluminum, cobalt, gold, and lithium. And we've done all that while making our products even more durable and easy to repair, because technology that lasts longer is better for the environment and our customers' wallets.

It is amazing to see this progress come together in a single product. In October, we unveiled our latest carbon neutral product, Mac mini, which is made with more than 50 percent recycled content and manufactured with electricity exclusively sourced from renewable energy. That's helped reduce the carbon footprint of Mac mini by 80 percent from our business-as-usual scenario. And to balance the remaining emissions that can't be avoided, we invest in high-quality, nature-based projects that reduce carbon in the atmosphere.

These projects are helping restore ecosystems around the world. Last year, I visited an area of the Atlantic Forest in Brazil that was fully deforested not long ago. Thanks to the Restore Fund we launched with our partners, it's now a flourishing working forest — filled with native tree species that could have been lost forever. It was a powerful reminder that with dedication and effort, we can bring new life to once-thriving habitats.

At Apple, we've always believed that innovation is a powerful force for progress. So we'll continue to do our part to protect the planet — and to build a better future for generations to come.

**Lisa Jackson**
VP, Environment, Policy and Social Initiatives

# Report highlights

## Reduced our overall GHG emissions by more than 60 percent

We reduced our gross greenhouse gas (GHG) emissions across scopes 1, 2, and 3 by more than 60 percent compared with our 2015 baseline year — not including offsets.[1] In that same time period, revenue grew by more than 65 percent. We estimate that we've avoided 41 million metric tons of emissions this year through reduction efforts like transitioning our supply chain to renewable electricity and sourcing recycled content.

Read more on page 12.

## Increased our use of recycled materials

We're making steady progress on our journey toward using only recycled or renewable materials in our products. In 2024, approximately 99 percent of tungsten, 71 percent of aluminum, 53 percent of lithium, and 40 percent of gold; and 76 percent of cobalt in our products came from recycled sources.[3] In 2024, 24 percent of the materials we shipped in Apple products, by weight, came from recycled sources.[4]

Read more on page 15.

## Enhanced repairability features

In 2024, we introduced design and software features to improve device repairability. The iPhone 16 debuted a new, faster process for removing the battery from the enclosure — using low-voltage electricity. We've improved support for third-party parts used in repair. And Repair Assistant, launched with iOS 18, allows customers and repair professionals to configure new and used Apple parts directly on the device.

Read more on page 40.

## Launched the first carbon neutral Mac

In October 2024, we announced the carbon neutral Mac mini, made with over 50 percent recycled content. The electricity used to manufacture Mac mini is sourced from 100 percent renewable energy. We've also invested in clean energy projects worldwide to address product use and prioritized lower-carbon shipping modes to reduce emissions. These actions have reduced the carbon footprint of Mac mini by over 80 percent from a business-as-usual scenario.[2] To offset the remaining emissions, we apply high-quality carbon credits from nature-based projects.

Read more on page 20.

## Expanded the use of recycled rare earth elements across our products

We now use 99 percent recycled rare earth elements in all magnets of our products. In 2024, more than 80 percent of the total rare earth elements that we shipped in products came from certified recycled sources — up from 75 percent in 2023.

Read more on page 15.

# Goals and progress

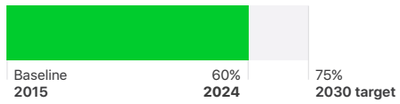
## Emissions

Apple 2030 is our science-based commitment to achieving carbon neutrality for our entire carbon footprint, including transitioning our entire value chain to 100 percent clean electricity.[5]

Become carbon neutral for our corporate operations.

Read more on our approach to carbon neutrality


Achieve carbon neutrality for our entire carbon footprint by 2030 — reducing related greenhouse gas emissions by 75 percent compared with 2015.[6]




Read more on our Apple 2030 goal

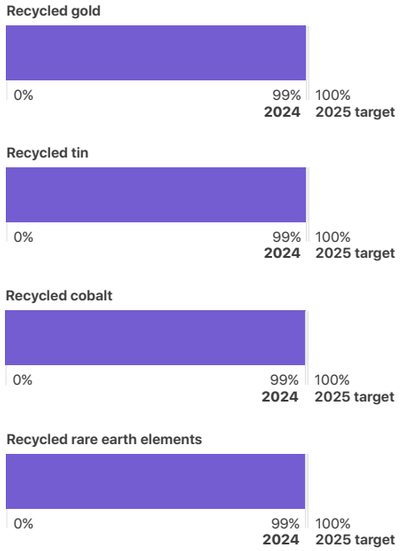
## Materials

We're committed to one day using only recycled or renewable materials in our products and packaging, and to enhance material recovery.[7]

Transition to 100 percent recycled cobalt, tin, gold, and rare earth elements in select components and applications by the end of 2025.[8]

- Gold plating in all Apple-designed rigid and flexible printed circuit boards
- Tin soldering in all Apple-designed rigid and flexible printed circuit boards
- Cobalt in all Apple-designed batteries[9]
- Rare earth elements in all magnets

Read more on the expansion of recycled materials in our products




Remove plastics from our packaging by the end of 2025.[10]

Read more about our efforts to shift to 100 percent fiber-based packaging


## Resources

We're committed to stewarding water resources and working to eliminate waste sent to landfills.

Replenish all of our corporate freshwater withdrawals in high-stress locations by 2030.[11]

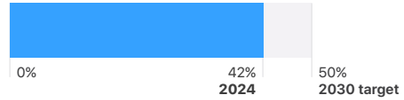
Read more about our water strategy and progress


Certify all Apple-owned data centers to the Alliance for Water Stewardship (AWS) Standard by 2025.[12]

Read more about our water strategy and progress


Increase supplier participation in the Supplier Clean Water program, prioritizing high water stress locations and driving participants to an average 50 percent water reuse rate by 2030.[13]

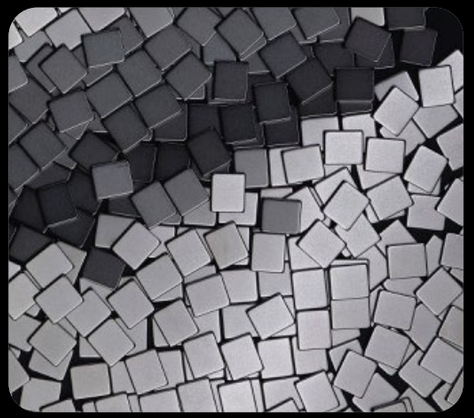
Read more about our water strategy and progress

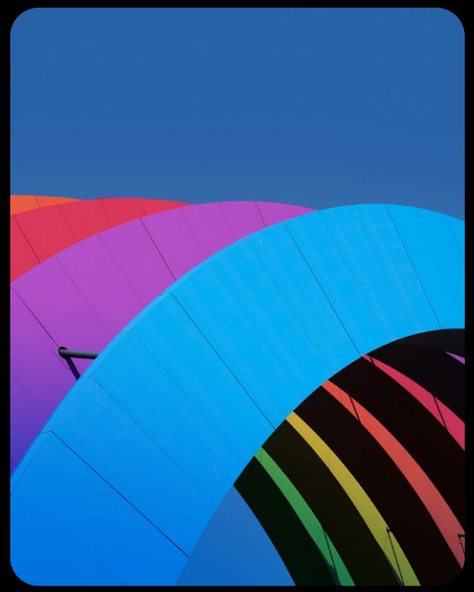



Eliminate waste sent to landfill from our corporate facilities and our suppliers.

Read more about our Zero Waste Program and progress

# Environmental Initiatives





**In this section**

Overview

# Environmental Initiatives

## Apple 2030

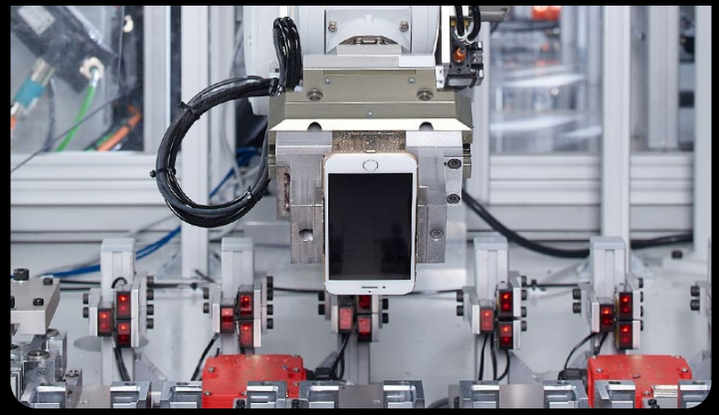
**Apple 2030 is our commitment to be carbon neutral for our entire carbon footprint. Our journey to 2030 is focused on first reducing our scope 1, 2, and 3 greenhouse gas emissions by 75 percent compared with 2015, and investing in high-quality carbon removal solutions for the remaining emissions.**

Design and materials
Electricity[14]
Direct GHG emissions
Carbon removal

## Resources

**We aim to make durable, long-lasting products and enhance material recovery. And we're committed to stewarding water resources and working to eliminate waste sent to landfills.**

Product longevity
Material recovery
Water
Zero waste



## Smarter Chemistry

**Through innovation and material selection, we design our products to be safer for anyone who assembles, uses, or recycles them — and to have less of an impact on the environment.**

Mapping
Assessment
Innovation

# Apple 2030

**In this section**

# Apple 2030 journey

## Where we've been

**2015**

**Launched**
Supplier Clean Energy and Energy Efficiency Programs established, partnering with global suppliers to transition the energy used to manufacture Apple products to renewable energy

**2018**

✓ Achieved
100% renewable electricity generated or sourced for our corporate operations

**2020**

✓ Achieved
Carbon neutrality for our corporate operations and announced 2030 targets

**2021**

**Launched**
Restore Fund to advance nature-based carbon removal projects

**2023**

**Introduced**
our first carbon neutral products in the Apple Watch lineup[15]

**Codified**
100% renewable energy mandate added to our Supplier Code of Conduct applicable to all suppliers for the manufacturing of Apple products

## 2024 activities

**24%**
of the material shipped in products came from recycled or renewable sources[16]

**Expanded**
our carbon neutral product lineup to Apple Watch Series 10 and Mac mini

**Introduced**
supplier commitments to abate at least 90% of their facilitywide F-GHG emissions in support of our Apple 2030 goal

**8.4 MT $CO_2e$**
avoided F-GHG emissions through our display and semiconductor suppliers' abatement efforts

## Where we're going

**2025**

Goal
**Use**
100% recycled cobalt in all Apple-designed batteries[17]

100% recycled tin soldering and 100% recycled gold plating in all Apple-designed rigid and flexible printed circuit boards[18]

100% recycled rare earth elements in all magnets across all products[19]

Goal
**Transition**
to 100% fiber-based packaging by the end of 2025[20]

**2030**

**Apple 2030**
To be carbon neutral for our entire carbon footprint by 2030[21]

Approach

# Apple 2030

**We're committed to our ambitious, science-based Apple 2030 goal to reduce our collective scope 1, 2, and 3 emissions — upstream and downstream — by 75 percent before balancing the remaining emissions with high-quality carbon removals. To achieve this goal, we're reducing emissions across our value chain and directing our efforts toward decarbonizing the largest sources of emissions. We've cut emissions across our value chain by more than 60 percent since 2015. During the same period, our revenue grew by more than 65 percent.**

We accelerated our progress with our transition to sourcing 100 percent renewable electricity for our offices, retail stores, and data centers in 2018. And in 2020, we achieved carbon neutrality for our corporate emissions, which we've maintained annually.[22]

Decarbonizing our supply chain is a crucial component of our efforts. We're driving progress by expanding our suppliers' sourcing of renewable energy and increasing the use of recycled and renewable materials in manufacturing our products. Our initiatives emphasize achieving emissions reductions before applying high-quality, nature-based credits.

Our goal is consistent with the Intergovernmental Panel on Climate Change's (IPCC) recommendation for global carbon neutrality.[23] We're also committed to working toward reaching a 90 percent reduction in emissions from our 2015 baseline by 2050. Achieving deep decarbonization will require a collective, global effort across industries and economies. And while reaching a 90 percent reduction in emissions is outside Apple's or any one company's control, we're committed to taking actions that support this goal. To catalyze change beyond our footprint, we're engaging with stakeholders and communities to identify opportunities to expand the use of recycled materials and renewable energy. For more details, read our Engagement and Advocacy section.

## Apple 2030 roadmap

**Design and materials**
Designing products and manufacturing processes to be less carbon intensive through thoughtful material selection, increased material efficiency, greater product energy efficiency, the use of recycled and renewable materials in our products and packaging, and enhanced material recovery

Read more on page 13

**Electricity**
Increasing energy efficiency at our facilities and transitioning the electricity throughout our entire value chain — including manufacturing and our customers' product use — to 100 percent clean electricity by 2030

Read more on page 23

**Direct GHG emissions**
Reducing direct greenhouse gas emissions across our facilities and supply chain through process innovation, emissions abatement, and shifting away from fossil fuels

Read more on page 31

**Carbon removal**
In parallel with our emissions reduction efforts, scaling up investments in carbon removal projects, including nature-based solutions that can protect and restore ecosystems worldwide

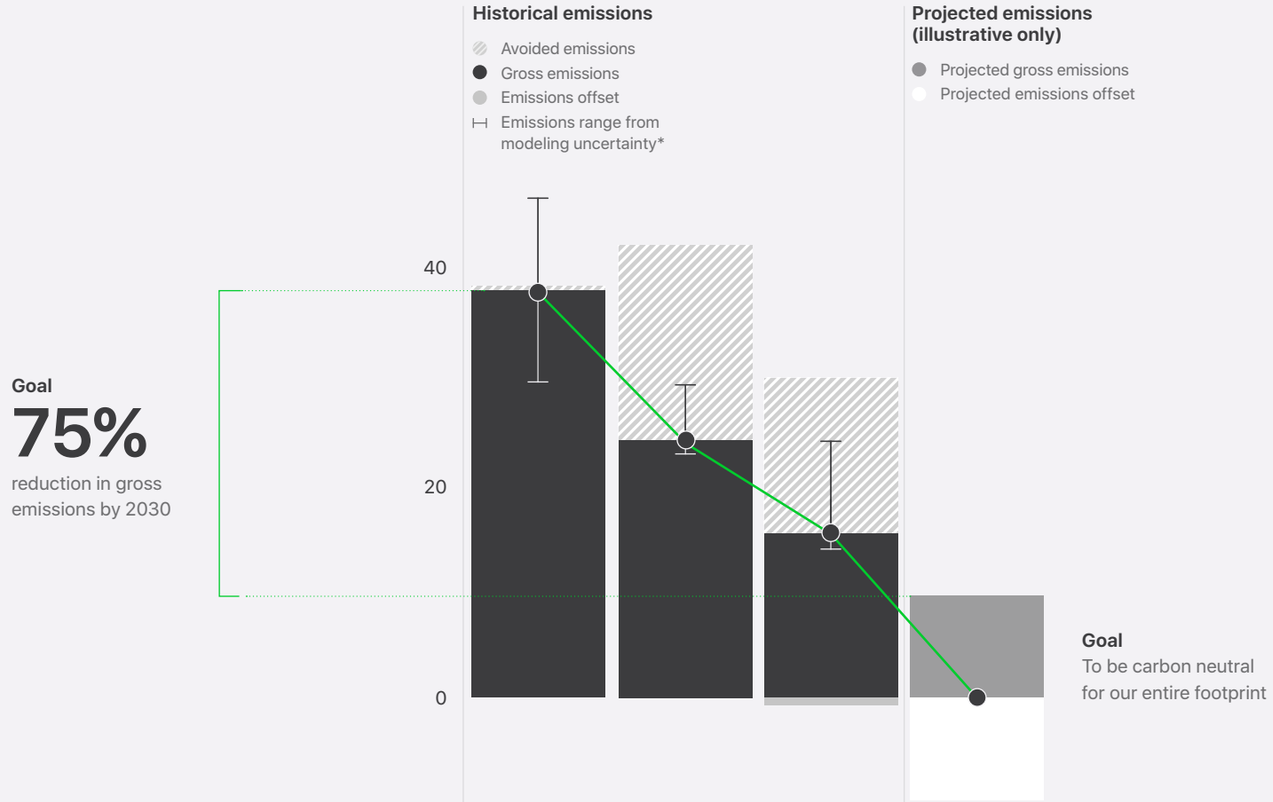
Read more on page 35

**≥75%**
emissions reduction

**≤25%**
remaining footprint

## Apple’s progress toward carbon neutrality

We’ve reduced our entire carbon footprint by more than 60 percent compared with 2015




| Million metric tons $CO_2e$ per fiscal year | 2015 | 2019 | 2024 | 2030 |
|---|---|---|---|---|
| **Gross emissions** | 38.4 | 25.1 | 15.3 | |
| **Carbon offsets/removal** | – | – | 0.7 | |
| **Net emissions** | 38.4 | 25.1 | 14.5 | |

* Error bars: We’re continuously refining our methodology as well as boundaries to model our carbon footprint, but inherent uncertainty remains in modeling greenhouse gas emissions, as illustrated by the error bars in this graphic. The error bars are based on assumptions, standards, metrics, and measurements believed to be reasonable at the time of preparation, but should not be considered guarantees that any error will fall within the range indicated by the graphs.

Note: Totals might not add up due to rounding.

**Achieving progress that benefits business**

We underpin our climate strategy with strong business principles and innovation, harnessing the power of markets to replicate our solutions at scale — aiming to create the impact necessary to meet global reduction targets. We’re also working to accelerate the global transition toward decarbonization, exploring the next generation of solutions, and advocating for more effective policies. These efforts include fostering new and strengthened collaborations in public and private partnerships and investing in technological advancements. We’ve issued $4.7 billion in green bonds to model how businesses can drive investments to reduce global emissions. Our most recent offering in 2019 supported 74 global projects that will mitigate or offset 33.4 million metric tons of $CO_2e$. To learn more about our work, read our Green Bond Impact Report.

Science and transparency guide our efforts. Our emissions reduction targets align with what current climate science shows is necessary to adhere to a 1.5° C pathway with no or limited overshoot. We calculate our footprint across our entire value chain, covering both direct and product-related emissions — from sourcing materials to end of life. We use the results of our detailed carbon accounting to adjust our Apple 2030 roadmap, which lays out our plan to become carbon neutral. And we’re committed to disclosing our carbon footprint, as well as our climate strategy and progress. Transparency and disclosure are essential not only for sharing our climate strategy and progress, but also for inviting others to collaborate with us. Our annual Environmental Progress Report, as well as our response to the global disclosure nonprofit CDP, provides details on our progress. Read our latest response to the CDP Climate Change 2024 questionnaire (PDF).

And progress needs to include low-income and historically marginalized communities that often bear the brunt of climate change. We’re pursuing ways to directly support these communities in our climate programs. To learn more about our work, read our feature on our Power for Impact program.

# Apple's comprehensive carbon footprint

Metric tons $CO_2e$


## Total avoided emissions

# 41Mmt

## Net Greenhouse Gas Emissions*

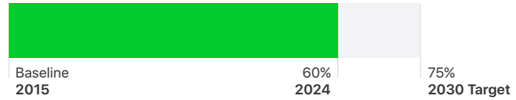
# 14.5Mmt

**Goal**

Achieve carbon neutrality for our entire carbon footprint by 2030 — reducing related emissions by 75 percent compared with 2015.

**Progress**

We estimate that in 2024, our environmental programs avoided 41 million metric tons of emissions across all scopes. Our long-standing initiatives continue to yield clear results, including sourcing 100 percent renewable energy for our facilities, transitioning suppliers to renewable energy, and using low-carbon materials in our products.[24] While our revenue has grown by more than 65 percent since 2015, our gross emissions have decreased by more than 60 percent during the same period.




* Net greenhouse gas emissions represents our total gross footprint minus carbon offsets. Percentages shown for each emissions category represent the share of Apple's gross footprint. Annual avoided emissions may exceed the reduction in emissions from our baseline footprint due to various factors, such as business growth. Totals add up to more than 100 percent due to rounding.

** Low-carbon materials represents emissions savings from transitioning to recycled materials in our products and using low-carbon aluminum. For details, see page 30.

† Clean energy represents emissions savings from clean energy procured by Apple or its suppliers.

‡ Business operations includes business travel, employee commutes, working from home, fuels and other energy-related activities, and the use of other cloud services.

# Design and materials

Our purpose

**We design our products to be less carbon intensive by prioritizing the use of recycled and renewable content and low-carbon materials while focusing on the energy efficiency of our software and hardware. We're working toward a future where every Apple product will be created from and contribute to circular supply chains. The design and material choices we make across our products also support reducing our carbon footprint.**

Our path

**Design and materials address emissions from:**

Product manufacturing (Scope 3)

Product use (Scope 3)

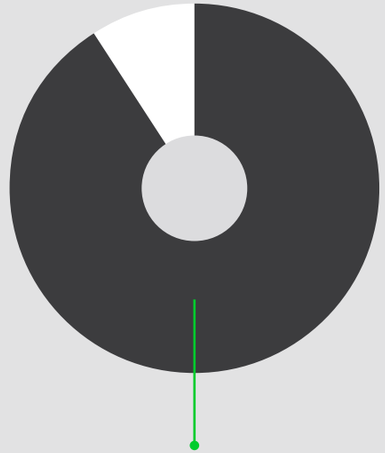
Product transport (Scope 3)

Our progress

**More than doubled the use of certified recycled lithium and zinc shipped in our products in 2024[25]**

Our progress

**iPhone 16 uses more than 95 percent recycled lithium in the battery, a first for Apple[26]**



95%

Our progress

**We now use 99 percent recycled rare earth elements in all magnets in our products**

## Our approach

Innovation drives our efforts around circularity — from the materials we source and the product design choices we make to the recycling and recovery innovations we pursue. We prioritize the materials and components that account for significant portions of our greenhouse gas emissions. This means that the choices we make product by product can scale toward reducing our overall footprint. These priorities inform our work to design for material efficiency and increase our use of recycled and renewable materials.

We're also continually improving our approach to calculating our product carbon footprint. In 2024, we updated our modeling process to capture more detailed emissions data on product use and logistics. For product use, we're now using data from a variety of sources, including field telemetry from users who opt-in to sharing device analytics and modeling battery drain from activities such as movie and music playback, rather than relying on testing data to estimate these figures. With product logistics, we're using improved data on how our products move from our manufacturers to our customers, paired with more detailed emissions information on transportation modes, including sea and air.

We aim to create products that use circular supply chains to one day end reliance on mined resources while meeting our rigorous standards for quality, durability, performance, and environmental and social protections. And we also maintain strict standards for responsibly sourcing materials from primary, recycled, and renewable sources. Our actions can inspire others to support building circular supply chains.

Working to positively influence the markets where we work and communities worldwide, advocating for policy that enables circular supply chains, and inspiring others to follow suit — these are the opportunities that drive us through the challenging work of creating circular supply chains.

Transitioning to recycled content

### iPhone 16e, iPhone 16, and iPhone 16 Plus use 85 percent recycled aluminum in their enclosures

## Using recycled materials to lower our product carbon footprint

We're reducing the carbon footprint of our products through the materials we select. Our strategy is to transition to materials that are manufactured using low-carbon energy and recycled content.[27] We've prioritized the materials and components that make up a large part of our product carbon footprint to move us closer to our goal of carbon neutrality. And to accelerate collective efforts, we signed on as a founding member of First Movers Coalition's near-zero emissions primary aluminum commitment for 2030 (see more on page 75).

Our use of aluminum exemplifies Apple's approach: We're transitioning to recycled content, and where we haven't yet, we're moving to low-carbon suppliers and exploring technological innovations to decarbonize — like ELYSIS aluminum, which was smelted without generating greenhouse gas emissions (see page 32). We've continued to use 100 percent recycled aluminum in the enclosures of many Apple products: Apple Watch Series 10, Apple Watch SE, iPad, MacBook Air, MacBook Pro, Mac mini, Mac Studio, and the Siri Remote. We use 100 percent recycled aluminum in the frame and battery enclosure of Apple Vision Pro. And with iPhone 16e, iPhone 16, and iPhone 16 Plus, we've increased recycled content by using 85 percent recycled aluminum in their enclosures.

Our first priority is to recover as much as possible of our own scrap at high quality. Since recycled aluminum manufacturing emits less carbon than newly mined materials, we look to other postindustrial and postconsumer sources for high-quality recycled aluminum. These emissions reduction efforts have reduced our aluminum-related emissions by 76 percent since 2015 and they now represent less than 7 percent of our product manufacturing footprint, compared with 27 percent in 2015.

We increased the content of certified recycled gold across all product lines — from 1 percent in 2021 to approximately 40 percent in 2024. This includes everything from the gold plating on multiple printed circuit boards to applications such as the USB-C connector on iPhone.

## Prioritizing our efforts

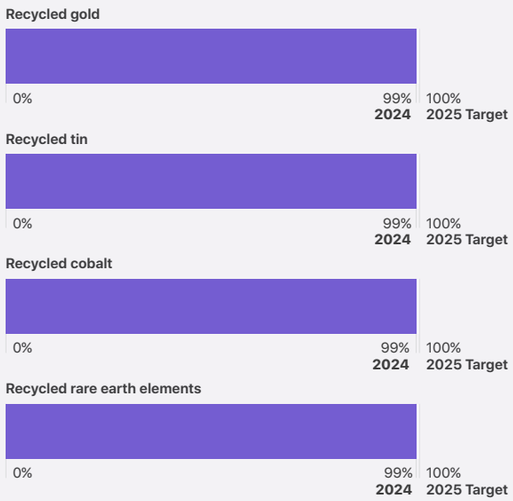
We're making progress toward our goal of sourcing only recycled and renewable materials for our products: In 2024, 24 percent of the materials contained in products shipped came from recycled or renewable sources.[28]

### Goals

Transition the following to 100 percent recycled by the end of 2025:[29]

- Cobalt in all Apple-designed batteries
- Tin soldering in all Apple-designed rigid and flexible printed circuit boards
- Gold plating in all Apple-designed rigid and flexible printed circuit boards
- Rare earth elements in all magnets across all products

### Progress




We've focused our efforts on 15 priority materials based on a broad range of environmental, social, and supply chain impacts. Each are outlined in detail in our Material Impact Profiles white paper.[30] Our priority materials consist of aluminum, cobalt, copper, glass, gold, lithium, paper, plastics, rare earth elements, steel, tantalum, tin, titanium, tungsten, and zinc, and they account for 87 percent of the total product mass shipped to our customers in 2024.

Maintaining our standards for recycled and renewable materials is essential to our journey to create a circular supply chain. Our requirements are based on international standards for recycled content and responsible resource management. By requiring certification to these standards, we're able to confirm that a material has been recycled or comes from a renewable source — one that can continually produce without depleting the earth's natural resources. We approach materials from new sources with the same rigor, evaluating each one for the safety of the material's chemistry. This process allows us to scale our use of materials that are better for the environment and safer for use in our products. Recycled material is certified by third parties to a recycled content standard that conforms with ISO 14021. Total recycled content numbers also include supplier-reported recycled content checked by Apple but not third-party certified.

Our teams are overcoming obstacles to creating closed loop supply chains, including material performance and traceability. This is possible through our work with a diverse group of partners stretching from suppliers to metallurgists to product designers. For example, we were able to design an alloy that meets our rigorous design performance standards and contains 100 percent recycled aluminum.

Barriers to our progress remain — including challenges within our control and those outside our direct influence. Addressing these requires a collective response. Through collaboration across the value chain, we can achieve impact felt beyond our business. The supply chains we're helping innovate serve more than just our product needs — they help promote the availability of competitively priced, quality recycled and renewable materials across geographies.

## Key challenges to developing circular supply chains

**Technical properties**
While many recycled or renewable materials have indistinguishable technical properties, some may differ from the conventional material. This needs to be accounted for during product design and manufacturing. For example, select recycled plastics differ in properties from other plastics. The composition of other recycled materials can also be impacted by some level of contamination during the recycling process.

**Availability and access**
The supply of recycled and renewable materials can be constrained by the limited availability of recoverable material or production of renewable content. When supply exists in some locations around the world, new suppliers need to be incorporated into supply chains for the material to be accessed. Technological limitations in recovering materials from complex waste streams can pose challenges to efficiency and effectiveness.

**Supply chains**
Recycled or renewable content may not be easily accessible on the market, requiring the development of new supply chains.

**Traceability**
Information about the source of materials — whether mined, recycled, or renewable — might not be readily available.

**Scale**
Materials for a single component can come from hundreds of different suppliers, requiring exponentially more effort as we scale the use of high-quality recycled or renewable materials across components and products.

**Regulatory barriers**
Transboundary movement regulations — created to establish critically important community and environmental protections — can have the unintended consequence of inhibiting material recovery and movement to recyclers or refiners for use in new products. Apple supports the U.S. ratification of the Basel Convention to better support recycling and recovery with this key geography. To learn about our support of other policies that enable circular supply chains while improving social and environmental protections, read the Apple 2030 policy platform.

# Progress across our 15 priority materials

## Aluminum

In 2024, approximately 71 percent of the aluminum in products we shipped to customers came from recycled sources.[31] Learn more on page 14.

## Cobalt

In 2024, 76 percent of the cobalt shipped in our products — up from 52 percent in 2023 — came from certified recycled sources using mass balance allocation.

## Copper

In 2024, we achieved 100 percent recycled copper in multiple printed circuit boards across products.[32] We also introduced 100 percent recycled copper in multiple thermal module components of Mac mini, 16-inch MacBook Pro, and iMac (four ports).[33]

## Glass

We expanded our use of recycled glass to select components of Apple Watch Series 10 and iPad mini.

## Gold

In 2024, our use of recycled gold increased to about 40 percent across all product lines — up from 1 percent in 2021.

## Lithium

In 2024, approximately 53 percent of the lithium shipped in our batteries came from certified recycled sources using mass balance allocation, including postindustrial scrap and postconsumer scrap from end-of-life batteries — up from 24 percent in 2023.

## Paper

For information about our progress with paper, see our feature on packaging.

## Plastics

In 2024, we used at least 50 percent recycled plastic in 20 components of iPhone 16 and iPhone 16 Plus. We also used 25 percent recycled plastic in the antenna lines, made from upcycled plastic bottles.

## Rare earth elements

In 2024, more than 80 percent of the total rare earth elements that we shipped in products came from certified recycled sources — up from 75 percent in 2023.

## Steel

In 2024, we introduced the use of 80 percent recycled steel in the speaker attachment and Taptic Engine in Apple Watch Series 10.

## Tantalum

We continue our efforts to source 100 percent recycled tantalum and are actively investigating recovery solutions from end-of-life electronics to expand the availability of recycled tantalum.

## Tin

In 2024, we used more than 45 percent recycled tin on average across all product lines — up from 40 percent in 2023.

## Titanium

In 2024, Apple Watch Series 10 contained 95 percent recycled titanium in the case.

## Tungsten

In 2024, approximately 99 percent of the tungsten used came from recycled sources. Our disassembly robot, Daisy, and our recycling machine, Dave, helped recover and recycle tungsten from the Taptic Engine in our products.

## Zinc

Mac mini contains 100 percent recycled zinc in the AC inlet prongs and multiple small parts.

### Challenges

- Technical properties
- Availability and access
- Traceability
- Scale
- Regulatory barriers
- Supply chains

## Increasing recycled content in our products

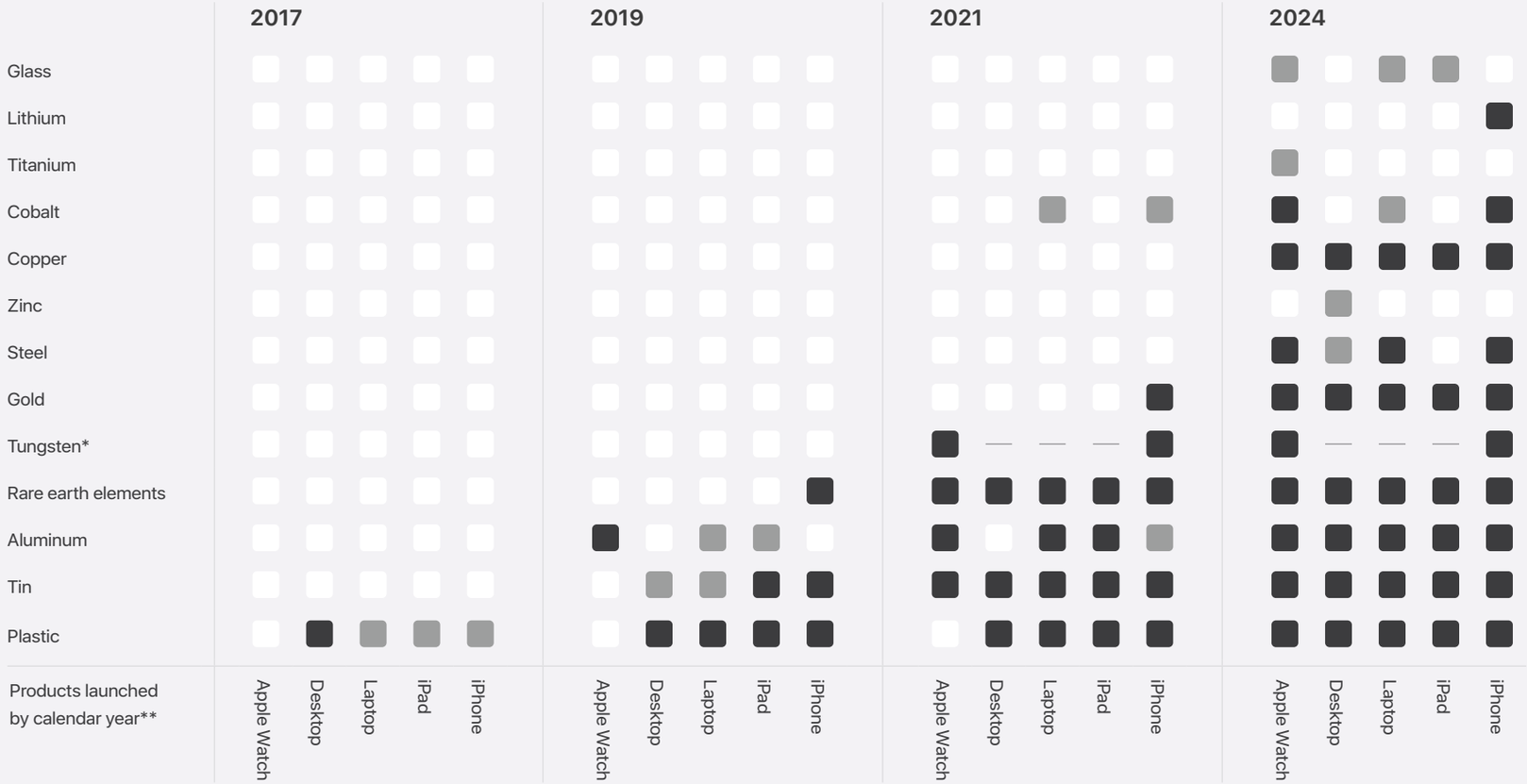
We're progressing toward our goal of relying solely on responsibly sourced recycled or renewable materials for our products and packaging. The source of the materials we rely on matters to us — we value materials that don't deplete the earth's resources.

In 2024, we accomplished the following material achievements:

- In the iPhone 16 lineup, we used 100 percent recycled cobalt and over 95 percent recycled lithium in the battery.[34]
- In Mac mini, we used 100 percent recycled gold in the plating of all Apple-designed printed circuit boards.
- In Apple Watch Series 10, we used 100 percent recycled tin in the solder of all Apple-designed printed circuit boards.

These and other innovations helped us increase our use of recycled or renewable content to 24 percent of all the material shipped in products in 2024.[35]

## Our transition to certified recycled materials by product line




● All products launched in the calendar year include certified recycled content.

● Some products launched in the calendar year include certified recycled content.

○ No products launched in the calendar year include certified recycled content.

— Recycled content is not applicable.*

* Material is considered "not applicable" if it's found only in trace amounts dispersed across modules.

** This chart reflects minimum recycled content by product. Some products may contain additional recycled material depending on production run or component availability. Please see our Product Environmental Reports for more information.

FEATURE

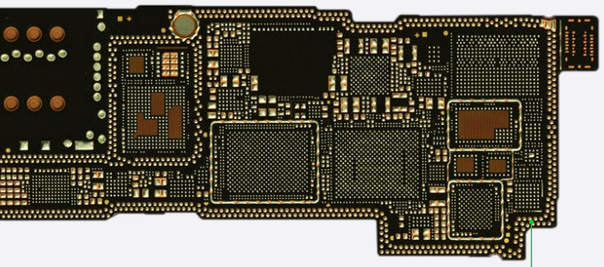
# Building a supply chain of recycled gold

**Over the past four years, we've significantly expanded the use of recycled gold shipped in our products — from just 1 percent in 2021 to 40 percent in 2024. And the progress doesn't stop with our products alone — by innovating with our suppliers to source, refine, and use more recycled gold across their businesses, we're extending our impact across the entire electronics industry.**

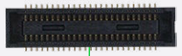
While used in low volumes, gold is an essential material in the circuit boards, connectors, and chips of Apple products. It offers excellent corrosion resistance, high electrical conductivity, and durability when alloyed with nickel or cobalt. But refining a small amount of gold requires mining a large amount of ore, making its carbon footprint significant.

That's why, across every component that uses gold, we're focused on building recycled gold supply chains that meet our high standards for responsible sourcing and performance. This requires close collaboration with suppliers to provide technical assistance, validate that recycled gold maintains component performance, and conduct rigorous due diligence processes, including compliance screenings, third-party traceability assessments, and certification audits.

Our efforts to expand the use of recycled gold in the plating of Apple-designed connectors, such as the USB-C connectors in the iPhone 16 lineup, have been especially successful. In 2024, we doubled the number of suppliers qualified to manufacture these custom-made connectors with 100 percent certified recycled gold. Now, these suppliers can apply what they've learned with us to other parts of their business, like in the standard connectors they build for our products and for their clients across the electronics industry. Today, 99 percent of the connectors in our products, both custom and standard, use 100 percent recycled gold plating. This progress, which extends beyond Apple, is the kind of ripple effect we hope to achieve with all our work.



**Printed circuit boards**
In 2024, Mac mini became our first product to use 100 percent recycled gold in all Apple-designed printed circuit boards



**Standard connector**
As of April 2025, 99 percent of our custom and standard connectors use 100 percent recycled gold plating, enabling use by others in the industry

**AirPods Pro 2**
100 percent recycled gold in the plating of multiple printed circuit boards

**Camera**
100 percent recycled gold used in the wire of all cameras of the iPhone 16 lineup

**USB-C connector**
100 percent recycled gold used in the USB-C connector of the iPhone 15 and iPhone 16 lineups

Packaging efficiency

**We designed Apple Watch Series 10 packaging to be smaller and more efficient than Apple Watch Series 9 packaging, reducing the volume by about 10 percent and increasing the number of boxes we can fit onto a shipping pallet.**

**Responsible sourcing of materials**

We require our suppliers to source our materials responsibly for both primary and recycled materials. Our Responsible Sourcing of Materials Standard is based on leading international guidance, including the United Nations Guiding Principles on Business and Human Rights and the Organisation for Economic Co-operation and Development (OECD) Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas. In 2024, 100 percent of the identified tin, tantalum, tungsten, gold (3TG), cobalt, and lithium smelters and refiners in Apple's supply chain completed third-party audits.

We require our suppliers to review reported incidents and public allegations involving their materials' supply chains, and to mitigate identified risks. In addition, suppliers must only use or source key materials in our supply chain from smelters, refiners, and recyclers who have completed, or demonstrated progress toward completion of, responsible sourcing audits. We also map the smelters and refiners suppliers use for other materials in our products — such as mica, copper, graphite, and nickel — and we evaluate suppliers' supply chain due diligence for compliance with our requirements. As we build supply chains for recycled materials, we partner with the smelters and refiners that are able to meet and maintain our standards.

**Industry collaboration**

We continue to drive progress in our broader industry through multiple initiatives. For example, we worked directly with WBCSD to create the Critical Materials Collective and held the kickoff at 2024 Climate Week. This initiative is focused on demonstrating action, starting with a focus on materials that have immediate policy, investment, and collaboration opportunities: aluminum and copper. We're also on the steering committee of the Responsible Minerals Initiative (RMI) — one of the most commonly used resources for companies working to source minerals responsibly in their supply chains. We're a supporter of the First Movers Coalition for Aluminum, whose focus is to aggregate demand signals for low-carbon technologies and materials.

Using recycled and renewable materials helps lower our carbon footprint, moving us closer to our climate goals. To fulfill the transition to these materials, we're working with policymakers to support international standards that enable the use of these materials globally.

Apple is committed to setting strict standards for responsible sourcing of the materials used in our products. For more information, read our People and Environment in Our Supply Chain Annual Progress Report and our Conflict Minerals Report.

## Improving material and manufacturing efficiency

Making our manufacturing processes more efficient creates less waste and helps us make the most of the materials that we use. We're also working to design our products and packaging so that they require less material, helping reduce emissions from transporting and processing materials.

For example, in 2024, we redesigned the packaging for Apple Watch Series 10 to be smaller and more efficient than Apple Watch Series 9 packaging, reducing the volume by about 10 percent and increasing the number of boxes we can fit onto a shipping pallet. This effort is a continuation of reducing the packaging volume of Apple Watch Series 9 compared with Apple Watch Series 8. We reduced the volume of the Apple Watch Series 10 box by more than 30 percent compared with Series 8 and increased the total number of boxes we can fit onto a pallet by 42 percent, meaning we can ship more watches on fewer trips. And as we progress toward our 2030 carbon neutrality goal, we're investigating new materials and new ways to manufacture packaging efficiently.

Integrated circuits are at the core of technology products and, historically, have been carbon intensive to create. In support of our journey to Apple 2030, we've prioritized improving the carbon footprint of integrated circuits. We've also continued our work with the sustainable semiconductor technologies and systems research program of imec, a world-leading research and innovation hub in nanoelectronics and digital technologies in Belgium. We have two goals in this collaboration: to improve the carbon footprint models associated with leading nodes of integrated circuit production, and to use these models to identify carbon reduction opportunities for the entire integrated circuits industry. We aim to apply similar carbon footprint model improvements to other components to support our Apple 2030 journey.

We're also exploring opportunities for improved efficiency across our product manufacturing processes. In 2024, we continued to invest in research and development projects aimed at creating less waste in processing materials, reducing machining time and associated energy use, more efficiently transforming material into near-net shapes, and maximizing the recovery and reprocessing of manufacturing scrap. Once these improved processes are successfully developed, we plan to work with our suppliers as they deploy them at scale at their facilities.

## Driving product energy efficiency

Product energy use accounts for 29 percent of our gross carbon footprint — and for this reason, we work to improve our products' energy efficiency. We approach this challenge in the earliest phases of design, taking a holistic view of each product — from how efficiently the software operates to the power requirements of individual components. Apple products are consistently rated by ENERGY STAR, which sets specifications that reflect the 25 percent most energy-efficient devices on the market. In 2024, all eligible Apple products continued to receive an ENERGY STAR rating for superior energy efficiency.[36] The new Mac mini, for example, exceeded those standards, using 79 percent less energy than required for ENERGY STAR.[37]

FEATURE

# Mac mini drives progress toward Apple 2030

**In 2024, we launched the carbon neutral Mac mini, our ultracompact and efficient update to the Mac family. Mac mini marked a milestone on our progress toward Apple 2030 — every decision across the product life cycle was informed by our goals to reduce emissions and use recycled materials. Mac mini is a powerful example of how those efforts come together, delivering measurable environmental progress while maintaining the high quality customers expect.**

The Mac mini features 100 percent recycled material in the following components:

- Aluminum used in the enclosure and thermal module
- Gold in the plating of all Apple-designed printed circuit boards — the first for an Apple product
- Rare earth elements in all magnets
- Copper in multiple printed circuit boards, multiple thermal module components, AC inlet prongs, and multiple small parts[38]
- Tin in the solder of multiple printed circuit boards

**Design and source**
More than 50 percent of the materials, by weight, are recycled. The lifetime carbon emissions of Mac mini have been reduced by over 80 percent (compared to a business-as-usual scenario).[39]

**Make**
The enclosure, made through a highly efficient impact extrusion process, requires 85 percent less aluminum than its predecessor.

**Package and ship**
We use 100 percent fiber-based packaging, and over half of Mac mini shipments by weight move via non-air transportation from final assembly to their next destination — lowering transportation-related emissions.

**Use**
By redesigning Mac mini around Apple silicon, we developed a new power supply and thermal architecture to improve energy efficiency without compromising performance.

**Recover**
Recoverability was a key consideration for end of use. Our work has made it easier to remove the battery for repair or recycling.

**Energy efficiency**
Uses 79 percent less energy than ENERGY STAR requirement.[40]

**Enclosure**
The enclosure of Mac mini is about 60 percent lighter than its predecessor, which reduces the material required to make the product and lowers emissions associated with transportation.


**Anodizing**
Suppliers introduced water-saving processes in cascade rinsing for enclosure production.

FEATURE

# Innovating to reduce waste in packaging

**We're approaching our goal to remove plastics from our packaging by transitioning to 100 percent fiber-based packaging by the end of 2025.[41]**

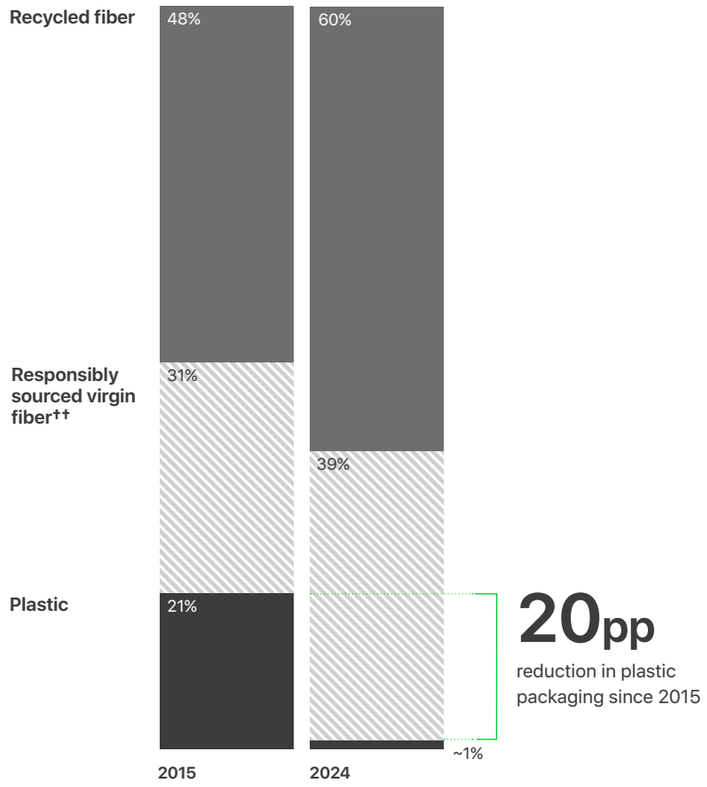
Along our journey, we've addressed many packaging components that typically rely on plastic, including large product trays, screen films, wraps, and foam cushioning. We've replaced each with fiber-based alternatives and implemented innovative alternatives to the small uses of plastics across our packaging — like labels and lamination. At the same time, we're taking steps to confirm that our packaging is recyclable and that the fiber we source comes from recycled sources or responsibly managed forests.

In 2024, we released multiple product lineups with 100 percent fiber-based packaging, including the iPhone 16, Apple Watch, and MacBook lineups.[42]

We also supported our second- and third-party vendors in their transitions to 100 percent fiber-based packaging. This group of more than 70 vendors offers approximately 1600 accessories and peripherals for Apple products. To kick off their efforts, we provided each vendor with a questionnaire to assess their current usage of plastics and identify the opportunities to use fiber-based materials. Vendors had access to our Product Development and Environment and Supply Chain Innovation teams to develop solutions for their packaging. As of January 2025, several vendors have completed the transition to fiber-based materials, while nearly 90 percent of our vendors are on track to do so by June. Many of these vendors create products that support other retailers. By joining in our goal to remove plastics in packaging by the end of 2025, some vendors are carrying their impact beyond Apple.

Apple's packaging design guidelines factor in packaging recyclability, requiring the use of fiber-based materials that can break down to pulp as part of mixed-paper recycling streams, alongside materials like cereal boxes.[43] We test our packaging to standards developed by independent industry and research organizations — including Western Michigan University, and the Confederation of European Paper Industries — and we continue to monitor evolving international packaging standards. And as we continue to reduce plastic in our packaging, we make sure that our wood, bamboo, and bagasse fibers are certified by standards such as FSC, PEFC, and Bonsucro.

## Packaging fiber and plastic footprint*† (metric tons)




* In 2022, we expanded our packaging goal boundary to better reflect our impact, resulting in an increase of about 36 percent of our total packaging mass, relative to fiscal year 2021. We include retail bags, all finished goods boxes (including plastic content in labels and in-box documentation), packaging sent to our customers as part of Apple Trade In, AppleCare packaging for whole units and service modules (with the exception of plastics needed to protect items from electrostatic discharge), and secondary packaging of Apple products and accessories sold by Apple. Our goal boundary does not include the inks, coatings, or adhesives used in our packaging. In addition to our packaging footprint, we also calculate the fiber used at our corporate facilities. In fiscal year 2024, this number was 1700 metric tons.

† By the end of calendar year 2025, we plan to remove plastic from our packaging by transitioning to 100 percent fiber-based packaging. Our goal to remove plastic from packaging includes retail bags, all finished goods boxes (including plastic content in labels and in-box documentation), packaging sent to our customers as part of Apple Trade In, AppleCare packaging for whole units and service modules (with the exception of plastics needed to protect items from electrostatic discharge), and secondary packaging of Apple products and accessories sold by Apple. Our goal does not include the inks, coatings, or adhesives used in our packaging. We plan to remove plastic from the packaging of refurbished Apple products to 100 percent fiber based by 2027, once old product packaging designs are phased out. We'll continue selling existing inventory of AppleCare packaging for whole units and service modules that contain plastics for vintage and products at end of life until it is consumed. This change will enable us to avoid waste generated by repackaging goods in new 100 percent fiber-based packaging.

†† Responsible sourcing of fiber is defined in Apple's Responsible Fiber Specification (PDF).

# Electricity

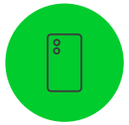
Our path

We prioritize energy efficiency in each stage in our work, from initial design through manufacturing and beyond. Achieving maximum efficiency across our footprint is essential to meeting our 2030 carbon neutrality goal. We've achieved 100 percent clean electricity across our operations, and we're working toward the same for our manufacturing supply chain and use of Apple products. By using clean electricity in place of fossil fuels, we're contributing to cleaner air and lowering greenhouse gas emissions.

