Microsoft

Sustainability. Good for Business.

Executive Playbook

2021 and beyond

Commissioned by Microsoft
and authored by EY

Preface

Sustainability is good for business.

The journey to sustainable transformation is one we must take together. And if you're reading this, then you've taken the first steps on that journey already. This executive playbook – commissioned by Microsoft and authored by EY – is designed to help you identify how sustainable transformation, and specifically the reduction of carbon emissions, can benefit your business as well as the environment.

As organizations of all sizes reevaluate strategy as a result of the Covid-19 pandemic, it's clear that deploying technology is key, both for accelerating economic recovery and ensuring we do so in a sustainable way. And as you will see, many organizations across Europe are already using innovative technologies to achieve more sustainable ways of working and reshaping the benefits of their endeavors. This playbook draws on their examples, as well as the insights of leading sustainability experts, to provide practical and inspirational guidance to business leaders.

In this executive playbook we explain why, and demonstrate that a focus on sustainability is a predictive indicator of company performance. And we show how six different roles across the C-suite can take immediate action to transform the prospects of their organizations and leave a positive mark on the world around them. With this playbook, I hope we will inspire business leaders to take action towards realizing a more sustainable and prosperous tomorrow.

Cindy Rose
President, Microsoft Western Europe

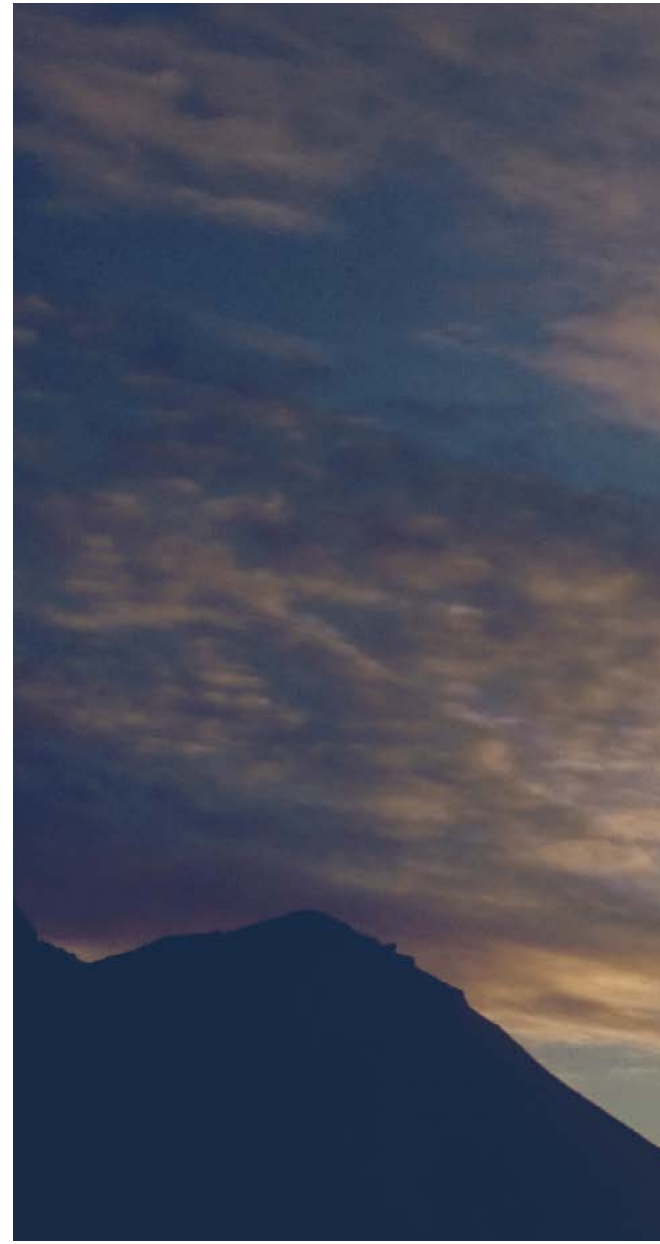


Table of Content

WHY THIS PLAYBOOK?

INTRODUCTION

TOPICS AND EMISSION SOURCES

INDUSTRIES

PRACTICAL GUIDES

CxO GUIDES

BEST PRACTICE EXAMPLES

CASES

LOOKING BEYOND

NEXT

About this report

Reading the interactive playbook online

For the best reader experience use the free software Adobe Reader. Interactive functionality may be limited when viewed in a web browser or on a mobile device.

Navigating the top panel

Click on any section in the top left panel to skip directly to the chapter. Use the top right icons to get back to the start and moving back and forth.

Go to Table of Content

Skip to previous or next page

Navigating key functions

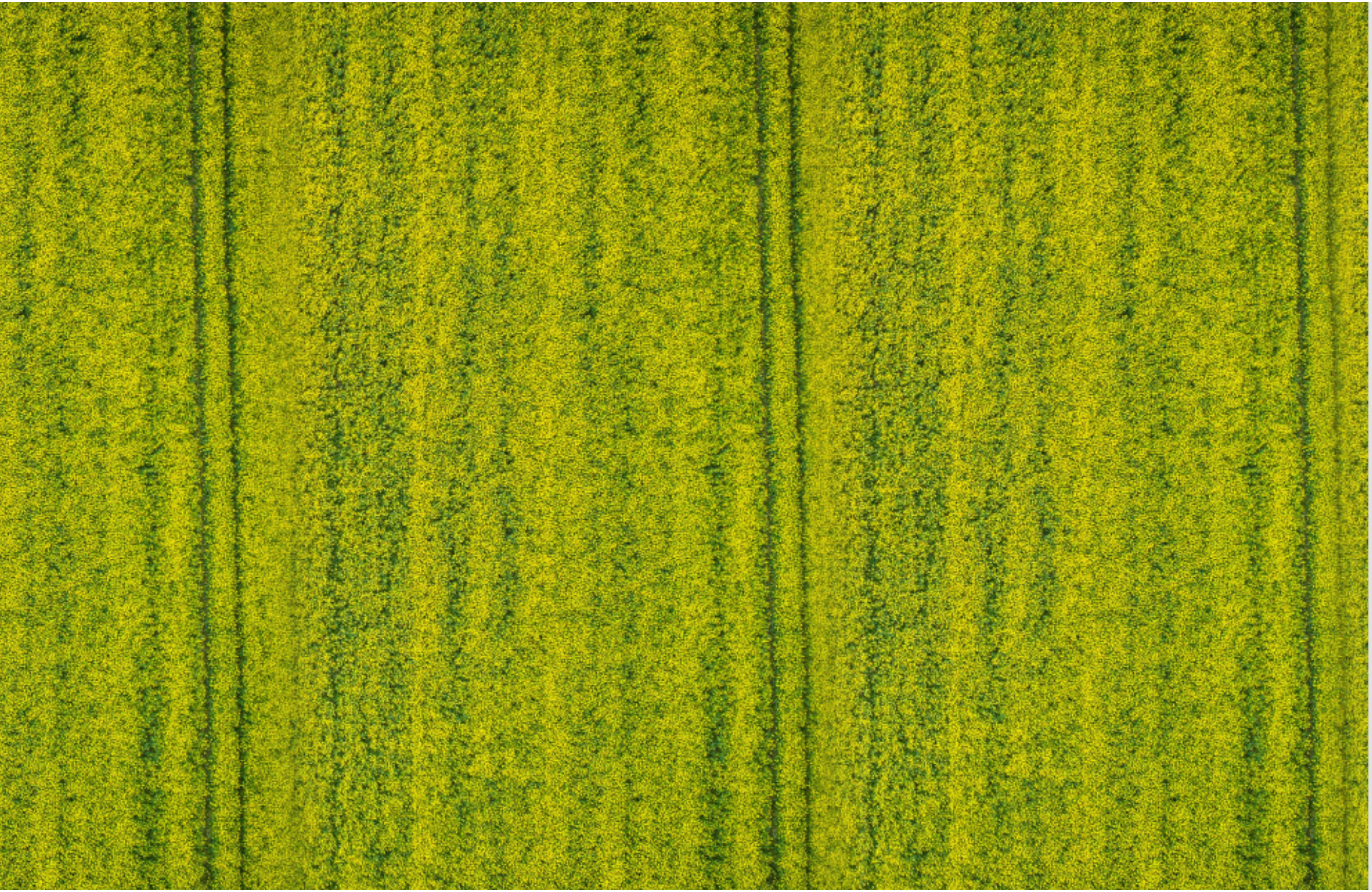
Click the icons throughout the playbook to access more information.

Link to another section of the report

Hover over for more information

Link to an external webpage

INTRODUCTION



"We should be taking a long-term perspective on all sustainability aspects and understand the systematic consumption of goods and services. Everything is a system, and you need to put in more than you take out."

CIO, AIB (Allied Irish Banks)

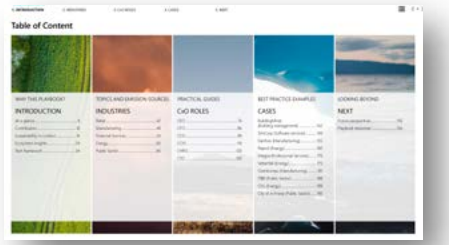
"The leading positions in a company are instrumental in accelerating the sustainability change."

HSQ&E Director, Ferrovial

Executive playbook at a glance

1. Technology can be used to fuel sustainable transformations

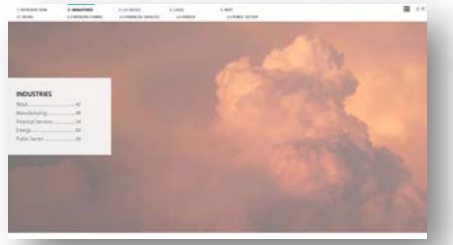
While the digital agenda and its potential role as a driver of transformational change is well documented, then it is clear from the interviews that there is more limited focus on using technology as an enabler to achieve sustainable results among corporations. The first part of the Executive Playbook explores how technology creates impetus for sustainability and presents key insights to sustainability transformations that business leaders will need to consider.



Find out more
Page 6

2. Significant differences in sustainability topics and focus areas between industries

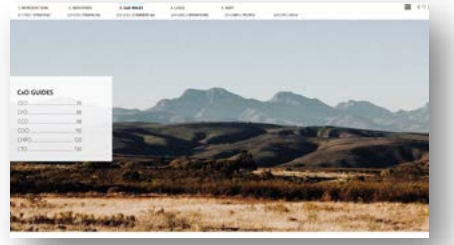
By assessing sustainability from different industry perspectives, it is evident that there are different sustainability focus areas across different industries. The second section of the Executive Playbook showcases key industry perspectives and insights to how different CxOs play different roles in driving the sustainability agenda forward.



Find out more
Page 38

3. C-level functions all have different roles to play to drive the sustainability transformation forward

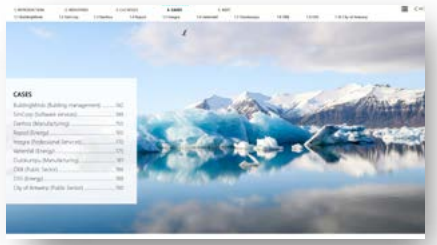
It requires the combined effort of the management team to drive the sustainability transformation across an organization. The third part of the Executive Playbook outlines what business leaders – including CEOs, CFOs, CCOs, COOs, CHROs and CTOs – should do to respond to the imperatives highlighted, including key priorities, best practices, latest insights and practical steps.



Find out more
Page 78

4. Sustainability is good for business

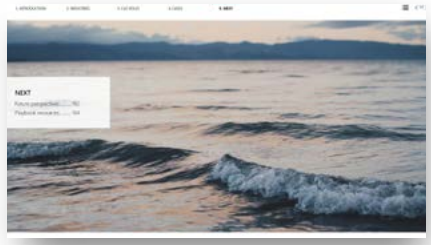
To get to the heart of why sustainability and digital strategy should be integrated, the Playbook showcases examples of companies that leverage technology to solve sustainability challenges and quantify both the carbon emission savings potential as well as the business case of tech-enabling the corporate sustainability agenda.



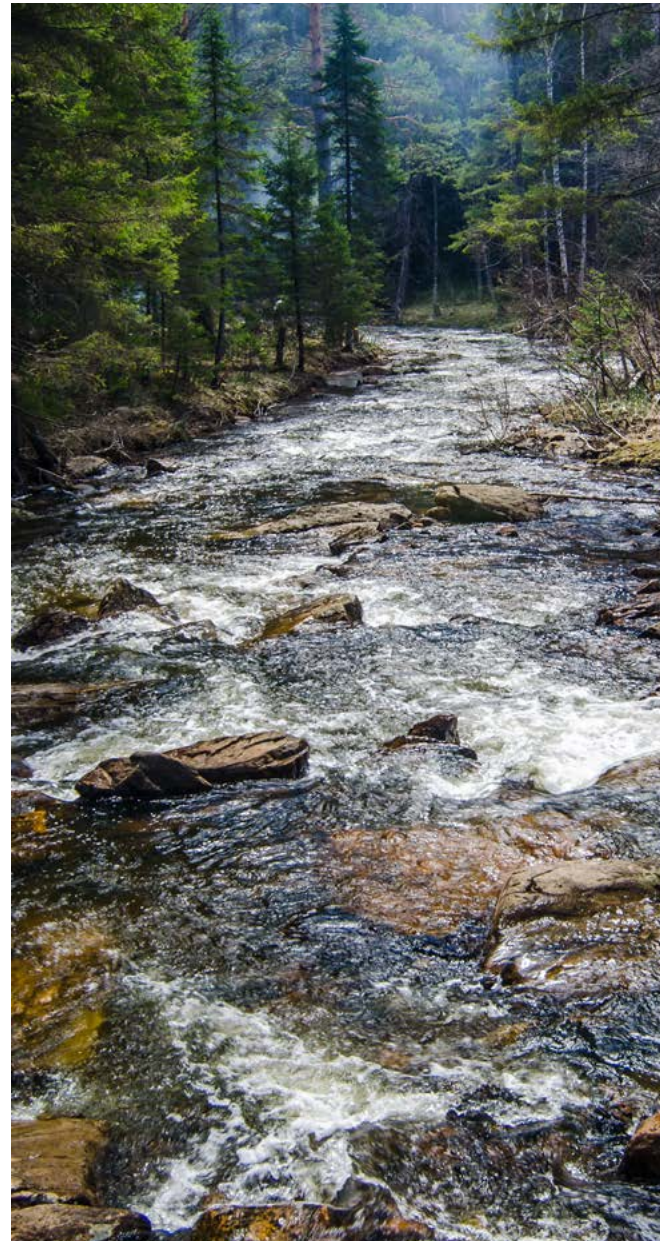
Find out more
Page 140

5. Next

In the last section of the Playbook, we propose a simple 7 step model to drive your sustainability transformation journey forward. Also we provide a repository of resources we have leveraged to develop the Executive Playbook. We hope the Playbook inspires you on how to move from ambition to action on your sustainability transformation journey.



Find out more
Page 191



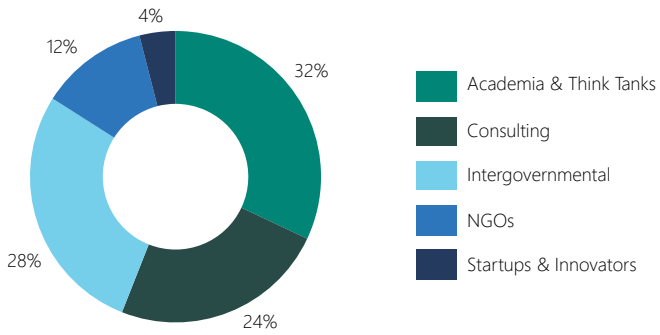
The insights, perspectives, best practices, and guidance in this Executive Playbook are based on interviews and input from sustainability thought leaders from intergovernmental organizations, academia and think tanks, startups and innovators, NGOs – and from discussions with C-level executives in more than 40 companies in different industries

Sustainability thought leadership contribution to the Executive Playbook

More than 65 thought leaders and corporate executives have contributed to the playbook

More than 25 sustainability thought leaders from well reputed European organizations, and C-level executives from more than 40 high performing companies, have contributed with input on how companies can work more sustainably to improve their environmental footprint, and to generate more sustainable business results.

Share of interviews



The thought leaders generally recognized the instrumental role that digital technologies should play in addressing corporate and societal sustainability issues at large, and called for companies across industries - including technology companies - to embark on a "Digital with Purpose" journey.

Among many ideas for C-level executives, regulators, and investors to consider, particularly three key elements were identified:

- Improve the public perception of the power of technology by telling the whole story, including both the benefits and negative externalities of technology.
- Upskilling and building capabilities among key decision makers to better deploy innovative technology to address sustainability challenges and opportunity areas.
- Support data sharing and analytics to derive better reasoning and sustainability decision support, and to quantify the true value and impact of digital solutions.

> "Digital technologies will deliver reductions in carbon emissions equivalent to nearly seven times the size of the growth in the total information and communications technology (ICT) sector emissions footprint over the same period."
>
> **Luis Neves, GeSi**

Intergovernmental

Global Enabling Sustainability Initiative
Luis Neves
CEO

World Economic Forum 2030 Vision
Maureen McDonagh, Director of Sustainability Arm, Senior Fellow World

International Energy Agency
George Kamiya
Digital/Energy Analyst

European Commission DG Joint Research Centre
Dr. Stefano Nativi
Big Data Lead Scientist

World Business Council for Sustainable Development
Aman Chitkara
Mobility Manager

European Committee for Electrotechnical Standardization
Kohler Constant
ICT Standardization Programme Manager

Academia & Think Tanks

Center for Corporate Reporting
Thomas Scheiwiller
Chairman of the Advisory Board

Cambridge Institute for Sustainability Leadership
Ben Kellard
Director of Business Strategy

HEC Paris
Jeremy Guez
Associate professor of Economics and International Affairs

ESCP Business School
Aurelien Acquier
Professor of Strategy & Sustainability, Department of Management

London South Bank University
Dr Deborah Andrews
Associate Professor, Design, School of Engineering

SITRA
Härkönen Tiina & Heli Parikka
Leading Specialists, IHAN - Human-driven data economy &IHAN - Fair data economy

Startups & Innovators

MapHubs
Leo Bottril
Founder & CEO

Operational Intelligence Ltd
Beth Whitehead
Associate Sustainability Engineer

NGOs

World Wildlife Fund
Dave Thau
Data and Technology Global Lead Scientist

STAND.Earth
Gary Cook
Global Climate Campaigns Director

Ouishare
Romain Barrallon
Project Manager

~65k
people following the thought leaders that have been interviewed for this playbook on social channels

Many of the best practices, and the identification of emerging challenges and opportunities for different C-level functions, in this playbook are the outcome of conversations with executives from more than 40 companies within the retail, manufacturing, financial services, energy and the public sector

Assessing sustainability through a C-level lens

Insights have been collected from a broad range of companies and across different C-level functions

To understand how executives are taking measures to enable sustainability strategies through the deployment of technology, application of data, and linking it to their general digital transformation, we interviewed more than 40 executives from various types of companies - large international corporates, as well as small and mid-sized local and regional companies. Additionally, a number of venture firms and start-ups were engaged to capture perspectives and insights related particularly to how sustainability can be advanced through data and technology.

To obtain a comprehensive perspective across different C-level functions, a broad array of diverse leadership roles were engaged. They range from company owners, CEOs, and Board of Directors members, to C-level functions responsible for Operations, Marketing, Finance, Digital, Technology, and Human Resources - as well as Sustainability.

Personal commitment and passion drive the sustainability agenda forward

Across the diverse set of interviewees it was evident that sustainability is not only a mere business necessity and priority, but often based on deep personal commitment, engagement and passion. Across industries, countries, and company sizes, and irrespective of whether the respective company was focusing specifically on CO_2 or pursuing a wider range of Sustainable Development Goals, most executives spoke enthusiastically about what they do to expand the opportunity for value creation through sustainable measures, on how they leverage technology and intend to deploy it in the future to develop new solutions with the potential to reshape their businesses, ecosystems, and society at large.

Click on each logo to visit company website

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Vast differences in organizations' approach to linking sustainability and technology

The interviewees' approach to utilizing technology to drive sustainability performance is two-fold. On one hand, we observed companies with a crystal clear business strategy which encompasses the prime sustainability purpose underlined by how technology will help them get there. On the other hand, we see firms where technology driven sustainability performance improvements are rather happening bottom-up, sometimes even opportunistically, based on the intrinsic motivation and passion of the employees.

Dissecting each CxO role on how to drive technology enabled sustainability performance, provides a deep understanding on how personal commitment, passion as well as acting as a member of a joint leadership team is indispensable to transform the entire company towards a tech-savvy, sustainable company.

> "Everyone, as part of the executive committee, must have sustainability and technology on their minds."
>
> **HSQ&E Director, Ferrovial**

> "A big responsibility is at board of director level of a company to select the right leadership team with the right mindset and experience in technology and sustainability."
>
> **Commercial Director, SPARTA Dynamics**

> "The essential step to becoming a truly sustainable company is to transform the core business model. A business model that is based on simply selling more products can never truly become sustainable."
>
> **President, Bayer France**

The appointment of Chief Sustainability Officers into the executive level depicts a transition from being responsible for monitoring companies' sustainability performance to becoming strategic change agents that champion how companies improve their overall innovation and business performance

Chief Sustainability Officers are the new breed of corporate value engineers

Entering the C-level with a business value-led approach

As the sustainability transformation is making its mark on companies across industries, adding pressure from new types of stakeholders and challenging existing profit pools while creating opportunities to open new ones, companies are increasingly forced to respond effectively with new types of solutions and tech-enabled approaches.

Doing so is good for business. Research from multiple sources indicates that sustainability front runners have a lower cost-of-capital, deliver superior equity market returns, get easier access to new markets by creating new types of products and services, and/or are better at managing risk and ensuring more resilient operations.

To champion these efforts, companies are increasingly welcoming a new strategic change agent into the C-level - the ***Chief Sustainability Officer (CSO).***

Transforming rapidly from what was once a role focused on communicating, liaising with non-traditional stakeholders, and ensuring compliance with reporting standards, the role is increasingly being integrated into the core of the business in ways that fundamentally transform the company.

These change agents possess a new set of skills to create value for the companies and ecosystems in which they serve. Most predominately they anticipate how social expectations, regulatory frameworks, and business environments will evolve, and actively engage in defining corporate responses to potential challenges and to unlock new profit pools.

Read more about the CSO's link to the strategic agenda in the CEO section

Future corporate change agents

"The role of the CSO is changing fundamentally, from reporting about sustainability to driving sustainability performance and bringing everyone in the company together to foster sustainability improvements."

- Managing Director, digitalswitzerland

"The most relevant point is to keep working on sustainability, having a clear vision of the middle and long-term and embedding sustainability in the business portfolio."

HSQ&E Director, Ferrovial

Source: Harvard Business Review, The Path to Corporate Responsibility

From compliance, to efficiency, to ultimately championing business innovation

Interviews with sustainability thought leaders outline how the CSO role is transitioning from an inward perspective to an outward focus, suggesting three key change areas:

- Placed in an executive position, to be consulted by other business functions looking to understand future requirements, and to assert ambitious solutions for how to respond
- Increasingly involved early stage as a key stakeholder in strategic projects, to assert influence over the future direction of the core business ("one that the CEO always want to invite")
- Striking the balance between deep sustainability domain expertise and having sufficient strategic altitude and business acumen to prove how sustainability initiatives generate value

Championing the sustainability transition typically goes through five learning stages:

Defensive: Ad hoc protection against attacks that could affect sales and introduce risk

Compliant: Adopting policy based compliance approaches as a cost of doing business

Managerial: Embedding societal issues in core management practices and daily operations

Strategic: Enhancing economic value by aligning strategy and innovation with societal issues

Civil: Promoting broad industry participation and realize gains through collective action

Source: Harvard Business Review, The Path to Corporate Responsibility

EXAMPLE

In retail, the CSO's involvement is in the product/SKU strategy

CSOs should be part of the overall product and SKU strategy in retail, i.e. defining procurement parameters together with the organization, since the majority of emissions stem from purchased goods and services. They are not responsible for ensuring that business functions succeed with sustainability measures, which is ultimately a controlling compliance function.

Read more about sustainability in retail

Carbon reduction is directly linked to six of the UN Sustainable Development Goals, and takes a central role in how companies are developing strategies and taking concrete steps to reduce carbon emissions and to improve their footprint

Linking the UN Sustainable Development Goals to carbon emissions

United Nations' Sustainable Development Goals are at the heart of sustainable transformations

In 2015, all 190 United Nations (UN) Member States adopted the 2030 Agenda for Sustainable Development, a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs) and 169 SDG targets.

The SDGs are an urgent call for action by all countries – developed and developing – in a global partnership. They recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve oceans and forests.

Technology plays a vital role in reaching the SDGs

Technology holds an incredible potential to power a sustainable transformation by increasing the productivity of systems while simultaneously lowering emissions, reducing waste, monitoring resources, collecting and harnessing vast amounts of data and making breakthrough advances to drive the sustainability agenda further across all sectors.

To exemplify the role of technology in reaching the SDGs, this playbook includes a case section, where you will find examples on how technology can contribute to a more sustainable agricultural sector (SDG 2), increase the adoption of renewable energy (SDG 7) and even help to improve sustainable infrastructure (SDG 11).

Find out more
Page 140

Read more about the SDGs

CxOs can leverage technology solutions to reduce carbon emissions and improve sustainability

While the majority of technology solutions discussed in this playbook focus on carbon reduction, there is a clear link from the carbon agenda to reaching other SDGs. This is exemplified by the connection of SDG 7, 12, 14 and 15. More specifically, the majority of the carbon emissions comes from SDG 7 and 12. If emitting more, a rise in the temperature will follow, which in turn will affect biodiversity, therefore indirectly affecting SDG 14 and 15.

According to the interviewed thought leaders, digital technology solutions can play a vital part to reach several of the SDG targets, hence also in the SDGs with a particular role to play in reducing carbon emissions, either directly or indirectly.

Reducing carbon emissions using technology align with the global SDG agenda, exemplified by the following goals

Hover over SDG boxes for more info

> "Of the 169 SDG targets,103 are directly influenced by ICT technologies, with established examples of deployment that provide insight into their potential to make an impact. Analysis of 20 targets and their indicators across the SDGs shows that the expected deployment of existing digital technologies will, on average, help accelerate progress by 22% and mitigate downward trends by 23%."
>
> **Luis Neves, CEO GeSI**

> "Our ambition is to fully align our innovation portfolio to meaningfully advance the United Nations SDGs. By 2030, 100% of our innovation projects, which are enabled by technology, will contribute to the SDGs."
>
> **Strategic President EMEA, DuPont**

The concept of Scope 1, 2 and 3 emissions was initially introduced by the Greenhouse Gas Protocol (GHGP) and provides a comprehensive framework to understand, quantify and measure the impact resulting from carbon emissions

Understanding carbon emissions across scope 1, 2 and 3

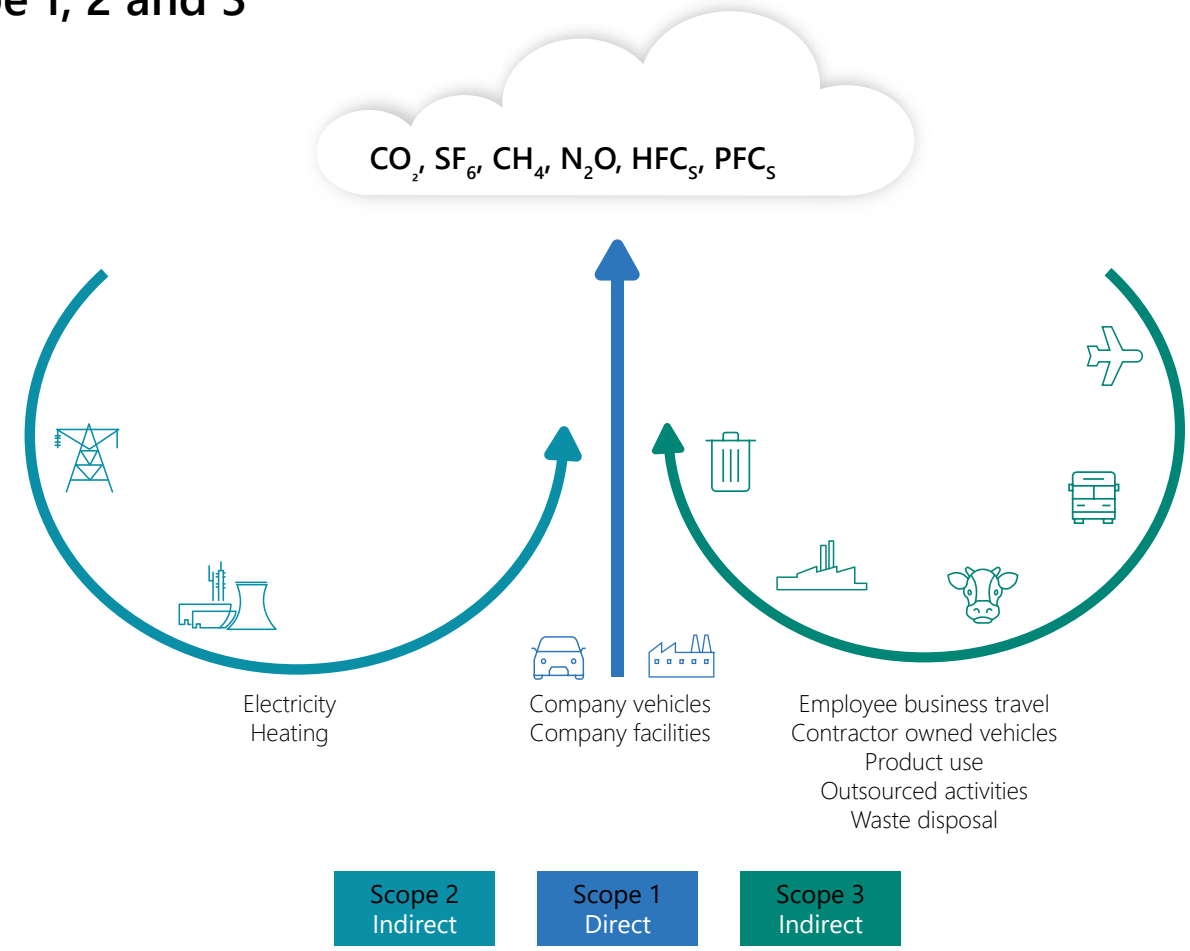
Hover over figure for more info

CxOs must be aware about Scope 1, 2 and 3 emissions

Organizations' greenhouse gas emissions can be classified in three scopes according to the leading Greenhouse Gas Protocol corporate standard. Scope 1 covers the organization's direct emissions from sources it owns and controls. Scope 2 covers its indirect emissions from the generation of purchased energy. Scope 3 covers the organization's indirect emissions from sources owned by others.

All scopes are important for assessing sustainability efforts and risks related to carbon emissions

To assess the risks and opportunities related to climate change, companies have to gain a detailed understanding of where the high greenhouse gas emissions sources are across their value chain. The longstanding focus on Scope 1 and 2 emissions, mainly driven by regulatory requirements, is now shifting with increasing expectations for companies to report their Scope 3 emissions, often comprising the greatest share of their carbon footprint.



Business executives should consider sustainability and low-carbon initiatives as key levers in the 'long-term value strategy' - and approach it in five key steps

How CxOs should think sustainability into their long-term value strategy

The five step long-term value framework can help companies embed sustainability in strategy

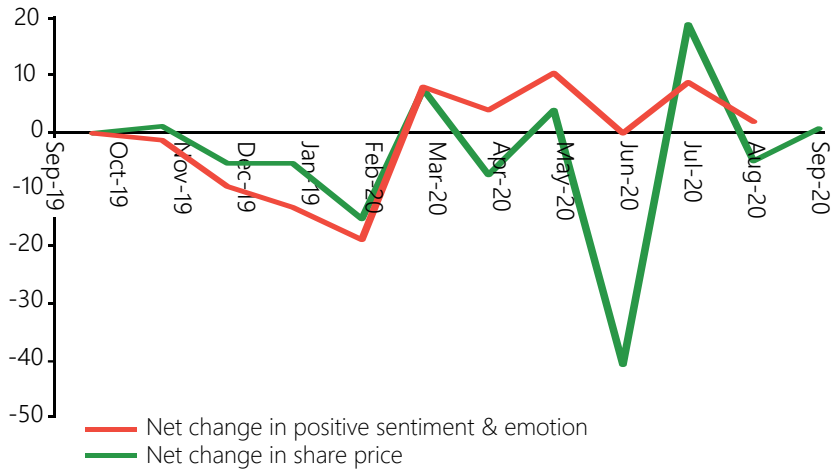
Successful sustainability strategies are value led. In next horizon strategy approaches, "value" is expanded much beyond the traditional financial performance indicators to the holistic set of benefits resulting from the company's products, services, operations, and general set of activities.

Successful corporate strategies are based on a balanced set of value objectives – financial, consumer, human, and societal value. To develop future proof strategies, all strategic options should be stress-tested for value and risk, linking P&L with balance sheet. A five step framework suggests how sustainability should be embedded in strategy development, and how ecosystem impact is imperative to long term value creation.

> "How businesses embrace opportunity in the transition to net zero and build resilience to a changing climate is crucial to the creation of long-term value."
>
> **Mathew Nelsen, EY Global Leader for Climate Change and Sustainability Services**

Figure **Share price performance are linked to consumers net sentiments on sustainability**

Correlation between consumers net sentiment* and company share price for global chemistry player, indexed
Source: EY analysis



*Consumers net sentiment are calculated based online mentioning of key sustainability topics as 'climate changes'; 'sustainability'; 'Greenhouse gas emissions'; 'carbon foot-print'; 'renewables'; 'supply chain transparency'; 'deforestation', etc.

INTERVIEW

Measuring long-term value

Nothing is more practical than a good theory. Learn more about how to measure long-term value with Barend van Bergen, EY Global Long Term Value Methodology Leader, and Monique Donders, Country Manager at BlackRock

Read the interview

Learn more about long-term value based strategy

Anchoring in the future	Long term value approach	Balancing value and risk	Implementing in a resilient way	Measuring ecosystem impact
				
Objectives				
Analysis of tomorrow's world Sketch possible 'future worlds' and the relevant drivers of long-term value.	**Four dimensions of value** Define long-term value (LTV) objectives to derive the company's strategic options.	**Profit and balance sheet** Develop a clear view on prioritized value potentials and associated risks of strategic options.	**Resilience assessment** Develop resilient ways of implementing strategies options along all dimensions.	**Holistic impact measurement** Document ecosystem impact, and mitigate deviations for continuous improvement.
Embedding sustainability in the company's strategic response				
Assess **sustainability** megatrends, and outline how resource scarcity, climate change, natural disasters, etc. - as well as new technological breakthroughs can impact the future, and consider post COVID-19 scenarios to identify risks and opportunities ahead.	Map strategic options to maximize long-term value across stakeholders and value dimensions - i.e. financial value, consumer value, human value, and societal value (measured as **environmental** impact, and social contribution and economic contribution).	Pursue societal value from a risk prevention perspective, i.e. **low-carbon** solutions (e.g. particularly transport, chemicals), **biodiversity** protection and **deforestation** prevention, and **resource** efficiencies (e.g. pollution and circular waste reduction mechanisms).	Implement resiliency by focusing on strategic options that best fit company capabilities, culture and ability to embrace change, have the mostfavorable impact on the **company's ecosystem**, and hold the least risk of adverse reaction from one or more stakeholders.	Execute across people, culture, processes, and technology, and continuously measure the holistic societal value and impact across employees, suppliers, investors, customers, and the surrounding ecosystem of governments, regulators, and **society** at large.

At Microsoft, sustainability is embedded into the company DNA and has led to significant strategic commitments, reinvention of products and operations, and fueled innovation across the organization - particularly within four areas of focus: Carbon, Ecosystems, Water and Waste

Microsoft is raising the bar on ambitious climate targets

Microsoft commits to become carbon negative and it is driven by innovative climate solutions

As part of Microsoft's commitment to become carbon negative, $1 billion will be invested over the next four years in new technologies and innovative sustainability solutions such as direct carbon removal, digital optimization, advanced energy systems, industrial materials, circular economy, water technologies and more.

Microsoft has already achieved significant progress across sustainability initiatives

- Reduced company emissions by 15.6 million tons of carbon dioxide equivalent.
- Directly purchased more than 1.9 gigawatts of new wind and solar energy.
- Every year recycled nearly 10 million kilograms of consumer e-waste.

The Building Blocks for Net Zero Transformation

Microsoft has developed a *practical guide on how to embed net zero aspirations and actions within and across your business*. The report highlights concrete actions to take along the value chain to take your sustainability agenda to the next level and become a net zero business before 2050.

Carbon

Microsoft's goal is to promote sustainable development and low-carbon business practices globally through sustainable business practices and cloud-enabled technologies.

Read more about Microsoft and carbon

Ecosystems

Microsoft is building the tools and services to help anyone, anywhere better understand the ecosystem around them, and monitor and model impacts from climate or human behavior.

