

DELL TECHNOLOGIES AND THE CIRCULAR ECONOMY

The circular economy is a systems solution framework that tackles global challenges like climate change, biodiversity loss, waste, and pollution. It is based on three principles driven by design: eliminate waste and pollution, circulate products and materials (at their highest value), and regenerate nature.ⁱ

At Dell Technologies, we want to become a more circular business.

As the world struggles to address the climate crisis and confront resource scarcity, population growth and unsustainable lifestyles, it is clear we need change. We need to shift away from linear thinking and move to a more circular model. This is a re-imagining of everything we do with a focus on how we can:

- Design out waste and obsolescence
- Embrace renewable sources of energy and materials
- Offer new ways for customers to drive their own circular evolution
- Partner broadly to accelerate this transition across the economy

Dell has been adopting circular practices for over two decades. We launched our global recycling programs over 20 years ago and since 2007 have recovered more than 2.5 billion pounds (1.1 billion kg) of used electronics. We use recycled plastics, rare earth magnets and aluminum from out-of-use technology and leverage waste streams from other industries like reclaimed carbon fiber to create sustainable materials for new Dell products. We design products for ease of repair, reuse and recycling, leveraging modular designs, standard tools limited adhesives to extend life and keep even more materials in the circular economy.

In alignment with our commitment to reach our sustainability goals, this document outlines our point of view on how Dell is transitioning operations, products and other offerings to embrace a circular economy and the environmental benefits it will bring.

Significance

Society's current, mostly linear approach to the global economy has been in place since the Industrial Revolution began. While material use is critical for continued global prosperity, the way materials are produced and consumed is increasingly unsustainable and has become an issue of global importance.

- The world currently consumes 100 billion tonnes of materials every year. Meanwhile, humanity uses a year's worth of ecological resources every 8 months – putting pressure on dwindling reserves.ⁱⁱ
- The population has grown from approximately 1 billion people in 1800, to 2 billion by the 1920s, to nearly 7.8 billion today. Estimates show we could reach 9.9 billion by 2050.ⁱⁱⁱ
- Global temperatures have already risen by 1°C since the 1880s. Two-thirds of that warming has occurred since 1975.^{iv}

All of this is not just tied to energy, but everything that goes into human existence. With shifting demographics increasing the demand for goods and services, we need to find ways to satisfy global needs and wants while reducing resource consumption and greenhouse gas emissions. Circularity offers an alternative, but today the world is falling short: global circularity (a measure of the share of “cycled” materials as part of the total material inputs into the economy each year) is only 8.6%. If global circularity doubled (to 17%), global emissions could be reduced by 39% by 2032 and put the world on track for staying below a 2-degree temperature rise.^v

Relevance to Dell Technologies

The rise of the Age of Information, along with society’s traditional approach to the use of materials has resulted in e-waste becoming one of the fastest growing waste streams in the world – more than 50 million metric tons every year or approximately 16 pounds for every person on the planet. Less than 20% of that gets formally recycled (4% winds up in waste streams and the fate of the other 76% is unclear – possibly dumped, traded, or recycled under inferior conditions).^{vi}

As a global technology company, we have a responsibility to change the system - taking back as much as possible for reuse or responsible recycling. Accomplishing this is a major undertaking that requires ingenuity, innovation, and investment. It also requires working our suppliers, partners, NGOs and customers to advance both the demand for circularity but also how we meet that demand and measure progress.

In addition to our focus on accelerating the circular economy across our product portfolio, we are also pursuing circularity in how we run our business such as powering facilities with renewable electricity and sourcing office equipment that is based on a circular model.

Dell Technologies’ position

At Dell Technologies, we believe we have a responsibility to protect and enrich our planet together with our customers, suppliers and communities. It is a core part of our business and we embed sustainability and ethical practices into all that we do, being accountable for our actions while driving improvements wherever and whenever possible.

