
intel
The
Sustainable
CTO
The Road to Tech Positive



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Foreword

"Tech leaders must embrace their new role as the most pivotal sustainability influencer in the corporate C-suite: **the Sustainable CTO."**

Humanity is at a critical point in history. We face the convergence of two major forces: sustainability and digitalization. As we approach 2030 – the target date set by both the UN's Intergovernmental Panel on Climate Change[1] and the US government[2] to significantly reduce CO2 emissions – organizations are under growing pressure to help mitigate climate change. At the same time, the rapid development of disruptive technologies such as artificial intelligence (AI), advanced automation, the Internet of Things (IoT), and Edge Computing has led to exponentially rising demand for compute. How can we balance climate action and digital growth strategies to protect societies and advance global economies?

For business leaders, technology plays a paradoxical role in the sustainability agenda. Global computing is inarguably a significant contributor to carbon emissions and e-waste. But technology also holds the key to the solution. It's in how we meet the ever-rising demand for computing performance in a sustainable way. It's also, more importantly, in how we use technology to sustainably transform entire organizations and business models to deliver a cleaner, greener, nature-positive future.

Leadership will be at the center of this sustainable transformation. This requires a long term, deep technical system-level architecture view of the problem, and we believe that chief technology officers (CTOs) have a critical role to play in aligning business strategy, technology and sustainability to meet this challenge.

The journey will not be easy. It will require not only reducing IT-related emissions but harnessing the power of technology to transform organizations. To get there, tech leaders must embrace their new role as the most pivotal sustainability influencer in the corporate C-suite: **the Sustainable CTO**. This new model of CTO must land **"tech zero"** (greener IT) and use technology to affect the sustainable transformation of their entire organization to be **"tech positive"** (greener business), which benefits from business-driven value to power growth and win in the new economy.

With this report, we are launching Intel's new Sustainable CTO initiative, which will help us all make this journey together. We will bring together our global CTO community to share understanding, insights and best practice to bridge knowledge gaps and help you shape your roadmap to tech positive.

In this study, we set out to discover how enterprise leaders are approaching the interconnected challenges of sustainability and radical digital transformation, and the actions they must take to accelerate progress, as well as the barriers that stand in their way. We would like to thank our Sustainable CTO advisory board and the 2,020 global business leaders from 22 markets who participated in this global research to share their perspectives as CTOs, CEOs and chief sustainability officers (CSOs) in the world's largest companies.

They told us that while tech is among the most challenging areas of their businesses to address in the race to net zero, technology has a critical role to play in sustainable transformation. Eighty-four percent of senior IT leaders believe technology has a pivotal (53%) or important (31%) role to play in their organizations' strategies to become sustainable businesses. Most important, four in five (79%) senior IT leaders **aspire to become sustainability leaders** in their organizations – **Sustainable CTOs.** And they have a mandate from the Board: 84% of CEOs and CSOs believe that CTOs have the potential to become **the greatest drivers of sustainability in organizations.**

This report reveals the immense potential of CTOs and the key steps that business leaders must take to support them. If the C-suite, including CTOs and CIOs, rally in support of a **tech positive** approach, technological transformation can propel us toward a future that is greener, fairer and smarter.

For more than five decades, Intel has shaped the technology that has powered growth and innovation. And, over the next five decades, technology has an even more critical role to play in building a sustainable future.

Greg Lavender,
Senior Vice President, Chief Technology Officer and General Manager of the Software and Advanced Technology Group, Intel

About this Study

The Sustainable CTO is based on opinion research among 2,020 business leaders from organizations with a minimum turnover of $500 million. Research participants were based in organizations across 22 markets and 11 different sectors.

C-suite decision-makers were split into three groups:

- **Senior IT leaders** (job titles including Chief Technology Officers, Chief Information Officers, Heads of Infrastructure and Vice-Presidents/Directors/Heads of Product)
- **Chief Executive Officers (CEOs)**
- **Chief Sustainability Officers (CSOs)**

The report also includes insights from the **Intel Sustainable CTO Advisory Board** – industry thought leaders from Intel's partners and client community – who participated in in-depth interviews and a panel discussion.

[1] https://unfccc.int/news/climate-plans-remain-insufficient-more-ambitious-action-needed-now#:~:text=The%2UN's%20Intergovernmental%20Panel%20on,be%20cut%2043%25%20by%202030.

[2] https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/

Executive Summary

From Tech Zero[3] to Tech Positive

Tech leaders are trying to accommodate rapidly increasing processing power while reducing environmental impact: 70% believe there is a conflict between their organization's need for ever-increasing computing power and the need to make their IT function more sustainable. But while technology is part of the sustainability problem, it is also a critical part of the solution, with the tech-positive promise of digital transformation powering decarbonization.

Tech Zero_

Reducing the carbon footprint of an organization's IT function.

81%

of senior IT leaders say that "green IT" – **reducing their tech-related environmental impact** – is high on their organization's corporate agenda.

Tech Positive_

Using technology as a lever for the whole organization to reach its net-zero goals and to have a positive overall impact, driving business growth and accelerating innovation.

77%

of senior IT leaders believe that "transformational IT" – using technology to improve their **whole organization's environmental impact** – is high on their organization's corporate agenda.

Outcome

This enhanced sustainability brings wide-ranging business benefits: 89% of senior IT leaders believe that focusing on sustainability will **drive product and service innovation and** 78% believe it boosts **employee recruitment and retention.**

Enter the Sustainable CTO

The Sustainable CTO is a new model of tech leader who can deploy technology to build an organization that is fairer, greener, and smarter.