Read more about Microsoft and ecosystems

Water

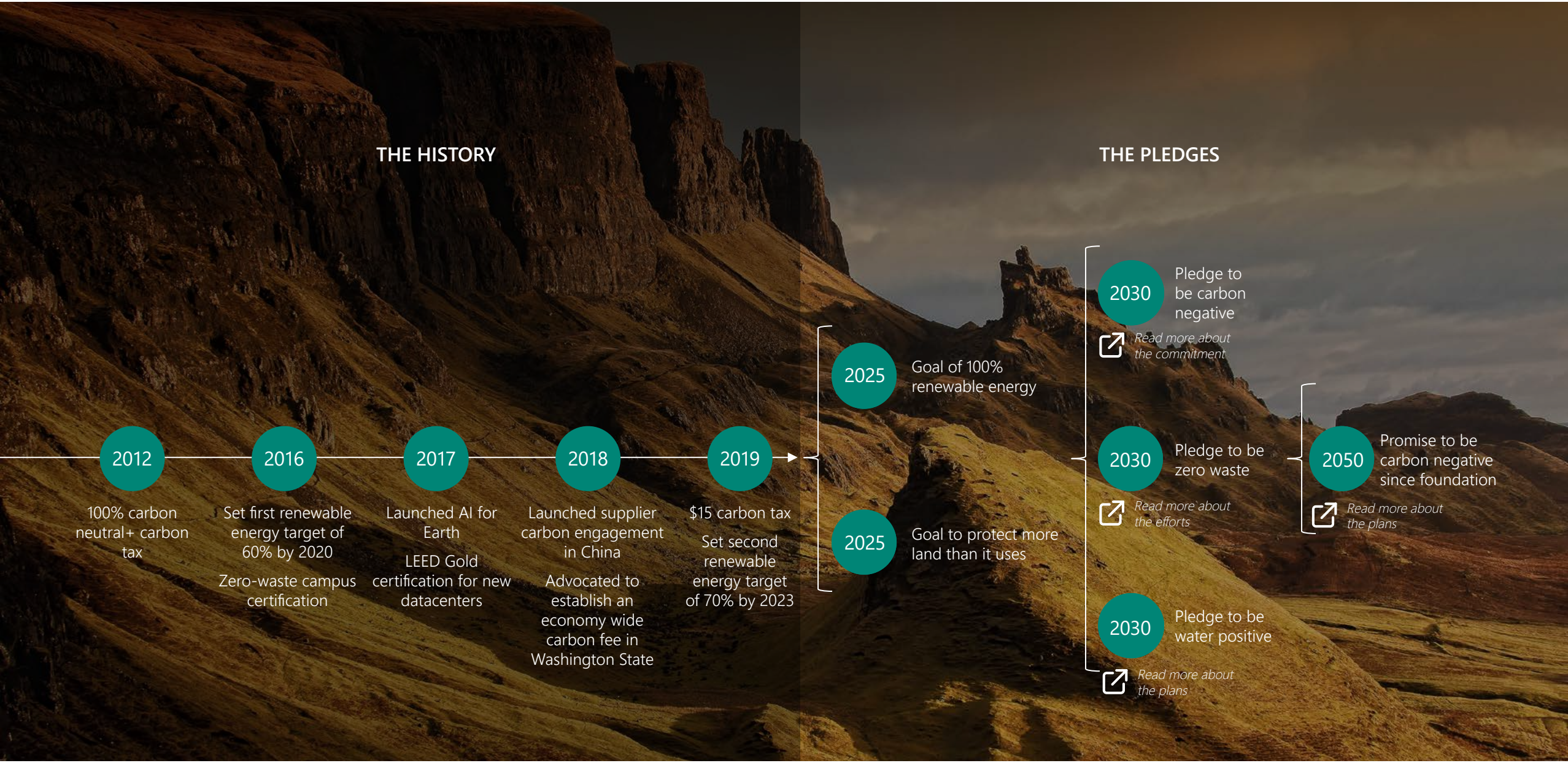
Microsoft is creating and employing tools to help address the world's water challenges including scarcity, pollution, and ocean health.

Read more about Microsoft and water

Waste

Microsoft believe that every device should be made with an emphasis on sustainability and aim to continually improve all products. All waste is treated with environmentally responsible methods and eliminated through material reuse and recycling.

Read more about Microsoft and waste



THE HISTORY

2012
100% carbon neutral+ carbon tax

2016
Set first renewable energy target of 60% by 2020
Zero-waste campus certification

2017
Launched AI for Earth
LEED Gold certification for new datacenters

2018
Launched supplier carbon engagement in China
Advocated to establish an economy wide carbon fee in Washington State

2019
$15 carbon tax
Set second renewable energy target of 70% by 2023

THE PLEDGES

2025
Goal of 100% renewable energy

2025
Goal to protect more land than it uses

2030
Pledge to be carbon negative
Read more about the commitment

2030
Pledge to be zero waste
Read more about the efforts

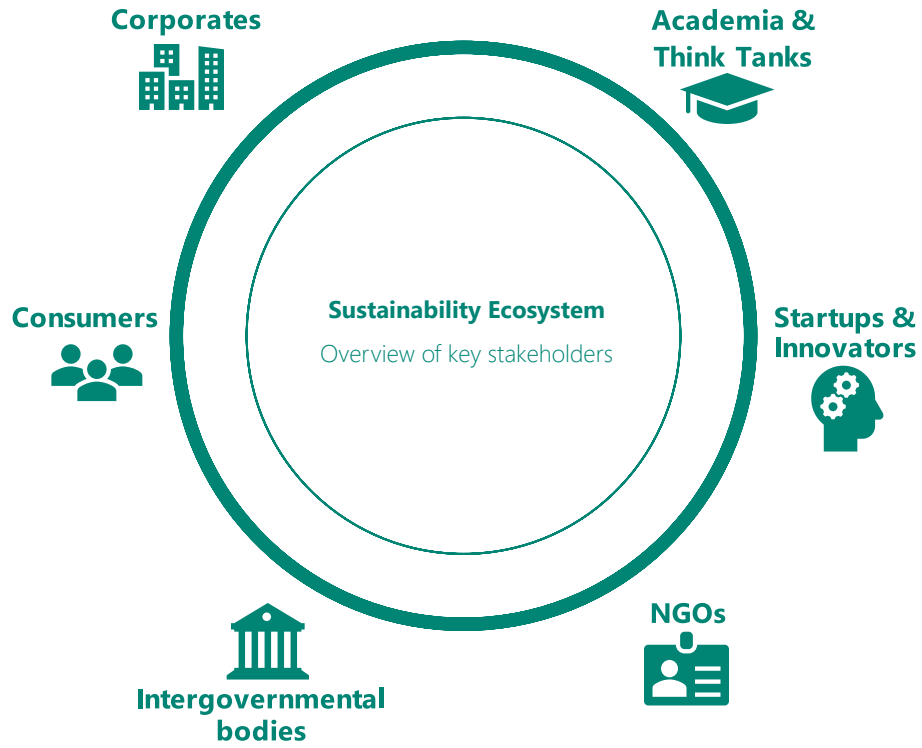
2050
Promise to be carbon negative since foundation
Read more about the plans

2030
Pledge to be water positive
Read more about the plans

Gathering insights from a broad range of key stakeholders in the sustainability ecosystem across Europe has led to five key imperatives that C-level executives working to improve their sustainability strategy will need to consider if they are to transform sustainability ecosystems, and communities

Overview and insights from the sustainability ecosystem

Hover over each stakeholder in the ecosystem for more info



5 key insights from thought leaders

Transforming sustainability requires working in an ecosystem with a broad range of stakeholders

When wanting to transform your sustainability agenda, working in an ecosystem is needed - for three main reasons: Firstly, because information and data needs to be exchanged. Secondly, for the learning effect and general sharing of experiences. Thirdly, for the possibility of co-developing solutions.

To maximize the potential of transforming your sustainability agenda, the ecosystem should ideally consist of a broad range of stakeholders stemming from a mix of corporate companies, consumer involvement, intergovernmental bodies, NGOs, startups and innovators, and academia and think tanks.

Working in such ecosystems imposes a new set of dynamics for CxOs to navigate, and an entirely new set of capabilities to master. This will be a learning exercise for executives in many companies, and one which the Chief Sustainability Officers must play a significant role in. Both in terms of making the future requirements clear, of ensuring that the company is engaging with relevant stakeholders and ecosystems, and in upskilling C-level colleagues to embrace and adopt a new set of capabilities.

Sustainability and digital transformations should be connected, not separated

Executives must increasingly connect how they approach their digital and sustainability transformation programs, and embed both in coherent strategies, blueprints, and roadmaps to achieve their overarching long-term value objectives

Find out more
Page 26

Increased sharing of sustainability data is key for progress and transformation

As data continues to grow in importance and takes on an increasingly pivotal role in the progress and transformation of sustainability, executives must find more optimal ways of gathering, handling, and sharing data in a sensible and standardized way

Find out more
Page 28

Capability building is required to expand the scope of sustainable opportunity

In order to properly tackle climate change, C-suites need to build the necessary capabilities themselves - also with regards to fully leveraging the novel digital technologies that are arising - while laying a foundation for broader development of the workforce

Find out more
Page 30

Corporate leaders must prepare for increased levels of scrutiny

With increased public attention on companies' sustainability performance, corporate leaders must be prepared to navigate thoroughly and accept that all steps taken on individual and company level are open for scrutiny at a previously unthinkable level

Find out more
Page 31

Executives must be prepared to enhance their support to regulators and push for increased regulation

With regulatory action increasing within the sustainability domain, corporations can no longer neglect their role in contributing to the development of future frameworks and policies, particularly within the application of data and digital technologies

Find out more
Page 32

Executives must increasingly connect how they approach their digital and sustainability transformation programs, and embed both in coherent strategies, blueprints, and roadmaps to achieve their overarching long-term value objectives

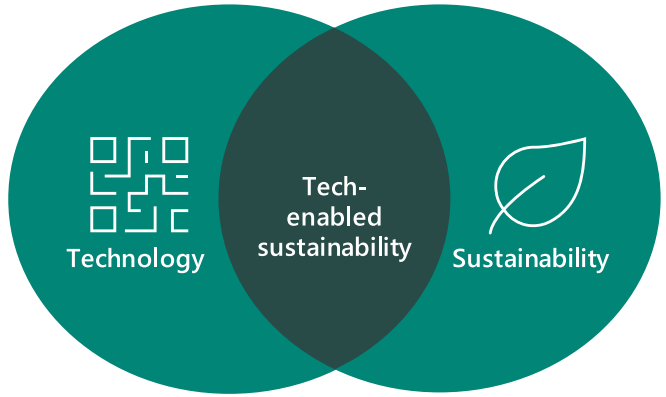
Sustainability and digital transformations should be connected, not separated

Hover over the figure for more info

Although digital and sustainability are both seen as top strategic priorities, a systematic combination of the two is often lacking

Sustainability and the deployment of digital technology are both increasingly C-level priorities with dedicated leadership and significant allocation of resources to achieve clearly defined objectives in different areas of the business.

However, although many great cases and solutions exist where technology is enabling sustainability performance, there is still a significant need to increasingly approach these two domains jointly through a strategic, conceptional and systematic framework where they are combined to unlock growth, drive efficiency gains, and create new opportunities. Doing so should be a C-level priority in most companies when looking ahead.



"We see significant potential for technology-enabled sustainability, e.g. for resilience, including the reduction of emissions, and cybersecurity or efficiency through digital technologies and innovation."

Head of Network Commercial Operations, Viesgo

"The merge between technology and sustainability has opened us to new business models and opportunities that did not exist before. Particular in the context of circular economy and the transitions from products to services."

HSQ&E Director, Ferrovial

Source: GeSi

Sustainability needs to be enabled by technology, and vice versa

So far, the use of data, technology and digital solutions to generate substantial sustainability impact has mainly focused on efficiency gains - i.e. through less use of energy and resources, AI for smarter decision making, circulation of materials based on transparent supply chains, etc.

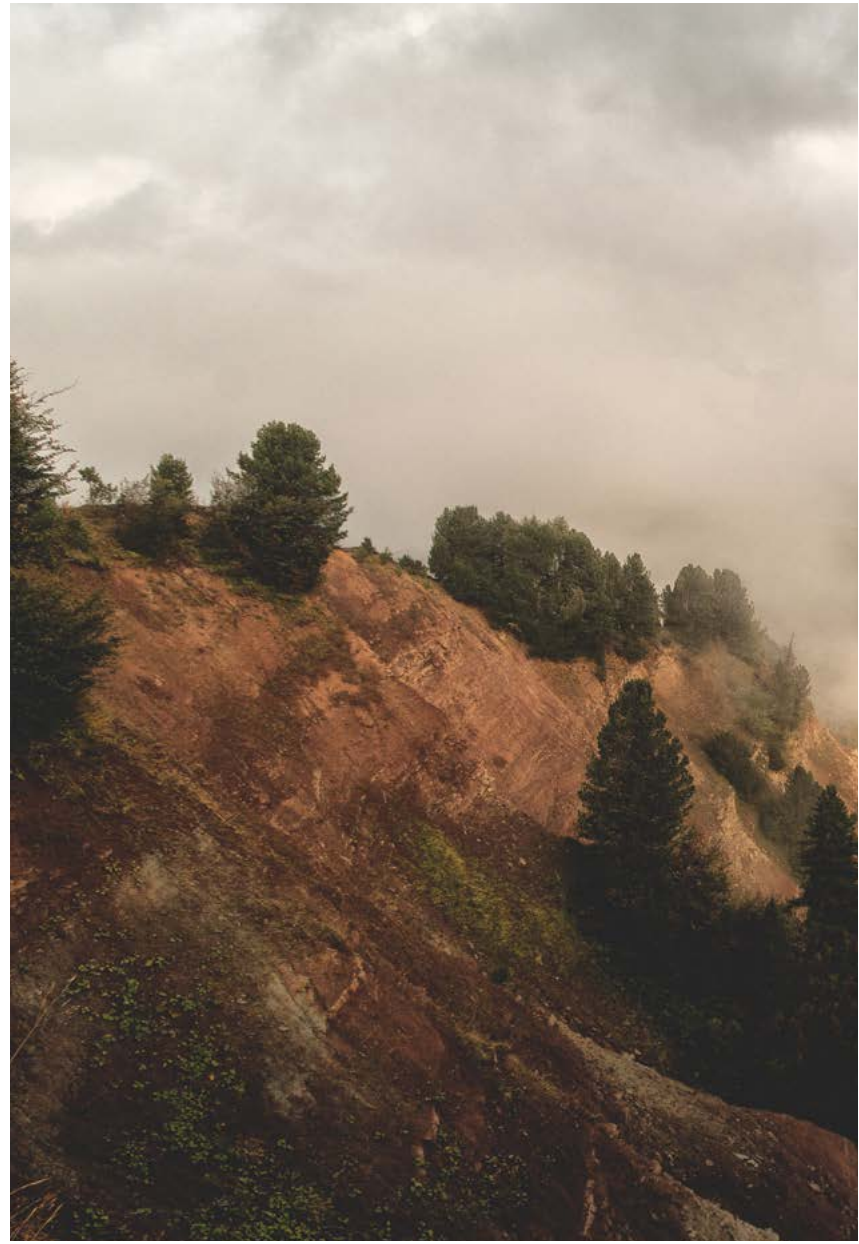
Looking beyond, deploying technology to create new sustainable products, services, business models, and experiences in a way that helps accelerate SDGs perhaps holds the most promising business potential.

Finding ways to do so, and ensuring the reciprocal relationship between tech and sustainable transformations, should be a pivotal C-level priority in the future.

Go to page 38 to learn about industry differences

Technology has the potential to generate sustainability gains in all sectors

- In the retail and consumer product sector, the increasing use of digital solutions enables greater transparency on environmental and social impacts of companies' supply chains. This includes, for example, providing real time information on companies' upstream carbon footprint that addresses emerging consumers expectations.
- In the smart climate agriculture space, digital solutions play a center role to address water scarcity and shortage as well as yield decrease.
- For strategic infrastructures and buildings exposed to more frequent and intense extreme weather conditions, digital solutions contribute to increasing their resilience and to reduce economic impacts.



Source: GeSi

As data continues to grow in importance and takes on an increasingly pivotal role in the progress and transformation of sustainability, executives must find more optimal ways of gathering, handling, and sharing data in a sensible and standardized way

Increased sharing of sustainability data is key for progress and transformation

Data has become the sustainability raw material of the modern age

Data has become the means to increase operating efficiency and a driver of added value in organizations and more broadly. There is a great opportunity under the European data strategy to showcase the benefits of creating the European data market. A potential leading role for companies in the forefront, particularly data generating and technology enabling companies, is up for grabs.

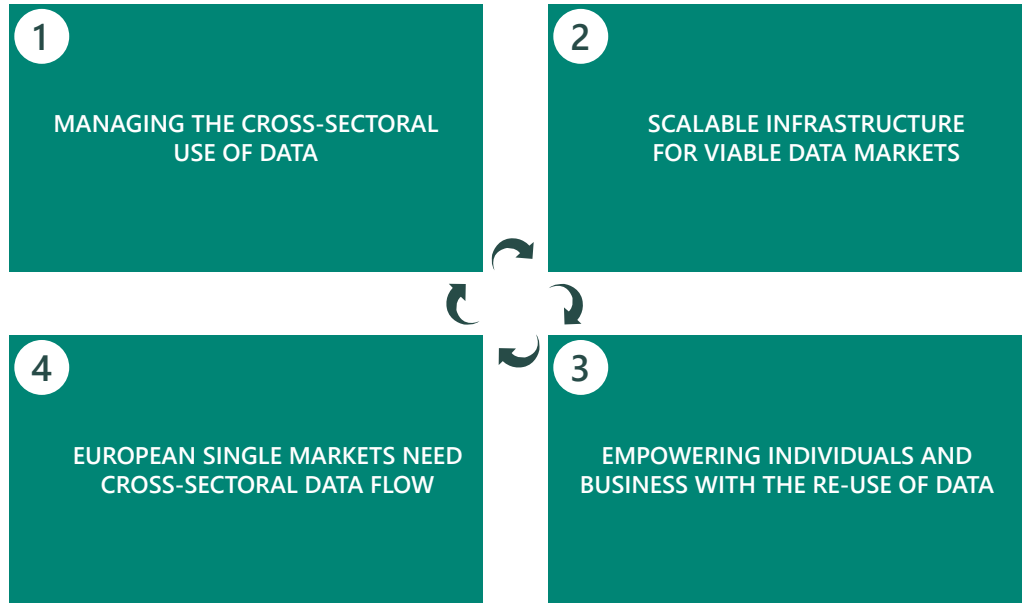
However, the thought leader interviews clearly emphasize that appropriately framing the debate in relation to the type of data economy wanted is critical and most certainly urgent.

Sharing sustainability data across the ecosystem will be key in the future

A specific example is in the transportation sector, where data sharing is instrumental to understand commuters behaviours and enable the various users of transport infrastructure to optimize their fleets and routes better, thereby reducing emissions related to and contributing to the advent of smart cities.

Overall, an increase of data sharing paves the way towards better data integration, which offers lots of promise. Indeed, data integration will enable the coordination of general data and more specifically the analysis of environmental data in a unified way, which will reduce the heterogeneity of impact assessments, and in turn give more value to the produced data across the spectrum.

On the other hand, this will require acceptable policies with regards to the individual rights of the data holders and access to this data, and to the standards associated with the purpose for which this data is put to use.



Framework to facilitate the sharing of data for sustainability benefits. Developed by the Finnish Innovation Fund Sitra as part of the IHAN project seeking to build the foundation for a fair data economy

Read more about the Sitra framework

Hover over the figure for more info

Source: Sitra

> "Sitra recommends and sees it is important that the European Commission, EU member states, different data sharing initiatives and research works towards implementing the EU data strategy by concentrating on four main topics: developing the management of cross-sectoral use of data, creating a scalable infrastructure for viable data markets, activating individuals and businesses to share data and developing data spaces."
>
> **Jaana Sinipuro**
> **Project Director, IHAN – Human-Driven Data Economy, Sitra**

> "Policymaking will be essential to enable and scale data sharing to help create societal and business value. We need to create a common understanding of a policy framework to improve mobility in cities and deliver positive impacts in carbon emissions, transport efficiency, safety of passengers and local communities and, accessibility to transport services, and for businesses to find new sources of value."
>
> **Aman Chitkara, Mobility Manager, WBCSD**

In order to share sustainability data, the handling of it must be both sensible and standardized

There is a need for educating companies on data sharing practices, benefits and safeguards, as a current knowledge gap is generally present. Currently, there is an opportunity for companies with expertise within data ecosystems to educate companies and to provide the skills that companies need to truly blossom.

However, not everything needs to be captured in data, but merely the required data, in order to avoid unnecessary Greenhouse Gas emissions. Yet, data management aspects need to be considered when handling private information.

In order to properly tackle the climate change, the C-level needs to build the necessary capabilities themselves - also with regards to fully leveraging the novel digital technologies that are arising - while also laying out a foundation for a broader development of the workforce

Capability building is required to expand the scope of sustainable opportunity

Train C-level executives, also on available digital solutions, to tackle climate change issues

The Fourth Industrial Revolution comprises unprecedented changes driven by new technologies, as well as innovations in business models, products and processes. The slow pace and reactive nature of regulation mean that companies cannot rely solely on policy makers to effectively navigate these challenges. Companies need to step up and lead this change, not just adapt to it.

However, thought leaders point out that the broader C-level community does not have a sufficiently detailed understanding of the connections between the sustainability aspects of their business. Neither do they have sufficient understanding of the digital levers at their disposal to address these issues in an effective and comprehensive way.

By this, it is clear that fundamental capability building is required and can, mainly, be delivered by experts recruited into the C-level.

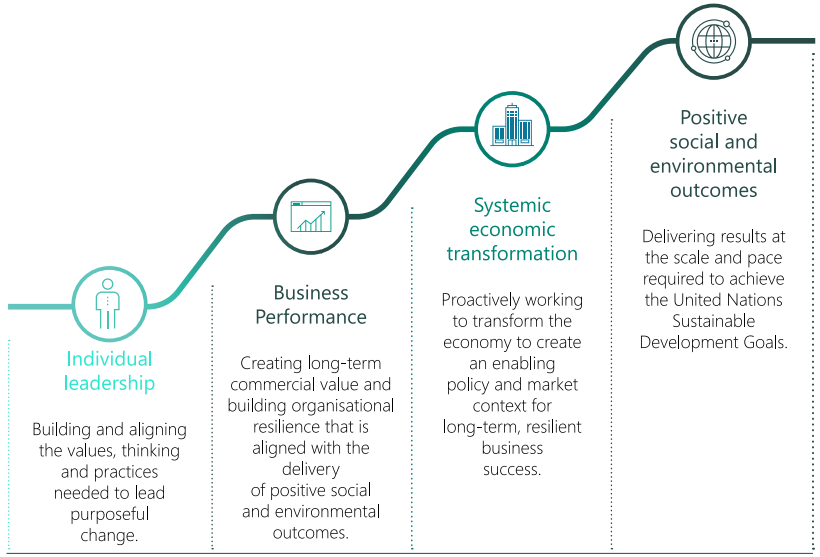
Building these C-level capabilities will require more use cases to put into action, which will again emulate corporate leaders to integrate digital solutions in their corporate sustainability strategies and targets.

Without actions towards capability building, long-term value will not be created

To put it simply, there is an evident need for CxOs to more than just participate in the future. They need to be a part of the movement shaping the future they want and need.

For this to be achieved, some steps need to be taken. With individual leadership building and aligning for a "change with purpose" road-map can be laid out for the masses. As this starts to materialize as improvements in the business performance and increased commercial value, it will in turn start to mobilize a systemic economic transformation. Ultimately, this is the prerequisite for reaching scale in delivering positive social and environmental outcomes, and long-term company value.

Yet, the current capability level among executives must be significantly enhanced to make this ideal become a reality.



Visualization of the leadership steps needed to shape the future. Developed by Cambridge Institute for Sustainability Leadership

Read the full report from Cambridge Institute for Sustainability Leadership about rewiring leadership

Source: Cambridge Institute for Sustainability Leadership

With the increased public attention on companies' sustainability performance, corporate leaders must be prepared to navigate thoroughly and accept that every step taken on individual and company level must be open for scrutiny at a level that was previously unthinkable

Corporate leaders must prepare for increased levels of scrutiny

Industry standards for quantifying the impact of digital solutions must be developed

There is currently a lack of standards when it comes to measuring the real impact of digital technologies. While the impact of hardware is relatively well understood, among other things due to the physical nature of the assets, then the impact of software is still subject to the discretion of the party assessing it.

There is also a lack of established industry standards to estimate the decarbonization potential of digital workplace solutions, treat the impact of rebound effect of digital technologies, such as Digital twins and IoT, or quantify the carbon emissions of data transfer.

For example, the estimation of the carbon emissions of video streaming varies greatly depending on the organization conducting the calculation (estimates by The Shift Project is 27 to 57 times higher than that of the IEA, the International Energy Agency).

Business leaders who deploy digital technology need to provide more granular data on the carbon emissions related to their solutions with examples including the energy consumption of a GB of data being transferred. This is currently only available in cutting edge academia and in ICT specialists, especially as efficiency gains are slowing and public concern is growing. Yet the needs for standards and protocols is ever more important.

Companies are increasingly being evaluated on non-financial performance

Previously, investors merely cared about financial numbers and metrics when evaluating an annual report. However, these days have passed as investors are increasing their broader scrutiny of corporations, with 98% of investors also evaluating on non-financial performance.

While more topics are driving the development, climate change in particular are seeing an increase in interest, which only underlines the increased sustainability scrutiny corporations must be prepared for.

> "For technology to deliver its full potential for societal and business good, multiple and diverse stakeholders need to align around a clear and strong vision."
>
> **Aman Chitkara, Mobility Manager, WBCSD**

> "Better to sit around the table than being what's on the plate."
>
> **Aurélien Acquier, ESCP Business School**
>
> [On the topic of ICT vendors making data available to the public instead of letting NGOs evaluate the impact of digital]

98%

of investors also evaluate on non-financial performance according to EY Institutional Investor Survey

The Shift Project is a French nonprofit think tank created in 2010 that aims to limit both climate change and the dependency of our economy on fossil fuels.

Source: EY Institutional Investor Survey

With regulatory action increasingly becoming apparent within the sustainability domain, corporations can no longer neglect their role in contributing to the development of future frameworks and policies, particularly within the application of data and digital technologies - and to the definition of "green use cases" that can serve as inspiration

Executives must be prepared to enhance their support to regulators and push for increased regulation

The EU Commission has set an ambitious regulatory framework for digital technology

The EU has set ambitious policy and targets in the fields of circular economy, climate change, energy efficiency and renewable energy. In the digital technologies space, these policies cover different elements including, but not limited to, the recovery of materials at the end-of-life of components, equipment obsolescence, sleep mode consumption, energy optimized datacenters, weight on the existing data bearing infrastructures, etc. For example, the EU Commission has committed to undertake initiatives to achieve climate-neutral, highly energy-efficient and sustainable datacenters by no later than 2030 and transparency measures for telecom operators on their environmental footprint.

The opportunities to push for more green digital use cases and projects

In line with the European Green Deal, the European Union's (EU) €750bn recovery fund (approved in July 2020) is an example of recent efforts to align economic recovery with emission reduction commitment. The European Commission has indicated that 30% of the funding (around €225bn) will target climate-related projects. Charles Michel, the President of the European Council, said all expenses will comply with our objective of climate neutrality by 2050, the EU's 2030 climate targets, and the Paris Agreement In addition, the European Commission set up a technical expert group on sustainable finance to assist in developing the so called EU taxonomy to determine whether an economic activity is environmentally sustainable.

Interestingly, the EU Green taxonomy recognizes the role of digital in the future green economy through two eligible activities including data processing, hosting and related activities and data-driven solutions for GHG emission reductions. This initiative provides indirect support for adoption of green digital technologies by European companies.

"Digital expertise is required to present the [environmental] data in a way regulators can act on it."

Dave Thau, Data and Technology Global Lead Scientist, WWF

"In the context of post COVID recovery funds, it is key avoid investing in infrastructure that will lock emissions for decades and consider investment into broadband supporting infrastructure to support use cases with low carbon outcomes. In the Next, technologies including 5G, ML and satellites data will enabled new transportation modes, optimization of transports and timely prediction of CO_2 emissions."

George Kamiya, Digital/Energy Analyst, IEA

30%

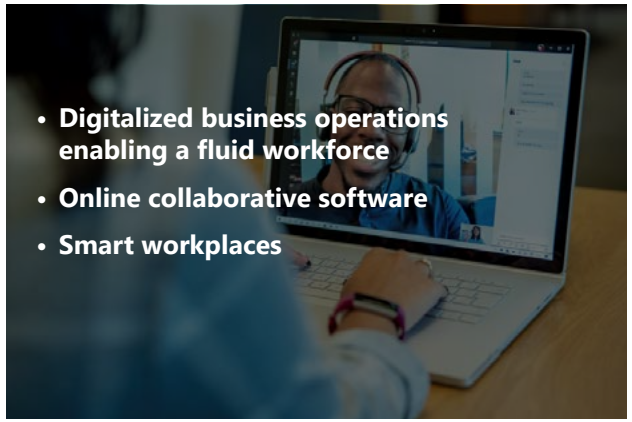
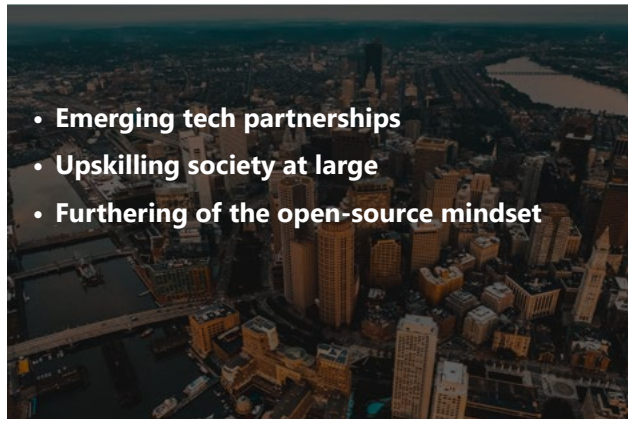
of the European Commission's recovery fund will target climate-related projects

Source: European Commission 2030 Climate Target Plan

There are three key pillars in which technology can contribute to a more sustainable future by solving important sustainability and business issues hereby creating true business impact and a meaningful value for society at large

Introducing the 'Tech-enabled Sustainability' framework

Hover over the framework for more info

	Infrastructure transformation Sustainable Platform	*Remote work & collaboration* Sustainable Operation	*Societal development* Sustainable Ecosystem
Topic			
Business value *The business and sustainability benefits*	**Leveraging new tech infrastructure to be future ready across operations**	Developing new ways of working in an increasingly digital workplace	Partnering to co-develop solutions that further the impact agenda
Technology enablement & examples *Showcasing how technology can solve the sustainability / business issues*	 • **Hyperscale datacenters** • **Green computing** • **Emerging lab tech projects**	 • **Digitalized business operations enabling a fluid workforce** • **Online collaborative software** • **Smart workplaces**	 • **Emerging tech partnerships** • **Upskilling society at large** • **Furthering of the open-source mindset**

Sustainable Platform and Infrastructure provides companies access to the forefront of new technological advances with regards to sustainability allowing them to benefit from new solutions which optimize capacity and resource use

Framework – Sustainable Platform & Infrastructure

Hover over the framework for more info

Infrastructure transformation
Sustainable Platform

Remote work & collaboration
Sustainable Operation

Societal development
Sustainable Ecosystem

Now
Solve using current technology

Optimize capacity
Optimize on-premise servers, e.g. by utilizing hardware capacity

Shared environments
Improved infrastructure to allow for multi-tenancy in shared environments

Surplus resources
Utilize surplus heating for other purposes

Next
Explore and accelerate with emerging technologies

Hyperscale datacenters - Meet demand for processing power through hyperscale datacenters

Seamless infrastructure - Establish seamless infrastructure allowing closer integration between services

Beyond
Imagine and transform with future technologies

Thin clients - New forms of datacenters and decentralized solutions that enable thin clients

Sustainable Work and Operations gives companies an opportunity to act more sustainable with the help of their employees by using tech to digitalize workplaces and processes and making the workforce more fluid

Framework – Sustainable Work & Operations

Hover over the framework for more info

	Infrastructure transformation Sustainable Platform	***Remote work & collaboration*** **Sustainable Operation**	*Societal development* Sustainable Ecosystem
Now *Solve using current technology*		**Digital collaboration** Continue digitalization of collaboration sparked by COVID-19 **Remote work** Capture sustainability gains from enabling remote working **Digitalize processes** Continue the ongoing digitalization of processes in recent years	
Next *Explore and accelerate with emerging technologies*		**Flexible workplaces** – flexible offices can reduce need for real estate and decrease company footprint **Digitalized operations** – Operations are fully digitalized making processes more efficient and more sustainable	
Beyond *Imagine and transform with future technologies*		**Fluid workforce** – Increasingly fluid workforce and augmented decision-making enabled by AI and new tech	

Sustainable Societies and Ecosystems showcases a way for companies to help each other evolve the sustainability agenda by engaging in partnerships to innovate and co-create for more sustainable future

Framework – Sustainable Societies & Ecosystems

Hover over the framework for more info

	Infrastructure transformation Sustainable Platform	*Remote work & collaboration* Sustainable Operation	*Societal development* Sustainable Ecosystem
Now *Solve using current technology*			**Emerging partnerships** Partnerships are forming between companies and less traditional players **Data sharing** Public data is openly shared, but most data remains proprietary **Societal contribution** Companies actively seek to position themselves as contributors to society
Next *Explore and accelerate with emerging technologies*			**Stronger ecosystems** – less focus on proprietary data and IP but rather collaboration and co-creation **Innovation hubs** – Tech partners take an active stance to accelerate new technology means via innovation hubs
Beyond *Imagine and transform with future technologies*			**Accelerated co-creation** – in advanced ecosystems of actors with the shared goal of tech-enabled sustainability gains

INDUSTRIES

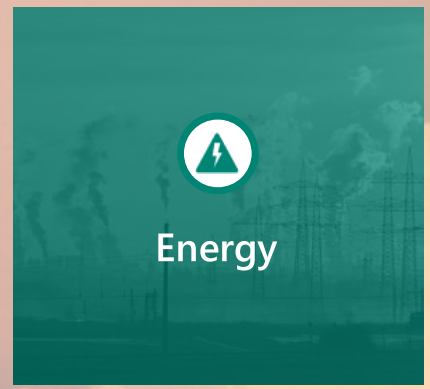
Five industries are in focus of this playbook

Hover over the boxes for more info

Go to page 42 to learn about Retail

Go to page 48 to learn about Manufacturing

Go to page 54 to learn about Financial Services



Go to page 60 to learn about Energy

Go to page 66 to learn about Public Sector

Web scraping 25 million records and applying machine learning to read 100,000's of records and segment them around key sustainability related themes – then linked to focus industries and C-level functions to understand their respective areas of focus

Linking sustainability related topics to industries and C-level functions

Applying ADRM and linking it to industries and CxO functions

The sustainability taxonomy applied in this study consists of multiple terms used interchangeably for the agenda. They are scraped from 25 million data records and tagged to phenomena representing the industries and C-level functions in this playbook, or a mix of the two.

Thereby we get an indication of the activity level and topical nature of how and how much each relates to the sustainability agenda.

Sustainability taxonomy

and variations thereof

carbon *waste* *climate* *net zero* *footprint* *energy efficiency* *renewable* *emission* *responsible procurement* *pollution* *supply chain transparency* *deforestation* *water* *sustainability* *traceability* *nature-based solutions* *re-naturalization* *non-financial information* *biodiversity* *environment* *ecology* *circularity*

Focus industries

+ adjacent terms for each industry

- Retail
- Manufacturing
- Financial Services
- Energy
- Public Sector

C-level functions

+ adjacent terms for each function

- Strategic
- Financial
- Commercial
- Operations
- People
- Tech

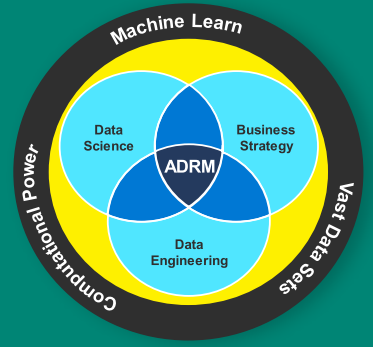
"We see AI and Big Data as an opportunity to optimize further our processes, which will result in more efficiency and sustainability improvements, simultaneously."

Strategic Planning – Sustainability and Innovation, Bondalti

MACHINE LEARNING

Advanced Digital Research Methods (ADRM)

The analysis is based on the use of machine learning to understand the thematic meanings contained within the text of records pertaining to sustainability between November 2019 and August 2020. It consists of a web-scrape of 25 million records, where machine learning was used to read 100,000's of records and segment them around key sustainability related topics.



Read about the ADRM solution

Large variance in the relative sustainability activity for different C-level functions

The relative activity level, measured as the "share of records related to sustainability" among the C-level functions, varies greatly between the five focus sectors. For example, the CTO has very high importance in the manufacturing sector (41% of records), while playing a less important role in financial services, where the CFO (34%) and CEO (30%) play the most important roles.

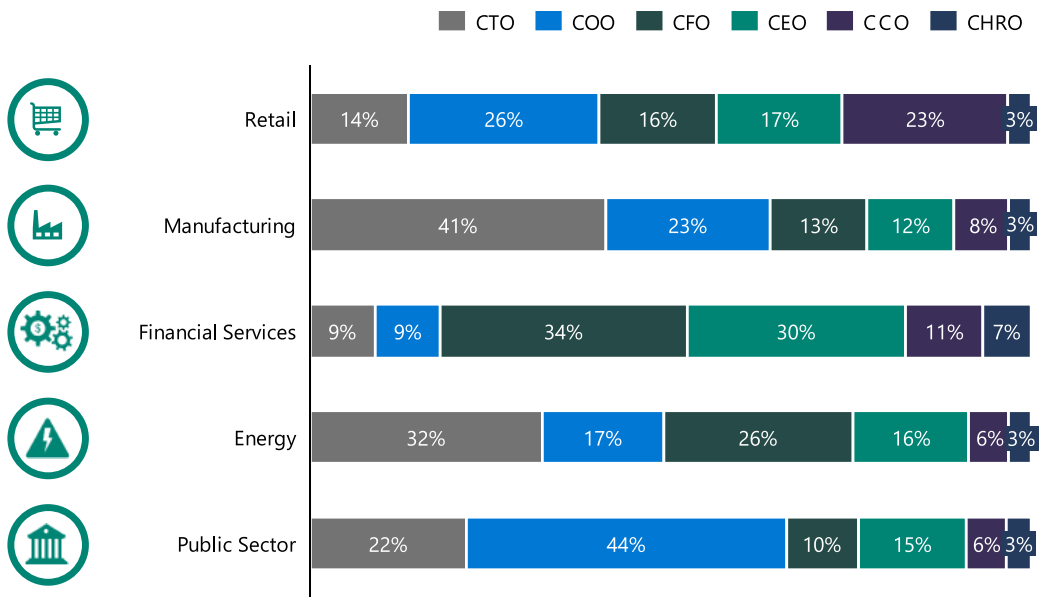
Perhaps not surprisingly, overall the CTO and COO are the most active roles in terms of sustainability - with the CTO being mostly active in manufacturing (41% of records) and energy (32%), and the COO in the public sector (44%).

The CEO role is particularly important in financial services (30%) together with the CFO role (34%), which is also highly relevant in energy (26%).