Our path

Energy efficiency and renewable electricity address emissions from:

Indirect emissions (Scope 2)



Product use (Scope 3)

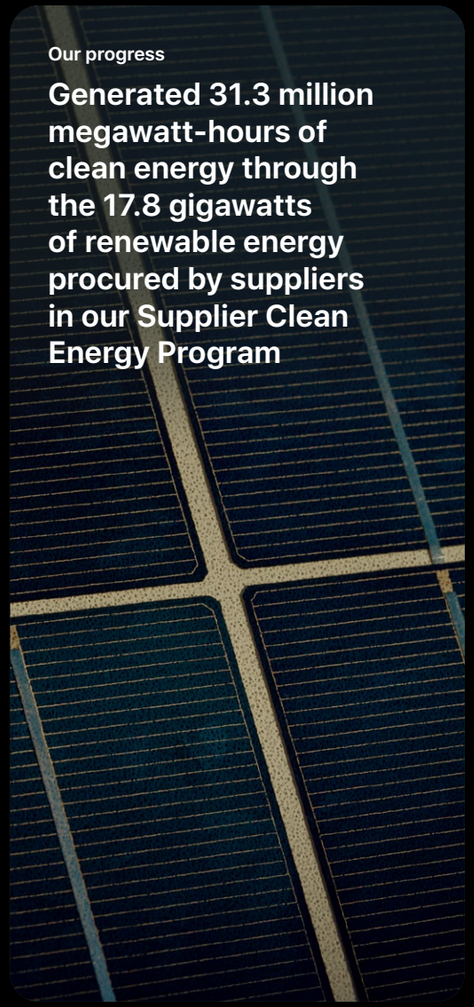
Product manufacturing (Scope 3)

Our progress

Avoided nearly 2 million MT $CO_2e$, with more than 80 supplier facilities participating in our Supplier Energy Efficiency Program

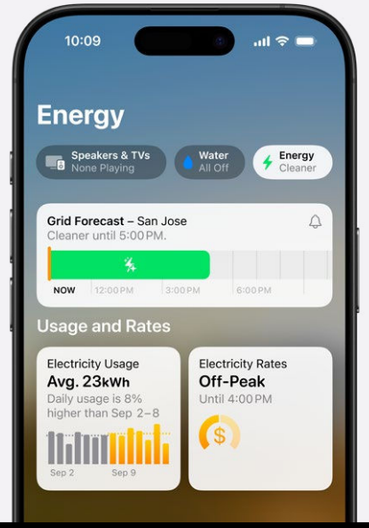
Our progress

Generated 31.3 million megawatt-hours of clean energy through the 17.8 gigawatts of renewable energy procured by suppliers in our Supplier Clean Energy Program



Our progress

Partnered with PG&E to launch the new Electricity Usage and Rates features, enabling customers to connect their PG&E account to the Home app to access, understand, and make informed decisions about their electricity use



## Operating Apple facilities efficiently

Our data centers, retail stores, and offices all source 100 percent renewable electricity, and we remain focused on implementing energy reduction measures across our facilities. We assess natural gas and electricity usage at each of these site types — as well as research and development facilities — auditing how we perform and using best practices for energy management to reduce our loads. And we design our new buildings around occupants' and lab users' specific needs, enabling us to use our facilities efficiently and productively.

**Enabling Apple Intelligence**

We remain focused on our Apple 2030 goal while offering Apple Intelligence. Many features run entirely on-device using the power of Apple silicon — reducing the need for cloud computing. For user requests that need even larger models, we've also created Private Cloud Compute hosted on Apple silicon servers at our data centers that source 100 percent renewable energy. Our unique integration of hardware and software enables energy and power efficiency at every step — from the performance and efficiency of Apple silicon to the power management software features derived from iOS, which runs on these servers. And we're optimizing inference execution and using the unique properties of Apple silicon to achieve greater efficiency.

**Measuring our progress**

Measurement is critical to maintaining building energy performance. We have a well-developed system of energy tracking and benchmarking, which includes data from utility meters that continuously monitor 15-minute electricity and daily natural gas energy consumption. This method helps us identify opportunities for performance improvement and actively manage our energy footprint.

In 2024, our energy efficiency program avoided more than 57 million kilowatt-hours of electricity, which includes savings from efficient servers, and more than 314,000 therms of natural gas through adjustments made to 4.7 million square feet of new and existing buildings.[44] Together, these recent initiatives will avoid an additional 18,000 metric tons of $CO_2e$ per year. Combined with ongoing energy savings from past years, and accounting for effective useful lifetime of legacy savings, we saved more than 93,000 metric tons of $CO_2e$ in 2024.[45]

### Data centers

Data centers are traditionally energy intensive, requiring significant resources to cool heat-generating servers and IT equipment. That's why we're continuously monitoring and improving the controls for our cooling systems. This retrospective view often enables us to increase the cooling capacity of our existing facilities, thereby maximizing the number of servers within our data center footprint. In 2024, we continued to see energy savings at data centers. A proprietary server design we deployed in 2021 that focused on energy and computing efficiency results in an additional 36 million kilowatt-hours per year in energy savings.

### Existing buildings

We have significant opportunities to save energy in retrocommissioning buildings that Apple already occupies or operates, including energy-intensive facilities like data centers. We audit the performance of buildings around the world, then deploy energy efficiency measures. Retrocommissioning focuses on building controls to optimize energy use and operational efficiency. We're reducing natural gas usage and replacing natural gas equipment with electrical. We're focused on reviewing and benchmarking our most natural gas–intensive buildings to look for reduction and fuel switching opportunities.

### Retail stores

We continue to prioritize energy efficiency and develop comprehensive energy models for stores as we work to align our design with our energy efficiency targets. We've also decarbonized even further by electrifying where possible.

### New facilities

When designing new facilities, or renovating existing facilities, we evaluate each major system as we manage our energy footprint. We select LED fixtures and install sensors and photocells to reduce light levels based on occupancy and the level of natural daylight. We install high-efficiency heating and cooling systems and transformers to reduce energy consumption from our plug loads. We take special attention to design safe, productive spaces, while still prioritizing energy savings. We also prioritize efficient compressed dry air systems and variable air-volume fume hoods for our R&D spaces.

## Improving energy efficiency in our supply chain

The manufacturing of Apple products accounts for 54 percent of our gross carbon footprint. To address this impact, we collaborate closely with our suppliers to prioritize energy reductions. Together, we work to use energy as efficiently as possible at every point in our supply chain, supporting the creation of more efficient factories all over the world. The Supplier Energy Efficiency Program, launched in 2015, helps our suppliers optimize their energy use. Implementing energy efficiencies reduces the energy intensity of manufacturing, which translates to reduced greenhouse gas emissions.

We provide technical and planning support to suppliers as they build more energy-efficient systems. We support our suppliers by helping them recognize optimization opportunities and identify solutions through energy assessments. To assist with implementation, we connect suppliers to extensive education and training opportunities — including technical assistance resources — and help them access external funding for energy efficiency projects.

Our suppliers have successfully implemented a range of energy efficiency projects, from installing light sensors and implementing free cooling systems to making boiler and HVAC system energy improvements.

We launched the Asia Green Fund in 2019 to help provide technical expertise and finance capital-intensive energy efficiency projects. As green financing mechanisms remain integral to the Supplier Energy Efficiency Program, we're exploring new approaches that connect suppliers to external funding for energy efficiency projects while scaling the program and accelerating reductions.

In 2024, more than 80 supplier facilities participated in our Supplier Energy Efficiency Program, achieving more than 2.5 billion kilowatt-hours of electricity savings and more than 2.3 MMBtu in additional energy savings. Together, we estimate that this avoided nearly 2 million metric tons of $CO_2e$, representing a 13 percent increase in savings since 2023.

## Clean electricity

**Maintaining 100 percent renewable electricity for Apple facilities**
Our retail stores, data centers, R&D facilities, and offices around the world currently source 100 percent renewable electricity. We've focused our efforts to source renewables around several key pillars:

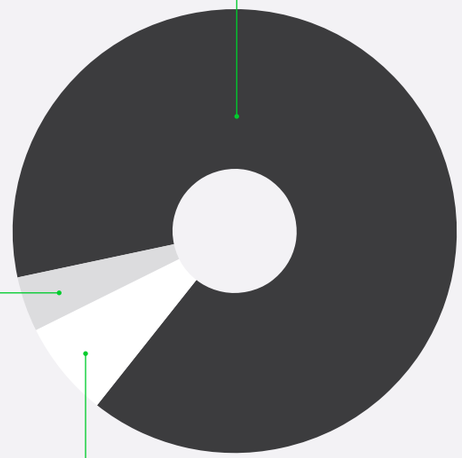
- Creating new renewable energy projects
- Undertaking projects that deliver clear benefits to local communities
- Supporting renewable energy innovations

Apple-created renewable sources account for about 89 percent of the renewable electricity that our facilities use — currently around 1.8 gigawatts. New renewable electricity projects require investment. Apple-created projects include long-term renewable energy contracts, equity investment, and direct ownership.

To address gaps in our renewable energy needs beyond what's provided by Apple-created projects, we directly purchase renewable electricity through available utility green energy programs — about 4 percent of our total corporate load in 2024. Colocation and distribution facility vendors supply about 3 percent of our total load of renewable energy. And in certain situations, we purchase renewable energy certificates (RECs), which in 2024 accounted for about 4 percent of our total load.[46] When possible, we aim for our RECs to share the same power grid as the Apple facility they support. Appendix A provides additional details on Apple's renewable energy solutions.

**Supporting social impact**
Our Power for Impact program, which launched in 2019, continues to help provide local communities with needed energy resources. With funding from Apple, local communities and organizations benefit from access to cost-effective renewable energy. Apple is currently supporting 17 renewable electricity projects around the world, including in the Philippines, Thailand, and South Africa. Read more about Power for Impact on page 29.

## Apple-created projects



**~89%**
**Long-term renewable energy contracts**
Through long-term power purchase agreements, virtual power purchase agreements, and other forms of long-term commitments, we help support new, local, and primarily solar photovoltaic and wind projects in line with our renewable energy–sourcing standards around the world.

**~4%**
**Equity investment**
Around the world, we invest capital in new solar PV or wind projects in some markets, matching the renewable energy generated with our energy use.

**~8%**
**Direct ownership**
We build our own projects — including solar, biogas fuel cells, and low-impact hydro projects — to provide renewable electricity, where feasible.

## Transitioning our suppliers to renewable electricity

The electricity that our manufacturing suppliers use represents the largest single source of greenhouse gas emissions throughout our manufacturing supply chain. That's why our efforts to facilitate our entire supply chain's transition to 100 percent renewable electricity are essential to reaching our 2030 carbon neutrality goal.

Our Supplier Clean Energy Program (CEP) helps enable suppliers' transition to renewable electricity by advocating for policy changes, providing information and access to renewable energy procurement options, and creating engagement opportunities with renewable energy experts. By engaging in this program, our suppliers can implement best practices in advocating for and procuring renewable energy across their corporate operations, including those associated with Apple production. The program also equips them to share lessons learned with other partners throughout their value chains, extending benefits beyond the scope of Apple.

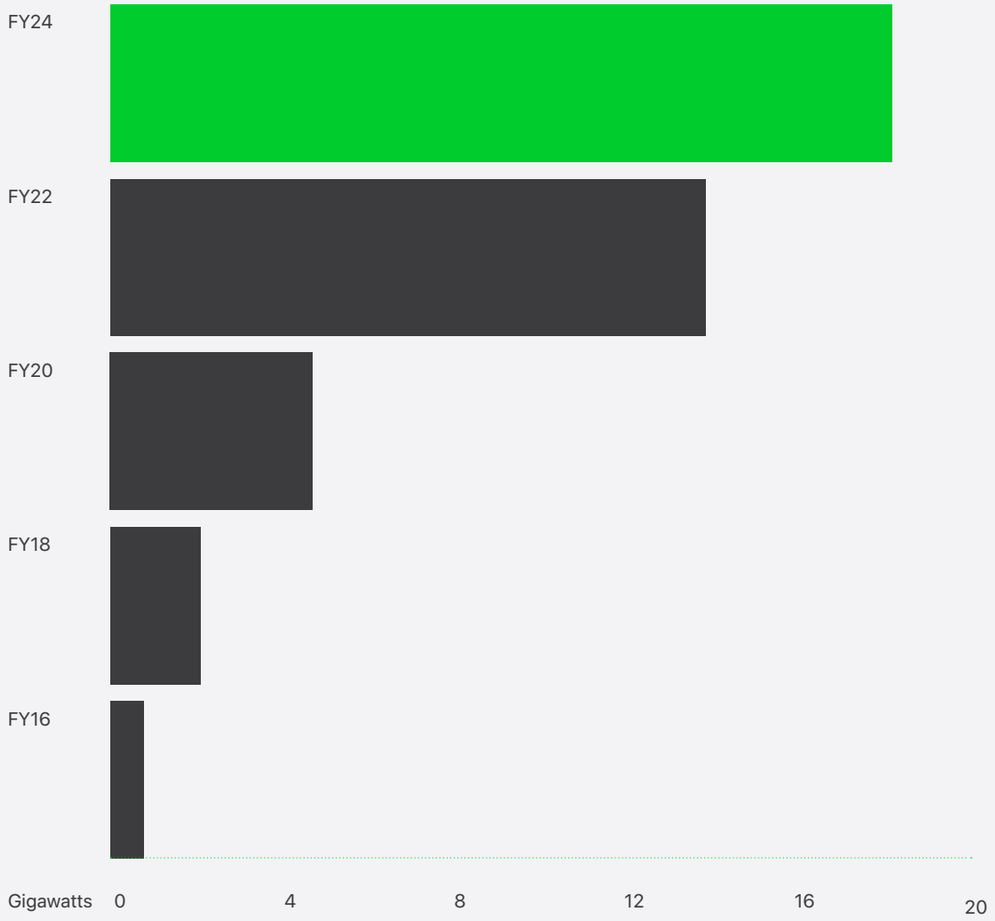
To rapidly scale and accelerate progress to Apple 2030, the Apple Supplier Code of Conduct now requires our entire direct manufacturing supply chain to use 100 percent renewable electricity for all Apple production before 2030. In 2024, the 17.8 gigawatts of renewable energy procured by suppliers and online in Apple's supply chain generated 31.3 million megawatt-hours of clean energy, avoiding 21.8 million metric tons of greenhouse gas emissions — a 17.4 percent increase over 2023.

**How suppliers are responding**

Despite growing momentum and advocacy for renewables, transitioning to 100 percent renewable electricity presents challenges: technical and regulatory barriers, the need for capital investment, and a lack of access to high-quality and cost-effective solutions. Long-standing energy policies and infrastructure that incentivize the use of fossil fuels like coal or gas can make it difficult to bring new renewable energy online in certain regions. In some cases, our suppliers are prompted to rely on less impactful interim solutions, like one-time purchases of energy attribute certificates from existing renewable energy projects. These options represent an annual cost for buyers and often offer little opportunity for cost savings or a return on investment. To overcome these challenges, suppliers are using new purchasing methods, creating renewable energy businesses, and even participating in some of the world's largest and most innovative renewable energy deals. Suppliers are also adapting to changing renewable energy markets by finding new solutions, including first-of-their-kind procurement structures in geographies that are introducing more corporate procurement options.

In China, renewable power purchase agreements are launching and the Green Power Trading program is expanding. South Korea continues to expand options for green power, including power purchase agreements. Japan has introduced virtual and physical power purchase agreements. While we've seen progress in key markets, cost-effective procurement remains challenging, and we continue to advocate for policies that enable renewable energy to compete fairly with fossil fuels and subsidized power rates, opening more avenues for our suppliers to transition to sourcing 100 percent renewable electricity (see page 77).

### Supply chain clean energy progress in gigawatts (GW)



## How we support our suppliers

**Galvanizing internal champions**

We've been able to quickly scale the Supplier Clean Energy Program by involving teams across Apple in supplier engagement, including supplier-facing Apple employees. We empower these employees with the tools to help speed a supplier's transition to 100 percent renewable electricity. Data and transparency drive this process. We track the electricity use and renewable procurement of all our direct suppliers, including those who are just beginning to learn about renewable electricity and those well on their way to using 100 percent renewable electricity. We help our suppliers measure progress and gain access to solutions. We've also continued to develop internal trainings and an engagement process for Apple employees and suppliers. By connecting our suppliers with resources and providing transparency on supplier progress, our teams are scaling impact across our supply chain.

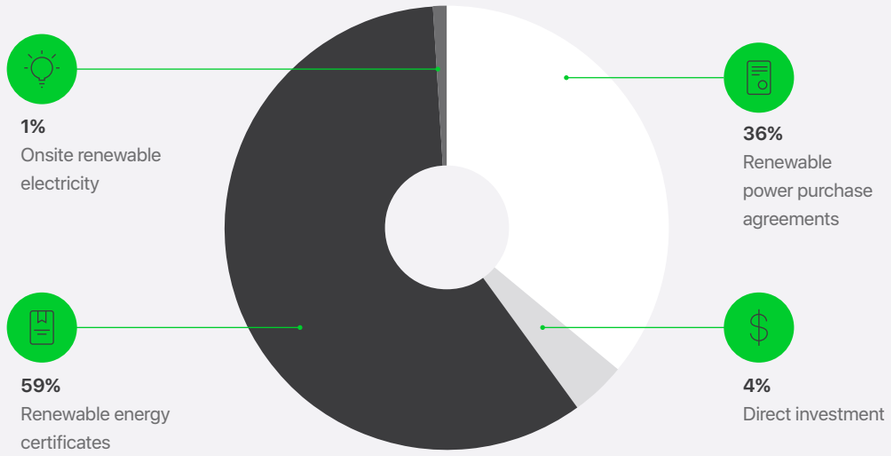
**Supporting supplier capacity**

We share the knowledge we've gained through our transition to 100 percent renewable energy with our suppliers, supplementing their efforts to identify and pursue opportunities to decarbonize as their businesses evolve. For this reason, we invest heavily in providing education and training across our supply chain through platforms such as our Clean Energy Academy, which includes advanced and customized trainings and workshops with leading experts.

In 2024, nearly 300 supplier facilities in China and Taiwan participated in our Clean Energy Academies, which were attended by renewable energy developers and other industry guest speakers. The academies offer updates on available energy procurement options in suppliers' markets, help suppliers prepare to participate in upcoming renewable energy pilots, and provide implementation guidance from local experts. This program supplements our Clean Energy Portal, available to all supplier facilities, which provides training materials, resources, and country-specific information to guide suppliers in their transition to 100 percent renewable electricity.

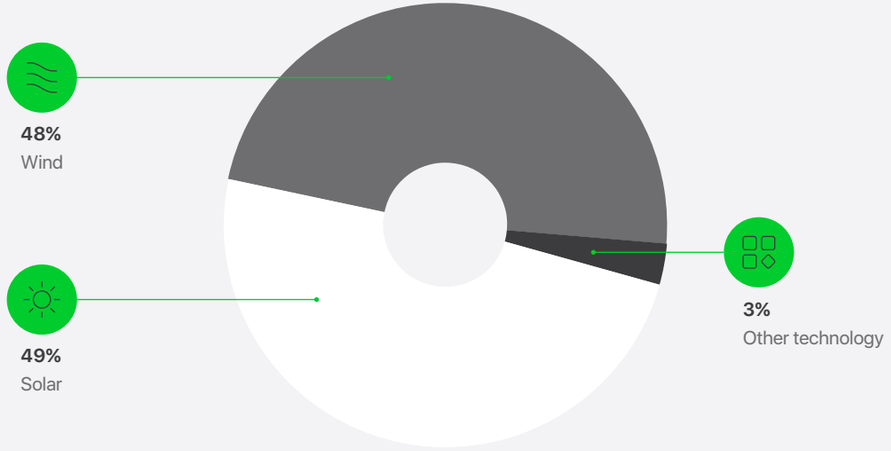
## Supplier renewable energy procurement mechanisms

Our suppliers are implementing clean energy solutions using a variety of contracting mechanisms. In 2024, suppliers relied mostly on renewable energy certificates (RECs) to meet their CEP commitments, largely due to the expansion of China's Green Electricity Certificate (GEC) system and the recognition of GECs as a primary instrument for tracking renewable energy consumption. We view the strategic use of well-designed REC programs as an important interim solution to longer-term procurement options like green tariffs or power purchase agreements (PPAs), which are becoming increasingly available across the globe. And we're working closely with our supply chain on their longer-term transitions.




## Supplier renewable energy technologies

We work with our suppliers to select projects with the greatest potential for impact and with a clear carbon, ecological, and social benefit. "Other technology" includes clean energy sources such as some forms of sustainable biomass, geothermal, and small-scale, low-impact hydro.[47]



China Clean Energy Fund

**In 2025, we launched a second fund to support renewable energy development in China. Our first fund enabled us and our suppliers to invest in renewable energy — with a total investment of more than 1 gigawatt of renewable electricity projects.**

We've continued to support the creation of a first-of-its-kind public training platform that will be available to businesses across many different industries, giving companies of all sizes — in Apple's supply chain and beyond — access to the resources and advocacy networks we've cultivated for nearly a decade. We've partnered with the Clean Energy Buyers Institute (CEBI) and other corporations to launch the inaugural Clean Energy Procurement Academy — a shared training curriculum and delivery process — which has begun hosting workshops in key markets to equip companies with the technical readiness to advance clean energy procurement, address scope 3 emissions, and decarbonize global supply chains.

Additionally, we support the creation and growth of renewable energy industry associations that include buyers, and that our suppliers can join to learn about local opportunities, such as the Asia Clean Energy Coalition and Clean Energy Buyers Association.

**Expanding access to renewable electricity**

To support our suppliers' transition to renewable electricity, we help them find high-quality solutions so they can decide how best to address their specific needs.

- **The China Clean Energy Fund:** In 2025, we launched a second fund to support renewable energy development in China. Our first fund enabled us and our suppliers to invest in renewable energy — with a total investment in more than 1 gigawatt of renewable electricity projects.
- **Power purchase agreements (PPAs):** We continue to support the global development of high-quality programs for generating and trading renewable energy certificates. We also connect suppliers with opportunities to buy renewable energy directly from project developers and utilities as those models emerge around the globe.
- **Direct investments:** To cover emissions from suppliers we don't contract with directly, we invest in additional renewable electricity projects. To date, we've directly invested in nearly 500 megawatts of solar and wind projects in China and Japan to address our upstream electricity emissions.

**Advocating for policy change**

Effective government policies and rules can remove significant barriers to low-carbon solutions and enable solutions to rapidly scale. Suppliers need clean energy investments that make financial sense to effectively transition to renewable energy. But carbon-intensive energy sources, like coal and gas, often have a price advantage because of subsidies and the ignored costs of externalities, such as greenhouse gas emissions.

Across the regions where our suppliers operate, we engage with policymakers to support renewable energy that's cost-effective, accessible to companies, and sourced from high-quality projects with a clear benefit to local markets.

For example, we're encouraging governments not to subsidize or expand carbon-intensive infrastructure. We also encourage them to keep pace with the speed of technological innovation, consider the life cycle emissions of energy solutions, and support new energy solutions that effectively reduce global emissions. Additionally, we support government efforts in beneficial electrification and the build-out of necessary transmission infrastructure, all while considering cost-effectiveness. Public investments in decarbonization should be properly supported by funds generated from establishing a price on carbon pollution.

Collaborating with groups like the Asia Clean Energy Coalition (ACEC), Corporate Energy Demand Initiative (CEDI), and RE100 — which bring together the world's most influential businesses through commitments to use renewable electricity — we've identified country-level policy barriers to procuring renewable electricity. By engaging in these initiatives and others, such as local working groups, we use local and international expertise and capacity to collate the challenges faced by member companies and advocate for critical policy shifts that support grid decarbonization. In Japan and South Korea, for example, we collaborated with other renewable energy users and called for enhancing the transparency in relevant renewable energy certificates. In China, Apple and suppliers continue to participate in meetings and events to share their experiences with renewable energy procurement, and discuss ways to improve policies and increase the availability of cost-effective solutions.

## Product use

The electricity that our customers use to charge and power their Apple devices represents 29 percent of Apple's gross carbon footprint. Our emissions strategy is centered on the following four pillars:

- Improving product-level energy efficiency
- Supporting renewable electricity projects globally, aiming to avoid as much carbon as charging and powering our devices emit
- Engaging with our customers to educate and provide opportunities to support decarbonizing the grid
- Continuing to advocate for energy policies that expedite the development and use of renewable energy around the world — critical for both our 2030 goals and for avoiding the worst impacts of climate change (see page 77)

To learn more, read our white paper Apple's Product Use Electricity Strategy.

**Clean energy projects**

One of the most meaningful ways to decarbonize the global electricity system between now and 2030 is to encourage the development of new renewable energy generation. Our goal is to match 100 percent of our product energy use in gigawatt-hours (GWh) with clean energy, aiming to avoid as much carbon as charging and powering our devices emit, including in 2024, our Mac mini and carbon neutral Apple Watch models. We plan to source 75 percent of renewable electricity from within the three broad geographic regions where the majority of our devices are sold — the U.S., Europe, and Asia Pacific — and we're maintaining geographic flexibility for the remaining emissions to maximize carbon impact. It has become increasingly clear that grid carbon intensity varies around the world, and we have the ability to prioritize the creation of projects that deliver even greater carbon impact than a strictly regional approach would provide. As best practices for addressing product use emissions take shape, we're working to identify ways that we match our product energy use in megawatt-hours with clean energy, while additionally optimizing the carbon savings to help shape best practices for our industry.

**Engaging with our customers**

In addition to investing in renewables, we're building features to make it easier for customers to access, understand, and make informed decisions about their overall home electricity usage. In 2024, we made the Energy category within the Home app more personal and actionable by integrating customers' home electricity usage directly into the experience. Millions of Pacific Gas and Electric Company (PG&E) customers across Northern and Central California can connect their utility account to the Home app to view their electricity usage and rate plan information, and we're working with more utilities to support additional homes in the future. With this feature, customers can view their home electricity usage over time and see how it's trending. If they're on a rate plan where electricity prices vary during the day, customers can see how much electricity they used during lower- and higher-cost periods. And customers with rooftop solar can see when they used electricity from the grid — and when they sent it back. In addition to the Home app, this energy information is also available via widgets on iPhone, iPad, and Mac, and on Apple Watch. To learn more, visit our support page.

Our work in 2024 is a continuation of our prior commitment to enabling customers to help decarbonize the grid. Grid Forecast, another Home app feature that launched in the contiguous U.S. in 2023, allows customers to see times of day when electricity from relatively cleaner sources is available on the grid. Customers can help reduce emissions generated when powering their devices in the home. To learn more, visit our support page.

Clean Energy Charging, which became available for iPhone in the contiguous U.S. in fall 2022, enables iPhone users to charge their devices at times of the day when the electric grid is relatively cleaner. We plan to expand Clean Energy Charging to iPhone and iPad demo devices in our retail and channel partner stores across the U.S. To learn more, visit our support page.

We continue to create features and experiences that help our customers understand and make informed decisions about their home electricity, and empower them to participate in the transition to a clean energy future.

Home app Electricity Usage and Rates features

**In 2024, we introduced the Electricity Usage and Rates features in the Home app on iPhone, iPad, Mac, and Apple Watch, connecting consumers to their home electricity data.**

FEATURE

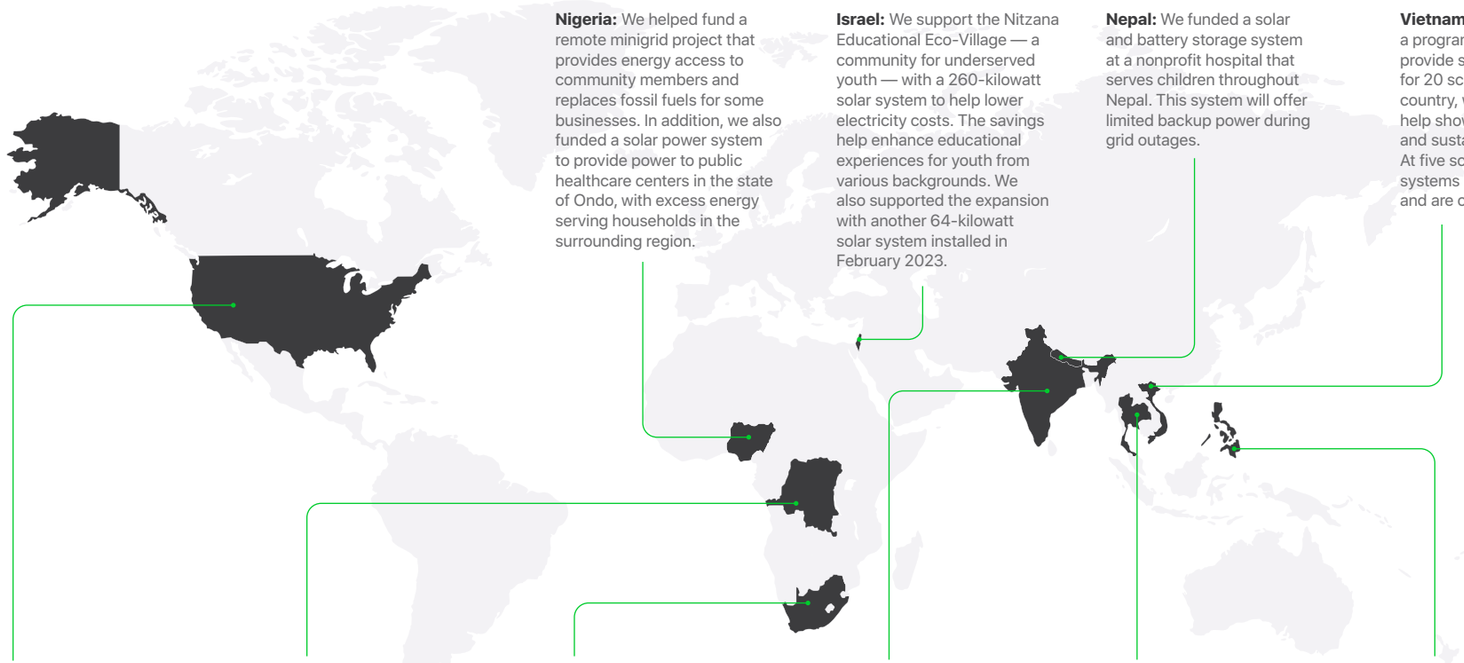
# Increasing access to clean energy around the world

**Power for Impact is driven by the idea that access to renewable energy creates opportunities within communities while benefiting our climate.**

We launched the initiative in 2019 to provide underresourced communities with renewable electricity while supporting economic growth and delivering social benefits.

The program funds renewable energy projects that are mutually beneficial — local communities and organizations get access to cost-effective energy, and we retain the environmental attributes of each project. We currently support 17 renewable projects in countries around the world.

## Global Power for Impact projects



**Nigeria:** We helped fund a remote minigrid project that provides energy access to community members and replaces fossil fuels for some businesses. In addition, we also funded a solar power system to provide power to public healthcare centers in the state of Ondo, with excess energy serving households in the surrounding region.

**Israel:** We support the Nitzana Educational Eco-Village — a community for underserved youth — with a 260-kilowatt solar system to help lower electricity costs. The savings help enhance educational experiences for youth from various backgrounds. We also supported the expansion with another 64-kilowatt solar system installed in February 2023.

**Nepal:** We funded a solar and battery storage system at a nonprofit hospital that serves children throughout Nepal. This system will offer limited backup power during grid outages.

**Vietnam:** Our work to support a program in Vietnam will provide solar electricity for 20 schools around the country, with aspirations to help showcase renewables and sustainable development. At five schools, solar energy systems have been installed and are operational.

**United States:** We supported a decarbonization project involving 22 schools in California. Under the project, engineering students completed an ASHRAE Level 1 Commercial Energy Audit while gaining skills and guiding their paths toward college and careers in sustainability.

**Democratic Republic of the Congo:** We provide access to renewable energy for the Malaika School, which empowers Congolese girls and their communities through education, agriculture, water projects, health outreach, sports, and vocational training. To support Malaika students and teachers, this solar initiative builds on other Apple collaborations, including virtual Today at Apple sessions on coding with Swift, photography, filmmaking, and design, as well as other events with Apple Retail teams and Diversity Network Associations.

**South Africa:** Our first PFI project in South Africa helped bring electricity to over 3500 households that previously lacked access to local street lighting. In addition, we'll help fund two more projects in South Africa at schools for children with disabilities. Along with five other operational projects across South Africa, these installations will reduce electricity costs, and the savings help fund operating costs and expand programs to support underserved groups.

**India:** We support a village-based solar project that provides schools and medical clinics with access to clean, renewable solar energy in regions where conventional power infrastructure is limited or nonexistent. By transitioning these vital institutions to solar power, they can reduce energy costs while fostering environmental stewardship and sustainable development.

**Thailand:** We helped establish a solar energy system to replace polluting diesel fuel for a remote fishing village that relies on refrigerators to maintain the quality of its fish products. We increased local renewable energy production and battery storage to improve reliable access to electricity.

**Philippines:** We helped fund a new rooftop solar installation at an educational institution in Bataan. This helps reduce electricity cost for the institution and free up funds for scholarships to high-achieving, underresourced students.

# Direct GHG emissions

Our purpose

We address the direct emissions that result from the materials we use in our products, as well as how we manufacture and transport them. In some cases, these emissions can be significant, which is why we seek out technological solutions and supplier engagement to abate emissions at their source.

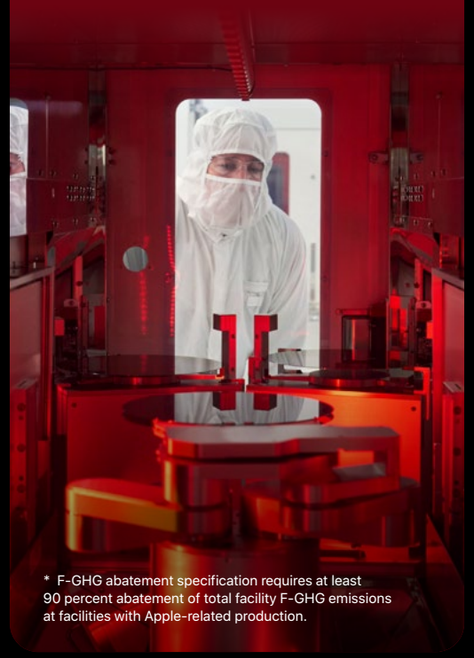
Our path

Direct emissions abatement addresses emissions from:

- Direct emissions (Scope 1)
- Product manufacturing (Scope 3)
- Product transport (Scope 3)
- Business travel (Scope 3)
- Employee commute (Scope 3)

Our progress

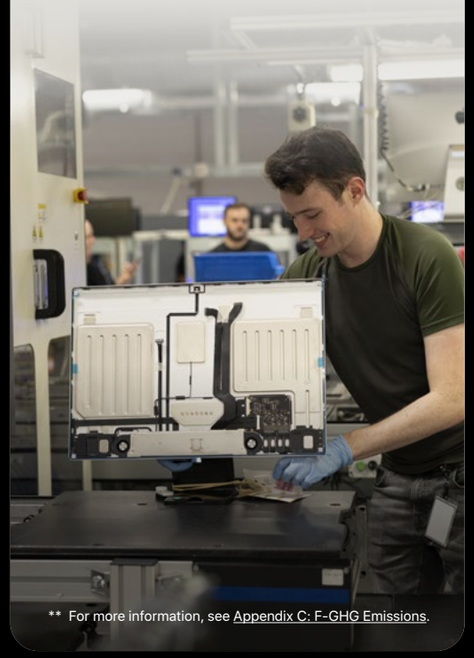
100 percent of applicable display suppliers committed to abate at least 90 percent of their facility F-GHG emissions by 2030*



* F-GHG abatement specification requires at least 90 percent abatement of total facility F-GHG emissions at facilities with Apple-related production.

Our progress

Avoided more than 8.4 million annualized metric tons of $CO_2e$ through our display and semiconductor suppliers' abatement efforts**

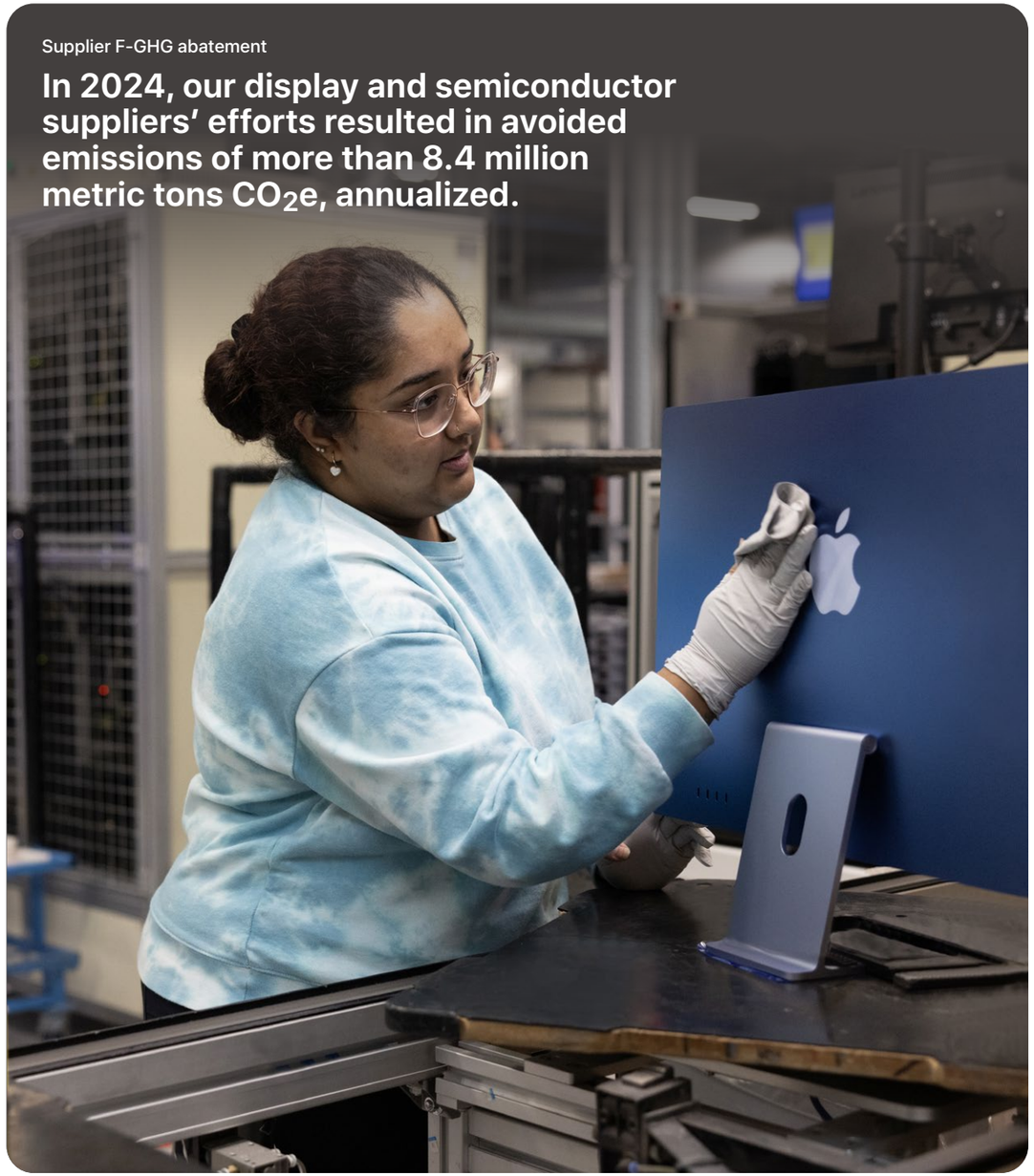


** For more information, see Appendix C: F-GHG Emissions.

Our progress

Reduced transportation emissions by cutting the overall volume of packaging in the iPhone 16 and iPhone 16 Plus by 8 percent with a smaller and more efficient packaging redesign***

*** Based on packaging volume relative to iPhone 15 and iPhone 15 Plus. Not included in U.S., Puerto Rico, U.S. Virgin Islands, Guam, and Canada.




## Rethinking how aluminum is made

As part of Apple's commitment to reduce our products' environmental impact through innovation, we partnered with aluminum companies and the governments of Canada and Quebec to invest in ELYSIS. This joint venture aims to commercialize patented technology that eliminates direct greenhouse gas emissions from the traditional smelting process. Since our collaboration began in 2018, we've helped accelerate the development of this technology by facilitating the joint partnership and providing initial funding and ongoing technical support.

We shipped iPhone SE devices that used ELYSIS aluminum in 2022, building on our 2019 purchase from the first-ever commercial batch of aluminum resulting from the joint venture. The commercial-purity aluminum in these products is the first to be manufactured without creating any direct greenhouse gas emissions during the smelting process. ELYSIS has continued to make progress within its Industrial Research and Development Center in Quebec to produce commercial-purity primary aluminum at industrial scale.

## Addressing fluorinated greenhouse gas emissions

One of the largest contributors of direct emissions in our supply chain is the use of fluorinated greenhouse gases (F-GHGs). F-GHGs are notably used in the electronics manufacturing of semiconductors and flat-panel displays, and their global warming potential (GWP) is orders of magnitude higher than that of $CO_2$. While the use of F-GHGs in certain manufacturing processes today is difficult to avoid, emissions can be reduced by switching to alternative low GWP gases, optimizing production processes to use and emit fewer F-GHGs, and installing gas abatement tools. We're collaborating closely with our supply chain partners as they work to prevent these gases from being released into the atmosphere.

Since the launch of our engagement efforts in 2019, our largest manufacturers of displays and semiconductors have committed to a high standard of F-GHG abatement. In 2024, our display suppliers' efforts resulted in avoided emissions of more than 8.4 million metric tons $CO_2e$, annualized.[48] Further, through engagement in sector-specific industry coalitions, we're working to accelerate climate action across the whole semiconductor value chain. For example, in 2024, we partnered with the Semiconductor Climate Consortium (SCC) to support Initiatives across the semiconductor value chain.

## Supporting supplier capacity

As we tackle direct emissions across our supply chain, we're building out new educational materials and resources support to help our suppliers decarbonize their direct emissions. In 2024, we continued our virtual training series focused on reporting and abating scope 1 emissions, with over 250 supplier attendees — up from 100 in 2023.

We continue to launch supplier programs targeted at addressing direct emissions from energy and processes that produce Apple products. The manufacturing of Apple products accounts for 54 percent of our gross carbon footprint. This includes emissions from fuel combustion; heating, ventilation, and air conditioning (HVAC); refrigeration; fluorinated gases; and other physical or chemical processes (excluding transportation). These sources vary widely and require use of diverse technologies and solutions to abate. Our approach is to identify carbon intensive processes across our supply chain — like the use of fluorinated gases in display and semiconductor manufacturing — and launch targeted programs to address these carbon hotspots in partnership with our suppliers, governments, and industry stakeholders.

FEATURE

# Obtaining commitments to reduce greenhouse gas emissions

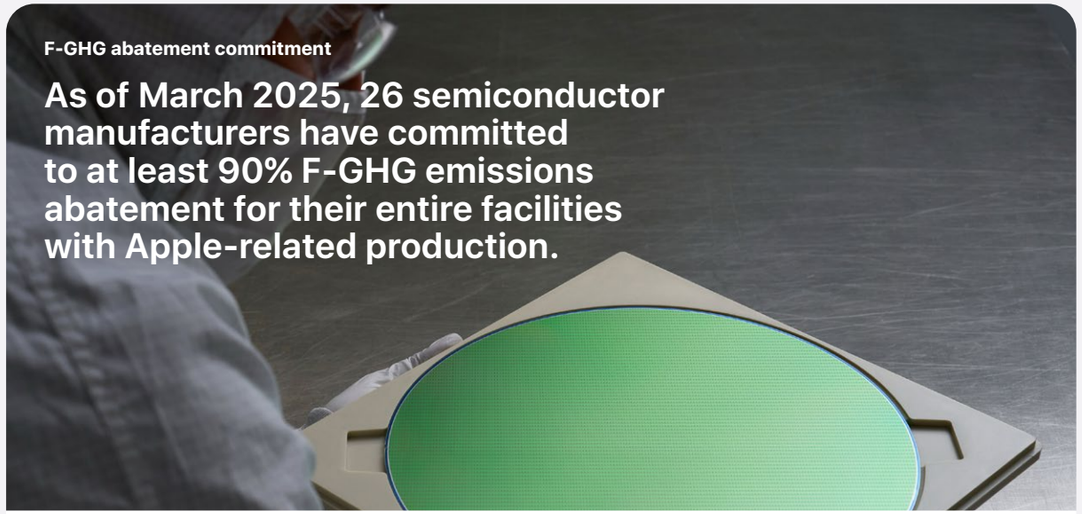
**We're working with our suppliers to reduce fluorinated greenhouse gases (F-GHGs) essential to their manufacturing processes.**

There's an urgency to act on mitigating F-GHGs emissions. Because of their significantly larger global warming potential relative to carbon dioxide, F-GHGs carry an outsized impact on supply chain direct emissions. Since these gases are integral to the manufacturing of semiconductors and flat-panel displays, which are increasingly in demand, there's a clear need to take decisive steps to reduce these impacts.

Existing technological solutions are capable of removing and destroying these gases at high efficiency. Cost remains a persistent barrier manufacturers face in deploying these systems. Procuring and installing abatement infrastructure and technologies represent a significant investment. Without clear regulatory requirements surrounding F-GHG emissions, many manufacturers have not prioritized maximizing F-GHG emissions reductions. Given the outsized impact of F-GHG emissions, the industry needs to continue driving emissions reductions through reducing the use of F-GHGs, finding and using safe alternative gases, and maximizing abatement.

We've historically supported voluntary efforts by our display and semiconductor manufacturers to reduce their F-GHG emissions. But we're pushing these efforts forward by seeking commitments from these suppliers to abate at least 90 percent of these gases from their facilities with Apple-related production in support of our Apple 2030 goal.[49] These commitments govern not only Apple components, but also those manufactured for other companies at the same facilities. In 2024, our display and semiconductor suppliers' abatement efforts reduced more than 8.4 million annualized metric tons of $CO_2e$ for Apple-related production.

Our manufacturers are willing to join us in addressing these emissions. As of March 2025, 100 percent of our applicable display suppliers and 26 of our semiconductor suppliers with direct manufacturing for Apple have committed to these reductions.[50] As we lead together on achieving these aggressive emission reduction targets, we're working with global environmental verification bodies to develop frameworks to validate the results we're achieving.




Committed semiconductor manufacturers include, but not limited to, the following:

| | |
|---|---|
| Alpha and Omega Semiconductor Limited | Qorvo, Inc. |
| ams-OSRAM AG | Rohm Company Limited |
| Analog Devices, Inc. (ADI) | Samsung Electronics Co. |
| Bosch Sensortec GmbH | Skyworks Solutions Incorporated |
| GlobalFoundries | Sony Semiconductor Solutions Corporation |
| Infineon Technologies AG | STMicroelectronics N.V. |
| Kioxia Corporation | Taiwan Semiconductor Manufacturing Company Limited |
| Murata Manufacturing Co., Ltd. | TDK Corporation |
| Nisshinbo Micro Devices Inc. | Texas Instruments Incorporated |
| Nuvoton Technology Corporation | Tower Semiconductor |
| onsemi | United Microelectronics Corporation |

## Transporting products

In 2024, transportation-related emissions increased compared to 2023, driven in part by a transformation of our methodology for calculating these emissions. Apple teams worked with experts to enhance our methodology using newly available data, international standards, and industry best practices to unlock detailed calculations of movements throughout our supply chain.

The methodology sets a broader boundary for transportation emissions and reflects our global supply chain. We enhanced how we incorporate movements to and from air and ocean ports, and from our distribution centers to Apple stores and customers. We also increased the accuracy of key emissions calculation inputs — for example, where possible, we utilize Apple Maps routing to estimate ground distances to delivery points. The new methodology demonstrates our commitment to achieving our Apple 2030 goals based on the most accurate view of available data.

This update has transformed the way our teams can use emissions data. For the first time, emissions impacts will be available within our execution workflows, including supply chain decisioning processes and planning tools, enabling new emissions reduction opportunities. We'll continue to work to improve the calculation as we make progress on Apple 2030 goals.

On average, ocean shipping emissions are 95 percent lower than air transport emissions.[51] Increasing the use of ocean shipping for our products remains a priority. For example, our carbon neutral Mac mini will ship at least 50 percent of the combined weight using non-air modes — like ocean shipping — over the lifetime of the product.[52]

We continue to focus on shipment efficiency and consolidation. For example, we've reduced unnecessary space aboard aircraft and trucks by using smaller, custom pallets, creating more efficient shipments. In 2024, we redesigned the packaging for Mac mini to be smaller and more efficient than its predecessor, reducing the volume by over 35 percent. And the Apple online store now offers customers the option to consolidate orders with multiple products into fewer shipments for eligible product combinations.

We're collaborating with our suppliers to explore technical innovations for transport, including alternative fuels and electric vehicles. We remain committed to exploring pathways for developing sustainable aviation fuel (SAF) through our engagement with First Movers Coalition. In 2023, we shared learnings with our partners, including suppliers and industry groups. Read the summary of our findings in the "Promising production pathways and opportunities to scale" section of the Sustainable Aviation Fuel Primer report. We also trialed the limited use of SAF on two flights that shipped select iPad models in 2023.

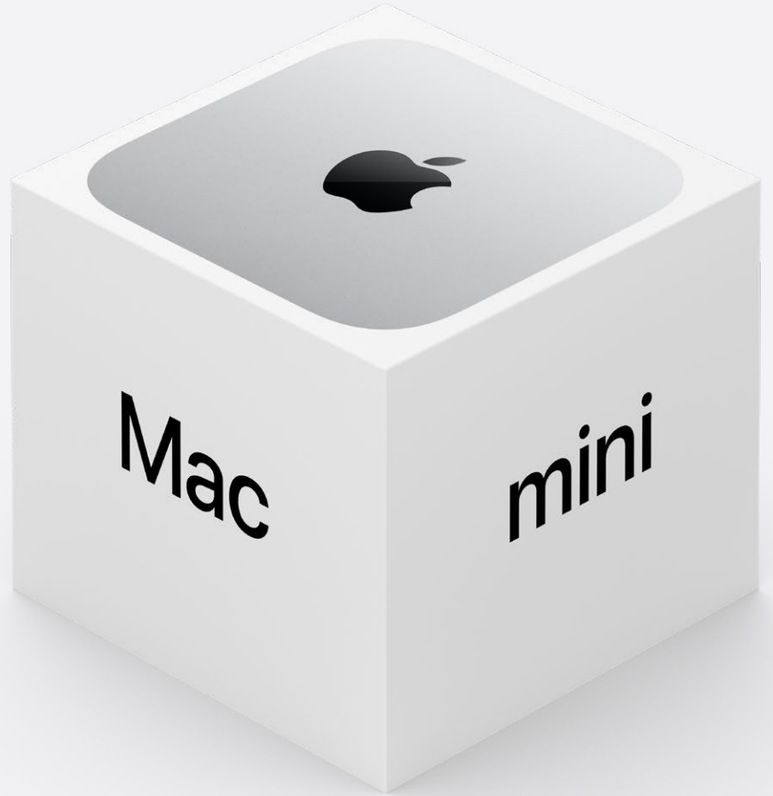
In 2024, we continued to partner with carriers that offer low-carbon deliveries using electric vehicles (EVs), such as e-bikes and cars, reducing our impact in customer communities. By prioritizing vendors that offer low-carbon options, we're signaling the value of these options and incentivizing further decarbonization.