It’s why we have [set ambitious goals](#) which we report on annually in [our Progress Made Real social impact report](#). The goals that most directly intersect with the circular economy include:

- By 2030, for every product a customer buys, we will reuse or recycle an equivalent product. 100% of our packaging will be made from recycled or renewable material. More than half of our product content will be made from recycled or renewable material.
- The materials and manufacturing processes we use to create our products also impact our goal to reach net zero greenhouse gas (GHG) emissions across Scopes 1, 2 and 3 by 2050. Our net zero goal is an extension of [our aggressive 2030 emissions goals](#) and will require global cooperation across many aspects of our business and sustained engagement with our entire value chain to achieve.

Circularity is a business imperative for Dell Technologies. In addition to setting these ambitious goals to push ourselves to move from incremental to impactful change, a shift to a circular

economy offers potential cost savings and aligns us with customer requirements and future regulations. It will help us stay on the path to net zero carbon emissions, attract and keep talent, and build brand equity while demonstrating our commitment to making a positive social impact.

To achieve circularity, we must incorporate new approaches to design and manufacturing that eliminate the concept of waste. Recycled and renewable sources must become the norm – both as the building blocks of our technologies and for powering our operations. We must also use purposeful design and explore new business models to extend product lifecycles and make it easy to recover materials when reuse or remanufacturing is impossible.

Beyond embracing our responsibilities and innovating our approaches, circularity also represents a tremendous opportunity for technology to help global efforts to restore balance to our planetary systems. Technologies like AI/ML, advanced data storage, IoT and blockchain are among the many tools available to help our customers change their own systems and processes.

Transitioning to a circular economy is a complicated endeavor. We must partner broadly, becoming advocates and influencers that work within our industry and customers, and across our communities to drive change.

Designing for circularity

A sustainable approach to materials use begins with guidelines and approaches for how components are designed and then come together to form complete systems. This focus creates significant opportunities to minimize material use, prevent waste and enable easy repair, reuse and recyclability.

Our design guidelines encourage a reduction in the size and number of needed components, the amount of material needed for each component and the complexity of system assembly. Not only does this reduce the amount of material we need and potentially reduce the system's carbon footprint, but it can also enable easier repairs by simplifying disassembly and reassembly processes.

Design principles such as repairability, modularity, standard tools and fasteners, and a preference for snap fits or uniform screws over adhesives help extend the service life of our products, while making it easier for technicians and customers to reach and replace components.

Design affects how easy it is to reuse/refurbish components or harvest recyclable materials at the end of a device's life. Because we design with durability and modularity in mind, parts that come back through our services network can often be put back into our supply chain to be used to repair and refurbish systems. For those components that cannot be reused, our design focus on easy disassembly – paired with clear markings, minimized paintings and coatings, and simplified material choices – makes it easy for the recycling industry to recover more material, and recover that material more quickly.

Material selection and sourcing

Waste is not the only cause of negative environmental impacts. Extraction of raw materials from the ground, along with subsequent processing to enable use, can carry significant social and environmental outcomes. Accordingly, material selection and sourcing are key aspects of Dell's approach to circularity.

Dell prioritizes the use of recycled and renewable materials in both products and packaging. Recycled materials can dramatically reduce the environmental impact of manufacturing. Renewable materials help minimize negative environmental impacts by relying on natural resources that can be replenished generation after generation without depleting stocks.

Dell takes a layered approach to the use of recycled materials, preserving as much value as possible from recovered materials and components. We look for the tightest possible loops. Reuse, followed by refurbished parts at scale, form the innermost loops. Dell then looks to closed loops within our value chain, where materials are recovered and potentially reprocessed from e-waste and re-engineered for use in new products. Beyond that, we look to open product loops with other value chains and industries – obtaining materials from other recycling streams or even from waste or environmental pollutants.

Renewable materials come from natural resources that can be replenished, generation after generation, without depleting stocks. Our use of renewable materials is most often seen in the use of plant-based materials. Some cases are straightforward – such as renewably harvested forestry products used for packaging. In other instances, our materials sources may be more innovative or novel – for example turning plant-based oils into recyclable plastics. The key in each case is to ensure that the original feedstock can be replenished, does not take food out of the system (e.g., using corn or soy), and is treated in a way that allows the nutrients to be returned to the earth.