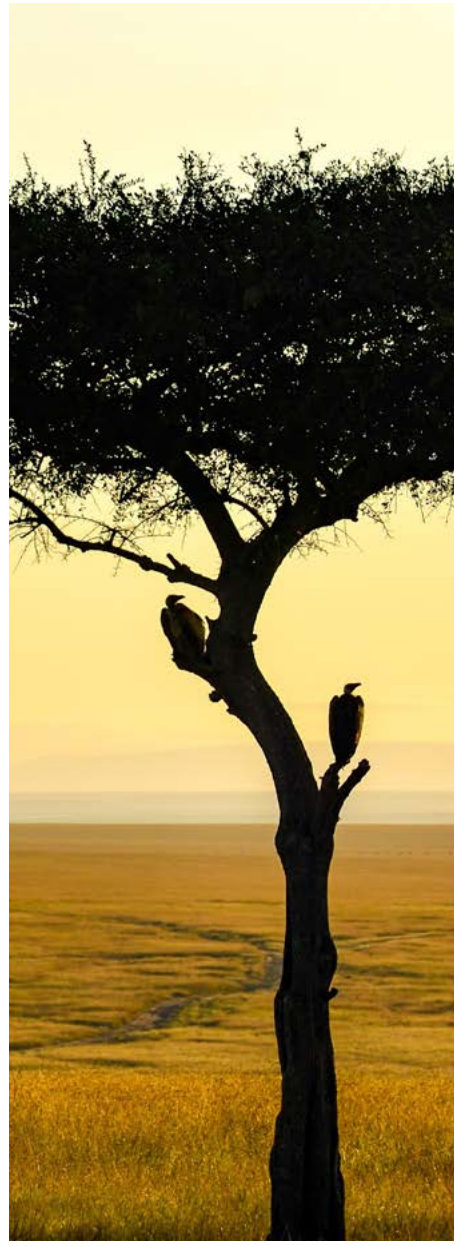
The CCO is a key driver in retail (23%), while CHRO currently has less sustainability coverage, with most importance in financial services (7%)

Figure **Significant difference in relative sustainability activity across CxO functions**

Share of records related to sustainability by industry and CxO function, 2019-2020
Source: EY ADRM web-scrape of ~25M records



Source: EY Advanced Digital Research Methods

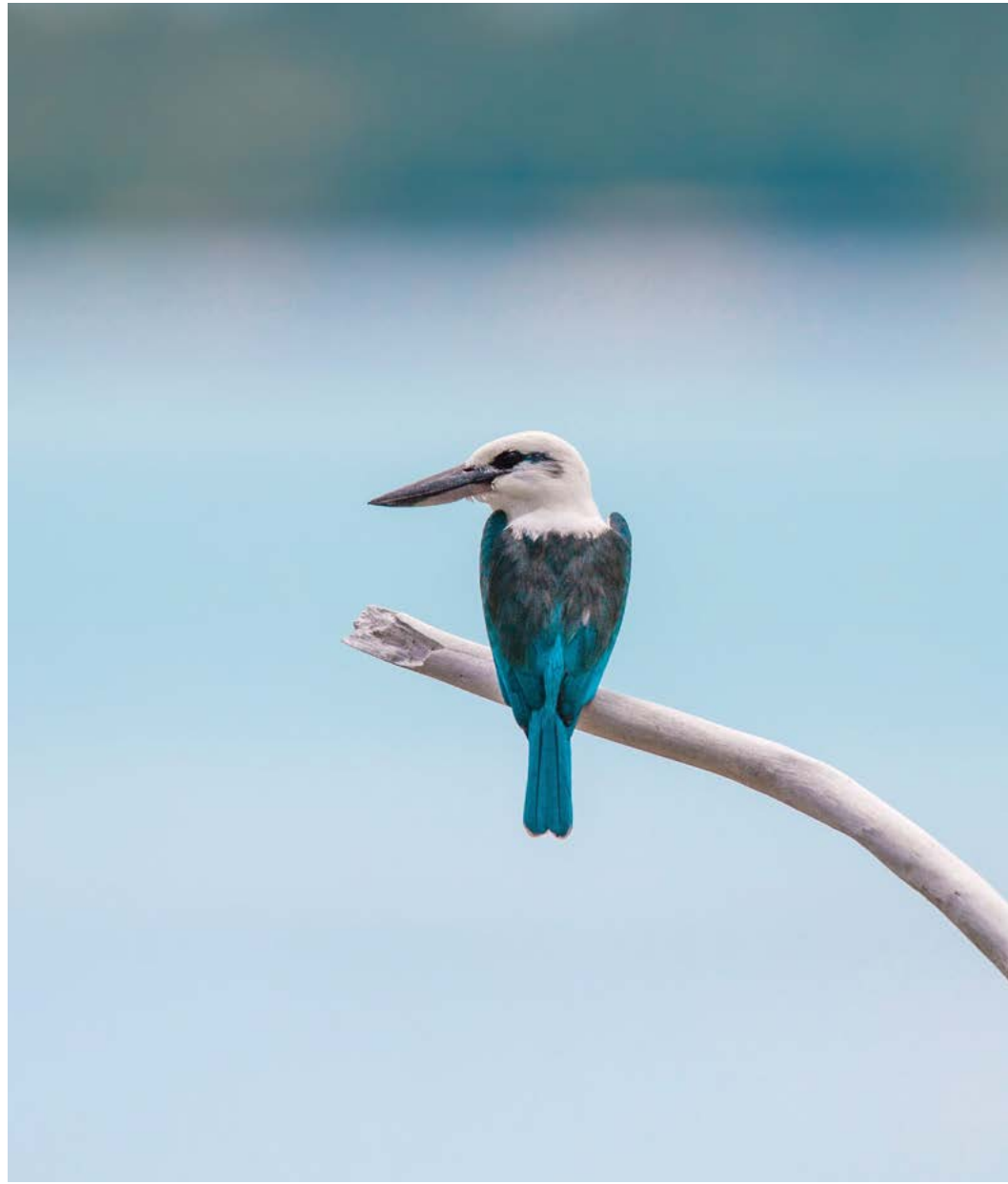


Consumer products, and online, offline, and omnichannel sales

RETAIL

"Transversally technology will continue to be key to ensure more transparent, responsible and sustainable supply chains and to help our consumers to make more informed decisions."

Deputy to the Executive Committee & Chief Development Officer, SONAE



A closer look at the development in sustainability focus, key topics, relative emission levels, the relevance of sustainability as a key purchasing criteria, and the relative sustainability activity across CxO functions in the *retail* industry

Overview of the most mentioned topics - and other sustainability matters in retail

Sustainable products have become of strategic importance to deliver profitable growth in retail

Across the C-suite functions, sustainability in the retail industry has mainly been associated with Sustainability-Driven Growth (49%) followed by New Materials, Investments, Products & Markets, and Recycling. Hence, C-suites are predominantly focused on how sustainability trends will be a key driver for growth in the coming years. Sustainability-marketed products represent an opportunity to increase revenue by catering to consumers' sustainability related criteria, which have grown in importance due to changing consumer demands, also sparked by COVID-19.

There are several ways to meet consumers' sustainability demands in retail, most prominently through the products

Offering products which in themselves bring sustainability benefits is one way of meeting increasing consumer sustainability demands. However, there are also several other alternatives, including offering a transparent, low-carbon supply chain, take-back consumption models ('as-a-Service'), or by engaging in philanthropic branding efforts at a company level.

Figure **'Growth' is the most mentioned sustainability topic in retail**

Share of records related to sustainability in the retail sector, 2019-2020 (top 5 topics only)

See the methodology on page 40

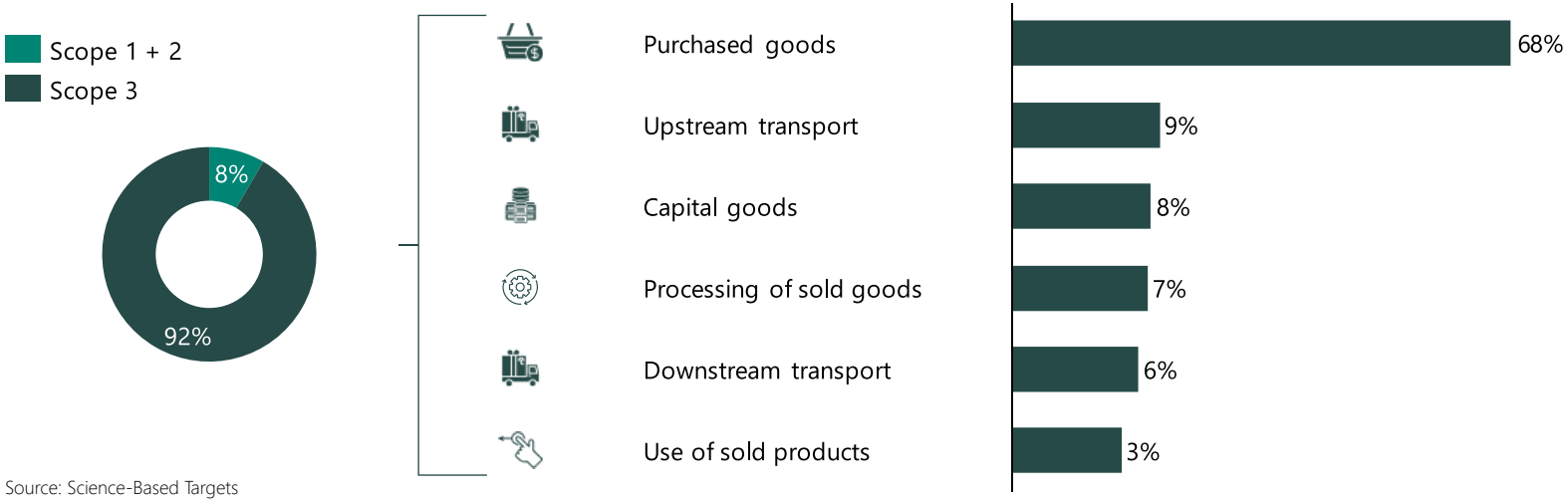
Source: EY Advanced Digital Research Methods

A carbon footprint driven by supply chain emissions

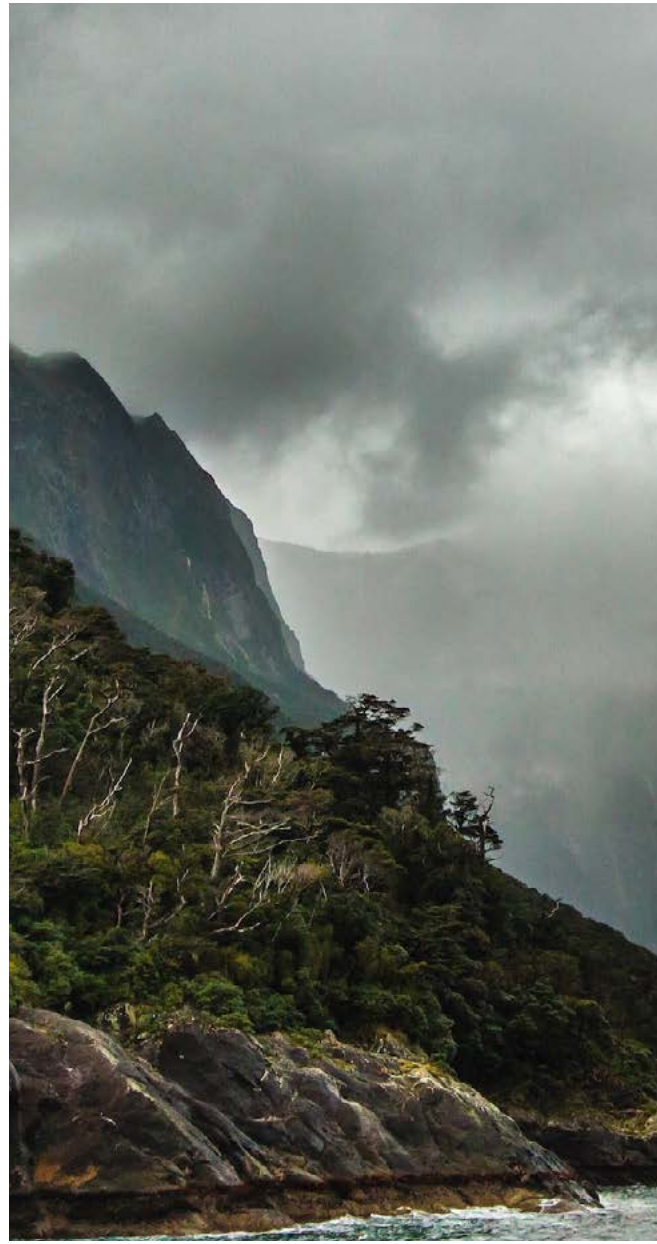
The carbon footprint of retail companies is mainly driven by emissions from supply chain activities (known as scope 3 emissions). Companies in retail have on average supply chain emissions that are more than 10 times greater than their scope 1 and 2 emissions, with sourcing of raw materials, production and transportation of goods as the main emissions sources.

Figure **Largest share of Scope 3 emissions in retail result from purchased goods**

Share of retail sector scope 3 emissions (top contributors)
Source: Science-Based Targets



Source: Science-Based Targets



Sustainability is becoming an increasingly important purchasing criteria in retail

Sustainability is increasingly catching up with traditional purchasing parameters such as value and ease of purchase. Moreover, consumer willingness to pay a premium for sustainability brands and products over non-sustainable alternatives has been gradually increasing with 50% of respondents in EY's FutureConsumerNow survey in July 2020 stating they intend to make climate change and sustainability a top priority in shaping their consumption.

Sustainable products remain a small segment, but account for a large share of total market growth

According to a study by NYU Stern and IRI, sustainability-marketed products account for 16.6% share of total market ($) in 2018, up from 14.3% in 2013. However, although sustainability-marketed products only account for a small share of the total markets, they have accounted for over half over total market growth from 2013-2018. This trend highlights how sustainability-focused product portfolios can be a key driver of growth and how companies within the retail industry can capture business value through sustainability transformations.

Source: NYU | STERN 2019

Figure **Increasing market share of sustainable products**

Market share development of sustainability-marketed products, 2013-2018
Source: NYU | STERN 2019. Sustainable share IndexTM: Research on IRI Purchasing data

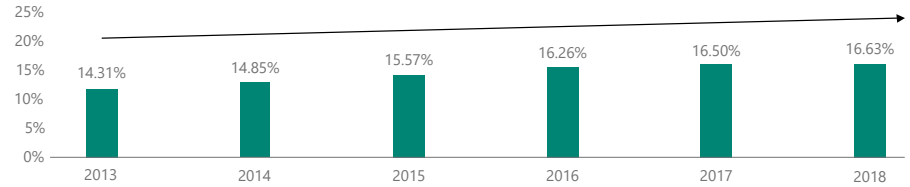
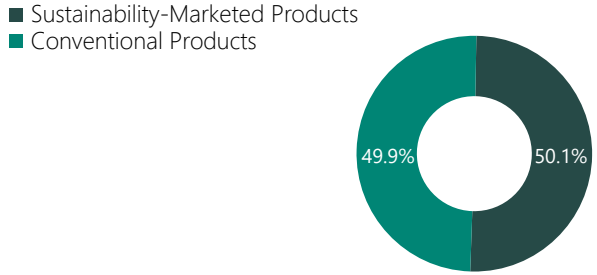
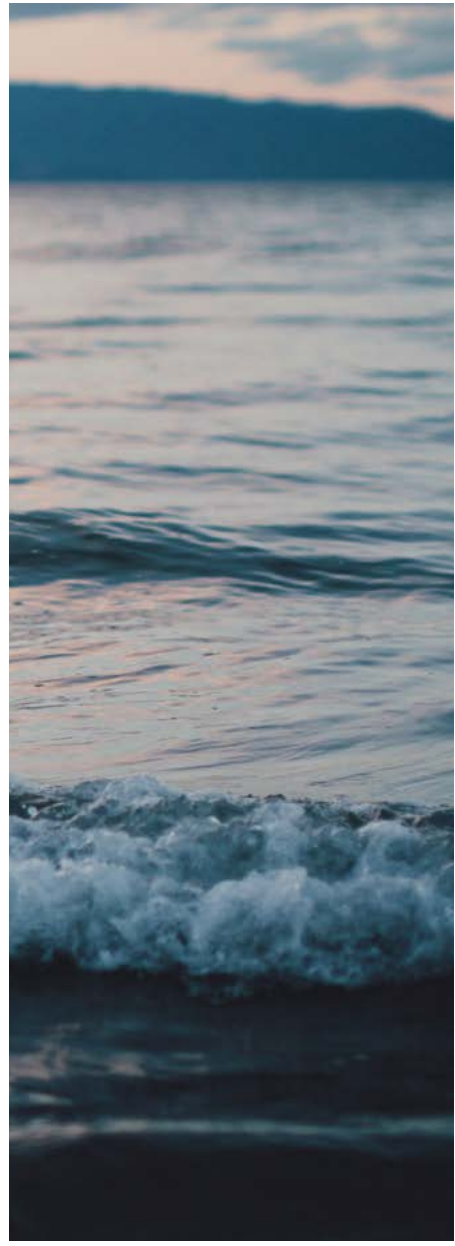


Figure **Sustainable products' share of market growth**

Sustainability-marketed vs conventional products' share of mkt. growth, 2013-2018
Source: NYU | STERN 2019. Sustainable share IndexTM: Research on IRI Purchasing data



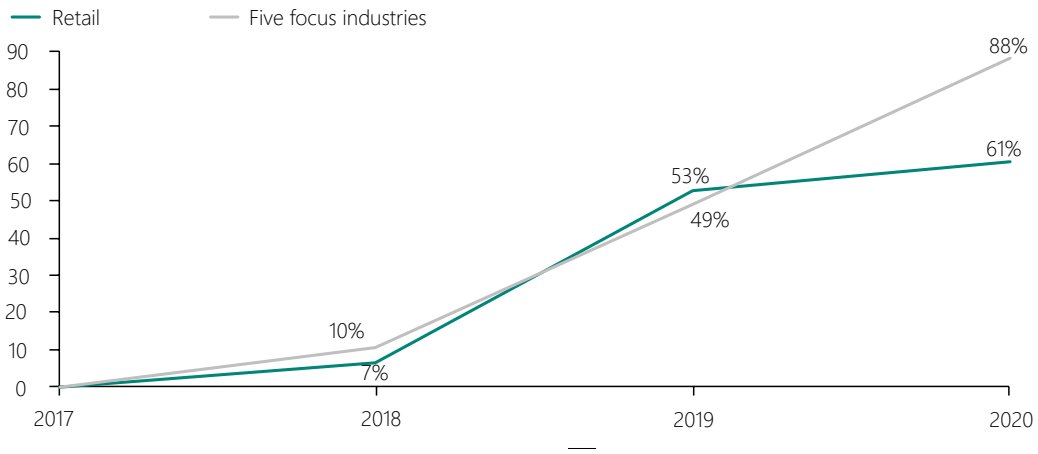


Growing focus on sustainability in the C-suite in retail

Sustainability is increasingly catching up with traditional purchasing parameters such as value and ease of purchase. Likewise, consumer willingness to pay a premium for sustainability products and labels over non-sustainable alternatives has been gradually increasing with 50% of respondents in EY's FutureConsumerNow survey in July 2020 stating they intend to make climate change and sustainability a top priority in shaping their consumption.

Figure **Increased focus on sustainability by C-suites in retail**

Growth in # of records related to sustainability in retail, 2017-2020



Source: EY Advanced Digital Research Methods

Based on EY Advanced Digital Research Methods web-scrape of ~25M records

> "We are at the beginning of systematically planning sustainability initiatives enabled by technology and communicating them to the public."
>
> **CIO, Asahi Breweries Europe Group**

> "There is a common understanding of the major impact sustainability will have on business performance, and consequently on social progress, and that they cannot be handled separately. Instead, they have to be the central dimension of any business strategy together."
>
> **Deputy to the Executive Committee & Chief Development Officer, SONAE**

COOs and CCOs driving sustainability transformation in Retail

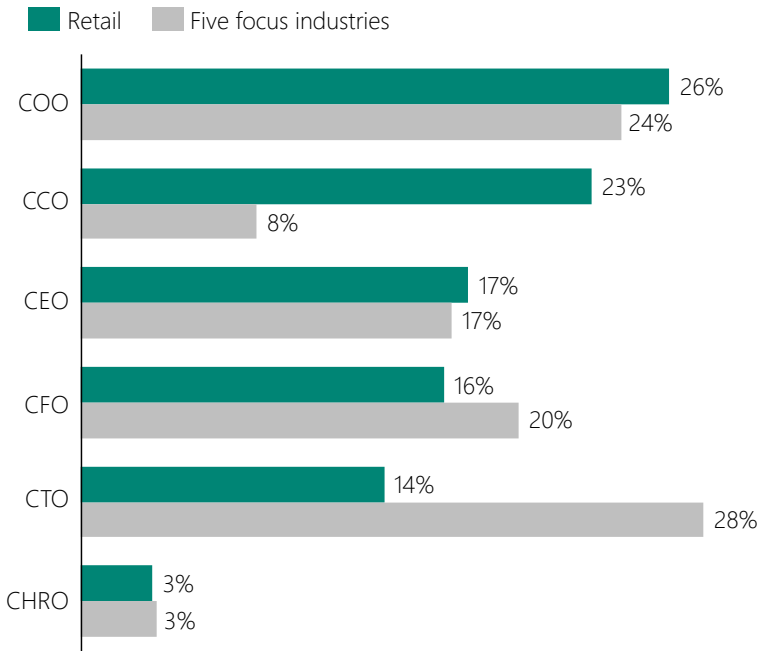
COOs play a pivotal role in retail in general, as they handle complex logistics and define efficient processes for often large workforces to strike positive margins, where especially logistics optimization is closely linked to carbon reductions. CCOs are crucial for retailers seeking to undergo a sustainability transformation, as they closely follow consumer trends and define the commercial strategy accordingly.

49%

of retail industry records associated with sustainability are related to COOs and CCOs

Figure **COOs and CCOs the most active functions in retail**

Share of records related to sustainability in retail by CxO function, 2016-2020
Source: EY ADRM web-scrape of ~25M records



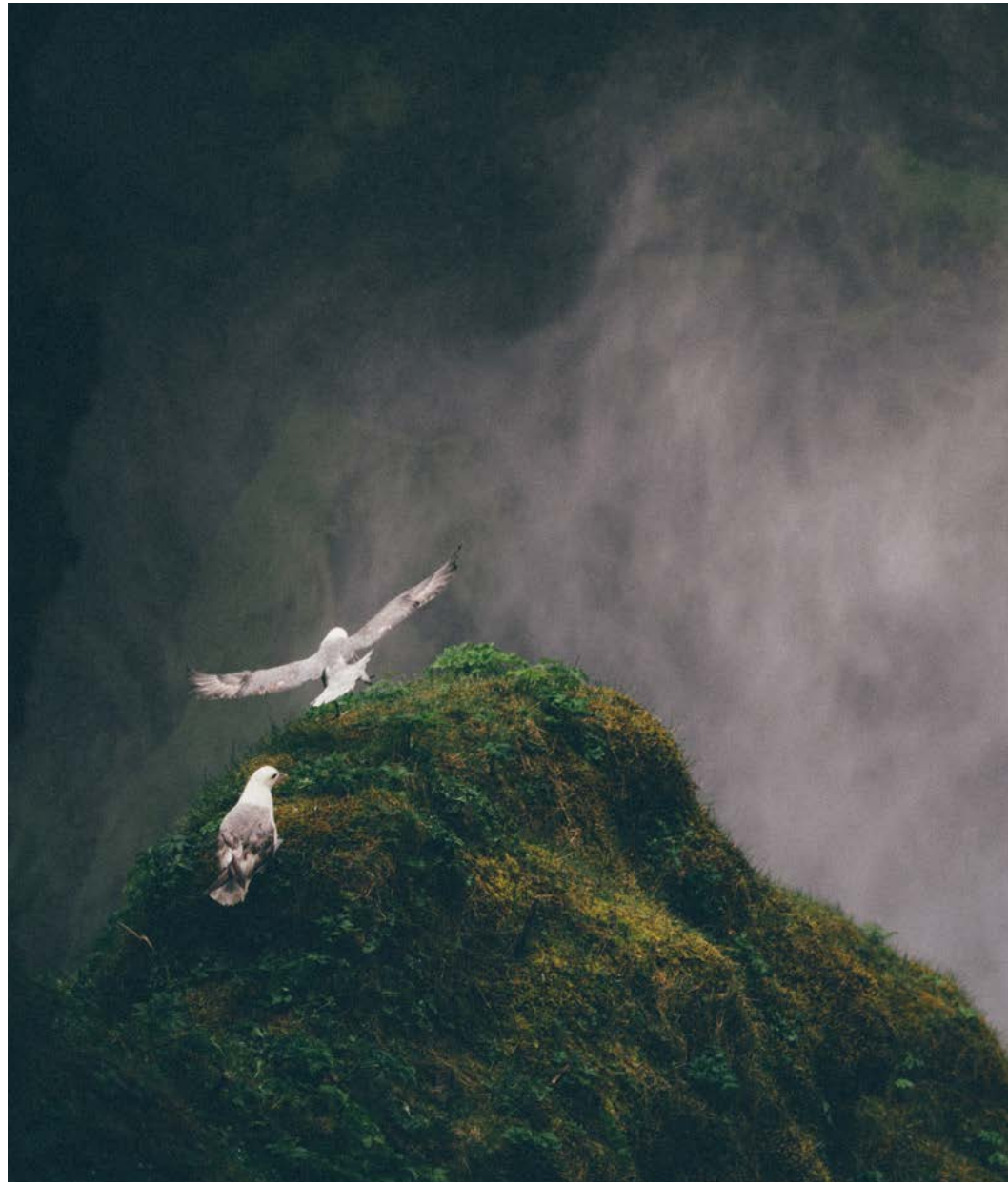
Source: EY Advanced Digital Research Methods

Conversion of materials into consumer or industrial goods

MANUFACTURING

"There is further potential to be captured by more systematically identifying opportunities to leverage digital technology for sustainability improvements."

Head of Strategy Europe, LafargeHolcim



A closer look at the development in sustainability focus, key topics, relative emission levels, the growing shift from cost-reduction to growth, and the relative sustainability activity across CxO functions in the *manufacturing* industry

Overview of the most mentioned topics - and other sustainability matters in manufacturing

Strong on new materials driven by the circular economy agenda in the manufacturing industry

Across the C-suite roles, sustainability in manufacturing is mainly associated to new materials and growth and to a lesser extent to environmental impacts, investments and progress measurement. That new materials is the key topic when C-suites communicate on sustainability reflects the momentum driven by the circular economy agenda and the increasing focus on materials sourcing, recycling and reuse. This is closely connected with material and energy efficiency.

Sustainability may shift focus from cost-reduction to growth in manufacturing

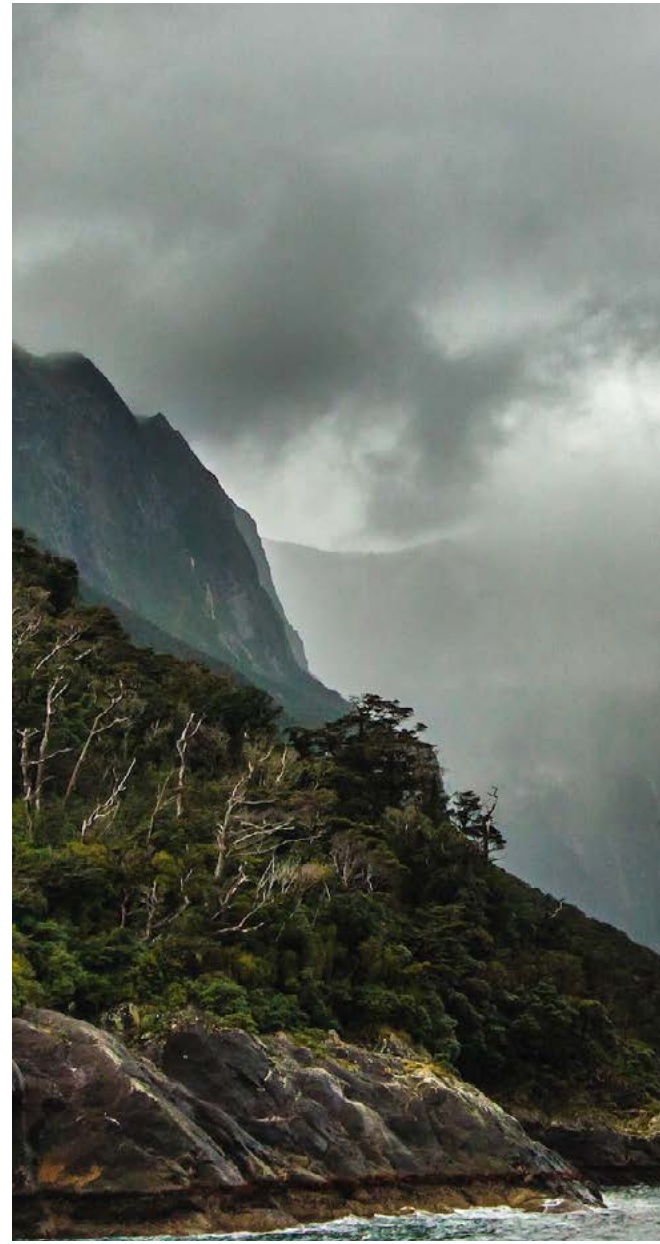
The focus on growth is interesting bearing in mind that the manufacturing industry has had a longstanding strong focus on efficiency and cost reduction. For C-suites, sustainability presents new growth opportunities, e.g. through new product designs which will have lower energy usage and emissions over their life cycle and which have been designed to meet both new regulatory requirements and shifting end-user expectations.

Figure **'New materials' is the most mentioned sustainability topic in manufacturing**

Share of records related to sustainability in the manufacturing sector, 2019-2020 (top 5 topics only)

See the methodology on page 40

Source: EY Advanced Digital Research Methods



Together upstream and downstream emissions represent the highest emissions of manufacturing

Traditional focusing on the emissions from its own manufacturing processes, the manufacturing sector has developed a greater capability to assess and report on its scope 3 emissions including upstream emissions associated with purchased goods and downstream emissions associated with the use of sold products.

This is instrumental for the sector to design and implement appropriate mitigation strategies working with strategic suppliers and addressing consumers´ preferences change. The role that digital can play to assist the sector in its decarbonization is unprecedent. For example, access to data along the value chain and generation of critical insights (e.g. with AI) is key to optimize the sustainability footprint. Also, AI-based production optimization is providing a win-win situation for the business and environment.

Figure **Largest share of Scope 3 emissions in manufacturing result from purchased goods**

Share of manufacturing sector scope 3 emissions (top contributors)
Source: Science-Based Targets

Source: Science-Based Targets

Climate change is impacting the value chain in the Manufacturing industry

In 2020, 60% of insured catastrophe losses of, accounting for $54 billion, have been caused by secondary perils (i.e. storms, floods, wildfire, winter weather, European windstorm and drought). From this, it becomes evident that physical risks increasingly impact the supply chain and general sourcing of raw materials. In other words, from supply chain management to products portfolio management. This is a major aspect of Manufacturing and the cost base, which ultimately leads to the price faced by the end-consumer. Addressing it requires involvement of all CxO functions.

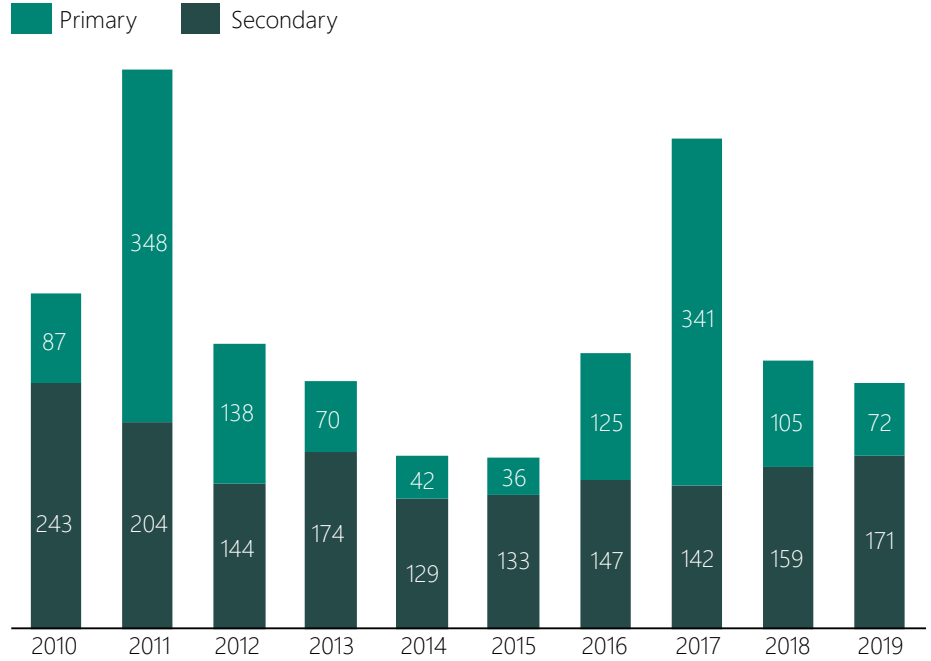
Energy efficiency in the Manufacturing industry in EU continuously improves

IIn the EU, the energy efficiency improved by 1.2% per annum on average since 2000. It is, among other things, strongly due to regulation and incentives driving more energy and emissions improvements, which happens across plants and also across EU countries. Up to 79% of Europeans have been influenced by the EU Energy Label when purchasing an appliance, which is evident from the development in the Manufacturing value chain. From this, it is clear that evolving customers and consumers needs adaptive and low carbon products, which is key for the Manufacturing industry to address in the right way.

> "We have an ambitious plan both in our ways of working and manufacturing. Today, we use green and sustainable design principles and other environmental design criteria in the development of our manufacturing processes and packaging right from the start."
>
> **President MSD Mid-Europe Region, MSD**

Figure **Increasing economic loss from secondary perils**

Economic loss from primary perils (TC, EQ) and secondary perils (SCS, FL, WF, WW, EU, WS, DR), $B
Source: AON - Reinsurance Market Outlook



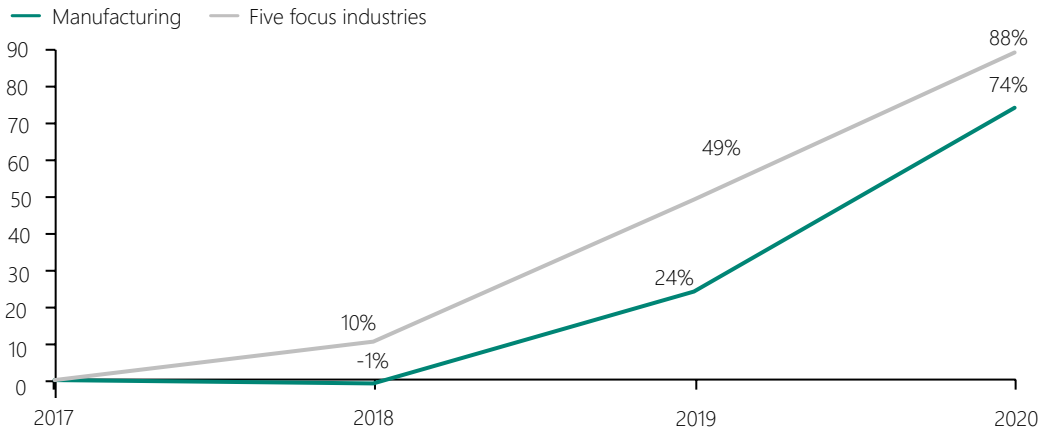
Source: AON – Reinsurance Market Outlook

Growing focus on sustainability in the C-suite in manufacturing

In recent years, the focus on sustainability has increased in Manufacturing. This has happened as manufacturers not only see win-win opportunities for business and sustainability when driving efficiencies, but also because the pressure from stakeholders, such as customers, investors, etc., and legislation, such as CO_2 tax, has increased. Furthermore, as a sustainable profile is growing in importance for employees, it is a necessity to attract the best talents to the industry.

Figure **Increased focus on sustainability by C-suites in manufacturing**

Growth in # of records related to sustainability in manufacturing, 2017-2020



Source: EY Advanced Digital Research Methods; Science-Based Targets

Based on EY Advanced Digital Research Methods web-scrape of ~25M records

> "Today we are successful in optimizing our core business, which means achieving efficiency gains through technology-enabled solutions. This leads to cost reductions and better sustainability performance."
>
> **Head of Strategy Europe, LafargeHolcim**

> "Technology is today often used to increase the efficiency of existing value chains and processes, e.g. smart manufacturing. That's an area where technology is well used to drive sustainable performance."
>
> **Commercial Director, SPARTA Dynamic**

CTOs and COOs drive sustainability transformation

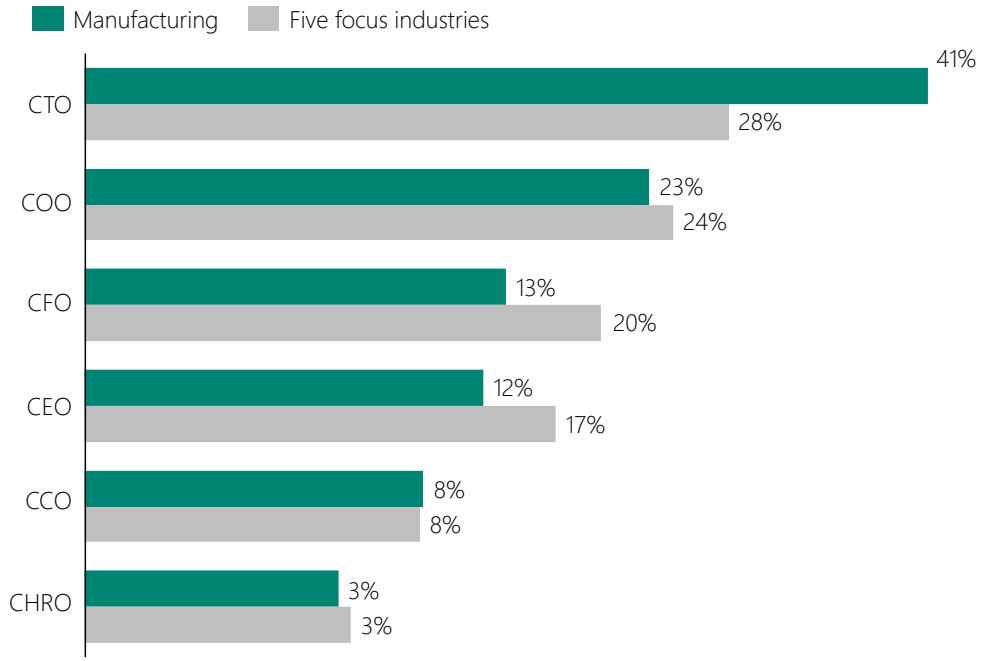
CTOs are important as manufacturing relies heavily on identifying and appropriately applying the right technologies to achieve competitive differentiation. COOs are crucial, as they are responsible for the business along the value chain, from procurement of sustainable raw materials, over efficient use of energy and materials, to being part of the circular economy to reduce and avoid waste.