## Improving employee travel and commute

We're focused on finding new ways to reduce the carbon footprint from our employees commuting to work. For example, we're helping our employees transition from single-occupancy vehicles to mass transit, coach services, and campus bicycles. To incentivize the use of electric vehicles, we provide 2104 EV charging stations and 4020 ports across our U.S. campuses. For the commute-related emissions that remain, we're applying high-quality offsets.

Packaging efficiency

**We reduced Mac mini packaging volume by more than 35 percent compared with its predecessor.**



# Carbon removal

Our purpose

We're rapidly scaling up carbon removal solutions, beginning with nature-based solutions that are available today, while exploring the solutions of the future aligned with a 1.5° C pathway. Science shows that limiting the planet's warming will require both deeply decarbonizing industrial emissions over the next 30 years and significantly ramping up carbon removal to address the surplus carbon dioxide ($CO_2$) already in the atmosphere.

Our path

We're pursuing opportunities for carbon removal through the following efforts:

- Aligning with science
- Ensuring project quality
- Achieving multiple benefits
- Building scalable solutions

Our progress

Planted more than 8 million trees across more than 24,000 hectares in Apple's Restore Fund joint venture in Brazil, where reforestation within the project created a 5-kilometer habit corridor to protect species and aid conservation efforts

## The need for carbon removal

The science is clear on the need to limit the planet's warming in order to avoid the worst impacts of climate change. Carbon removal is essential to any strategy to address climate change — while working alongside efforts to decarbonize industry and protect and restore Earth's ecosystem. We're committed to reducing our scope 1, 2, and 3 emissions by 75 percent by 2030 and working toward reaching a 90 percent reduction in emissions from our 2015 baseline by 2050.

This is why we've made a bold commitment to rapidly scale up carbon removal solutions, aligning our goals with the Intergovernmental Panel on Climate Change (IPCC), and pushing for more aggressive reductions where possible. 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, prioritizing significant emissions reductions, followed by long-term carbon removal initiatives. We started by reducing our corporate emissions through the use of 100 percent renewable electricity and energy efficiency efforts at our facilities. But emissions remain difficult to avoid in some activities — including the emissions from business air travel and employee commute.

For the emissions we can't avoid, we use high-quality offsets as an interim solution. We're intentional about identifying avoided deforestation and removal projects that are of a high 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. We're also pursuing innovative solutions to reach our 2030 goals and beyond.

For more details about our purchases of high-quality carbon credits, see Data: High-quality carbon credits.

## Nature-based carbon removal

Nature-based solutions are the only scalable and economically viable opportunities to mitigate climate change between now and 2030, according to the current science. In addition to providing climate benefits, nature-based solutions offer multiple co-benefits, including enhanced employment and local livelihoods, improved biodiversity, soil carbon and nutrient cycling, and increased timber supply that can reduce the pressure on primary forests.

The IPCC lays out a range of options to remove carbon from the atmosphere using a combination of photosynthesis and chemistry. These approaches include existing climate solutions, such as afforestation and reforestation, and relatively new technologies, such as direct air capture (DAC) and ocean alkalinization. We've looked at how these approaches could help balance our residual emissions as we focus on the global urgency to scale up carbon removal.

Our review of different available technologies helped us determine that nature-based solutions — including afforestation, reforestation, and revegetation (ARR) and soil carbon sequestration — currently offer the most comprehensive carbon removal approach.

## Initiating a shift in investments in voluntary carbon markets

The current carbon markets are too small to deal with the scope and integrity of impact needed to remove tens of billions of metric tons of carbon by 2050. We've set out to improve the scale, quality, and capacity of these markets — and their appeal to investors — while initiating a shift in the potential of these markets to achieve an impact. We're also aiming to build a pipeline of projects that meet the highest-quality standards and that can scale to meet the growing demand for nature-based removals.

In 2021, Apple partnered with Goldman Sachs and Conservation International 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. Both of these funds aim to remove 1 million metric tons of carbon dioxide annually from the atmosphere at peak, as well as provide important benefits for local communities and protect and enhance biodiversity.

We developed the Restore Fund as a pilot to pursue nature-based carbon removals and bring investable solutions to scale. And as we continue to implement the Restore Fund, we're also looking to see how we can make nature-based removals more accessible. The expanded fund targets two types of investments: regenerative agriculture and other ecosystem assets and a pipeline of landscape restoration projects that aim to remove carbon from the atmosphere.

## Verifying high-quality projects to achieve high impact

Working to verify the quality of projects is foundational to our carbon removal efforts. We screen potential Restore Fund projects, conduct site visits, and perform due diligence with the managers prior to approval. To confirm our projects meet strict quality standards, we carry out detailed assessments of the carbon impact of each investment by using satellite data analysis by Space Intelligence, and evaluate the social and environmental impacts to ensure they align with our investment criteria developed in partnership with Conservation International. After a project is approved, we continue assessing quality through validation and certification processes — like the International Carbon Registry project design description (PDD) program — and ongoing audits, satellite-based monitoring enabled by Upstream Tech and Space Intelligence, and ground-based inventories.

We also collaborate with like-minded organizations such as the World Business Council for Sustainable Development's Nature Climate Solutions Alliance to support government-led climate action that incentivizes voluntary business investments in high-quality nature-based solutions. The alliance focuses on identifying opportunities and barriers to investment in the natural climate solutions voluntary carbon market and also serves as a forum for knowledge sharing and technical capacity building to help natural climate solutions reach their full potential in abating climate change.

Read more about our work in our white paper, Apple's Carbon Removal Strategy.

FEATURE

# Investing in restoring and reforesting degraded lands in Brazil

**Carbon removal projects can achieve environmental and social benefits while offering potentially profitable investments. Our support of a Brazilian reforestation strategy demonstrates how reforestation and tree farming can work side by side toward a profitable model that benefits the environment and the people who depend on it.**

Through the Restore Fund, we provided the foundational investment in Project Alpha in 2022, the first investment in a pioneering large-scale restoration strategy alongside the BTG Pactual Timberland Investment Group and advised by Conservation International that supports commercial eucalyptus tree farms with the revival of native forests in the Brazilian states of Minas Gerais, Mato Grosso, and Mato Grosso do Sul. This integrated approach recognizes that solely relying on tree farms or natural forest restoration would be insufficient to achieve social impact and financial goals. A combined approach, however, has the potential to achieve environmental, social, and economic returns.

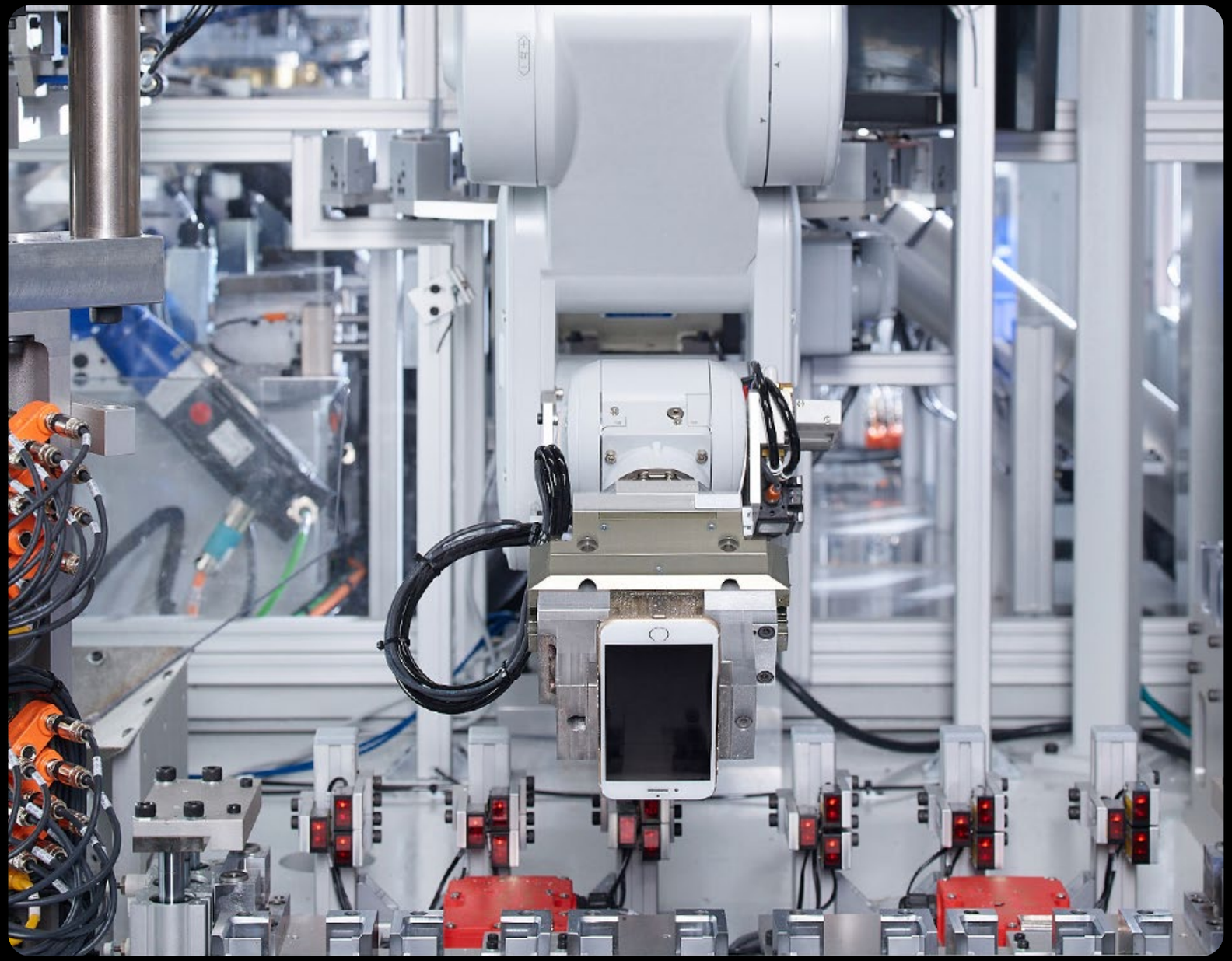
Ecological integrity is at the center of the project. Much of the 24,119-hectare site — approximately four times the size of Manhattan — had been deforested and degraded through cattle ranching practices, but offered significant carbon removal potential. Since 2022, the project has planted nearly 15 million trees and is projected to offset more than 8.5 million tons of carbon dioxide equivalent within 15 years. At the same time, the project can achieve positive impacts on water quality, watershed function, and habitat connectivity. Riparian buffers of 400 meters surround the site, providing crucial protection of wildlife habitats of 385 species, including nine threatened species. This commitment to conservation has resulted in the creation of a 5-kilometer habitat corridor, connecting restored forest areas with a neighboring legal reserve, forming a contiguous forest cover spanning over 10,000 hectares.

Beyond conservation and ecological restoration, Project Alpha also drives positive social impact. The project supports 213 full-time employees (up from 9 employees in 2022).

Nine different forest restoration methods are being tested to support the project's long-term success. The project also employs cutting-edge technology for monitoring and management. Light Detection and Ranging (LiDAR), drone flyovers, and Apple Maps are used to track restoration progress and support the health of both tree farms and natural forests. This data-driven approach allows for adaptive management and continuous improvement.

Project Alpha's impact extends beyond its immediate boundaries. The project is projected to receive its first Verra verification in 2026 to measure and quantify emissions reductions and removals — and assess additionality. The results will also serve as a model for other large-scale restoration initiatives, encouraging investment in similar projects where economic development and environmental impact can align.

# Resources



**In this section**

Approach

# Resources

**We prioritize sourcing, using, and recycling the materials we rely on in a way that meets our high standards for labor, human rights, and environmental stewardship.**

Our commitment to responsibly using resources spans our corporate operations and supply chain. This means sourcing responsibly, minimizing our freshwater use, and working to eliminate waste across both Apple-owned and supplier sites. We aim to reduce the overall resource footprint of our products by collaborating with suppliers, NGOs, recyclers, community stakeholders, and innovation leaders. Reaching our commitments requires broader engagement through collaborations that enable the stewardship of shared resources.

Building durable, long-lasting products is central to our approach, ensuring the best use of the resources required to create them. Our aim is to one day make our products solely from responsibly sourced materials — whether recycled or renewable — while maintaining our same rigorous standards of quality and durability.

Water is one of our most critical resources. Because it's also a community resource, we prioritize our stewardship efforts and look beyond our facilities to the various water basins where Apple and our suppliers operate. We're working to improve the quality of the water that our communities rely on through collaborations with local partners — including companies, NGOs, and government agencies.

We also conserve resources by working to eliminate waste. We reuse and recycle across our operations and supply chain, including innovating reuse approaches and creating new recycling opportunities with local businesses.

## Areas of impact

**Product longevity**
Designing durable, repairable hardware, using software updates to extend functionality, providing convenient access to safe and high-quality repair services, and directing devices and parts for refurbishment and reuse.

**Material recovery**
Improving how we collect end-of-life products and developing recycling innovations to enable us and others to use old devices as raw material sources for the future.

**Water**
Reducing water impacts in the manufacturing of our products, the use of our services, and our facility operations while transitioning to alternative solutions, improving the quality of water we discharge, and protecting shared water resources.

**Zero waste**
Minimizing overall waste generated and working to eliminate waste sent to landfill from our manufacturing supply chain, corporate offices, data centers, and retail stores.

# Product longevity

Our purpose

We approach designing our products for longevity as a companywide effort, which informs our earliest product decisions and is guided by data on how products have performed over time. Working toward product longevity requires balancing durability and repairability while not compromising safety, security, and privacy. We strive to increase product longevity through new design and manufacturing technologies, ongoing software support, and expanded access to repair services.

Our path

To achieve product longevity, we prioritize the following actions:

- Durability
- Repair access
- Software updates
- Refurbishment and reuse

Our progress

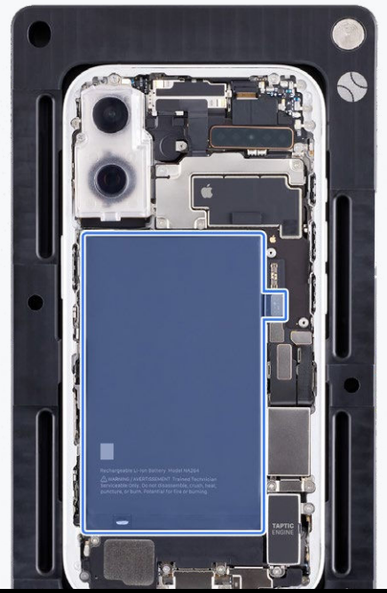
Expanded the number of genuine Apple parts that can be recovered or refurbished to meet our high quality and performance standards for reuse as replacements

Our progress

Launched Repair Assistant with iOS 18, allowing customers and repair professionals to configure new and used Apple parts directly on a device while optimizing performance and supporting the safety, security, and privacy of iPhone

Our progress

Introduced a new, easier battery replacement process for iPhone 16 using novel adhesives, enabling faster, more repeatable, and safer removal



## Durability

Our customers and the environment are best served by enhancing a product's durability. And durable products hold their value longer. iPhone, for example, holds its value longer than other smartphones.[53] As of January 2025, iPhone 7 Plus, introduced in 2016, still had monetary value for Apple Trade In in the United States.[54]

We design our devices with the rigors of daily use in mind. Our engineering teams look for every opportunity to achieve high levels of durability for every material used, part selected, and product assembled. Our Reliability Testing Lab assesses our designs against our rigorous durability standards. This process occurs across the product development life cycle, exploring potential points of failure before the first prototype is built and informing component and design improvements. Our testing methods mimic realistic conditions in which our customers use their products — exposing products to liquids and foods, skincare products, intense UV light, and abrasive materials. As customer-use patterns evolve, we continue updating our test approaches to improve our product quality year after year.

During product development, we test numerous units of a product, relying on the results to inform each successive round of design. For example, we use a range of techniques to test iPhone for exposure to water. These include a swing arm nozzle, which simulates spraying or splashing to assess for IPX3/4 water resistance, and a pressurized vessel that creates underwater conditions to test for IPX7/8 water immersion protection.[55] And in 2024, we launched an improved Ceramic Shield in iPhone 16. The latest-generation Ceramic Shield features an advanced formulation that's 50 percent tougher than the first generation and two times tougher than glass on any other smartphone.

## Designing products with repairability in mind

We continue to make progress in designing more durable products and offering customers more repair options. At the same time, we're working to make repairs more accessible and affordable through the following efforts:

- iPhone 16 introduced a new process for removing the battery from the enclosure, making replacement faster, easier, and safer for individual technicians and repair professionals. Running a low-voltage electrical current through the battery adhesive causes the battery to release from the enclosure.
- The iPhone 16 Pro lineup improves serviceability for the USB-C connector and LiDAR Scanner.
- Mac mini was designed with features to facilitate easier battery removal.
- We've expanded the availability of repair parts around the world to support older products for up to seven years. For example, a program for Mac laptops makes battery repair available for up to 10 years after a product was last distributed, subject to parts availability.

For more information about the availability of service parts and repairs, refer to the Apple Support page or app.

To learn more about our approach to Product longevity, see our white paper, Longevity, by Design.

**"The iPhone 16 is the most repairable mass market flagship phone out there."**

**Kyle Wiens**
CEO of iFixit

# Increased durability and repairability enhance iPhone longevity

● Repairable at retail stores, Apple Authorized Service Providers, and central repair locations

✓ Features to enhance durability

## 2007

### iPhone (1st generation)

- ● SIM tray

## 2010

### iPhone 4

- ● SIM tray
- ● Battery
- ● Haptics
- ● Rear camera

## 2016

### iPhone 7

- ● SIM tray
- ● Battery
- ● Haptics
- ● Rear camera
- ● Main logic board
- ● Display
- ✓ Splash, water, and dust resistant: IP67*
- ✓ Sapphire crystal lens cover

## 2018

### iPhone X

- ● SIM tray
- ● Battery
- ● Haptics
- ● Rear camera
- ● Main logic board
- ● Display
- ● Bottom speaker
- ● Enclosure
- ✓ Splash, water, and dust resistant: IP67*
- ✓ Sapphire crystal lens cover
- ✓ Surgical-grade stainless steel

## 2021

### iPhone 13

- ● SIM tray
- ● Battery
- ● Haptics
- ● Rear camera
- ● Main logic board
- ● Display
- ● Bottom speaker
- ● Top speaker
- ● Enclosure
- ● TrueDepth camera
- ✓ Splash, water, and dust resistant: IP68*
- ✓ Sapphire crystal lens cover
- ✓ Surgical-grade stainless steel
- ✓ Ceramic Shield

## 2024

### iPhone 16

- ● SIM tray
- ● Battery
- ● Haptics
- ● Rear camera
- ● Main logic board
- ● Display
- ● Bottom speaker
- ● Top speaker
- ● Enclosure
- ● TrueDepth camera
- ● Back glass
- ● Main microphone
- ● USB-C connector
- ✓ Splash, water, and dust resistant: IP68*
- ✓ Sapphire crystal lens cover
- ✓ Aerospace-grade aluminum
- ✓ Latest-generation Ceramic Shield**

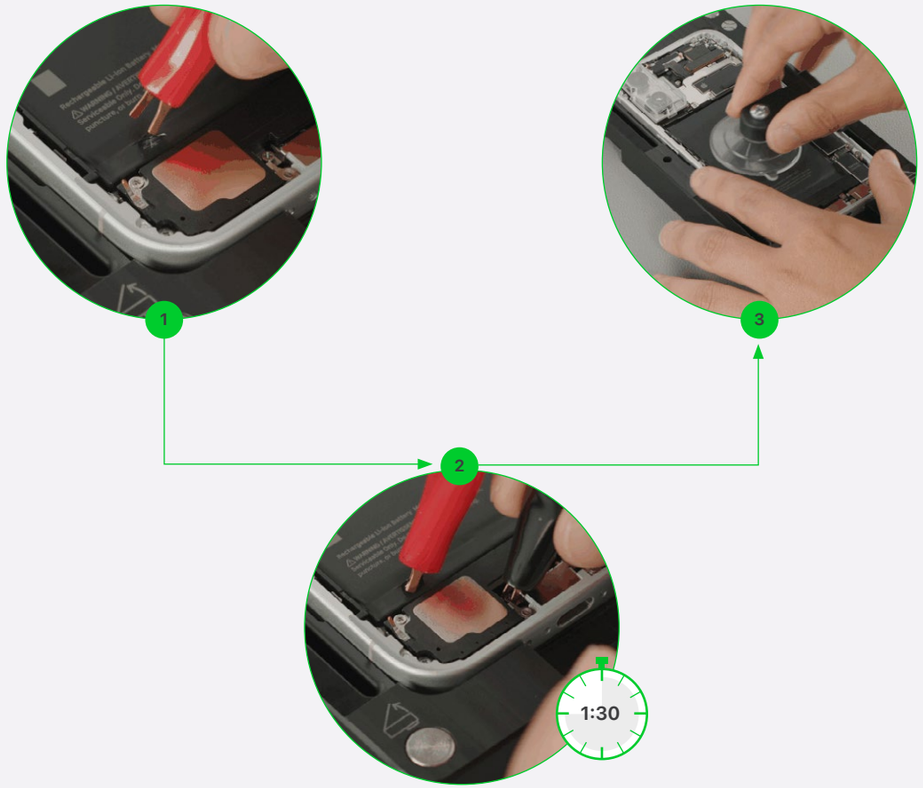
* iPhone 7, iPhone X, iPhone 13, and iPhone 16 models are splash, water, and dust resistant and were tested under controlled laboratory conditions. iPhone 7 and iPhone X have a rating of IP67 under IEC standard 60529 (maximum depth of 1 meter up to 30 minutes). iPhone 13 and iPhone 16 have a rating of IP68 under IEC standard 60529 (maximum depth of 6 meters up to 30 minutes). Splash, water, and dust resistance are not permanent conditions, and resistance might decrease as a result of normal wear. Do not attempt to charge a wet iPhone; refer to the user guide for cleaning and drying instructions. Liquid damage is not covered under warranty.

** Latest-generation Ceramic Shield available in iPhone 16, iPhone 16 Plus, iPhone 16 Pro, and iPhone 16 Pro Max.

**iPhone 16 introduced a new, easier battery replacement process for utilizing novel adhesives which allow for faster, more repeatable, and safer removal.**

Connect the adhesive tabs to the 9V battery.

Lift the battery from the enclosure using a suction cup.




Hold the connection to debond the adhesive.

## Repair access

The ability to repair a device and access repair services are important considerations when designing long-lasting products. But optimizing for repairability alone may not yield the best outcome for our customers or the environment. Apple strives to improve the longevity of devices by following a set of design principles that help resolve tensions between repairability and other important factors — including impact on the environment; expanding access to repair services; preserving the safety, security, and privacy of our customers; and enabling transparency in repair. If a repair is needed, we seek new ways to offer convenient access to safe, reliable, and secure repairs — whether by Apple, a third-party repair shop, or the customer directly — to help solve the issue as quickly as possible.

We've expanded our repair footprint over the past four years — increasing the number of professional service locations with access to genuine Apple parts, tools, and training. Repair options include Apple Store locations, Apple Authorized Service Providers, participating Independent Repair Providers, mail-in repair centers, onsite service, and Self Service Repair. This also includes a global network of more than 10,000 Independent Repair Providers and Apple Authorized Service Providers.

Since 2019, our Independent Repair Provider program has enabled repair businesses of all sizes to access genuine Apple parts, tools, diagnostics, and training. This program expanded from the U.S., Europe, and Canada to more countries and territories worldwide. We train and certify service personnel to repair Apple products, helping them correctly diagnose issues — leading to successful service and repair and preventing damage to devices so that they work as they should.

Launched in April 2022, Self Service Repair gives anyone with relevant experience in repairing electronic devices access to the manuals, genuine Apple parts, and tools used at Apple Store locations and Apple Authorized Service Providers. In February 2024, Apple Diagnostics for Self Service Repair became available in Europe following its introduction to the U.S. in 2023. Apple Diagnostics troubleshooting sessions give customers the same ability as Apple Authorized Service Providers and Independent Repair Providers to test devices for optimal part functionality and performance, as well as to identify parts that may need repair. With this expansion, Apple Diagnostics for Self Service Repair now supports iPhone, Mac, and Studio Display models in 33 countries and 24 languages.

Self Service Repair is available in the U.S. and is now offered to Apple users in 32 European countries — including the UK, France, Germany, and the Netherlands. Self Service Repair supports 42 Apple products and now includes MacBook Air models powered by M3. In the coming months, Canada will become the 34th country where Apple offers Self Service Repair.

## Software features

Free software updates also support our product longevity goals. We provide these to enhance our customers' experience by allowing them to access the latest features available to their devices for as long as possible. This includes important security and privacy updates. As we continually improve the operating systems that power our products, we also make sure that each software release runs seamlessly on all supported devices. Customers can benefit from the latest software updates whether they're using a brand-new device or one that's several generations older.

iOS 18 introduced Repair Assistant, a powerful tool that helps customers and repair professionals complete repairs after a part has been replaced in an iPhone or iPad. Repair Assistant installs calibration data to pair recently installed parts and validate that they're working as expected and calibrated correctly.

Our most recent release, iOS 18 extends support back to iPhone XS (2018). iPadOS 18 compatibility goes back to the seventh-generation iPad (2019), and macOS 14 Sonoma supports MacBook models from 2018 on. These updates provide customers with access to the newest security and privacy features.

High adoption rates are a clear signal that customers value software updates. By January 2025, more than 75 percent of all iPhone devices introduced in the last four years had updated to iOS 18, and iPadOS 18 was used on over 60 percent of iPad devices introduced in the last four years.

## Refurbishment and reuse

Refurbishing and reusing products helps lower the impact that each device has on the environment — including its carbon intensity per year of life. We extend the life of our products by building them with durability in mind — enabling them to serve more than one owner and allowing our customers to exchange devices for an upgrade.

We collect devices for refurbishment and reuse through several programs, including Apple Trade In, the iPhone Upgrade Program, AppleCare service, and our corporate Hardware Reuse Program. In 2024, we sent 15.9 million devices and accessories to new owners for reuse. The Apple Trade In program, available in 28 countries, provides customers with product end-of-life options: They can access the value of their current device if they upgrade to a newer model, or they can recycle their device for free.

Some device parts can also be reused. We continue to expand the number of parts that can be recovered or refurbished to meet our high quality and performance standards so they can be reused as replacements. This enables us to reduce the need to create spare parts as we repair devices. We also remain focused on opportunities to reuse accessories sent for recycling. For example, we send collected power cables and adapters that still function to our final assembly sites, where they power products used on production lines.

# Material recovery

Our purpose

We foster circular supply chains by recovering materials from end-of-life products and in-process scrap to serve the next generation of products. This helps reduce the need to mine new materials and saves the energy expended in material extraction and refining, driving down emissions and conserving resources.

Our path

We aim to design our products for optimal material recovery, innovate recycling technology, and work with others to help build circular supply chains.

Designing for recoverability

Optimizing collection and reuse

Developing processes

Our progress

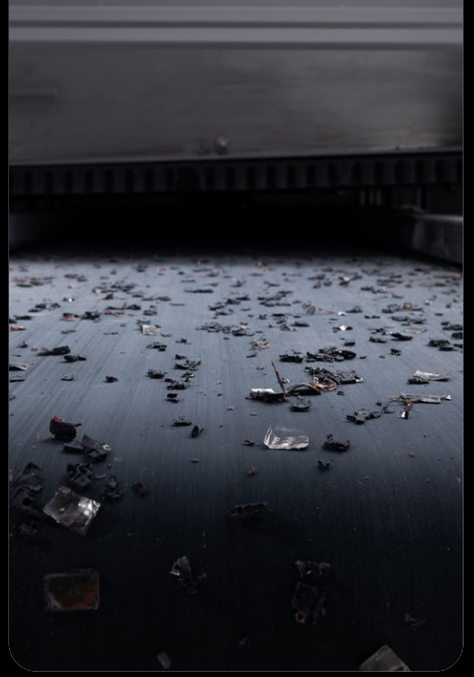
Launched a first-of-its-kind recycling system to purify fine metal waste to a quality suitable for remelting back into new iPhone devices

Our progress

Collaborated with our product design team to optimize the location of the battery in Mac mini, reducing the battery removal time during recycling

Our progress

Deployed Taz, a recycling machine, to one of our recycling partners to recover rare earth elements from our products



## Designing for the next generation of recovery

We're committed to a long-term approach to recycling innovation, continually improving current methods while nurturing new and emerging technologies. We also continue to support initiatives that redefine disassembly and material recovery.

These efforts include recovering valuable resources from manufacturing loss and at the end of a product's life to support circular supply chains. Understanding material recoverability is crucial for informing the design process. We worked with researchers to develop a recoverability metric for electronic devices that incorporates detailed insight into the best available recycling technologies, including a supporting database of material recovery rates, recovered material quality, and calculation methodology. This research has the potential to impact product design by improving material recoverability at end of life. To learn more, read the case study from one of our partners in the journal *Sustainability*.

In 2024, we established the goal of improving recoverability at the outset of the Mac mini product design process. We focused on battery removal because it's often the first step in the recycling process. By engaging with the product design team early, we restructured the placement of components within Mac mini so that the battery could be identified and removed easily and safely. While this improved the recoverability of Mac mini, it also demonstrated that product innovation can incorporate end-of-life recovery for future designs.

## Optimizing recycling through innovative collection and reuse

Our recycling strategy plays a key role in building circular supply chains. We provide or participate in product take-back and recycling collection programs in 99 percent of the countries where we sell products. Customers can trade in devices for reuse or recycling at retail locations, through recycling programs offered by local operators around the world, and through online programs like Apple Trade In. In 2024, we directed nearly 40,000 metric tons of electronic scrap globally to recycling facilities with the help of customer and employee programs. To learn more about our Trade In program, visit the Apple Trade In web page.

In 2024, our IT Asset Disposition (ITAD) program continued to grow as a best-in-class approach to handling end-of-life materials at Apple data centers, including servers, hard drives, network equipment, and more. We scaled up the ITAD program, treating data center material recovery similarly to product material recovery, emphasizing reuse and the recovery of priority materials. We're also pursuing recovery innovations for data center components, including technology to dismantle hard drives and extract rare earth elements.

We also 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 these recyclers as those capable of recovering materials at high rates and doing so with better environmental and safety performance. We verify recyclers' compliance with our Supplier Code of Conduct and Supplier Responsibility Standards through third-party assessments. In addition, we encourage our recyclers to maintain regional leading certifications, such as WEEELABEX, e-Stewards®, or R2. We assess our recyclers regularly for compliance with standards, regulations, and best practices in the areas of labor and human rights; security; and environment, health, and safety (EHS).

**Engaging with recovery partners**

In 2024, we conducted 112 recycler assessments. We've increasingly sought out specialty providers capable of handling specific material streams to enhance both the yield and the quality of materials. This global footprint of recyclers also helps us build a more resilient recycling supply chain and innovate with more suppliers around the world.

Education and training can help us improve recovery rates for our products. We've significantly invested in this because it equips recyclers with the information needed to enhance efficiency, quality, and capacity. We work with recyclers to develop new recycling solutions, sharing them through training and ongoing support. We help these partners develop the ability to disassemble our products and recover as much material as possible while minimizing waste.

We continue to expand our Apple Recycler Guides to provide up-to-date recycling guidance across our products. Our engineering teams develop these guides to help professional recyclers optimize recovery and complete the processes using the tools and procedures available to them. The guides provide valuable insights into the recycling process, including details about the materials used to disassemble parts. We're increasing the market availability of high-quality recycled content by improving material recovery rates.

We also continue to work with our partners, including Atea — a leading provider of IT infrastructure solutions in the Nordic and Baltic regions — to collect end-of-life iPhone devices for recycling with our Daisy robot in the Netherlands. We encourage our customers around the world to return end-of-life devices to Apple so materials can be reintroduced into the circular economy.

To learn more about our recycling programs, visit the Apple Reuse and Recycling Program web page.

Automated approaches

**Our Advanced Recovery Centers employ AMRs to help transport products and components throughout the facility, increasing operational efficiency.**

## Committing to excellence in disassembly and recovery

Innovation plays a key role in realizing the potential of recycling Apple products. We continuously develop better, more efficient means of disassembling products to maximize material recovery while minimizing waste. Our investment in automation and the development of new recycling techniques has expanded at our Material Recovery Lab (MRL) in Austin, Texas, and our Santa Clara Valley, California facility. Each facility is R2 certified — the same qualification we require our recyclers to meet.

At the MRL in Austin — which has led the way in automated approaches to material recovery with our robots Daisy, Dave, and Taz — we opened a new 17,000-square-foot Advanced Recovery Center (ARC) to investigate and operationalize recycling techniques toward scalability. In Santa Clara Valley, we also operate an Advanced Recovery Center, where we've significantly expanded our technical capabilities and developed best-in-class recycling tools, automation, and processes. The techniques our recycling robot Daisy uses have extended to other products in the area of battery removal. Using the same commercially available air chillers from Daisy, we're experimenting with stations that quickly chill multiple laptop batteries, allowing easier removal. To support additional dismantling and battery removal, we've added multiple stations with augmented reality projection systems to guide at-scale processing in our Austin and Santa Clara Valley facilities. Autonomous mobile robots (AMRs) connect the various stations and steps at both sites, supporting efficiency through seamless material handling.

Our ARC operations help us identify the problems we need to solve, train our team, and enable the development of robust solutions. These technologies improve material handling and sorting efficiency, directly enhancing the material capacity of our operations. This initiative aims to create low-cost solutions that our suppliers can deploy to recover more materials, allowing employees to focus on more complex tasks that can't be easily automated. Each facility contributes to our ability to design more recyclable products, learn how to deploy the material recovery technologies we've developed, and create economical recycling approaches.

A new system we launched in 2024 captures fine metal waste generated during the manufacturing of aluminum iPhone enclosures for recovery. This system washes and separates aluminum "chips" from other materials the scraps come into contact with during the manufacturing process. Once the pure aluminum is separated, it can be remelted for use in manufacturing new devices. Through this approach, we're able to recover material that might otherwise be lost and reuse it in our products, supporting our efforts to increase the amount of recycled content in iPhone each year.

**Impacting industry-wide recovery**

We're investing in recycling innovations that can have industry-wide impacts. For several years, we've worked with Carnegie Mellon University's (CMU) Biorobotics Lab in the School of Computer Science's Robotics Institute to identify and disassemble e-scrap. These projects have the potential to enable recyclers to recover the materials at a higher quality. The software we develop will be open source and available to others in the industry working to maximize the recovery of recyclable materials. In 2025, CMU extended our work to build solutions for flat-panel display recycling. Through our research and development, we're driving toward truly intelligent disassembly technology. Learn more about Apple's research with Carnegie Mellon University in our white paper.

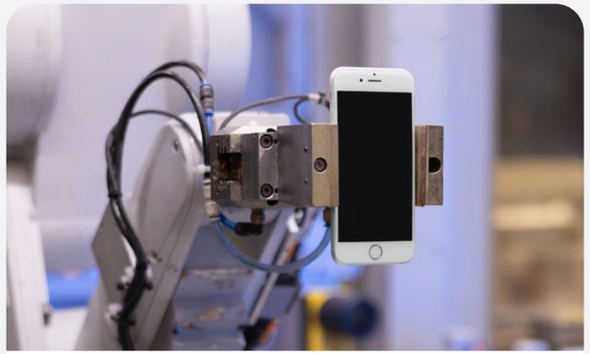
Material tracing also provides significant potential to improve recovery. We've begun exploring this approach by conducting detailed analysis at each step in the recycling process to examine materials and recovery rates. By doing so, we've discovered opportunities to direct post-industrial materials, which don't need the dismantling step of an e-recycler directly to refiners and smelters. Routing these material streams to the best available technology improves the overall yield of recycled content while providing greater insight into achieving the best recycling outcome for each material.

FEATURE

# Advanced material recovery technologies

**We continue to develop better, more efficient means of disassembling products that maximize material recovery while minimizing waste.**

To advance the field of electronics recycling, we've engineered new technologies — including the disassembly robot Daisy and recycling machines Dave and Taz. We're committed to sharing the technology with recycling partners around the world as a low-cost, time-saving solution.



## Daisy

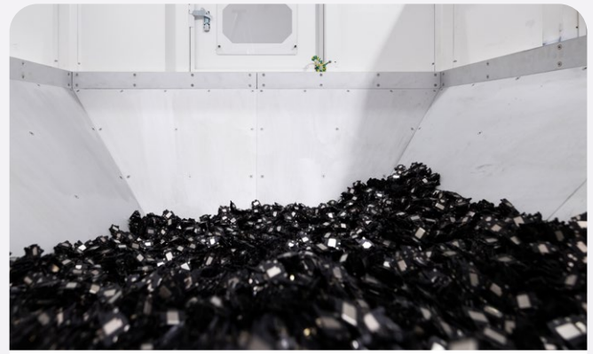
**U.S. and the Netherlands**

In 2024, we expanded the capabilities of Daisy, which can now disassemble 36 iPhone models — including various models between iPhone 5 and iPhone 14 Pro Max — into discrete components, helping us recover more materials for recycling.

## Dave

**China**

Our robot specializes in disassembling the Taptic Engine, enabling the recovery of rare earth magnet, tungsten, and steel. Since 2023, Dave has been operating at our recycling partner's facility in China.



## Taz

**China**

Our shredder system helps recycle modules by separating magnets containing rare earth elements from audio modules. While rare earth elements are typically lost in conventional shredders, Taz is designed to access these valuable materials, improving our overall recovery rate. As of 2024, Taz operates at our recycling partner's facility in China.

## Autonomous mobile robots (AMR)

**U.S.**

Our Advanced Recovery Centers now employ AMRs to help transport products and components around the facility and increase operational efficiency. In 2024, our AMRs supported our material recovery processes by making over 80,000 deliveries.

## Augmented reality (AR) systems

**U.S.**

Overhead projector-based AR systems are deployed in our Advanced Recovery Centers and provided to recycling partners to guide the disassembly of devices, including MacBook and iPad, by projecting video imagery directly onto a work surface.

# Water

Our purpose

## We aim to advance water security and protect communities where we and our suppliers operate through actions that improve freshwater availability, quality, and equity.

Our path

## We focus our work on five strategic pillars:

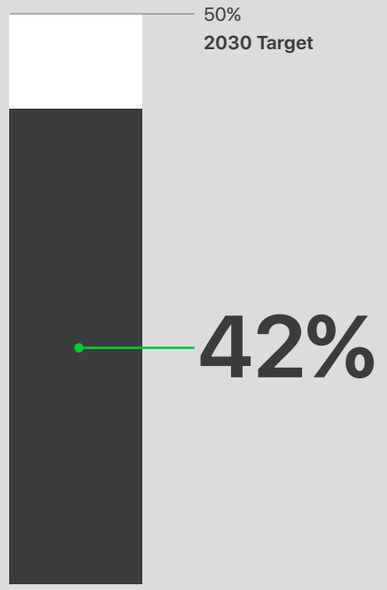
- Low-water design
- Site efficiency and conservation
- Site water stewardship
- Replenishment and nature-based solutions
- Leadership and advocacy

Our progress

## We've collaborated with partners on freshwater replenishment projects expected to address over 40 percent of the water we plan to replenish

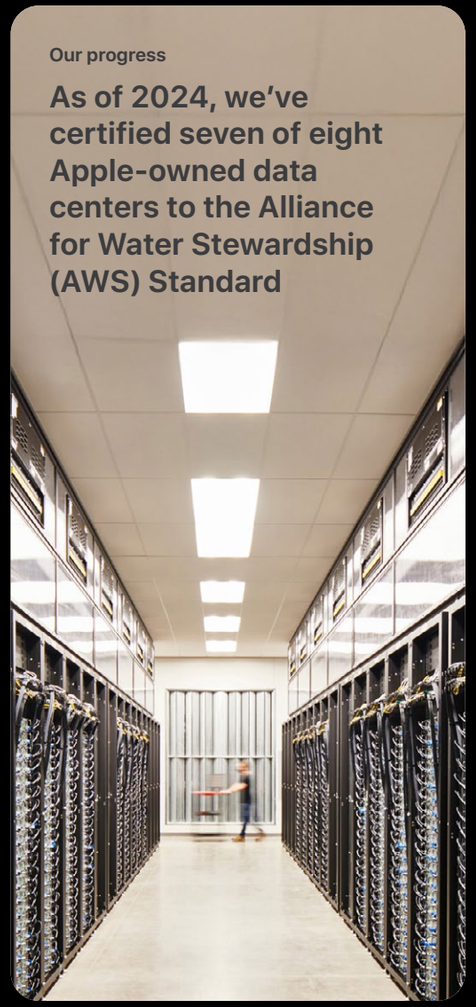
Our progress

## Through our Supplier Clean Water Program, we've supported an average reuse of 42 percent at more than 250 participating supplier facilities




Our progress

## As of 2024, we've certified seven of eight Apple-owned data centers to the Alliance for Water Stewardship (AWS) Standard



## Our water strategy

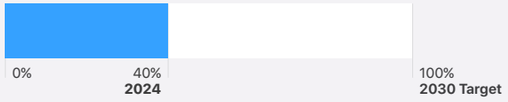
Water is a local resource. For this reason, we have a context-based strategy that takes into account local conditions where we and our suppliers operate. We collect and analyze data and site-level feedback to understand our water impacts. We also gain insights into local watershed health — such as baseline water stress — using tools like the World Resources Institute (WRI) Aqueduct Water Risk Atlas.

We've identified that 70 percent of our corporate water use occurs in areas with high basin stress.[57] And we've found that the majority of our water-related impact is in the manufacturing supply chain.

We know that we can't address water stewardship challenges alone. We believe we must go beyond our operations to collaborate with communities and work in basins on stewardship, replenishment, and WASH (water access, sanitation, and hygiene) projects throughout our value chain.

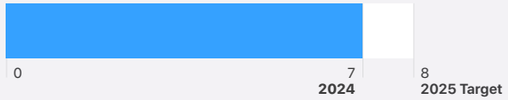
**Goal**
Replenish all our corporate freshwater withdrawals in high-stress locations by 2030.

**Progress**



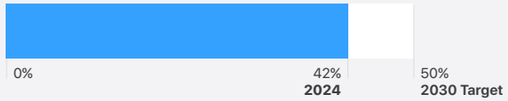

**Goal**
Certify all Apple-owned data centers to the Alliance for Water Stewardship (AWS) Standard by 2025.

**Progress**




**Goal**
Increase supplier participation in the Supplier Clean Water Program, prioritizing locations with high water stress and supporting participants in achieving a 50 percent average water reuse rate by 2030.[56]

**Progress**




## We focus our work on five strategic pillars:

**Low-water design**
Minimizing water impacts in the design of products, Apple-managed services, and sites[58]

**Site efficiency and conservation**
Improving the performance of existing sites and processes

**Site water stewardship**
Demonstrating responsibility beyond our facilities through watershed-level management

**Replenishment and nature-based solutions**
Improving water availability, quality, and access through regenerative approaches

**Leadership and advocacy**
Advancing water management through policy, advocacy, and technology innovation

To learn more, read our white paper, Apple's Water Strategy.

## Low-water design

We approach low-water design by focusing first on site selection whenever possible and conducting a water risk evaluation to determine whether a potential site is in a water-stressed area. The results inform our decision-making and help mitigate the impact of our expected water use. We then design solutions to manage the quality of the wastewater that we return to the watershed.

Our low-water design efforts avoided 161 million gallons of freshwater use in 2024 in our corporate offices and data centers.[59] At our campus in Austin, Texas, we aim to achieve net-zero water use by relying on an onsite wastewater reuse system, as well as condensate recovery and stormwater capture, limiting potable water use to potable purposes only. This effort will save up to 60 million gallons of freshwater use annually.[60] Using wastewater for cooling will also allow us to achieve 28 million kilowatt-hours in energy savings annually at the location.

Our three most recent data centers have prioritized water efficiency by using high-efficiency air-cooled chillers instead of water-cooled systems, resulting in zero water use for cooling. At our newest data center in Waukee, Iowa, we're also pursuing a 221-acre wetland restoration project on the property. The initiative will restore the land to native prairie potholes and wetlands, providing stormwater capture, groundwater recharge, and water quality benefits, as well as creating a habitat for native species.

In our supply chain, the majority of water is used in manufacturing. We look for opportunities to innovate around water- and chemistry-intensive processes when possible. An example of this is a green anodizing project we initiated, which involved subject matter experts across internal design, product development, manufacturing, and quality teams, as well as an outside vendor piloting acid recovery equipment. The project integrated an acid recovery technology that separated and recycled two process chemistries — sulfuric and phosphoric acids — along with modular reverse osmosis systems that filtered water in the anodizing baths. The team worked to confirm that the approach functioned within both the tight process tolerances and the delicate chemistry required to maintain product quality. From 2020 to 2022, the collaboration facilitated this technology transfer — from early offline experiments and a proof of concept pilot to full production of a MacBook product.

The impact was profound, resulting in a 75 percent reduction in water usage and approximately 90 percent reduction in chemical use, which also helped achieve carbon savings.

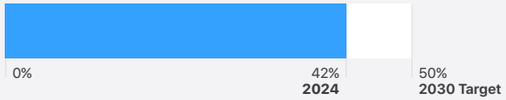
## Site efficiency and conservation

Next, we identify steps to use less freshwater in our existing operations and those of our suppliers, prioritizing regions where our efforts can immediately reduce stress on local watersheds.

**Goal**

Increase supplier participation in the Supplier Clean Water Program, prioritizing locations with high water stress and supporting participants in achieving a 50 percent average water reuse rate by 2030.

**Progress**




In 2024, our facilities used about 1.8 billion gallons of water in our direct operations — a 9 percent increase from 2023. This was driven by growth in our corporate campus portfolio, as well as hot weather increasing irrigation and cooling needs. But through our site efficiency and conservation efforts, we saved 96 million gallons of freshwater.[61] Last year, alternative water sources — primarily municipal recycled water — accounted for about 13 percent of our total corporate water usage. Additional efficiency and conservation accomplishments include:

- In early 2025, we completed cooling system controls optimization at our Maiden, North Carolina, data center, which is expected to save 7 million gallons of water per year. A second phase of this project is in progress.
- At our Parmer Lane campus in Austin, we performed retrocommissioning work that reduced the load on the cooling plant, saving over 3 million gallons of water per year.

At our data centers, server upgrades in 2024 saved 11 million gallons of water. We've also piloted a resin water treatment system that reduced makeup water use by 30 percent and discharge by up to 60 percent.[62] Based on this success, we're implementing this technology at our data centers in Prineville, Oregon, and Mesa, Arizona.

We also continued to use plant-based water treatment at several data centers, helping eliminate the need for biocides and corrosion inhibitors. This system, which uses compostable, natural sphagnum moss to improve water quality, can further support water savings. We implemented this at our Reno, Nevada, and Maiden, North Carolina, data centers and have begun a permanent installation in Mesa, Arizona.

Our supply chain accounts for 99 percent of our total water footprint, based on our detailed water inventory. We require our suppliers to maintain the high standards for water discharge outlined in the Apple Supplier Code of Conduct. Through our Supplier Clean Water Program, we help suppliers minimize process water impacts and adopt best practices in water management and wastewater treatment. The program supports our suppliers in going above and beyond requirements to become stewards of the water resources where they operate by conserving water, promoting water reuse, and preventing water pollution within our supply chain. Since the program's launch in 2013, the average reuse rate of more than 250 participating suppliers has increased to 42 percent, saving 14 billion gallons of freshwater in 2024 and over 90 billion gallons of water.[63] These savings come from a range of initiatives, such as the reuse of reclaimed water, upgrades to water-efficient equipment, and countercurrent rinse methods.

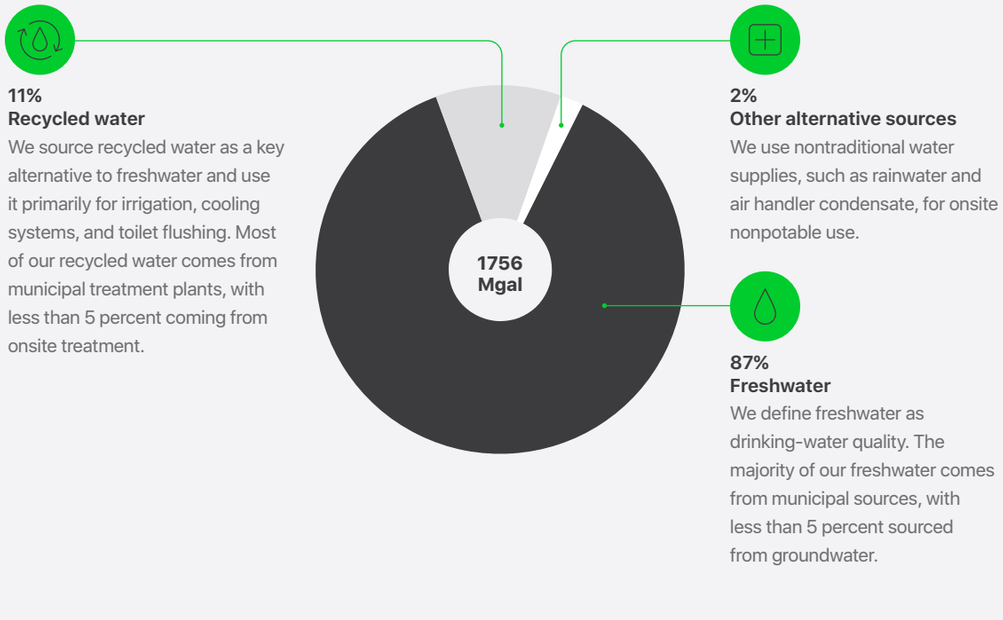
## Site-level water stewardship

We engage with the communities around our facilities for the protection of local watersheds. Since 2018, we've partnered with the Alliance for Water Stewardship (AWS) to advance the AWS Standard, the first global framework to measure responsible water stewardship across social, cultural, environmental, and economic criteria. In 2020, we joined the AWS board of trustees to highlight water stewardship opportunities to our suppliers and promote collective action on shared water challenges impacting the sector.