CTOs have the vision and the appetite to step into this role: 79% of senior IT leaders aspire to become sustainability leaders in their organizations. Importantly, they also have a mandate from the rest of the C-suite: 82% of CEOs and CSOs believe that the CTO's role is pivotal to a successful transition.

IT leaders are embracing the role

82% of senior IT leaders say that **technology strategy and sustainability strategy must become increasingly aligned** if their organization is to become a more sustainable business.

'Leading the sustainable transformation of the IT function' is currently the number one CTO priority according to senior IT leaders.



... and they have a mandate from other leaders

84% of CEOs and CSOs say that the CTO has the potential to become **the greatest driver of sustainability in the organization.**

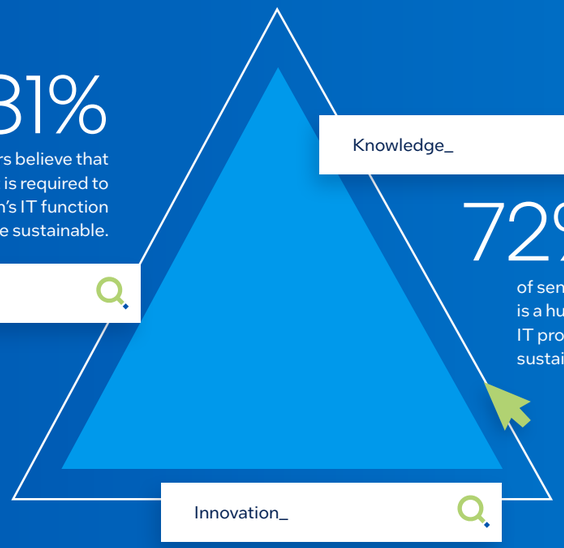
81% of CEOs and CSOs believe that **tech leaders must now be sustainability leaders.**

80% of CEOs and CSOs believe that **the CTO is critical to turning sustainability strategy into action.**

[3] In this report, *tech zero* means reducing the carbon footprint of an organization's IT function.
'Tech Zero' is a trademark of Octopus Energy Group Limited. See disclaimer for more information.

The Tech Trilemma:
Barriers to tech positive

CTOs have the power, the mandate and the enthusiasm to drive tech zero and tech positive. However, they cannot do it alone. There are currently three key areas that need board-level attention for CTOs to become successful Sustainable CTOs: **knowledge, innovation, and investment.**



81%
of senior IT leaders believe that significant investment is required to make their organization's IT function and technology more sustainable.

72%
of senior IT leaders believe there is a huge knowledge gap in the IT profession when it comes to sustainability and green IT.

5%
Innovation will be key to transformation but is currently the number one priority for just 5% of CTOs.

The CTO's Sustainability Roadmap:
Steps to Tech Positive

1. Build skills to understand where to optimize
2. Get buy-in from the wider business
3. Understand the data and optimize existing infrastructure
4. Plan for solution and software innovation





Section 1

From Tech Zero to Tech Positive

Business leaders face a formidable challenge: prioritizing the transition to net zero while keeping pace with the mainstreaming of processor-hungry technologies like AI and IoT. Organizations must harness the power of technology to **transform their organizations** – accelerating net zero and beyond for both compliance and competitive advantage.

Dual Objectives: More Power, Less Energy?

Global business leaders are facing the convergence of two critical agendas: reducing their carbon footprint while simultaneously adopting ever more powerful technologies. As processor-hungry tech like AI becomes ubiquitous, how do businesses balance the dual objectives of exponentially increasing computing power and using less energy? Currently, they are struggling: more than seven in 10 senior IT leaders, CEOs and CSOs (71%) believe there is a conflict between their organization's need for ever-increasing computing power –particularly the performance demanded by technology like AI – and the need to deliver green IT.

Technology is undoubtedly part of the problem – with pressure to green the IT function and achieve tech zero at an all-time high – but it is also a critical part of the solution, with the tech-positive promise of digital transformation powering decarbonization. Eight in 10 senior IT leaders, CEOs and CSOs believe that tech innovation, including AI, will play a significant role in their whole organization's transformation to a sustainable business.

Tech Zero_

Reducing the carbon footprint of an organization's IT function.

81%

of senior IT leaders say that "green IT" – **reducing their tech-related environmental impact** – is high on their organization's corporate agenda.





Tech Positive_

Using technology as a lever for the whole organization to reach its net-zero goals and to have a positive overall impact, driving business growth and accelerating innovation.

77%

of senior IT leaders believe that "transformational IT" – using technology to improve their **whole organization's environmental impact** – is high on their organization's corporate agenda.

This enhanced sustainability brings wide-ranging business benefits: 89% of senior IT leaders believe that focusing on sustainability will **drive product and service innovation and** 78% believe it boosts **employee recruitment and retention.**

The Tech-Zero Imperative

Eight in 10 senior IT leaders (81%) say that reducing their tech-related environmental impact is a high priority for their organization, but this is proving to be a difficult circle for CTOs to square. More than three-quarters of senior IT leaders (76%) told us it is a significant challenge to **deliver greener IT while significantly increasing computing performance** and seven in 10 (70%) believe there is a **conflict** between their organization's need for ever-increasing **computing power** and the need to make their IT function more sustainable.

This task will become more complex as new technologies like AI become widespread and demand for computing power increases: between now and 2030, senior IT leaders predict that their organization's computer processing power will increase by an average of 9% – although close to a third (31%) believe that it will increase by between 11% and 15%.[4] The challenge is to ensure that the IT function's carbon footprint does not rise at the same rate, making sustainability performance a priority for CTOs.