64%

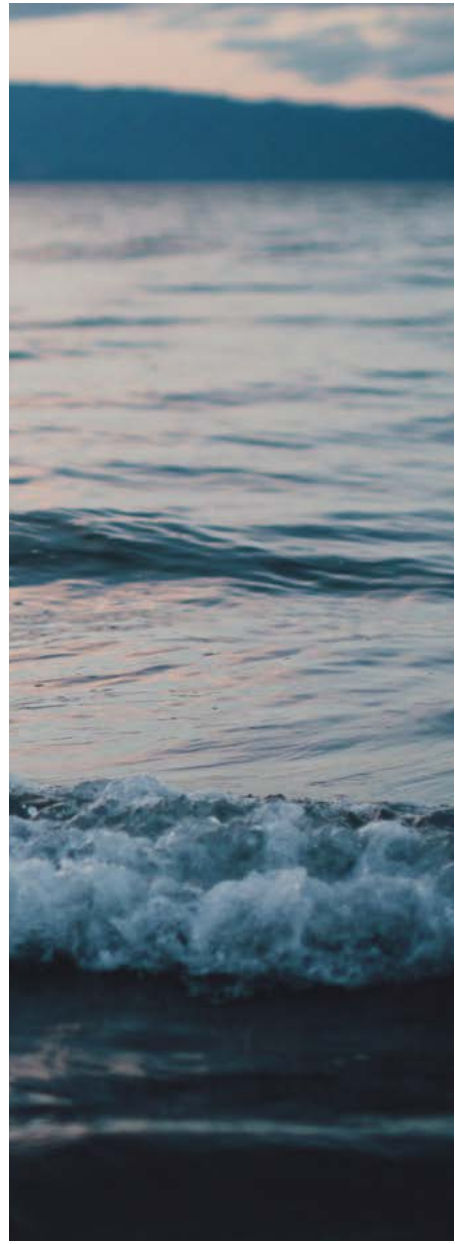
of manufacturing industry records associated with sustainability are related to CTOs and COOs

Figure **CTOs and COOs the most active functions in manufacturing**

Share of records related to sustainability in manufacturing by CxO function, 2016-2020
Source: EY ADRM web-scrape of ~25M records



Source: EY Advanced Digital Research Methods



Sales of and advice related to financial products

FINANCIAL SERVICES

> "In our asset management, we systematically integrate environmental, social and governance (ESG) criteria across our whole investment portfolio. This makes economic sense and helps the real economy to shift to a more sustainable path. "
>
> **Chairman of the Board of Directors and Group CEO, Annual Report 2020, Danske Bank**

A closer look at the development in sustainability focus, key topics, relative emission levels, the rise of sustainable finance, and the relative sustainability activity across CxO functions in the *financial service*s industry

Overview of the most mentioned topics - and other sustainability matters in financial services

Capital allocation is increasingly directed towards sustainable investment projects in financial services

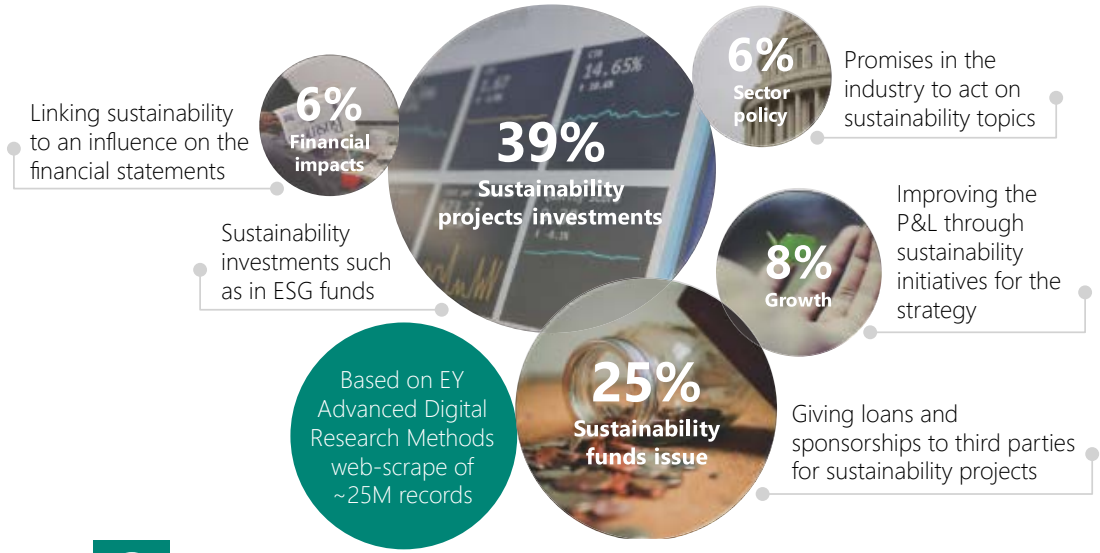
The connection between sustainability and investments has several drivers. Firstly, financial sector customers are increasingly expecting to be offered sustainable investment products. Secondly, many green investment projects require substantial capital injections. EY has identified over 1000 'shovel-ready' projects within the EU, which require around €200 billion of public and private investments and have the potential to create sustainable value. Support schemes for sustainability projects, is another growing topic, evidenced by large initiatives such as the Task Force on Climate-related Financial Disclosures (TCFD), the United Nations Environment Programme Finance Initiative and, more recently, the European Commission green taxonomy.

Rapid growth in issuing funds to dedicated to sustainable investments within financial services

The issuance of sustainability funds is another key topic within the financial service industry. Bloomberg reported that global socially responsible investments totaled to over $30 trillion in 2019 (Europe accounting for nearly 50%) representing an increase of 34% over the last two years.

Figure **'Investments' is the most mentioned sustainability topic in financial services**

Share of records related to sustainability in the financial services sector, 2019-2020 (top 5 topics only)



See the methodology on page 40

Source: EY Advanced Digital Research Methods

The emissions remain under-estimated by the financial services industry

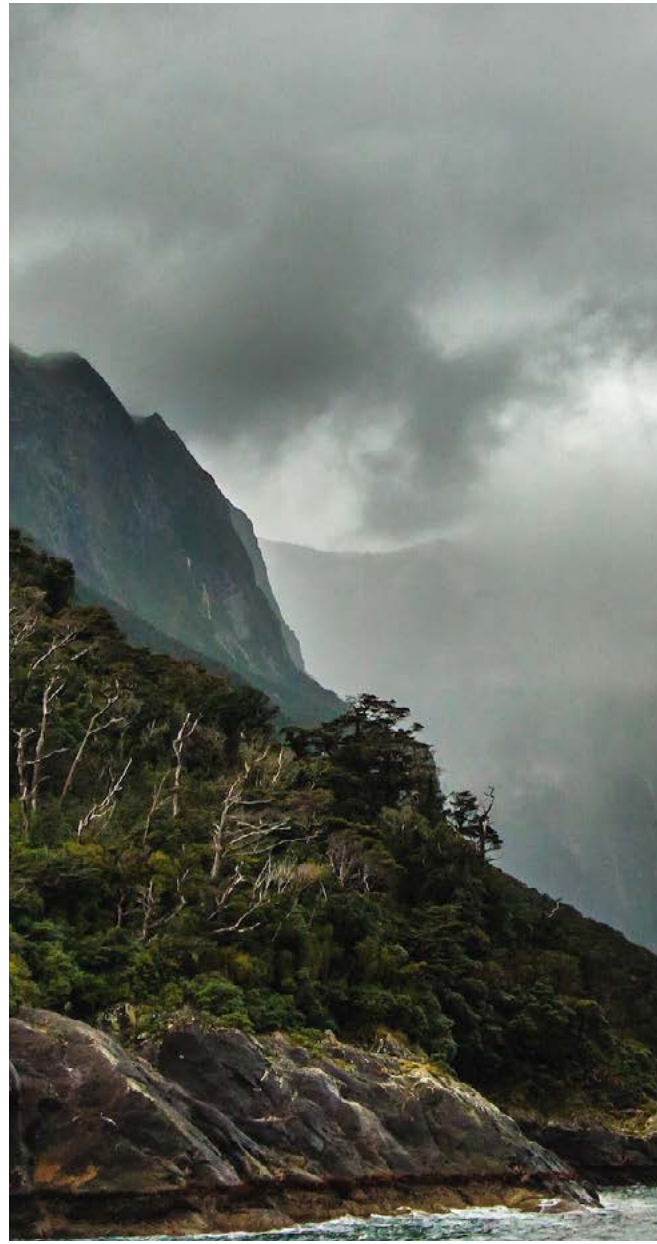
Most financial services companies disclose their scope 1 and 2 emissions and scope 3 (such as those from purchased goods and services, employees travel and waste), which do not align to their key climate risks – those that are a risk to investments. With 30% of total scope 3 emissions, the disclosure of financed emissions is not a common practice in the sector.

In order for banks, investors and insurance companies to set targets to address transition risks to their investments, they need to improve the quantification of the financed emissions.

Figure **Largest share of Scope 3 emissions in financial services result from purchased goods**

Share of financial services sector scope 3 emissions (top contributors)
Source: Science-Based Targets

Source: Science-Based Targets



Increased focus on incorporating sustainability into investment decisions

Increasingly, investors are broadening their investment criteria from a narrow focus on return to also focusing on sustainability aspects, e.g. carbon emissions, diversity and tax transparency. In response to this, companies within the financial service sector must offer investment opportunities which to a higher extent factor in Environments, Social and Governance (ESG) factors.

Increasing focus on sustainable finance also presents new opportunities for financial service providers, e.g. due to increased and more sophisticated sustainability reporting needs among companies as well as larger demand for sustainability-focused financial products among investors.

> "In the global landscape, Europe has differentiated itself through innovative and flagship regulations (e.g. carbon price and GDPR). Now it is time to demonstrate capacity to innovate and work hand-in-hand with companies to showcase the net positive benefits of digital technologies"
>
> **Jeremy Guez, HEC Paris Business School**

The European Commission Action Plan provides a guide

The European Commission has published an action plan on financing sustainable growth, which is built around three main pillars. One of these addresses the need to manage new sustainability risks. In general, there is a growing recognition of ESG factors as relevant risk parameters, when assessing the attractiveness of an asset. Financial firms must be particularly aware of climate-related risks, and manage these accordingly, e.g by assessing exposure to extreme weather and analyzing the climate transition risk by client, by sector, and at credit portfolio level.

Reorienting capital flows towards sustainable investments, in order to achieve sustainable and inclusive growth

Managing financial risks stemming from climate change, environmental degradation and social issues

Fostering transparency and long-termism in financial and economic activity

European Commissions Action Plan's three main objectives regarding financing sustainable growth

Read more about the European Commision's work regarding sustainable finance

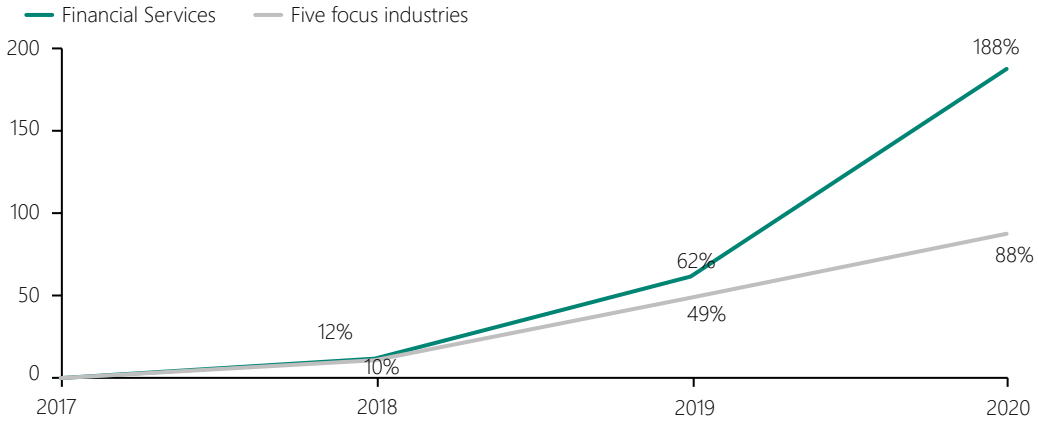
Source: European Commission

Growing focus on sustainability in the C-suite in financial services

The focus on sustainability has been growing significantly within Financial Services, driven by multiple factors, including various governmental recommendations and public legislations, but also from the shareholders, as in recent years, a number of "limit high-carbon financing" resolutions were put for vote by the shareholders of several banks, raising the awareness to the C-suite on climate matters, if not already present in an industry where sustainable finance is the new black.

Figure **Increased focus on sustainability by C-suites in financial services**

Growth in # of records related to sustainability in the financial services sector, 2017-2020



Based on EY Advanced Digital Research Methods web-scrape of ~25M records

Source: EY Advanced Digital Research Methods

> "Most CEO's have the desire and vision to become more sustainable, but we're waiting for shareholders to accept profit reductions and customers to accept paying a premium."
>
> **CEO, Coromatic Denmark**

> "For us, it is not sufficient that a partner only shows us their carbon footprint certificate, we want a partner who convinces us that if we work together, it results in a more significant sustainability impact. We don't need passive partners; we want active partners."
>
> **CEO, Coromatic Denmark**

CFOs and CEOs drive sustainability transformation

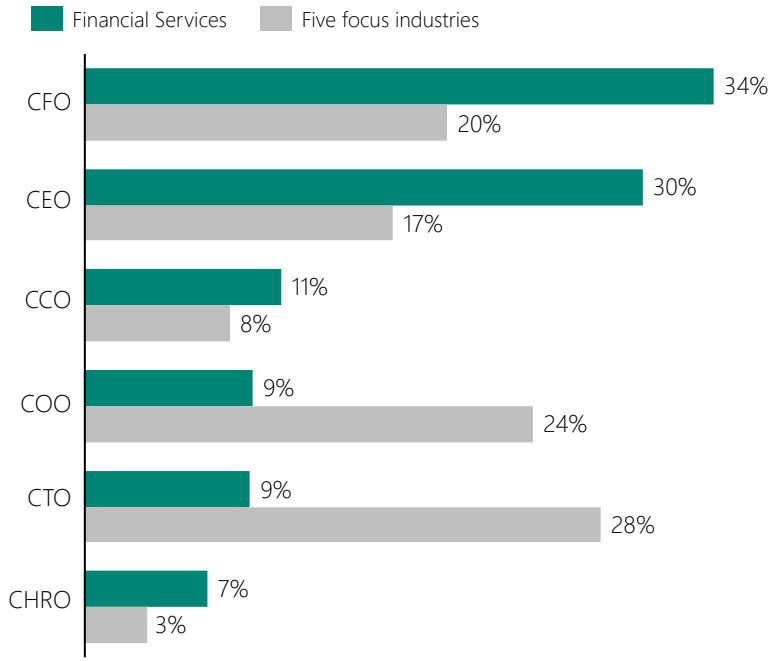
For financial services, the most discussed functions in sustainability records are the CFO and CEO. This is in line with key industry topics being financial items such as investments and support schemes which would fall under the domain both of a CEO and CFO in the financial sector.

64%

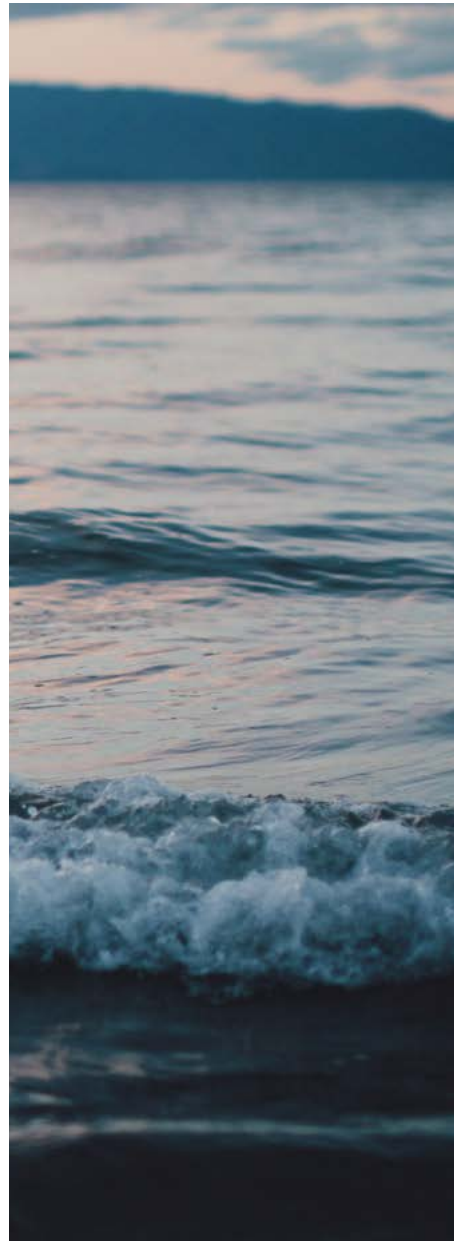
of financial services records associated with sustainability are related to CFOs and CEOs

Figure **CFOs and CEOs the most active functions in financial services**

Share of records related to sustainability in financial services by CxO function, 2016-2020
Source: EY ADRM web-scrape of ~25M records



Source: EY Advanced Digital Research Methods

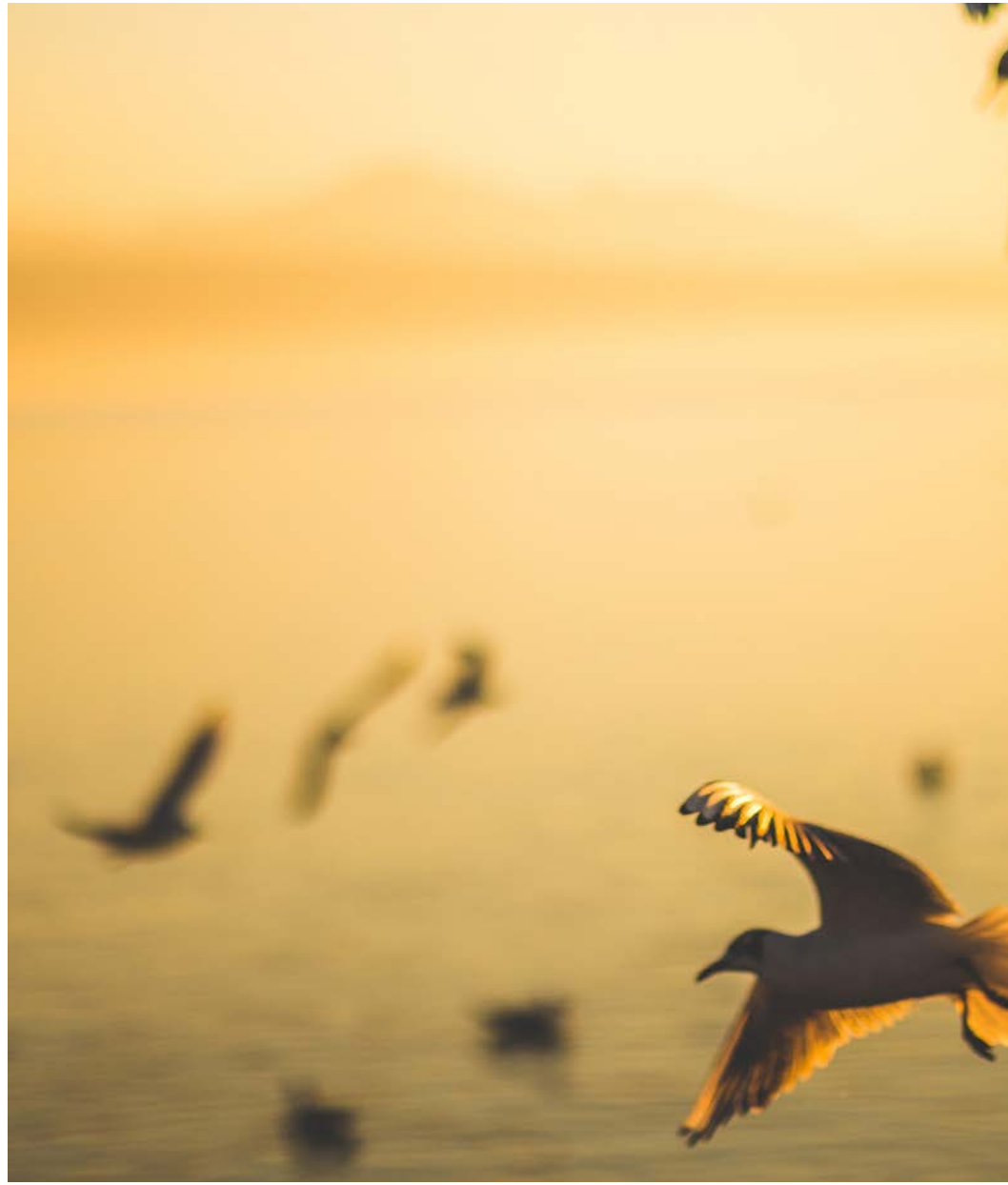


Production, sales and distribution of energy

ENERGY

"By chance, sustainability and digitalization have reached a mature stage in the same age and fit together; they deeply interlink with each other. "

Executive Vice President Digital Transformation & Technology, SNAM



A closer look at the development in sustainability focus, key topics, relative emission levels, the changing energy landscape, and the relative sustainability activity across CxO functions in the *energy* industry

Overview of the most mentioned topics - and other sustainability matters in energy

Focus on renewables and high future uncertainty has sparked sustainable transformations in the energy industry

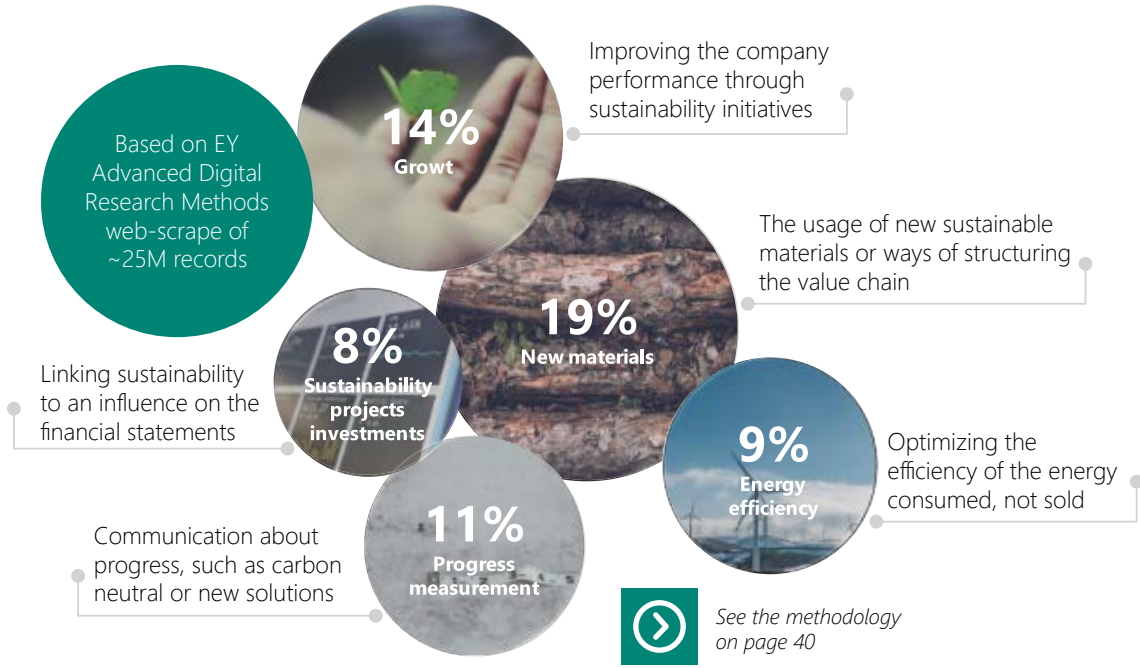
Materials used to generate power have come under increasing scrutiny, primarily due to sustainability concerns about emissions from namely fossil fuels, and to some extent biomass. In response to such concerns, energy are looking towards sustainable alternatives such as wind, solar and hydro. From this focus shift, growth opportunities have emerged, as evidenced by the long-term strategic transformations into new renewables markets communicated by the European oil majors, who have made substantial investments into renewable assets.

High levels of future uncertainty in the energy sector (customer, regulatory, technology, new entrants) will focus incumbents' business design strategies on future-proofing positions. Utilities must prepare for the future with a mix of taking firm, 'no regret' positions against large uncertainties and essential investment 'must do's' for developments that are here and now.

Leaders in the sector have started to disclose metrics around investments in low carbon technology, the effectiveness of carbon capture technologies, targets to phase down fossil-fuel generated electricity and ways that internal carbon price is used in decision-making.

Figure **'New materials' is the most mentioned sustainability topic in energy**

Share of records related to sustainability in the energy sector, 2019-2020 (top 5 topics only)



See the methodology on page 40

Source: EY Advanced Digital Research Methods

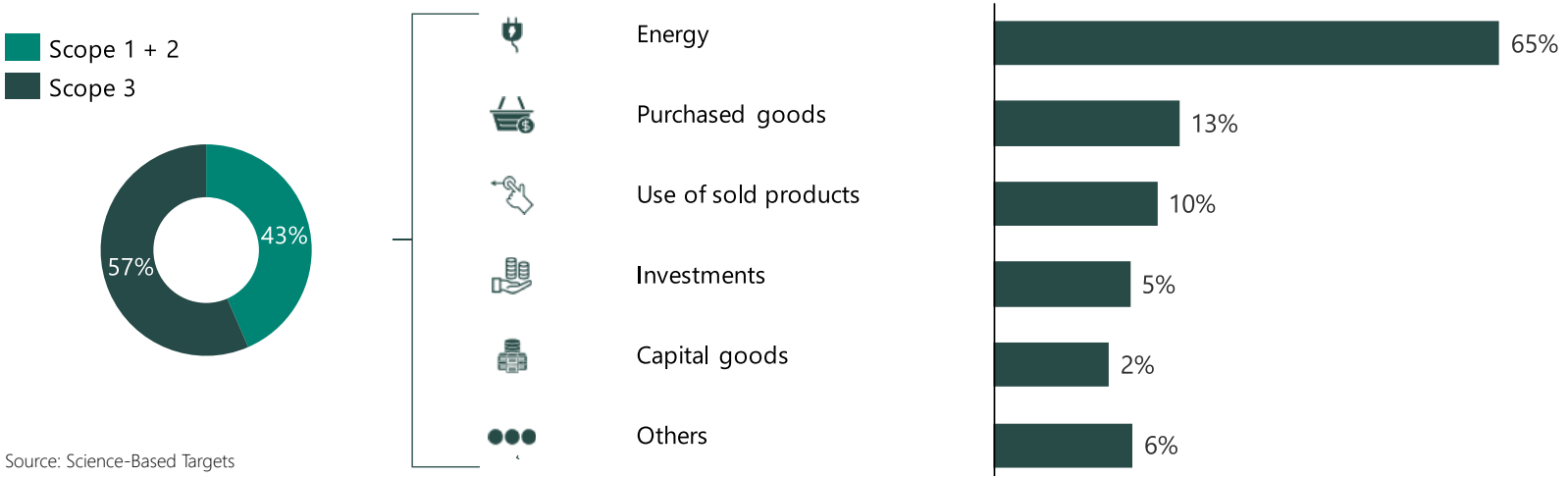
The emissions from the use of sold products remain under-estimated by energy

Most energy companies disclose their scope 1 and 2 emissions. For the energy sector, it is expected that companies would be reporting both upstream and downstream emissions (known as scope 3 emissions), no matter where they are positioned on the energy supply chain. Remarkably, few companies report on scope 3 emissions as shown below.

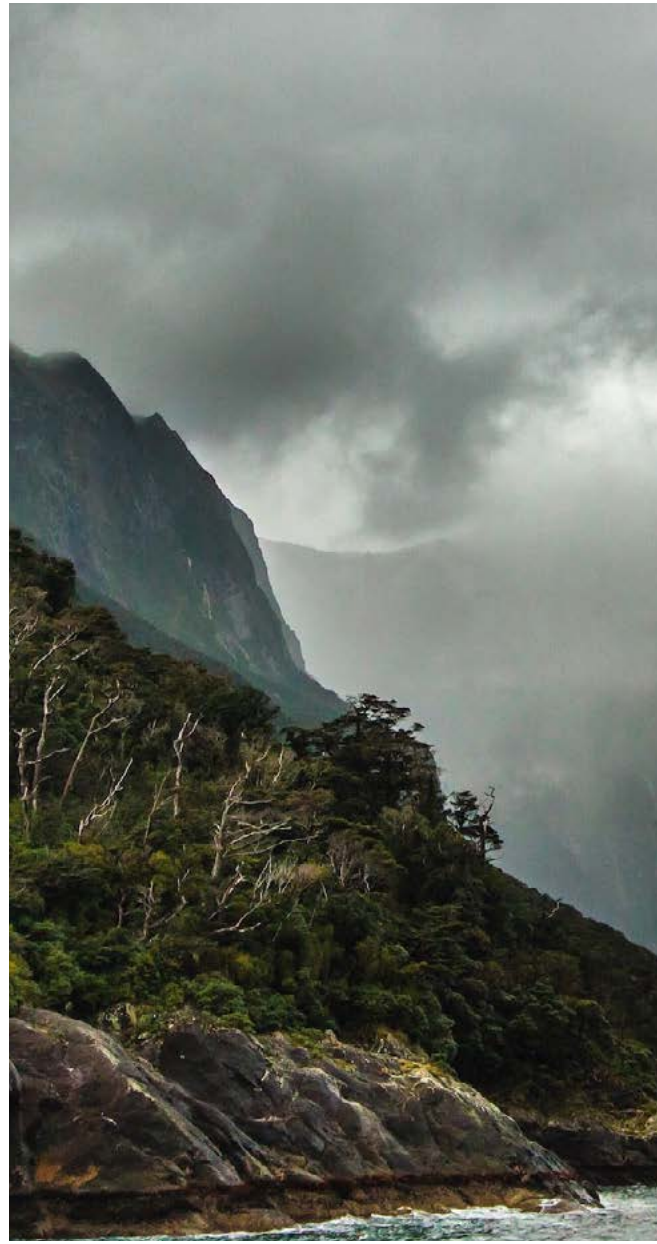
In order for oil & gas and energy utilities companies to develop strategies to mitigate emissions and develop low carbon portfolio products and services they need to improve the quantification of the scope 3 emissions.

Figure **Largest share of Scope 3 emissions in energy result from energy**

Share of energy sector scope 3 emissions (top contributors)
Source: Science-Based Targets



Source: Science-Based Targets

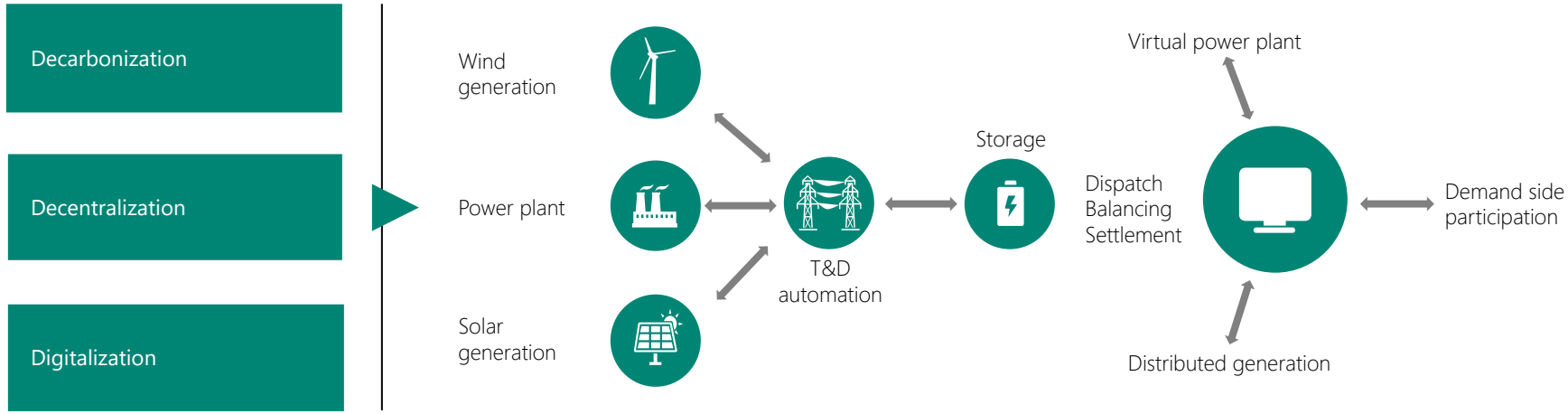


The global energy landscape is changing and will impact every part of the electricity value chain

Currently, the global energy landscape is shifting toward a new value chain where both power information will flow in both directions. The future energy value chain will be augmented and interconnected by digital technologies which will enable demand side participation and sustainability gains.

The pace of change will be defined by new technologies

New technologies, specifically non-utility solar, battery storage and EVs, will drive the transformation to the new energy system. After the birth of the new system, we will see a convergence of the electricity and mobility industry and ultimately the emergence of a new digital energy marketplace.



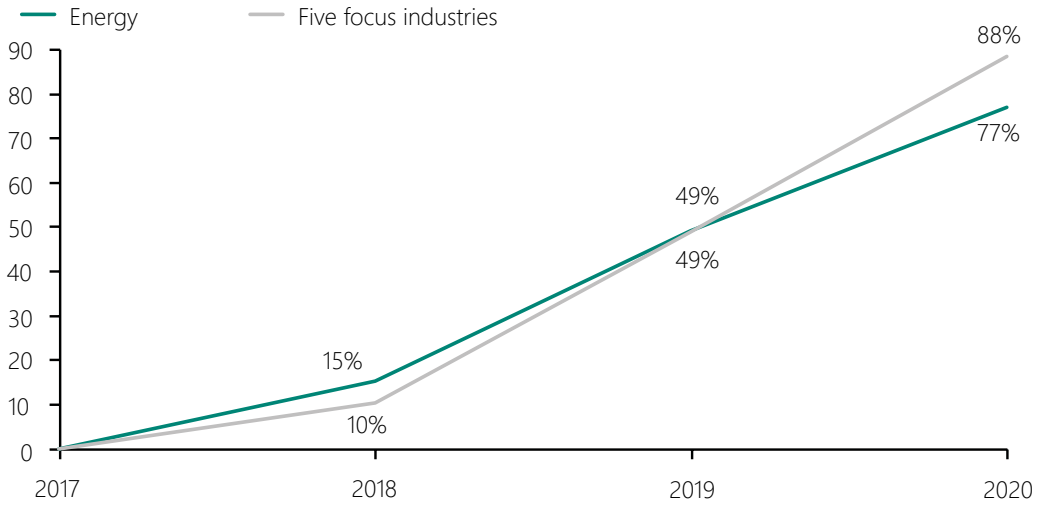
Source: EY

Growing focus on sustainability in the C-suite in energy

Energy is at the forefront of the sustainability debate, given the risk of high emissions and direct exposure to fossil fuel supply chains, but also due to the opportunities of investments in readily accessible low-carbon substitutes. With a lot of stakeholder activism, actions such as lawsuits and shareholder resolutions, have been directed towards the largest energy companies. These actions appear to have had an impact and have encouraged companies to engage with a wide range of stakeholders to measure how environmental concerns are affecting consumer trust, investor valuations and relevant regulation.

Figure **Increased focus on sustainability by C-suites in energy**

Growth in # of records related to sustainability in the energy sector, 2017-2020



Source: EY Advanced Digital Research Methods

Based on EY Advanced Digital Research Methods web-scrape of ~25M records

"We have made sustainability the core purpose to build and grow the company."

CEO, Enprove

"Sustainability is a core pillar of our strategy and is driven by the CEO and the entire executive team."

Executive Vice President Digital Transformation & Technology, SNAM

COOs and CTOs drive sustainability transformation

The COOs and CTO functions account for most focus when assessing sustainability topics in the energy sector. This resonates well with the importance of continuously developing and applying new technology as well as committing substantial capital outlays, both to R&D and renewable energy farms.