Through AWS, we've certified seven of the eight data centers that we own and operate in Prineville, Oregon; Reno, Nevada; Maiden, North Carolina; Mesa, Arizona; Viborg, Denmark; and Ulanqab and Gui'an in China. We're on track to certify our eighth data center in 2025.[64]

Since 2018, 29 of our supplier sites have been certified to the AWS Standard, 24 of which have achieved a Platinum rating — the highest score within the AWS framework. Our work with AWS has allowed us to engage with suppliers at the regional level, focusing on the stewardship of basins with a concentration of manufacturing partners. In the Taihu Basin, proximate to Shanghai, we've supported our efforts in the Supplier Clean Water Program and AWS certification by working with Water Champions. This program facilitates supplier field trips to water-sensitive areas within the basin. On these trips, participants experience first-hand lessons in water and wetland replenishment, as well as nature-based solutions for clean water flowing through the basin. These experiences reinforce the importance of efforts at the supplier sites by connecting individuals with the natural environment. In India, we also work with AWS and Frank Water to identify stewardship opportunities with our suppliers in the Bengaluru and Chennai basins, assessing the local water infrastructure and community needs.

### Water use at corporate facilities



## Replenishment and nature-based solutions

Replenishment and nature-based solutions are essential tools for addressing water availability, quality, and equity. Our goal is to replenish 100 percent of our corporate freshwater withdrawals in high-stress locations by 2030.[65] By the end of fiscal year 2024, we had contracts in place to address over 40 percent of what we expect to replenish.

## 2024 projects

**Water Quality Protection and WASH in Northern Nevada**
In the Truckee River Basin, home to our Reno Data Center, we partner with the local water utility, Truckee Meadows Water Authority. The project addresses water quality in the river and provides sanitation and water for drinking and hygiene to the downtown river corridor. The installation of a new Portland Loo in Reno City Plaza, along with continued operation and maintenance of freestanding public restrooms along the river in area parks, will prevent bacterial and nutrient pollution while providing access to dignified toilet facilities for the estimated 2000 people experiencing homelessness in Reno.

**Progress:** Apple's support provided estimated water benefits of 70 million gallons in 2024 and is expected to result in a total of 468 million gallons through 2030.

**Environmental Flows Restoration in Arizona**
Our second project in the Colorado River Basin, home to our Mesa Data Center, supports ongoing efforts by The Nature Conservancy and its local irrigation partners to restore streamflow to the Verde River. The Verde Ditch canal piping project is expected to result in total of 3 billion gallons of water benefits, starting in 2025.

**Groundwater Recharge and Bird Habitat in Northern California**
In the Central Valley, we engaged with The Nature Conservancy on a second project, facilitating late irrigation season watering to recharge groundwater and support local bird habitat. Our collaboration with a Yolo County landowner and the Dunnigan Water District provided the majority of the water benefits in 2024. In Colusa County, the conservancy engaged with a commercial tomato grower to undertake field trials that added water to three different post-harvest tomato treatment methods. The conservancy and the growers aim to determine which method optimizes bird habitat and soil quality while accounting for water use, treatment costs, and impacts on the following year's crop. The trial is aimed at determining the viability of using drip-irrigated, harvested tomato fields for late-season bird habitat, which would provide the conservancy with access to an additional 200,000 acres of land to support threatened and endangered shorebirds that travel the Pacific Flyway through the Central Valley.

**Progress:** Apple's support provided an estimated 58 million gallons of water benefits in 2024.

**Wetland Restoration in the Chesapeake Bay Watershed**
We partner with Ducks Unlimited to improve water quality in the Chesapeake Bay Watershed by reducing excess nutrient loading. Beginning in 2025, Apple will fund the restoration of degraded agricultural land to wetlands to improve water quality and support wildlife in the Chesapeake.

**Progress:** Our first project with Ducks Unlimited will reduce nitrogen, phosphorus, and sediment entering the Chesapeake Bay, resulting in total water benefits of 266 million gallons.

**Village Water Supply in Tanzania**
To support our replenishment needs in Africa, we've partnered with Water for Good to provide a safe, affordable, and lasting water supply to Bugogo, a village located in the Shinyanga Region of Tanzania. Water for Good is systematically addressing the region's water supply, sanitation, and hygiene needs in partnership with the Tanzanian government's Rural Water Supply and Sanitation Agency. In 2024, our funds supported the construction and maintenance of a water system that includes a solar-powered pump, which raises well water to a tank above the village before distributing it to 12 subvillage tapstands and taps at the village primary school and dispensary.

**Progress:** Water benefits are anticipated to grow over time, resulting in 21 to 42 million gallons in total water benefits.

## Ongoing projects

**Invasive Species Removal in Southern California**
We expanded our efforts with the Council for Watershed Health to remove the invasive *Arundo donax* cane species in Southern California, home to our Culver City campus. Our support provided an estimated 13 million gallons of water benefits in 2024 and is expected to result in a total of 350 million gallons over the lifetime of the agreements.

**Drinking Water Supply in India**
We provided 40 million gallons of drinking water in partnership with the Uptime Catalyst Facility in India over the past two years. This work helped us meet our 100 percent water replenishment target for our corporate operations in India in 2023.

**Forest Restoration in Arizona**
We monitored ongoing restoration work under our 20-year agreement with the Salt River Project, where the Arizona Department of Forestry and Fire Management has more than 12,000 acres of the total 30,000 acres contracted or undergoing restoration. In 2024, the project provided water benefits of 4 million gallons and is on track to meet the expected total of 1.8 billion gallons of water benefits over the next 20 years.

**Floodplain Restoration in Northern California**
We continued our engagement with River Partners — a leader in large-scale, multi-benefit river restoration across California — as they prepare the conceptual restoration design for the nearly 1600-acre Dos Rios Norte property at the confluence of the Sacramento and Feather Rivers. In 2024, River Partners initiated a partnership with a local Native American Tribe that identified Dos Rios Norte as a site of ancestral significance. River Partners is collecting native seeds and propagating plants with traditional uses. Water benefits totaling 4.9 billion gallons are expected to begin in 2028.

## Advocacy efforts and local partnerships

Addressing global water challenges requires collective action, and we aim to share our knowledge and work with others to accelerate progress. We collaborate with groups, including AWS and the Responsible Business Alliance (RBA), and we speak at conferences and engage with audiences driving impact within their communities and industries.

### Engagements

**Volumetric Water Benefit Accounting methodology**
Engaged in developing the next phase of this methodology with the World Resources Institute (WRI) to advance technical best practices in the sector.

**University of Oxford and Uptime**
Contributed to the briefing paper "Reducing Uncertainty in Corporate Water Impact: The Role of Results-Based Contracting for Drinking Water Supply," which explains the efficiency and effectiveness of these contracts in delivering corporate funding to augment drinking water supply in developing regions.[66]

**Alliance for Water Stewardship**
Supported the report Water Stewardship in Data Centres, which showcases how we addressed our water challenges through our water strategy in discussions on water-related challenges at the data centers of technology companies.[67]

**Pacific Institute**
Contributed to the white paper Evaluating the Cost-Effectiveness of Corporate Water Stewardship Projects, which addresses the challenge companies face in assessing the best projects aligned with their water stewardship goals.[68]

### Projects

**AWS Global Water Stewardship Forum**
Participated in sharing our expanded strategic initiatives in our corporate sites and indirect supplier efforts.

**Catawba-Wateree Water Management Group**
Joined the Advisory Board to partner locally on sustainable water management in high-water withdrawal basins where we operate. This organization oversees water management in the Catawba-Wateree Basin, home to our Maiden, North Carolina data center.

**Water Champion Field Trip**
Hosted various brand leaders, suppliers, and local partners to tour nature-based solutions and wetlands restoration projects aimed at reducing water pollution to raise awareness of water issues and water stewardship.

### Grants

**Frank Water**
Continued our partnership with the UK-based organization, which works alongside local partners in India to support access to safe water, sanitation, and hygiene. In 2024, the grant continued to support the expansion of the organization's programming from focusing on Bengaluru to include Chennai. This involved implementing the Decision Support System, through Water Dialogues in partnership with Indian industry, and water stewardship practices designed with our support, in a new critical region of India.

**Gravity Water**
Provided over 38,000 students in Vietnam's Hòa Bình province with a clean water source using innovative, climate-resilient rainwater harvesting and filtration technology. Gravity Water partners with schools to identify their unique challenges and create solutions tailored to their specific needs. This approach allows schools to have complete ownership of their clean water source, using familiarity with their existing water storage system and the automation provided by Gravity Water's intervention.

# Zero waste

Our purpose

**We're working to eliminate waste sent to landfill — and the environmental costs that come with it. Our values drive us to protect the most vulnerable communities who disproportionately bear the costs associated with waste disposal.**

Our path

**Our approach focuses on eliminating waste through the following:**

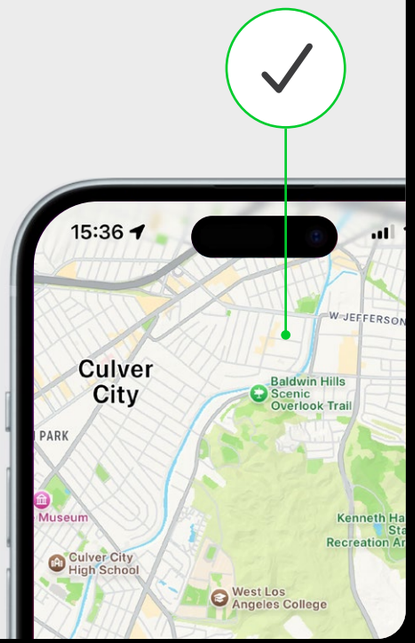
- Measuring our progress
- Prioritizing waste-free operations
- Driving waste diversion and elimination
- Partnering for waste reduction

Our progress

**Diverted an estimated 3.6 million metric tons of supplier facility waste from landfills through our Zero Waste Program**


Our progress

**Achieved TRUE certification for zero waste at five data centers and two corporate facilities as of 2024**




Our progress

**Recognized more than 230 supplier facilities in 10 countries and regions as Zero Waste to Landfill by UL Solutions**

## Reducing waste at our corporate facilities

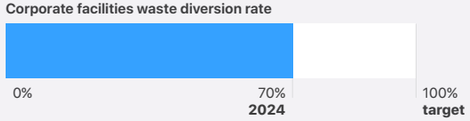
We're reducing the amount of waste generated in our corporate operations and directing more to recycling programs. In 2024, recycling and composting efforts allowed us to achieve a waste diversion rate of 70 percent. We also limited landfill waste from our global operations to about 18,700 metric tons.[69]

We've continued our efforts to make progress on waste diversion since achieving our first zero-waste certification, UL Solutions' Zero Waste to Landfill Validation, in 2015 for our campus in Cork, Ireland. In 2023, our Taiwan Technology Center became the second Apple facility to receive the UL Solutions Zero Waste to Landfill Validation.[70] In 2024, our corporate offices in Sacramento and Los Angeles, California, and our data centers in Reno, Nevada and Maiden, North Carolina received TRUE certification in 2023, joining our data centers in Mesa, Arizona, Viborg, Denmark, and Prineville, Oregon.[71] These facilities achieved TRUE Platinum, the highest certification level. TRUE recognizes facilities that divert more than 90 percent of waste through recycling, compost, reuse, and other design strategies.

**Goal**

Eliminate waste sent to landfill from our corporate facilities and our suppliers

**Progress**




**Promoting material reuse, composting, and waste diversion across our corporate and retail locations**

We prioritize finding opportunities to recycle construction and demolition waste across all our global construction projects:

- In 2024, our recycling and source separation from corporate office and data center construction and demolition efforts resulted in an overall waste diversion rate of 81 percent — more than 22,500 metric tons.
- We've continued to divert materials through our specialty recycling initiatives that return them to their original suppliers, who manufacture new materials. In 2024, this program diverted over 840 metric tons of materials, including office furniture, electronics, doors, trees, HVAC equipment, and even terrazzo benches. These items were deconstructed and salvaged from existing buildings before starting demolition. The program also diverted more than 60 metric tons of ceiling tile and 105 metric tons of carpeting from the landfill.

**Apple Los Angeles:** In 2024, we set out to push the possibilities of solid waste management at Apple Los Angeles. Our objectives involved developing data-driven approaches, including conducting daily waste characterizations and targeting materials for source reduction and diversion programs. This effort entailed bringing materials from the 13 Apple sites within our Los Angeles campus to a centralized location and sorting by hand. Through this process, we developed a clearer understanding of the materials coming through our sites and were able to significantly enhance recycling and composting. We achieved our initial target of TRUE certification, which verifies our Zero Waste Program, reinforcing the importance of data accuracy in targeting waste reduction.

**Expanding reusables:** We're focused on reducing single-use items as part of our zero-waste goals. In 2024, we expanded a program to implement reusables, including dishware and utensils, at our Caffè Macs and break rooms across our campuses in California. By introducing reusables onsite, we're better able to reduce the amount of waste that leaves our campuses and could otherwise be diverted to landfills. At the Worldwide Developers Conference (WWDC) in 2024, our expanded use of reusables drove significant waste reductions and increased the event's total diversion from landfills. Following the success in California, we aim to apply this approach to our Apple campuses worldwide.

**Driving solutions internally through communication, reporting, and education**

Our employees play a critical role in reporting on waste and facilitating waste audits at our locations. We support these efforts with training, education, and access to resources. In 2024, we launched a global campaign to encourage better sorting of materials by standardizing bin colors, clearly defining acceptable items, and improving signage. On Earth Day, 180 volunteers across eight campuses worldwide participated in peer-to-peer education programs on proper sorting techniques, reinforcing the importance of individual action and connecting employees to Apple's journey to zero waste.

We standardized waste reporting requirements and implemented a centralized dashboard system across all our data centers and corporate offices. Our retail auditing program examines locations in North America, documenting the material characteristics of our waste. This data allows for better assessment of our waste practices and opportunities to improve our approaches. We also provide site-specific zero-waste training for all Apple data centers. All new data center employees are required to complete this site-specific zero-waste training and receive manager approval of completion.

## Taking a zero-waste approach with our suppliers

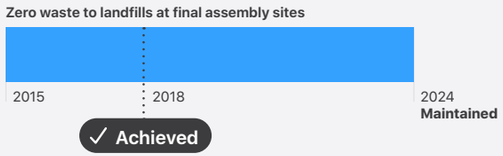
Apple employees, suppliers, recyclers, and waste solution providers are central to achieving our zero-waste goal. We launched the Zero Waste Program for our manufacturing partners in 2015 and have made significant, continuous progress. And we've expanded this program to include more than 480 supplier facilities across 15 countries and regions.

We require our suppliers to participate in our Zero Waste Program as part of our Supplier Code of Conduct. They must implement a systematic approach that includes identifying all waste sources and characterizing each stream in the waste inventory, developing a program or solution to quantify and monitor their waste-to-landfill diversion rate, setting waste minimization goals, and maintaining progress toward achieving zero waste to landfill. Our Zero Waste Program provides training and tools to help suppliers track their waste, set waste minimization goals, and create improvement plans for achieving zero waste in their operations.

**Goal**

Eliminate waste sent to landfill from our corporate facilities and our suppliers

**Progress**




In 2023, the Supplier Zero Waste Implementation Plan became an assessment requirement following a year of training and piloting. All our key manufacturing suppliers must implement the Zero Waste Program, including evaluating their performance against the program criteria.

As part of the Supplier Code of Conduct requirement, we also require more than 1000 supplier production facilities to annually report waste inventory to Apple. Facilities have received training and templates to record and correctly classify waste data and document the visible diversion rate. To verify suppliers' waste data quality, we partner with third-party auditors to conduct sample evaluations, focusing on waste classifications, waste data recordkeeping and reporting, and reasonable waste treatment methods.

We provide all facilities participating in the program with resources and guidance on reducing waste and reusing materials, recycling, or composting waste. Suppliers at these locations can also access tools to improve waste management and, in some cases, onsite support. The program continues to make an impact: In 2024, suppliers redirected approximately 600,000 metric tons of waste from landfills, bringing the total to 3.6 million metric tons since the program's inception — equivalent to eliminating 4.5 million square meters of landfill space. Throughout 2024, 100 percent of established final assembly sites maintained zero-waste-to-landfill operations.[72]

We're prioritizing the next challenge in achieving zero waste, which is a level deeper — the subassembly module suppliers who assemble the individual components of Apple products. The waste stream at this level is often more complex than at final assembly sites, but we're making progress. As of 2024, more than 400 module suppliers have participated in the Zero Waste Program since its inception — including those who provide core technology components, displays, PCBs and flex, packaging, and enclosures. These suppliers have diverted approximately 350,000 metric tons of waste from landfills.

**Pushing toward zero-waste innovation**

We use novel recycling approaches to divert greater quantities of waste from landfill in our supplier facilities at higher rates. We also pursue material solutions to impact the waste streams entering these facilities to simplify and maximize the recyclable content that our suppliers work with.

Plastic is a significant source of waste in our supply chain, and we've concentrated our initiatives on minimizing the production of plastics in manufacturing. Since 2018, we've been dedicated to developing waste-reducing components. Among these are recyclable protective films (RPFs) — designed to protect products during the manufacturing phase — and reusable trays, which allow for secure transportation of modules across various assembly locations. Since 2018 through the end of 2024, we've diverted about 22,000 metric tons of plastic films and achieved the reuse of approximately 33,000 metric tons of plastic trays externally across different sites in our supply chain. We've also reached more than 35 percent in-process RPF reduction for iPhone.

We also work to reduce complex waste streams, including chemical waste generated during manufacturing. In 2024, we continued our efforts in coolant recycling and reuse throughout our supply chain. Coolant is a chemical material essential to cooling the surface of machinery involved in manufacturing components like enclosures. To avoid sending this material to landfills or incinerators, we promoted reuse through a coolant-containing waste recycling practice and expanded it to more applicable facilities. We achieved positive results in 2024, reducing coolant-containing waste by more than 36,000 metric tons through fine filtration and sterilization.

We focus on recovering valuable metals from waste liquids generated during printed circuit board (PCB) manufacturing, including copper (Cu), gold (Au), and palladium (Pd). These metals are efficiently separated and processed into high-quality raw materials using advanced extraction and purification technologies. The recovered metals are then reintegrated into the production cycle. In 2024, approximately 1800 metric tons of metals and metal compounds were recovered through this process.

**Engaging with suppliers to reduce waste**

We work closely with our suppliers to realize our zero-waste goals. This work faces a range of challenges, including a lack of access to recycling technologies, the absence of local infrastructure, and the lower value of recyclable material that impacts the economics of recycling.

An example of a resource benefiting the industry is a tool developed by Apple and UL Solutions, our partner that validates zero-waste efforts. The tool provides the first-ever supply chain zero-waste management system assurance program, enabling third-party zero-waste verification at a system level rather than at a site level. The assurance procedure has enabled the significant acceleration of the verification process and establishes a new model that companies across industries can employ to verify zero-waste programs at scale. This streamlined approach has brought even more suppliers into our program, with more than 230 facilities assured by UL Solutions in 2024 — 45 more than the previous year.[73]

We also support our suppliers in verifying their zero-waste efforts. Since launch of our Zero Waste Program, its foundation has followed the UL 2799 Zero Waste to Landfill Environmental Claim Validation Procedure (ECVP), which requires at least 90 percent diversion through methods other than waste-to-energy. Through this standard, our supplier facilities can certify against clear benchmarks for waste diversion, including Platinum, Gold, and Silver levels of verification. We've spent the last eight years expanding this program throughout our supply chain, with suppliers in China, India, and Vietnam becoming UL validated. Since we switched from individual site verification to system-level verification, suppliers participating in the assurance program can easily apply their verification statements from UL.

**Focusing on industry impact**

We've used the expertise of UL to evaluate and verify the zero-waste performance of our suppliers. We've worked with UL to promote the experience and best practices we've developed, implementing zero-waste projects in our supply chain and leading the development of zero-waste efforts in the consumer electronics industry. In 2024, we invited UL's waste experts to join us for onsite visits to representative suppliers to understand better the current status of waste management and innovative waste treatment projects in electronic supply chain manufacturing facilities. The experts also participated in discussions on revising the UL 2799 Zero Waste to Landfill Verification Standard. By working closely together, we've benefited from constructive insights for updates to the standard and deepened the integration of theory and practice in the standard.

Our zero-waste and carbon reduction initiatives have had an influence across the supply chain. Using our guidance, resources, and tools, suppliers have embarked on related efforts, with six receiving awards from local governments and industry associations for their zero-waste and carbon reduction projects.

In 2024, we supported the development of the Waste Minimization Toolkit with the Responsible Business Alliance (RBA) alongside other members of its Environmental Sustainability Working Group (ESWG). Through a survey, the RBA confirmed that members saw value in the development of standardized supply chain tools to support industry-wide approaches to addressing environmental issues. The RBA developed the toolkit in consultation with the ESWG and the newly formed Circularity & Waste Minimization Working Group — representing all segments of the electronics industry value chain. Launched in December 2024 in the RBA's e-Learning Academy, the toolkit includes a Waste Tracking Record Tool and a video learning module to help suppliers manage solid waste, reduce environmental impacts, and move toward a circular economy. The learning module teaches waste minimization best practices and how to use the tracking tool. This collaboration aligns with our environmental commitment and drive to set new industry standards.

**Building supplier capability**

To address the challenge of waste classification for suppliers across countries and regions, we've created the Apple Recommended Waste Category List to provide standardized guidance on classifying different types of waste. This list has been widely implemented and used by suppliers in the Zero Waste Program. Suppliers have also received access to training and coaching on waste classification to support their efforts in separating waste while promoting waste reduction, reuse, and recycling.

The data we've aggregated summarizes the top 10 waste streams — including plastics, papers, and metals — and their corresponding diversion solutions. This data provides a valuable perspective on the waste footprint across our supply chain. It also shows us where we can expand our efforts on material utilization to reduce the amount of waste sent to incineration or landfill.

Starting in 2022, we've organized a series of webinars with suppliers, policymakers, and industrial leaders to share their experiences in the Zero Waste Program with participating suppliers and those who plan to join. These sessions provide an opportunity to discuss the lessons learned from implementing the Zero Waste Program, best practices around the compliance requirements of waste management, and emerging recycling and waste reduction technologies.

We're focused on expanding the impact of the Zero Waste Program in our supply chain and beyond. We've introduced various educational initiatives in India since 2023, focused on sharing the foundations of sustainable development, strategies for achieving zero-waste goals, and optimal waste management techniques. In 2024, 12 suppliers with more than 1250 employees completed our community-based online learning courses, equipping them with fundamental waste management skills and sustainable living practices, including composting at home.

We're committed to amplifying the reach of our Zero Waste Program within our supply chain and beyond. Through our Supplier Employee Development Fund, we've been implementing a zero-waste education initiative in India. This initiative reflects our dedication to fostering environmental consciousness in the communities connected to the supply chain. It has also enabled us to create tailored zero-waste training programs for supplier leadership, employees, and local community members.

In 2024, we conducted seven hands-on workshops at various locations in India, engaging more than 640 participants from diverse backgrounds. Each session focused on themes such as waste segregation, composting, and sustainable living. Our efforts extended beyond the sessions, with discussion groups offering additional guidance and a forum to share progress. Many participants began composting at home, and some residential communities initiated broader waste management programs. This initiative demonstrates our approach to achieving impact through community education, combining innovative strategies with hands-on engagement to inspire lasting change and environmental stewardship.

We've also launched zero-waste workshops in China and Japan. The Apple Education Hub at Zhejiang University in China, a workshop attended by approximately 500 participants, shared cutting-edge waste recycling technologies and innovative solutions, including an intelligent digital waste management system developed by one of our key vendors, which streamlines waste management processes and enhances efficiency and sustainability. The workshop also addressed innovative approaches to distinct challenges, such as recycling acidic waste. In Tokyo, 67 representatives from 24 Japanese suppliers attended a workshop focusing on the implementation of a zero-waste landfill project. The event brought together key stakeholders, including waste management experts and representatives from recycling companies and UL, which explained certification requirements. The outreach sought to connect long-standing local waste management practices with the goal to achieve zero waste.

FEATURE

# Green buildings

**Whether we're constructing a data center or corporate office or restoring a historic site to house a retail store, we have an opportunity to advance our vision of the world we'd like to live in — one that's inclusive and accessible, reflects the value we place on creativity and innovation, and furthers our environmental goals.**

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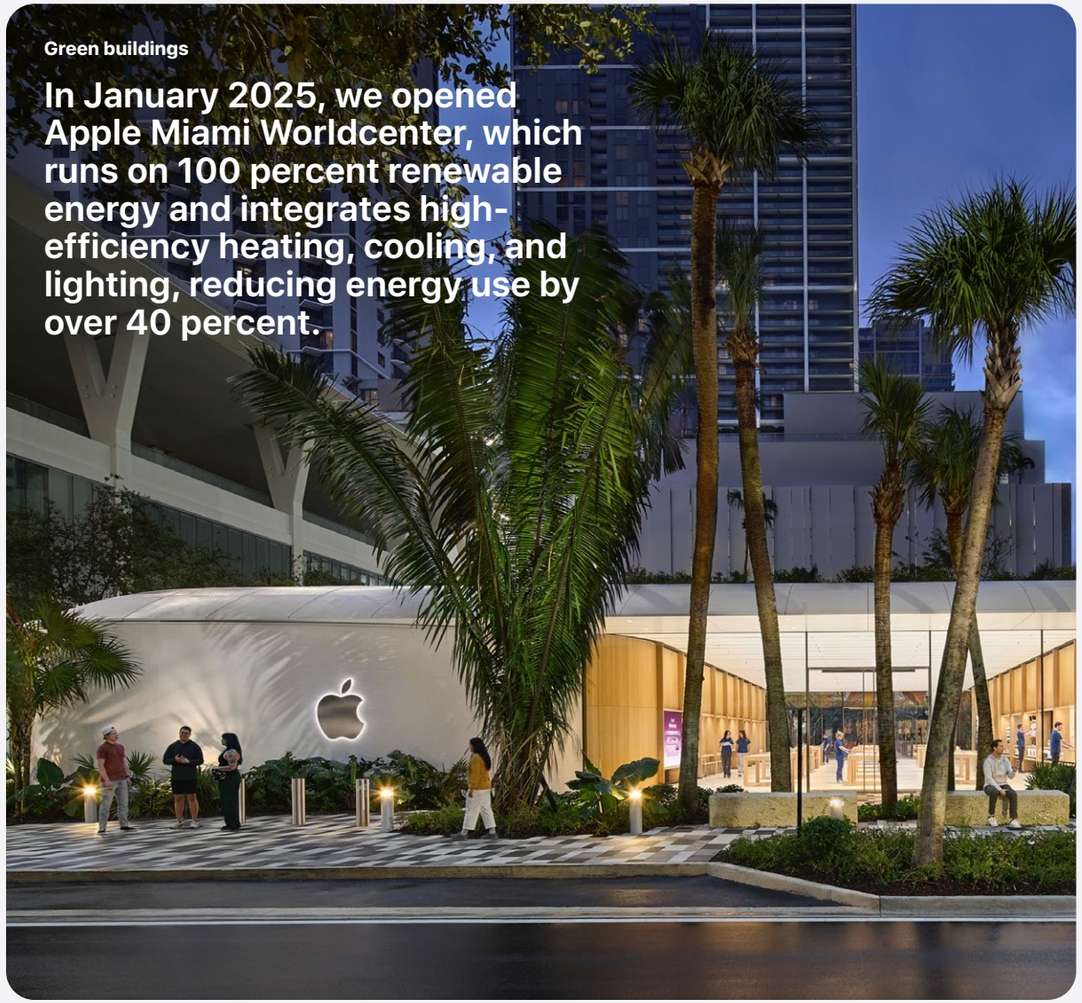
Our environmental approach to design and construction adheres to industry-recognized best practices for green buildings, emphasizing renewable energy, water conservation, energy efficiency, and responsible material management.

Our global footprint requires adapting to different locations and climates while pursuing sustainability goals. In 2024, one Apple site in France achieved LEED Platinum, and four sites — two in California, one in Barcelona, and one in India — achieved LEED Gold. We also added a building in Bengaluru, a LEED Platinum-certified office and research space, to our corporate facilities in India. The 400,000-square-foot project uses 100 percent renewable energy, onsite wastewater treatment, and high-level air filtration.

Apple Observatory, our new subterranean events venue at Apple Park, showcases our commitment to sustainability through emissions reduction, energy efficiency, and support for local ecology. The project used low-carbon concrete, steel, and insulation.

Our environmental approach extends to retail. In January 2025, we opened Apple Miami Worldcenter, built using low-carbon materials and biophilic design. The construction achieved a 60 percent reduction in emissions compared with industry baselines. The store runs on 100 percent renewable energy and integrates high-efficiency heating, cooling, and lighting — reducing energy use by over 40 percent.



# Smarter Chemistry

**In this section**

Approach

# Smarter Chemistry

**We identify and use the chemicals and materials that best serve our priorities of safety, performance, and the environment. This strategy is the foundation of smarter chemistry — and it underpins our efforts across our supply chain.**

Our approach to smarter chemistry proactively promotes the use of safer materials and chemicals. We identify chemicals that balance our priorities — including safety and performance — to minimize our environmental impact. This work supports our efforts toward a circular supply chain by reducing the recirculation of potentially harmful substances. It also contributes to a healthier workplace for the people making our products.

We focus on limiting chemical exposure through the commonly used hierarchy of controls. This consists of five actions that organizations can take with materials:

- Elimination
- Substitution
- Engineering controls
- Administrative controls
- Personal protective equipment (PPE)

Of these actions, we prioritize elimination and substitution. When no alternative is available to eliminate or substitute potential exposure, we rely on engineering and administrative controls to safeguard against hazard exposure.

As part of our program, we establish safety requirements that often exceed local industry standards and support our suppliers in implementing them. To drive these efforts, we've created standards and programs that include rigorous requirements — defined in our Regulated Substances Specification (RSS) — and deep supply chain engagement through our Full Material Disclosure (FMD) and Chemical Safety Disclosure (CSD) programs.

Maintaining comprehensive information on the chemicals and materials we use is essential to protecting the people who design, make, use, and recycle our devices. It also guides our efforts to protect the environment and to push for the development and broad adoption of safer alternatives, working alongside leading members of the scientific community, NGOs, and industry organizations. We share what we've learned from creating these systems with others in the industry — and push for change that can transform product manufacturing.

Advocacy and leadership are needed to make this happen, and we're committed to both. We advocate for the broader use of safer and more sustainable materials based on smarter chemistry while working with our suppliers and material manufacturers to create alternatives that can help move our industry forward.

## Strategic pillars

**Mapping**
Engaging our supply chain partners to comprehensively identify the processes and chemicals in the materials used to make our products — driving change beyond what's required for regulatory compliance.

Read more on page 60.

**Assessment**
Assessing the potential human health and environmental risks of material chemistries to evaluate compliance with our requirements and to inform our product design.

Read more on page 63.

**Innovation**
Driving the development and use of innovative materials that enable the creation of groundbreaking products and support industry-wide change.

Read more on page 67.

See our Regulated Substances Specification.

See our Restricted Chemicals for Prolonged Skin Contact Materials list.

Read our white paper about our commitment to phasing out per- and polyfluoroalkyl substances.

# Mapping

Our purpose

**We work with our supply chain partners to identify the chemicals in the materials used to make our products and in their manufacturing processes. This allows us to drive change beyond what regulatory compliance requires.**

Our path

**Through collaboration, we're build a comprehensive view of the chemicals in the materials we use and improving how we make our products.**

Full Material Disclosure (FMD)

Chemical Safety Disclosure (CSD)

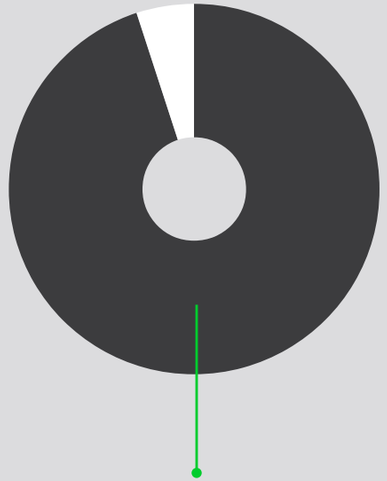
Multi-tiered supply chain engagement with data collection and auditing

Our progress

**Shared data from more than 1000 manufacturing partner facilities on their chemical use, management, and safety**

Our progress

**Collected detailed chemical information about more than 95 percent of iPad Air by mass**



95%

Our progress

**Included 80,000 materials in our comprehensive material library, which suppliers use to assess against our Regulated Substance Specification**

Our Full Material Disclosure (FMD) program maps the materials in our products and their chemistries, while our Chemical Safety Disclosure (CSD) program tracks the materials used to manufacture our products. We drive our supply chain partners to collect in-depth information on the material chemistries they use, including their purpose, the amount consumed, and how the chemicals are applied, stored, and handled. We also work closely with our partners to review the steps they're taking to protect their employees.

We also examine the effects of material chemistries across a product's life cycle — from design and manufacturing to the customer experience and ultimately, recycling and recovery. This information guides our decisions related to health, safety, and environmental risks. The changes we're making have an impact beyond our footprint and across our industry, supporting our efforts to build responsible circular economies at scale.

## Building a comprehensive view of the materials in our products

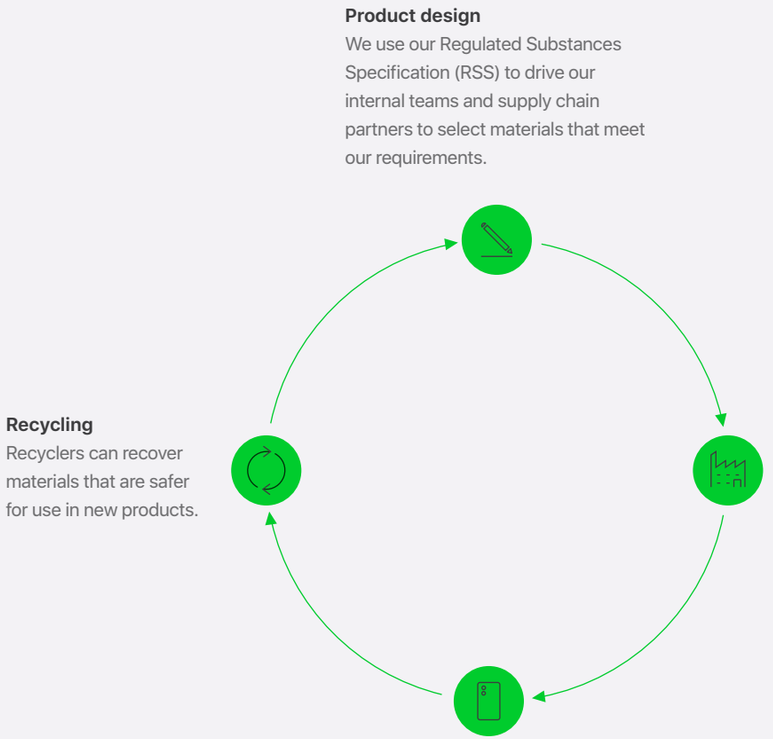
Detailed and comprehensive information guides our decision-making about material chemistries. The FMD program, which launched eight years ago, is our ongoing effort to catalog and map each chemical in the materials used in our products. Material manufacturers provide thorough reporting on material compositions from deep within our supply chain — proprietary data that's shared through our secure data collection system. This system informs our choices about materials that have been used in the past or are currently in use. For iPhone, iPad, and Mac devices released in 2024, we collected detailed chemical information on 93 percent of each product, on average, by mass. We collected information on more than 95 percent of iPad Air products by mass.

Our suppliers are required to participate in the program. They share information on thousands of materials, collectively, used to manufacture our products. The advanced collection system we've implemented has made this process easier for suppliers who have access to a library of more than 80,000 materials as of 2024. Our suppliers use this library to assess materials against our RSS and select materials to use in our products. When a new material a supplier uses isn't listed in our library, we authenticate it with documentation from the manufacturer.

The FMD program includes tens of thousands of parts and assemblies across our product lines. We prioritize high-volume materials and those that come under prolonged skin contact, which we assess for biocompatibility. The program helps address a challenge faced across our industry: lack of visibility into materials' chemical composition. We rely on our deep knowledge of the materials used to reduce potential toxicological risk and pursue opportunities to develop better chemistries. Through the program, we're able to identify ways to improve and further contribute to our safety and environmental goals.

The comprehensive materials library helps inform decisions across our product life cycles. It helps drive our suppliers to make better material selections that align with our RSS. It also provides a foundation for assessing the materials we specify, how our products are manufactured, and, eventually, how they'll be recycled. We use innovative approaches, including machine learning, to digitize chemical test data so this information is easier to assess. We're driving the development of industry standards that will help encourage the exchange of data on materials. These efforts support our goals of improving the safety of our products, as well as the broader electronics industry and beyond.

## Smarter chemistry matters at every stage in the product life cycle

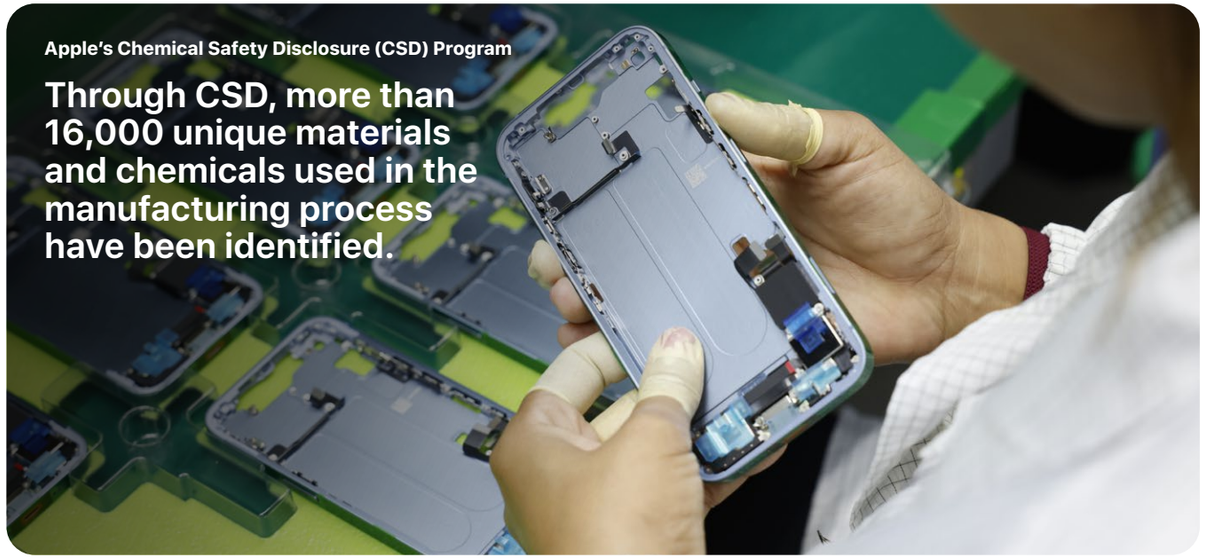


## Creating an inventory of chemicals used in manufacturing

The Apple Supplier Code of Conduct and Supplier Responsibility Standards outline our requirements for suppliers in the areas of health and safety, labor and human rights, the environment, ethics, and management systems, including requirements related to their use of chemicals. We also account for how chemicals are selected and managed within our supply chain — and the impact it can have on the health and safety of people working in our supply chain. Read more about our work across our global supply chain in our People and Environment in our Supply Chain Report.

Collecting detailed and accurate information drives this process, including which chemicals our suppliers use to make our products and how they store, handle, and use each one. Through the Chemical Safety Disclosure (CSD) program, suppliers are required to provide this data as part of a rigorous disclosure process. The detailed chemical inventory from our suppliers allows us to support our supply chain partners in identifying risks and opportunities to implement safer alternatives.

In 2024, more than 1000 supplier facilities — including suppliers representing the majority of our direct spend — shared their chemical inventories as well as their storage and control information as part of the CSD program. Through this initiative, we've identified more than 16,000 unique materials and chemicals used in the manufacturing process. All these efforts contribute to a safer work environment for people across our supply chain.




### Comprehensive chemical mapping for safer products

**An understanding of chemical ingredients leads to better materials for Apple products**

Through the FMD program, Apple manufacturing partners share the materials they use to manufacture Apple products.

We work with material manufacturers to understand the chemistries of the materials, enabling evaluation.

**Data helps Apple suppliers manage chemicals and materials they use to make Apple products**

Through our CSD program, suppliers provide Apple with information about how they use and store the chemicals and protect their employees.

This data informs and prioritizes supplier engagement, encouraging rigorous chemical management practices and the adoption of safer alternatives.

**Apple customers benefit from using products made with safer materials and chemicals**

The FMD and CSD programs support the creation of quality products in a responsible manner for our customers.

# Assessment

Our purpose

We use chemical and material data collected from our supply chain to assess that our product designs, manufacturing processes, and approaches to recycling and reuse meet the high standards set in our Regulated Substances Specification and Restricted Chemicals for Prolonged Skin Contact Materials Specification.

Our path

We use industry-leading assessment methods and tools as we work to confirm that only materials meeting our stringent requirements are used in Apple products.

Chemical hazard assessments

Supplier engagement

Safer cleaners

Our progress

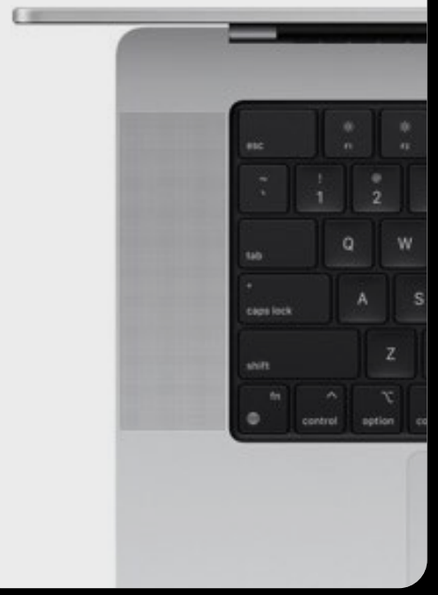
Codified safer alternatives in Apple's March 2025 Regulated Substances Specification (RSS) update — the first Apple RSS revision to enforce safer chemistry in its supply chain

Our progress

Approved more than 65 new safer cleaners in fiscal year 2024, for a total of more than 200 safer cleaners approved for use in Apple's supply chain

Our progress

Launched CleanScreen — a cloud-based app designed to streamline the creation of safer formulations — in collaboration with ChemFORWARD



## Setting and maintaining rigorous chemical safety requirements

We first published the Regulated Substances Specification over 20 years ago, establishing requirements for the use of chemicals or materials in our products, accessories, manufacturing processes, and packaging. The specification builds on our history of advancements in material safety — and reflects our dedication to the collection of necessary data to uphold these requirements.

We continue to evolve the RSS with new chemicals and restrictions based on the latest scientific research and standards, drawing from regulations, international standards, and voluntary requirements. Many of the specification's restrictions exceed the most stringent local regulatory requirements to protect workers' health and the environment. The specification designates restricted substances and requires reporting on additional substances. This year, we've released a revision with our most ambitious requirements to date, including new testing requirements for heavy metals in dyes and a new section that addresses substitution of materials with appropriate alternatives. This new section addresses requirements for our material suppliers to work to confirm alternatives to chemicals phased out are replaced by appropriate alternatives, and also requires suppliers to exclusively use verified materials for specific uses, such as cleaners used at final assembly sites. This update makes Apple one of the first companies to codify a clear policy to enforce substitution with safer materials, creating greater awareness and true accountability among our supply chain partners.

Our Green Chemistry Advisory Board — an independent group of leading researchers and academics — provides feedback on key initiatives, including potential updates to the RSS. Their diverse experience and perspectives help us lead the way in protecting our customers and those who make or recycle our products.

We apply controls to materials that come into prolonged skin contact (as defined in our Restricted Chemicals for Prolonged Skin Contact Materials list). These restrictions focus on substances that are potential skin sensitizers, minimizing reactions commonly reported across wearable products like jewelry. We derive these restrictions from leading standards, recommendations from toxicologists and dermatologists, international laws and directives, and Apple policies. We mandate that our suppliers analyze each material that comes into prolonged contact with skin according to Apple's requirements, and we review compliance with these requirements. Our specifications are incorporated into contractual obligations for our suppliers, and each specification helps us maintain stringent requirements.

## Verifying and developing in the environmental testing lab

We evaluate the safety of our products and materials through chemical analyses at our Environmental Testing Lab. Our chemists test materials to monitor compliance with our specifications. The lab continues to grow in its mission and capacity — expanding its testing facilities with new technologies to conduct chemical analysis. Our teams also review test reports from suppliers to evaluate substances against the Regulated Substances Specification and Restricted Chemicals for Prolonged Skin Contact Materials Specification. In 2024, we performed toxicological assessments on more than 1800 new materials to proactively evaluate and eliminate potentially harmful substances from our products.

The data we collect from our disclosure programs drives our assessments. We're able to generate comprehensive assessments such as GreenScreen®, a methodology that we use to gauge the potential impact of chemicals on individuals' health and the environment based on 18 criteria. We develop toxicological profiles for new chemicals using scientific literature and internal assessments. These profiles detail the impacts of each chemical, providing data that enables us to evaluate the safety of using a substance in a specific product. We also continue to expand the scope of biocompatibility testing beyond individual materials to include modules and whole products. Through this work, we have an even more comprehensive view of each material and the potential impact that assembly has on safety. We conduct toxicological analyses of the materials in our products to help guide our material safety guidelines. The information we share through material specifications benefits our suppliers and those we collaborate with in the industry.


## Working with suppliers to meet global requirements

We've created systems to help our suppliers learn about our material specifications, track and assess the materials they use, and regularly communicate their material usage. This helps our suppliers meet global standards and regulations governing their operations. The FMD and CSD programs require suppliers to gather, understand, and share information on the materials they use — beyond regulatory requirements.

We support suppliers' engagement with these programs — and the RSS — through ongoing training, which is central to our partnership and shared efforts to promote smarter chemistry in our products and processes. The RSS describes Apple's global requirements and restrictions on the use of certain chemical substances or materials in Apple products, accessories packaging, ingredient formulations, and manufacturing processes. We provide supplemental support to our suppliers through training and workshops on our specifications. We're also working with our suppliers to identify and develop alternative non-PFAS materials without regrettable substitutions that meet the current and upcoming regulatory requirements for complex per- and polyfluoroalkyl substances (PFAS).

Our suppliers in China have been working under regulations since 2020 governing the use of materials containing volatile organic compounds (VOCs). In 2024, we continued providing additional support to suppliers through trainings on the regulations, attended by more than 480 participants. These attendees helped validate over 3900 materials for low-VOC compliance. By deploying a VOC specification worldwide, we're also helping drive the global adoption of low-VOC alternatives.

## Creating a list of safer cleaners

Our efforts are making an immediate and lasting impact in protecting workers and the environment through our approach to the application of cleaners and degreasers — some of the highest-use materials at final assembly sites. Regulators and environmental health and safety organizations have focused considerable attention on the chemistries of cleaners and degreasers.

We've restricted the use of cleaners with known carcinogens, mutagens, reproductive toxicants, strong sensitizers, and persistent bio-accumulative toxins (including PFAS) from cleaners and degreasers used at our supplier final assembly sites. This work was guided by globally recognized standards (such as EPA Safer Choice, GreenScreen Certified®, and ToxFMD®). These standards are based on chemical hazard assessments, a more comprehensive and robust hazard approach than eliminating individual substances of concern. In 2024, we approved 67 additional safer cleaners for use in our supply chain, bringing the total number of safer cleaners we've approved over the past three years to more than 200.

These efforts have had a direct impact on health and safety — and have the potential to transform how our industry operates. We're promoting their use across our supply chain by making it easier for suppliers to select safer alternatives for process chemicals at the outset. We restrict the use of cleaners and degreasers not included in our safer cleaners list set forth by our Restricted Substances Specification — including at all of our final assembly sites, where cleaners and degreasers account for some of the most used materials by volume.[74] We've consistently expanded this work deeper into our supply chain to suppliers and processes beyond final assembly, helping them identify and implement opportunities to use safer alternatives in their operations. In 2024, we received the EPA Safer Choice Partner of the Year Award for the fourth time in five years in recognition of our work to advance the use of safer cleaners and degreasers.

We also look outside our supply chain to promote a broader transition to safer chemicals across our industry. See page 69 for more information on how we're advocating for safer cleaners and degreasers.

FEATURE

# Building an industry resource for safer cleaners

**Developing safer cleaners and degreasers and implementing their use in manufacturing our products has been central to our work on smarter chemistry — and integral in our efforts to protect workers and the environment. In 2024, we've expanded the reach of this work with the launch of CleanScreen, a cloud-based app designed to streamline the creation of safer formulations, in collaboration with ChemFORWARD.**

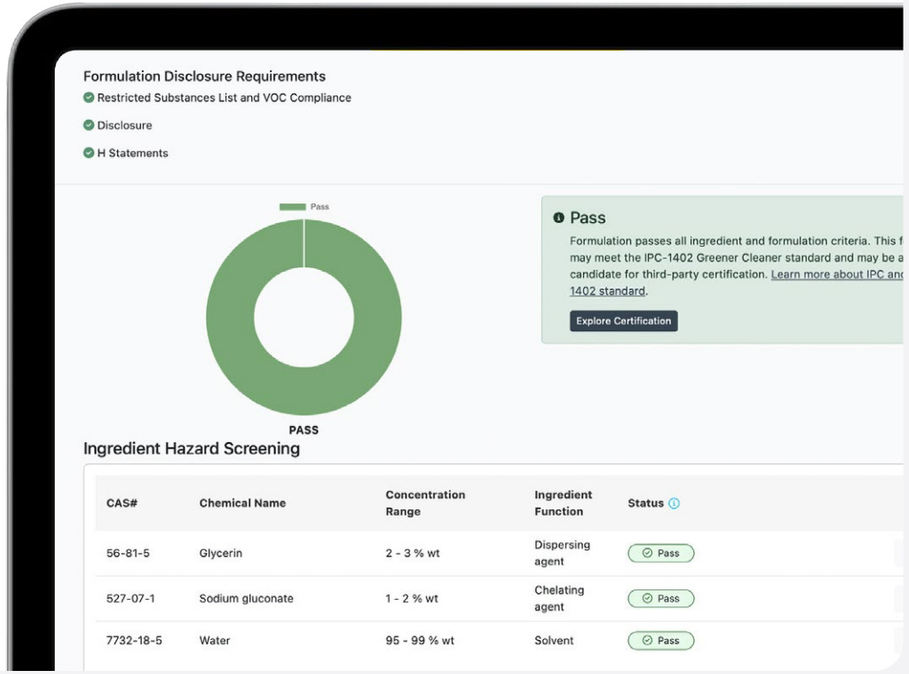
CleanScreen makes the knowledge we've developed with ChemFORWARD on safer cleaners immediately accessible to formulators through an easy-to-use app. ChemFORWARD's repository of comprehensive chemical hazard assessments allows users to screen ingredients in their cleaners and degreasers, receive high-quality results, and identify substitutions for chemicals of concern. The app protects formulators' confidential business information while providing transparent feedback on potential hazards.