[4] This is a sub-sample that includes only the senior IT leaders who understand the scale of their organizations' scope one and two emissions in terms of both their overall organization and their IT function.



The Cybersecurity Quandary

Cybersecurity is high on the CTO agenda, but many IT leaders are finding this priority difficult to manage alongside sustainable transformation. Almost a third of CTOs (30%) say that **increased cyber security** is one of the top three barriers to delivering green IT, **as it has the unintended consequence of increasing their IT-related environmental impact.**

The top barriers to delivering green IT

1. The rapid rise of new technologies like AI and IoT will demand ever-increasing computing power and therefore increase our IT function's carbon footprint / negative environmental impact.
2. Increasing cyber security has the unintended consequences of increasing our IT-related environmental impact.
3. Legacy technologies and processes within my organization will hinder tech-zero progress.

"To successfully improve the impact that technology is having on the environment, sustainability must be consistently considered across all areas of the business. Each department or role will have specific concerns – for example, a technical architect who is focusing on security as a priority can incorporate sustainable architectures into the technology decisions they are making. Sustainability targets are only achievable when leaders across the business work together. Technology needs to be secure, it also needs to be sustainable; leaders need to think about both."

Emily Martin, EVP, Converge Technology Solutions

Technology in the Spotlight

The role of technology in organizational emissions matters like never before. Enterprise technology is in the spotlight, with the corporate IT function under intense scrutiny to reduce energy usage from both a cost perspective (according to 78% of senior IT leaders) and a sustainability perspective (76%), as well as feeling under increasing pressure from employees to adopt more sustainable IT-related products and services (76%). Our study reveals increased transparency in this area: 59% of organizations externally report their IT-related energy usage, for example.

But although increased data and reporting is a positive step, with this increased transparency comes increased pressure. **Nearly eight in 10 senior IT leaders (78%) told us that investors are more interested than ever in the environmental performance of their IT function and tech-related emissions.**

The Tech-Positive Opportunity

Almost eight in 10 senior IT leaders (77%) say that transformational technology – using tech to improve their whole organization's environmental impact – is high on their corporate agenda.

Technology has the power to transform the whole organization, playing a pivotal role in the corporate sustainability journey. **The rapid acceleration of tech developments does not just mean increased processing power; it also means that we have the tools to sustainably transform entire organizations and business models to deliver a cleaner, greener future.** This is becoming a key determinant of corporate success: business leaders rank sustainability as the number one driver of growth for their organization.

But senior IT leaders know the road ahead will not be an easy one. Seven in 10 senior IT leaders believe **significant change or complete transformation** of their organization is required to transition to a net-zero business model – just 5% of senior IT leaders believe minimal change is needed.

But technology and data hold the key to the solution. Eighty-four percent of senior IT leaders believe technology has a pivotal (53%) or important (31%) role to play in their organization's strategy to become a sustainable business, with **just one in 100 seeing technology as unimportant to their sustainability strategy.** Four in five senior IT leaders believe tech innovation such as AI and IoT will play a significant role in their organization's transformation to a sustainable business model.

Leadership will be critical to this sustainable transformation. To deliver **tech positive**, CTOs are tasked with reducing the carbon footprint of their organization's technology while simultaneously harnessing the transformational power of technology to move the needle on net zero for their whole organization.

Can tech leaders achieve both objectives at the same time? Most seem to think so. Over three-quarters of senior IT leaders (77%) believe that, on balance, the positive contribution of new technologies to making the whole organization more sustainable will outweigh their negative impact in increasing IT function emissions.

Read the learnings from sustainability frontrunners on page 26 and find practical steps towards tech positive on page 34.

CTO Perspectives

"Sustainability is everyone's responsibility. You need to bring the entire organization along on the journey – meeting sustainability goals requires business transformation, and you can't achieve this without bringing IT leadership and every function into the equation. Over the last decade, the number of devices and the amount of energy used on tech has increased exponentially. Education and awareness are important, and action-led leadership and collaboration are key. Technology is an accelerator for energy efficiency and a more sustainable future."

Denise Lee Yeh,
Vice President, Engineering
Sustainability Office, Cisco





Section 2

Enter the Sustainable CTO

CTOs not only have the vision and the appetite to accelerate sustainable transformation, but they also have a mandate from the rest of the C-suite. **Four in five senior IT leaders (79%) aspire to become a sustainability leader in their organization – a Sustainable CTO.** And 82% of CEOs and CSOs believe that the CTO's role is pivotal to a successful transition.

Driving Two Agendas

The success of digitization and sustainability strategies are inextricably entwined, and not only because technology can help to drive sustainable transformation. CEOs see sustainability as their organization's top growth driver between now and 2030, with digitization a close second, followed by customer experience (where technology also has a key role to play). The relationship works both ways; not only does digitization drive sustainability, but increased innovation can emerge from prioritizing sustainability. Indeed, nine in 10 senior IT leaders (89%) believe that **focusing on sustainability will drive product and service innovation.**

Top three organizational growth drivers between now and 2030 according to CEOs:
(by % who ranked this number 1)

1. Sustainability
2. Adoption of new technology/ digitization
3. Customer experience
4. New product/ service development/ innovation
5. Employee upskilling



As technology and sustainability converge, technology leaders must embrace their new role as the most pivotal sustainability influencer in the C-suite: **the Sustainable CTO.** This is a **new model of tech leader who can deploy technology to build an organization that is fairer, greener, and smarter.**

Senior IT leaders recognize that these two agendas are intrinsically interlinked. Over four in five (82%) say that **technology strategy and sustainability strategy must become increasingly aligned** if their organization is to reach net zero and become a more sustainable business. Senior IT leaders are also clear on the pivotal role that technology and the CTO must play: eight in 10 believe that organizations are heavily reliant on technology and the CTO to make their business more sustainable. Success against their net-zero goals depends on tech, in fact: seven in 10 senior IT leaders believe their organization **will not be able to reach net zero** without the IT function's support and action.