Our view on renewable resources even extends to the use of energy throughout our value chain, embracing the use of renewably generated electricity. As such, we are committed to transitioning our own electricity to 100% renewables and advocating for others to do the same.

Repair, reuse and recycling

At the heart of the circular economy is the idea that nothing should go to waste. In addition to our circular design and manufacturing efforts, we provide various services aimed at extending the product lifecycle and recovering materials when they reach end of life.

In addition to offering multiple repair options across global markets, we make it easy to [access information online](#), including manuals and downloads that keep products performing (SW, drivers, BIOS, firmware, OS, security patches). We also publish our parts list online and enable customers [to order those parts](#) to conduct their own repairs. We even created an augmented reality app (Dell AR Assistant) that provides step-by-step part replacement instructions for many customer-addressable issues.

To support our goal of taking back an equivalent product for every product sold, we provide innovative asset retirement, leasing, recycling, trade-in and resale programs. We work closely

with our disposition partners to maximize recovery, to minimize complexity and to meet all relevant regulations.

We use closed-loop strategies, returning materials back into our own supply chain where possible for a reduced environmental impact. Materials from recycled equipment that cannot be reused in our own manufacturing is then offered to the broader market, helping keep material in the wider open-loop economy.

Circular business innovations

Circularity requires taking a holistic view of managing technology assets across their lifecycle. Leasing options through Dell Financial Services and other as-a-Service offerings creates opportunities to maximize product utilization, improve logistics and otherwise reduce environmental impacts, taking advantage of Dell's scale and efficiencies. For example, end-of-lease equipment is processed through our efficient take-back services – which first identifies equipment that can be remanufactured and resold, and then ensures materials are recycled responsibly when all reuse opportunities have been exhausted.

Dell is committed to exploring other innovative ways of delivering value via circular principles. We are working on ways that technology can be used to extend the life of hardware assets - using AI/ML to predict performance issues, perform maintenance and enable augmented reality-assisted repairs. We are also exploring how hardware devices can have several reincarnations, with components cascading across multiple lifecycles. For example, enabling top-tier performing processors used for business or gaming, to have a second, and possibly third lifetime in home or education environments - ensuring the same components are used in multiple generations of product.

Partnering broadly to accelerate this transition across the economy

No individual company or organization has the breadth or scale necessary to drive a global shift in the relationship between society and material use. Shifting the world to a new economic paradigm requires holistic mobilization.

We must engage with customers, suppliers, peers and competitors (via pre-competitive groups) to identify best practices, listen to needs and support broad initiatives. Our membership in the [Circular Electronics Partnership](#) (CEP) is a great example of this in action. Convened by the World Business Council for Sustainable Development (WBCSD), the CEP brings together leaders from industry, government, international organizations and civil society to collaborate at a global level on an industry roadmap for circular electronics.

We also must engage with policymakers and regulators in ways that stimulate innovation and investment, remove barriers, and take advantage of technology to transition other areas of the economy.

Dell understands this and is committed to continuing its long-standing leadership, working both within its industry and across industries to drive impactful change. Through innovation and collaboration, Dell will deliver on its commitment to drastically reduce waste and keep even

more circular materials in the economy, shrinking resource use and greenhouse gas emissions in pursuit of a net zero future.

Document references:

ⁱ <https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/glossary>

ⁱⁱ <https://overshootday.org>

ⁱⁱⁱ <https://www.worldometers.info/world-population/world-population-by-year/> and <http://sdg.iisd.org/news/world-population-to-reach-9-9-billion-by-2050/>

^{iv} <https://earthobservatory.nasa.gov/world-of-change/global-temperatures>

^v <https://www.circularity-gap.world/2021>

^{vi} <http://ewastemonitor.info/>