We supported ChemFORWARD's launch of CleanScreen in 2024 as a resource for formulators to proactively meet the safer chemistry standards and requirements we're setting for our suppliers. The app also helps qualify formulations against third-party certification requirements, like IPC-1402, US EPA Safer Choice, and all the external standards accepted by ChemWorks.org. Additionally, CleanScreen makes these certification standards more accessible. And the app was available at no cost to formulators at launch.

CleanScreen is an example of how we engage the supply chain through innovative collaborations. Our approach to safer chemistry goes beyond establishing safety requirements for our suppliers. The knowledge and experience we've developed with ChemFORWARD provide a unique opportunity to help chemical formulators in our supply chain create safer cleaners within the community and promote their broader adoption across the industry.

Safer cleaners

## We helped launch CleanScreen, a cloud-based app designed to streamline the creation of safer formulations, in collaboration with ChemFORWARD.



# Innovation

Our purpose

**We're working to continually improve the chemical safety, performance, and environmental impact of materials by expanding our knowledge of material properties through assessments, enabling us to pursue innovations that align with our values.**

Our path

**We seek out and support the development of safer chemistries and aim to continually improve the overall safety of our products and processes.**

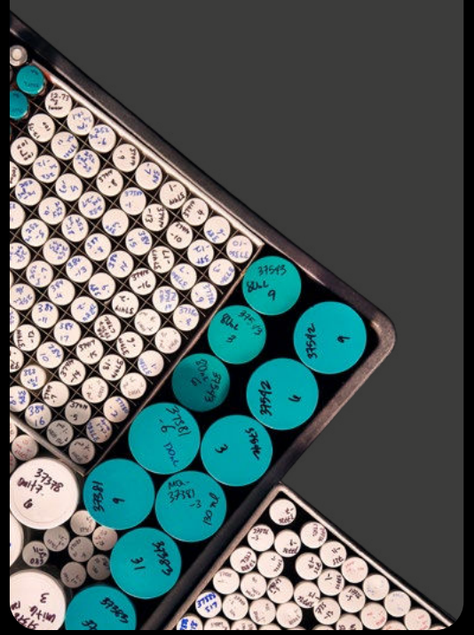
Discover new, safer chemistries

Drive the creation of better dyes

Advocate for safer alternatives

Our progress

**Developed a test method for more accurate measurement of fluorine in plastics to better monitor PFAS in consumer electronics**



Our progress

**Apple co-authored a scientific publication on applying a regression model that uses *in vitro* methods to predict the safe level of skin allergens**

Our progress

**Achieved #1 ranking on Toxic-Free Future's Retailer Report Card as the only company to receive an *A* for its commitment to safer chemistry and approach to restrictions and safer alternatives**

## Creating new, safer chemistries to move the industry forward

Our strict requirements govern potentially harmful substances in our products and processes, encouraging our manufacturing partners to prioritize safer materials. These requirements also help create a market for better alternatives. We lend our expertise on safer chemistries to support our suppliers as they meet the growing demand for safer materials. Prioritizing these materials also means phasing out chemistries that don't meet our specifications. We've approached this across our company and products while investing in safer alternatives to drive change across our industry. The use of safer cleaners today supports the circular supply chains of the future.

Using our research and analysis of materials, we've collaborated with suppliers to create safer alternatives — including for substances where none currently exist. In these cases, we lend our technical capabilities in material science to work with suppliers to develop entirely new chemistries. We maintain the same high safety, performance, and environmental standards for new alternative materials, submitting them through rigorous testing and evaluation to avoid regrettable substitutions.

We've led in the identification and successful removal of potentially harmful substances since the late 1990s. This process has involved rigorously assessing chemicals and removing those that don't align with our goals and standards — in some cases before removal becomes a requirement and industry standard. We've been working to phase out the use of PFAS in our products, engaging with our supply chain partners, and developing alternatives.

While our analysis indicates that PFAS used in our products are safe during product use, it was important to expand our scope to consider manufacturing throughout the supply chain. We're prioritizing phaseout activities in applications that result in the highest volumes of PFAS reductions and the most meaningful environmental impact. We're pursuing our phaseout in three steps: compiling a comprehensive catalog of PFAS uses in our products, identifying and developing non-PFAS alternatives that can meet our performance needs, and confirming that non-PFAS alternatives align with our safety and environmental goals. We've created new formulations of plastics, adhesives, and lubricants, replacing PFAS with other existing technologies to achieve similar performance in flame resistance and friction reduction.

We're also advancing the ability to more effectively detect PFAS. We've developed a test method for more accurate measuring fluorine in plastics to better monitor PFAS in consumer electronics. This method will be made available to industry and non-industry stakeholders to identify areas where alternatives are needed.

Read our white paper about our commitment to phasing out per- and polyfluoroalkyl substances.

## Driving the creation of better dyes

In partnership with our suppliers, we've created dye formulations in our anodizing processes that better safeguard worker health and the environment. The innovation challenge was to achieve the quality and selection of colors that meet our rigorous design standards while improving environmental performance. We narrowed our options to the most color-versatile and UV-stable dyes, and we engaged with our manufacturers to develop a wide range of colorants. These alternatives mitigate the risks associated with conventional dyes used in anodizing processes, including potential workplace exposure and impact on the local environment through discharge.

## Advocating for safer alternatives across our industry

Our work in smarter chemistry helps facilitate the transition to safer alternatives that are accessible to others in our industry. Identifying and promoting the use of safer cleaners beyond Apple is a way to increase the impact of safer alternatives. The criteria we set for chemicals in materials — and how our suppliers use them — help establish even more stringent standards around health and safety across the electronics industry. We collaborate with standards-setting bodies, trade associations, and NGOs to achieve this, developing tools, standards, and mechanisms to drive the identification and adoption of smarter chemistries throughout our supply chain.

We've focused on cleaners and degreasers, building multiple pathways to advance industry innovation in safer cleaners. Our efforts to use safer cleaners in our supply chain have been central to our advocacy for greater industry collaboration and instrumental to our participation as a founding signatory of the Toward Zero Exposure program led by the Clean Electronics Production Network (CEPN).

## Apple's Regulated Substances

### Materials selection

**Per- and polyfluoroalkyl substances (PFAS)**

We proactively removed PFOA and PFOS from our products in 2010 and 2013, respectively, far ahead of global requirements. In addition, we were ahead of our industry peers in making a commitment to completely eliminate PFAS from our products. We plan to do this by developing or selecting non-PFAS alternatives that do not result in regrettable substitutions.

### Manufacturing

**Safer cleaners and degreasers**

We've restricted the use of cleaners and degreasers that contain known carcinogens, mutagens, reproductive toxicants, strong sensitizers, and persistent bio-accumulative toxins (including PFAS) from those used at our supplier final assembly sites. We did this by using globally recognized standards (such as EPA Safer Choice, GreenScreen Certified®, and ToxFMD®) based on full formulation-level (or material-level) chemical hazard assessments because this approach is more comprehensive and robust than simply eliminating individual substances of concern.

### Recycling

**Brominated and chlorinated flame retardants**

We've replaced brominated and chlorinated flame retardants, which reduce the recyclability of plastics and limit material circularity, with safer metal hydroxides and phosphorous compounds. Incineration of waste plastics containing brominated and chlorinated flame retardants can release toxic chemicals such as dioxins and furans.

### Product use

**PVC and phthalates**

We've replaced PVC and phthalates with safer thermoplastic elastomers.* Phthalates are known endocrine disruptors that are not bound in PVC and can leak. Both are still used by other companies in power cords and headphone cables.

* We broadly restrict the use of PVC and phthalates in our products, except for AC power cords in India, Thailand (two-prong AC power cords), and South Korea, where we continue to seek government approval for our PVC and phthalates replacement.

In 2023, we collaborated with IPC, a globally recognized electronics standards-setting body, to draft and help launch IPC-1402, Standard for Green Cleaners Used in Electronics Manufacturing. This standard resulted from work over the past three years with the Green Cleaners for Electronics Manufacturing task group, where we've served as chair, working with more than 20 industry partners. It will help suppliers across the electronics industry select cleaners that are safer for workers and the environment. In 2022, we received the IPC Stan Plzak Corporate Recognition Award for our work on this effort and our contributions to the industry.

We continued to partner with ChemFORWARD, a nonprofit committed to creating broad access to chemical hazard data to make it easier for suppliers to choose safer alternatives. In 2023, we worked with ChemFORWARD to announce ChemWorks, a new open resource aimed at helping others identify certified safer formulations to accelerate the adoption of safer cleaners and degreasers, as we have in our supply chain. And in 2024, Toxic-Free Future, an environmental health research and advocacy organization, ranked Apple #1 on its Retailer Report Card — the only company to receive an *A* grade for its commitment to and transparency in safer chemistry, as well as its approach to restrictions and safer alternatives.

We also supported the Responsible Business Alliance (RBA) in developing the Specialty Validated Assessment Program on Chemical Management, a world-class chemical management due diligence evaluation program. Last year, the RBA launched the Chemical Management Leadership Program — a risk-based, voluntary achievement program to advance responsible chemical management in global electronics supply chains — and published the *Practical Guide to Chemical Management Due Diligence in Supply Chains*, documenting best practices to safeguard workers' health and the environment.

In February 2024, we co-authored an article proposing an innovative approach to using safer materials and addressing the challenge of eliminating PFAS.[75] We've already eliminated two PFAS members, perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), from our products by restricting their use in 2010 and 2013, respectively. We're committed to phasing out PFAS as we continue to create products that are safe for our customers. The innovation we're pursuing combines machine learning and a data-driven framework to identify and screen potential alternatives to harmful chemicals. The framework integrates technical and environmental data, to design materials that are benign by considering hazard impacts throughout their life cycle. The approach also leverages AI to analyze complex structure-function relationships, creating a "digital signature" to efficiently search for safer chemistries across vast chemical spaces. This new approach seeks to accelerate the discovery and design of materials that achieve both technical functionality and minimal hazard impact.

## Safer cleaner Journey

### 2018

**Achieved**
100% participation of final assembly supplier sites in the Safer Cleaners Program

### 2020

**Achieved**
EPA Partner of the Year Award for the first time

**Established**
internal Safer Cleaners list containing more than 50 cleaners

### 2021

**Transitioned**
internal criteria to industry GreenScreen® certificates

**95+**
total cleaners were on the Safer Cleaners list, with more than 40 added that year

### 2022

**Published**
certified Safer Cleaners List for industry use with ChemWorks Product Registry

**130+**
total cleaners were on the Safer Cleaners list, with more than 35 added that year

**Partnered**
with Clean Production Action (CPA) to use Safer Cleaners criteria for GreenScreen certificates

### 2023

**175**
added more than 40 additional cleaners added to the Safer Cleaners list, comprising up to 175 cleaners

**Expanded**
the Safer Cleaners Program deeper into the supply chain to processes beyond final assembly

### 2024

**200+**
total cleaners were on the Safer Cleaners list, with more than 65 added that year

**Codified**
the Safer Cleaners Program in the Regulated Substances Specification, making it a requirement for all Apple suppliers

# Engagement and Advocacy

**In this section**

Listening to a range of voices
Achieving change together
Supporting communities worldwide

# Engagement and Advocacy

Our purpose

**We collaborate with groups working to address environmental challenges — from policymakers to stakeholders driving change day-to-day. We believe it's our responsibility to use our global platform and influence to address the urgent needs of the environment. We know we can't solve complex environmental challenges alone — through engagement, we can catalyze the systemic changes needed to achieve lasting global impact.**

## Stakeholders

**Nongovernmental organizations (NGOs)**
Sharing resources and gaining insights into environmental practices

**Industry associations**
Understanding issues and informing regulations and policy

**Policymakers**
Informing policy and supporting regulations that align with our objectives

**Communities**
Addressing environmental impacts and injustices

## Focus areas

**Research**
Informing environmental research and best practices

**Partnerships**
Collaborating on NGOs' strategy and program delivery

**Coalitions**
Promoting environmental leadership with others in the industry

**Advocacy**
Taking action to drive environmental policy

**Events and bilateral meetings**
Sharing our perspective with multisectoral leaders

Spotlight

**As of 2024, we've funded 30+ grants across 25+ countries on initiatives supporting environmental efforts.**

# Listening to a range of voices

**We learn from diverse communities devoted to environmental stewardship. We approach these conversations to gain insights and thoughtfully engage with those who bring a range of perspectives.**

Our conversations with stakeholders are fundamental to our environmental efforts. The communities we engage with help shape how we evaluate global and regional regulations, approaches, and the promise of emerging technologies. As we implement what we've learned, we incorporate feedback to aid our progress — including aligning with new standards and best practices and exploring the potential impact of cutting-edge research on our operations.

We consult with the scientific community to better understand emerging approaches, technologies, and tools that can support our environmental goals. To enhance material recovery for Apple and others, we worked with Carnegie Mellon University researchers to create robotic recycling systems, advancing product disassembly and material sorting mechanisms. We also continue to engage our Green Chemistry Advisory Board, an independent group of toxicologists and experts who advise on our smarter chemistry initiatives, including potential updates to the RSS.

We draw from cross-sector engagement platforms like the Alliance for Water Stewardship (AWS) to help guide our programs and set standards for environmental efforts. The expertise of AWS defines the world-class water stewardship practices that we've implemented at select Apple and supplier facilities, earning AWS Standard certification.

The business community — including our customers, suppliers, industry partners, and investors — also serves as a valuable source of collaboration. As co-chair of the United States Information Technology Office (USITO) — a trade association representing the U.S. information and communications technology industry in China — we lead the environmental protection and energy efficiency working groups. In this role, we engage with other companies in China as we work to comply with new environmental regulations and with policymakers on future standards.

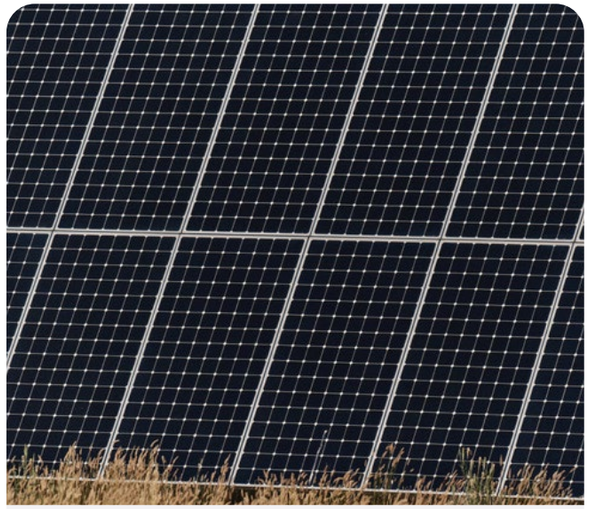
# Achieving change together

**We participate in collective action as the best means to address urgent environmental issues. Proactively sharing our experiences and contributing to collaborative efforts in our areas of focus and expertise help us better realize the environmental goals we share with our stakeholders. As industry leaders, we believe we have a responsibility to influence change — through advocating for policy and directly engaging with our stakeholders.**

## Supply chain

Engaging with our suppliers on our climate and environmental goals is critical to achieving impact across our footprint. We establish requirements and methods of communication and data exchange through specific supplier platforms, surveys, and programs. Each supplier engagement program serves as the foundation for our working relationships. Within those programs, we build the networks and systems required to continue engaging with our suppliers.

Through these programs, we help facilitate efforts to decarbonize operations across our supply chain, drive water reuse, establish standards to source and use resources responsibly in manufacturing, and more. Additionally, we've offered our suppliers trainings, workshops, educational materials, webinars, and connections to external funding and support throughout our supplier capability-building programs.



**Supplier Clean Energy Program**
We're working with our industry partners to advance renewable energy throughout our manufacturing supply chain while also focusing on scaling areas of decarbonization that are not yet mature. Our Supplier Clean Energy Program (CEP), launched in 2015, helps suppliers transition to renewable electricity by advocating for policy changes, providing information and access to renewable energy procurement options, and creating engagement opportunities with energy experts. The program also equips suppliers with learnings to be shared with other partners throughout their value chains, extending benefits beyond the scope of Apple. For more information about the Supplier Clean Energy Program, read the Electricity section.

**Supplier Energy Efficiency Program**
We offer suppliers energy efficiency best practices and measures to help avoid emissions that will become requirements for all factories. The Supplier Energy Efficiency Program, launched in 2015, helps suppliers optimize their energy use. Implementing efficiencies reduces the energy intensity of manufacturing, which translates to reduced greenhouse gas emissions. We provide technical support to suppliers as they build more energy-efficient systems. And help them to recognize optimization opportunities and to identify solutions through energy assessments. To assist with implementation, we connect suppliers to extensive education and training opportunities — including technical assistance resources — and help them access external funding for energy efficiency projects. For more information about the Supplier Energy Efficiency Program, read the Electricity section.

**Supplier Clean Water Program**
We continue to increase supplier participation in the program at their facilities, prioritizing high water stress locations and driving participants to an average 50 percent water reuse rate by 2030. The Supplier Clean Water Program, launched in 2013, helps suppliers minimize process water impacts and adopt best practices in onsite water management. We support these efforts with training, offering guidance on advanced wastewater treatment methods and technologies. This knowledge empowers our suppliers to improve the quality of water they discharge, making it ready for subsequent use. For more information on the Supplier Clean Water Program, read the Water section.

## Industry engagement

Through partnerships and coalitions, we collaborate with various industries by sharing proprietary tools and standards and pursuing policy objectives that drive our shared goals. We regularly evaluate our engagement with trade associations. As part of this process, we assess relevant trade association positions on climate and identify areas of misalignment with our values and principles. We then work with our trade associations to align our positions.

We also participate in industry events and conferences, sharing our knowledge and best practices. In 2024, we delivered keynote addresses at the International Electronics Recycling Congress (IERC) and the World Circular Economy Forum (WCEF), as well as presented research papers at the Electronics Goes Green scientific conference on environmental topics such as eco-design and climate action.

## Collaborative impact

We make public commitments alongside our partners to clarify our support and signal the change we're working to create. We're transparent about the progress we make against these commitments, ensuring accountability for results and inspiring broader action.

In 2024, we partnered with the Clean Energy Buyer's Alliance to develop supplier education materials and digital content alongside others in the industry, conducting in-person training in China and Vietnam. We also continued our collaboration with the Center for Resource Solutions on the Clean Energy Accounting Project to develop standardized, stakeholder-reviewed clean energy and GHG emissions accounting guidance.

Also in 2024, we partnered with the China Green Carbon Foundation to develop the high-quality forestry carbon removal projects assessment guideline in China, a first-of-its-kind framework for suppliers and other companies operating in the country. Published by the China Society of Forestry and available as a voluntary group standard, the guideline aligns with Restore Fund investment qualifications to help determine the quality of forestry carbon removal projects.

## Global climate partnerships and memberships

**America is All In**
Coalition of leaders in the United States who champion a whole-of-society mobilization to deliver the transformational change that will meet the challenge of the climate crisis and secure a healthy, prosperous, equitable, and sustainable future for everybody
- Member, Leaders Circle

**BSR**
Sustainable business network and consultancy focused on creating a world in which all people can thrive on a healthy planet
- Member

**Ceres**
Nonprofit dedicated to taking action to stabilize the climate, protect water and natural resources, and build a just and inclusive economy
- Member of the Ceres Company Network

**Climate Group**
International nonprofit with a network of over 500 multinational businesses in 175 markets worldwide focused on the goal of a world of net-zero carbon emissions by 2050, with greater prosperity for all
- RE100 Member

**CN100 Alliance**
Industry alliance launched in 2024 to advocate for industry actions and policies promoting carbon neutrality and circular supply chains in China
- Member

**Conservation International (CI)**
A nonprofit that empowers societies to responsibly and sustainably care for nature, our global biodiversity, for the well-being of humanity
- Partner

**Corporate Eco Forum (CEF)**
Invitation-only forum for senior executives representing large, influential companies that demonstrate a serious commitment to sustainability as core to business strategy
- Member

**Exponential Roadmap Initiative (ERI)**
Accredited initiative of the UN Climate Change High-Level Champions' Race to Zero, with the mission to halve emissions before 2030 through climate action and groundbreaking projects
- Member

**MIT Climate & Sustainability Consortium (MCSC)**
Academia and industry collaboration galvanizing the business community to impact broad and intersecting environmental challenges
- Industry Advisory Board member

**Responsible Business Alliance (RBA)**
Industry coalition dedicated to responsible business conduct in global supply chains
- Full member, served on the RBA Board of Directors and steering committee of the Responsible Minerals Initiative

**SEMI Sustainability and Climate Initiatives**
Coalition accelerating climate action across the semiconductor value chain through direct emissions reductions in semiconductor manufacturing and Scope 3 transparency, Energy Collaborative for renewables procurement, and water and waste management working groups
- Member

**World Business Council for Sustainable Development (WBCSD)**
Community of the world's leading sustainable businesses working toward a net-zero, nature-positive, and more equitable future
- Member

**World Economic Forum**
The International Organization for Public-Private Cooperation, providing a global, impartial, and not-for-profit platform for meaningful connection between stakeholders to establish trust and build initiatives for cooperation and progress
- Member

**World Wildlife Fund (WWF)**
The world's leading conservation organization, working to sustain the natural world for the benefit of people and wildlife and collaborating with partners from local to global levels in nearly 100 countries
- Partner

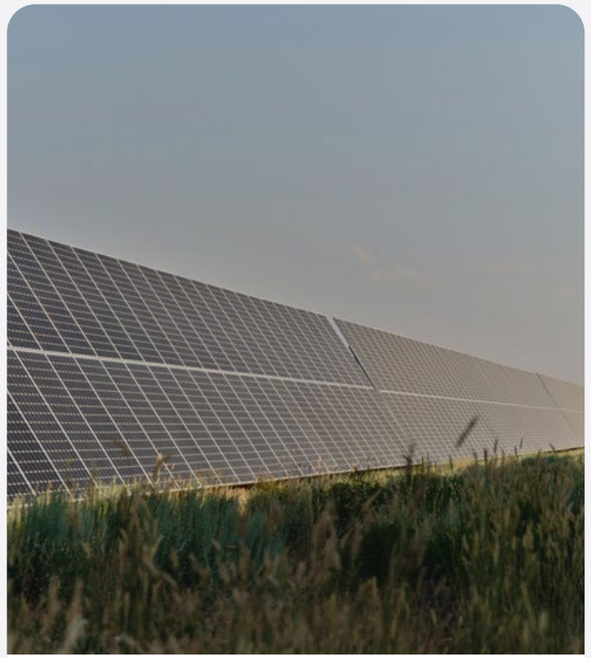
FEATURE

# Engagement across our environmental initiatives

**Our partnerships align with our strategic initiatives and engage with organizations and institutions operating across the globe. We participate at all levels, from acting in leadership as founders, members, and sponsors to working alongside others.**

## Design and materials

- Aluminum Stewardship Initiative (ASI)
- ChemFORWARD
- China Association of Circular Economy (CACE)
- IMEC Sustainable Semiconductor Technologies and Systems (SSTS)
- MIT Climate and Sustainability Consortium (MCSC)
- Responsible Business Alliance (RBA)
- Responsible Minerals Initiative (RMI)
- SEMI Sustainability
- WBCSD Critical Materials Collective
- World Economic Forum, Aluminum First Movers Coalition



## Electricity

- Advanced Energy United
- Asia Clean Energy Coalition (ACEC)
- Center for Resource Solutions (CRS)
- Clean Energy Buyers Alliance (CEBA)
- Corporate Energy Demand initiative (CEDI)
- Japan Climate Leaders' Partnership (JCLP)
- RE100
- SEMI Energy Collaborative (EC)
- VERACI-T
- WattTime
- ZEROgrid

## Direct GHG emissions

- IMEC Sustainable Semiconductor Technologies and Systems (SSTS)
- MIT Climate and Sustainability Consortium (MCSC)
- Semiconductor Climate Consortium (SCC)
- World Economic Forum, Aviation First Movers Coalition

## Carbon removal

- Conservation International
- Space Intelligence
- Goldman Sachs
- MIT Climate and Sustainability Consortium (MCSC)
- Oxford University
- Climate Asset Management

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# Apple 2030 policy platform

**We support climate and environmental policy through our actions and stakeholder engagement.**

Our Apple 2030 roadmap is intended not only to address the impacts of our business but also to catalyze ambitious environmental leadership globally. Strong, worldwide government action is essential to enable the systemic policy changes the world needs. Our environmental advocacy is grounded in fundamental principles that support science-based pathways, transparent targets, and accountability mechanisms. We're guided by principles that include, but aren't limited to, the following.

## Climate

Advocate for policymakers and businesses to set science-based targets to reduce emissions in line with the Paris Agreement and the global ambition to be net zero by 2050 to avoid the worst impacts of climate change.

Enable rapid decarbonization through government-led policies, including carbon pricing and emissions mitigation programs, such as fluorinated greenhouse gas abatement in display and semiconductor industries.

Promote the development and scalable adoption of technological solutions within hard-to-abate sectors.

Encourage rules for high-integrity corporate measurement and disclosure of emissions along the entire value chain, using globally recognized standards and harmonized approaches.

Support carbon removal credit schemes that set strict environmental, social, and governance standards for natural carbon removal solutions that deliver durable climate, community, and biodiversity benefits.

Support strong national and international policies that drive the scale-up of all available forms of climate mitigation, including the role that corporate investment in quality carbon projects play in supporting national carbon targets.

Encourage policymakers, peers, and partners to center equity and justice in climate solutions during the development of the new green economy, so that communities most impacted by climate change benefit from the economic opportunities climate solutions offer.

## Energy

Encourage and incentivize the global transition to renewable electricity — including tripling renewables capacity to 11,000 gigawatts by 2030 — and move away from electricity sources emitting more pollution, such as fossil fuels, fossil fuels with carbon capture, and hydrogen from fossil fuels.

Promote energy efficiency, remove barriers to renewable energy development, and increase investment in high-capacity transmission, energy storage, and load-shaping technologies.

Enable energy consumers to have access to cost-competitive renewable energy purchase options.

Consider the life cycle emissions of energy resources and mitigation technologies, and set high-integrity mitigation standards accordingly, in line with high-quality product carbon footprint methodologies.

Encourage research into pre-commercial technologies addressing GHG emissions — like advanced fuels, manufacturing, and energy storage — and provide incentives to identify, develop, and bring them to market, particularly in hard-to-decarbonize sectors.

Support policies accelerating the decarbonization of the transportation sector, including the development and adoption of non-fossil, low-carbon, and zero-carbon alternatives for aviation, ground transport, and maritime shipping.

## Circularity

Drive policies that include circularity as part of the solution to responsibly meet the growing demand for critical materials used in electronics.

Drive our suppliers to continuously improve labor, human rights, and environmental protection standards across recycled and primary materials supply chains.

Promote policies that maximize product longevity and minimize environmental impact by balancing design for reliability and ease of repair while ensuring that user privacy and device security are protected.

Support globally aligned, evidence-based, and product-specific eco-design standards.

Develop collection programs that engage customers, protect environmental and human health, and capture large volumes of electronics for reuse, repair, refurbishment, and recycling.

Promote consistent waste regulations — harmonized across geographies — to enable efficient and commercially viable movement of materials for recovery and recycling.

Encourage rapid adoption of recycled content through policies that enable the availability of high-quality secondary material supply, such as incentives for the development and expansion of pre-consumer and post-consumer recycling infrastructure.

Support the development of advanced electronics recycling facilities that can recover a broader range of resources at higher qualities, including materials that are difficult to recover or less valuable.

## Apple's climate policy milestones

2015 — 2024

**U.S.:** Joined the White House's American Business Act on Climate Pledge. (2015)

**World:** Addressed 700 senior government, business, and community leaders at the seventh Clean Energy Ministerial (CEM), where we called for governments to put a price on carbon across the world to address climate change. (2016)

**U.S.:** Urged the White House to remain in the Paris Agreement and take meaningful action on climate change. (2017)

**Vietnam:** Joined other companies in urging the government of Vietnam to make regulatory changes allowing businesses to procure renewable energy through direct power purchase agreements. (2017)

**U.S.:** Filed comments to the Federal Energy Regulatory Commission (FERC) urging it not to finalize a rule that would subsidize fossil fuels, which would limit the ability of renewables to compete in the electricity market. FERC chose not to finalize that rule. (2018)

**U.S.:** Filed comments to the U.S. EPA urging it not to repeal the Clean Power Program (CPP) because of its importance in reducing emissions. (2018)

**China:** Submitted formal comments to China's National Development and Reform Commission (NDRC) on the implications of the draft policy on corporate clean energy procurement. (2018)

**South Korea:** Met with government officials in Korea to discuss the need for increased renewable generation and retail choice, enabling consumers to select their power source. (2018)

**Japan:** Joined the Japan Climate Leaders' Partnership (JCLP) — one of the first multinational companies to participate. (2018)

**World:** Participated in the UN Environment Assembly (UNEA) and conducted bilateral discussions with a number of countries to advocate for policies that enable a circular economy and bold action on climate. (2019)

**EU:** Called on European leaders to increase their climate ambition to achieve targets of at least 55 percent greenhouse gas emissions reductions by 2030 and carbon neutrality by 2050. The EU adopted these targets. (2020)

**U.S.:** Called on the U.S. Securities and Exchange Commission to require the disclosure of global greenhouse gases across all emissions scopes, one of the first large, public U.S. companies to do so. (2021)

**Vietnam:** Vocalized support to the government of Vietnam for an ambitious Power Development Plan (PDP) prioritizing clean energy. (2021)

**U.S.:** Voiced support for enacting the Clean Energy Standard (CES), which would decarbonize the power grid by 2035 — the first company to do so. (2021)

**South Korea:** Called for Korea's 2030 energy plan to set a higher target for renewable energy, establish a fairer competitive market for renewables, and improve transparency for renewable energy solutions. (2022)

**U.S.:** Filed comments to encourage more rapid integration of renewable energy into the transmission grid, a key bottleneck to deploying renewable energy. (2022)

**U.S.:** Supported California's Climate Corporate Data Accountability Act (SB 253), writing a letter affirming the policy in the final stages of negotiations. (2023)

**U.S.:** Submitted comments supporting the EPA's proposed rule to regulate greenhouse gas emissions from existing coal power plants and new and existing natural gas plants. (2023)

**Japan:** Supported policy statements on power sector decarbonization by 2035, more floating offshore wind, diminishing reliance on fossil fuels, higher carbon pricing, and more Non-Fossil Certificate (NFC) transparency. (2023)

**EU:** Provided feedback on a science-aligned corporate climate action framework to policymakers, businesses, civil society organizations, and other stakeholders to support European policy efforts to incentivize transparent and high-integrity action. (2024)

**Global:** Signed the 3xRenewables letter calling for the tripling of global renewable energy capacity by 2030, along with support for energy storage and grids, to be included in UNFCCC Nationally Determined Contributions (NDCs) and energy plans. (2024)

**Asia:** Supported the creation or improvement of cost-effective renewable energy procurement mechanisms across several countries, including Japan, Korea, and Vietnam, through engagement in multiple renewable energy coalitions. (2024)

# Supporting communities worldwide

**Through our engagement efforts, we work directly with groups and individuals striving for global environment impact and addressing environmental injustice in their communities. We evaluate each opportunity based on our strategic framework for engagement partners and alignment with Apple 2030. When we partner with another organization, our success depends on close collaboration and a shared focus on our objectives.**

Our work combines collaboration and philanthropic contributions, determined based on each organization's focus and potential to effect change. We direct our support toward urgently needed environmental solutions of all sizes, driven by people-first organizations that share our values.

Environmental progress guides our strategy. We focus on maximizing impact, promoting innovation, and fostering leadership while strengthening communities to achieve equitable outcomes. Our intention is for the work we support to endure long after our contributions are complete. We engage this through deep partnerships with communities, working toward sustainable models for transformative change.

## Gravity Water

Gravity Water's use of rainwater harvesting technology provides climate-resilient clean water sources to communities, including harvesting devices installed at schools throughout Northern Vietnam.

## Justice Outside

Justice Outside's Network for Network Leaders program promotes leadership in the outdoors, environmental education, and environmental justice.

## Beyond Benign

Beyond Benign provides educators with the tools, training and support to make green chemistry an integral part of chemistry education. As part of their Minority Serving Institution (MSI) Initiative, they engage with higher education institutions to expand the global talent pool of scientists trained in sustainability for high-value companies.

## Karrkad Kanjdji Trust Public Fund

Founded and led by Traditional Owners in Arnhem Land — one of Australia's most biodiverse and culturally rich regions — the Karrkad Kanjdji Trust supports Indigenous ranger programs through conservation initiatives and professional development across vast protected areas.

## Earth Island

We've partnered with Earth Island on the ÉnergieRich project which advances environmental justice and clean energy innovation by establishing durable, renewable energy and expanding access to technology through local production of innovative technology.

## China Green Carbon Foundation

The China Green Carbon Foundation focuses on ecological restoration, increasing the capacity of carbon sequestration, conserving biodiversity in national parks, and promoting green development in China. We engage with the foundation to provide capacity building for China National Park staff and to offer national park internship opportunities to junior researchers and students.

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# Restoring grassland and balance to communities in Chyulu Hills

**An Apple-supported effort to restore the degraded savannas of Kenya's Chyulu Hills region is demonstrating how a nature-based climate solution can help communities adapt to a changing climate and reduce human-wildlife competition and social conflicts.**

Working in partnership with the Kenyan government, four local Maasai and Kamba Indigenous community organizations, and Conservation International, we've recently restored 11,000 hectares of grasslands in Chyulu Hills, with 20,000 hectares projected to be restored by 2027.

Grasslands are vital ecosystems for livelihoods and biodiversity — and in Chyulu Hills, they're under increasing pressure from climate change and human activity. This region of Kenya is home to iconic wildlife, including African elephants and black rhinos, which share the land with pastoral Maasai communities. This coexistence often leads to competition for limited water, land, and pasture, sparking tensions both between humans and wildlife and within the community.

A study published in Frontiers in Environmental Science was conducted over 16 months in Chyulu Hills to assess how restoring degraded grasslands influences conflict dynamics between local Maasai people and wildlife. Household survey data from more than 40 percent of households in the area indicate a significant correlation between the expansion of restored grassland areas and a reduction in human-wildlife and social conflicts.[76]

Apple's partnership with CI also includes a carbon credit project that raises funds to protect forests, support livelihoods, and improve grassland health. The project spans 410,000 hectares (one million acres), preventing on average 580,000 metric tons of greenhouse gases from entering the atmosphere each year. Over its 30-year span, the project is expected to prevent approximately 18 million metric tons of climate-warming carbon emissions from entering the atmosphere, equivalent to taking more than 4 million gas-powered cars off the road for a year.

The revenues generated by the carbon project make it possible to protect multiple landscapes, including a portion of Chyulu Hills National Park, and vast amounts of Maasai community lands and private conservancies. Also funded with the revenue are an emergency school food program, improvements to local health services, and scholarships for families in need.

# Data

**In this section**

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# Greenhouse gas emissions

We account for our carbon footprint by following internationally recognized standards, like the World Resources Institute (WRI) Greenhouse Gas (GHG) Protocol and ISO 14040/14044.[1] Improving the accuracy of our carbon footprint is an ongoing process — as we learn more, we refine our carbon models and adjust our climate roadmap. We also regularly revisit the boundary of our carbon footprint as our data sources improve and our business evolves.

| | | Fiscal year | | | | |
|---|---|---|---|---|---|---|
| | | **2024** | **2023** | **2022** | **2021** | **2020** |
| **Corporate emissions** (metric tons $CO_2e$)[2] | **Gross emissions** | **666,800** | **471,400** | **324,000** | **166,380** | **334,430** |
| | **Scope 1** | **55,200** | **55,200** | **55,200** | **55,200** | **47,430** |
| | Natural gas, diesel, propane | 37,400 | 35,300 | 39,700 | 40,070 | 39,340 |
| | Fleet vehicles | 15,400 | 17,000 | 12,600 | 12,090 | 4,270 |
| | Other emissions[3] | 2,400 | 2,900 | 2,900 | 3,040 | 3,830 |
| | **Scope 2 (market-based)** | **3,300** | **3,400** | **3,000** | **2,780** | **0** |
| | Electricity | 0 | 0 | 0 | 0 | 0 |
| | Steam, heating, and cooling[4] | 3,300 | 3,400 | 3,000 | 2,780 | 0 |
| | **Scope 3** | **608,300** | **412,800** | **265,800** | **108,400** | **287,000** |
| | Business travel | 284,500 | 225,700 | 113,500 | 22,850 | 153,000 |
| | Employee commute[5] | 152,700 | 164,100 | 134,200 | 85,570 | 134,000 |
| | Other fuel and energy-related activities[6] | 166,400 | 10,600 | 0 | 0 | 0 |
| | Work from home (market-based) | 4,700 | 4,700 | 7,500 | 0 | 0 |
| | Transmission and distribution loss (market-based) | 0 | 0 | 0 | N/A | N/A |
| | Other cloud (market-based) | 0 | 0 | 0 | 0 | 0 |
| | **Carbon credits** | | | | | |
| | Corporate carbon credits | -666,800[7] | -471,400[8] | -324,100[9] | -167,000[10] | -70,000[11] |
| **Product life cycle emissions** (metric tons $CO_2e$)[12] | **Gross emissions (Scope 3)** | **14,500,000** | **15,570,000** | **20,280,000** | **23,020,000** | **22,260,000** |
| | Manufacturing (purchased goods and services) | 8,200,000 | 9,400,000 | 13,400,000 | 16,200,000 | 16,100,000 |
| | Product transportation (upstream and downstream) | 1,950,000 | 1,500,000 | 1,900,000 | 1,750,000 | 1,800,000 |
| | Product use (use of sold products) | 4,400,000 | 4,600,000 | 4,900,000 | 4,990,000 | 4,300,000 |
| | End-of-life processing | 70,000 | 70,000 | 80,000 | 80,000 | 60,000 |
| | **Carbon credits** | | | | | |
| | Product carbon credits | -70,300 | -13,500 | 0 | -500,000[13] | 0 |
| **Total gross scope 3 emissions (corporate and product)** (metric tons $CO_2e$) | | **15,110,000** | **15,982,800** | **20,545,800** | **23,130,000** | **22,550,000** |
| **Total gross carbon footprint (without offsets)** (metric tons $CO_2e$)[14] | | **15,300,000** | **16,100,000** | **20,600,000** | **23,200,000** | **22,600,000** |
| **Total net carbon footprint (after applying offsets)** (metric tons $CO_2e$)[14] | | **14,500,000** | **15,600,000** | **20,300,000** | **22,530,000** | **22,530,000** |

Notes:

- For data on years prior to 2020, please reference past Environmental Progress Reports.
- Totals might not add up due to rounding.

1 Apple's carbon footprint boundary is aligned with the Greenhouse Gas (GHG) Protocol framework and includes emissions that are material and relevant to Apple, where data is available. Apple's carbon footprint includes direct scope 1 emissions; indirect scope 2 emissions from purchased electricity, steam, heating, and cooling; and indirect scope 3 emissions from purchased goods and services, other fuel and energy related activities, transportation and distribution, business travel, employee commute, product use, and end of life.

2 Apple is carbon neutral for corporate emissions as of April 2020. Beginning in fiscal year 2022, we've expanded our footprint boundary to include scope 3 emissions associated with work from home, other cloud services, electricity transmission and distribution losses, and other fuel and energy-related activities.

3 Emissions from R&D processes.

4 Beginning in fiscal year 2021, we're accounting for scope 2 emissions from the purchase of district heating, chilled water, and steam.

5 Beginning in fiscal year 2020, we updated our methodology for calculating emissions from employee commute to reflect employees working from home during COVID-19.

6 Impacts such as upstream emissions for scope 1 fuels and life cycle emissions associated with renewable electricity are included.

7 For a detailed breakdown of carbon offset purchases applied to our corporate footprint, see the carbon offsets table on the following page.

8 We retired 471,400 metric tons of carbon credits from the Chyulu Hills project in Kenya and Guinan project in the Guizhou Province of China to maintain carbon neutrality for our corporate emissions in fiscal year 2023. These projects are certified to the VCS and CCB standards.

9 We retired 324,100 metric tons of carbon credits from the Alto Mayo project in Peru and Chyulu Hills project in Kenya to maintain carbon neutrality for our corporate emissions in fiscal year 2022. These projects are certified to the VCS and CCB standards.

10 We retired 167,000 metric tons of carbon credits from the Chyulu Hills project in Kenya to maintain carbon neutrality for our corporate emissions in fiscal year 2021. This project is certified to the VCS and CCB standards.

11 We retired 70,000 metrics tons of carbon credits — 53,000 from the Chyulu Hills project in Kenya and 17,000 from the Cispatá Mangrove project in Colombia.

12 Because we're committed to accuracy and transparency, we regularly refine our product life cycle assessment model and sources of data.

13 For fiscal year 2021, we retired credits from the Chyulu Hills project in Kenya and purchased carbon credits from two additional projects to offset a total of 500,000 metric tons of direct emissions across our value chain. The first project, a REDD+ coastal conservation project in Guatemala, protects and conserves forests from deforestation and degradation. The second project aims to establish forests on about 46,000 hectares of barren land that isn't otherwise in use across seven counties in the Guizhou province of China. Both projects are certified to the same high standards that we require for projects in the Restore Fund, including VCS and CCB standards.

14 Due to rounding, our gross and net carbon footprints do not always equal the sum of the subtotals disclosed above.

Data

# High quality carbon credits

We retired the following high-quality carbon credits toward our corporate and product emissions footprint for 2024.

| Project name | Project description | Vintage | Volume retired (metric tons $CO_2e$) | Registry link |
|---|---|---|---|---|
| AF Forestal Apepu Expansion | Forestal Apepu S.A. is a company established in 2019 by an international forestry fund to conduct sustainable reforestation in Eastern Paraguay. The aim of the company is the sequestration of carbon and the production of quality timber in a highly deforested landscape. Forestal Apepu purchased two contiguous properties of 2658 ha in the Department of San Pedro. As most private properties in the region, the land was deforested decades ago and then used for agriculture and beef production. Through fast growing eucalypt plantations, trials of plantations with native species, and the strict protection of the remaining natural forest, Forestal Apepu aims at restoring forest cover. The company may expand even further in the future, upon identification of potential expansion areas in the region. | 2021 | 73,093* | https://registry.verra.org/app/projectDetail/VCS/2369 |
| Arbaro Forestal San Pedro | The VCS grouped project "Afforestation in cooperation with local landowners for Forestal San Pedro S.A." represents one of the first major afforestation projects of the private sector in Paraguay. Forestal San Pedro is a company established in 2019 by an international forestry Fund. The company aims to establish and manage an area of 8000 ha of sustainable forest plantations for the sequestration of carbon and the production of quality timber in Eastern Paraguay. Forestal San Pedro seeks to cooperate with local medium and large landowners to conduct tree planting on their properties. As a diversification strategy, plantations are largely established in silvopastoral systems on traditional cattle farms. Landowners lease their land to the company and get a share of the expected benefits. At the same time, they continue using the land for cattle grazing in a manner compatible with forestry. The expansion strategy provides an entry point for tree planting in the degraded and deforested landscape of Eastern Paraguay, dominated by cattle grazing and mechanized soy production. Despite the need to develop new models that can address environmental degradation and climate change, while at the same time offering a sustainable supply to the national wood and timber market, the tree component is still far from integrated into the regional productive landscape. Target production areas encompass areas deforested decades ago that have been used for implanted pastures and mechanized soy, but are now degraded. | 2019, 2020, 2021, 2022 | 78,507* | https://registry.verra.org/app/projectDetail/VCS/2361 |
| Chyulu Hills | The Chyulu Hills REDD+ Project (CHRP) is a multi-partner initiative designed to promote climate change mitigation and adaptation, restore biodiversity, and create alternative livelihoods under the UN scheme of Reducing Emissions from Deforestation and forest Degradation (REDD+). It's located in the Tsavo-Amboseli ecosystem in southeastern Kenya and stretches over an area of over 410,000 hectares. Its main geographic feature is the volcanic Chyulu Hills mountain range, from which the project derives its name. This project presents a broad ecosystem approach, including REDD+, to provide long-term sustainable financing and management to maintain the ecological integrity of an iconic African landscape. The project will help protect a very high-value wildlife and biodiversity area while supporting the development needs of Indigenous and other local communities. | 2020 | 385,000 | https://registry.verra.org/app/projectDetail/VCS/1408 |
| Guinan | The Guinan Afforestation Project is located in the Guizhou Province of China and contributes to carbon removal and local sustainable development by planting trees on the barren lands. The project is planting across 46,000 ha on barren hills and degraded lands. The project activity aims to enhance biodiversity conservation by increasing the connectivity of forests, improve soil and water conservation, and generate income and job opportunities for local communities. | 2019 | 100,500 | https://registry.verra.org/app/projectDetail/VCS/2070 |
| Guyana REDD+ | Guyana's Jurisdictional Forest Carbon Credit Program generates REDD+ carbon credits at a nationwide scale within the Amazon basin of South America, a critical watershed and hotspot of biodiversity. ART has issued 33.47 million TREES credits to Guyana for the five-year period from 2016 to 2020, which are available to buyers on the global carbon market for use toward voluntary corporate climate commitments. The jurisdictional program includes all 18 million hectares of forest in Guyana — about 85 percent of the landmass — and enables the country to benefit from its historically low deforestation rate, while funding low-carbon development priorities. | 2019 | 100,000 | https://art.apx.com/mymodule/reg/accview.asp?id1=1017 |

* This figure accounts for carbon credits applied to both product and corporate emissions for 2024.

Data

# Carbon footprint by product

The following tables list the carbon footprints (in kilograms) of Apple products sold as of March 9, 2025, along with select configurations.[1]

| | | Storage configurations | | | |
|---|---|---|---|---|---|
| **iPhone** | **Unit** | **128GB** | **256GB** | **512GB** | **1TB** |
| iPhone 16 | kg $CO_2e$ | 56 | 61 | 74 | – |
| iPhone 16 Plus | kg $CO_2e$ | 60 | 64 | 77 | – |
| iPhone 16 Pro | kg $CO_2e$ | 66 | 72 | 84 | 95 |
| iPhone 16 Pro Max | kg $CO_2e$ | – | 74 | 86 | 97 |
| iPhone 16e | kg $CO_2e$ | 48 | 52 | 62 | – |
| iPhone 15 | kg $CO_2e$ | 56 | 61 | 74 | – |
| iPhone 15 Plus | kg $CO_2e$ | 61 | 66 | 79 | – |

| | | Storage configurations | | | |
|---|---|---|---|---|---|
| **iPad** | **Unit** | **128GB** | **256GB** | **512GB** | **1TB** |
| iPad Pro 13-inch (M4) Wi-Fi + Cellular | kg $CO_2e$ | – | 107 | 120 | – |
| iPad Pro 11-inch (M4) Wi-Fi + Cellular | kg $CO_2e$ | – | 93 | 107 | – |
| iPad Air 13-inch (M3) Wi-Fi + Cellular | kg $CO_2e$ | 89 | 95 | 108 | 114 |
| iPad Air 11-inch (M3) Wi-Fi + Cellular | kg $CO_2e$ | 76 | 83 | 96 | – |
| iPad (A16) Wi-Fi + Cellular | kg $CO_2e$ | 74 | 77 | 86 | – |
| iPad mini (A17 Pro) Wi-Fi + Cellular | kg $CO_2e$ | 65 | 71 | – | – |

| | | Select product configurations | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Apple Watch[2]** | **Unit** | **Aluminum case with Sport Loop** | **Titanium case with Sport Loop** | **Aluminum case with Milanese Loop** | **Titanium case with Milanese Loop** | **Titanium case with Alpine Loop** | **Titanium case with Trail Loop** | **Titanium case with Titanium Milanese Loop** |
| Apple Watch Ultra 2, carbon neutral | kg $CO_2e$ | – | – | – | – | (12) | (11) | (11) |
| Apple Watch Series 10, carbon neutral | kg $CO_2e$ | (8) | (8) | (8) | (8) | – | – | – |
| Apple Watch SE, carbon neutral | kg $CO_2e$ | (7) | – | (8) | – | – | – | – |

Note: Dashes indicate that the configuration does not exist.

1 Product carbon footprint data for Apple products are published in our Product Environmental Reports and are accurate as of product launch. In instances where carbon models were developed prior to product launch, we use preproduction units.