Seven in 10 senior IT leaders believe their organization will not be able to reach net zero without the IT function's support and action.

The CTO as Chief Sustainability Influencer

Now is the time for CTOs to assume the mantle of the Sustainable CTO. Today, the CTO has more influence on the organization's sustainability strategy than ever before, according to 82% of CEOs and CSOs. And the CTO's sustainability star is set to ascend further: 84% of CEOs and CSOs say that the CTO has the potential to become **the greatest driver of sustainability in the organization.**

81%

of CEOs and CSOs believe that **tech leaders must now be sustainability leaders.**

82%

of CEOs and CSOs believe **that the CTO role is pivotal to a successful net zero transition.**

80%

of CEOs and CSOs believe that **the CTO is critical to turning sustainability strategy into action.**

Stepping Into the Role of the Sustainable CTO

Our study reveals, however, that this is not a role being imposed on CTOs, but a shift that they are willingly embracing. Four in five CTOs (81%) aspire to become a sustainability leader in the business, and 'leading the sustainable transformation of the IT function' is currently the number one CTO priority according to senior IT leaders (both CTOs themselves and other IT decision-makers). This comes above other significant priorities such as harnessing the potential of new technology innovations, improving organizational productivity through digital transformation, and enhancing cyber-security. A related factor – upskilling themselves and their team on sustainability and technology – is the fifth-highest priority for CTOs, coming above maximizing the benefits of cloud computing to drive transformation through flexibility and scalability.

"Four in five CTOs, aspire to become a sustainability leader in the business."

CTO Priorities:
% of senior IT leaders who said this was a top three priority for the CTO

1. **38%** Leading the sustainable transformation of the IT function
2. **23%** Harnessing the potential of new technology innovations (e.g. AI, IoT).
3. **22%** Improving organizational productivity through digital transformation / effective technology.
4. **22%** Improving security and cyber defenses.
5. **21%** Upskilling [themselves/ myself] and the IT team on sustainability and technology.
6. **20%** Maximizing the benefits of cloud computing to drive transformation through flexibility and scalability.



The CTO and the Chief Sustainability Officer

With the CTO rising in influence and importance when it comes to sustainability leadership, where does this leave other leaders, especially those with a sustainability-focused role?

Is the nascent specialist CSO (Chief Sustainability Officer) role being challenged by a more cross-functional approach? Over three-quarters of senior IT leaders (76%) believe the concept of a siloed 'sustainability team' should be abolished, and that sustainability must be fully embedded across the whole organization. If this is the case, who will ultimately represent the sustainable transformation agenda at the top table?

According to their peers, the CTO is a stand-out member of the C-suite when it comes to strategic thinking: 84% of CSOs and CEOs believe the CTO often takes a **more innovative** approach to business growth than other organizational leaders.

And on sustainability specifically, our study reveals that CTOs may be set to surpass CSOs: 80% of CEOs say that the CTO's growing organizational sustainability responsibilities will make them **more influential** than the CSO.

Ultimately, however, close CTO-CSO collaboration holds the key to a successful and sustainable transformation. The fact that the organization's sustainability strategy and technology strategy are not joined up is identified by IT leaders as a key barrier to transformation, and 81% of senior IT leaders say that **the CTO and the CSO need to act in partnership** for the organization to achieve its sustainability targets.

Section 3

The Tech Trilemma

CTOs have the vision and the mandate to drive tech zero and tech positive. But they cannot do it alone. This study also highlights important organizational barriers currently standing in their way. For CTOs to become successful Sustainable CTOs, they will need board-level support to help them close key gaps in terms of **knowledge, innovation, and investment.**



Investment_

81%

of senior IT leaders believe that **significant investment** is required to make their organization's IT function and technology more sustainable.

Knowledge_

72%

of senior IT leaders believe there is a huge **knowledge gap** in the IT profession when it comes to sustainability and green IT.

Innovation_

5%

Innovation will be key to transformation, but is currently the number one priority for just 5% of CTOs.

The Barriers to Tech Positive

The Sustainable CTO has the power to champion tech positive and revolutionize the way their organization addresses, implements, and manages the relationship between technology and sustainability. However, there are currently three areas that need focus before CTOs can confidently take on this new role and the challenge of tech positive.



Knowledge_

CTOs are prepared to take on the mantle of sustainability leadership, but they are not confident that their organization – or the tech sector – has the right knowledge and skills. For CTOs to become Sustainable CTOs, they will need the power to rally others and to guide change. They will also need teams that have the skills and understanding in place to drive the sustainability agenda.

Currently, the skills they need are not there. More than seven in 10 senior IT leaders (72%) admit there is a **huge sustainability knowledge gap in the IT profession**, and seven in 10 believe their organization **lacks people with the right knowledge or skills** in sustainability within the IT function (70%) – and indeed across the whole business (67%). CTOs also doubt their own skills: "I don't have the specialist skills and training to effectively increase sustainability performance" is identified by CTOs as a top barrier to sustainable transformation.