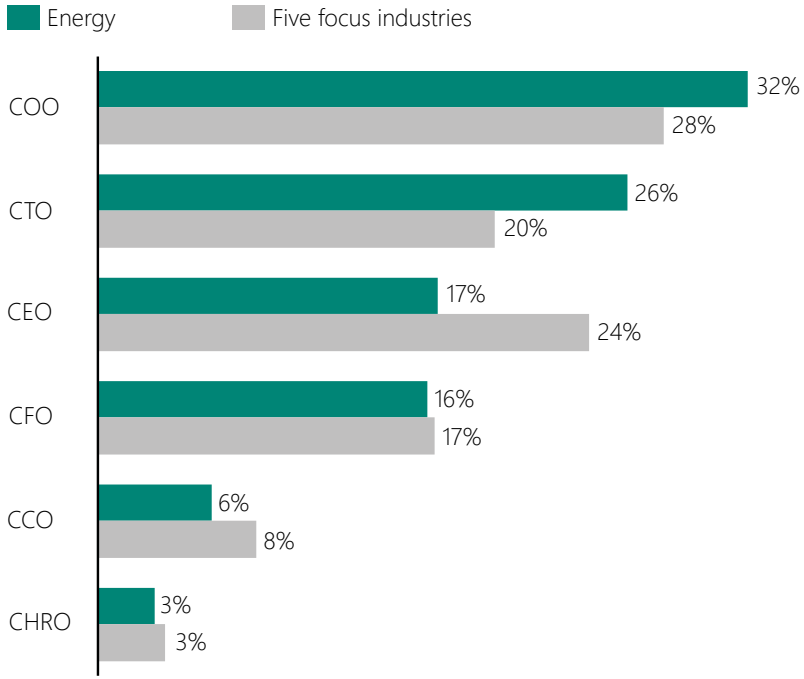
58%

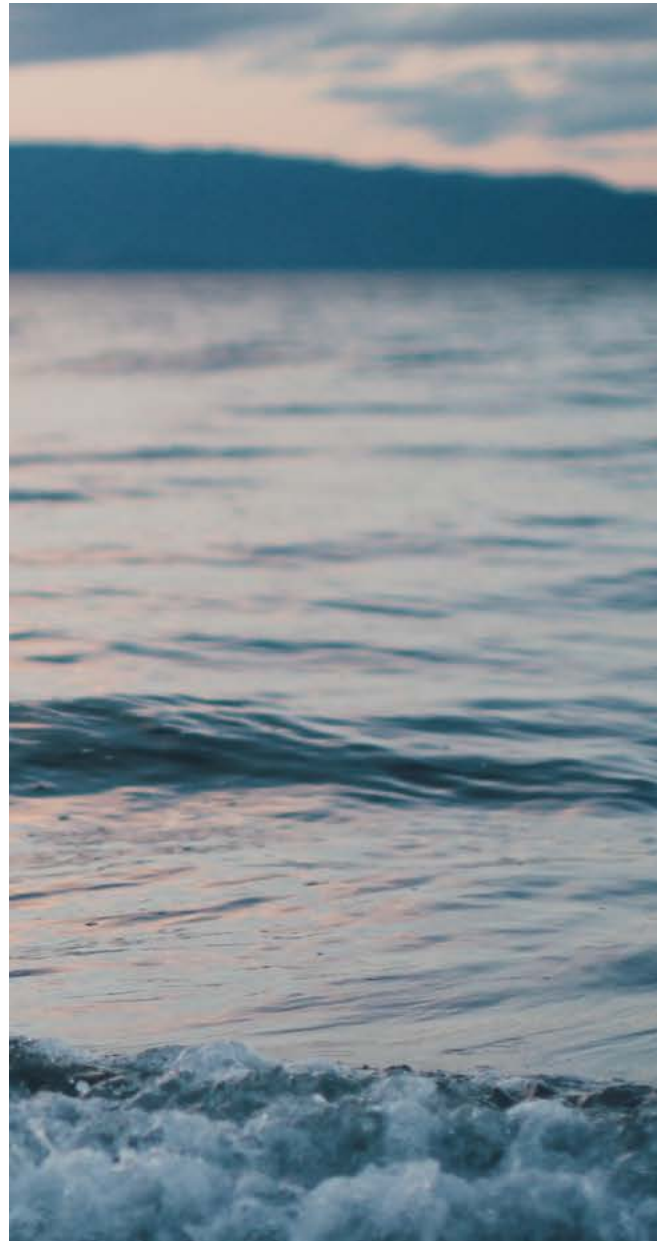
of energy industry records associated with sustainability are related to COOs and CTOs

Source: EY Advanced Digital Research Methods

Figure **COOs and CTOs the most active functions in energy**

Share of records related to sustainability in energy by CxO function, 2016-2020
Source: EY ADRM web-scrape of ~25M records





Public entities at government and municipal level

PUBLIC SECTOR

> "Like digital transformation, you need a sustainability ecosystem around you. For transformative topics, ecosystems are more efficient than if everyone would do it themselves."
>
> **Managing Director, digitalswitzerland**

A closer look at the development in sustainability focus, key topics, relative emission levels, the rise of smart cities, and the relative sustainability activity across CxO functions in the *public sector*

Overview of the most mentioned topics - and other sustainability matters in the public sector

Technology is creating opportunities and challenges in the public sector

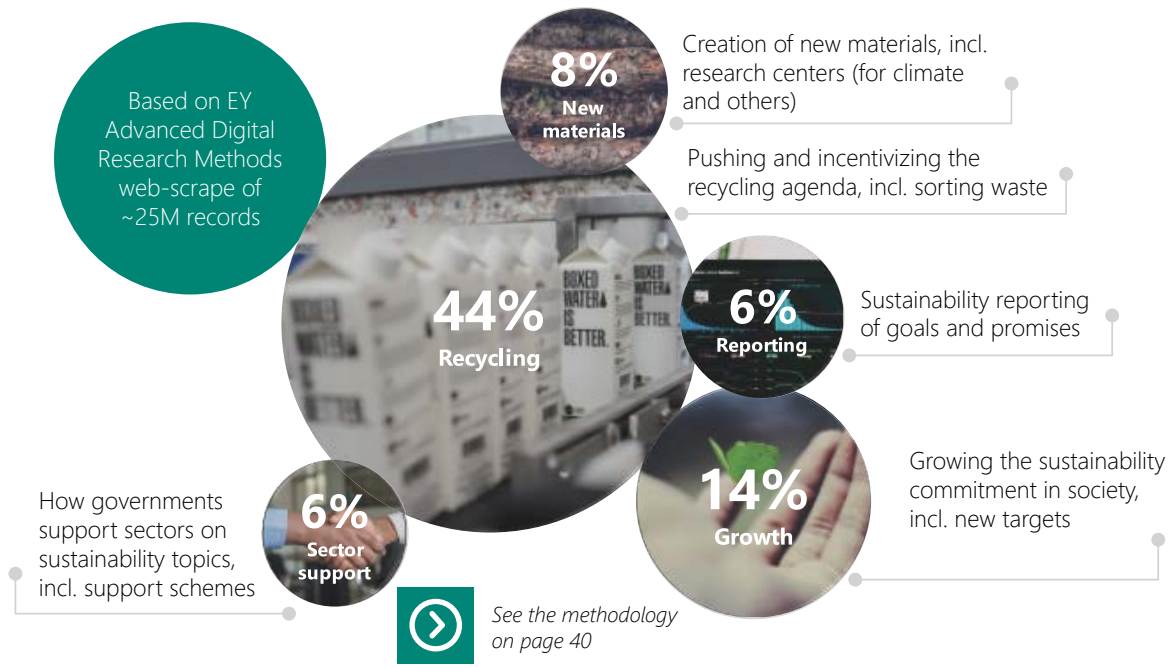
Digital technologies are rapidly creating new patterns of citizen behavior, from the way people work to the services they use and the places they live. This brings new challenges for public entities seeking future-proof societies. Entities within the public sectors need to engage citizens in order to fully understand their needs and must utilize digital technologies in order to have the reach and efficiency necessary to succeed in creating more agile and sustainable solutions for society.

The public sector plays a key role in setting the sustainability agenda, including that of circularity and recycling

Public entities play an important role in setting sustainability goals, and outlining how society at large is able to achieve them both at a national level and more local levels. Within the public sector, recycling is one of the most important sustainability topics among C-suites. Recycling is highly connected to the general circular economy, in which goods are reused rather than disposed. Public entities play a considerable role as a contributor to the circular economy transition, both as policy makers and as major buyers and users of products. However, there is still room to increase circularity within the sector in order to become more sustainable while also capturing efficiency gains.

Figure **'Recycling' is the most mentioned sustainability topic in the public sector**

Share of records related to sustainability in the public sector, 2017-2020 (top 5 topics only)



Source: EY Advanced Digital Research Methods

Key statistics that shape governments' perception of sustainability

Urban areas account for **75%** of global carbon dioxide **emissions**, and the 100 cities with the greatest footprints account for **18% of global emissions**

800 million people, 11% of the world's population, is currently vulnerable to climate change impacts such as droughts, floods, heat waves, extreme weather events and sea-level rise

Globally, **only 9.1% of materials society uses are re-used**, the remaining 91% are primary materials that end up in a landfill

The world is extracting more and more raw materials to keep up with growth. From 1970 to 2010, **annual global extraction of materials grew from almost 22 to 70 billion tons**

Over 6 million people currently live in coastal areas vulnerable to sea level rise at 1.5°C of additional global warming, and at 2°C this would affect 10 million more people by the end of this century.

$29.4 trillion in culminative climate investment opportunity to be had in emerging economies across six urban sectors by 2030

More than **70 cities worldwide** have pledged to become **carbon neutral by 2050**, meaning they will produce no more climate-changing emissions than they can offset

Today, **33 large cities** (> 3 million), home to more than 250 million people, face **extremely high water stress**, a number that is expected to rise to **45 cities affecting nearly 500 million people by 2030**

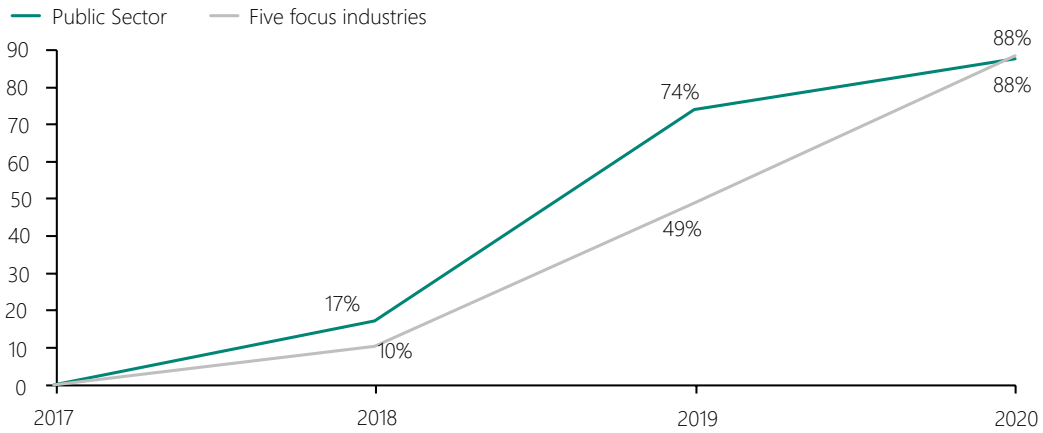
Source: EY

Growing focus on sustainability in the C-suite in the public sector

The public sector is facing increasing expectations to not only stay within budget allocations but also to deliver value to all stakeholders in a transparent and sustainable way, showcasing both social and environmental impacts. With the environmental agenda being a key political topic, the sustainability agenda will in turn follow in the broader public sector.

Figure **Increased focus on sustainability in the public sector**

Growth in # of records related to sustainability in the public sector, 2017-2020



Source: EY Advanced Digital Research Methods

Based on EY Advanced Digital Research Methods web-scrape of ~25M records

"Technology enables sustainability, with sustainability as integrated part of the company purpose and ambition."

Professor at ETH Zurich and Director of the (Swiss) National Centre of Competence in Research (NCCR) in Digital Fabrication

"Technology is an enabler, and a means to the sustainable company purpose; it is not a final result."

Managing Director, Digitalswitzerland

COOs and CTOs drive public sector sustainability transformation

The two roles mentioned most in records related to sustainability in the public sector are the CTO and, most predominantly, the COO. This distribution makes sense as the COO role is the natural anchor point of recycling, which is the core sustainability topic in the public sector. To enable better recycling, new and advanced solutions could be imagined, which would fall under the CTO domain.

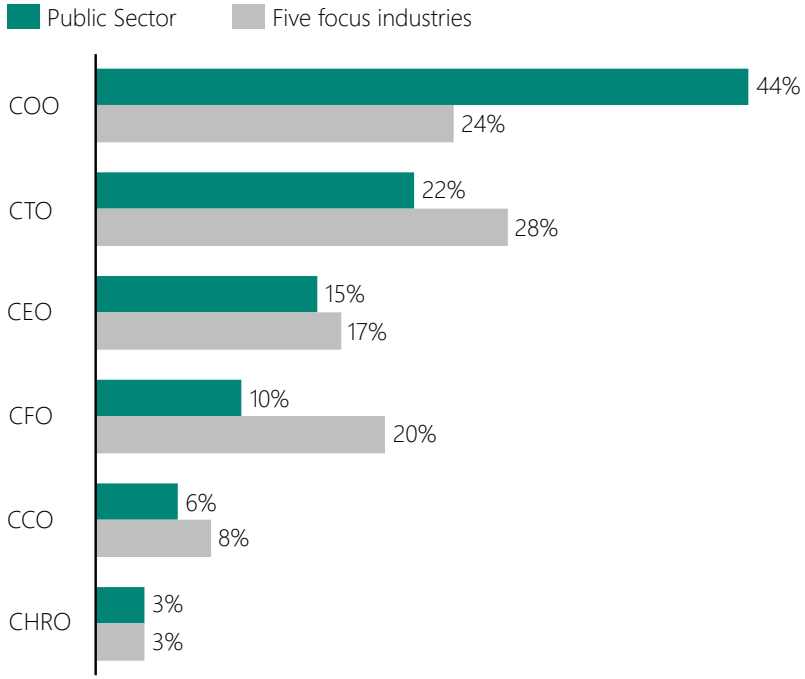
66%

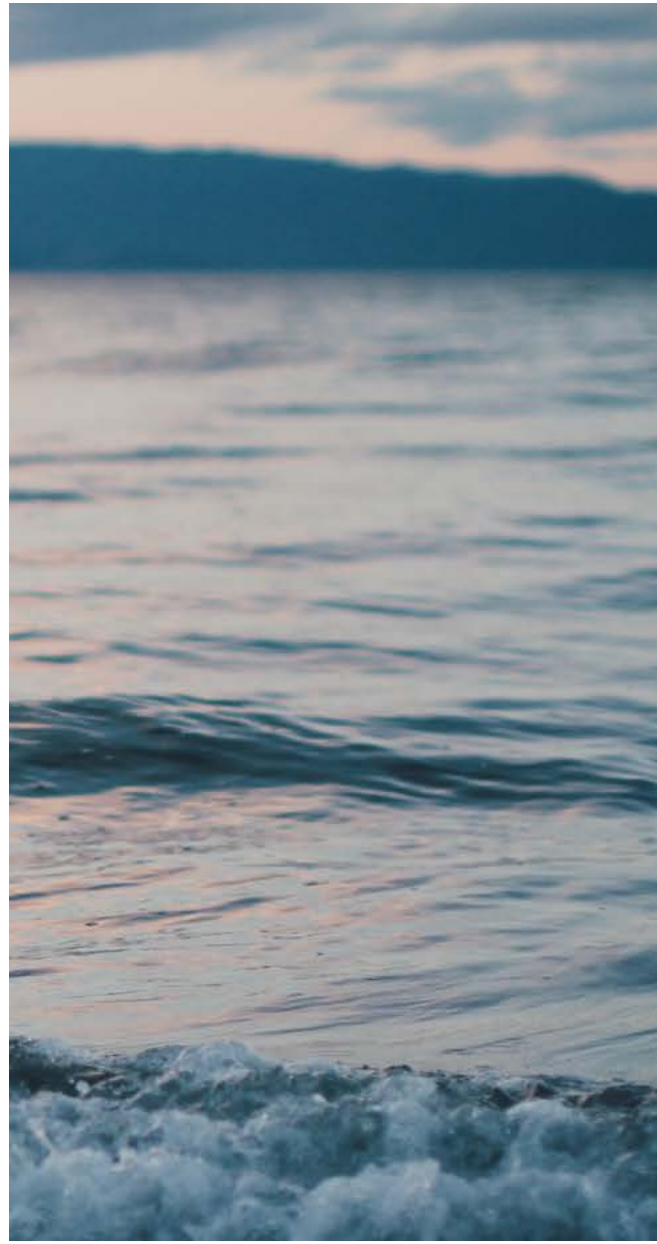
of public sector records associated with sustainability are related to COOs and CTOs

Source: EY Advanced Digital Research Methods

Figure **COOs and CTOs the most active functions in public sector**

Share of records related to sustainability in public sector by CxO function, 2016-2020
Source: EY ADRM web-scrape based on ~25M records





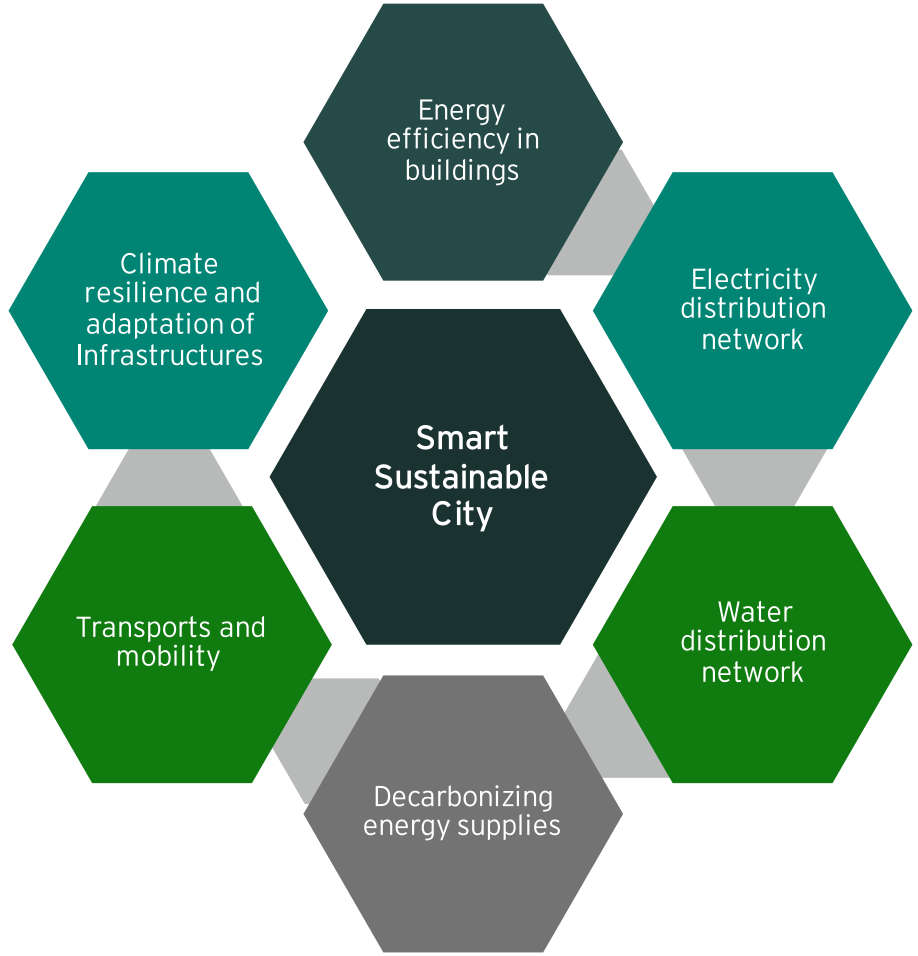
Smart cities can combine sustainability and technology at the benefit of society at large

Public sector actors can fuel sustainable transformation by untapping capital to invest in sustainable city transformation projects and smart cities. By leveraging the value of data and green infrastructure, smart cities can combat climate risks and become more resilient to the many unexpected events of today's increasingly unpredictable world. Furthermore, these cities can support the decoupling of resource use and environmental impacts by diffusing circular economy approaches to production and consumption.

Read five lessons in digital transformation from a smart city

"An underlying key driver for sustainability is the society itself; the societal demand for more sustainable products is influencing the regulatory and legal changes and the interest of investors."

President Bayer France



Source: EY

CxO GUIDES

Guides for how the CxO functions can leverage technology to navigate the sustainability agenda with key priorities to consider, latest insights for improved knowledge, leading practices to learn from, and practical steps to follow

CxO reader guide

Six role-specific sustainability guides

This chapter contains six unique guides providing business executives with a holistic view on sustainability topics as seen specifically from their job role. This functional perspective includes both key issues and priorities as well as the most promising opportunities and activities.

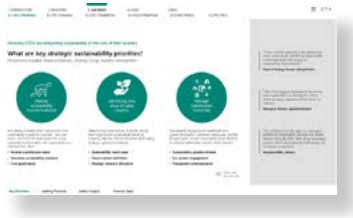
The 6 CxO guides covered in this report are: CEO, CFO, CCO, COO, CHRO and CTO.

The content in the CxO chapters is based on extensive interviews with C-suites, across industries, geographies, maturity levels and job functions, as well as dialogues with leading sustainability and technology experts.

Each CxO chapter is divided into four key sections: Key priorities, Leading practices, Latest insights and Practical steps

Key priorities

Outlines which sustainability related issues should be at the top of each CxO agenda, what the objective should be, and specific activities to pursue.



Latest insights

Contains novel analysis to see sustainability-related issues from a new perspective, bringing insights for each of the CxO functions.

Leading practices

Provides inspiring examples of how companies are finding new solutions to role specific challenges, and references to innovative resources and tools.

Practical steps

A guide to help executives understand immediate tasks ahead of them, whether that is establishing the fundamentals necessary to start the sustainability journey or considering advanced technologies to drive future best practice.

The sustainability agenda is increasingly gaining traction across the different CxO guides, however, some roles seem to be further ahead in driving the sustainability agenda

Growing focus on the sustainability agenda across CxO guides

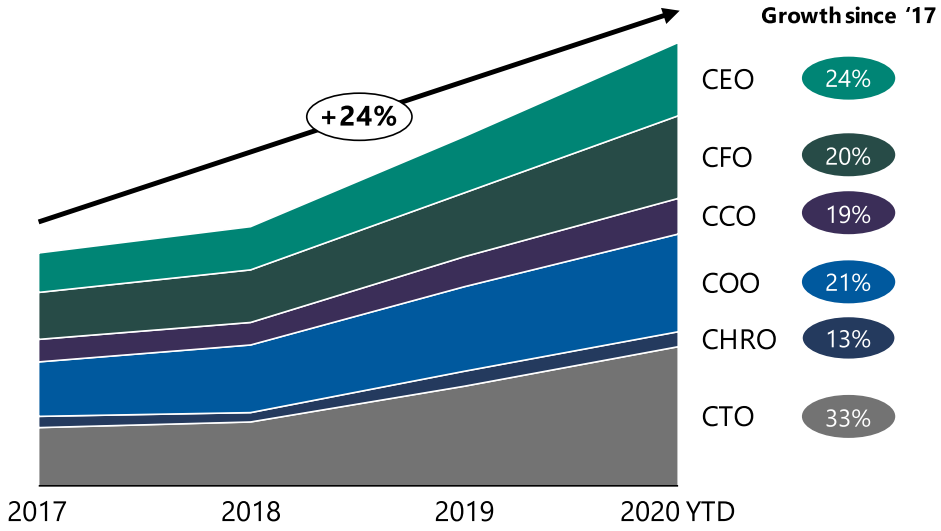
The importance of sustainability topics is increasing across the CxO guides

Since 2017, the number of sustainability topics related to all CxO job roles have grown significantly. Among the 6 CxOs in focus, relevant topics linked with CTO responsibilities have seen the strongest growth at 33% per annum.

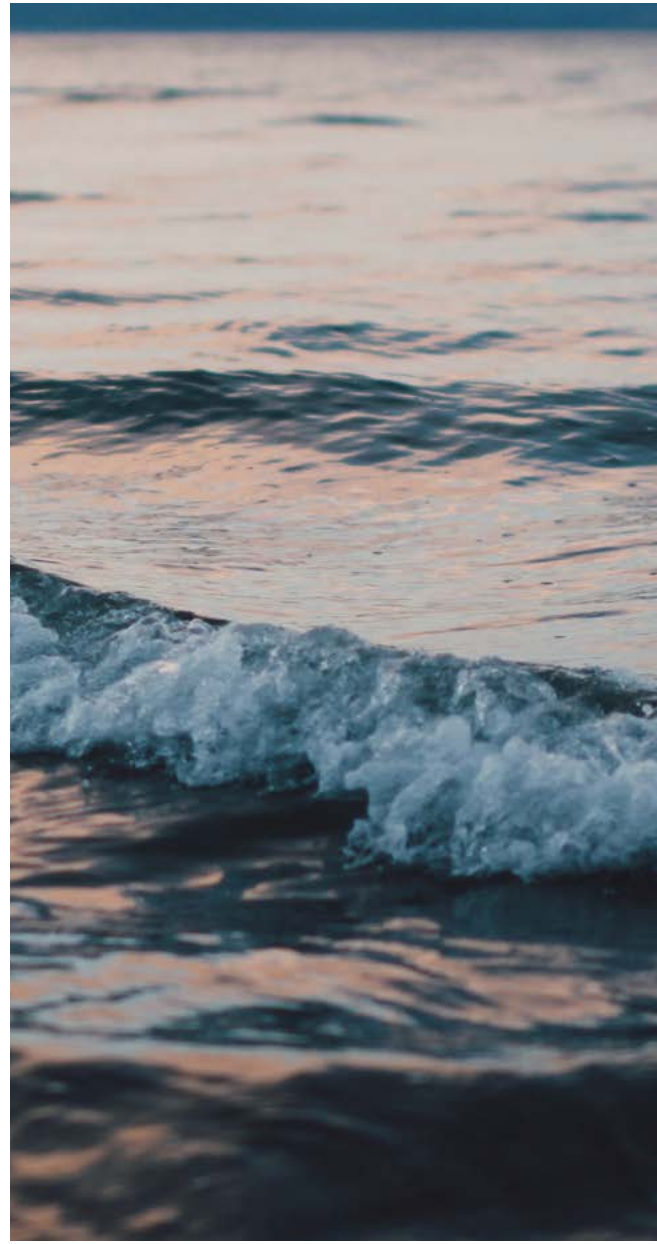
With 27% and 24% of all mentions since 2017, the CTO and COO agendas have received most attention. Following, are the CFO and CEO roles accounting for 17% and 19% of records. The least awareness has been given to the CCO and particularly the CHRO functions with 9% and 4%, respectively.

Figure **Sustainability is a continuously increasing topic**

Share of records related to sustainability across sectors by CxO, 2017-2020
Source: EY ADRM web-scrape of ~25M records



Source: EY Advanced Digital Research Methods



With different sustainability priorities for the CxOs, the model provides a guide for where the respective roles can start the sustainability journey and how they can integrate it in strategic, financial, commercial, operations, people and tech decisions

Key CxO sustainability priorities

Hover over the figure for more info

CTO | Tech

Looks at how sustainability trends can be thought into processes related to data and hardware and drive innovative products or services

Read the full CTO guide from page 130

CHRO | People

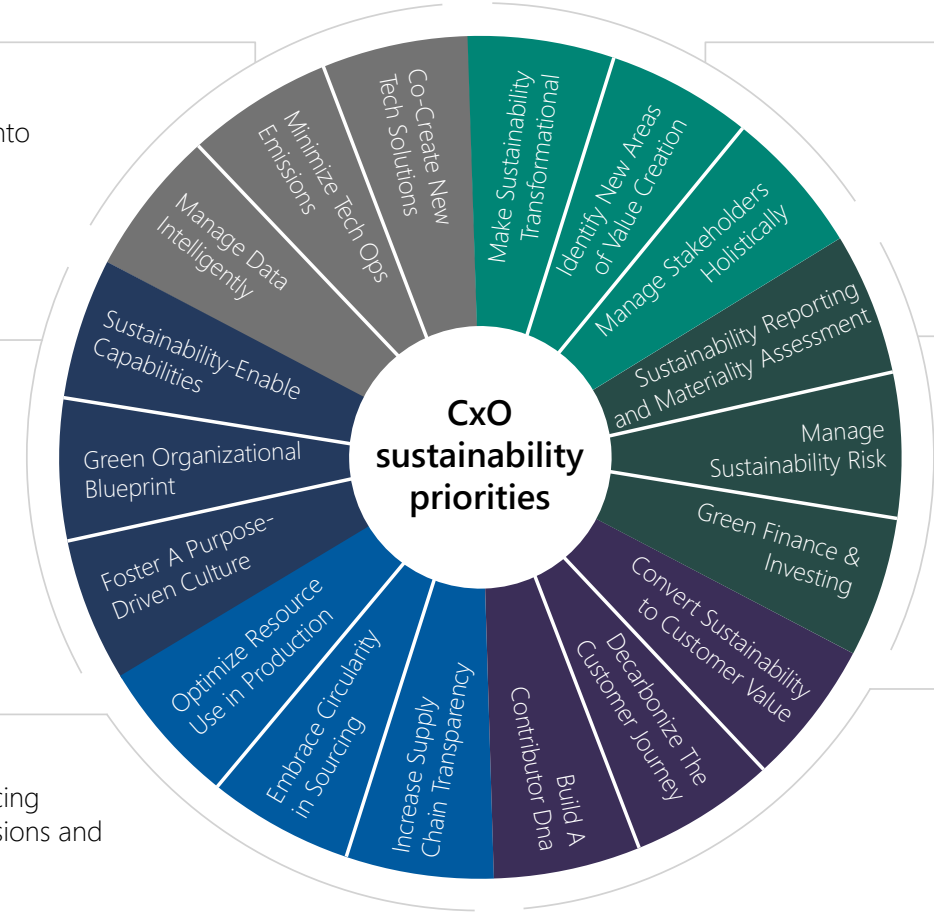
Thinks sustainability preferences into company culture, training and talent interaction to create engagement.

Read the full CHRO guide from page 120

COO | Operations

Prepares for impact of sustainability trends on sourcing requirements and demands to reduce carbon emissions and costs simultaneously.

Read the full COO guide from page 110



CEO | Strategic

Evaluates strategic threats and opportunities arising from sustainability trends and defines future visions, goals and positioning of the company.

Read the full CEO guide from page 76

CFO | Financial

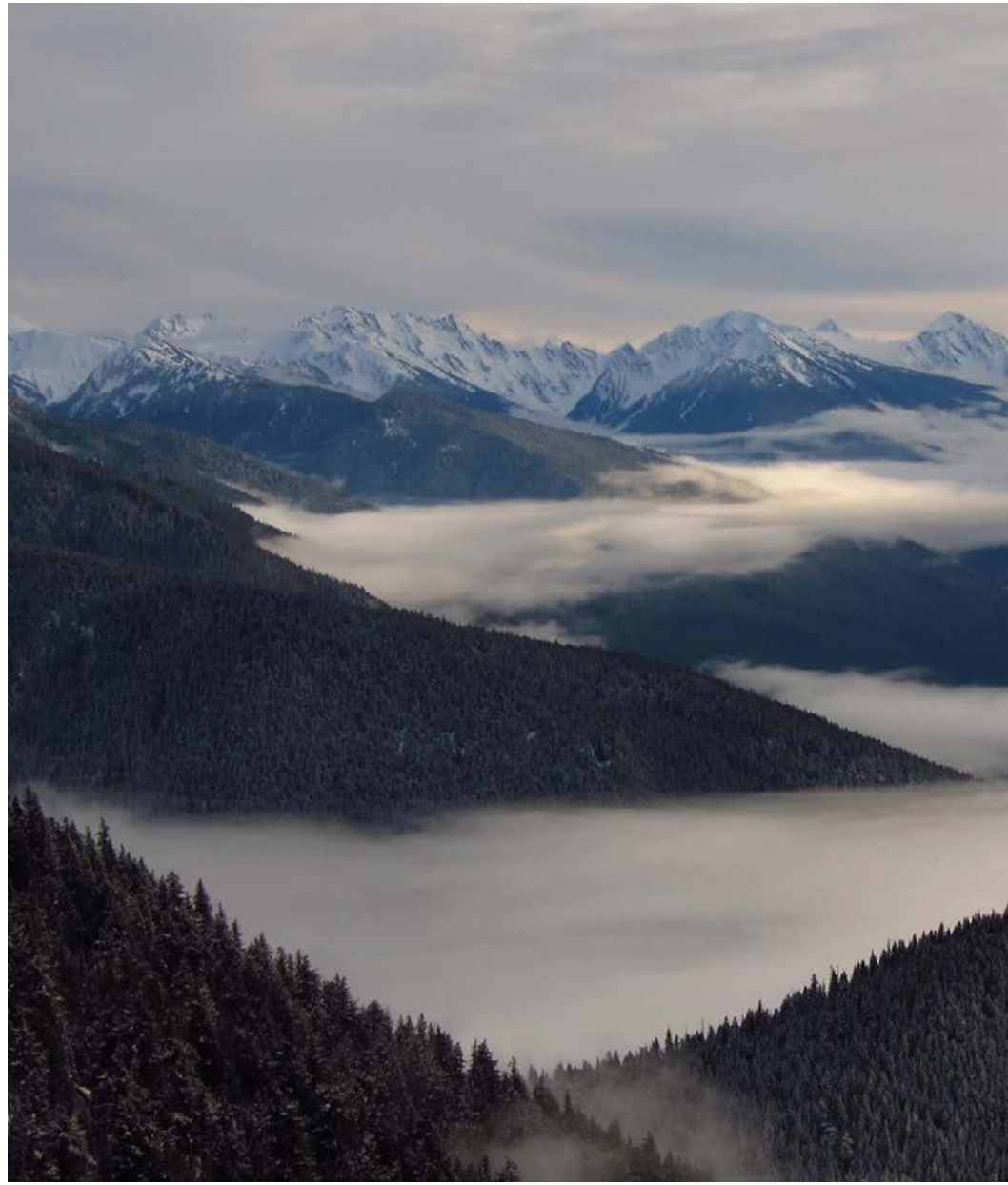
Understands how sustainability topics impact financial planning and reporting, as well as compliance and capital allocation decisions.

Read the full CFO guide from page 86

CCO | Commercial

Recognizes how sustainability trends affect customer behavior and re-thinks sales processes, branding, marketing and public relations accordingly.

Read the full CCO guide from page 98



Perspectives included: Board of Directors, Corporate Strategy, Business Development

CEO | STRATEGIC PERSPECTIVE

> "Digital technology and sustainability initiatives have the common ambition to increase efficiency, but are often implemented independently."
>
> **Head of Strategy Europe and Global Head of Sustainable Development, LafargeHolcim**

Visionary CEOs are integrating sustainability at the core of their business to drive growth and transformation together with the stakeholder ecosystem

What are key *strategic* sustainability priorities?

Perspectives included: Board of Directors, Corporate Strategy, Business Development

Hover over bullets for more info

Articulating a shared net zero vision that follows a science-based approach and anchors how sustainability is good for business - and vice versa - and how this materializes into a true corporate transformation with sustainability as a core business value and standing agenda item at executive level.

- **Positive contribution vision**
- **Executive sustainability mandate**
- **Core governance**

Determining future sources of growth arising from long-horizon sustainability trends by fostering selective internal disruption and making strategic capital prioritizations.

- **Sustainability trend radar**
- **Future market definition**
- **Strategic resource allocation**

Transparently engaging the stakeholder ecosystem of investors, customers, employees, and the broader public around sustainability goals. Building an external stakeholder network where relevant.

- **Sustainability growth-mindset**
- **Ecosystem engagement**
- **Transparent communication**

> "Sustainability includes all the different actions that will have a long-term impact and should be taken into consideration together with short-term financial goals."
>
> **President, Bayer France**

> "Today, there is an accelerated demand for sustainability as customers are asking for more sustainable products and services. Our company has a long history of environmental stewardship and compliance, but we also realize we need to go further in an increasingly resource-constrained world."
>
> **President MSD Mid-Europe Region, MSD**

> "Our goal is to be carbon neutral by 2050. Technology is a crucial enabler in everything we do to achieve this goal."
>
> **President EMEA, DuPont**

Get inspired by leading CEOs and access a wide range of helpful tools, encouraging cases and developed frameworks to help your organization successfully embark upon the sustainability journey ahead

CEO sustainability best practices

CASE

Ensuring sustainability in governance

In 2020, Bayer established an independent Sustainability Council to advise the Board of Management of Bayer and other functions within the company in all sustainability matters, as a part of the commitment to sustainability that Bayer announced in 2019. The council is made up of nine

experts, including academics and non-profit leaders, and will review Bayer's progress and advise the company's board.

Source: https://www.bayer.com/en/sustainability/sustainability-council

Read about Bayer's sustainability council

COMPASS

Align corporate strategy to the SDGs

The SDG Compass aims to provide guidance to companies to help align their strategies and measure their contributions to the UN SDGs. This guide is a five step process, which focuses on helping corporates to set out specific, measurable, and time bound sustainability goals across the organization, ultimately maximizing companies' contribution to the SDG.

Source: https://sdgcompass.org/

Read about the SDG Compass

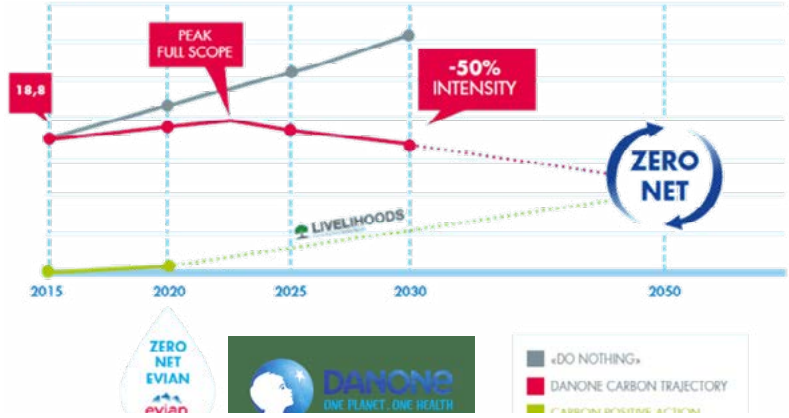
POLICY INSPIRATION

Leverage climate policies for strategic innovation

As a key part of Danone's net zero carbon policy, internal carbon taxation is strategically re-invested into sustainable solutions in the Livelihoods Carbon Fund. The Livelihoods Fund's target is to stock 8 million tons of carbon over 20 years for a minimum investment of 40 million euros.

Source: https://media.business-humanrights.org/media/documents/files/DANONE_Climate-Policy_Full_Version_EN_091115.pdf

Read about Danone's Climate Policy



CASE

Eliminate past and future emissions

Velux will take responsibility for all their historical carbon emissions dating back to the founding in 1941, while also taking responsibility for their future at the same time. This will be done through forest conservation projects, identified and managed by Worldwide Fund for Nature (WWF).

The ultimate goal is to become Lifetime Carbon Neutral.

Source: https://www.velux.com/what-we-do/sustainability/lifetime-carbon-neutral

Read about Velux commitment and collaboration

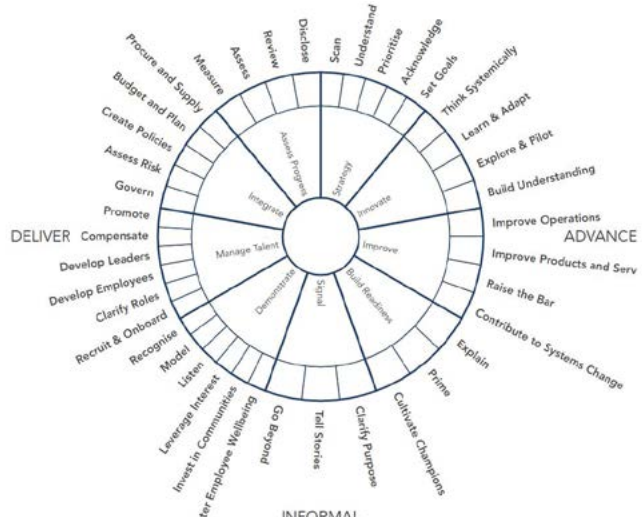
RESOURCE

Access resources through Embedding Project

A selection of the most relevant resources and tools to help you better embed sustainability into your company.

Source: https://www.embeddingproject.org/resources/

Read about the Embedding Sustainability



BENCHMARK

Benchmarking against necessary levels of sustainability performance

The Future-Fit Business Benchmark is a free open-source tool designed to help corporates assess, measure, and manage the impact of their activities, by translating 30+ years of research into a practical guide with the aim of providing progress toward a flourishing future.

Source: https://futurefitbusiness.org/

Read about Future-Fit Business Benchmark

Disruption can be sparked by numerous forces and sustainability is both part of and exposed to these cross-currents of disruption. More than ever, sustainability strategies need to look beyond traditional boundaries to identify potential threats and opportunities

Framework for how disruption meets sustainability

The megatrends framework provides guidance for sustainability strategy

The megatrends framework provides a structure for understanding the root causes of disruption and projecting its outcomes in the medium-term and beyond.

Applied to sustainability, the megatrends framework indicates the environmental, social, governance, and market transformations on the horizon which will catalyze new opportunities for value creation and challenge current business models.

CEOs can look at their own business through the megatrends framework to develop a sustainability strategy that looks toward the future to drive action today.

The framework is centered around four forces driving disruption

Four primary forces are the root cause of disruption: technology, globalization, demographics and environment. These forces have existed for years and continue to drive change globally.

While they are not new, the forces evolve in waves, and the interaction between these new waves gives rise to new megatrends. Like their counterparts in the natural world, the waves can have different wavelengths and frequencies.

The current waves of the primary forces will have profound impacts on sustainability.

Sustainability megatrends will impact companies in unique ways

The interaction between the waves of primary forces creates megatrends. This framework highlights several important megatrends to illustrate the wide-ranging disruptions influencing sustainability

Sustainability will shape the rules in future working worlds

In the longer term, the combined effect of sustainability megatrends reshapes the political and economic landscape. The future working worlds describe the new rules that will govern various systems.