2 Greenhouse gas emissions prior to applied high-quality carbon credits are represented in parenthesis.

| | | Storage configurations | | |
|---|---|---|---|---|
| **Laptops** | **Unit** | **256GB** | **512GB** | **1TB** |
| 16-inch MacBook Pro (2024), Apple M4 Pro chip | kg $CO_2e$ | – | 279 | – |
| 16-inch MacBook Pro (2024), Apple M4 Max chip | kg $CO_2e$ | – | – | 303 |
| 15-inch MacBook Air (2025), Apple M4 chip | kg $CO_2e$ | 147 | 155 | – |
| 14-inch MacBook Pro (2024), Apple M4 chip | kg $CO_2e$ | – | 198 | – |
| 14-inch MacBook Pro (2024), Apple M4 Pro chip | kg $CO_2e$ | – | 218 | – |
| 14-inch MacBook Pro (2024), Apple M4 Max chip | kg $CO_2e$ | – | – | 248 |
| 13-inch MacBook Air (2025), Apple M4 chip | kg $CO_2e$ | 120 | 128 | – |

| | | Storage configurations | | | | |
|---|---|---|---|---|---|---|
| **Desktops**[3] | **Unit** | **256GB** | **512GB** | **1TB** | **4TB** | **8TB** |
| iMac, Two ports | kg $CO_2e$ | 346 | – | – | – | – |
| iMac, Four ports | kg $CO_2e$ | – | 391 | – | – | – |
| Mac mini (2024), Apple M4 Pro chip, carbon neutral | kg $CO_2e$ | – | (50) | – | – | (121) |
| Mac mini (2024), Apple M4 chip, carbon neutral | kg $CO_2e$ | (32) | (35) | – | – | – |
| Mac Studio (2025), Apple M4 Max chip | kg $CO_2e$ | – | 276 | – | – | – |
| Mac Studio (2025), Apple M3 Ultra chip | kg $CO_2e$ | – | – | 382 | – | – |
| Mac Pro (2023) | kg $CO_2e$ | – | – | 1,572 | – | – |

| **Displays** | **Unit** | |
|---|---|---|
| Studio Display (2022) | kg $CO_2e$ | 544 |
| Pro Display XDR with Pro Stand | kg $CO_2e$ | 974 |

| **HomePod** | **Unit** | |
|---|---|---|
| HomePod (2nd generation) | kg $CO_2e$ | 92 |
| HomePod mini | kg $CO_2e$ | 42 |

| **Apple Vision Pro** | **Unit** | |
|---|---|---|
| Apple Vision Pro | kg $CO_2e$ | 335 |

| | | Storage configurations | |
|---|---|---|---|
| **Apple TV** | **Unit** | **64GB** | **128GB** |
| Apple TV 4K, Wi-Fi | kg $CO_2e$ | 43 | – |
| Apple TV 4K, Wi-Fi + Ethernet | kg $CO_2e$ | – | 46 |

3 Refer to footnote 2.

Data

# Energy

| | | Unit | 2024 | 2023 | 2022 | 2021 | 2020 |
|---|---|---|---|---|---|---|---|
| **Corporate facilities energy** | **Electricity** | | | | | | |
| | **Total** | **MWh** | **3,777,000** | **3,487,000** | **3,199,000** | **2,854,000** | **2,580,000** |
| | U.S. | MWh | 3,000,000 | 2,830,000 | 2,614,000 | 2,377,000 | 2,192,000 |
| | International | MWh | 777,000 | 657,000 | 585,000 | 477,000 | 389,000 |
| | **Fuel** | | | | | | |
| | **Total** | **MWh** | **591,770** | **662,950** | **334,250** | **467,280** | **439,170** |
| | Natural gas | MWh | 307,390 | 312,490 | 188,630 | 203,010 | 202,360 |
| | Biogas | MWh | 183,330 | 218,780 | 76,280 | 208,620 | 210,820 |
| | Propane liquid | MWh | 1,760 | 1,030 | 1,830 | 40 | 140 |
| | Gasoline | MWh | 45,140 | 50,760 | 38,790 | 34,880 | 14,910 |
| | Diesel (other) | MWh | 36,150 | 57,030 | 15,610 | 9,780 | 9,610 |
| | Diesel (mobile combustion) | MWh | 18,000 | 22,860 | 13,120 | 10,950 | 1,330 |
| | **Other** | | | | | | |
| | Steam, heating, and cooling[1] | MWh | 18,130 | 45,370 | 19,800 | 22,480 | 0 |
| **Energy efficiency** | **Corporate facilities[2]** | | | | | | |
| | Electricity savings | MWh/year | 298,358 | 290,079 | 223,942 | 215,264 | 215,263 |
| | Fuel savings | MMBtu/year | 124,034 | 113,686 | 110,309 | 136,803 | 136,825 |
| | **Supplier facilities[3]** | | | | | | |
| | Electricity savings | MWh/year | 2,469,991,170 | 2,040,000,000 | 1,620,425,230 | 1,418,825,350 | 1,101,440 |
| | Fuel savings | MMBtu/year | 2,361,730 | 2,281,059 | 2,038,930 | 1,047,440 | 752,680 |
| **Renewable electricity** | **Corporate facilities** | | | | | | |
| | Renewable electricity used | MWh | 3,777,000 | 3,489,000 | 3,199,000 | 2,854,000 | 2,580,000 |
| | Renewable electricity percentage[4] | % of total energy | 100 | 100 | 100 | 100 | 100 |
| | Scope 2 emissions avoided | metric tons $CO_2e$ | 1,213,600 | 1,144,000 | 1,201,000 | 1,063,720 | 948,000 |
| | **Supply chain[5]** | | | | | | |
| | Renewable electricity capacity (operational) | GW | 18.9 | 16.5 | 13.7 | 10.3 | 4.5 |
| | Renewable electricity capacity (committed) | GW | –[6] | 20.0 | 6.8 | 15.9 | 7.9 |
| | Renewable electricity used | MWh | 31,300,000 | 25,500,000 | 23,700,000 | 18,100,000 | 11,400,000 |

1 Beginning in fiscal year 2021, we're accounting for the purchase of district heating, chilled water, and steam.

2 Because energy efficiency measures have lasting benefits, energy efficiency savings are calculated cumulatively since 2012. All efficiency measures are retired based on their effective useful lifetime as documented by the California Energy Commission.

3 Energy savings from supplier energy efficiency improvements are reported as annualized numbers. Beginning in 2020, supplier energy savings are calculated based on the fiscal year instead of on a calendar-year basis.

4 Beginning January 1, 2018, 100 percent of the electricity we use to power our global facilities is sourced from renewable energy.

5 Supply chain renewable electricity capacity (operational) and renewable electricity use for fiscal year 2021 do not include REC purchases Apple made, equivalent to 0.3 GW and 500,000 MWh, respectively, to address a small increase to its carbon footprint.

6 In an effort to rapidly scale and accelerate progress to Apple 2030, the Apple Supplier Code of Conduct now requires our entire direct manufacturing supply chain to use 100 percent renewable electricity for all Apple production before 2030.

Data

# Resources

| | | | Fiscal year | | | | |
|---|---|---|---|---|---|---|---|
| | | **Unit** | **2024** | **2023** | **2022** | **2021** | **2020** |
| **Water** | **Corporate facilities** | | | | | | |
| | **Total** | **million gallons** | **1,756** | **1,610** | **1,527** | **1,407** | **1,287** |
| | Freshwater[1] | million gallons | 1,532 | 1,411 | 1,380 | 1,259 | 1,168 |
| | Recycled water[2] | million gallons | 197 | 151 | 142 | 141 | 113 |
| | Other alternative sources[3] | million gallons | 27 | 48 | 5 | 7 | 5 |
| | **Supply chain** | | | | | | |
| | **Freshwater saved** | **million gallons** | **14,000** | **12,700** | **13,000** | **12,300** | **10,800** |
| **Waste** | **Corporate facilities** | | | | | | |
| | **Landfill diversion rate** | **%** | **70** | **74** | **71** | **68** | **70** |
| | Landfilled (municipal solid waste) | pounds | 41,401,830 | 38,343,490 | 33,260,990 | 33,202,200 | 25,826,550 |
| | Recycled | pounds | 81,025,310 | 81,781,660 | 78,618,250 | 73,489,220 | 63,812,300 |
| | Composted | pounds | 90,029,990 | 14,803,510 | 8,726,170 | 4,844,960 | 6,302,410 |
| | Hazardous waste | pounds | 2,148,950 | 7,321,130 | 2,780,610 | 3,525,840 | 4,053,770 |
| | Waste to energy | pounds | 2,537,960 | 5,713,790 | 1,197,570 | 657,890 | 786,250 |
| | **Supply chain** | | | | | | |
| | **Waste diverted from landfill** | **metric tons** | **600,000** | **497,000** | **523,000** | **419,000** | **400,000** |
| **Product packaging footprint** | **Packaging** | | | | | | |
| | **Total packaging[4]** | **metric tons** | **241,800** | **254,274** | **276,100** | **257,000** | **226,000** |
| | Recycled fiber | % of total | 60 | 62 | 66 | 63 | 60 |
| | Responsibly sourced virgin fiber[5] | % of total | 39 | 35 | 30 | 33 | 35 |
| | Plastic | % of total | ~1 | 3 | 4 | 4 | 6 |

1 We define freshwater as water that is drinking-water quality. The majority of our freshwater comes from municipal sources, and less than 5 percent comes from onsite groundwater sources.

2 Recycled water represents a key alternative water source. Our recycled water is sourced primarily from municipal treatment plants, with less than 5 percent coming from onsite treatment. Recycled water is primarily used for irrigation, makeup water in cooling, and toilet flushing.

3 Other alternative sources of water include rainwater and recovered condensate captured onsite. Water used for construction activities like dust control is not included in this total and represents 19 million gallons of water used in fiscal year 2024. Beginning with our fiscal year 2023 water footprint, we began allocating our Prineville data center water use, which comes from an Aquifer Storage and Recovery system, to alternative sources to better represent the impact of our water use.

4 Beginning in fiscal year 2022, we expanded our packaging goal boundary to better reflect our impact to include retail bags, all finished goods boxes (including plastic content in labels and in-box documentation), packaging sent to our customers as part of Apple Trade In, AppleCare packaging for whole units and service modules (with the exception of plastics needed to protect items from electrostatic discharge), and secondary packaging of Apple products and accessories sold by Apple. Our goal boundary does not include the inks, coatings, or adhesives used in our packaging In addition to our packaging footprint.

5 Responsible sourcing of wood fiber is defined in Apple's Sustainable Fiber Specification. Since 2017, all the virgin wood fiber used in our packaging has come from responsible sources.

Data

# Normalizing factors*

| | Fiscal year | | | | |
|---|---|---|---|---|---|
| | **2024** | **2023** | **2022** | **2021** | **2020** |
| **Net sales (in millions, US$)** | 391,035 | 383,285 | 394,328 | 365,817 | 274,515 |
| **Number of full-time equivalent employees** | 164,000 | 161,000 | 164,000 | 154,000 | 147,000 |

* As reported in Apple's Form 10-K Annual Report filed with the SEC.

# Green Bond Impact Report

Fiscal Year 2024 Update

**In this section**

# Apple’s green bonds

**Apple is committed to leaving the world better than we found it, and that commitment is considered in everything we do — from how we design our products to the processes we use to make and recycle them.**

We have long sought to model how businesses can lead in driving the reduction of global carbon emissions to address climate change, and our green bonds have helped Apple to demonstrate that leadership. Since the 2015 United Nations Climate Change Conference (COP21) in Paris, Apple has issued and invested proceeds from three green bonds to support global efforts to reduce carbon emissions. We issued our first $1.5 billion green bond in February 2016 and our second $1 billion green bond in June 2017 to help advance projects to mitigate our impact on climate change and inspire others to do the same. Both of these green bonds are fully allocated.

In November 2019, we proceeded with our third green bond issuance, and our first in Europe — raising €2 billion (approximately $2.2 billion) across two tranches (the “2019 Green Bond”). The 2019 Green Bond supports environmental efforts across the company, as well as our ambitious goal to reach carbon neutrality across Apple’s entire carbon footprint, including the full product life cycle, by 2030.[1] We first aim to leverage low-carbon product design, energy efficiency, clean electricity, and direct emissions abatement to reduce emissions by 75 percent by 2030, compared with our fiscal year 2015 carbon footprint. We then plan to address residual emissions by investing in high-quality carbon removal projects.

This year’s annual impact report covers the cumulative allocation of Apple’s 2019 Green Bond proceeds to environmental projects that incurred spend between September 29, 2019, and September 28, 2024 — Apple’s 2020 through 2024 fiscal years.

## Process for selecting projects and quantifying benefits

The 2019 Green Bond proceeds are intended to prioritize projects that mitigate our carbon emissions, including supporting the execution of our Apple 2030 roadmap. Our Environment, Policy and Social Initiatives team leads an annual evaluation and project selection process to identify projects eligible for green bond proceeds. The final allocation of net proceeds to eligible projects is determined by our vice president of Environment, Policy and Social Initiatives, based on each project’s alignment with the 2019 Green Bond eligibility criteria: low-carbon design and engineering, energy efficiency, renewable energy, carbon mitigation, and carbon sequestration.[2]

Apple allocated proceeds to a variety of project types across the eligible categories, including operational projects with immediate direct carbon benefits, capacity-building projects that enable suppliers to achieve carbon emissions reductions, and research and development that will unlock future carbon reductions once scaled.

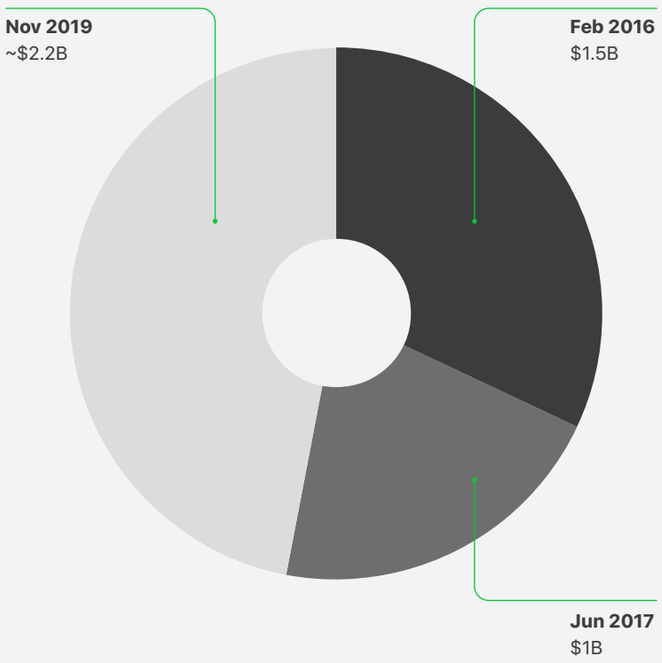
For many projects, we’re able to quantify a direct carbon benefit. When this is possible, we calculate the carbon impact over the project’s lifetime by estimating the annual carbon emissions reductions or removals of each project[3] and multiplying it by the project’s expected lifetime based on the underlying contracts.

We’re also quantifying the new renewable energy capacity we’re adding to the grid through the projects to which we’ve allocated green bond proceeds based on the terms of our agreements with project developers.

### Issuance

## $4.7 billion

Since February 2016, Apple has issued a total of $4.7 billion in green bonds.




1 We plan to reach carbon neutrality beginning with our fiscal year 2030 carbon footprint.

2 Across our other environmental reporting, we also use the term “direct emissions” and “emissions abatement” for “carbon mitigation” and “carbon removal” for “carbon sequestration.”

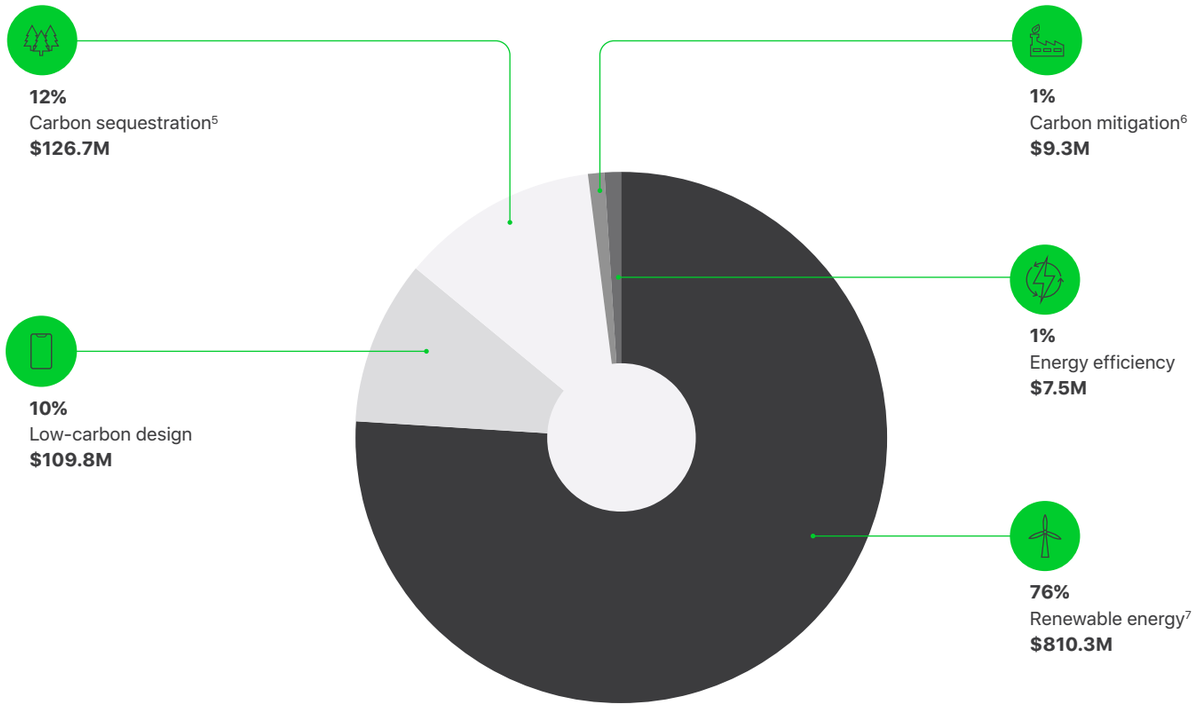
3 Notes on Projected Environmental Benefits:

- We estimated future environmental benefits of projects that are not yet fully operational, including carbon emissions avoided or removed, energy capacity, and annual renewable energy generation. To estimate carbon emissions avoided for renewable energy projects and renewable energy certificates (RECs), we use regional grid emissions factors as well as projections for annual electricity generation or the MWh associated with RECs. For the Restore Fund, we estimated the total carbon removal potential over the lifetime of the projects. There is inherent uncertainty in all of these projections. There is currently no generally accepted accounting principle to measure or account for many of these metrics, and our measurement methodologies may change. Projects dedicated to research and development or capacity building are not quantified, as their carbon benefit — which we believe is often sizable — is indirect and may take place across Apple’s global supply chain.
- Proceeds from Apple’s 2019 Green Bond were allocated to new and ongoing projects. For ongoing, multiyear projects, we included the spend that occurred during the fiscal year allocation period and the estimated environmental benefits of the entire completed project.
- Starting in fiscal year 2022, we changed our methodology for quantifying the benefits of eligible projects to a project lifetime calculation. We believe a lifetime calculation to be a better method of quantifying the impact of these projects compared to the prior calculation methodology that entailed estimating annual emissions reductions, as our projects range from 1 to 25 years — well beyond the maturity of the 2019 Green Bond and related impact reporting.

# Cumulative allocation: 2019 Green Bond

Fiscal year 2024 update

## Allocation by eligibility category[4]




## Allocation and budget

**74**

projects[8]

**$1.1B**

approximately 49% allocated

## Projected environmental benefits[9]

**33.4M**

metric tons of $CO_2e$ emissions to be mitigated or offset over the lifetime of the project[10]

**707MW**

installed renewable energy capacity[11]

4 The green bond allocations do not capture financial returns from project investments. As a result, the information provided does not capture a full view of the net abatement costs to Apple.

5 Across our other environmental reporting, we also use the term "direct emissions" for "carbon mitigation" and "carbon removal" for "carbon sequestration."

6 Refer to footnote 5.

7 Renewable energy spend includes equity investments, long-term contracts like power purchase agreements (PPAs) and virtual power purchase agreements (vPPAs), as well as some renewable energy credits, and long-term environmental attribute purchase agreements. For PPAs/vPPAs, the allocated amount is calculated as the net present value of future cash flows based on estimated annual production in megawatts and power price over the contract term. Because of this allocation methodology, the financial allocations to the 2019 Green Bond use of proceeds may not proportionally match the carbon contributions that we expect from each category of Apple's 2030 roadmap.

8 The "project count" represents projects or groups of projects comprised of similar project types within the eligibility criteria that Apple funds and tracks in aggregate.

9 A number of projects to which green bond proceeds were allocated since issuance are dedicated to research and development, capacity building, and policy advocacy. These types of projects have an indirect carbon benefit and therefore are not reflected in the projected environmental benefits quantified above.

10 We calculate greenhouse gas emissions mitigated or offset using the projected lifetime benefits of eligible projects from cumulative allocations for the period from fiscal year 2020 to fiscal year 2024. Project lifetimes range from 1 to 25 years. This number includes 7.3 million metric tons of $CO_2e$ emissions mitigated or offset that were previously inadvertently not reported under the project lifetime calculation.

11 This number represents PPAs and vPPAs where Apple is the sole investor, and obtains environmental attributes that are applied to our corporate carbon footprint. Apple's investments also support capacity from which we do not directly obtain environmental attributes. We also co-invest with other partners. The capacity from both of these kinds of investments are not included in the number above. Apple's combined investments, including those made with partners, have resulted in over 2200 MW installed renewable energy capacity from fiscal year 2020.

# Featured projects

In fiscal year 2024, we continued to expand the projects that support our Apple 2030 roadmap, with investments in R&D, renewable energy, and other environmental initiatives. What follows are select examples of the projects to which Apple allocated green bond funds in fiscal year 2024. In addition to continuing to fund our long-term environmental initiatives, we introduced four new projects in fiscal year 2024, the majority of our spend remained allocated to continuing long-term environmental initiatives necessary to reach our carbon neutrality goal. The complete list of projects with detailed descriptions and key performance indicators was provided to Sustainalytics for their second-party review (see the Sustainalytics Annual Review section for the review statement).

| Eligibility criteria | Project type | Project description |
|---|---|---|
| Renewable energy  | Clean energy for product use | To meet our Apple 2030 goal, we aim to generate enough clean energy to match the annual electricity consumption of our products used by customers. Our efforts include large-scale investments in new renewable energy in markets globally, and in fiscal year 2024, we've allocated green bond proceeds to invest in solar projects in the U.S. This is part of a broader effort to minimize emissions from product use. To learn more, read the Product use section of our Environmental Progress Report. |
| | Supplier Clean Energy Program | Our Supplier Clean Energy Program is aimed at enabling suppliers' transition to clean, renewable electricity through levers such as policy advocacy, information about renewable energy procurement options, data insights, and engagement opportunities with renewable energy experts. In fiscal year 2024, we continued to allocate green bond proceeds to our Supplier Clean Energy Program. To learn more about our program progress, read the Transitioning our suppliers to renewable electricity section of our Environmental Progress Report. |
| Energy efficiency  | Supplier Energy Efficiency Program | The Supplier Energy Efficiency Program, launched in 2015, aims to help our suppliers optimize energy use in their facilities by focusing on approaches to reduce energy use and avoid energy waste. We provide technical and planning support to suppliers as they build more energy-efficient systems by helping them recognize optimization opportunities and identify solutions through assessments and audits. In fiscal year 2024, we continued to allocate proceeds to our Supplier Energy Efficiency Program. To learn more about our program progress, read the Improving energy efficiency in our supply chain section of our Environmental Progress Report. |
| Low-carbon design  | Recycled materials | The use of recycled materials is central to our goal of one day making our products solely from responsibly sourced recycled or renewable materials. Incorporating recovered materials into our design process has already helped us lower the carbon footprint of the products we create. But to maximize the use of recycled content, additional research and development is needed. In fiscal year 2024, we continued to allocate green bond proceeds to further investigate ways to address challenges in improving the purity of recovered materials so they can be reused in Apple products instead of being downcycled. To learn more about our work in low-carbon design, read the Design and materials section of our Environmental Progress Report. |
| Carbon mitigation  | Direct emissions abatement | One of the largest contributors of direct emissions in our supply chain is the use of fluorinated greenhouse gases (F-GHGs), which have a higher global warming potential (GWP) than $CO_2$ and are notably used in the electronics manufacturing of semiconductors and flat-panel displays. We've continued to allocate green bond proceeds to support our close collaboration with our supply chain partners as they work to prevent F-GHGs from being released into the atmosphere. While the use of F-GHGs in certain manufacturing processes today is difficult to avoid, emissions can be reduced by switching to alternative low-GWP gases, optimizing production processes to use and emit fewer F-GHGs, and installing gas abatement tools. To learn more about our work, read the Direct GHG emissions section of our Environmental Progress Report. |
| Carbon sequestration  | Nature-based solutions | To reach our goal of carbon neutrality for our entire carbon footprint by 2030, in fiscal year 2024 we continued to allocate green bond proceeds to invest in high-quality carbon removal projects through Apple's Restore Fund, with the aim of addressing the portion of emissions that we're not yet able to avoid through other methods. To learn more about our carbon removals efforts, read the Carbon removal section of our Environmental Progress Report. |

Sustainalytics

# Annual Review

MORNINGSTAR | SUSTAINALYTICS

## Apple Inc.

**Type of Engagement:** Annual Review
**Date:** 10 February 2025
**Engagement Team:**
Bhakti Chikhalikar, bhakti.chikhalikar@morningstar.com
Tomya Sardana, tomya.sardana@morningstar.com

### Introduction

In November 2019, Apple Inc. ("Apple") issued a green bond (the "2019 Green Bond") to finance projects that have positive environmental impacts, with the goal of reducing the carbon footprint associated with Apple's own operations and more broadly across its entire value chain. In February 2025, Apple engaged Sustainalytics to review the projects to which green bond proceeds were allocated during Apple's fiscal year 2024 and provide an assessment as to whether they meet the use of proceeds criteria and the reporting commitments outlined in the Apple Green Bond Framework (the "Framework").[1] Sustainalytics provided a Second-Party Opinion on the Framework in November 2019.[2] This is Sustainalytics' fifth annual review of allocation and reporting of the instruments issued under the Framework, following previous reviews in fiscal years 2020, 2021, 2022 and 2023.[3,4,5,6]

### Evaluation Criteria

Sustainalytics evaluated the projects to which green bond proceeds were allocated in Apple's fiscal year 2024 (1 October 2023 to 28 September 2024) based on whether the projects financed:

1. Met the use of proceeds and eligibility criteria defined in the Framework; and
2. Reported on at least one key performance indicator (KPI) for each use of proceeds category defined in the Framework.

**Table 1: Use of Proceeds Categories, Eligibility Criteria and Associated KPIs**

| Use of Proceeds Category | Eligibility Criteria | Key Performance Indicators[7] |
|---|---|---|
| **Low Carbon Design and Engineering** | Expenditures related to the development or procurement of less carbon-intensive products and materials (compared to an established "pre-activity" baseline), such as improving product power usage efficiency, using materials produced from manufacturing processes requiring lesser greenhouse gas emissions, or sourcing materials with recycled or renewable content. | • Lifetime carbon benefit (MT $CO_2e$)[8]<br>• Renewable energy capacity (MW) |

[1] For Apple's Green Bond Framework, see the section "Use of Proceeds" in the Prospectus Supplement dated 7 November, 2019 filed with the U.S. Securities and Exchange Commission and available at: https://www.sec.gov/Archives/edgar/data/320193/000119312519288412/d804226d424b2.htm#supptoc804226_8
[2] Sustainalytics, "Second-Party Opinion, Apple Green Bond Framework", (2019), at: https://mstar-sustops-cdn-mainwebsite-s3.s3.amazonaws.com/docs/default-source/spos/apple-green-bond-second-party-opinion.pdf?sfvrsn=b41aa66d_3
[3] Apple, "Annual Review", (2020), at: https://s2.q4cdn.com/470004039/files/doc_downloads/additional_reports/Apple_GreenBond_Report_2020.pdf
[4] Apple, "Annual Review", (2021), at: https://s2.q4cdn.com/470004039/files/doc_downloads/additional_reports/2022/Apple_GreenBond_Report.pdf
[5] Apple, "Annual Review", (2022), at: https://s2.q4cdn.com/470004039/files/doc_downloads/additional_reports/2023/apple_greenbond_report_fy2022.pdf
[6] Apple, "Annual Review", (2023), at: https://s2.q4cdn.com/470004039/files/doc_downloads/additional_reports/2023/apple_greenbond_report_fy2023.pdf
[7] Starting fiscal year 2022, Apple changed its methodology for quantifying the carbon benefits of eligible projects to a project lifetime calculation. As a result, Apple has revised its KPIs and is reporting on two KPIs for allocations: 1) Lifetime carbon benefit of projects (MT $CO_2e$), which will also capture the previously reported average annual GHG emissions avoided KPI, and 2) Renewable energy capacity (MW). Apple believes that this change enables it to better reflect total benefits, while accounting for varying project lifetimes.
[8] Lifetime greenhouse gas emissions mitigated or offset includes the combined impact of all projects over the course of their lifetimes which range from 1 to 25 years.





| | | |
|---|---|---|
| **Energy Efficiency** | Expenditures related to the development of energy efficiency projects intended to reduce emissions in new or existing corporate and supply chain facilities, such as sensors and controls, energy management systems, and facility design, commissioning, and retrofits. | |
| **Renewable Energy** | Expenditures related to the development of renewable energy projects intended to reduce emissions in Apple's corporate facilities and supply chain, such as solar and wind projects, or associated energy storage solutions, including work to advance market structures, regulations and policy that support renewable energy through coalition and capacity building. | |
| **Carbon Mitigation** | Expenditures related to the development of projects intended to reduce direct and process emissions (compared to an established "pre-activity" baseline) from Apple's and its supplier's operations, such as abating direct emissions from manufacturing or sourcing non-fossil low carbon fuels. | |
| **Carbon Sequestration** | Expenditures related to the development of projects that sequester carbon, such as habitat restoration and conservation. | |

### Issuer's Responsibility

Apple is responsible for providing accurate information and documentation relating to the details of the projects, including descriptions, amounts allocated and impact.

### Independence and Quality Control

Sustainalytics, a leading provider of ESG research and ratings, conducted the verification of the use of proceeds from Apple's 2019 Green Bond. The work undertaken as part of this engagement included collection of documentation from Apple and review of said documentation to assess conformance with the Framework.

Sustainalytics relied on the information and the facts presented by Apple with respect to projects to which green bond proceeds were allocated for Apple's 2024 fiscal year. Sustainalytics is not responsible nor shall it be held liable for any inaccuracies in the opinions, findings or conclusions herein due to incorrect or incomplete data provided by Apple.

Sustainalytics made all efforts to ensure the highest quality and rigor during its assessment process and enlisted its Sustainability Bonds Review Committee to provide oversight of the review.

### Conclusion

Based on the limited assurance procedures conducted,[9] nothing has come to Sustainalytics' attention that causes us to believe that, in all material respects, the reviewed projects do not conform with the use of proceeds criteria and reporting commitments in the Framework. Apple has disclosed to Sustainalytics that the 49% of the proceeds from the 2019 Green Bond were allocated as of 28 September 2024.

[9] Sustainalytics' limited assurance process includes reviewing documentation relating to details of projects, as provided by the issuing entity, which is responsible for providing accurate information. These may include descriptions of projects, estimated and realized costs, and reported impact. Sustainalytics has not conducted on-site visits to projects.





### Detailed Findings

**Table 3: Detailed Findings**

| Framework Requirements | Procedure Performed | Factual Findings | Error or Exceptions Identified |
|---|---|---|---|
| **Use of Proceeds Criteria** | Verification of projects to which green bond proceeds were allocated in FY2024 to determine alignment with the use of proceeds criteria outlined in the Framework and above in Table 1. | The reviewed projects comply with the use of proceeds criteria. | None |
| **Reporting Criteria** | Verification of projects to which green bond proceeds were allocated in FY2024 to determine if impact was reported in line with the KPIs outlined in the Framework and above in Table 1. | Apple reported on at least one KPI per use of proceeds category. | None |

## Appendices

### Appendix 1: Allocation of Proceeds

**Table 4: Allocation of proceeds from the 2019 Green Bond**

Apple has allocated USD 199.9 million to eligible projects in its 2024 fiscal year and a total of USD 1,064.1 million to 74 projects since Apple's 2020 fiscal year, as outlined in the table below:

| Use of Proceeds Category | Proceeds Allocated, FY2024 (USD million) | Proceeds Allocated, Cumulative (USD million) |
|---|---|---|
| **Low Carbon Design** | 21.9 | 109.8 |
| **Energy Efficiency** | 2.1 | 7.5 |
| **Carbon Mitigation** | 0.4 | 9.3 |
| **Renewable Energy** | 126.9 | 810.3 |
| **Carbon Sequestration** | 48.6 | 127.1 |
| **Total Proceeds Allocated** | **199.9** | **1,064.1** |
| **Net Proceeds Raised (USD million)** | | 2,192.9 |
| **Percentage Allocation** | | 49% |

### Appendix 2: Reported Impact

**Table 5: Reported impact of proceeds from the 2019 Green Bond**

| Key Performance Indicators | Environmental Impact Reported[10] |
|---|---|
| **Lifetime carbon benefit ($tCO_2e$)[11,12]** | 33,400,000 |
| **Renewable energy capacity (MW)** | 707 |
| In addition to the above quantified benefits, Apple estimates that several projects will have indirect carbon benefits across its supply chain from investments in research and development, capacity building and policy advocacy. | |

[10] Apple has communicated to Sustainalytics that this represents a cumulative impact over the life of the green bond for eligible projects.
[11] Projected lifetime benefits from cumulative allocations for eligible projects. Project lifetimes range from 1 to 25 years. As of the end of FY2024, none of the financed projects are beyond 25 years.
[12] GHG emissions mitigated or offset by projects to which green bond proceeds were allocated under the eligible use of proceeds categories.





## Disclaimer







## About Morningstar Sustainalytics

Morningstar Sustainalytics is a leading ESG research, ratings and data firm that supports investors around the world with the development and implementation of responsible investment strategies. For more than 30 years, the firm has been at the forefront of developing high-quality, innovative solutions to meet the evolving needs of global investors. Today, Sustainalytics works with hundreds of the world's leading asset managers and pension funds, which incorporate ESG and corporate governance information and assessments into their investment processes. Sustainalytics also works with hundreds of companies and their financial intermediaries to help them consider sustainability in policies, practices and capital projects. For more information, visit www.sustainalytics.com.

Ernst & Young LLP

# Use of Proceeds Examination

Report of Independent Accountants

To the Management of Apple Inc.:

We have examined management's assertion, in Exhibit A, that $1.1 billion of net proceeds from the 0.000% notes due 2025 and 0.500% notes due 2031 issued by Apple Inc. ("Apple") were allocated, during the period from September 29, 2019 to September 28, 2024 (the "Reporting Period"), to qualifying Eligible Projects that meet one or more of the Eligibility Criteria (each as defined in the "Use of Proceeds" section of the Prospectus Supplement dated November 7, 2019, to the Prospectus dated November 5, 2018, filed by Apple on November 8, 2019, with the Securities and Exchange Commission pursuant to Rule 424(b)(2) under the Securities Act of 1933, as amended). Apple's management is responsible for the assertion, having a reasonable basis for its assertion, selection of the Eligibility Criteria and the allocation, during the Reporting Period, of amounts to Eligible Projects that meet one or more of the Eligibility Criteria. Our responsibility is to express an opinion on the assertion based on our examination.

Our examination was conducted in accordance with attestation standards established by the American Institute of Certified Public Accountants ("AICPA"). Those standards require that we plan and perform the examination to obtain reasonable assurance about whether management's assertion is fairly stated, in all material respects. An examination involves performing procedures to obtain evidence about management's assertion. The nature, timing, and extent of the procedures selected depend on our judgment, including an assessment of the risks of material misstatement of management's assertion, whether due to fraud or error. We believe that the evidence we obtained is sufficient and appropriate to provide a reasonable basis for our opinion.

We are required to be independent of Apple and to meet our other ethical responsibilities, as applicable for examination engagements set forth in the Preface: Applicable to All Members and Part 1 – Members in Public Practice of the Code of Professional Conduct established by the AICPA.

Our examination was not conducted for the purpose of evaluating (i) whether funds in excess of the net proceeds were allocated to Eligible Projects during the Reporting Period, (ii) the amount allocated to each category of Eligible Projects during the Reporting Period, (iii) that any payments made pursuant to any power purchase agreements or virtual power purchase agreements to which amounts were allocated during the Reporting Period were in accordance with such agreements, (iv) the environmental benefits of the Eligible Projects, (v) conformance of any Eligible Projects with any third-party published principles, standards or frameworks, such as the Green Bond Principles, dated June 2018, published by the International Capital Market Association or (vi) any information included in Apple's Annual Green Bond Impact Report, Fiscal Year 2024 Update, other than management's assertion. Accordingly, we do not express an opinion or any other form of assurance other than on management's assertion included in Exhibit A.

In our opinion, management's assertion, included in Exhibit A, that $1.1 billion in net proceeds from the 0.000% notes due 2025 and 0.500% notes due 2031 issued by Apple were allocated during the Reporting Period to qualifying Eligible Projects that met one or more of the Eligibility Criteria is fairly stated, in all material respects.

Ernst & Young LLP

San Jose, California
February 17, 2025

**Exhibit A**

**Apple Inc.**
**Management's Assertion**

We assert that $1.1 billion of net proceeds were allocated from our issuance of the 0.000% notes due 2025 and 0.500% notes due 2031, during the period from September 29, 2019 to September 28, 2024 (the "Reporting Period"), to qualifying Eligible Projects that meet one or more of the Eligibility Criteria (each as defined in the "Use of Proceeds" section of the Prospectus Supplement dated November 7, 2019, to the Prospectus dated November 5, 2018, filed by Apple Inc. ("Apple") on November 8, 2019, with the Securities and Exchange Commission pursuant to Rule 424(b)(2) under the Securities Act of 1933, as amended). The Eligibility Criteria are also set forth in Table 1 below. Apple's management is responsible for this assertion, including selection of the Eligibility Criteria and the allocation, during the Reporting Period, of amounts to Eligible Projects that meet one or more of the Eligibility Criteria. We worked with an outside party, a leading provider of second-party opinions for green, social, sustainability and KPI-linked bonds and loans, to provide a second party opinion on the Apple Green Bond framework at the time of issuance. We have engaged them annually thereafter to review the projects to which net proceeds were allocated and provide an assessment as to whether the projects met the Use of Proceeds criteria and the reporting commitments outlined in our Green Bond framework.

**Table 1: Eligibility Criteria**

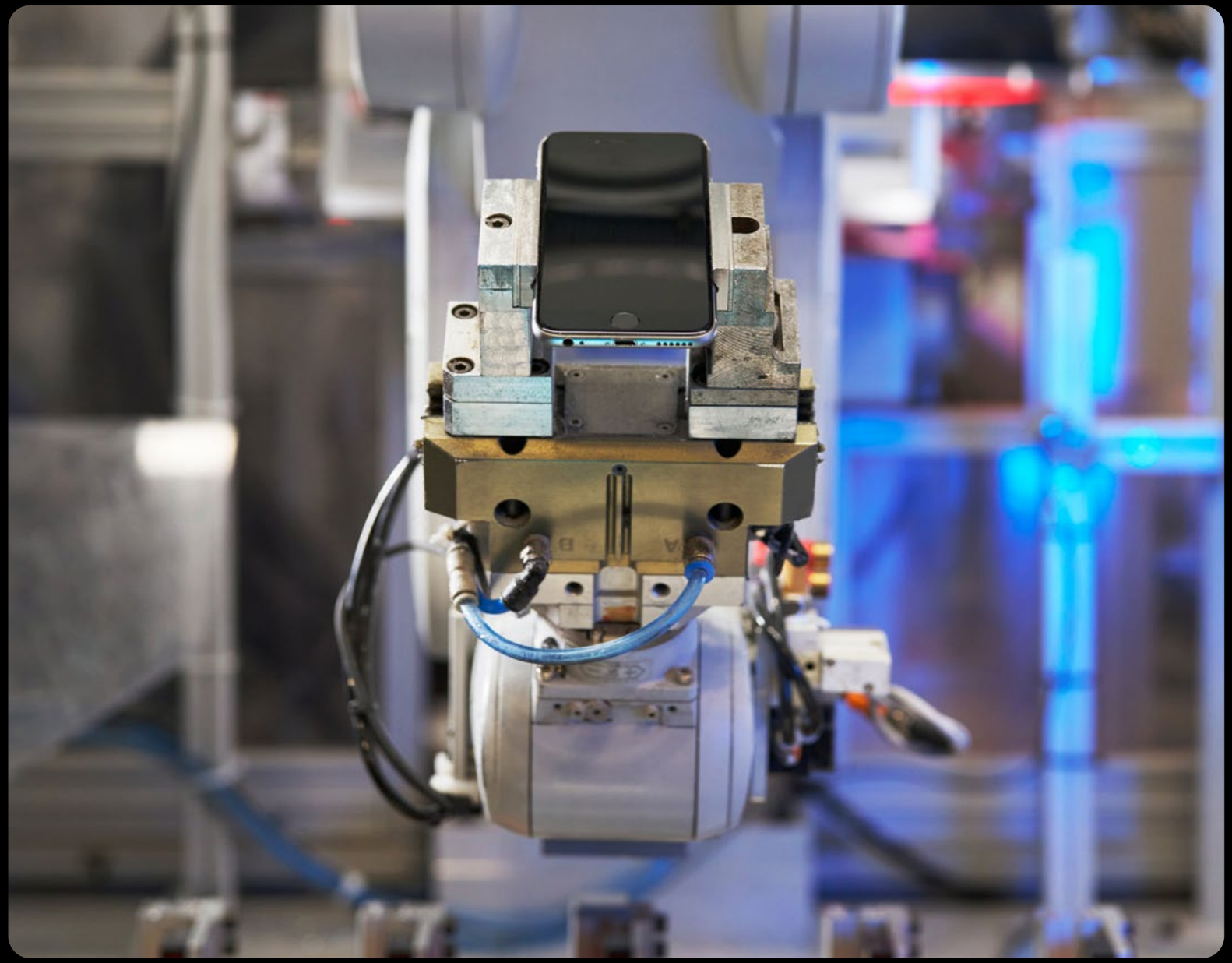
| | |
|---|---|
| **Low carbon design and engineering** | expenditures related to the development or procurement of less carbon-intensive products and materials (compared to an established "pre-activity" baseline), such as improving product power usage efficiency, using materials produced from manufacturing processes requiring lesser greenhouse gas emissions, or sourcing materials with recycled or renewable content, |
| **Energy efficiency** | expenditures related to the development of energy efficiency projects intended to reduce emissions in new or existing corporate and supply chain facilities, such as sensors and controls, energy management systems, and facility design, commissioning, and retrofits, |
| **Renewable energy** | building on our successful transition to 100% renewable electricity at our facilities, expenditures related to the development of renewable energy projects intended to reduce emissions in our corporate facilities and supply chain, such as solar and wind projects, or associated energy storage solutions, including work to advance market structures, regulations and policy that support renewable energy through coalition and capacity building, |
| **Carbon mitigation** | expenditures related to the development of projects intended to reduce direct and process emissions (compared to an established "pre-activity" baseline) from Apple's and our supplier's operations, such as abating direct emissions from manufacturing or sourcing non-fossil low carbon fuels, and |
| **Carbon sequestration** | expenditures related to the development of projects that sequester carbon, such as habitat restoration and conservation. |

**Note 1:** Apple Inc. or its subsidiaries directly invest in Eligible Projects in its own operations or its suppliers' operations.
**Note 2:** Proceeds are considered allocated upon the date of commercial operations for power purchase agreements or virtual power purchase agreements. The allocated amount is calculated as the net present value of future cash flows based on estimated annual production in megawatts and power price over the contract term. The determination of the amount to be allocated to the power purchase agreements and virtual power purchase agreements involves estimates. Actual results could differ from those estimates and those differences may be material.
**Note 3:** The net proceeds allocated to carbon sequestration projects include the purchase of carbon offsets.

# End notes

This Green Bond Report (the "Report") contains forward-looking statements, within the meaning of the Private Securities Litigation Reform Act of 1995, that involve risks and uncertainties. Such forward-looking statements provide current expectations of future events based on certain assumptions and include any statement that does not directly relate to any historical or current fact. For example, statements in this Report regarding the potential future impact of allocated projects are forward-looking statements. Forward-looking statements can also be identified by words such as "future," "goal," "anticipates," "believes," "estimates," "expects," "intends," "aims," "plans," "predicts," "projected," "will," "would," "could," "can," "may," and similar terms. Forward-looking statements are not guarantees of future performance and Apple's actual results may differ significantly from the results discussed in the forward-looking statements. Factors that might cause such differences include, but are not limited to, those discussed in the "Risk Factors" sections of Apple's most recently filed periodic reports on Form 10-K and Form 10-Q and subsequent filings as filed with the Securities and Exchange Commission. Apple assumes no obligation to revise or update any forward-looking statements for any reason, except as required by law. This Report has been prepared for information purposes only. Apple does not make any warranties or representations as to the completeness or reliability of the information, opinions or conclusions expressed herein. This Report is not intended to provide the basis for the evaluation of any securities issued by Apple. This Report should not be construed and does not constitute an invitation, recommendation or offer to subscribe for or purchase any of Apple's securities. Under no circumstances shall Apple or its affiliates be liable for any loss, damage, liability or expense incurred or suffered which is claimed to have resulted from use of this Report.

# Appendix



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Appendix A

# Corporate facilities energy supplement

Use of renewable energy at our facilities has been a central component of our emissions reduction strategy since 2011. We've learned a lot about how best to secure renewable energy, which has helped us educate suppliers and expand our renewable energy efforts into our supply chain. This appendix summarizes the types of renewable energy solutions we've deployed, and it details how we implement renewable energy at our data centers — our largest energy loads.

## How we procure renewable energy

Our strategy has evolved over time to create the most positive impact.

**2011**

**Ownership and PURPA:** Apple's 100 percent equity ownership of our Maiden solar arrays was the first time a nonenergy commercial company built its own utility-scale solar PV project. We used a 1978 federal law called the Public Utility Regulatory Policies Act (PURPA) to structure the project. We then applied this same structure to two more large solar PV and biogas fuel cell projects in North Carolina and two microhydro projects in Oregon. This was a landmark moment in corporate renewable energy development and led to an increased use of PURPA in these states.

**2012**

**Direct Access:** In California and Oregon, we've used a program called Direct Access to bypass the default electricity generation offered by the utilities servicing our data centers in those states. Instead, we contracted directly with independent power producers and electricity service providers who could supply 100 percent renewable electricity. After initially buying from existing, third-party-owned projects, we're now procuring renewable energy from projects we created: The Solar Star II and Montague Wind projects deliver renewables to our Oregon data center, and the California Flats solar project delivers renewables to our data centers, offices, and retail stores in California.

**2013**

**GreenEnergy Rider:** We opened a new data center in Reno, Nevada. With no PURPA or Direct Access options in Nevada, we worked directly with the local utility, NV Energy, to create a whole new regulatory structure. The Nevada GreenEnergy Rider enables us to secure a long-term, fixed-price contract for renewable electricity from a new solar PV project built for us but managed by the utility. We've used this partnership to create four solar projects totaling 320 megawatts.

**2014**

**Equity investment:** We invested in two 20-megawatt solar PV projects in Sichuan, China, to support all our in-country retail stores, corporate offices, and data storage facilities. This project represented the first time a commercial company created a new large-scale project in China for its own use. We've since replicated this model many times for Apple's supply chain.

**2015 & 2016**

**Portfolio solutions:** We adapted to land scarcity constraints in Singapore and Japan by contracting for solar PV on 800 rooftops in Singapore and 300 in Japan. We adapted our approach in each country to fit local partnerships and regulatory structures: We signed a long-term agreement similar to a power purchase agreement in Singapore and made an equity investment in Japan. These projects offer us long-term flexibility as our load grows.

**2017**

**Renewable microgrid:** We've been powering Apple Park with 100 percent renewable energy — more than 50 percent of which is generated onsite and managed by a microgrid. The onsite generation comes from 14 megawatts of rooftop solar PV and 4 megawatts of baseload biogas fuel cells. Any additional energy required is drawn by Direct Access from the California Flats solar project in nearby Monterey County. The microgrid system with battery storage manages the renewable energy generation and the building's energy use; optimizes demand management, load shifting, and frequency regulation services; and supports uninterrupted energy reliability against local grid outages.

**2018**

✓ Achieved

**100 percent renewable electricity generated or sourced for our corporate operations.**

## Facilities renewable energy projects

To reach 100 percent renewable electricity for Apple's own facilities, Apple has helped create 1782 MW of renewable energy around the world. The projects listed below represent Apple-created renewable energy projects that support Apple facilities' electricity use and contribute to cleaner grids around the world. Operational projects apply a mix of renewable energy technology, including wind (27 percent), solar (72 percent), microhydro (0.2 percent), and biogas fuel cells (0.2 percent). This table represents all operational renewable energy projects that Apple has helped create.

| Location | Renewable energy technology | Size (MW) |
|---|---|---|
| Australia | PV | 0.5 |
| Brazil | Wind | 0.5 |
| China mainland | PV | 195 |
| China mainland | Wind | 130 |
| Denmark | PV | 42 |
| Denmark | Wind | 17 |
| India | PV | 16 |
| Israel | PV | 5 |
| Japan | PV | 12 |
| Mexico | Wind | 0.8 |
| Rooftop solar projects | PV | 5.0 |
| Power for Impact projects | PV | 7 |
| Singapore | PV | 54 |
| Taiwan | PV | 1 |
| Turkey | PV | 4 |
| Arizona, U.S. | PV | 62 |
| California, U.S. | Biogas fuel cell | 4 |
| California, U.S. | PV | 144 |
| Illinois, U.S. | Wind | 112 |
| Nevada, U.S. | PV | 320 |
| North Carolina, U.S. | PV | 164 |
| Oregon, U.S. | Microhydro | 3 |
| Oregon, U.S. | PV | 125 |
| Oregon, U.S. | Wind | 200 |
| Texas, U.S. | Wind | 25 |
| Virginia, U.S. | PV | 134 |
| | **Total** | **1,782** |

Note: Data current as of February 2025 (operational). Totals might not add up due to rounding.

## Fiscal year 2024 energy and carbon footprint (corporate facilities)

The table below provides a detailed breakdown of 2024 energy use, which we used to calculate our greenhouse gas emissions.

| | Scope 1 | | | Scope 2 | | |
|---|---|---|---|---|---|---|
| Location | Total gas (MMBtu) | Renewable biogas (MMBtu) | Scope 1 emissions (metric tons $CO_2e$) | Electricity (million kWh) | Renewable electricity (million kWh) | Scope 2 emissions (market-based, metric tons $CO_2e$)[1] |
| **Corporate** | **354,028** | **625,053** | **55,200** | **1,055** | **1,055** | **278,108** |
| Cupertino, CA | 230,072 | 220,696 | 17,982 | 450 | 450 | 26,796 |
| Elk Grove, CA | 10,155 | 0 | 711 | 13 | 13 | 2,664 |
| Austin, TX | 26,690 | 0 | 2,621 | 117 | 117 | 45,946 |
| Other U.S. | 0 | 404,357 | 11,960 | 118 | 118 | 53,748 |
| Cork, Ireland | 23,619 | 0 | 1,399 | 17 | 17 | 3,039 |
| Singapore | 548 | 0 | 93 | 22 | 22 | 8,385 |
| China | 1,445 | 0 | 2,678 | 53 | 53 | 31,289 |
| Other international | 61,499 | 0 | 17,756 | 195 | 195 | 106,241 |
| **Data center** | **868** | **0** | **5,330** | **2,515** | **2,515** | **837,859** |
| Maiden, NC | 0 | 0 | 860 | 466 | 466 | 117,872 |
| Mesa, AZ | 203 | 0 | 1,410 | 530 | 530 | 187,673 |
| Newark, CA[2] | 0 | 0 | 0 | 0 | 0 | 0 |
| Prineville, OR | 665 | 0 | 1,618 | 255 | 255 | 72,027 |
| Reno, NV | 0 | 0 | 1,442 | 454 | 454 | 155,434 |
| Viborg, Denmark | - | - | - | 59 | 59 | 34,570 |
| Colocation facilities (U.S.) | - | - | - | 422 | 422 | 93,538 |
| Colocation facilities (international) | - | - | - | 105 | 105 | 45,897 |
| China | - | - | - | 214 | 214 | 126,775 |
| **Retail stores** | **58,452** | **0** | **3,180** | **206** | **206** | **80,105** |
| Domestic (U.S.) | 31,388 | 0 | 1,667 | 95 | 95 | 29,466 |
| International | 27,064 | 0 | 1,513 | 111 | 111 | 50,639 |
| **Total** | **413,348** | **625,053** | **63,710** | **3,776** | **3,776** | **1,196,072** |

Dash indicates unavailable data.