Organizations need to close knowledge gaps fast and foster collaboration and understanding across their business to enable the Sustainable CTO to fulfil their mandate. Many will also need to seek expertise from outside of their business and strategically engage with consultants and educational resources.

Innovation_

To achieve tech positive, innovative ideas and technology will be critical; 79% of senior IT leaders claim that technological innovation will play a significant role in their whole organization's transformation to a sustainable business. But as organizations face a raft of priorities, are they giving innovation the emphasis it deserves? Only 46% of senior IT leaders say that product or service development and innovation is currently a top three driver of growth for their organization, and innovation is currently the number one priority for just 5% of CTOs. With so many competing agendas, innovation may be hard to prioritize, but without it, building a sustainable organization will be almost impossible.

CTO Perspectives

"Previously, when people invented new technologies in their field, sustainability wasn't often top of mind. It's only once companies consider sustainability from the outset and build from the ground up, with sustainability considerations baked in, that they'll see the highest return.

"It's important for the industry – especially more established companies – to drive towards a shift in the way we do things if we want to make a significant change. There isn't necessarily a lack of innovation; it's more a priority issue or lack of focus. Organizations need to find new ways to prioritize sustainability when creating or driving new products and services."

Rimma Iontel,
Chief Architect, Global Telco Team, Red Hat

Investment_

Leaders recognize that significant transformation of their organization is required to transition to a sustainable business model, and 84% of senior IT leaders believe technology has a pivotal or important role to play. But while the need for significant investment is acknowledged – 82% of senior IT leaders say their CEO and other leaders understand that technology investment is the best way to become a more sustainable business – there is evidence that this isn't yet translating into financial action across all organizations.

Over four in five senior IT leaders (81%) believe that significant investment is required to make their organization's IT function and technology more sustainable. This includes updating the legacy technologies and processes that are hindering their organization's sustainability progress, and investing in transformative new technologies. Despite senior IT leaders' confidence that technology innovation will play a significant transformative role in organization's operational models, only half (50%) of organizations are currently investing in technology like AI, IoT, and robotics.

The lack of financial and tax incentives to encourage investment into sustainable technologies is identified by senior IT leaders as one of the most significant barriers to using technology to support the sustainable transformation, as is a lack of regulation and legislation, discouraging sustainable technology investment. Perhaps the greatest barrier to investment required for long-term transformation is current economic turbulence, with senior IT leaders concerned that they don't have the investment they need, and they can't justify the increased budget required due to the economic outlook. However, leveraging sustainability initiatives that provide co-benefits (for example, energy efficiency providing more readily quantifiable cost savings), can make it easier to garner support from other areas of the business.

"Only half of organizations are currently investing in technology like AI, IoT, and robotics."

CTO Perspectives

"Sustainability and profitability can go hand-in-hand, without making tradeoffs or sacrifices to business productivity. We need to demonstrate the true business value of focusing on sustainability and green IT, like how investing in green IT solutions can reduce your computing costs. Once we can show the overall business impact and any correlating ramifications, the investment and funding in more sustainable, responsible IT will come."

Sunil Joshi,
Vice President and CTO,
North America Hybrid Cloud Services, IBM



"It's very complex for leaders to know and understand what it is they can do to reduce emissions in the IT environment. It's not as simple as just turning something off or down to make an impact. The CTO or CIO must balance providing innovative business capabilities with sustainability.

"Previously, CTO and CIOs were primarily responsible for modernizing and elevating a company's tech capabilities, now it's essential to innovate and drive sustainability as part of the overall understanding of technology, the business, and customer needs."

Motti Finkelstein,
Corporate Vice President – Digital Transformation Officer, Intel

Best Practice for the Sustainable CTO

Where are CTOs on their journey to become Sustainable CTOs, what are tech leaders prioritizing across key sustainable tech dimensions (measurement, investment and supply chain), and what can we learn from the organizations with the most mature sustainability strategies?



Sustainability Frontrunners

31%

Organizations in our study that have the most mature level of net-zero strategy: "a clear net-zero strategy to deliver positive ESG impact" (31% of the total sample).

Key dimensions of tech sustainability:

- Measurement and Reporting
- Investing in Tech Positive
- Building a Sustainable Supply Chain
- Improving the IT Function's Sustainability Performance

Measurement and Reporting

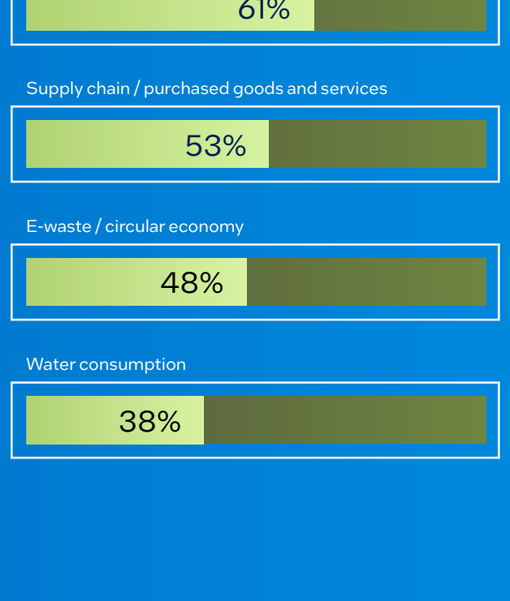
As the famous saying goes, 'what gets measured gets managed', and our study shows that organizations are making good progress on sustainability measurement. Almost all organizations (99%) measure their scope one and scope two emissions and over four in five (83%) monitor the carbon output of their entire IT infrastructure. Over three-quarters of senior IT leaders (77%) believe that assessing the sustainability performance of their organization's IT function, hardware and software is critical to reducing their emissions.