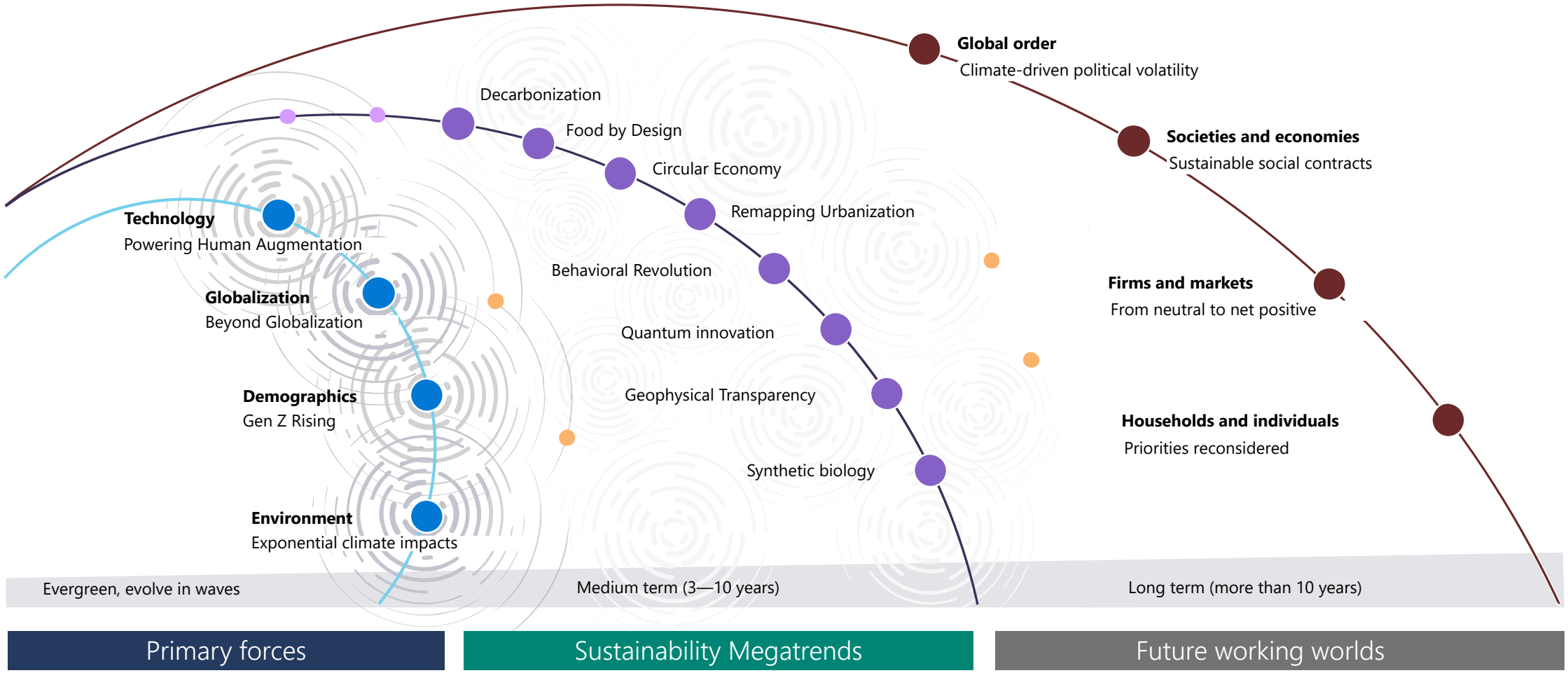
FRAMEWORK

Megatrends Framework

The Megatrends Framework for Sustainability Strategy was developed by EYQ, EY's global think tank. The framework draws on EYQ's biennial megatrends reports, most recently Megatrends 2020 and beyond: Are you reframing your future or is the future reframing you?

Read the report here

Hover over the framework for more info



Visualization developed by EYQ based on the EY Megatrends framework

Source: EYQ; EY

Using the megatrends framework to develop a future-back sustainability strategy

The future of sustainability is not just more of the same

Sustainability sits at the nexus of volatile climate change, disruptive technology and new stakeholder expectations. Whether you are pursuing operational sustainability or developing sustainable market offerings, you must question all your operational assumptions. The megatrends framework helps challenge these assumptions in a structured way, bringing trends and forces far outside usual scope of analysis into sustainability strategy development.

Rather than planning focusing on the quickly obsolete current state, use the megatrends to envision multiple future scenarios, unencumbered by the past and unconstrained by the present. Customize the list of megatrends relevant to your sustainability objectives based on factors such as your sector, size and geographic footprint. You can also identify additional megatrends by applying the evolution of the four primary forces – technology, globalization, demographics, and environment – to the specifics of your business.

With your future scenarios as a starting point, create a multi-horizon strategic map that bridges from the future back to today. This will help you structure a portfolio of now-next-beyond sustainability initiatives with immediate impact, determine needed capabilities, and assess the opportunity to collaborate your ecosystem of partners and other stakeholders.

"Technology is an enabler, and a means to the sustainable company purpose; it is not a final result."

Managing Director, digitalswitzerland

"There are a lot of technologies and tools available; being educated on how to use them effectively is key for driving sustainability performance."

CEO, Enprove

Make sustainability transformational

Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Positive contribution vision	**Connect sustainability & business** Define targets for sustainability and clarify to all stakeholders how these connect with business activities	**Sustainability led transformation** Integrate sustainability in the overall transformation narrative of the company (e.g. Unilever)	**Sustainability as start of all** Make sustainability the company raison d'être, with all value-creation having sustainability as the starting point
Executive sustainability mandate	**Introduce a CSO & KPIs** Appoint a Chief Sustainability Officer and make sustainability performance part of executive management scorecards with clear KPIs	**Integrate sustainability in daily operations** Embed the CSO across functions to ensure sustainability objectives are converted to daily priorities and reflected in performance	**Lead the global agenda** Have executive management drive the sustainability agenda globally, setting new standards of transparency
Core governance	**Define structures and authorities** Give the CSO power to influence, challenge and veto executive decisions if necessary, and define governance structures	**Establish specialist committees** Appoint cross-functional specialist committees to advise on sustainability matters and track sustainability progress (e.g. Bayer)	**Extensive live-governance in IT** Hold departments and individuals accountable for high-level sustainability progress through real-time tracking

Identify new areas of value creation

Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Sustainability trend radar	**Market scan framework** Set a frame for understanding sustainability context by setting a frame to guide the CCO and CTO, how to scan data and bring forward commercial insights	**Automated trend detection** Continuously scrape through big data using machine learning and applying AI-guided weights to detect important signals early	**Predictive decision-support** Simulate trend developments using quantum computing and obtain active decision support in real-time
Future market definition	**Map opportunity space** Establish frame for CCOs to compare sustainability trends with internal capabilities to define growth markets	**Data-driven relation assessment** Convert complex relations between trends and internal capabilities into predictions of competitive advantage opportunities	**Real-time market selection** Integrate advanced simulations to ensure the company reaps opportunities in local markets based on real-time value estimates
Strategic resource allocation	**Budgeting framework** Define framework for the CFO to prioritize resources to maximize contribution to business and sustainability goals	**Agile resource prioritization** Move capital fast and flexibly to sustainability initiatives with integrated communication to inform the market	**Automatic allocation** Assign funds automatically in real-time based on probability-weighted analytics,

Manage stakeholders holistically

Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Sustainability growth mindset	**Understand opportunity space** Break down different opportunities arising from sustainability by identifying best practices internally and externally	**Create deliberate disruption** Act on opportunities to support a low-carbon future and pursue sustainable transformations (e.g. Ørsted)	**Develop knowledge platforms** Enable others to transform by sharing steps, experiences and data using open source platforms
Ecosystem engagement	**Mobilize stakeholders** Map out internal and external stakeholders and encourage active participation in the company's sustainability efforts	**Create sustainable coalitions** Identify key sustainability issues and partner across industries to actively tackle these with technology (e.g. Maersk coalition)	**Tech-enable ecosystem growth** Build a solid introduction for dynamic collaboration, by democratizing access to data using online ecosystem platforms
Transparent communication	**Articulate ambitions and targets** Ensure appropriate channels to communicate corporate ambitions and targets openly to the public	**Quantify progress and impact** Track and communicate corporate sustainability advancements and potential set-backs	**Real-time sustainability dashboard** Showcase day-to-day sustainability metrics from operations in all scopes across the full value chain

Perspectives included: Finance, Treasury, Legal, IP, Admin

CFO | FINANCIAL PERSPECTIVE

> "Our reporting dashboard is comprehensive, includes metrics such as finance, environment, health, safety, human resources and operations, and allows for a holistic view on non-financial aspects of the company."
>
> **CFO, Lonza**

Diligent CFOs are treating non-financial KPI's and targets with the same prudence as traditional financial targets and linking sustainability to value drivers

What are key *financial* sustainability priorities?

Perspectives included: Finance, Treasury, Legal, IP, Admin

Hover over bullets for more info

Analyzing the impact baseline and issues, identifying sustainability metrics and targets, and reporting on the impact across stakeholders in the ecosystem

- **Materiality assessment**
- **Sustainability metrics & targets**
- **Non-financial reporting**

Ensuring compliance with internal and external sustainability requirements, managing operational and financial risk, and supporting policymaking in collaboration with external partners

- **Environmental compliance**
- **Externality preemption**
- **Green agenda support**

Connecting sustainability initiatives to drivers of company value, ensuring optimal conditions for green financing, and allocating capital to green objectives

- **Future value drivers**
- **Green financing**
- **Sustainability M&A**

> "CFOs in particular will likely be expected to report back confidently to the Board on how the company is managing its climate-related financial risk."
>
> **Mathew Nelson, EY Global Climate Change and Sustainability Services Leader**

> "What we see is that instead of retreating to short-term performance models, institutional investors are focusing on long-term value creation and raising the stakes when it comes to assessing company performance using ESG factors."
>
> **Mathew Nelson, EY Global Climate Change and Sustainability Services Leader**

Inspiration and practical tools from CFOs and organizations which are sustainability leaders to inspire your organization to embark upon a sustainability journey ahead

CFO sustainability best practices

FRAMEWORK
Developing sustainable portfolios

The Portfolio Sustainability Assessments (PSA) Framework helps companies across different industries develop and apply consistent, high quality PSA approaches that will result in more sustainable product portfolios.

Source: https://docs.wbcsd.org/2017/10/Framework4Port_Sustainability.pdf

Read about the PSA Framework

PROCESS
Automated carbon reporting

Normative is a software that analyzes a company's internal and external data sets and automatically calculates carbon emissions for reporting purposes. Where traditional processes are costly, time-consuming and typically only include easily traceable emissions from electricity and fuel (often less than 10% of total company emissions), Normative includes supply chain emissions, transport, travel and production.

Source: https://normative.io/

Read about Normative

DISCLOSURE RECOMMENDATIONS
Corporate disclosures on climate-related financial information

The Task Force on Climate-related Financial Disclosures (TCFD) provide a volunteer framework for companies to implement robust climate-related disclosures to be integrated with corporate financial reporting. The framework has so far been adopted by 800+ companies, and consists of eleven key recommendations on climate risks and opportunities, and their potential impacts.

Source: https://www.fsb-tcfd.org/

Read more about TCFD

LEARNING HUB
Keep track of climate regulations

The We Mean Business coalition and BSR* have created the Climate Policy Tracker to help businesses determine which climate policies are relevant across key countries and industries. The tool is a free online platform and provides up-to-date information on climate regulations, to allow corporates to obtain a comprehensive picture of the policies impacting business operations and value chain based on industry and location of operations.

Source: https://climatepolicytracker.org/

Read about the Climate Policy Tracker

CASE
Shadow carbon pricing

Get inspired by internal carbon pricing at Unilever which is used to support informed long-term decision making, make climate-smart decisions and allocate funds to carbon sequestration activities across the value chain. In addition, banks are using internal carbon pricing as a tool to factor climate risks into their decision making at sectoral and portfolio levels.

Source: https://www.unilever.com/news/news-and-features/Feature-article/2018/explainer-what-is-carbon-pricing-and-why-is-it-important.html

Read about Unilever Carbon Pricing

REGULATORY FRAMEWORK
European new green deal

The European Green Deal provides an action plan to boost the efficient use of resources by moving to a clean, circular economy as well as restoring biodiversity, and cutting pollution. The plan outlines investments needed and financing tools available and explains how to ensure a just and inclusive transition. The EU has a target to be climate neutral in 2050, and proposed the European Climate Law to turn the political commitment into a legal obligation.

Source: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en#timeline

Read about the EU New Green Deal

* BSR is a global nonprofit organization that works with its network of more than 250 member companies and other partners to build a just and sustainable world.

As governments push for stricter regulations and investors increasingly scrutinize non-financial disclosures, CFOs need to factor potential new requirements into their long-term visions and plan for the future

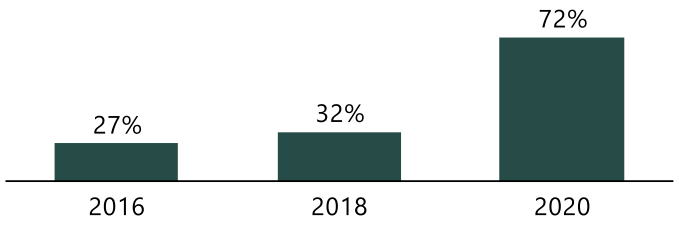
How climate risk will impact non-financial reporting requirements

Companies should expect to be evaluated by investors on non-financial performance

In 2013, 64% of respondents conducted little or no review of non-financial disclosures. In 2020, the number jumped, significantly, and 98% of investors surveyed stated that they evaluate non-financial performance based on corporate disclosures. Moreover, 72% of investors say they conduct a structured, methodical evaluation, suggesting a major leap forward from the 32% who said they used a structured approach in 2018.

Figure **Increasing number of investors conduct structured review of nonfinancial disclosures**

Percentage of respondents who say they usually conduct a structured, methodical evaluation of nonfinancial disclosures.
Source: EY Institutional Investor Survey 2020.



Source: EY Institutional Investor Survey

Physical and transition risks are critical considerations in asset allocation and selection

Climate risks are in particular gaining increasing attention from investors when assessing non-financial disclosures. 73% of investors surveyed say they will devote considerable time and attention to evaluating the physical risk implications of climate change when they make asset allocation and selection decisions. 71% say the same regarding the transitionary risks due to climate change, indicating a belief that climate change can influence corporate performance.

91%

of investors say that nonfinancial performance has played a pivotal role in their investment decision making over the past 12 months

SURVEY

EY Institutional Investor Survey

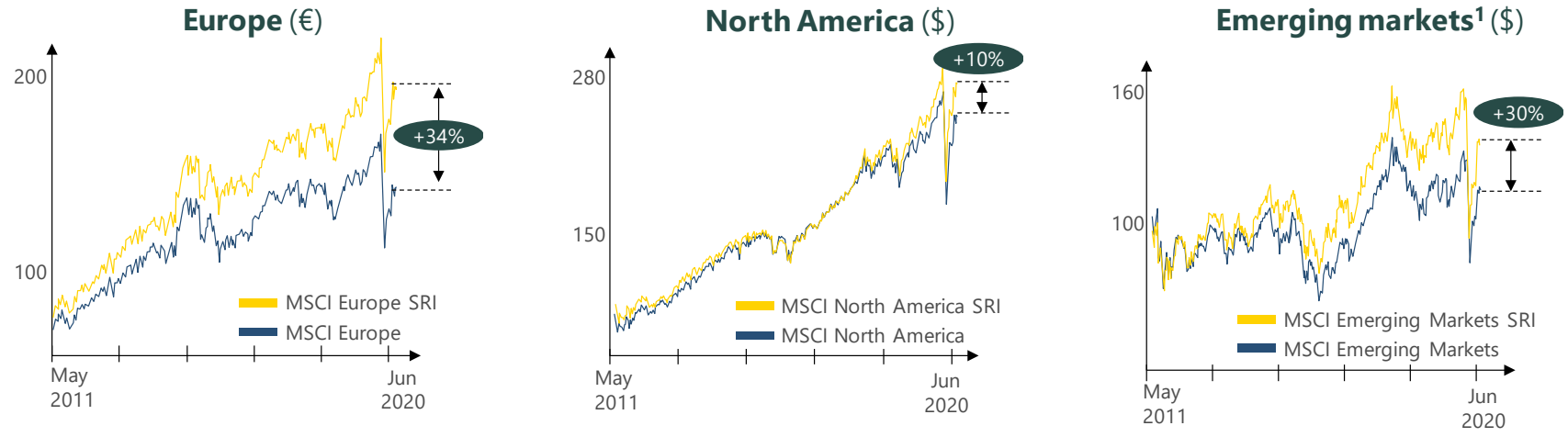
More than ever, investors are stepping up the game when it comes to assessing the performance of companies using nonfinancial factors. Learn more about how investors evaluate non-financial performance from the 2020 EY Institutional Investor Survey

Read the report here

Sustainable companies' performance relative to counterparts

Figure **Comparison of share price performance of shares with outstanding ESG performance (MCSI SRI) versus the broad MSCI Index**

Index performance comparison for Europe, North America and emerging markets. Only companies with outstanding (>BBB) ESG ratings in their industry sector are included in SRI indices and 'sin stocks', e.g. nuclear power, tobacco, firearms, are per definition excluded.
Source: MSCI; UBS; BlackRock; Axioma



1. Including inter alia Taiwan, China, South Africa, South Korea
2. Weak performance significantly impacted by overweight of a strongly decreasing equity market in South Africa in the SRI index compared to the broad market (c. 4 vs. 12%)

Source: MSCI; UBS; Blackrock; Axioma

PREPARE FOR THE FUTURE

The EU Green Taxonomy

The EU Taxonomy is one of the most significant developments in sustainable finance and is expected to have wide ranging implications for investors and issuers working in the EU and beyond.

The Taxonomy is a EU-recognized criteria for identifying sustainable activities, applicable from 1 January 2022.

Read about the EU taxonomy

The future business implications of a carbon tax

GHG emissions covered by carbon pricing initiatives rose from 6% to 22% between 2011 and 2021

Carbon pricing mechanisms are instrumental to help countries achieve reduction in greenhouse gas emissions. As of August 2020, there are 61 carbon pricing initiatives in place or scheduled for implementation in 2021 spread across 31 EU Emissions Trading Schemes (ETS) and 30 carbon taxes.

Figure **GHG emissions covered by implemented and scheduled carbon pricing initiatives**

Share of global emissions covered by implemented and scheduled carbon pricing initiatives in 2011 and 2021.
Source: World Bank 2020

Carbon taxes affect industries differently - emission intensive industries affected the most

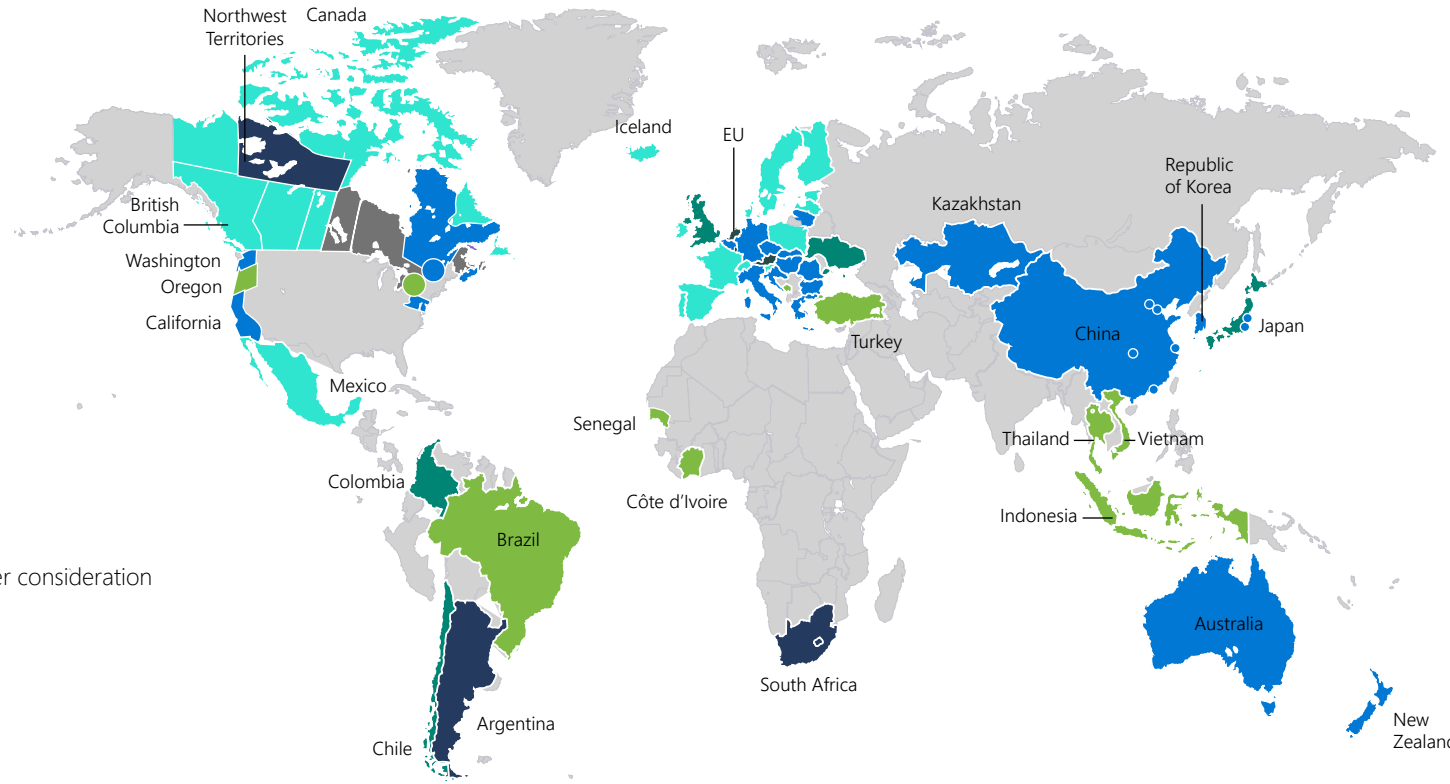
A carbon tax would induce additional direct and indirect business costs, with emissions-intensive industries incurring more of the former and other industries more of the latter. In a recent EY study examining direct and indirect production costs, the potential industry impacts of an illustrative 25$/ton carbon tax on all energy related CO_2 emissions in the US suggested that a carbon tax would increase production costs of electric power generation companies with 12%, compared to a 0.3% increase in production costs for wholesale and retail trade.

While the direct impact of a carbon tax will vary, industries that are not directly subject to the tax may still experience overall cost increases if they rely heavily on inputs that use energy-intensive production processes.

Source EY Analysis 2020: How key industries would fare under a carbon tax; World Bank Caron Pricing Dashboard 2020

Global carbon pricing initiatives in place or scheduled

Go to the World Bank Pricing Dashboard



- ETS and carbon tax implemented or scheduled
- Carbon tax implemented or scheduled, ETS under consideration
- ETS implemented or scheduled, ETS or carbon tax under consideration
- ETS and carbon tax implemented or scheduled, ETS or carbon tax under consideration

- ETS implemented or scheduled for implementation
- Carbon tax implemented or scheduled for implementation
- ETS or carbon tax under consideration

Source World Bank Caron Pricing Dashboard 2020

Internal carbon pricing as a tool for a low-carbon transition

Internal carbon pricing can guide sustainable decision making and reduce risk

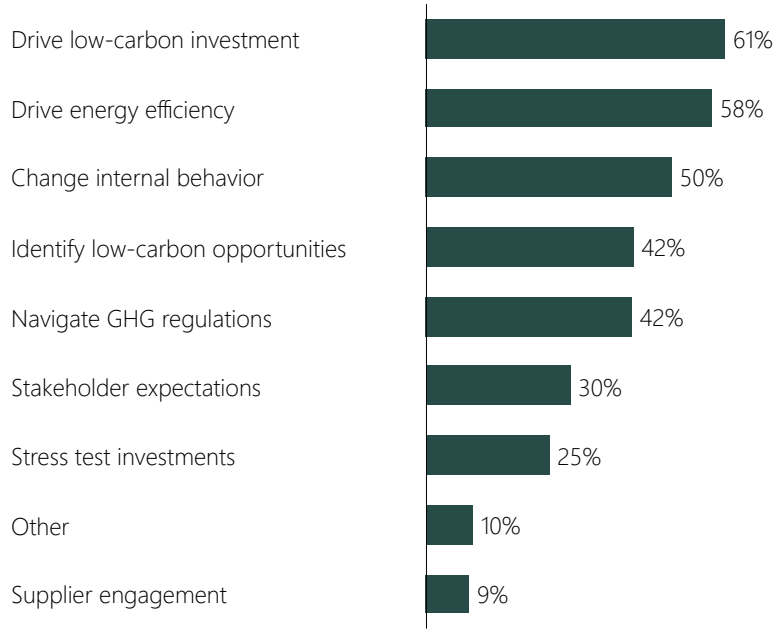
Increasingly, corporates recognize the value of leveraging internal carbon pricing as a tool to manage and contribute to the low carbon transition. By assigning a monetary value to the carbon emissions associated with key corporate decisions, emissions can be translated into financial metrics to inform decision makers on future investments and acquisitions.

Internal carbon tax income can drive low-carbon investments and improve energy efficiency

Corporates can leverage internal carbon taxation to gather revenue for decarbonization projects, allocate fund to R&D activities on carbon removal solutions (CCU, CCS, DAC) as well as investing in compensation projects (nature-based solutions) that sequester carbon and generate carbon credits that can be sold to third parties or used by the company itself.

Figure **Carbon prices are most often implemented to drive low-carbon investment**

Objectives for implementing internal carbon price.
Source: State and Trends of Carbon Pricing 2020, World Bank



Source: State and Trends of Carbon Pricing 2020, World Bank

Sustainability reporting & materiality assessment

Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Materiality assessment	**One-off baseline assessment** Conduct a baseline assessment of economic, environmental and social topics from stakeholder points of view	**Frequent stakeholder alignment** Regularly exchange data and views on current and future sustainability issues, and adjust actions and goals accordingly	**Automatic issue-prioritization** Automatically generate ranked list of stakeholder issues via predictive analytics of complex cause-and-effect relations
Sustainability metrics & targets	**Target carbon-neutral** Identify company emissions and set out targets to become carbon-neutral	**Target carbon-negative** Set detailed targets to reach carbon-negative, by leveraging big data to understand and report all emissions	**Carbon-negative by default** Tech-enable carbon measuring and carbon capture storage to automatically remove emissions released in all scopes
Non-financial reporting	**Follow best practice reporting standards** Report non-financial information following best practice initiatives such as the GRI (Global Reporting Initiative) standards and TCFD (Task Force on Climate-related Financial Disclosures) framework	**Automated carbon reporting** Calculate carbon emissions automatically for reporting purposes across all scopes	**Real-time sustainability reporting** Disclose a range of sustainability metrics and risks in real-time

Manage sustainability risk

Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Environmental compliance	**Identify requirements** Ensure that CFOs are on top of existing and future compliance requirements from authorities and customers	**Transparency across the company** Empower employees in all levels to understand their role in ensuring environmental compliance	**Tech-enable information flows** Automatically detect early signals of compliance risks in live dash-boards using open-source data sharing and blockchain
Externality preemption	**Systematic risk assessment** Set in place a systematic approach to gain an exhaustive overview of potential sustainability risks and associated costs	**Internal carbon tax** Prepare for potential future carbon tax by implementing an internal carbon tax	**Tech-enable risk scanning** Detect potential future risks using real-time sentiment analysis to track sustainability related topics
Green agenda support	**Openly promote green initiatives** Share values supporting the green agenda and define a plan to participate in the public debate	**Collective action** Engage with NGOs and regulatory bodies to share experiences and help shape the dialogue to promote greener initiatives	**Customized platform sharing** Build platforms to share data with partners in real-time, using tailored dashboards and ai-led recommendations to joint actions

Green finance & investing

Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Future value drivers	**Metrics & valuation methods** Build understanding of green valuation drivers evaluated by investor groups – e.g. customer value, brand value and market cap	**Return on green investment** Estimate how much of industry peer valuations can be attributed to investments in boosting sustainability metrics	**Advanced simulations** Justify sustainability efforts by showcasing valuation forecasts based on multi-dimensional simulations
Green financing	**Schemes and statutes** Identify existing, up-coming and potential public support schemes and private dedicated funds for sustainable investments	**Exceed investor expectations** Set internal standards above investor expectations to extensiveness and performance of sustainability metrics	**New financial instruments** Develop sophisticated financial instruments whose value reflects sustainability metrics, e.g. crowdfunded green bonds
Sustainability M&A	**Green "inorganic" roadmap** Agree on sustainability M&A strategy, incl. Screening and due diligence processes to present risks to investment committees	**Smart synergy assessment** Analyze a broad range of data to identify and showcase synergies every time when evaluating transaction activities	**AI-led acquisitions** Receive live notifications of attractive sustainability targets and diligence steps based on real-time scanning driven by AI

Perspectives included: Sales, Marketing, Customer Service, Branding

CCO | COMMERCIAL PERSPECTIVE

> "Technology is today often used to increase the efficiency of existing value chains and processes, e.g. smart manufacturing. That's an area where technology is well used to drive sustainable performance."
>
> **Head of Network Commercial Operations, SPARTA Dynamics**

Visionary CCOs are capturing value in the sustainability agenda by integrating sustainability into the customer journey, while ensuring targets are both tangible and ambitious

What are key *commercial* sustainability priorities for CCOs?

Perspectives included: Sales, Marketing, Customer Service, Branding

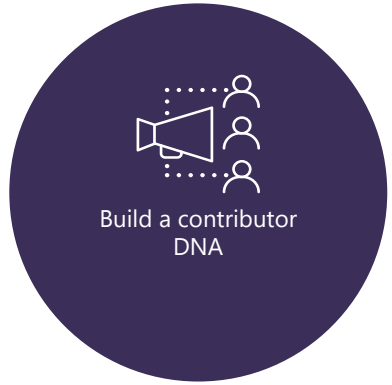
Hover over bullets for more info

Identifying value pockets arising from growing sustainability preferences and integrating it into product design and overall value proposition.

- **Sustainability preference listening**
- **Emerging premium segments**
- **Green product design**

Living up to increasing customer expectations regarding sustainability by decreasing carbon emissions throughout the end-to-end customer journey.

- **Green customer experience**
- **Sustainable disposal**
- **Low emission commercial blueprint**



Engage publicly in sustainability efforts and discussions to build company brand as a sustainability champion and a vocal participant contributing positively to society.

- **Purposeful brand**
- **Reputation management**
- **Strategic philanthropy**

> "A challenge is that the application of technology for sustainability, e.g. energy management, also needs to be accepted by the end-user - some are eager and quick to adapt, others are more skeptical."
>
> **Energy & Innovation Manager, VINCI Facilities**

> "Sustainability is deeply rooted in our innovation culture. By acting sustainably in all we do and telling the stories, we further engage our employees and strengthen our credibility with our stakeholders."
>
> **President EMEA, DuPont**

> "We are at the beginning of systematically planning sustainability initiatives enabled by technology and communicating them to the public."
>
> **CIO, Asahi Breweries Europe Group (ABEG)**

Get inspired by the sustainability commitments of leading organizations and CCOs and access guides and frameworks to help your organization successfully embark upon the sustainability journey ahead

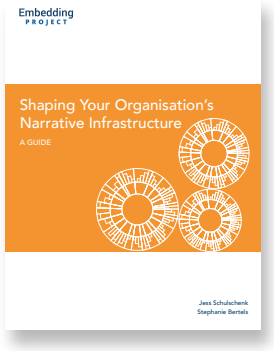
CCO sustainability best practices

STORYTELLING GUIDE
Empower sustainable storytelling

The guide is based on four years of research and over 100 interviews in twenty different global companies exploring the impact of organizational narratives and how change agents helped to shift them to better support strategic decision making aligned with sustainability.

Source: https://embeddingproject.org/pub/resources/EP-Shaping-Your-Organisations-Narrative-Infrastructure.pdf

Read the guide by Embedding Project



MARKETING GUIDE
Improve sustainability communication

A guide published by the BSR Sustainable Lifestyle Frontiers Group, a collaboration between Johnson & Johnson, AT&T, Waste Management, Carlsberg, Walmart, L'oreal, McDonald's, eBay, and Disney on how your organization can be more strategic when communicating the functional, emotional, and social sustainability related values of your products.

Source: https://www.bsr.org/files/work/bsr-slfg-selling-sustainability.pdf

Read the guide by BSR

BSR

CASE
Implementing ambitious sustainability commitments

Every time a product is updated or invented, L'Oréal is committed to improve its environmental or social profile against at least one of the following criteria:

- The new formula reduces the environmental footprint
- The new formula uses renewable raw materials that are sustainably sourced or raw materials derived from Green chemistry
- The new packaging has an improved environmental profile
- The new product has a positive social impact

Source: https://loreal-dam-front-corp-en-cdn.damdy.com/ressources/afile/86309-089ac-resource-the-looreal-sustainability-commitment.html

Read about L'Oréal's sustainability commitment

L'ORÉAL PARIS

CCOs must pay close attention to how sustainability concerns influence consumer behavior. More than ever, CCOs need to be on top of customer sustainability preferences and buying behavior to ensure timely alignment of commercial initiatives

A guide on changing consumer behavior and commercial initiatives

Increased focus on sustainability is expected to influence consumer behavior

The imperative for sustainability has been mounting over the past two decades but has been on an accelerated path over the last two years, recently enhanced by the outbreak of the pandemic. Physical evidence of the impact of climate change has heightened awareness among consumers and regulators as natural disasters, climate events and rising global average temperatures have become more prominent. Going forward, 54% of consumers expect to pay more attention to the environment in the longer term and 50% expect to make climate change and sustainability a top priority in shaping their consumption. Companies urgently need to adjust their commercial strategies to anticipate the effect of increased sustainability awareness among consumers.

Consumer Response Clusters can help identify changing consumer behavior now and beyond

The Consumer Response Cluster Index has been developed in order to identify distinct consumer clusters of today, and map the different emerging clusters based on customers' expected future behavior. Evidently, the index shows that environmental concerns are expected to largely affect customer behavior in the future, and presents key opportunities for businesses to tap into.

50%

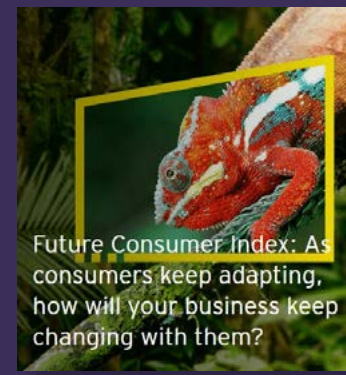
expect intend to make climate change and sustainability a top priority in shaping their consumption according to EY's Future Consumer index

Source: EY Future Consumer Now

CONSUMER INDEX

EY Future Consumer Index

As consumers keep adapting, how will your business keep changing with them? The 2020 Consumer Response Clusters analysis is conducted by EY Future Consumer Now based on data from 13,519 consumers in 18 countries in July 2020 and tracks changing consumer sentiment and demand beyond COVID-19.



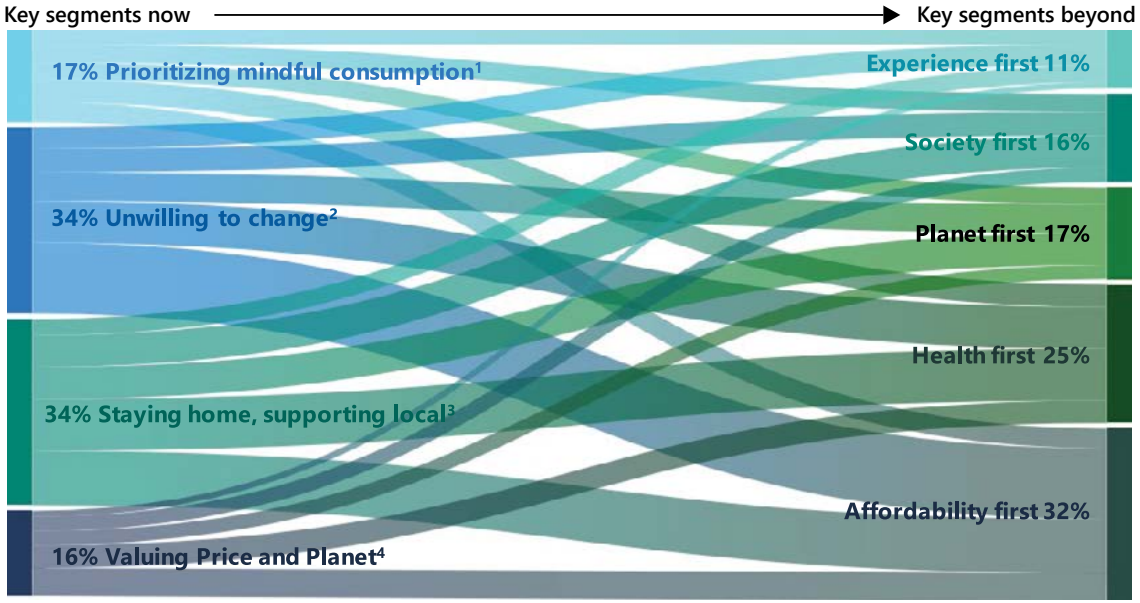
Learn about how customers are adapting to Covid-19 from the EY Future Consumer Index 2020

The Consumer Response Clusters

Hover over for more info

Figure **Consumer Response Clusters Index**

How consumer segments are expected to transition now and beyond. Source: EY Future Consumer Index, July 2020



Initial response to COVID-19: 1) "Hibernate & Spend"; 2) "Stay Calm & Carry On"; 3) "Save and Stockpile"; 4) "Cut Deep"

As consumers move from reactive to proactive, corporates must follow

The immediate priorities of consumers have been outlined by their response to the Covid-19 pandemic. In the current situation where many see lockdowns ease by degrees after months of restrictions an overwhelming priority has been to target a return to normal social and consumption behaviors. But the pandemic has also shown consumers how to make do with less and post Covid-19 consumption will be more mindful to the environment.

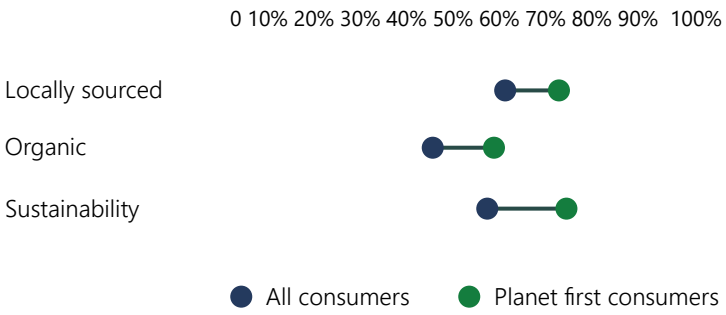
As we move to the segments that are emerging beyond the outbreaks a significant proportion (17%) are also aligning their purpose to the needs of the planet. This segment will scrutinize the activities of companies and products more and adjust their own behaviors to benefit the planet. They are more willing than other segments to pay a premium for sustainable goods and services and will adapt their own behaviors to bring benefits to the planet.