N/A = Gas use at colocation facilities is considered outside of Apple's operational control.

1 Scope 2 market-based emissions from purchased electricity is zero. But, we also account for purchased steam, heating, and cooling, which resulted in 3300 metric tons of emissions in fiscal year 2024.

2 Starting with fiscal year 2023, we no longer include the Newark, CA, data center as it was sold in fiscal year 2022.

## A focus on data centers

**We now operate eight data centers.[3] These data centers are spread across North America, Europe, and Asia. Each has unique design features that conserve energy and reflect the climate, as well as other aspects, of its location.**

In 2024, we used over 2.5 billion kWh of electricity to power our data centers and colocation facilities around the world. We're proud that 100 percent of that electricity came from renewable sources including solar, wind, biogas fuel cells, and low-impact hydropower. To cover our needs, we build our own renewable power projects and work with utilities to purchase clean energy from locally obtained resources. We're staying at 100 percent even as Apple's data center capacity continues to grow.

### Maiden, North Carolina

**100 percent renewable since opening June 2010**

Between 2011 and 2015, we installed 68 megawatts of Apple-created projects: two 20-megawatt solar projects, an 18-megawatt solar project, and 10 megawatts of biogas fuel cells. We then worked with the local utility, Duke Energy, to help build five solar projects through its Green Source Rider program. These solar projects came online beginning in 2015 and were Duke Energy's first Green Source Rider projects to become operational. We worked with Duke Energy for several years to develop this green energy tariff option, which allowed Apple and Duke Energy to develop new renewable energy projects. The five Green Source Rider projects have a combined capacity of 22 megawatts. In 2017, we made long-term commitments to five more solar projects in North Carolina, for an additional 85 megawatts of renewable energy.

The energy efficiency measures we've implemented at our Maiden data centers include use of outside air cooling through a waterside economizer during night and cool-weather hours, which, along with water storage, allows the chillers to be idle 75 percent of the time.

**Maiden, North Carolina: Grid mix versus Apple-sourced renewable energy**
Electricity use in 2024: 466 million kWh
Emissions avoided in 2024: 117,800 million MT $CO_2e$[4]

| Default grid mix | % |
|---|---|
| Gas | 41 |
| Nuclear | 38 |
| Coal | 9 |
| Renewable | 9 |
| Hydro | 3 |

Source: eGRID 2022.

| Apple actual renewable energy allocation | % |
|---|---|
| Apple's solar projects | 68 |
| Apple's wind projects | 32 |

Source: 2024 energy data.

### Prineville, Oregon

**100 percent renewable since opening May 2012**

To support our Prineville data center, we signed a 200-megawatt power purchase agreement for a new Oregon wind farm, the Montague Wind Power Facility, which entered commercial operation at the end of 2019.

This is in addition to our power purchase agreement for the 56-megawatt Solar Star Oregon II project located just a few miles from our data center. This solar PV project came online and began supporting the data center in 2017. To strengthen the connection between Apple and these projects, we use Oregon's Direct Access program to supply the renewable energy from these projects directly to our data center.

Also supporting the data center are two microhydro projects that harness the power of water flowing through local irrigation canals that have been operating for over 60 years. To supplement these projects, we executed a long-term purchase agreement for all environmental attributes from a 69-megawatt portfolio of eight solar projects in Oregon.

Our Prineville data center takes advantage of the cool and dry climate by cooling its servers with outside air whenever possible. Indirect evaporative cooling is enabled when the outside air temperature gets too high to cool the servers with outside air alone.

**Prineville, Oregon: Grid mix versus Apple-sourced renewable energy**
Electricity use in 2024: 255 million kWh
Emissions avoided in 2024: 72,000 million MT $CO_2e$[5]

| Default grid mix | % |
|---|---|
| Hydro | 43 |
| Gas | 40 |
| Renewable | 17 |

Source: eGrid 2022.

| Apple actual renewable energy allocation | % |
|---|---|
| Apple's solar projects | 43 |
| Apple's wind projects | 56 |
| Apple's microhydro projects | 1 |

Source: 2024 energy data.

### Mesa, Arizona

**100 percent renewable since opening March 2017[6]**

Our global command data center in Mesa, Arizona, came online in 2016. To support this facility, we partnered with the local utility, Salt River Project (SRP), to build the 50-megawatt Bonnybrooke solar project, which became operational in December 2016.

As the Mesa data center grew, it became apparent that we needed additional sources of renewable energy to maintain our 100 percent renewable electricity goal.

We began to explore onsite solar options at the data center and determined that we could provide valuable shaded parking that paid for itself through energy bill reductions while adding to our renewable energy portfolio. The resulting PV facility includes five elevated parking canopies and three ground-mounted arrays, for a total generating capacity of 4.67 MW. The onsite PV system began commercial operation in February 2019.

**Mesa, Arizona: Grid mix versus Apple-sourced renewable energy**
Electricity use in 2024: 530 million kWh
Emissions avoided in 2024: 187,700 million MT $CO_2e$[7]

| Default grid mix | % |
|---|---|
| Gas | 47 |
| Nuclear | 29 |
| Coal | 8 |
| Hydro | 4 |
| Renewable | 12 |

Source: eGRID 2022.

Note: Total doesn't add up to 100 percent due to rounding.

| Apple actual renewable energy allocation | % |
|---|---|
| Apple's solar projects | 100 |
| Apple's wind projects | 0 |

Source: 2024 energy data.

3 Starting with fiscal year 2023, we no longer include the Newark, CA, data center as it was sold in fiscal year 2022. In October 2024, we opened our Waukee data center in Iowa, bringing our total Apple-owned data center count to eight. We worked with local partners, including the City of Waukee and MidAmerican Energy, to source and provide wind energy for the site.

4 Emissions avoided are calculated using the GHG Protocol methodology for calculating market-based emissions.

5 Emissions avoided are calculated using the GHG Protocol methodology for calculating market-based emissions.

6 Apple took operational control of the building in October 2015 and converted it to a data center that began servicing customers in March 2017.

7 Emissions avoided are calculated using the GHG Protocol methodology for calculating market-based emissions.

## Reno, Nevada

**100 percent renewable since opening December 2012**

In 2013, we created a partnership with the local utility, NV Energy, to develop the Fort Churchill Solar project. Apple designed, financed, and constructed the project. NV Energy owns and operates the facility and directs all the renewable energy it produces to our data center. The nearly 20-megawatt Fort Churchill Solar project was based on a unique tracker with curved mirrors that concentrate sunlight onto photovoltaic cells.

To facilitate further renewable development in Nevada, Apple worked with NV Energy and the Public Utility Commission of Nevada to create a green energy option open to all commercial customers, called the NV GreenEnergy Rider, that does not require the customer to fund project development up front. Thanks to this new option, in 2015 we announced our second Nevada solar project, the 50-megawatt Boulder Solar II project. This project came online in 2017. We've utilized the NV GreenEnergy Rider program to create two additional projects: the 200-megawatt Techren II solar project, online in 2019, and the 50-megawatt Turquoise Project, online in 2020.

Next was the 50-megawatt Turquoise Nevada project, which came online in late 2020. Like in Prineville, our Reno data center takes advantage of the mild climate by cooling its servers with outside air whenever possible. When the outside air is too warm to cool the servers alone, it draws from indirect evaporative cooling.

**Reno, Nevada: Grid mix versus Apple-sourced renewable energy**
Electricity use in 2024: 454 million kWh
Emissions avoided in 2024: 155,400 million MT $CO_2e$[8]

| Default grid mix | % |
|---|---|
| Gas | 54 |
| Renewable | 35 |
| Coal | 6 |
| Nuclear | 5 |

| Apple actual renewable energy allocation | % |
|---|---|
| Apple's solar projects (NV GreenEnergy Rider program) | 100 |

Source: 2024 energy data.

Source: eGRID 2022.

## Denmark

**100 percent renewable energy from the first day of operations**

Our data center came online in 2020. The data center's construction phase was powered with 100 percent wind energy from a local renewable energy retailer in Denmark. Our Northern Jutland PV project achieved commercial operation in late 2019, will meet all the data center's near-term energy needs, and at 42 megawatts, is one of Denmark's largest solar power plants. Our second renewable project in Denmark, a 17 megawatt wind project, also came online in late 2020. We've secured long-term supply contracts with both Danish renewable projects, which will scale up as our data center loads grow.

The power system design at the data center is based on a resilient substation that eliminates the need for backup diesel generators. This reduces the carbon footprint of the data center and completely eliminates the need for large diesel fuel storage systems and diesel engine emissions that would impact the local community.

**Denmark: Grid mix versus Apple-sourced renewable energy**
Electricity use in 2024: 59 million kWh
Emissions avoided in 2024: 34,500 million MT $CO_2e$[9]

| Default grid mix | % |
|---|---|
| Renewable | 89 |
| Hydro | — |
| Coal | 7 |
| Gas | 4 |
| Nuclear | — |
| Other | — |

| Apple actual renewable energy allocation | % |
|---|---|
| Apple's wind and solar projects | 100 |

Source: 2024 energy data.

Source: Energinet. https://energinet.dk/data-om-energi/deklarationer-og-csr/lokationsbaseret-deklaration-miljodeklaration/.

## China

**100 percent renewable energy from the first day of operations**

To cover the electricity load at our two data centers in China, we secured long-term agreements with solar and wind projects in China — both operational.

As the data centers further expand, we'll continue to source renewable electricity in-country to support the growth with renewable electricity.

**China: Grid mix versus Apple-sourced renewable energy**
Electricity use in 2024: 214 million kWh
Emissions avoided in 2024: 126,800 million MT $CO_2e$[10]

| Default grid mix | % |
|---|---|
| Coal | 63 |
| Hydro | 17 |
| Renewable | 11 |
| Nuclear | 5 |
| Gas | 3 |

| Apple actual renewable energy allocation | % |
|---|---|
| Apple's solar projects | 50 |
| Apple's wind projects | 50 |

Source: 2024 energy data.

Source: IEA Electricity Information 2022, www.iea.org/data-and-statistics/data-product/electricity-information.

8 Emissions avoided are calculated using the GHG Protocol methodology for calculating market-based emissions.

9 Emissions avoided are calculated using the GHG Protocol methodology for calculating market-based emissions.

10 Emissions avoided are calculated using the GHG Protocol methodology for calculating market-based emissions.

### Our colocation facilities

The majority of our online services are provided by our own data centers; however, we also use third-party colocation facilities for additional data center capacity. While we don't own these shared facilities and use only a portion of their total capacity, we include our portion of their energy use in our renewable energy goals.

Starting in January 2018, 100 percent of our power for colocation facilities was matched with renewable energy generated within the same country or regional grid. As our loads grow over time, we'll continue working with our colocation suppliers to match 100 percent of our energy use with renewables.

### Third-party computing

Beyond the use of our own data centers and colocation facilities, we also use third-party services to support some of our on-demand cloud computing and storage services. As of 2023, all the electricity associated with Apple's load at our third-party computing vendors is matched with 100 percent clean energy.

### Apple Intelligence

Apple Intelligence was developed with the environment in mind. When a user makes a request, Apple Intelligence analyzes whether it can be processed on device. If it needs greater computational capacity, it can draw on Private Cloud Compute, our groundbreaking cloud intelligence system design specifically for private AI processing. It will send only the data that is relevant to the task to be processed on Apple servers at our data centers, which run on 100 percent renewable energy. When requests are routed to Private Cloud Compute, data is not stored or made accessible to Apple, and is only used to fulfill the user's requests.

| | Total energy use (kWh) | Renewable energy (kWh) | Default utility emissions (metric tons $CO_2e$)[11] | Apple's emissions – including renewable energy (metric tons $CO_2e$)[12] | Percent renewable energy (%)[13] |
|---|---|---|---|---|---|
| **FY 2012** | 38,552,300 | 1,471,680 | 17,200 | 16,500 | 0 |
| **FY 2013** | 79,462,900 | 46,966,900 | 31,800 | 14,500 | 59 |
| **FY 2014** | 108,659,700 | 88,553,400 | 44,300 | 11,000 | 81 |
| **FY 2015** | 142,615,000 | 121,086,100 | 60,500 | 12,700 | 85 |
| **FY 2016** | 145,520,900 | 143,083,200 | 66,300 | 1,600 | 98 |
| **FY 2017**[14] | 289,195,800 | 286,378,100 | 125,600 | 1,500 | 99 |
| **FY 2018** | 327,663,800 | 326,959,700 | 146,600 | 400 | 100 |
| **FY 2019** | 339,047,649 | 339,047,649 | 146,400 | 0 | 100 |
| **FY 2020** | 372,901,398 | 372,901,398 | 153,459 | 0 | 100 |
| **FY 2021** | 384,727,076 | 384,727,076 | 146,780 | 0 | 100 |
| **FY 2022** | 487,921,930 | 487,921,930 | 182,700 | 0 | 100 |
| **FY 2023** | 483,299,062 | 483,299,062 | 186,141 | 0 | 100 |
| **FY 2024** | 527,655,650 | 527,655,650 | 182,944 | 0 | 100 |

11 We calculate default utility emissions to provide baseline emissions of what our carbon footprint would have been without the use of renewable energy. This allows us to demonstrate the savings resulting from our renewable energy program.

12 Apple's greenhouse gas emissions are calculated using the World Resources Institute Greenhouse Gas Protocol methodology for calculating market-based emissions.

13 We calculate our progress toward our 100 percent renewable energy goal on a calendar-year basis, while the numbers reported in this table are based on fiscal year. Beginning January 1, 2018, all the electricity use at our colocation facilities is from 100 percent renewable energy.

14 Over the past few years, we've been installing submeters in colocation facilities to better track electricity usage. Beginning in fiscal year 2016, we started reporting this submetered electricity usage. Prior to fiscal year 2016, reported electricity usage was conservatively estimated based on maximum contract capacity quantities. We've updated our fiscal year 2016 colocation facilities footprint to more accurately reflect Apple's operational boundaries. Per the GHG Protocol, we've removed from our electricity usage and scope 2 calculations those emissions associated with colocation facility cooling and building operations.

Appendix B

# Apple’s life cycle assessment methodology

When conducting a product life cycle assessment (LCA), we calculate greenhouse gas emissions using the 100-year time horizon global warming potentials (GWP100) from the 2023 IPCC Sixth Assessment Report (AR6),[1] including biogenic carbon.

There’s inherent uncertainty in modeling greenhouse gas emissions due primarily to data limitations. For the top component contributors to Apple’s greenhouse gas emissions, Apple develops 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 continuously improve our abilities to accurately calculate our emissions, seeking more detailed data and models to reflect the impact of our products as new information becomes available.

## How Apple conducts our product greenhouse gas life cycle assessment

### To model the manufacturing phase

We use part-by-part measurements of the entire product along with data on part production. In some cases where part-by-part data is not readily available, we also use design-level data for size and weight detail. The measurements help us determine the size and weight of the components and materials in the product, while data on manufacturing processes and yield loss during production allows us to account for the impact of manufacturing. The LCA includes accessories and packaging, as well as decreased emissions through Apple’s Supplier Clean Energy Program. When calculating Apple’s comprehensive carbon footprint, we also include units that are repaired and replaced through AppleCare.

### To model transportation

We use data collected on shipments of single products and multipack units by land, sea, and air. We account for transporting materials between manufacturing sites; transporting products from manufacturing sites to regional distribution hubs; transporting products from regional distribution hubs to individual customers; and transporting products from final customers to recycling facilities.

### To model customer use

Apple assumes an average of three years of total energy use for iPhone and Apple Watch devices, and an average of four years of total energy use for iPad, Mac, and other devices including Apple Vision Pro and Apple TV. Total energy use assumptions are based on field performance of historically similar products when the devices are showing periods of activity.

Average daily energy use is calculated using data from a variety of sources including, but not limited to, field telemetry from users who opt-in to sharing device analytics and modeling battery drain from activities such as movie and music playback. Geographic differences in power grid mix is accounted for at a regional level. Measurement practices follow Apple’s Privacy guidelines/policies, which can be found on Apple’s privacy website. More information on our product energy use is provided in our Product Environmental Reports.

### To model end of life

We use material composition data on our products and estimate the ratio of products that are sent to recycling or disposal. For products sent to recycling, we capture the initial processing by the recycler to prepare the product for recovery of electronic, metal, plastic, and glass material streams. Subsequent downstream recycling processes are not included, as these are considered stages of production and not end-of-life processing. For products sent to disposal, we capture the emissions associated with landfilling or incineration of each type of material.

### Putting it all together

After we collect data about manufacturing, use, transportation, and end of life, we combine it with detailed greenhouse gas emission data. This emission data is based on a combination of Apple-specific and industry-average data sets for material production, manufacturing processes, electricity generation, and transportation. Renewable energy used in the supply chain, initiated by suppliers independently or through the Apple Supplier Clean Energy Program, is also accounted for within the LCA model. Combining product-specific information with emission data in our LCA allows us to compile detailed results for greenhouse gas emissions as they relate to each product. The data and modeling approaches are checked for quality and accuracy by the Fraunhofer Institute in Germany.

1 Intergovernmental Panel on Climate Change (IPCC), Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II, and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, ed. Hoesung Lee, José Romero, and the Core Writing Team (Geneva: IPCC, 2023), 35–115, doi.org/10.59327/IPCC/AR6-9789291691647.

Appendix C

# Net comprehensive carbon footprint, facilities energy, carbon, waste, paper, and water data (Apex)

**INDEPENDENT ASSURANCE STATEMENT**

**To: The Stakeholders of Apple Inc.**

### Introduction and objectives of work

Apex Companies, LLC (Apex) was engaged by Apple Inc. (Apple) to conduct an independent assurance of select environmental data reported in its 2024 environmental report (the Report). This assurance statement applies to the related information included within the scope of work described below. The intended users of the assurance statement are the stakeholders of Apple. The overall aim of this process is to provide assurance to Apple's stakeholders on the accuracy, reliability and objectivity of Subject Matter included in the Report.

This information and its presentation in the Report are the sole responsibility of the management of Apple. Apex was not involved in the collection of the information or the drafting of the Report.

### Scope of Work

Apple requested Apex to include in its independent review the following (Subject Matter):

- Assurance of select environmental data and information included in the Report for the fiscal year 2024 reporting period (October 1, 2023 through September 30, 2024), specifically, in accordance with Apple's definitions and World Resources Institute (WRI)/World Business Council for Sustainable Development (WBCSD) Greenhouse Gas Protocol:
  - Energy: Direct (Million Therms) and Indirect (Million kilowatt hours (mkWh))
  - Renewable Energy (mkWh)
  - Water Withdrawal (Million Gallons)
  - Greenhouse Gas (GHG) Emissions: Direct Scope 1 emissions by weight, Indirect Scope 2 emissions by weight, Indirect Scope 3 emissions by weight (Purchased Goods and Services, Fuel and Energy Related Activities, Employee Commute and Business Travel) (Metric Tonnes of Carbon Dioxide equivalent)
  - Apple's Comprehensive Carbon Footprint
  - Waste Quantities and Disposition (Metric Tonnes)
  - Paper Quantities (Metric Tonnes)

Excluded from the scope of our work is any assurance of information relating to:

- Text or other written statements associated with the Report
- Activities outside the defined assurance period

### Assessment Standards

Our work was conducted against Apex's standard procedures and guidelines for external Verification of Sustainability Reports, based on current best practice in independent assurance. Apex procedures are based on principles and methods described in the International Standard on Assurance Engagements (ISAE) 3000 Revised, Assurance Engagements Other than Audits or Reviews of Historical Financial Information (effective for assurance reports dated on or after Dec. 15, 2015), issued by the International Auditing and Assurance Standards Board and ISO 14064-3: Greenhouse gases -- Part 3: Specification with guidance for the validation and verification of greenhouse gas statements.

### Methodology

Apex undertook the following activities:

1. Site visits, with associated data review, to Apple facilities in Reno, Nevada and Singapore;
2. Interviews with relevant personnel of Apple;
3. Review of internal and external documentary evidence produced by Apple;
4. Audit of environmental performance data presented in the Report, including a detailed review of a sample of data against source data; and
5. Review of Apple information systems for collection, aggregation, analysis and internal verification and review of environmental data.

The work was planned and carried out to provide reasonable assurance for the following indicators, and we believe it provides an appropriate basis for our conclusions:

- Energy: Direct (Million Therms) and Indirect (Million kilowatt hours (mkWh))
- Renewable Energy (mkWh)
- Water Withdrawal (Million Gallons)
- Greenhouse Gas (GHG) Emissions: Direct Scope 1 emissions by weight, Indirect Scope 2 emissions by weight (Metric Tonnes of Carbon Dioxide equivalent)
- Paper Quantities (Metric Tonnes)

The work was planned and carried out to provide limited assurance for the following indicators, and we believe it provides an appropriate basis for our conclusions:

- Greenhouse Gas (GHG) Emissions: Indirect Scope 3 emissions by weight (Purchased Goods and Services, Fuel and Energy-Related Activities, Employee Commuting and Business Travel) (Metric Tonnes of Carbon Dioxide equivalent)
- Apple Comprehensive Carbon Footprint
- Waste Quantities and Disposition (Metric Tonnes)

### Our Findings

Apex verified the following indicators for Apple's fiscal year 2024 reporting period (October 1, 2023 through September 30, 2024):

| Parameter | Quantity | Units | Boundary / Protocol |
|---|---|---|---|
| Natural Gas Consumption | 1,048,000 | Metric million British thermal unit | Worldwide occupied properties / Apple Internal Protocol |
| Electricity Consumption | 3,800 | Million kilowatt hours (mkWh) | Worldwide occupied properties / Apple Internal Protocol |
| Renewable Energy | 3,800 | Million kilowatt hours (mkWh) | Worldwide / Invoiced quantities & self-generated |
| Scope 1 GHG Emissions | 55,200 | Metric tonnes of carbon dioxide equivalent ($tCO_2e$) | Worldwide occupied properties / WRI/WBCSD GHG Protocol |
| Scope 2 GHG Emissions (Location-Based) | 1,224,500 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol |
| Scope 2 GHG Emissions (Market-Based) | 3,300 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol |
| Scope 3 Transmission and Distribution Loses – Electricity (Market-Based) | 0 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol Value Chain (Scope 3) |
| Scope 3 GHG Emissions – Upstream Fuel and Energy-Related Activities | 166,400 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol Value Chain (Scope 3) |
| Scope 3 GHG Emissions – Business Travel | 284,500 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol Value Chain (Scope 3) |
| Scope 3 GHG Emissions – Employee Commute | 152,700 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol Value Chain (Scope 3) |
| Scope 3 GHG Emissions - Work from Home Emissions (Employee Commute) (Location-Based) | 19,800 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol Value Chain (Scope 3) |
| Scope 3 GHG Emissions – Work from Home Emissions (Employee Commute) (Market-Based) | 4,700 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol Value Chain (Scope 3) |
| Scope 3 GHG Emissions - Other Cloud Services (Purchased Goods and Services) (Location-Based) | 953,200 | | |
| Scope 3 GHG Emissions - Other Cloud Services (Purchased Goods and Services) (Market-Based) | 0 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol Value Chain (Scope 3) |
| Water Withdrawal | 1,800 | Million gallons | Worldwide occupied properties / Apple Internal Protocol |
| Water Discharge | 900 | Million gallons | Worldwide occupied properties / Apple Internal Protocol |
| Trash Disposed in Landfill | 18,800 | Metric tonnes | Worldwide occupied properties / Apple Internal Protocol |
| Hazardous Waste (Regulated waste) | 1,200 | Metric tonnes | Worldwide occupied properties / Apple Internal Protocol |
| Recycled Material (Removal by recycling contractor) | 36,500 | Metric tonnes | Worldwide occupied properties / Apple Internal Protocol |
| Composted Material | 4,100 | Metric tonnes | Worldwide occupied properties / Apple Internal Protocol |

| | | | |
|---|---|---|---|
| Waste to Energy | 1,000 | Metric tonnes | Worldwide occupied properties / Apple Internal Protocol |
| C&D Landfilled | 5,200 | Metric tonnes | Worldwide occupied properties / Apple Internal Protocol |
| C&D Recycled | 22,500 | Metric tonnes | Worldwide occupied properties / Apple Internal Protocol |
| Paper Used | 1,700 | Metric tonnes | Worldwide occupied properties / Apple Internal Protocol |
| Product end use avoided emissions | 312,100 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol Value Chain (Scope 3) |

| **Comprehensive Carbon Footprint (Market Based)** | | | |
|---|---|---|---|
| Corporate GHG Emissions (Market-Based)[1] | 666,800 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol |
| Product Use[2] | 4,367,900 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol |
| Manufacturing[3] | 8,204,100 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol |
| Product Transportation[4] | 1,950,000 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol |
| Recycling[4] | 70,000 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol |
| Comprehensive Carbon Footprint[5] | 15,258,000 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol |

| **Parameter** | **Quantity** | **Units** | **Boundary / Protocol** |
|---|---|---|---|
| Carbon Removals | 737,100 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol Value Chain |
| Net Footprint[6] | 14,500,000 | $tCO_2e$ | Worldwide occupied properties / WRI/WBCSD GHG Protocol Value Chain |

1. Corporate GHG Emissions = Scope 1 GHG Emissions + Scope 2 (Market-Based) GHG Emissions + Scope 3 GHG Emissions
2. Product Use emissions (4.68 million metric tonnes) verified by a non-Apex third-party provider contracted to Apple. Apex verified 0.31 million metric tonnes emissions reduction.
3. Manufacturing emissions (29.03 million metric tonnes) verified by a non-Apex third-party provider contracted to Apple. Apex verified 20.83 million metric tonnes emissions reduction.
4. Not verified by Apex. Verified by a non-Apex third-party provider contracted to Apple.
5. Comprehensive Carbon Footprint = Corporate GHG Emissions + Product Use + Manufacturing + Transportation + Recycling



6. Net Footprint = Comprehensive Carbon Footprint – Carbon Removals



**Our Conclusion**

Based on the assurance process and procedures conducted regarding the Subject Matter, we conclude that:

- The Energy, Water, Paper, and Scope 1, Scope 2, Scope 3 (Business Travel & Employee Commute) GHG Emissions assertions shown above are materially correct and are a fair representation of the data and information;
- There is no evidence that the Scope 3 (Business Travel, Employee Commute Work from Home, Waste, Other Cloud Services, and Fuel and Energy Related Activities) GHG emissions, and Comprehensive Carbon Footprint assertions shown above are not materially correct and are not a fair representation of the data and information;
- Apple has established appropriate systems for the collection, aggregation and analysis of relevant environmental information, and has implemented underlying internal assurance practices that provide a reasonable degree of confidence that such information is complete and accurate.

**Statement of independence, integrity and competence**

Apex has implemented a Code of Ethics across the business to maintain high ethical standards among staff in their day to day business activities. We are particularly vigilant in the prevention of conflicts of interest.

No member of the assurance team has a business relationship with Apple, its Directors or Managers beyond that required of this assignment. We have conducted this verification independently, and there has been no conflict of interest.

The assurance team has extensive experience in conducting verification and assurance over environmental, social, ethical and health and safety information, systems and processes, has over 30 years combined experience in this field and an excellent understanding of Apex standard methodology for the Assurance of Sustainability Data and Reports.

**Attestation:**

David Reilly, Lead Verifier
ESG Principal Consultant
Apex Companies, LLC

John Rohde, Technical Reviewer
ESG Principal Consultant
Apex Companies, LLC

March 18, 2025

*This independent assurance statement, including the opinion expressed herein, is provided to Apple Inc. and is solely for the benefit of Apple in accordance with the terms of our agreement. We consent to the release of this statement by you in order to satisfy public disclosure requirements but without accepting or assuming any responsibility or liability on our part to any party who may have access to this statement.*

Appendix C

# Product carbon footprint (Fraunhofer Institute)

Fraunhofer IZM

## Letter of Assurance

Comprehensive Carbon Footprint – Scope 3: Product related Carbon Footprint for Fiscal Year 2024

Fraunhofer IZM reviewed Apple's scope 3 carbon footprint data related to the products manufactured and sold by Apple Inc. in fiscal year 2024.

### 1 Summary

This review checks transparency of data and calculations, appropriateness of supporting product related data and assumptions, and overall plausibility of the calculated comprehensive annual carbon footprint comprised of emissions derived from the life cycle assessment (LCA) of Apple products shipped in fiscal year 2024. This review and verification focuses on Scope 3 emissions for products sold by Apple Inc. (as defined by WRI/WBCSD/Greenhouse Gas Protocol – Scope 3 Accounting and Reporting Standard). Confidential data relating to product sales and shipments were excluded from the scope of this verification.

This review and verification covers Apple's annual greenhouse gas emissions and does not replace reviews conducted for individual product LCAs for greenhouse gas emissions (GHGs). The life cycle emissions data produced by Apple for individual products has been calculated in accordance to the standard ISO 14040/14044: Environmental management – Life cycle assessment – Principles and framework / Requirements and guidelines and ISO 14067: Greenhouse gases - Carbon footprint of products - Requirements and guidelines for quantification. This letter of assurance furthermore complies with verification report requirements of ISO 14064-3: Greenhouse gases – Part 3: Specification with guidance for the verification and validation of greenhouse gas statements.

The review of the annual carbon footprint has considered the following criteria:

- The system, boundaries and functional unit are clearly defined
- Assumptions and estimations made are appropriate
- Selection of primary and secondary data is appropriate and methodologies used are adequately disclosed

These criteria are also fundamental to the review of LCAs conducted for individual product emissions. The reviewers note that the largest share of Apple Inc. annual carbon footprint is comprised of scope 3 emissions from individual products. The aforementioned criteria have



Fraunhofer IZM

been regularly reviewed by Fraunhofer IZM experts since 2007 with a view to providing independent feedback that can facilitate continuous improvement and refinement in the LCA methodology applied by Apple Inc.

On February 28, 2025, Apple withdrew the originally reported results and introduced a revised and improved approach to accounting for component yield. As a result, the reported figures increased slightly.

Data reported by Apple on March 3, 2025, is as follows:

| | Manufacturing | Transportation | Product Use | Recycling | Total base product footprint |
|---|---|---|---|---|---|
| 2024 | 29.03 | 1.95 | 4.68 | 0.07 | 35.73 |
| | [MMT $CO_2e$] | [MMT $CO_2e$] | [MMT $CO_2e$] | [MMT $CO_2e$] | [MMT $CO_2e$] |

*MMT $CO_2e$: million metric tons carbon dioxide equivalents*

The total scope 3 product related carbon footprint is reported to be 35.73 million metric tons $CO_2e$, applying a location-based method reflecting the average emissions intensity of grids on which energy consumption occurs. This figure does not include greenhouse gas emissions reductions for manufacturing resulting from Apple renewable energy projects, supplier renewable electricity purchases, and supplier renewable electricity installations.

Based on the process and procedures conducted, there is no evidence that the Greenhouse Gas (GHG) assertion with regards to scope 3 carbon footprint

- is not materially correct and is not a fair representation of GHG data and information, and
- has not been prepared in accordance with the related International Standard on GHG quantification, monitoring and reporting.

### 2 Reviewed Data and Plausibility Check

A verification and sampling plan as required by ISO 14046-3 has been established for the comprehensive carbon footprint review and verification, defining the level of assurance, objectives, criteria, scope and materiality of the verification.

As part of this review and verification Apple disclosed following data to Fraunhofer IZM:

- Sales data for FY2024, including accessories and including AppleCare, Apple's extended warranty and technical support plans for their devices.



Fraunhofer IZM

- Life cycle GHG emissions for all products, differentiating the actual product configurations (e.g. memory capacity and processor variant)
- Calculation methodology for the comprehensive carbon footprint
- Detailed analysis of the comprehensive carbon footprint including:
  - The breakdown of the carbon footprint into life cycle phases manufacturing, transportation, product use and recycling
  - Detailed product specific split into life cycle phases
  - The contribution of individual products and product families to the overall carbon footprint

The data and information supporting the GHG assertion were projected (use phase and recycling) and historical (i.e. fiscal year 2024 data regarding sales figures, manufacturing, transportation, use patterns where available).

This review comprises a check of selected data, which are most influential to the overall carbon footprint. The overall plausibility check addressed the following questions:

- Are product LCAs referenced and updated with more recent data correctly?
- Are results for products, for which no full LCA review was undertaken, plausible?

This review was done remotely.

### 3 Findings

As not all individual product configurations were assessed with a full LCA, in some cases data from similar configurations was used as a proxy. Due to this effect, the stated CCF is slightly lower than the actual value.

In FY2024 25 recent product LCA studies have been reviewed successfully against ISO 14040/44 and ISO 14067. These LCAs cover product segments iPhone, iPad Air, iPad Pro, MacBook Air, MacBook Pro, iMac, Mac mini, Apple Watch and Apple Watch Band. Representatives of other product segments (Mac Pro, Mac Studio, HomePod, AirPort Express / AirPort Extreme, Apple TV, Airpods and Beats products) underwent no or only minor design changes compared to those which went through a full LCA review in former years. All reviewed LCA studies up to now cover in total 77.6% of the total scope 3 carbon footprint.

Fraunhofer IZM

All questions raised in the course of the review were answered by Apple and related evidence was provided where needed.

## 4 Conclusions

Apple's assessment approach is excellent in terms of granularity of the used calculation data. A significant share of components is modelled with accurate primary data from Apple's suppliers.

The review has not found assumptions or calculation errors on the carbon footprint data level that indicate the scope 3 carbon footprint has been materially misstated. The excellent analysis meets the principles of good scientific practice.

Berlin, March 3, 2025

- Karsten Schischke -
Fraunhofer IZM
Dept. Environmental and Reliability Engineering

- Marina Proske -
Fraunhofer IZM
Dept. Environmental and Reliability Engineering

- David Sánchez -
Fraunhofer IZM
Dept. Environmental and Reliability Engineering

### Reviewer Credentials and Qualification

**Karsten Schischke**: Experience and background in the field of Life Cycle Assessments include
- Life Cycle Assessment course and exam as part of the Environmental Engineering studies (Dipl.-Ing. Technischer Umweltschutz, Technische Universität Berlin, 1999)
- more than 200 Critical Reviews of LCA and PCF studies since 2005 (batteries, displays, mobile devices, networked ICT equipment, home automation devices, servers, desktop computers, inverters, welding equipment, heat pumps) for 8 different industry clients and of the EPEAT Environmental Benefits Calculator
- coordination of and contribution to compilation of more than 100 ELCD datasets (available at www.lca2go.eu; product groups: hard disk drives, semiconductors, printed circuit boards, photovoltaics)



Fraunhofer IZM

- Environmental Lifecycle Assessments following the MEEuP / MEErP methodology in several Ecodesign Product Group Studies under the European Ecodesign Directive since 2007 (external power supplies, complex settop-boxes, machine tools, welding equipment, mobile phones, tablets)
- comparative Life Cycle Assessment of SIM technologies
- various environmental gate-to-gate assessments in research projects since 2000 (wafer bumping, printed circuit board manufacturing)
- coordination of PCR development for various ICT products

Further updated information at: www.linkedin.com/in/karsten-schischke

**Marina Proske:** Experience and background in the field of Life Cycle Assessments include
- Life Cycle Assessment course and exam as part of the Environmental Engineering studies (Dipl.-Ing. Technischer Umweltschutz, Technische Universität Berlin, 2009)
- Critical Reviews of LCA studies incl. water, fiber and plastic footprints since 2012 for 2 industry clients and of the EPEAT Environmental Benefits Calculator
- Life Cycle Assessment of modular smartphones (Fairphone 2, 3 and 4) and laptops (Framework)
- studies on the environmental assessment and carbon footprint of ICT
- studies on material and lifetime aspects within the MEErP methodology

Further updated information at: https://de.linkedin.com/in/marina-proske-74347164/en

**David Sánchez:** Experience and background in the field of Life Cycle Assessments include
- Life Cycle Assessment course and exam as part of Environmental Engineering and Energy Efficiency studies at Universitat Rovira i Virgili (URV) in Tarragona, Spain (M-Eng, 2016-2017).
- LCA practitioner since 2018, including Life Cycle Assessment of modular smartphones and accessories (Fairphone 4 and 5, FairBuds XL), comparative Life Cycle Assessment of a physical SIM card and an eSIM (G+D), Life Cycle Assessments of different electronic modules and populated boards as part of research projects at German and European level (GreenICT, Sustronics), screening PCFs for various electronics companies at product and module level (project scope3transparent).
- studies in preparation of EU ecodesign regulations (smartphones, tablets, computers)

Further updated information at: www.linkedin.com/in/dsanchez94

Appendix C

# Supplier Clean Energy Program (Apex)

**INDEPENDENT ASSURANCE STATEMENT**

**To: The Stakeholders of Apple Inc.**

### Introduction and objectives of work

Apex Companies, LLC (Apex) was engaged by Apple Inc. (Apple) to conduct independent assurance of its Supplier Clean Energy Program data reported in its 2024 environmental report (the Report). This assurance statement applies to the related information included within the scope of work described below. The intended users of the assurance statement are the stakeholders of Apple. The overall aim of this process is to provide assurance to Apple's stakeholders on the accuracy, reliability and objectivity of select information included in the Report.

This information and its presentation in the Report are the sole responsibility of the management of Apple. Apex was not involved in the collection of the information or the drafting of the Report.

### Scope of Work

Apple requested Apex to include in its independent review the following:

- Methodology for tracking and verifying supplier clean energy contributions, including the Energy Survey, Renewable Energy Agreement, and other forms of supporting documentation provided by suppliers where available.
- Assurance of Clean Energy Program data and information for the fiscal year 2024 reporting period (October 1, 2023 through September 30, 2024), specifically, in accordance with Apple's definitions:
  - Energy - Reported megawatt-hours (MWh) of clean energy attributed to the Clean Energy Program for suppliers;
  - Avoided Greenhouse Gas (GHG) emissions associated with clean energy attributed to the Clean Energy Program;
  - Operational Capacity in megawatts of alternating current output capacity (MWac) of clean energy in support of Apple manufacturing as a part of Apple's Supplier Clean Energy Program;
  - Appropriateness and robustness of underlying reporting systems and processes, used to collect, analyze, and review the information reported.

Excluded from the scope of our work is any assurance of information relating to:

- Text or other written statements associated with the Report
- Activities outside the defined assurance period

### Assessment Standards

Our work was conducted against Apex's standard procedures and guidelines for external Verification of Sustainability Reports, based on current best practice in independent assurance. Apex procedures are based on principles and methods described in the International Standard on Assurance Engagements (ISAE) 3000 Revised, Assurance Engagements Other than Audits or Reviews of Historical Financial Information (effective for assurance reports dated on or after Dec. 15, 2015), issued by the International Auditing and Assurance Standards Board and ISO 14064-3 (2019-04): Greenhouse gases -- Part 3: Specification with guidance for the verification and validation of greenhouse gas statements.

### Methodology

1. Interviews with relevant personnel of Apple;
2. Review of internal and external documentary evidence produced by Apple;
3. Audit of environmental performance data presented in the Report, including a detailed review of a sample of data against source data; and,
4. Review of Apple information systems for collection, aggregation, analysis and internal verification and review of environmental data.

The work was planned and carried out to provide limited assurance for all indicators and we believe it provides an appropriate basis for our conclusions.

### Our Findings

Apex verified the following indicators for Apple's Fiscal Year 2023 reporting period (October 1, 2023 through September 30, 2024):

| Parameter | Quantity | Units | Boundary / Protocol |
|---|---|---|---|
| Clean Energy Use | 31.3 | Million megawatt hours (mMWh) | Apple suppliers / Apple Internal Protocol |
| Avoided GHG Emissions | 21.8 | Million metric tons of carbon dioxide equivalent ($mMtCO_2e$) | Apple suppliers / Apple Internal Protocol |
| Operational Capacity | 17,855 | Megawatts (MWac) | Apple suppliers / Apple Internal Protocol |

### Our Conclusion

Based on the assurance process and procedures conducted, we conclude that:

- Nothing has come to our attention to indicate that the reviewed Clean Energy Use, Avoided GHG Emissions, and Operational Capacity assertions within the scope of our verification are inaccurate and the information included therein is not fairly stated and have not been prepared in accordance with Apple's stated protocols for the Supplier Clean Energy Program; and
- Apple has established appropriate systems for the collection, aggregation and analysis of relevant environmental information, and has implemented underlying internal assurance practices that provide a reasonable degree of confidence that such information is complete and accurate.



### Statement of independence, integrity and competence

Apex has implemented a Code of Ethics across the business to maintain high ethical standards among staff in their day-to-day business activities. We are particularly vigilant in the prevention of conflicts of interest.

No member of the assurance team has a business relationship with Apple, its Directors or Managers beyond that required of this assignment. We have conducted this verification independently, and there has been no conflict of interest.

The assurance team has extensive experience in conducting verification and assurance over environmental, social, ethical and health and safety information, systems and processes, has over 30 years combined experience in this field and an excellent understanding of Apex standard methodology for the Assurance of Sustainability Reports.

**Attestation:**

David Reilly, Lead Verifier
ESG Principal Consultant
Apex Companies, LLC

Scott Johnston, Technical Reviewer
ESG Principal Consultant
Apex Companies, LLC

February 18, 2025

## Appendix C

# Supplier Energy Efficiency Program (Apex)

**INDEPENDENT ASSURANCE STATEMENT**

**To: The Stakeholders of Apple Inc.**

**Introduction and objectives of work**

Apex Companies, LLC (Apex) was engaged by Apple Inc. (Apple) to conduct an independent assurance of its Supplier Energy Efficiency Program data. This assurance statement applies to the related information included within the scope of work described below. The intended users of the assurance statement are the stakeholders of Apple. The overall aim of this process is to provide assurance to Apple's stakeholders on the accuracy, reliability and objectivity of the reported information.

This information and its presentation are the sole responsibility of the management of Apple. Apex was not involved in the collection of the information or the drafting of the reported information.

**Scope of work**

Apple requested Apex to include in its independent review the following:

- Methodology for tracking and verifying supplier energy efficiency projects, including supplier energy audit reports, supplier progress reports, energy efficiency project verifications, and other forms of supporting documentation provided by suppliers where available;
- Assurance of Energy Efficiency Program data and information for the fiscal year 2024 reporting period (October 01, 2023 through September 30, 2024), specifically, in accordance with Apple's definitions:
  - Avoided Greenhouse Gas (GHG) emissions associated with energy reductions attributed to the Energy Efficiency Program;
  - Appropriateness and robustness of underlying reporting systems and processes, used to collect, analyze, and review the information reported.

Excluded from the scope of our work is any assurance of information relating to:

- Activities outside the defined assurance period.

**Methodology**

As part of its independent verification, Apex undertook the following activities:

1. Interviews with relevant personnel of Apple;
2. Review of documentary evidence produced by Apple;
3. Audit of performance data;
4. Review of Apple's systems for quantitative data aggregation.

Our work was conducted against Apex's standard procedures and guidelines for external Verification of Sustainability Reports, based on current best practice in independent assurance. Apex procedures are based on principles and methods described in the International Standard on Assurance Engagements (ISAE) 3000 Revised, Assurance Engagements Other than Audits or Reviews of Historical Financial Information (effective for assurance reports dated on or after Dec. 15, 2015), issued by the International Auditing and Assurance Standards Board and ISO 14064-3 Second Edition 2019-04: Greenhouse gases -- Part 3: Specification with guidance for the verification and validation greenhouse gas statements.



The work was planned and carried out to provide limited, rather than reasonable assurance and we believe it provides an appropriate basis for our conclusions.

**Our Findings**

Apex verified Avoided Greenhouse Gas emissions for the fiscal year 2024 reporting period:

| Period | Quantity | Units | Boundary / Protocol |
|---|---|---|---|
| FY2024 (10/01/2023 - 9/30/2024) | 1.97 | Million metric tons of carbon dioxide equivalent | Apple suppliers / Apple Internal Protocol |

On the basis of our methodology and the activities described above:

- Nothing has come to our attention to indicate that the reviewed emissions data within the scope of our verification are inaccurate and the information included therein is not fairly stated and have not been prepared in accordance with Apple's stated protocols for the Supplier Energy Efficiency Program;
- It is our opinion that Apple has established appropriate systems for the collection, aggregation and analysis of quantitative data such as energy and associated GHG emissions reductions.

This independent statement should not be relied upon to detect all errors, omissions or misstatements that may exist.

**Statement of independence, integrity and competence**

Apex has implemented a Code of Ethics across the business to maintain high ethical standards among staff in their day to day business activities. We are particularly vigilant in the prevention of conflicts of interest.

No member of the assurance team has a business relationship with Apple, its Directors or Managers beyond that required of this assignment. We have conducted this verification independently, and there has been no conflict of interest.

The assurance team has extensive experience in conducting verification and assurance over environmental, social, ethical and health and safety information, systems and processes, has over 20 years combined experience in this field and an excellent understanding of Apex standard methodology for the Assurance of Sustainability Reports.

**Attestation:**

David Reilly, Lead Verifier
ESG Principal Consultant
Apex Companies, LLC.

Scott Johnston, Technical Reviewer
ESG Principal Consultant
Apex Companies, LLC.

February 10, 2025

Appendix C

# Packaging fiber and plastic footprint (Fraunhofer Institute)

Fraunhofer IZM

## Review Statement

Corporate Packaging Fiber and Plastic Footprint

Fraunhofer IZM reviewed Apple's corporate packaging fiber and plastic footprint data related to corporate packaging fiber and plastic usage from products, retail and service operations in fiscal year 2024.

### 1 Summary

This review checks transparency of data and calculations, appropriateness of supporting product and packaging related data and assumptions, and overall plausibility of the calculated corporate annual packaging fiber and plastic footprint of Apple products shipped in fiscal year 2024 and of retail and service operations in the same period.

As there is no standardised method available for calculating a packaging fiber and plastic footprint Apple defined a methodology for internal use. The scope of the fiber and plastic packaging footprint includes Apple's corporate packaging fiber and plastic usage from products (including trade-in packaging, in-box material and re-pack packaging), retail operations, AppleCare services, and facilities. The packaging fiber and plastic footprint tracks the total amount of plastic, virgin and recycled wood fibre, that Apple uses in packaging. Apple obtains and analyses supplier-specific data for each product line and sums up these figures for the entire company using sell-in numbers. For some products, a representative supplier is chosen to calculate the product-specific packaging. The output is a total packaging fiber and plastic footprint. For labels, Beats products and accessories, individual sell-in numbers were only availabe for a share of products. These were extrapolated for the whole category. Some types of polymer material are excluded from the packaging plastic footprint. These are ESD material, adhesives, ink, varnish, coating. Also metal foils might be used on some packaging, but is not covered by fiber or plastic footprint data.

The review of the corporate annual packaging fiber and plastic footprint has considered the following criteria:

- The system boundaries are clearly defined
- Assumptions and estimations made are appropriate



Fraunhofer IZM

- Use of supplier data is appropriate and methodologies used are adequately disclosed

Data reported by Apple is as follows:

| 2024 | Total | Virgin | Recycled |
|---|---|---|---|
| Plastic w/o adhesives | 3,070 | 3,070 | -- |
| Fiber | 238,730 | 94,060 | 144,660 |
| | [metric tons] | [metric tons] | [metric tons] |

All results and figures reviewed for fiscal year 2024 are plausible.

### 2 Reviewed Data and Findings

As part of this review Apple disclosed following data to Fraunhofer IZM:

- Calculation methodology for the corporate packaging fiber and plastic footprint
- Sales data for FY2024, including accessories
- Selected product and supplier specific data on packaging materials and production yields
- Aggregated packaging fiber and plastic data for all products and the total corporate packaging fiber and plastic footprint for the fiscal year 2024

The methodology papers provided by Apple (Packaging Plastic Footprint at Apple – Methodology Description – V2.0, dated March 2025, Fiber Footprint at Apple - Methodology Description – V1.1, dated 2017), is considered a sound and appropriate guidance for determining the company packaging fiber and plastic. Where appropriate, this approach follows methodological principles applied for state-of-the-art Life Cycle Assessments.

This review comprises a check of packaging fiber and plastic data for selected products (iPhone, MacPro, Macbook Pro).

Plausibility of some data has been questioned and discussed with Apple in detail. More granular data for accessories is recommended in the future.

This review was done remotely. All questions raised in the course of the review were answered by Apple and related explanation was provided where needed.



Fraunhofer IZM

Based on the process and procedures conducted, there is no evidence that the corporate packaging fiber and plastic footprint is not materially correct and is not a fair representation of fiber and plastic data and information.

Berlin, March 6, 2025

- Marina Proske -
Fraunhofer IZM
Dept. Environmental and Reliability Engineering

- Karsten Schischke -
Fraunhofer IZM
Dept. Environmental and Reliability Engineering

- David Sánchez -
Fraunhofer IZM
Dept. Environmental and Reliability Engineering

Appendix C

# Fluorinated greenhouse gas (F-GHG) emissions (Trinity Consultants)

Trinity Consultants

**INDEPENDENT REVIEW STATEMENT**

**To:** The Stakeholders of Apple, Inc.

### Introduction and Objectives of Work

Trinity Consultants, Inc. (Trinity) was engaged by Apple, Inc. (Apple) to conduct an independent general review of Apple's identified top emitting semiconductor and display manufacturers, herein referred to as the suppliers, fluorinated greenhouse gas emissions (F-GHG) and claimed point-of-use (POU) abatement system installations and performance (e.g., destruction and removal efficiency). This statement applies to the related information included within the scope of work described below for Apple's fiscal year 2024 (October 2023 – September 2024).

This information and its presentation are the sole responsibility of the management of Apple.

### Scope of Work

Apple requested Trinity to include in its independent general review the following:

- Desktop review of supplier certified and reported F-GHG usage of the Apple portion of commodity production, gas usage by process type, POU abatement equipment installation rates and POU abatement claimed destruction and removal efficiencies.
  - This review was completed by collecting information via a web-based survey distributed by Apple to suppliers and then reviewing supplier reported process gas usage data and answers regarding POU abatement equipment design, installation, maintenance, and operation.
- Desktop review of supplier provided third-party greenhouse gas verification reports of entity wide Scope 1 emissions.
- Identify Apple suppliers to qualify for inclusion in the calculated metric presented in Table 1 of this part. The following methods were used to determine if a supplier's reported data qualified for verification, and if qualified, it was included in the metric presented in Table 1.
  - Apple supplier submitted complete survey responses to Apple's fiscal year survey.
  - Apple supplier provided a third-party greenhouse gas verification report which met the following minimum criteria:
    - The verification statement issued by an independent third-party
    - The verification statement employed a verification protocol accepted by the Carbon Disclosure Project (CDP)
    - The verification statement covered full Scope 1 greenhouse gas emissions, including F-GHG, for a supplier on an entity wide basis or manufacturing site basis
    - The verification statement covered at least a portion of the fiscal year included in the scope of review statement
    - The verification statement did not identify any adverse findings
- Excluded from the scope of our work is any detailed verification relating to:
  - Activities outside the defined assurance period or scope.