And, while capturing and analyzing data on **energy consumption and carbon emissions** is most common, our study also reveals that focus is beginning to broaden out to take wider sustainability performance into account. Many organizations are now also collecting data on factors like e-waste and water consumption.

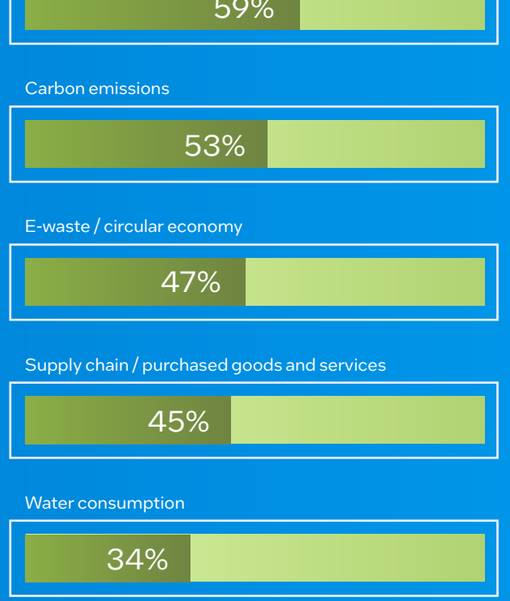
Sustainability Frontrunners

In companies with the most mature sustainability strategies, measurement is advanced and tech leaders are clear on the broader picture: 83% of senior IT leaders in sustainability frontrunner organizations say that they **personally understand how their organization's scope one and two emissions operate within the business overall and within the IT function specifically** (compared to 57% across all organizations). Many of these frontrunner organizations are also going a step further than measurement and are **externally reporting data** on a broad range of sustainability factors, including energy consumption, carbon emissions, waste and supply chain. This requires robust information management practices, particularly as ESG data faces greater scrutiny from both investors and government entities.

In terms of data related to the sustainability of their technology, organizations are beginning to measure factors beyond carbon emissions (senior IT leaders):



The factors that sustainability frontrunners are most likely to be externally reporting on, in relation to their use of technology:





"At Intel, we're championing a unification of carbon accounting methodologies as we believe that ideally, there needs to be one open-source solution for the industry at large to access.

"For example, we're a founding member of the Semiconductor Climate Consortium and are committed to collaborating on technology innovations, transparency of scope emissions, and setting decarbonization targets. We're also a founding member of MIT's Product Attribute to Impact Algorithm (PAIA) consortium, with a view to developing a common approach to calculating product carbon footprint for electronics.

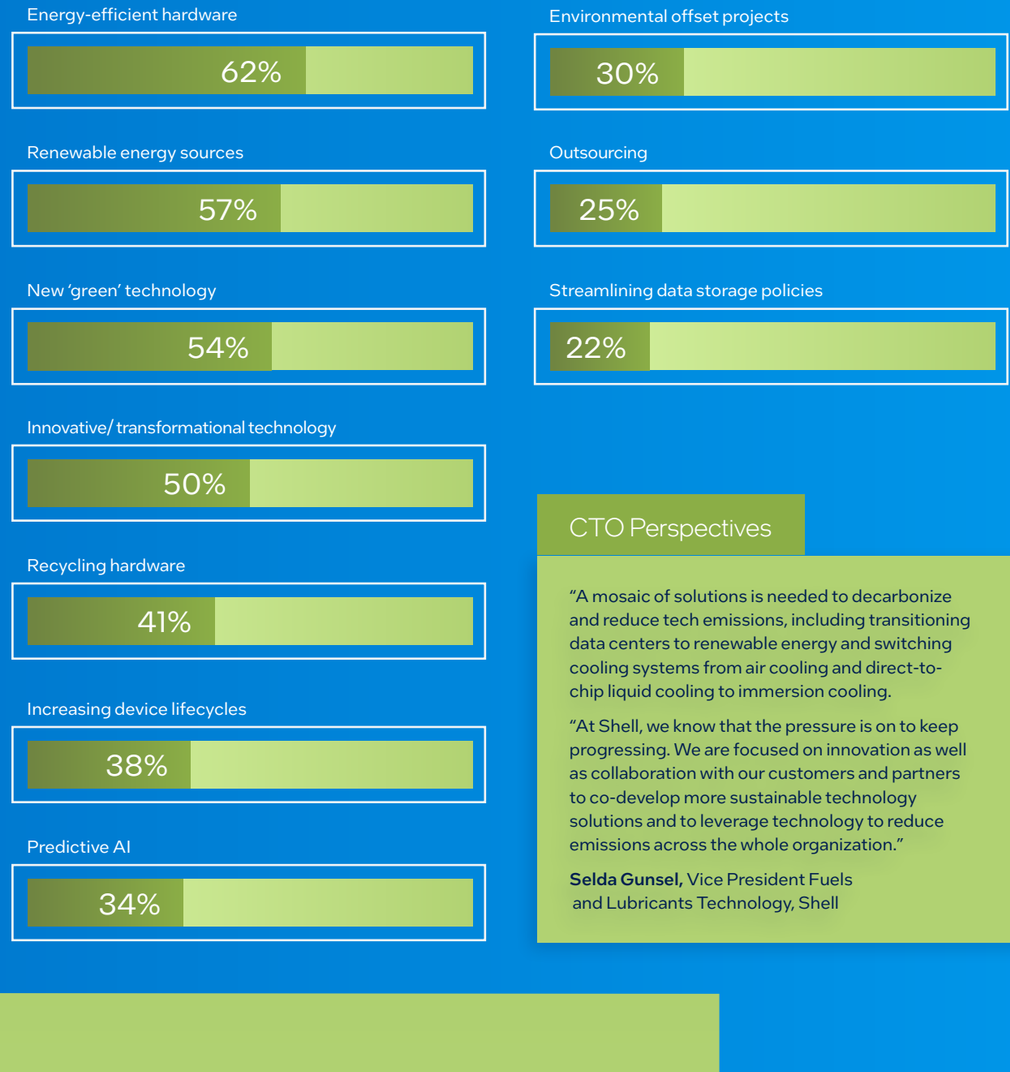
"The industry needs to be able to easily and accurately measure progress and have a clear understanding of its footprint, and the CTO can champion the importance of this, spearheading collaboration and encouraging adoption of a new, consistent approach."