1. The EY Future Consumer Index tracks changing consumer sentiment and behaviors across time horizons and identifies the new consumer segments that are emerging. It gives us longitudinal indicators and a unique perspective on which changes are temporary reactions to the Covid-19 crisis, which point to more fundamental shifts, and what the consumer post Covid-19 might be like. The consumer segments are defined by the Future Consumer Index and originally labeled according to their initial response to COVID-19: 1) 'Hibernate & Spend'; 2) 'Stay Calm & Carry On'; 3) 'Save and Stockpile'; 4) 'Cut Deep'

Changes in Consumer Purchasing Criteria

Figure **Changes in consumer purchasing criteria**

Share of consumers who responded that the below purchase criteria have become more important. Source: EY Future Consumer Index, July 2020

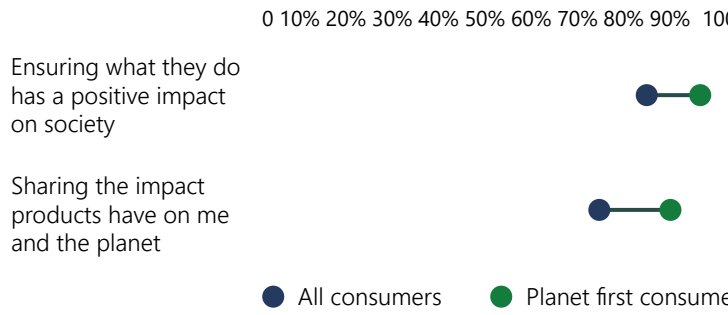


Consumers demand sustainability

Heightened consumer awareness towards brands with higher ethical practices and more sustainable processes require corporates to adapt existing product portfolios to cater to consumer preferences. Sustainability practices must be brought into all business processes from procurement to waste disposal.

Figure **Changes in consumer shopping priorities**

Share of consumers that are 'more likely to purchase' from companies exhibiting the below behavior. Source: EY Future Consumer Index, July 2020



Corporates are expected to do good for society

Consumers demand proof that businesses and brands are doing good for the society and putting the needs of society ahead of profits. Consequently, brands must pursue sustainability certifications and highlight the sustainability footprint of products as well as ensure clear labelling. Moreover, corporates must proactively support local communities and report on sustainability related initiatives.

Source: EY Future Consumer Now

Suggested focus of commercial initiatives

Consumers look for companies to take action to promote sustainability

A large share of consumers agree that companies have an active role to play in sustainability. More than 60% of consumers think that brands have a responsibility to make a positive change in the world and must put society ahead of profits while only 40% think that the positive actions brands currently are taking are good enough. Corporates should actively work to improve their sustainability profiles both domestically and internationally and examine opportunities for improving sustainability.

Sustainability may confer a premium but will more fundamentally be seen as a baseline expectation

Companies that shift towards sustainability will expectedly, to some degree, be able to charge a premium for the products that they sell.

Overall, a quarter of consumers would pay a premium for more sustainable goods and services, a proportion that rises to almost 40% for the sustainably minded 'Planet First' segment. But more crucially, sustainability is beginning to become embedded in consumers' general expectations of the brands that serve them.

Consumers are shifting focus away from products towards the organizations that sell them

There is currently a clear shift in priorities for consumers. Sustainability is moving from being something that consumers are willing to pay more for at a product level towards being something that is seen as an integral part of company behavior.

60%

of consumers think that brands have a responsibility to make a positive change in the world and must put society ahead of profits

Consumers are shifting focus away from products towards the organizations that sell them. 39% of consumers and 51% of the 'Planet first' segment will buy more from organizations which benefit society, even if their products/services are more expensive.

> "Building a robust European program to commercialize the reduction and sequestration of carbon emissions will reward the long-term investment of the Cork Producers."
>
> **CEO, Corticeira Amorim**

Source: EY Future Consumer Now

Convert sustainability to customer value

Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Sustainability preference listening	**Understand sustainability needs** Leverage data and surveys to identify key sustainability purchase criteria from all types of customers (B2B, B2C, B2B2C)	**Crowd-source opinions** Use online platforms to crowd-source customer opinions and integrate preferences into product development	**Quantum led paradigm predictions** Detect early signals of new consumer sustainability paradigms by applying quantum computing and AI
Emerging premium segments	**Premium assessment** Understand existing and potential sustainability premiums from current customer segments and new segments	**Dynamic trend adjustment** Leverage sentiment analysis and text mining to dynamically track emerging segments on a wider scale	**Micro segmentation** Use predictive analytics to forecast how individuals will respond to sustainability topics and identify microsegments
Green Product Design	**'Minimum' sustainability requirements** Define and implement minimum 'green' requirements for all product development	**'Up or out' product design** Commit to every new offering bringing new or improved sustainability benefits (e.g. L'oréal)	**Extend value proposition beyond** Leverage real-time data sharing on product development and design to enable others to benefit from key learnings and follow suit

Decarbonize the customer journey

Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Green customer experience	**Sustainability experience gap analysis** Map sustainability experience gaps, both where current experiences can be upgraded and where sustainable experiences do not yet exist	**Test green UX elements continuously** Test new sustainability UX components in continuous waves across local markets to gauge customer reactions	**Dynamically customer-defined experience** Let customers tailor their experience and be part of community providing live feedback and suggestions to improve sustainability offerings
Sustainable disposal	**Recyclable packaging** Identify sustainable packaging options for all products made and consumed by the company	**"as-a-Service" model** Lease out products with open dashboards showing customer carbon savings in real-time to encourage returns, and recycle all products	**Full take-back** Accept 100% recycling of all products sold historically by the company e.g. through additive manufacturing and synthetic biology
Low-emission commercial blueprint	**Map carbon pain points to digitize** Identify company carbon pain points that could be digitized, incl. low-hanging fruits such as meetings to be made online	**VR & AR-enabled interactions** Perform all meetings and service remotely also using AR and VR for remote quality assurance and possibly guided maintenance	**Partnership platforms** Build interactive platforms for customers and competitors to reduce footprint

Build a contributor DNA

Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Purposeful brand	**Identify sustainability stories** Outline fact-based and captivating sustainability stories on business and product level for internal and external sharing	**Brand together with stakeholders** Build a platform and invite others to communicate sustainability stories to address the global agenda collectively	**Be the leading example** Set new standards as open-source brand sharing rich sustainability content in inspiring formats that all stakeholders can identify with
Reputation management	**Map reputation drivers** Identify sustainability reputation drivers and define a systematic approach to make data-driven decisions to mitigate risks	**React to sentiment changes in real-time** Respond agile to directly defined feedback and social listening, leading to real-time alerts on potential negative feedback	**Proactively manage reputation** Preempt changes in sustainability brand perceptions in plausible future scenarios using AI-suggestions to proactive campaigns
Strategic philanthropy	**Plan charitable efforts** Define the role the organization plays in society and how it can enable societal benefits with a connection to also benefit the company	**Identify impactful partners** Support noble causes with most expected future impact together with NGOs and endorsers expected to be most relevant	**Offer IP to open new doors** Put company IP into play for the greater good in beneficial R&D processes to open new doors to technologies and partnerships

Perspectives included: Operations, Sourcing/Procurement, Logistics

COO | OPERATIONS PERSPECTIVE

> "For us, sustainability needs to be part of the day to day work; that's why we have combined the role of operations and sustainability leader. Smart meters are a good example of how technology helps to improve sustainability performance."
>
> **Head of Network Commercial Operations, Viesgo**

Visionary COOs are integrating technology into the entire value chain in order to increase transparency and become ever more smart and efficient

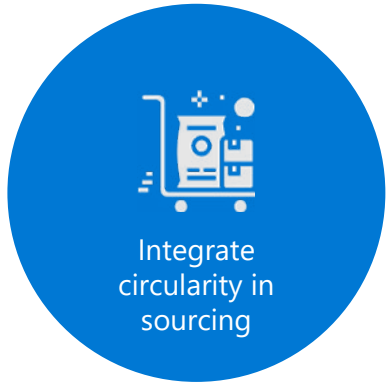
What are key *operations* sustainability priorities?

Perspectives included: Operations, Sourcing/Procurement, Logistics

Hover over bullets for more info

Increasing data access to gain an overview of carbon emissions throughout the entire supply chain and to enable benchmarking and data sharing

- **Transparency blueprint**
- **Life-Cycle Assessment**
- **Green ecosystems**



Advancing documentation of materials to increase use of sustainable materials and to enable recycling of as many components as possible thus reducing waste

- **Product passport**
- **Sustainable substitutes**
- **Holistic recycling**

Increasing efficiency in production and maintenance to reduce resource consumption per unit

- **Zero-carbon energy transition**
- **Predictive operations**
- **Additive manufacturing**

> "A transparent supply chain is crucial. The challenge is to create a viable business case that makes use of new technologies like blockchain."
>
> **CIO, Asahi Breweries Europe Group (ABEG)**

> "We are leveraging our long history of technology know-how and high-quality work to drive the transformation of our company to be more efficient and sustainable."
>
> **CASE Strategy Manager, Mercedes-Benz España**

> "Machine learning is a big opportunity for us; we can simulate a similar learning behavior as humans, which will allow us to be more efficient and more competitive."
>
> **CEO, Corticeira Amorim**

Get inspired by leading COOs and access a wide range of helpful guides and encouraging cases to help your organization successfully embark upon the sustainability journey ahead

COO sustainability best practices

CAMPAIGN
Commit to green energy

RE100 is a global campaign for leading businesses to commit to using 100% renewable electricity, which entail moving away from electricity generated by using fossil fuels to power produced from biomass (including biogas), geothermal, solar, water or wind sources. RE100 companies must select a target date for achieving 100% renewable electricity. The minimum requirements are: 100% by 2050, with interim steps of at least: 60% by 2030 and 90% by 2040.

Source: https://www.there100.org/technical-guidance-1

Read about the Re100 requirements

RE 100

COMMUNITY
Engage your suppliers

Become a CDP supply chain member and commit to help put pressure on suppliers to disclose their environmental impact.

Source: https://www.cdp.net/en/research/global-reports/global-supply-chain-report-2019

Read about the CDP commitment

CDP
DISCLOSURE INSIGHT ACTION

PROGRAM
Promote a transparent supply chain using technology

Zalando launched zImpact in April 2020: a program that brings together the many stakeholders in the supply chain, scales innovative technology solutions, increases awareness for sustainable fashion, and empowers customers and brands to engage in sustainable fashion.

Source: https://corporate.zalando.com/en/newsroom/en/stories/digitizing-supply-chain-transparency

Read about the Zalando zImpact

zalando

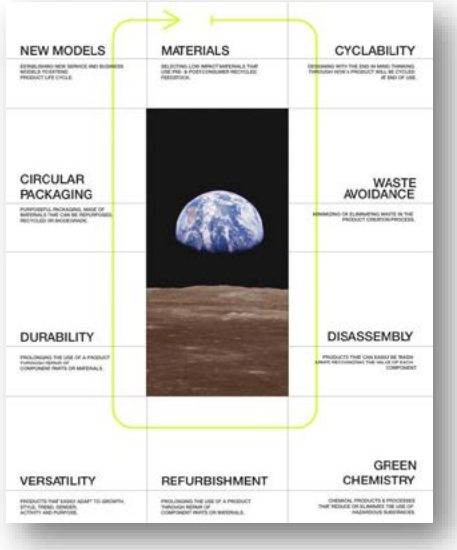
CASE
Recycling – from running shoes to ski boots

In Spring 2021, Salomon will launch the fully recyclable Index.01 running shoe. At the end of their lifecycle, the shoes can be returned to Salomon free of charge, where they are disassembled and used to create Salomon ski boots.

Source: https://www.youtube.com/watch?v=9cYQAlokWhQ

Watch video about Salomon's recyclable shoe

salomon



CASE

Mapping transparency in the supply chain

As of August 2020 M&S has 1,382 suppliers listed in their interactive supply chain map. The map contains information on product, country, workers, gender, participation in trade unions and access to established worker committees.

Source: https://interactivemap.marksandspencer.com/

Read about Marks & Spencer suppliers

GUIDING PRINCIPLES

NikeCircularDesign.com

Inspired by Global Fashion Agenda, Nike has created the guide 'Circularity: Guiding the Future of Design'. The guide and related workbook share ten key principles that manufacturers need to address in order to create products that eliminate waste and avoid negative environmental impact.

Source: https://www.nikecirculardesign.com/

Read about circular design at Nike

CASE

Using big data to improve sustainability in supply chains

Walmart's Sustainability Insight System gathers and analyzes information across a product's life cycle — from sourcing, manufacturing and transporting, to selling, customer usage and end of use. Walmart uses the data from the surveys to identify key social and environmental hot spots, rank suppliers relative to the field, and gain insight into improvement opportunities for each of the categories they supply.

Source: https://www.walmartsustainabilityhub.com/sustainability-index

Read about Walmart's Sustainability Insight System Index

INTRODUCTORY GUIDE

Corporate Sourcing of Renewable Electricity

Renewable energy procurement provides organizations with the means to power their operations with carbon-free electricity and secure low-cost electricity consumption over a long-time period. Corporates can adopt different strategies to procure renewable electricity, but before doing so, they should assess which strategy best suits their needs and helps achieve their goals. The report is an introduction to the different strategies a corporate can follow to procure renewable electricity in Europe.

Source: http://resource-platform.eu/files/toolkit/RE-Source-introduction-to-corporate-sourcing.pdf

Read the report about renewable energy sourcing

With key digital technologies, the transformation towards a sustainable supply chain is possible. This will entail more than just doing good, as it is established that additional benefits such as cost savings, risk management and more will also follow

Benefits of sustainable supply chains

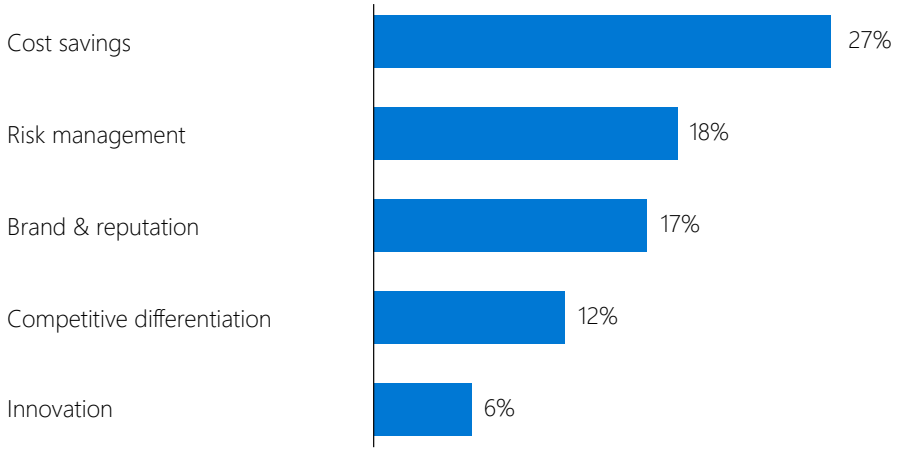
Sustainability in the supply chain is good for business

Of the 212 supply chain executives surveyed, in the EY Supply Chain Pulse Survey 2020, almost half (48%) had cost-savings as a top priority for moving towards a more sustainable supply chain. This reflects the goal of boosting efficiency to generate the same or more output using less resources, which goes hand-in-hand both from a sustainability and cost-perspective.

Managing risk is the second-most common reason to move towards a sustainable supply chain. This may reflect both risks of negative media attention as well as operational risks reinforced by the recent COVID-19 increasing focus on local sourcing to preempt supply chain freezes.

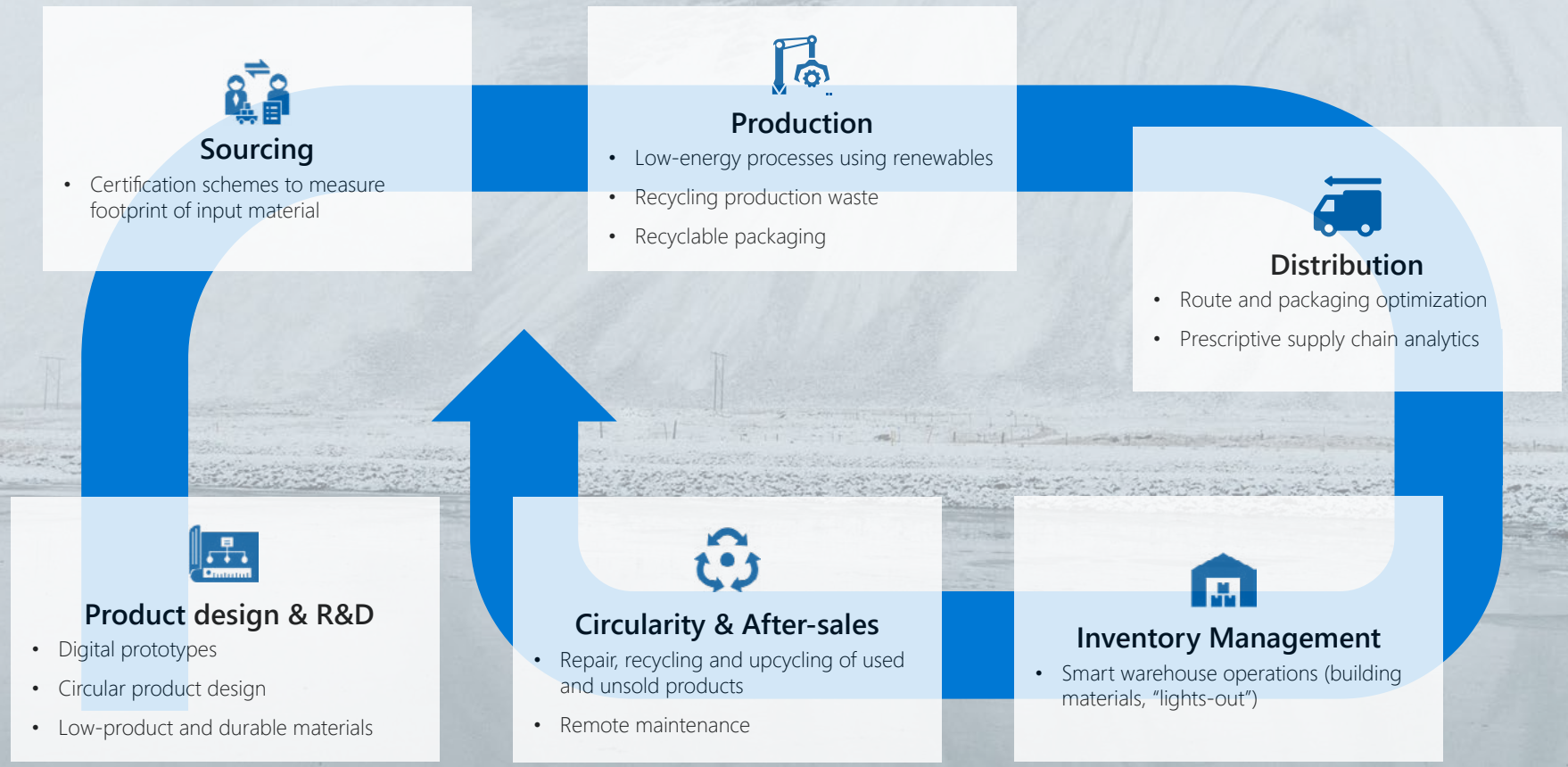
Figure **Reasons to move towards sustainable supply chain**

What is your top reason for moving towards a sustainable supply chain?
Source: EY Supply Chain Pulse Survey 2020, N=212 supply chain executives



Source: EY Supply Chain Pulse Survey

Key elements in sustainable supply chain transformations



Increase supply chain transparency

Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Transparency blueprint	**Strategic clarification** Map supply chain transparency together with the CFO. Focus on relationship with suppliers and emission data exchange	**Integrated supply chain governance** Design governance structures to integrate sustainability. Work with reliable partners committed to transparency	**Dynamic SC-strategy update** Adjust supply chain priorities continuously based on live feedback. Address sustainability and business goals as opportunities arise
Life-Cycle Assessment	**First Life-Cycle Assessment** Document product footprint throughout its life-cycle. Pass on collected data to consolidation by the CFO team	**Automatic emission tracking** Automatically gather granular data across product life-cycle. Update and benchmark LCA in real-time	**LCA simulations & suggestions** Simulate LCA developments. Get suggestions from AI massive data sets. Get data from sensor networks, user-sources and satellite imagery
Green ecosystems	**Partner benchmarking** Map where the company can outsource to realize sustainability gains. Benchmark suppliers on ability to share emission data and best practice	**Open data exchange** Collaborate with existing and potential partners in open platforms. Let suppliers see own ranking and encourage sharing of insights	**E2E blockchain network** Form encrypted networks. Share emission data real-time both with suppliers, customers, NGOs, governments and competitors

Integrate circularity in sourcing

Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Product passport	**Product documentation** Document material composition of all products used and made. Document origins and properties allowing recycling	**Live-track materials & movements** Track product movements automatically with RFID chips. Store information on bill of materials, producer, shipment and purpose	**Open, automated passport network** Automatically validate and update product passports. Collaborate in open platform with distributed ledgers
Sustainable substitutes	**Alternative material mapping** Identify internal needs for alternative materials. Follow trends to map alternative inputs. Estimate impact on quality and costs	**Replace components** Substitute all harmful input materials with sustainable alternatives, and continuously replace components to allow for both higher product quality and sustainability level at lower costs	**Co-create synthetic inputs** Partner with tech providers. Co-create sustain-able alternatives based on megatrends (e.g. synthetic biology for fuel, food & packaging)
Holistic recycling	**Recycling potential estimation** Assess opportunities to circulate products made by the company	**Up-cycling enablement** Build products for up-cycling. Use clean fragments for modular design and take-back. Exchange waste with other value chains	**Zero-waste live match-making** Develop match-making platform. Exchange waste products in real-time. Connect both companies and crowds

Optimize resource-use in production

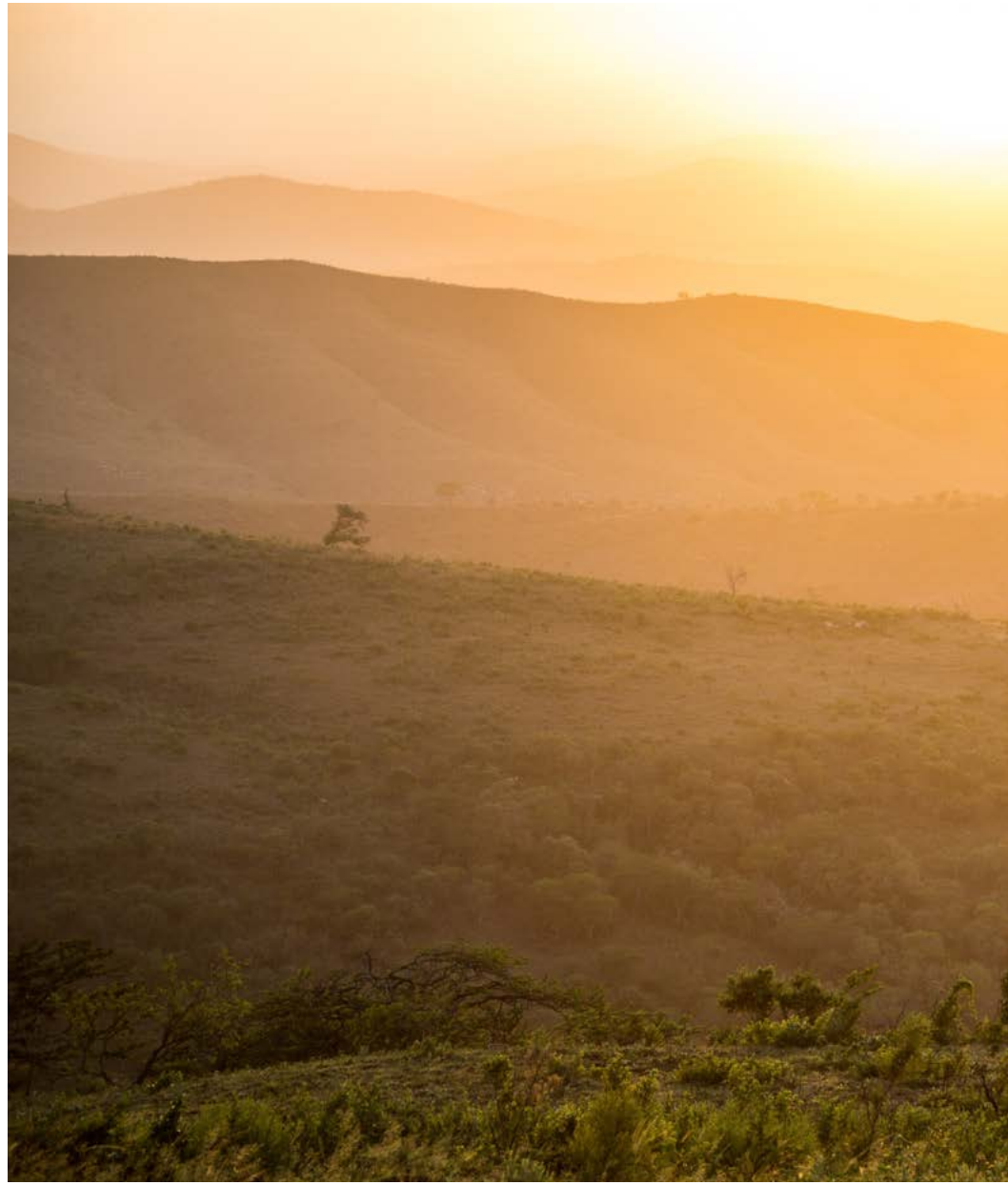
Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Zero-carbon energy transition	**Power footprint baseline** Baseline carbon footprint of energy used in operations. Partner with the CFO	**PPA's & own investments** Enter into off-site and on-site Power-Purchase Agreements. Invest directly in renewable energy farms. Form micro-grids	**Power-to-X** Run all operations only on green energy. Use emerging tech for battery storage, smart microgrids and power generation forecasting
Predictive operations	**Smart forecasting potential** Estimate potential carbon and cost savings from production, travel and freight that could be avoided with predictions	**Sensorial optimization** Collect data from IoT sensory networks and satellite imagery. Use predictive maintenance, route optimization and dynamic charging	**Pattern recognition** Automate decision-making for production, logistics, field service and asset operations. Feed AI with big data and rich data
Additive manufacturing	**3D print feasibility** Map products that could be made with additive manufacturing. Estimate impact on logistics, production and resources saved	**Modular products** Develop products suitable for additive manufacturing. Use space-optimized, possibly flexible, dimensions for efficient shipping	**Parametric design** Simulate and create material-efficient products with Parametric Design (e.g. stronger and more flexible packaging and building structures)

Perspectives included: HR, Culture, Talent, Performance, Facilities, HSE

CHRO | PEOPLE PERSPECTIVE

> "I have felt a clear pressure from employees on the broad sustainability agenda, and focus on carbon is increasing and could snowball fast."
>
> **CHRO, (former) LanguageWire**



Visionary CHROs are integrating sustainability into the core of the organizational culture and ensuring that employees across the organization possess the required skills

What are key *people* sustainability priorities?

Perspectives included: HR, Culture, Talent., Performance, Facilities, HSE

Hover over bullets for more info

Driving relevant cultural change throughout the organization by linking sustainability to values, incentives and the mix of employees across levels

- **Integrated values**
- **Green LTI programs**
- **Inclusive sustainability**

Reducing carbon emissions from offices, employee transport and through supporting employee contributions outside also outside work

- **Workspace emissions**
- **Sustainable workflows**
- **Extra-professional contributions**

Assessing organizational capabilities and upskilling in order to leverage the latest technology to continuously deliver on sustainability goals

- **Skills benchmarking**
- **Personalized learning**
- **Integrated feedback loops**

> "By investing in sustainability, digital and talent, Europe will build more resilient local communities and economies."
>
> **EY Managing Partner for EU Institutions**

> "Sustainability is deeply rooted in our innovation culture. By acting sustainably in all we do and telling the stories, we further engage our employees and strengthen our credibility with our stakeholders."
>
> **President EMEA, DuPont**

> "A big responsibility is at board of director level of a company to select the right leadership team with the right mindset and experience in technology and sustainability."
>
> **Commercial Director, SPARTA Dynamics**

Get inspired by leading CHROs and access a wide range of helpful guides and encouraging cases and frameworks as well as good inspiration to help your organization successfully embark upon the sustainability journey ahead

CHRO sustainability best practices

FRAMEWORK
Shaping people strategies in the Fourth Industrial Revolution

The HR 4.0: Shaping People Strategies in the Fourth Industrial Revolution is a framework for shaping people strategies. It examines the role of the human resources function as a key driver in defining how work is experienced, how it is done and how the workforce evolves and adapt to changing technology demands.

Source: ddwww3.weforum.org/docs/WEF_NES_Whitepaper_HR4.0.pdf

Read about the framework

INSPIRATION PAPER
Engaging employees to create a sustainable business

Paper from Unilever CEO and E.ON Chair Professor in Corporate Responsibility on how to get all employees personally engaged in day-to-day corporate sustainability efforts.

Source: https://ssir.org/articles/entry/engaging_employees_to_create_a_sustainable_business

Read the paper

INCENTIVE SCHEME GUIDE
Integrating Sustainability into executive pay

Guide developed by the UN-backed Principles for Responsible Investment (PRI) initiative and Global Compact LEAD. The paper is a guide to corporates and investors and discusses the effectiveness and rationale of corporate practices on environmental, social, and governance factors within executive management goals and incentive schemes.

Source: https://d306pr3pise04h.cloudfront.net/docs/issues_doc/lead/ESG_Executive_Pay.pdf

Read the guide

CASE
Local sustainability champions

UK retailer Marks & Spencer has sustainability champions in every one of its 1,380 stores, to ensure each store performs best possible on all sustainability targets.

Source: https://careers.marksandspencer.com/inside-mands/life-of-a-plan-a-champion

Read about Marks & Spencer champions

CASE
Driving progress with sustainability incentives

At PepsiCo, executive officers are awarded annual incentives for individuals' contribution to PepsiCo's strategic business imperatives of driving sustainable innovation, to help drive sustainability progress.

Source: https://pepsico-stage.pepext.com/sustainability/sustainability-governance

Read about PepsiCo's sustainability governance

CASE
Embedding sustainability in compensation

At Bayer, the achievement of the sustainability targets are integrated in the long-term remuneration package for the Bayer Board of Management.

Source: https://media.bayer.com/baynews/baynews.nsf/id/Science-Based-Targets-initiative-endorses-climate-protection-targets-of-Bayer-AG

Read about Bayer's climate protection targets

HR leaders play a critical role in ensuring that employees are equipped to tackle the challenges of tomorrow and they must clearly map out skills needed for the future and help foster a culture of continuous learning

A guide for CHROs to leverage sustainability

Attract, engage and retain the right talent by understanding what employees value the most

In a 2020 survey by EY, 73% of the respondents asked believed that the behavior of a company is as important as what it sells. Evidently employee acquisition, particularly of millennials, is increasingly affected by the company's sustainability performance and reputation, and this must effectively become a key priority for any CHRO.

Simultaneously, with 67% of the respondents asked believe that brands must put employees ahead of profits. It is clear that a general work transformation is both undergoing and necessary.

Upskilling the workforce to drive a sustainable future must be done

CEOs are increasingly turning to the HR functions to seek more holistic people strategies to prepare for the future of work and the changing employee demands. HR professionals are moved to the front line in helping their organizations and leaders to drive technology adaption while fostering a purpose driven culture, and ultimately attract and retain the workforce.

However, only 18% of today's CHROs say they are prepared to truly drive significant reskilling of the workforce, which is a major gap to the needed effort. This provides a great opportunity for the organization prioritizing putting this on the agenda for their CHRO.

67%

of respondents in the EY Future consumer Index believe that brands must put employees ahead of profits

18%

of today's CHROs say they are prepared to truly drive significant reskilling of the workforce

Sources: EY Future Consumer Index; World Economic Forum: HR4.0

Benefits of embedding sustainability into the company culture from an HR perspective

72% of the **global workforce** will be constituted by **millennials** by 2025

30% larger concentration of **high-performers** in employees with a strong purpose and 3 times more likely to stay long-term

50% **greater health care expenditures** for solely profit-oriented businesses than smaller or people-focused ventures

#1 **driver of workplace engagement** is pride from being associated with a particular brand and its impact on the wider world

10k participants show that training in environmental management is linked with **high productivity** and **increased employee engagement**

72% of millennials believe it is **important to have a public commitment** to making positive contributions

Source: EY; Harvard Business Review; Wharton; UCLA

The skill wheel

Hover over the wheel for more info

The upskilling agenda is a continuous effort

The traditional work sphere is continuously changing with the emergence of new technology. With this there is a need to constantly ensure that employees and management are equipped with the right skillset to navigate in an increasingly digital and fluid world. As traditional models of administrative leadership proves to be fundamentally flawed for the future, the CHRO play an essential role in driving the upskilling agenda.

Understanding the skill wheel

Sustainability change management requires CHROs to actively work towards building a common understanding on how the interplay between digitalization and sustainability is changing the nature of work. The Skill Wheel is a tool for HR leaders to guide the sustainability change management agenda. The model pinpoints core skills that must be cultivated within any organization.

> "Training in remote collaboration is a low-hanging fruit. You reduce both costs and risk."
>
> **CHRO (former), LanguageWire**

Foster a purpose-driven culture

Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Integrated values	**Map clarity of purpose** Ensure sustainability is a key part of internal storytelling and communicating how the company acts in line with sustainability values	**Engage with the organization** Fund sustainability projects co-created with employees. Communicate efforts internally and externally	**Track culture real-time** Track commitment to values across the organization through intelligent surveys and analysis
Green LTI programs	**Structure internal LTI programs** Outline long-term value metrics that should be included in LTI (Long Term Incentive) programs, based on integrated values. Define process for implementation	**Link sustainability performance with rewards** Connect C-suite performance on long-term value metrics to rewards and recognition	**Automated individual contribution rewards** Develop personalized LTI programs with real-time transparency on performance metrics for all organizational levels
Inclusive sustainability	**Get the metrics right** Define a blueprint for inclusive sustainability. Set up structures for measuring and tracking progress. Communicate to all HR units	**Tech-enable development processes** Ensure inclusive sustainability is embedded into all HR processes using technology. Track and monitor effect using apps (e.g. Microsoft India)	**Source talent intelligently** Base talent attraction on real time metrics on workforce diversity. Use NLP to develop inclusive job postings and communication

Green organizational blueprint

Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Workspace emissions	**Outline workspace emissions baseline** Systematically assess baseline. Set targets for reductions.	**Smart offices** Implement smart office solutions to reduce energy use. Use AI predictive maintenance of infrastructure.	**Zero-emission workspaces** Work from self-sufficient and carbon-capturing offices that run on green energy and leverage micro-grids and peer to peer sharing of potential surplus
Sustainable workflows	**Workflow assessment** Define opportunity space for working remote. Map out technology needs to enable remote operations. Create company guidelines.	**Flexible working** Implement policies that encourage remote work. Tech-enable online collaboration.	**Fluid workforce** Peer to peer platform enabled completely fluid workforce
Extra-professional contributions	**Map out employee opportunity space** Identify current extra professional contribution initiatives. Empower HR to support and engage in new activities. Mobilize support and funding.	**Democratize data** Support partnerships. Democratize data to solve sustainability challenges.	**Establish contribution platform** Develop online ecosystem of contribution opportunities by linking NGOs, academia and industry leaders using technology

Sustainability capabilities upskilling

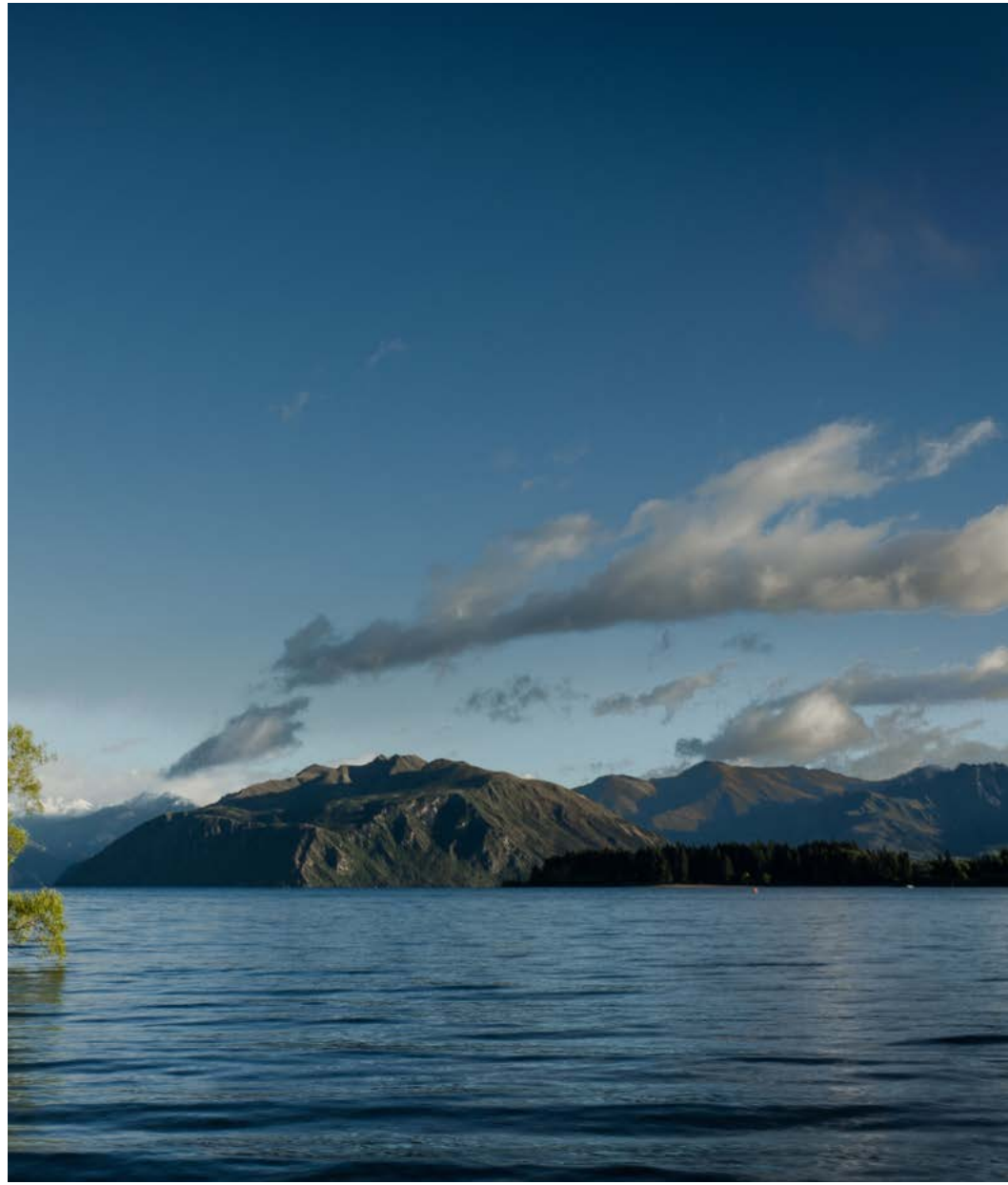
Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Skills bench-marking	**Understand required capabilities** Assess sustainability competencies required now and in the future. Put in place structures to track development	**Predict future roles needed** Create reskilling programs based on predictive analytics assessments. Develop skills to tackle sustainability opportunities and challenges	**Peer-to-peer skill sharing** Leverage talent inside the organization to share key capabilities. Leverage open platforms
Personalized learning	**Assess sustainability training baseline** Understand what learning opportunities are present within the organization. Set up structures for learning. Develop learning plans	**Tech-enable learning** Personalize sustainability learning offerings within the organization and use AR and VR in training sessions	**Decode the optimal learning path** Leverage AI to ensure training and skill development is optimal
Integrated feedback loops	**Map out feedback loop process** Define opportunity space for gathering feedback loop data. Define process for integration	**Automatically optimize workflow** Leverage AI to optimize learning process. Automatically update workflows	**Real-time topic adjustments** Leverage real time feedback gathering to continuously adjust learning processes

Perspectives included: Data, IT, Technology, Digital

CTO | TECH PERSPECTIVE

> "Technology is a means to an end, an enabler, also for sustainability performance improvements."
>
> **Co-founder and CEO, Clearbox AI**



Visionary CTOs are supporting sustainability goals by implementing the right technologies across the organization and leveraging data effectively and cautiously

What are key *tech* sustainability priorities?