### Methodology

As part of its independent review, Trinity undertook the following activities:

8705 SW Nimbus Ave, Ste 350, Beaverton, OR 97008
P 503.713.5550



- Interviews with relevant personnel of Apple;
- Review of documentary evidence reported by Apple suppliers;
- Verified the Apple reportable F-GHG avoided emissions by Apple's suppliers included in the scope of review statement were calculated in accordance with IPCC 2019 Refinement Tier 2c methodology including applying default DREs.[1]
- Where available, comparison to prior fiscal year supplier reported survey data (e.g., process gas usage, abatement installation rate) was conducted for Apple's suppliers included in the scope of this review statement to identify justifiable trends in year over year data.

### Our Findings

Trinity reviewed data from Apple's suppliers included in the scope of this review statement and verified the minimum reportable F-GHG avoided emissions for the fiscal year of 2024 were calculated in accordance with industry accepted emission calculation methodology. Table 1 below details the verified reportable minimum F-GHG avoided emissions for Apple's suppliers included in the scope of this review statement:

**Table 1. Apple Supplier Avoided F-GHG Emissions**

| Fiscal Year 2024 Period Metric | Quantity | Units | Boundary |
|---|---|---|---|
| F-GHG Emissions Reduced from Abatement | 8,407,304 | Metric Tons $CO_2e$ | Suppliers included in this statement's scope of work |

### Statement of Qualifications

Trinity is an independent professional services firm specializing in environmental, health and safety, and sustainability compliance, risk, and performance management. The work performed by the Trinity project team has been assessed against the company's standard procedures and guidelines, including its established Quality Assurance and Quality Control (QA/QC) procedures. Trinity's headquarters office holds ISO 9001:2015 certification, with a strong emphasis on quality and effective project management. Additionally, all individual offices adhere to internal QA/QC procedures aligned with the ISO 9001-certified protocols of the headquarters office. This verification has been conducted independently, and it is our professional judgment that no conflict of interest has affected the assessment.

**Rich Pandullo – Director, EHS & Energy Management / Sustainability and Assurance**
Trinity Consultants, Incorporated
Dallas Texas Corporate Headquarters
April 1, 2025

[1] As detailed in the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Appendix D

# Mac mini (2024) with M4 Pro chip (64GB)

**SCS Global Services** *does hereby certify that an independent assessment has been conducted for:*

## Apple Inc.

1 Apple Park Way, Cupertino, California 95014, United States

### *Mac mini with M4 Pro (64GB Memory, 8TB SSD)*

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

CARBON NEUTRAL CERTIFIED
SCS GLOBAL SERVICES

**Certification Scope:**
Validation of Apple Inc.'s 2024 declaration of commitment to Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emission for its Mac mini with M4 Pro (64GB Memory, 8TB SSD) product.

**Certification Criteria:**
- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL ESTIMATED EMISSIONS VERIFIED: 120.98 KGS OF $CO_2e$**
**TOTAL ESTIMATED EMISSIONS TO OFFSET: 120.98 KGS OF $CO_2e$**

Carbon Neutral Certification, based on the declaration of commitment made by Apple Inc. for its Mac mini with M4 Pro (64GB Memory, 8TB SSD) product, in accordance with the SCS-108 Carbon Neutral Standard for the period of October 1, 2024 through September 30, 2025.

Certificate # SCS-CN-10025
Commitment Date: 10-01-2024 to 09-30-2025

Diana Kirsanova Phillips, Chief Assurance Officer
SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA

Appendix D

# Mac mini (2024) with M4 Pro chip (512GB)

**SCS Global Services** *does hereby certify that an independent assessment has been conducted for:*

## Apple Inc.

1 Apple Park Way, Cupertino, California 95014, United States

### *Mac mini with M4 Pro (24GB Memory, 512GB SSD)*

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

CARBON NEUTRAL CERTIFIED
SCS GLOBAL SERVICES

**Certification Scope:**
Validation of Apple Inc.'s 2024 declaration of commitment to Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emission for its Mac mini with M4 Pro (24GB Memory, 512GB SSD) product.

**Certification Criteria:**
- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL ESTIMATED EMISSIONS VERIFIED: 49.28 KGS OF $CO_2e$**
**TOTAL ESTIMATED EMISSIONS TO OFFSET: 49.28 KGS OF $CO_2e$**

Carbon Neutral Certification, based on the declaration of commitment made by Apple Inc. for its Mac mini with M4 Pro (24GB Memory, 512GB SSD) product, in accordance with the SCS-108 Carbon neutral Standard for the period of October 1, 2024 through September 30, 2025.

Certificate # SCS-CN-10024
Commitment Date: 10-01-2024 to 09-30-2025

Diana Kirsanova Phillips, Chief Assurance Officer
SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA

Appendix D

# Mac mini (2024) with M4 chip (256GB)

**SCS Global Services** *does hereby certify that an independent assessment has been conducted for:*

## Apple Inc.

1 Apple Park Way, Cupertino, California 95014, United States

### *Mac mini with M4 (16GB Memory, 256GB SSD)*

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

CARBON NEUTRAL CERTIFIED
SCS GLOBAL SERVICES

**Certification Scope:**
Validation of Apple Inc.'s 2024 declaration of commitment to Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emission for its Mac mini with M4 (16GB Memory, 256GB SSD) product

**Certification Criteria:**
- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL ESTIMATED EMISSIONS VERIFIED: 31.45 KGS OF $CO_2e$**
**TOTAL ESTIMATED EMISSIONS TO OFFSET: 31.45 KGS OF $CO_2e$**

Carbon Neutral Certification, based on the declaration of commitment made by Apple Inc. for its Mac mini with M4 (16GB Memory, 256GB SSD) product, in accordance with the SCS-108 Carbon Neutral Standard for the period of October 1, 2024 through September 30, 2025.

Certificate # SCS-CN-10022
Commitment Date: 10.01.2024 to 09.30.2025

Diana Kirsanova Phillips, Chief Assurance Officer
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2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA

Appendix D

# Mac mini (2024) with M4 chip (512GB)

**SCS Global Services** *does hereby certify that an independent assessment has been conducted for:*

## Apple Inc.

1 Apple Park Way, Cupertino, California 95014, United States

### *Mac mini with M4 (16GB Memory, 512GB SSD)*

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

CARBON NEUTRAL CERTIFIED
SCS GLOBAL SERVICES

**Certification Scope:**
Validation of Apple Inc.'s 2024 declaration of commitment to Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emission for its Mac mini with M4 (16GB Memory, 512GB SSD) product.

**Certification Criteria:**
- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL ESTIMATED EMISSIONS VERIFIED: 34.25 KGS OF $CO_2e$**
**TOTAL ESTIMATED EMISSIONS TO OFFSET: 34.25 KGS OF $CO_2e$**

Carbon Neutral Certification, based on the declaration of commitment made by Apple Inc. for its Mac mini with M4 (16GB Memory, 512GB SSD) product, in accordance with the SCS-108 Carbon Neutral Standard for the period of October 1, 2024 through September 30, 2025.

Certificate # SCS-CN-10023
Commitment Date: 10-01-2024 to 09-30-2025

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SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA

Appendix D

# Sport Loop

***SCS Global Services*** *does hereby certify that an independent assessment has been conducted on behalf of:*

## Apple Inc.

1 Apple Park Way, Cupertino, California 95014, United States

### *Sport Loop*

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

**Certification Scope:**

Verification of Apple Inc.'s 2023 achievement of Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emissions for its Sport Loop product.

**Certification Criteria:**

- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL EMISSIONS VERIFIED: 0.97 KGS OF $CO_2e$ PER UNIT**
**TOTAL EMISSIONS OFFSET: 0.97 KGS OF $CO_2e$ PER UNIT**

Carbon Neutral Certification was achieved by Apple Inc. for its Sport Loop product, in accordance with the SCS -108 Carbon Neutral Standard for the period of September 12, 2023 through September 11, 2024. Apple has also committed to maintain certification for the period of September 12, 2024 through September 11, 2025.

Certification # SCS-CN-00112
Achievement Date: 09.12.2023 to 09.11.2024
Commitment Date: 09.12.2024 to 09.11.2025

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Appendix D

# Alpine Loop

***SCS Global Services*** *does hereby certify that an independent assessment has been conducted on behalf of:*

## Apple Inc.

1 Apple Park Way, Cupertino, California 95014, United States

### *Alpine Loop*

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

**Certification Scope:**

Verification of Apple Inc.'s 2023 achievement of Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emissions for its Alpine Loop product.

**Certification Criteria:**

- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL EMISSIONS VERIFIED: 2.58 KGS OF $CO_2e$ PER UNIT**
**TOTAL EMISSIONS OFFSET: 2.58 KGS OF $CO_2e$ PER UNIT**

Carbon Neutral Certification was achieved by Apple Inc. for its Alpine Loop product, in accordance with the SCS -108 Carbon Neutral Standard for the period of September 12, 2023 through September 11, 2024. Apple has also committed to maintain certification for the period of September 12, 2024 through September 11, 2025.

Certification # SCS-CN-00116
Achievement Date: 09.12.2023 to 09.11.2024
Commitment Date: 09.12.2024 to 09.11.2025

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Appendix D

# Trail Loop

***SCS Global Services*** *does hereby certify that an independent assessment has been conducted on behalf of:*

## Apple Inc.

1 Apple Park Way, Cupertino, California 95014, United States

### *Trail Loop*

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

**Certification Scope:**

Verification of Apple Inc.'s 2023 achievement of Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emissions for its Trail Loop product.

**Certification Criteria:**

- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL EMISSIONS VERIFIED: 1.77 KGS OF $CO_2e$ PER UNIT**
**TOTAL EMISSIONS OFFSET: 1.77 KGS OF $CO_2e$ PER UNIT**

Carbon Neutral Certification was achieved by Apple Inc. for its Trail Loop product, in accordance with the SCS -108 Carbon Neutral Standard for the period of September 12, 2023 through September 11, 2024. Apple has also committed to maintain certification for the period of September 12, 2024 through September 11, 2025.

Certification # SCS-CN-00111
Achievement Date: 09.12.2023 to 09.11.2024
Commitment Date: 09.12.2024 to 09.11.2025

CARBON NEUTRAL CERTIFIED SCS GLOBAL SERVICES

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SCS Global Services
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Appendix D

# Milanese Loop

**SCS Global Services** *does hereby certify that an independent assessment has been conducted for:*

## Apple Inc.

1 Apple Park Way, Cupertino, California 95014, United States

### *Milanese Loop*

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

**Certification Scope:**

Validation of Apple Inc.'s 2024 declaration of commitment to Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emission for its product consisting of Milanese Loop.

**Certification Criteria:**

- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL ESTIMATED EMISSIONS VERIFIED: 1.10 KGS OF $CO_2e$ PER UNIT**
**TOTAL ESTIMATED EMISSIONS TO OFFSET: 1.10 KGS OF $CO_2e$ PER UNIT**

Carbon Neutral Certification, based on the declaration of commitment made by Apple Inc. for its product consisting of Milanese Loop, in accordance with the SCS-108 Carbon Neutral Standard for the period of September 1, 2024 through August 31, 2025

Certificate # SCS-CN-10010
Commitment Date: 09-01-2024 to 08-31-2025

CARBON NEUTRAL CERTIFIED SCS GLOBAL SERVICES

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SCS Global Services
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Appendix D

# Titanium Milanese Loop

**SCS Global Services** *does hereby certify that an independent assessment has been conducted for:*

## Apple Inc.

1 Apple Park Way, Cupertino, California 95014, United States

### *Titanium Milanese Loop*

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

**Certification Scope:**

Validation of Apple Inc.'s 2024 declaration of commitment to Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emission for its product consisting of Titanium Milanese Loop.

**Certification Criteria:**

- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL ESTIMATED EMISSIONS VERIFIED: 0.90 KGS OF $CO_2e$ PER UNIT**
**TOTAL ESTIMATED EMISSIONS TO OFFSET: 0.90 KGS OF $CO_2e$ PER UNIT**

Carbon Neutral Certification, based on the declaration of commitment made by Apple Inc. for its product consisting of Titanium Milanese Loop, in accordance with the SCS-108 Carbon Neutral Standard for the period of September 1, 2024 through August 31, 2025.

Certificate # SCS-CN-10009
Commitment Date: 09-01-2024 to 08-31-2025

CARBON NEUTRAL CERTIFIED SCS GLOBAL SERVICES

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SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA

Appendix D

# Apple Watch Ultra 2 with Alpine Loop

***SCS Global Services*** *does hereby certify that an independent assessment has been conducted on behalf of:*

## Apple Inc.

1 Apple Park Way, Cupertino, California 95014, United States

### *Apple Watch Ultra 2 with Alpine Loop*

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

**Certification Scope:**

Verification of Apple Inc.'s 2023 achievement of Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emissions for its product consisting of Apple Watch Ultra 2 with Alpine Loop.

**Certification Criteria:**

- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL EMISSIONS VERIFIED: 12.0 KGS OF $CO_2e$ PER UNIT**
**TOTAL EMISSIONS OFFSET: 12.0 KGS OF $CO_2e$ PER UNIT**

Carbon Neutral Certification was achieved by Apple Inc. for its product consisting of Apple Watch Ultra 2 with Alpine Loop, in accordance with the SCS-108 Carbon Neutral Standard for the period of September 12, 2023 through September 11, 2024. Apple has also committed to maintain certification for the period of September 12, 2024 through September 11, 2025.

Certification # SCS-CN-00110
Achievement Date: 09.12.2023 to 09.11.2024
Commitment Date: 09.12.2024 to 09.11.2025

CARBON NEUTRAL CERTIFIED SCS GLOBAL SERVICES

Diana Kirsanova Phillips, Chief Assurance Officer,
SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA

Appendix D

# Apple Watch Ultra 2 with Trail Loop

***SCS Global Services*** *does hereby certify that an independent assessment has been conducted on behalf of:*

## Apple Inc.

1 Apple Park Way, Cupertino, California 95014, United States

### *Apple Watch Ultra 2 with Trail Loop*

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

**Certification Scope:**
Verification of Apple Inc.'s 2023 achievement of Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emissions for its product consisting of Apple Watch Ultra 2 with Trail Loop.

**Certification Criteria:**
- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL EMISSIONS VERIFIED: 11.1 KGS OF $CO_2e$ PER UNIT**
**TOTAL EMISSIONS OFFSET: 11.1 KGS OF $CO_2e$ PER UNIT**

Carbon Neutral Certification was achieved by Apple Inc. for its product consisting of Apple Watch Ultra 2 with Trail Loop, in accordance with the SCS-108 Carbon Neutral Standard for the period of September 12, 2023 through September 11, 2024. Apple has also committed to maintain certification for the period of September 12, 2024 through September 11, 2025.

Certification # SCS-CN-00113
Achievement Date: 09.12.2023 to 09.11.2024
Commitment Date: 09.12.2024 to 09.11.2025

CARBON NEUTRAL CERTIFIED
SCS GLOBAL SERVICES

Diana Kirsanova Phillips, Chief Assurance Officer,
SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA

Appendix D

# Apple Watch Ultra 2 with Titanium Milanese Loop

**SCS Global Services** *does hereby certify that an independent assessment has been conducted for:*

## Apple Inc.

1 Apple Park Way, Cupertino, California 95014, United States

### *Apple Watch Ultra 2 with Titanium Milanese Loop*

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

**Certification Scope:**
Validation of Apple Inc.'s 2024 declaration of commitment to Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emission for its product consisting of Apple Watch Ultra 2 with Titanium Milanese Loop.

**Certification Criteria:**
- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL ESTIMATED EMISSIONS VERIFIED: 10.80 KGS OF $CO_2e$ PER UNIT**
**TOTAL ESTIMATED EMISSIONS TO OFFSET: 10.80 KGS OF $CO_2e$ PER UNIT**

Carbon Neutral Certification, based on the declaration of commitment made by Apple Inc. for its product consisting of Apple Watch Ultra 2 with Titanium Milanese Loop, in accordance with the SCS-108 Carbon Neutral Standard for the period of September 1, 2024 through August 31, 2025.

Certificate # SCS-CN-10011
Commitment Date: 09-01-2024 to 08-31-2025

CARBON NEUTRAL CERTIFIED
SCS GLOBAL SERVICES

Diana Kirsanova Phillips, Chief Assurance Officer,
SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA

Appendix D

# Aluminum Apple Watch Series 10 with Sport Loop

**SCS Global Services** *does hereby certify that an independent assessment has been conducted for:*

**Apple Inc.**

1 Apple Park Way, Cupertino, California 95014, United States

***Aluminum Apple Watch Series 10 with Sport Loop***

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

**Certification Scope:**

Validation of Apple Inc.'s 2024 declaration of commitment to Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emission for its product consisting of Aluminum Apple Watch Series 10 with Sport Loop.

**Certification Criteria:**

- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL ESTIMATED EMISSIONS VERIFIED: 7.80 KGS OF $CO_2e$ PER UNIT**
**TOTAL ESTIMATED EMISSIONS TO OFFSET: 7.80 KGS OF $CO_2e$ PER UNIT**

Carbon Neutral Certification, based on the declaration of commitment made by Apple Inc. for its product consisting of Aluminum Apple Watch Series 10 with Sport Loop, in accordance with the SCS-108 Carbon Neutral Standard for the period of September 1, 2024 through August 31, 2025.

Certificate # SCS-CN-10005
Commitment Date: 09-01-2024 to 08-31-2025

CARBON NEUTRAL CERTIFIED
SCS GLOBAL SERVICES

Diana Kirsanova Phillips, Chief Assurance Officer,
SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA

Appendix D

# Aluminum Apple Watch Series 10 with Milanese Loop

**SCS Global Services** *does hereby certify that an independent assessment has been conducted for:*

**Apple Inc.**

1 Apple Park Way, Cupertino, California 95014, United States

***Aluminum Apple Watch Series 10 with Milanese Loop***

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

**Certification Scope:**

Validation of Apple Inc.'s 2024 declaration of commitment to Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emission for its product consisting of Aluminum Apple Watch Series 10 with Milanese Loop.

**Certification Criteria:**

- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL ESTIMATED EMISSIONS VERIFIED: 8.30 KGS OF $CO_2e$ PER UNIT**
**TOTAL ESTIMATED EMISSIONS TO OFFSET: 8.30 KGS OF $CO_2e$ PER UNIT**

Carbon Neutral Certification, based on the declaration of commitment made by Apple Inc. for its product consisting of Aluminum Apple Watch Series 10 with Milanese Loop, in accordance with the SCS-108 Carbon Neutral Standard for the period of September 1, 2024 through August 31, 2025.

Certificate # SCS-CN-10006
Commitment Date: 09-01-2024 to 08-31-2025

CARBON NEUTRAL CERTIFIED
SCS GLOBAL SERVICES

Diana Kirsanova Phillips, Chief Assurance Officer,
SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA

Appendix D

# Titanium Apple Watch Series 10 with Sport Loop

**SCS Global Services** *does hereby certify that an independent assessment has been conducted for:*

## Apple Inc.

1 Apple Park Way, Cupertino, California 95014, United States

***Titanium Apple Watch Series 10 with Sport Loop***

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

CARBON NEUTRAL CERTIFIED SCS GLOBAL SERVICES

**Certification Scope:**

Validation of Apple Inc.'s 2024 declaration of commitment to Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emission for its product consisting of Titanium Apple Watch Series 10 with Sport Loop.

**Certification Criteria:**

- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL ESTIMATED EMISSIONS VERIFIED: 7.90 KGS OF $CO_2e$ PER UNIT**
**TOTAL ESTIMATED EMISSIONS TO OFFSET: 7.90 KGS OF $CO_2e$ PER UNIT**

Carbon Neutral Certification, based on the declaration of commitment made by Apple Inc. for its product consisting of Titanium Apple Watch Series 10 with Sport Loop, in accordance with the SCS-108 Carbon Neutral Standard for the period of September 1, 2024 through August 31, 2025.

Certificate # SCS-CN-10007
Commitment Date: 09-01-2024 to 08-31-2025

Diana Kirsanova Phillips, Chief Assurance Officer,
SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA

Appendix D

# Titanium Apple Watch Series 10 with Milanese Loop

**SCS Global Services** *does hereby certify that an independent assessment has been conducted for:*

## Apple Inc.

1 Apple Park Way, Cupertino, California 95014, United States

***Titanium Apple Watch Series 10 with Milanese Loop***

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

CARBON NEUTRAL CERTIFIED SCS GLOBAL SERVICES

**Certification Scope:**

Validation of Apple Inc.'s 2024 declaration of commitment to Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emission for its product consisting of Titanium Apple Watch Series 10 with Milanese Loop.

**Certification Criteria:**

- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL ESTIMATED EMISSIONS VERIFIED: 8.40 KGS OF $CO_2e$ PER UNIT**
**TOTAL ESTIMATED EMISSIONS TO OFFSET: 8.40 KGS OF $CO_2e$ PER UNIT**

Carbon Neutral Certification, based on the declaration of commitment made by Apple Inc. for its product consisting of Titanium Apple Watch Series 10 with Milanese Loop, in accordance with the SCS-108 Carbon Neutral Standard for the period of September 1, 2024 through August 31, 2025.

Certificate # SCS-CN-10008
Commitment Date: 09-01-2024 to 08-31-2025

Diana Kirsanova Phillips, Chief Assurance Officer,
SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA

Appendix D

# Apple Watch SE with Sport Loop

***SCS Global Services*** *does hereby certify that an independent assessment has been conducted on behalf of:*

## Apple Inc.

1 Apple Park Way, Cupertino, California 95014, United States

### *Apple Watch SE with Sport Loop*

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

**Certification Scope:**

Verification of Apple Inc.'s 2023 achievement of Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emissions for its product consisting of Apple Watch SE with Sport Loop.

**Certification Criteria:**

- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL EMISSIONS VERIFIED: 7.18 KGS OF $CO_2e$ PER UNIT**
**TOTAL EMISSIONS OFFSET: 7.18 KGS OF $CO_2e$ PER UNIT**

Carbon Neutral Certification was achieved by Apple Inc. for its product consisting of Apple Watch SE with Sport Loop, in accordance with the SCS-108 Carbon Neutral Standard for the period of September 12, 2023 through September 11, 2024. Apple has also committed to maintain certification for the period of September 12, 2024 through September 11, 2025.

Certification # SCS-CN-00115
Achievement Date: 09.12.2023 to 09.11.2024
Commitment Date: 09.12.2024 to 09.11.2025

CARBON NEUTRAL CERTIFIED SCS GLOBAL SERVICES

Diana Kirsanova Phillips, Chief Assurance Officer,
SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA

Appendix D

# Apple Watch SE with Milanese Loop

**SCS Global Services** *does hereby certify that an independent assessment has been conducted for:*

## Apple Inc.

1 Apple Park Way, Cupertino, California 95014, United States

### *Apple Watch SE with Milanese Loop*

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

**Certification Scope:**

Validation of Apple Inc.'s 2024 declaration of commitment to Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emission for its product consisting of Apple Watch SE with Milanese Loop.

**Certification Criteria:**

- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL ESTIMATED EMISSIONS VERIFIED: 8.20 KGS OF $CO_2e$ PER UNIT**
**TOTAL ESTIMATED EMISSIONS TO OFFSET: 8.20 KGS OF $CO_2e$ PER UNIT**

Carbon Neutral Certification, based on the declaration of commitment made by Apple Inc. for its product consisting of Apple Watch SE with Milanese Loop, in accordance with the SCS-108 Carbon Neutral Standard for the period of September 1, 2024 through August 31, 2025.

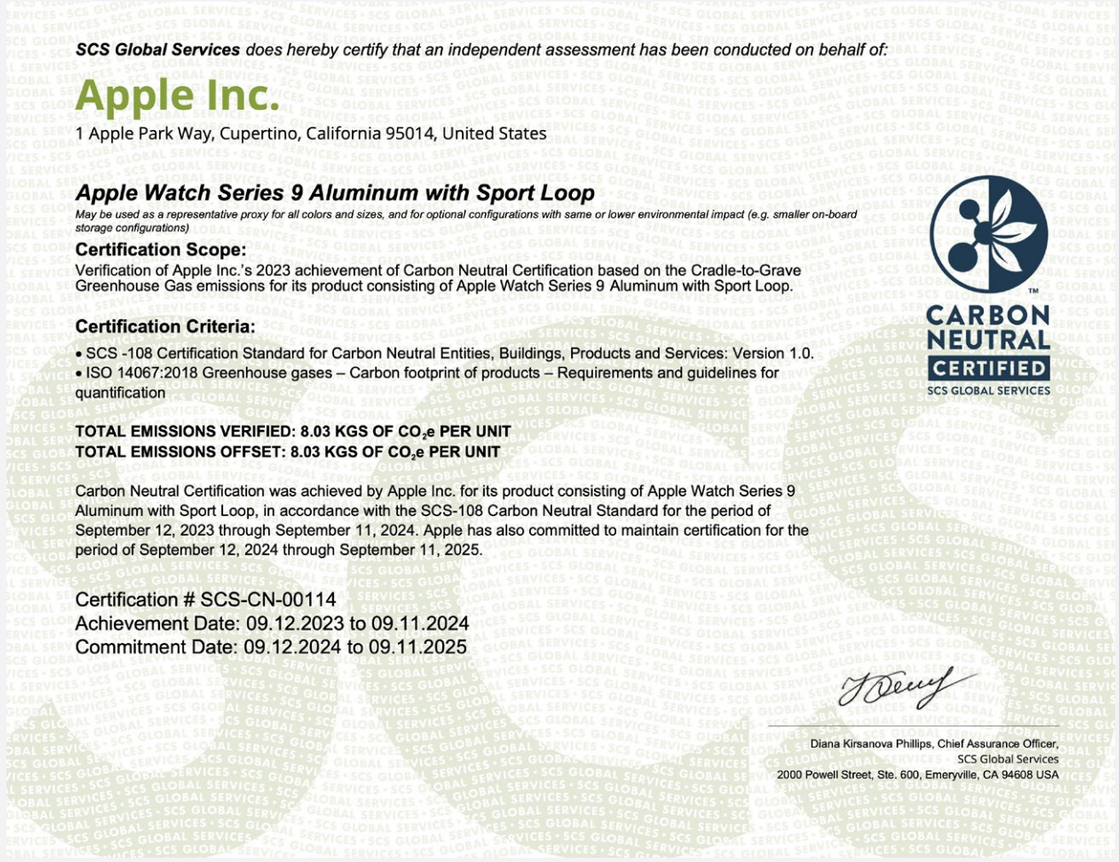
Certificate # SCS-CN-10012
Commitment Date: 09-01-2024 to 08-31-2025

CARBON NEUTRAL CERTIFIED SCS GLOBAL SERVICES

Diana Kirsanova Phillips, Chief Assurance Officer,
SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA

Appendix D

# Aluminum Apple Watch Series 9 with Sport Loop



***SCS Global Services*** *does hereby certify that an independent assessment has been conducted on behalf of:*

**Apple Inc.**

1 Apple Park Way, Cupertino, California 95014, United States

***Apple Watch Series 9 Aluminum with Sport Loop***

*May be used as a representative proxy for all colors and sizes, and for optional configurations with same or lower environmental impact (e.g. smaller on-board storage configurations)*

**Certification Scope:**

Verification of Apple Inc.'s 2023 achievement of Carbon Neutral Certification based on the Cradle-to-Grave Greenhouse Gas emissions for its product consisting of Apple Watch Series 9 Aluminum with Sport Loop.

**Certification Criteria:**

- SCS -108 Certification Standard for Carbon Neutral Entities, Buildings, Products and Services: Version 1.0.
- ISO 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

**TOTAL EMISSIONS VERIFIED: 8.03 KGS OF $CO_2e$ PER UNIT**
**TOTAL EMISSIONS OFFSET: 8.03 KGS OF $CO_2e$ PER UNIT**

Carbon Neutral Certification was achieved by Apple Inc. for its product consisting of Apple Watch Series 9 Aluminum with Sport Loop, in accordance with the SCS-108 Carbon Neutral Standard for the period of September 12, 2023 through September 11, 2024. Apple has also committed to maintain certification for the period of September 12, 2024 through September 11, 2025.

CARBON NEUTRAL CERTIFIED
SCS GLOBAL SERVICES

Certification # SCS-CN-00114
Achievement Date: 09.12.2023 to 09.11.2024
Commitment Date: 09.12.2024 to 09.11.2025

Diana Kirsanova Phillips, Chief Assurance Officer,
SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA

Appendix E

# Environment, Health and Safety Policy

**Mission Statement**

Apple Inc. is committed to protecting the environment, health and safety (EHS) of our employees, customers, and contractors in the design, research, manufacture, distribution, and use of our products and services in global communities where we operate.

We recognize that by integrating best EHS management practices into all aspects of our business, we can offer technologically innovative products and services while conserving and enhancing resources for future generations.

Apple strives for continuous improvement in our EHS management systems and in the environmental quality of our products, processes, and services.

**Guiding Principles**

Meet or exceed applicable EHS requirements through the design and safe management of our facilities.

Apply higher standards to protect human health and the environment where laws and regulations do not provide adequate controls.

Promote responsible management and stewardship of clean energy, water, waste, resources, and biodiversity.

Encourage contractors, vendors, and suppliers to provide safe working conditions, treat workers with dignity and respect, and act fairly and ethically.

Support and promote scientific principles, best practices, and public policy initiatives that enhance environmental quality, health and safety performance, and ethical sourcing of materials.

Communicate EHS policies and programs to Apple employees and stakeholders and hold its suppliers accountable to Apple's Supplier Code of Conduct. Supplier Responsibility resources and Supplier Code of Conduct are available at apple.com/supplychain.

Strive to create products that are safe in their intended use and are manufactured in alignment with our strict environmental standards.

Pursue continual improvement through the evaluation of our EHS performance by monitoring ongoing performance results through periodic management reviews, and committing to correct EHS nonconformities.

Ensure that all employees are aware of their role and responsibility to fulfill and sustain Apple's EHS management systems and policy by providing training and tools in the user's primary language.

February 2025

Appendix F

# ISO 14001 certification

Apple operates manufacturing facilities in Cork, Ireland.
We certify 100 percent of these facilities with ISO 14001.

IQNET

Building trust together.

## Certificate

**NSAI** has issued an IQNET recognized certificate that the organization:

**Apple Operations International Limited**
**Hollyhill Industrial Estate, HH01 Building, Hollyhill, Cork, Ireland, 7340DEF**

has implemented and maintains an
**Environmental Management System**

for the following scope:
**The management of all EMEA operational activities related to manufacturing, sales, delivery and after sales support for direct retail and channel customers**

which fulfils the requirements of the following standard:

**I.S. EN ISO 14001:2015**

Issued on: **11 July 2024**
First issued on: **20 March 2001**
Expires on: **10 July 2027**

Registration Number: **IE-14.0202**

**Alex Stoichitoiu**
President of IQNET

**Stewart Hickey**
Head - Business Excellence, NSAI

NSAI

This attestation is directly linked to the IQNET Member's original certificate and shall not be used as a stand-alone document.

**IQNET Members*:**
**AENOR** Spain **AFNOR Certification** France **APCER** Portugal **CCC** Cyprus **CISQ** Italy **CQC** China **CQM** China **CQS** Czech Republic **Cro Cert** Croatia **DQS Holding GmbH** Germany **EAGLE Certification Group** USA **FCAV** Brazil **FONDONORMA** Venezuela **ICONTEC** Colombia **ICS** Bosnia and Herzegovina **Inspecta Sertifiointi Oy** Finland **INTECO** Costa Rica **IRAM** Argentina **JQA** Japan **KFQ** Korea **LSQA** Uruguay **MIRTEC** Greece **MSZT** Hungary **Nemko AS** Norway **NSAI** Ireland **NYCE-SIGE** México **PCBC** Poland **Quality Austria** Austria **SII** Israel **SIQ** Slovenia **SIRIM QAS International** Malaysia **SQS** Switzerland **SRAC** Romania **TSE** Turkey **YUQS** Serbia

* The list of IQNET Members is valid at the time of issue of this certificate. Updated information is available under www.iqnet-certification.com

CERT-067.14001 – NSAI IQNET 14001:2015 A4 (3)

NSAI

## Certificate of Registration
of Environmental Management System to I.S. EN ISO 14001:2015

**Apple Operations International Limited**
**Hollyhill Industrial Estate**
**HH01 Building**
**Hollyhill**
**Cork**
**Ireland**
**7340DEF**

NSAI certifies that the aforementioned company has been assessed and deemed to comply with the provisions of the standard referred to above in respect of:-

**The management of all EMEA operational activities related to manufacturing, sales, delivery and after sales support for direct retail and channel customers**

Approved by:
Stewart Hickey
Head - Business Excellence, NSAI

ENVIRONMENT ISO 14001:2015 NSAI Certified

Registration Number: 14.0202
Original Registration: 20 March 2001
Last amended on: 11 July 2024
Valid from: 11 July 2024
Remains valid to: 10 July 2027

*This certificate remains valid on condition that the Approved Environmental Management System is maintained in an adequate and efficacious manner. NSAI is a partner of IQNet – the international certification network (www.iqnet-certification.com)*

*Partner of:* IQNET

*All valid certifications are listed on NSAI's website – www.nsai.ie. The continued validity of this certificate may be verified under "Certified Company Search"*

NSAI (National Standards Authority of Ireland), 1 Swift Square, Northwood, Santry, Dublin 9, Ireland T +353 1 807 3800 E: info@nsai.ie www.nsai.ie

CERT-161 WM: 14001 2015 INAB (4)

# Report notes

**About this report**

This report addresses our environmental programs and initiatives across our business. To provide feedback on this report, please contact environment-report@apple.com.

This report does not cover all information about our business. References in this report to information should not be interpreted as an indication of the materiality of such information to Apple's financial results or for purposes of U.S. securities laws, or any other laws or requirements, such as potential upcoming requirements under the EU Corporate Sustainability Reporting Directive (CSRD), the European Sustainability Reporting Standards (ESRS), or the EU Corporate Sustainability Due Diligence Directive (CSDDD). Additionally, certain terminology used in this report, such as "value chain", "impacts", "risks", and "targets" may differ from the terminology used in legal reporting frameworks, including CSRD and CSDDD. Also, any reference in this report to sustainable activities should not be interpreted as an indication of the classification of such activity under the EU Taxonomy Regulation, or any other legal classification framework. The classification under EU Taxonomy Regulation, or any other legal classification framework, is subject to specific criteria and requirements, which may differ from the general references made in this report.

**Reporting year**

We track our environmental progress based on Apple's fiscal year. All references to a year throughout the report refer to Apple's fiscal years, unless "calendar year" is specified. Apple's fiscal year is the 52- or 53-week period that ends on the last Saturday of September.

**Data assurance**

We obtain third-party verification for some of the information in this report from Apex Companies and the Fraunhofer Institute in Germany (as denoted in Appendix C). Data in this report, including data or verification from third parties, reflects estimates using methodologies and assumptions believed to be reasonable and accurate. Those estimates, methodologies, and assumptions may change in the future as a result of new information or subsequent developments, or they ultimately may prove to be inaccurate. The bulk of Apple's recycled content data is certified and thus verified by a third party with less than 5 percent of the the total mass shipped in Apple products representing content that was either supplier verified, meaning it was reported by the supplier and verified by Apple, or supplier reported based on production and allocation values. In all cases, Apple defines recycled content in alignment with ISO 14021. Product claims are made as of the launch date of those individual products, and they are accurate as of product launch. We assume no obligation, and expressly disclaim any duty to update any product claims, unless otherwise required by law.

**Forward-looking statements**

The information covered by the report contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995, including statements regarding our environmental or sustainability goals or targets, commitments, and strategies and related business and stakeholder impacts. Forward-looking statements can be identified by words such as "future," "anticipates," "believes," "estimates," "expects," "intends," "plans," "predicts," "will," "would," "could," "can," "may," "aim," "strive," and similar terms. These statements involve risks and uncertainties, and actual results may differ materially from any future results expressed or implied by the forward-looking statements.

These risks and uncertainties include, without limitation, any failure to meet stated environmental or sustainability targets, goals, and commitments; and execute our strategies in the time frame expected or at all; global sociodemographic, political, and economic trends; changing government regulations or policies; technological innovations, climate-related conditions and weather events; our ability to gather and verify data regarding environmental impacts; the compliance of various third parties, including our suppliers with our policies and procedures, or their commitments to us; and our expansion into new products, services, technologies, and geographic regions. More information on risks, uncertainties, and other potential factors that could affect our business and performance is included in our filings with the U.S. Securities and Exchange Commission, including in the "Risk Factors" and "Management's Discussion and Analysis of Financial Condition and Results of Operations" sections of the company's most recently filed periodic reports on Form 10-K and Form 10-Q and subsequent filings. Further, from time to time we engage in various initiatives (including voluntary disclosures, policies, and programs), but we cannot guarantee that these initiatives will have the desired effect. We assume no obligation, and expressly disclaim any duty (including in response to new or changed information) to update any statements or information, which speak as of their respective dates. Readers should not place undue reliance on the forward-looking statements made in this report. Moreover, many of the assumptions, standards, metrics, and measurements used in preparing this report continue to evolve, are sourced from third parties, and are based on assumptions believed to be reasonable at the time of preparation, but should not be considered guarantees. Given the inherent uncertainty of the estimates, assumptions, and timelines contained in this report, we may not be able to anticipate whether, or the degree to which, we'll be able to meet our plans, targets, or goals in advance.

# End notes

## Introduction

1 Apple follows the GHG Protocol Corporate Accounting and Reporting Standard (GHG Protocol) to calculate value chain emissions. The GHG Protocol currently defines scope 1 emissions as direct greenhouse gas emissions that occur from sources that are owned or controlled by the company; scope 2 emissions as the indirect greenhouse gas emissions from the generation of purchased electricity, steam, heat, and cooling consumed by the company; and scope 3 emissions as all "other indirect emissions" that occur in the value chain of the reporting company, including both upstream and downstream emissions. Apple currently sets an operational boundary for its emissions and excludes the following scope 3 categories, as defined by the GHG Protocol, which collectively make up less than 10 percent of our 2015 base year scope 3 emissions currently: "capital goods" due to limited data availability, which limits our ability to influence these emissions, and "waste generated in operations," as these emissions are negligible. The following subset of greenhouse gas categories recognized in the Kyoto Protocol are included: carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride ($SF_6$), nitrogen trifluoride ($NF_3$).

2 Carbon reductions are calculated against a product-specific business-as-usual scenario as modeled by Apple: 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). 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. 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.

3 Cobalt in the battery claims or references uses mass balance allocation.

4 Apple reports data about the recycled content of its products at different levels of fidelity, based on the level of independent data verification. The bulk of Apple's recycled content data is certified and thus verified by a third party. Less than 1 percent of the total mass shipped in Apple products in fiscal year 2024 contained recycled content that is either supplier verified, meaning it has been reported by the supplier and cross-checked by Apple, or supplier reported, meaning it has been reported by the supplier based on production and allocation values. In all cases, Apple defines recycled content in alignment with ISO 14021. We do not currently include industry-average recycled content, which may result in underreporting actual recycled content. Total recycled material shipped in products is driven by product material composition and total sales — as a result, this overall recycled or renewable content percentage may fluctuate based on the number and type of products sold each year.

5 In addition to working toward transitioning our entire product value chain to using 100 percent clean electricity by 2030, we're prioritizing energy efficiency and emissions reductions within supplier facilities and operations.

6 We plan to reach carbon neutrality for our fiscal year 2030 carbon footprint.

7 Refer to footnote 4.

8 By the end of calendar year 2025, we plan to use 100 percent recycled cobalt in all Apple-designed batteries (using mass balance allocation), 100 percent recycled tin soldering 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 plan excludes products and components manufactured for replacement or repair. Cobalt in the battery claims or references uses mass balance allocation.

9 Refer to footnote 3.

10 By the end of calendar year 2025, we plan to remove plastic from packaging by transitioning to 100 percent fiber-based packaging. Apple's goal to remove plastic from packaging includes retail bags, all finished goods boxes (including plastic content in labels and in-box documentation), packaging sent to our customers as part of Apple Trade In, AppleCare packaging for whole units and service modules (with the exception of plastics needed to protect items from electrostatic discharge), and secondary packaging of Apple products and accessories sold by Apple. Our goal does not include the inks, coatings, or adhesives used in our packaging. We plan to remove plastic from the packaging of refurbished products by 2027, once old product packaging designs are phased out. We'll continue selling existing inventory of AppleCare packaging for whole units and service modules that contain plastics for vintage and products at end of life until it is consumed. This approach will enable us to avoid waste generated by repackaging goods in new 100 percent fiber-based packaging.

11 By 2030, we plan to replenish 100 percent of our corporate freshwater withdrawals in high-stress locations, as determined by a World Resources Institute (WRI) Aqueduct Baseline Water Stress Indicator and further refined through local context and analysis.

12 By the end of fiscal year 2025, we plan to have certified all Apple-owned data centers to the Alliance for Water Stewardship Standard.

13 By 2030, we plan to identify priority suppliers and drive their enrollment in our Supplier Clean Water Program. Apple prioritizes supplier facilities by overall basin stress indicator, onsite activity type, and annual water volume usage.

## Environmental Initiatives

14 Renewable electricity refers to fossil fuel–free sources of energy from renewable sources, like wind, solar, and low-impact hydroelectricity projects. Clean electricity refers to both renewable electricity as well as other projects that Apple considers "low carbon" but not "renewable," like nuclear and large-impact hydroelectricity projects. Apple currently only allows for clean electricity sources to address electricity for product use when part of a residual grid factor, in markets where there is sufficient data to ensure that the clean electricity is not already claimed. For Apple's corporate footprint, supply chain manufacturing, and the portion of our product use impact that is not already clean electricity, Apple is investing in only new renewable electricity sources.

15 Aluminum Apple Watch Series 9, Apple Watch Ultra 2, and Apple Watch SE when paired with a carbon neutral band

16 Refer to footnote 4.

17 Apple's commitment is to use 100 percent recycled cobalt, using mass balance allocation, in all Apple-designed batteries by the end of calendar year 2025. Our commitment excludes products and components manufactured for replacement or repair.

18 Apple's commitment is to use 100 percent recycled tin soldering and gold plating in all Apple-designed rigid and flexible printed circuit boards by the end of calendar year 2025. Our commitment excludes products and components manufactured for replacement or repair.

19 Apple's commitment is to use 100 percent recycled rare earth elements in all magnets by the end of calendar year 2025. Our commitment excludes products and components manufactured for replacement or repair.

20 Refer to footnote 10.

21 Refer to footnote 6.

22 Corporate emissions include scope 1 and 2 emissions from Apple Store locations, corporate offices, Apple-owned and colocated data centers, and Apple-produced digital content for Apple One services, as well as scope 3 emissions associated with business travel, employee commutes, working from home, upstream impacts from scope 1 fuels, and use of other cloud services.

23 Intergovernmental Panel on Climate Change (IPCC), "Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C Approved by Governments," press release, October 8, 2018, https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/.

24 Apple defines low-carbon materials as 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.

25 We increased the following certified recycled materials in our products from 2023 to 2024: lithium from 24 percent to over 50 percent, zinc from less than 1 percent to more than 15 percent.

26 Lithium in the battery claims use mass balance allocation.

27 Refer to footnote 24.

28 Refer to footnote 4.

29 Refer to footnote 8.

30 Since publishing the "Material Impact Profiles" white paper, we've expanded our analysis to include biodiversity factors.

31 To account for recycled aluminum, we use third-party certified recycled aluminum data, as well as supplier-verified data, meaning it has been reported by the supplier and cross-checked by Apple.

32 We use 100 percent recycled copper in multiple printed circuit boards in the iPhone 16 lineup, MacBook Air with M3, MacBook Pro with M4, iPad mini, Apple Watch Series 10, iMac, and Mac mini.

33 Recycled copper in the thermal module applies to iMac (four ports) only.

34 Cobalt and lithium in the battery claims or references use mass balance allocation.

35 Refer to footnote 4.

36 Eligible products are those in a product category for which ENERGY STAR certification exists. For more information, visit www.energystar.gov. ENERGY STAR and the ENERGY STAR mark are registered trademarks owned by the U.S. Environmental Protection Agency.

37 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. ENERGY STAR and the ENERGY STAR mark are registered trademarks owned by the U.S. Environmental Protection Agency. For more information on the power consumption of Mac mini, read the Mac mini Product Environmental Report.

38 Recycled copper in the thermal module applies to M4 Pro chip only.

39 Refer to footnote 2.

40 Refer to footnote 37.

41 Refer to footnote 10.

42 Breakdown of U.S. retail packaging by weight. Adhesives, inks, and coatings are excluded from our calculations of plastic content and packaging weight.

43 Our packaging design guidelines apply to retail packaging and shippers.

44 In fiscal year 2024 we exceeded the requirements of criterion 4.9.3.1 in IEEE 1680.1 by achieving 2.3 percent of energy savings in Apple facilities that consumed more than 70 million kWh/yr energy consumption.

45 All efficiency measures are retired based on their effective useful lifetime as documented by the California Energy Commission.

46 Our use of the term *RECs* covers both U.S. and international renewable energy certificates and similar certifications around the world, such as Guarantees of Origin (GOs) in Europe (including international renewable energy certificates or I-RECs), Large-Scale Generation Certificates (LGCs) in Australia, and Green Electricity Certificates (GECs) in China.

47 In 2024, suppliers relied predominantly on U.S. or international renewable energy certificates (RECs) to meet their CEP commitments, as an interim solution to longer-term procurement options like power purchase agreements (PPAs), which are becoming increasingly available across the globe. With the evolution of renewable procurement options in China, suppliers have started transitioning to the expanded Green Energy Certificate (GEC) and Green Power Trading mechanism, which are nationally recognized ways of procuring renewable energy in China today.

48 For more information, see Appendix C: F-GHG Emissions.

49 We're working with our suppliers on commitments to our F-GHG abatement specification requiring at least 90 percent abatement of total facility F-GHG emissions in support of our Apple 2030 goal. We define F-GHGs as certain perfluorocarbons (e.g., $CF_4$, $C_2F_6$, and $C_4F_8$), trifluoromethane ($CHF_3$), nitrogen trifluoride ($NF_3$), and sulfur hexafluoride ($SF_6$). Suppliers' F-GHG emissions and abatement rate should conform to the requirements of the 2019 Refinement Intergovernmental Panel on Climate Change ("IPCC") Guidelines for National Greenhouse Gas Inventories Tier 2c calculation methodologies and use the most up-to-date GWP values if applicable.

50 The applicable display and semiconductor manufacturing refers to suppliers who perform the relevant processes outlined in the IPCC Tier2c methodology. Fabless suppliers were not in scope for the engagement.

51 Based on the methodology Apple uses to calculate transportation emissions, which is regularly reviewed by a third party, Fraunhofer IZM.

52 As of product launch, 50 percent of all carbon neutral Mac mini products by weight are planned to be to be shipped via non-air modes of transportation over the lifetime of the products from our final assembly sites to their next destination — primarily regional distribution hubs.

53 Based on device pricing on SellCell.com and some carriers/resellers that accept trade-in devices as of March 2024.

54 This applies specifically to our U.S.-based Apple Trade In program.

55 iPhone 16 and iPhone 16 Plus are splash-, water-, and dust-resistant. They were tested under controlled laboratory conditions, and have a rating of IP68 under IEC standard 60529 (maximum depth of 6 meters for up to 30 minutes). Splash, water, and dust resistance are not permanent conditions. Resistance might decrease as a result of normal wear. Do not attempt to charge a wet iPhone; refer to the user guide for cleaning and drying instructions. Liquid damage is not covered under warranty.

56 Refer to footnote 13.

57 We define facility water use as high stress if the area is located within or withdraws water from a basin that has high or extremely high baseline water stress, based on the Aqueduct Water Risk Atlas V4.0 tool from the World Resources Institute and refined by additional local knowledge and third-party research.

58 Apple-managed services include cloud services, payment services, app services, and digital content hosted in Apple-owned or colocated data centers.

59 These savings do not include the reduction in water use from facility closures and reduced occupancy due to the COVID-19 pandemic. We consider these savings temporary and acknowledge that the water use was transferred to employees' homes.

60 Based on previous estimated consumption.

61 Refer to footnote 59.

62 These savings are based on data observed in pilot operations.

63 We account for savings through this program on a fiscal-year basis rather than a calendar-year basis, as reported in publications before fiscal year 2021.

64 Refer to footnote 12.

65 Refer to footnote 11.

66 Duncan McNicholl and Rob Hope, "Reducing uncertainty in corporate water impact: The role of Results-Based Contracting for drinking water supply," (Oxford, UK: Uptime Global and Oxford University, 2024).

67 Alliance for Water Stewardship. 2025. "Water Stewardship in Data Centres (2025) - Alliance for Water Stewardship." January 16, 2025. https://a4ws.org/download/water-stewardship-in-data-centres-2025/.

68 Kruse, S., Pilz, D., Abraham, S., and Cooley, H., "Evaluating the Cost-Effectiveness of Corporate Water Stewardship Projects" (Oakland, CA: Pacific Institute, 2025)

69 Waste diversion rates do not include construction and demolition waste or electronic waste for fiscal year 2024. Electronic waste is accounted for in the total metric tons of electronic waste that we sent to recycling, found on page 87.

70 These sites have been third-party verified by UL Solutions against the UL 2799 Zero Waste to Landfill Environmental Claim Validation Procedure (ECVP). UL Solutions 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.

71 Our Mesa and Prineville data centers earned TRUE certification in 2021 and 2020, respectively. Administered by Green Business Certification Inc., TRUE certification requires 90 percent waste diversion or higher from landfill, incineration (waste-to-energy), and the environment.

72 All established final assembly supplier sites — or those that have been Apple suppliers for more than one year — for iPhone, iPad, Mac, Apple Watch, AirPods, HomePod, Apple TV, and Beats have been third-party verified by UL Solutions against the UL 2799 Zero Waste to Landfill Environmental Claim Validation Procedure (ECVP). UL Solutions 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.

73 Refer to footnote 70.

74 Final Assembly, Test, and Pack-out (FATP) facilities does not include all facilities that support Accessories and Beats.

75 Arthur Fong, Alexandra McPherson, Mark Rossi, Krishna Rajan, "Building a roadmap for safer and sustainable material chemistries: Addressing the PFAS problem through informatics and data-driven chemistry," MRS Energy & Sustainability (2024) doi:10.1557/s43581-024-00122-1.

## Engagement and Advocacy

76 Donatti CI, Moraga-Lewy N, Nyongesa J, Mwanzia M, Edmond J and Fedele G (2024) Grassland restoration impacts human-wildlife and social conflicts in the Chyulu Hills, Kenya. Front. Environ. Sci. 12:1431316. doi: 10.3389/fenvs.2024.1431316.