Jennifer Huffstetler,
Chief Product Sustainability Officer, VP & GM
Future Platform Strategy & Sustainability

Investing in Tech Positive

When it comes to making investments to reduce IT-related emissions, **energy-efficient hardware is the focus**, with over six in 10 organizations (62%) investing in this area, followed by renewable energy sources (57%) and new 'green' technology (54%). Half of organizations are also investing in **transformational technology** like AI, IoT and robotics to reduce IT emissions, although this rises to **60% of sustainability frontrunner organizations.**

Top areas of investment for reducing IT-related emissions:



CTO Perspectives

"A mosaic of solutions is needed to decarbonize and reduce tech emissions, including transitioning data centers to renewable energy and switching cooling systems from air cooling and direct-to-chip liquid cooling to immersion cooling.

"At Shell, we know that the pressure is on to keep progressing. We are focused on innovation as well as collaboration with our customers and partners to co-develop more sustainable technology solutions and to leverage technology to reduce emissions across the whole organization."

Selda Gunsel, Vice President Fuels and Lubricants Technology, Shell

Building a Sustainable Supply Chain

Large organizations are increasingly scrutinizing their supply chains to ensure that partners do not derail their net-zero strategies, and sustainability is now a key driver of purchasing decisions when buying IT products and services.

Almost eight in 10 organizations (78%) – **rising to 87% of sustainability frontrunners** – review suppliers and partners through a sustainability lens and will cut ties with those that fail to positively contribute to their targets. Most organizations are also willing to pay more for 'green' products and services: 78% will pay a premium for an IT product or service that has strong sustainability credentials, compared to a product that is less sustainable to produce and use.

Senior IT leaders also tell us that **sustainability in use** – in terms of both reuse and recycling and energy efficiency – is the **top consideration for their organization when purchasing tech products and services**, rated above security, provenance, and financial cost.

The top considerations for organizations when buying IT products and services:

1. Sustainability in use
   - reuse / recycling / circular economy
2. Sustainability in use
   - energy efficiency
3. Security
   (including cybersecurity)
4. Provenance of imported tech that may pose a future threat to corporate or national security
5. Financial cost
6. Sustainable design
   (designs that are optimized for sustainability)

CTO Perspectives

"Tech recycling and device reuse needs more thought, many large organizations are addressing sustainability initiatives by donating used equipment to not-for profit organizations.

"While these programs enable connectivity and access to technology for individuals and organizations that need it, it can also inadvertently push the recycling responsibility to those organizations. It's worth examining the second life and ultimate recycling of that technology as part of the full life-cycle of equipment.

"As an industry, we need to support organizations in getting the data they need to assess and place a value on technology products designed for circularity. I am enthusiastic about the developments in our industry, leveraging advanced analytics to quantify equipment performance, energy consumption, life span and potential circularity in mission-critical environments."

Emily Martin, EVP, Converge Technology Solutions

Improving the IT Function's Sustainability Performance

When it comes to individual actions that IT departments are taking to boost the function's sustainability performance, our study shows that companies are largely focusing on **minimizing waste**; they are aiming to repair tech, keep equipment in circulation for longer, and encourage changes in user behavior to optimize energy efficiency. These efforts are a critical part of limiting e-waste and minimizing Scope 3 greenhouse gas emissions.

IT departments are also making hardware and processor adjustments – to improve sustainability, they are matching hardware to the right task, using optimal settings, and adjusting the type of processor used and the memory available. But other considerations like using renewable energy sources to power devices or choosing hardware based on energy usage are practices that are being deployed by a significant proportion of companies – some are even starting to implement sustainable software and sustainable code.

Practices deployed to improve the IT function's sustainability performance (senior IT leaders):

1. Minimizing electronic waste by repairing equipment when necessary — 64%
2. Minimizing electronic waste by keeping technology in use for longer — 59%
3. Educating employees in my organization about optimizing energy efficiency through user behavior — 54%
4. Adjusting the type of processor used and memory available, e.g. reducing memory — 50%
5. Using hardware on optimal settings and using the most appropriate hardware for each task — 44%
6. Powering devices using renewable energy — 40%
7. Re-using / redeploying electronic devices — 36%
8. Choosing hardware based on energy usage — 33%
9. Reducing the number of devices required by my organization — 30%
10. Utilizing sustainability-optimized software — 27%

CTO Perspectives

"There are three key things in my view. The first is simplicity. While there are lots of great ideas of how to improve efficiency, the simplest answers are often the most effective. Zombie servers, for example, continually consume energy and resources without performing useful tasks, so simply turn them off. The second is being pragmatic and looking for realistic solutions; for example, it may be better to invest in new sustainable technology than try to make old equipment behave differently than intended. The third is to activate change with the wider ecosystem in mind. Technology is just a subset of a much larger picture and we need to ensure gains in one area don't create a negative impact in another; for example, training on sustainability is good, but traveling across the globe for that training may not make sense with the carbon impact."

Brent Collins,
Senior Director, Data & Emerging Solutions, WWT

Summary

The Roadmap to Tech Positive

The real power of a sustainable CTO is not their ability to make IT more sustainable, but their ability to leverage IT to make the whole organization more sustainable. CTOs are under pressure to land tech zero and harness technology to effect the sustainable transformation of their organization and become tech positive. The rapid acceleration and adoption of AI adds to the challenge, due to the high computing power required, but could also provide solutions.

The study shows that CTOs are embracing their potential role as the greatest driver of sustainability in their organization: four in five (83%) aspire to become Sustainable CTOs. But the task ahead is significant. To meet the need for exponentially more processing power while also reducing emissions and energy usage, CTOs need the support of other business leaders to **align business, technology and sustainability strategies.**

Steps to tech positive:

1 Build skills to understand where to optimize

Almost half of senior IT leaders say that sustainability training for the IT and operations team is one of the most important factors for achieving net zero. IT leaders and their teams need the knowledge to devise strategies and understand where to focus resources and attention.

2 Get buy-in from the wider business

Sustainability skills and understanding are also needed beyond the IT and operations teams. Wider knowledge-sharing and interaction on sustainability across the business is critical for getting buy-in from across the organization on the role that tech can play in the journey to net zero.

3 Understand the data and optimize existing infrastructure

Data from existing technology – and from across the organization more broadly – can provide powerful insights that can help CTOs prioritize efficiency alongside performance to optimize operations and drive growth. Over half of senior IT leaders say that optimizing their existing technology is one of the three most important factors for net-zero success.

From a tech perspective, implementing data-driven optimization as processing demand continues to grow can increase the lifespan of technology and reduce buying cycles. Across the wider business, data insights can be used to inform growth strategies and help leaders understand where to invest – for example, by modeling the ROI of pilot schemes, or using digital twins to understand what emerging technologies best enable new products or services.

4 Plan for solution and software innovation

Once organizations have the training, knowledge and buy-in in place and have taken steps to optimize existing tech and data insights, CTOs can support growth and the sustainability strategy by developing their organization's tech infrastructure to enable new solutions.

This involves ensuring the right cloud infrastructure is in place to support current needs and future innovation, including IoT, AI and emerging climate technology; almost six in 10 senior IT leaders (57%) say that seeking green-accredited cloud providers is a critical step in the journey to net zero. It can also include building circular economy systems to re-manufacture or re-use end-of-life products to lower lifetime emissions and reduce waste.

Becoming a Sustainable CTO

As you embark on the path to becoming a Sustainable CTO – please visit our hub for more information: https://www.intel.com/content/www/us/en/environment/sustainable-cto.html

If you would like to join our growing community to share your insights and help the industry explore and deploy best-in-class sustainable technology, please get in touch for more information: TheSustainableCTO@manbitesdog.com

Methodology

The Sustainable CTO report is based on an independent, global opinion research study, and supplementary qualitative interviews with industry thought leaders (the Sustainable CTO Advisory Board).

The concept development and research design were carried out by Intel and Man Bites Dog, with the opinion research fieldwork conducted by Coleman Parkes Research.

Global opinion research – quantitative interviews

The opinion research sample consisted of 2,020 business leaders, including senior IT leaders (1,520), Chief Executive Officers (250), and Chief Sustainability Officers (250). Respondents were based across 22 markets and 11 sectors, working for organizations with a minimum turnover of $500m.

The interviews took place between February to March 2023 and were conducted under the ethical research guidelines set by both the MRS (Market Research Society) and ESOMAR.

The 22 markets were made up of:

- The Americas: USA, Canada, Brazil, and Mexico.
- EMEA: UK, France, Germany, Spain, Sweden, Belgium, Italy, Switzerland, UAE, South Africa, and Nigeria.
- APAC: China, Japan, India, Australia, New Zealand, Singapore, and Hong Kong.

The 11 sectors included:

- TMT, Financial Services, Healthcare and Life Sciences, Manufacturing, Transportation, Education, Public Sector, Professional Services, Retail, Travel & Hospitality.
- Global hyperscalers – we gathered opinions from 20 of the world's largest hyperscaler companies – cloud service providers that provide services such as computing and storage at enterprise scale.

The Sustainable CTO Advisory Board - qualitative interviews with industry thought leaders

In addition to the quantitative research, a series of seven in-depth interviews were conducted with Intel's partners and client community to provide a qualitative layer to the research.

- Rimma Iontel, Chief Architect Global Telco Team, Red Hat.
- Denise Lee Yeh, Vice President Engineering Sustainability Office, Cisco.
- Sunil Joshi, Vice President & Chief Technology Officer, Hybrid Cloud Services, Americas, IBM.
- David Bernstein, Distinguished Cloud Architect, Roche.
- Selda Gunsel, Vice President Fuels and Lubricants Technology, Shell.
- Brent Collins, Senior Director - Data & Emerging Solutions, WWT.
- Emily Martin, EVP, Converge Technology Solutions

The Advisory Board is chaired by Motti Finkelstein, Corporate Vice President – Digital Transformation Officer, Intel.

Resources

For more information about Intel's sustainability goals and progress please visit: www.intel.com/sustainability

About Intel

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To find out more

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