Perspectives included: Data, IT, Technology, Digital

Hover over bullets for more info

Ensuring relevant data is sourced, analyzed and shared to deliver on sustainability goals and that processes are challenged to become more agile

- **Data model & architecture**
- **Environmental data capturing**
- **Sustainability data adoption**

Understanding emissions from internal and outsourced IT infrastructure, and ways to reduce power use and thus carbon emissions

- **Green cloud operations**
- **Recycled hardware footprint**
- **Indirect tech emissions**

Planning the product roadmap and R&D efforts based on emerging sustainability tech, internal capabilities and co-creation opportunities

- **Sustainability tech trends**
- **Tech strategy**
- **Co-creation**

> "There should always be a business case. The challenge of technology for sustainability is to know how, where, and when you employ, for example, AI."
>
> **Co-founder and CEO, Clearbox AI**

> "We look for appropriate environmental certifications from our IT providers as one key measure to reach our target of being CO_2 neutral by 2023 with our IT."
>
> **CIO, Asahi Breweries Europe Group (ABEG)**

> "Technology is today often used to increase the efficiency of existing value chains and processes, e.g. smart manufacturing. That's an area where technology is well used to drive sustainable performance."
>
> **Commercial Director, SPARTA Dynamics**

Get inspired by leading CTOs and access a wide range of helpful tools, and encouraging cases to help your organization successfully embark upon the sustainability journey ahead

CTO sustainability best practices

CASE
3D Printing with concrete

Heidelberg Cement's Italian subsidiary Calcestruzzi is working on 3D-printing with concrete.

Source: https://www.heidelbergcement.com/en/sustainability

Read about sustainability at Heidelberg

HEIDELBERG CEMENT

FRAMEWORK
Open source sustainability development

Schneider Electric's EcoStruxure architecture framework lets partners and end-users co-develop sustainable solutions based on decisions driven by real-time data.

Source: https://sdreport.se/en/climate-highlights

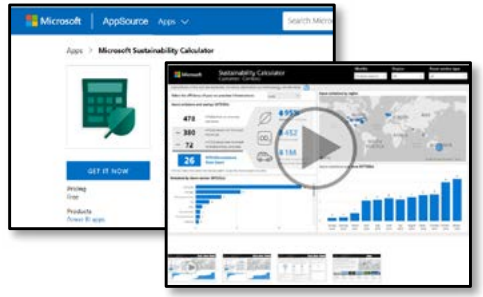
Read about sustainability at Schneider

Schneider Electric

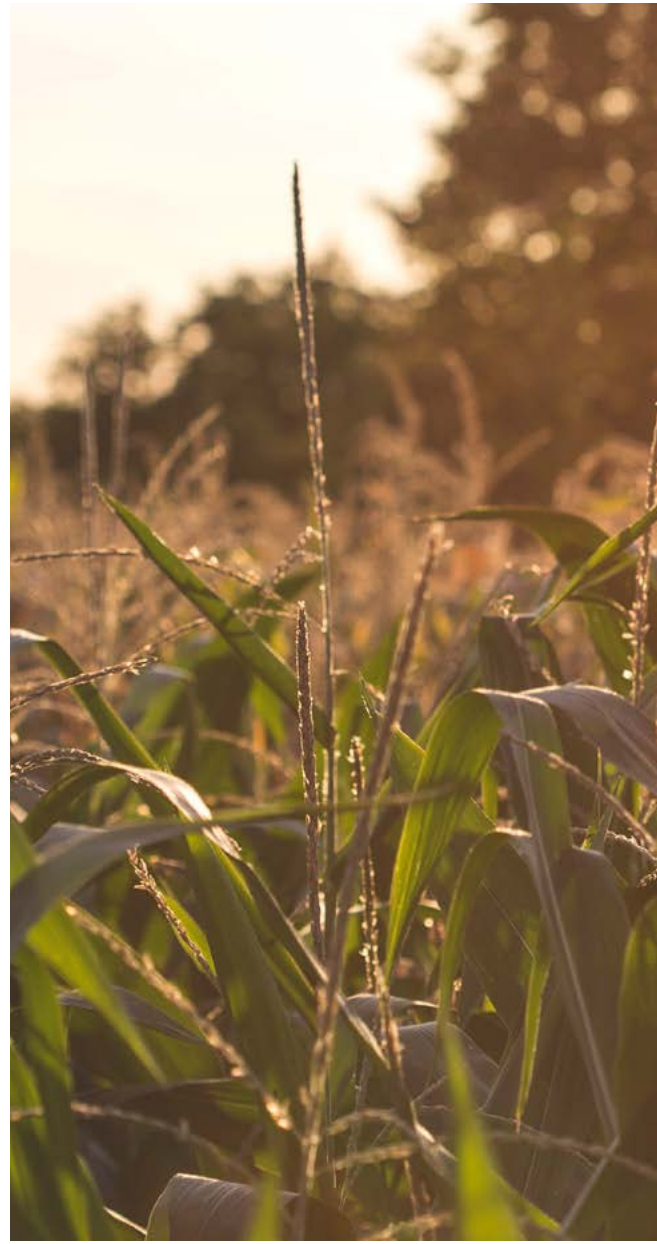
MONITORING TOOL
Measuring water quality with tech

Microsoft's Water Quality Monitoring app is an IoT Central app template to help you kickstart your IoT solution development and enable water utilities to digitally monitor water quality in smart cities.

Source: https://docs.microsoft.com/en-us/azure/iot-central/government/tutorial-water-quality-monitoring



Read about Microsoft's water quality monitoring app



CASE

Leveraging smart grids to optimize energy solutions

By deploying smart grids Iberdrola is actively contributing to the decarbonization of the economy, while at the same time improving the efficiency of the network, optimizing demand management and promoting the integration of more renewable energy.

Source: https://www.iberdrola.com/about-us/lines-business/flagship-projects/star-project

Read about smart grids at Iberdrola

IBERDROLA

CASE

Leveraging AI to improve sustainability

Using AI, LG compares information against more than 20,000 data points related to the washer usage to program the optimal wash cycle setting, improving cleaning performance and extending the life of garments by 15%.

Source: https://www.lg.com/global/pdf/Sustainability-Report/2019-2020%20Sustainability%20Report.pdf

Read about sustainability at LG

LG Life's Good

PARTNER

Enabling green software development

Greenspector partner with companies to develop software and technology solutions that take environmental concerns into the core of development.

Source: https://greenspector.com/en/home/

Read about Greenspector

GREENSPECTOR
Software ecodesign for developer

CTOs must pay close attention to emerging and future digital solutions and their potential to unlock business value and efficiency gains while tackling core sustainability challenges to power their sustainability journey

How to use emerging technologies as a contributor for sustainability goals

CTOs have to play an active role in pushing the sustainability agenda forward

Emerging technologies are sparking transformational change across the planet, unlocking value and optimizing processes that benefit the climate and sustainable development. CTOs across the globe play a vital role in driving technology adoption across their organizations. They must understand the sustainability opportunities provided by new technology and support the entire C-suite in driving technology enabled sustainable transformation.

R&D triggers can help predict the technologies that could be powering the sustainability agenda in the future

By analyzing information from patent offices, universities and research organizations globally, EY has identified a range of patents[1] and tech transfers[2], that potentially could reshape industries and provide urgently needed solutions to global environmental challenges. Assessing the most recent patented digital technologies can help CTOs sense new emerging technology solutions to qualify potential fit for their sustainability agenda.

> "Fully computerized end-to-end processes from design to manufacturing to use-phase will significantly help to reduce CO_2 emissions in the construction industry."
>
> **Professor at ETH Zurich and Director of the (Swiss) National Centre of Competence in Research (NCCR) in Digital Fabrication**

1. Patents are a form of intellectual property and gives its owner the right to exclude others from making, using, selling, and importing.
2. Tech Transfers are technologies or scientific findings available for license from universities and research organizations.

Source: EY Plus

The analysis was conducted using EY TechWatch and EY Plus. EY TechWatch is a proprietary interactive tech and innovation trends insights content platform. EY Plus is a suite of third-party technology and innovation research platforms. EY Plus mines information from 100+ patent offices and 30K+ universities and research organizations globally.

Learn more about how EYTechWatch address business issues with technology

How AI and IoT can solve sustainability issues

Hover over visualization for more info

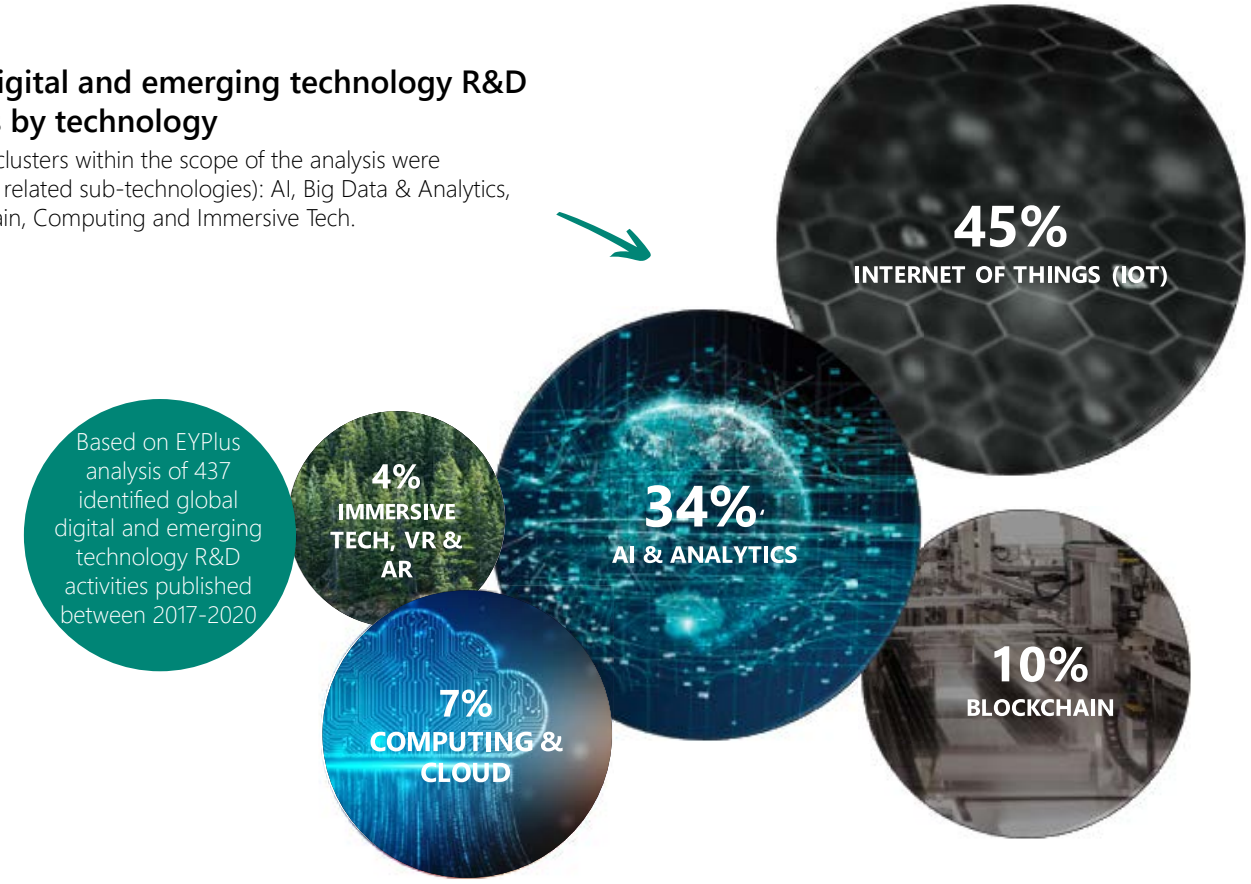
An increasing number of patents and tech-transfers target sustainability topics

Over the past three years, more than 5,000 patents and tech transfers were published globally in the broader sustainability field, according to our analysis. The analysis extracted those findings with a clear link to digital emerging technology, while discarding physical/operational technologies (such as drones, electric vehicles, sustainable materials). From the emerging digital solutions identified, the majority related to IoT (45%), followed by AI & Analytics (34%).

According to a study by the World Economic Forum, IoT solutions can add $14 trillion of economic value to the global economy by 2030, and 84% of IoT deployments are currently addressing, or have the potential to address, the SDGs. Equally, AI & Analytics are predicted to have enormous potential for sustainability. According to a 2019 Microsoft study, AI could help reduce worldwide greenhouse gas emissions by up to 4% in 2030, an amount equivalent to the 2030 annual emissions of Australia, Canada and Japan combined.

Global digital and emerging technology R&D activities by technology

Technology clusters within the scope of the analysis were (considering related sub-technologies): AI, Big Data & Analytics, IoT, Blockchain, Computing and Immersive Tech.



Source: EY Plus; WEF Internet of Things Guidelines for Sustainability; How AI can enable a Sustainable Future 2019

R&D in sustainability

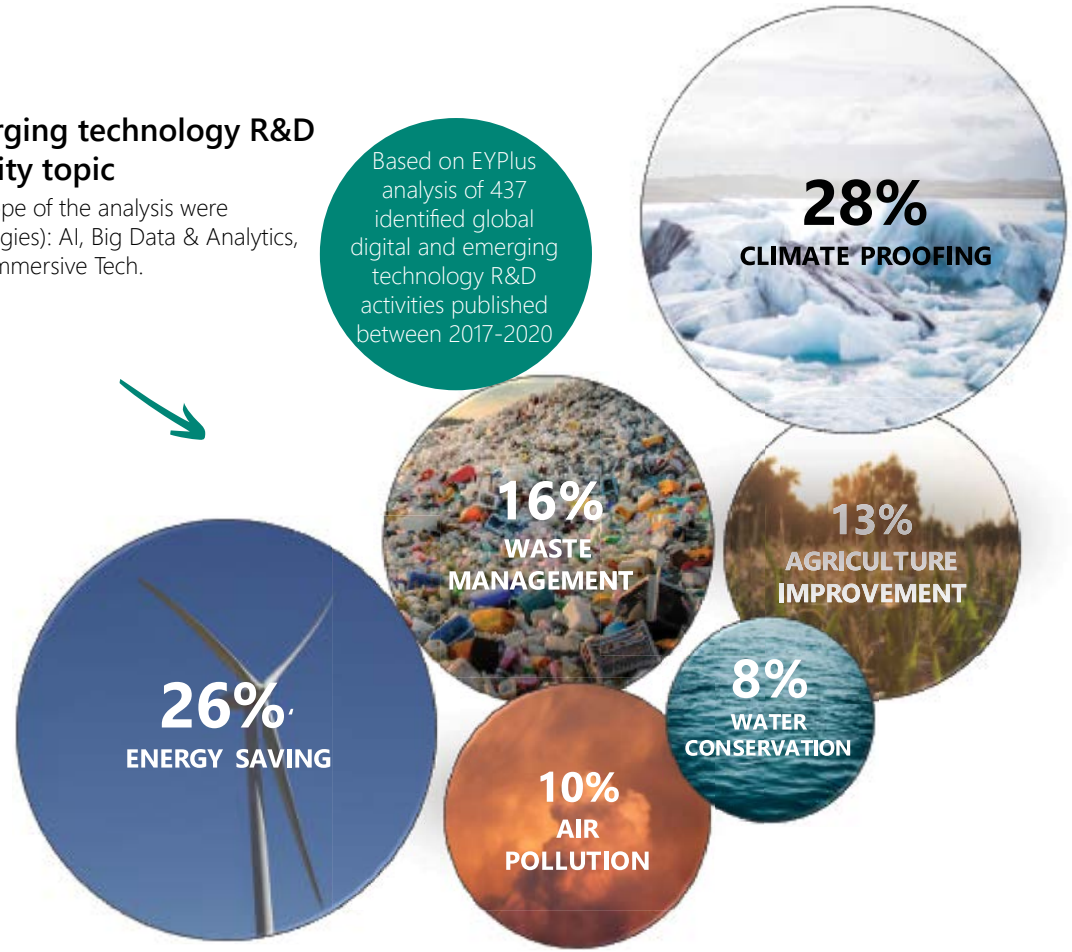
Hover over visualization for more info

54% of emerging digital solutions within R&D target climate proofing and energy savings

About 28% of emerging technology solutions were linked to climate proofing, while 26% were linked to energy savings. Digital technologies can help combat climate change through reducing emissions, strengthening resilience to climate related disasters, and overall improve corporates' capacity to act and contribute. As climate change increasingly affects all areas of business conduct, R&D activities in digital and emerging technologies are creating opportunities for corporates to tap into.

Global digital and emerging technology R&D activities by sustainability topic

Technology clusters within the scope of the analysis were (considering related sub-technologies): AI, Big Data & Analytics, IoT, Blockchain, Computing and Immersive Tech.



Source: EY Plus; WEF Internet of Things Guidelines for Sustainability; How AI can enable a Sustainable Future 2019

Manage data intelligently

Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Data model & architecture	**Data model for sustainability measuring** Assess current data availability. Define missing links. Set up structures for collecting data. Outline sustainability data model.	**Automatic data relevance assessment** Leverage advanced analytics to continuously gather data with most expected relevance for business users to make sustainability impact	**Predictive data modelling** Leverage predictive analytics to understand future data requirements. Forecast implications on current data model for sustainability measuring
Environmental data capturing	**Data collection and cleaning** Engage business units for data collection. Define roles and responsibilities. Agree on cleaning and formatting	**Tech-enable data sharing** Ensure insights and supporting data is shared and accessible. Implement automatic processes to support data cleaning. Make data available in real-time dashboards	**Customized insight distribution** Push data dashboards in real-time to business users. Customize to predicted needs, applying natural language processing on data. Make all insights available in open platforms
Sustainability data adoption	**Agility baseline** Measure agility. Make sustainability data insights available to all units. Integrate data into decision making process. Support learning loops	**Intelligent issue support** Apply in-memory analytics to give BI professionals faster answers to sustainability questions	**AI sustainability insight support hub** Create 'AI Digital Support Hubs' to improve analysis for employee initiatives. Tailor support to business units. Forecast business outcomes of employee questions

Minimize tech ops emissions

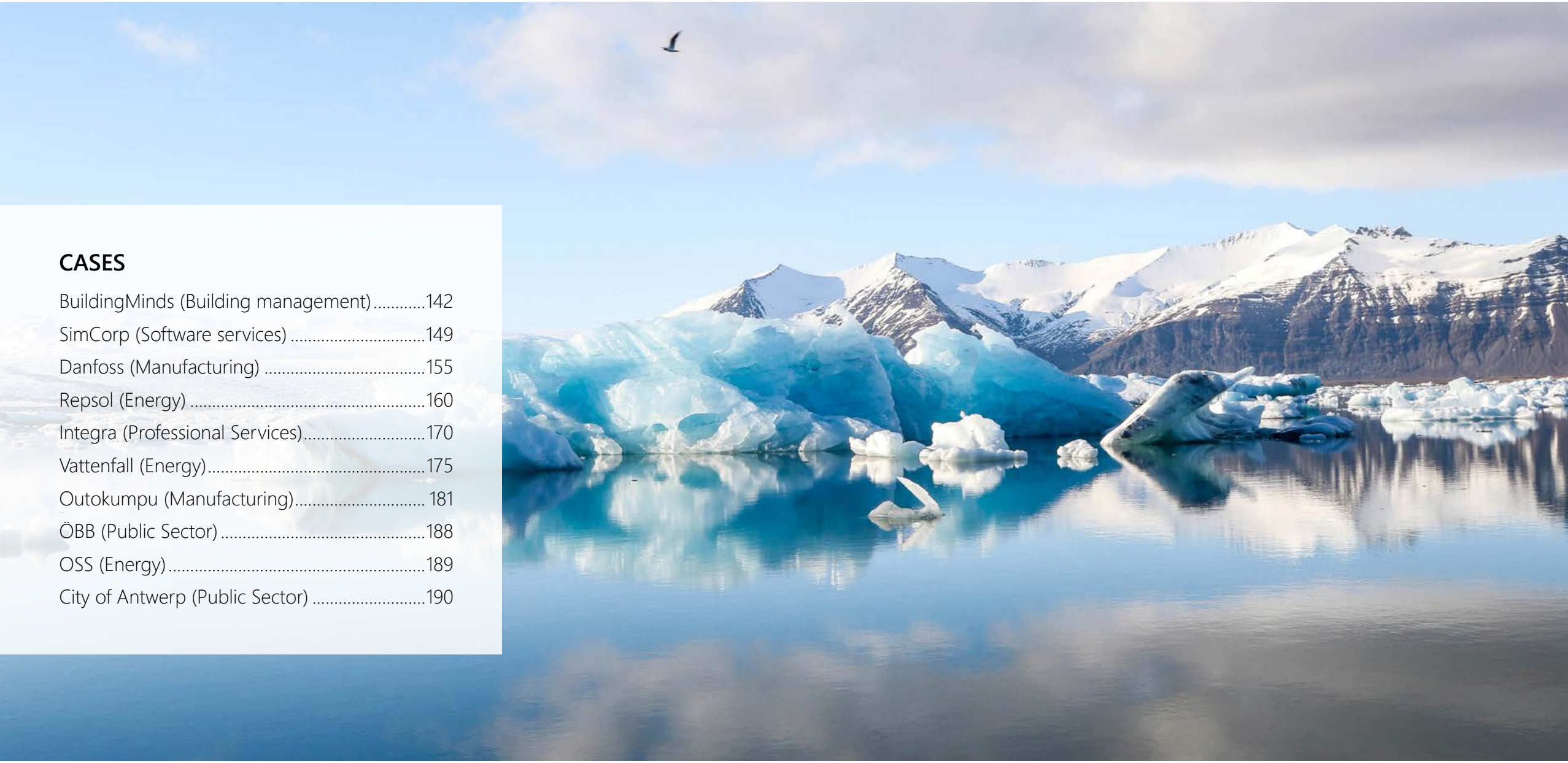
Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Green cloud operations	**Cloud potential assessment** Define footprint from hosting, storage and computing. Estimate requirements and impact from cloud. Benchmark providers	**Full data migration** Migrate all data to cloud. Save energy with hyperscale datacenter. Leverage green energy sources	**Thin clients** Computations done in cloud instead of device. Device only serving as monitor
Recycled hardware footprint	**Hardware emission estimates** Map full life-cycle hardware emissions.	**Responsible device disposal** Select low-footprint hardware. Have sustainable disposal in place. Ideally recycling.	**Zero e-waste** Use only fully circular equipment. Both conventional equipment, workstations, network solutions, cabling and IoT sensors.
Indirect tech emissions	**Map scope 3 tech emissions** Baseline tech supplier emissions. Benchmark competitors. Set emission reduction goals. Communicate goals to suppliers.	**Footprint as tech selection criterion** Integrate LCA as key selection criterion for third-party IT providers.	**Zero-carbon tech suppliers only** Use only carbon-neutral tech suppliers. Include their scope 3. Select for full circularity in all products they consume.

Co-create new tech solutions

Hover over each box for more info

ACTIVITIES	BASIC STEPS	ADVANCED PRACTICE	EMERGING SOLUTIONS
Sustainabiltiy tech trends	**Systematic trend sourcing** Define systematic processes to scan emerging sustainability tech. Use paid and partner sources to follow research, patents, start-ups and tech transfers	**Automatic tech scraping** Automatically scrape big data sets. Apply machine learning to detect trending tech	**Live tailored tech notifications** Get live notifications of emerging tech. Use advanced AI simulations of trends. Predict trends not existing yet using quantum
Tech strategy	**Organizational sustainability tech vision** Develop vision for the company to understand opportunity space of sustainability tech. Define tech strategy and product roadmap with sustainability in the core.	**Carbon-improving tech pursuit** Only pursue new tech which is actively lowering carbon footprint	**Carbon-negative tech by default** Only integrate new tech that is carbon-negative by default. Push prioritization of direct carbon capture and storage, direct air capture and geological storage of CO_2
Co-creation	**Partner prioritization** Map stakeholders to co-create with. Consider both customers, suppliers, competitors and NGOs. Evaluate on values and tech capabilities	**Innovation ecosystems** Form innovation ecosystems with social entrepreneurs, NGOs and academia. Share data and address sustainability issues jointly	**Competitor co-development** Gain larger capability space by co-creating, also with competitors. Use open collaboration platforms with live data exchange, joint lab testing and possibly shared project ownership



CASES

Company case reader guide

Tech-enabled sustainability

Microsoft solutions hold the potential to help customers meet their sustainability goals – either by a) receiving the built-in benefits inherent in the products, b) the ability to accelerate the progress of introducing new tools and C) systems and platforms that can potentially transform the business model.

10 illustrative company cases

The following presents 10 cases of companies – across countries and industries – that have applied Microsoft solutions to resolve business challenges by enhancing either their digital platform and infrastructure, work and operations and / or making an impact for the society and ecosystem surrounding the companies.

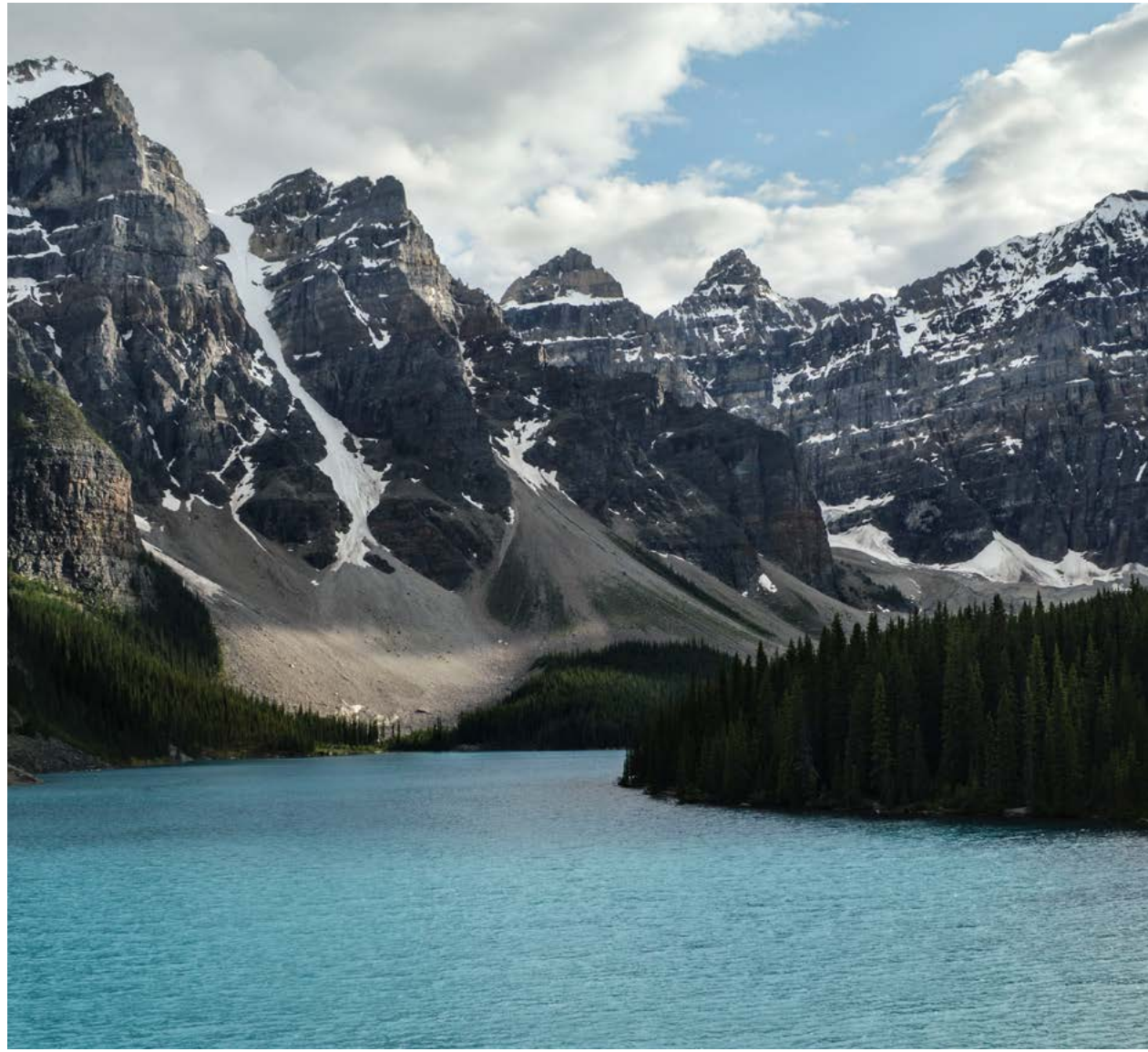
The ambition is to showcase how these companies are addressing their sustainability challenges and how tech-enabled sustainability can be applied already today, and what impact the latter can make on your CO_2 emissions – meanwhile also inspire the reader on what lies next and beyond, to exemplify the full potential of technology to reach your sustainability goals.

Some company cases are more elaborative than others with three cases being short one-page briefs.

Impact estimations

For some of the cases, we are estimating the impact of implementing selected services or showcasing estimates made by the customers' internal sustainability departments. The estimation is limited to the scope of the service, and not representative for all sustainability levers the respective customer is, has been or intend to be pulling – tech. enabled or not. All estimates are subject to some uncertainty, especially where targets or potentials are stated. In all cases, most critical assumptions are explicitly stated.

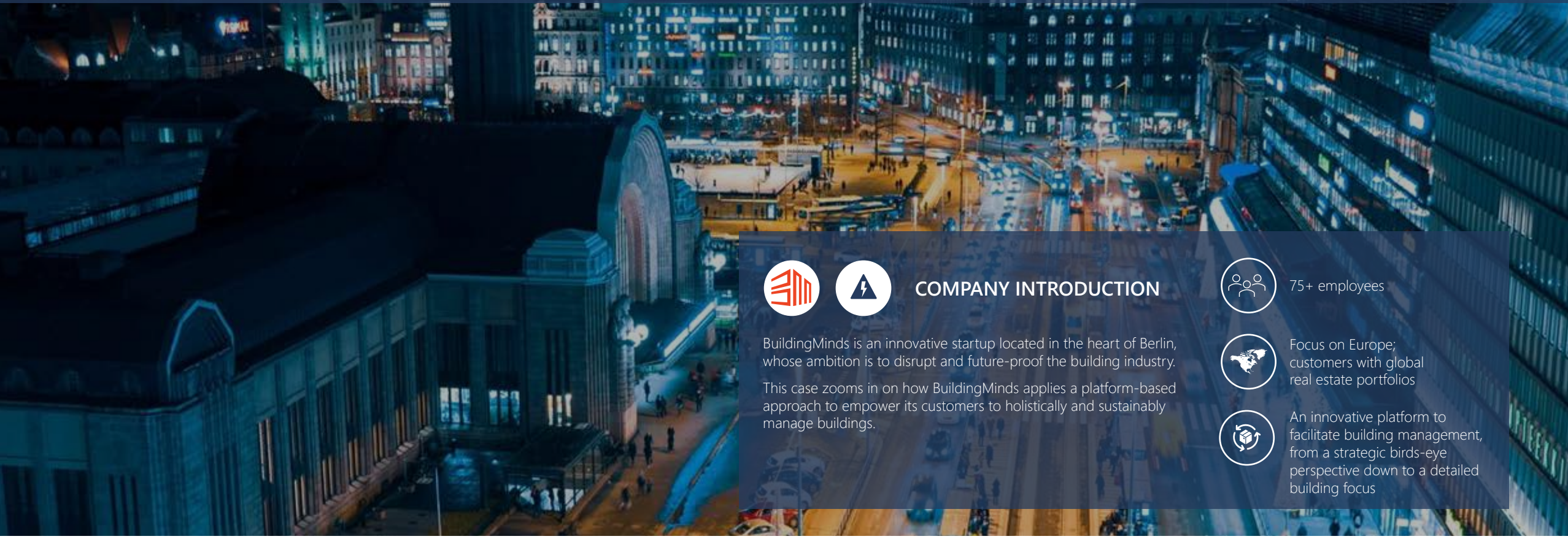
The cases have been developed by The Footprint Firm together with the companies.



The cases presented in the Company Case section of the Executive Playbook have been developed by The Footprint Firm (TFF). All information is based on input from the case companies and external sources. EY has not conducted verification of the information and figures, and consequently holds no responsibility for calculations, emissions statements, or other matters displayed in this section.

There is a need for a data revolution to kickstart the decarbonization and green transition of the real estate industry.

By taking a platform-based approach, BuildingMinds enables emission reductions and carbon risk management through smart real estate portfolio analytics



COMPANY INTRODUCTION

BuildingMinds is an innovative startup located in the heart of Berlin, whose ambition is to disrupt and future-proof the building industry.

This case zooms in on how BuildingMinds applies a platform-based approach to empower its customers to holistically and sustainably manage buildings.

75+ employees

Focus on Europe; customers with global real estate portfolios

An innovative platform to facilitate building management, from a strategic birds-eye perspective down to a detailed building focus

Sustainability is at the core of BuildingMinds' value proposition; the startup seeks to transform how buildings are managed aligning decarbonization goals, people satisfaction targets and profitability KPIs

At BuildingMinds, sustainability and data are inseparably linked

BuildingMinds

Digital Building Asset Optimization:
The One-Stop Cloud Platform

Mission: To empower our clients by unleashing the power of their data

PLANET Improve the use of resources for a sustainable future

PEOPLE Enable a better experience for tenants, employees and customers

PROFITS Assure innovation and increase business value

About BuildingMinds

1 | Solution: Broad and Deep

BuildingMinds supports their clients to manage large real estate building portfolios from a holistic portfolio view down to single building management.

By leveraging data-driven insights, BuildingMinds empowers customers to individually plan, analyze and benchmark to make the best possible decisions for the present and plan for a sustainable future.

BuildingMinds maximizes data leverage through a single, centralized and secure platform integrating dynamic Digital Building Twins*.

2 | Team: Domain and Digital Experts

BuildingMinds believes that the Digital Twin enhances the understanding and enables improvements of the physical building.

The team is comprised of technology, domain and digital transformation experts, who work every day to take portfolio and building management to the next level.

With the full backing of Schindler, BuildingMinds have the stability, support and resources of an established world leader in the building industry.

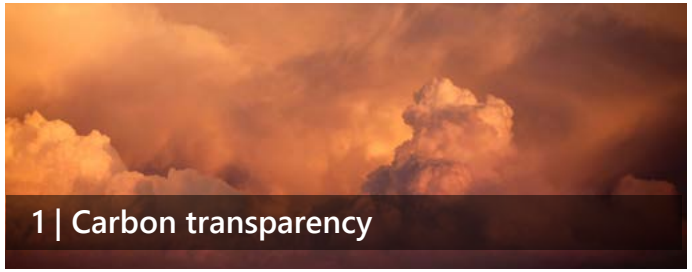
3 | Industry: Building the Future Standard

The Common Data Model (CDM) encompasses all the data-applicable structures, roles, processes and standards in the real estate industry. It provides the foundational data framework for real estate productivity applications, enabling data harmonization and data exchange among real estate organizations and their business partners.

BuildingMinds, together with partners has founded the International Building Performance and Data Initiative (see https://ibpdi.org/) with the goal of integrating international and national standards into the CDM for real estate.

* A Digital Building Twin connects a building's design and utilization, in a single model, that mimics and predicts the building's operation and performance based upon a multitude of parameters.

BuildingMinds addresses three sustainability concerns for the real estate sector: transparency of carbon emissions, resource efficiency and future-proofing buildings against climate risk



Megatrends such as decarbonization and digitalization are already disrupting the real estate industry.

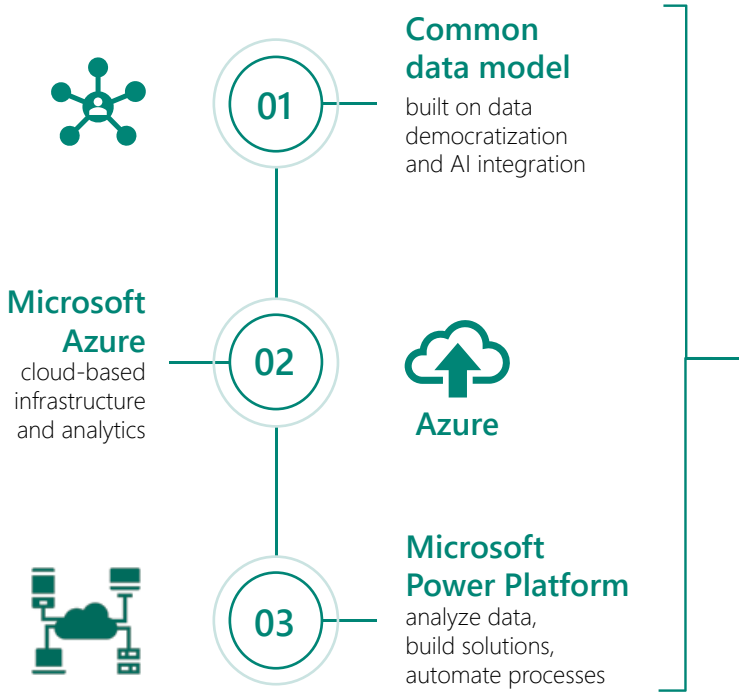
BuildingMinds' platform provides easily accessible and transparent information, supporting real estate owners and investors to analyze, monitor and benchmark building performance. This enables responsiveness and supports informed decision-making.

Analyzing building resource performance and identifying efficiency opportunities in terms of environmental performance can be a daunting task. Yet, the benefits of increasing resource efficiency are substantial. By analyzing operational and embodied building performance in terms of energy, CO_2 emissions, water consumption and waste, BuildingMinds improves its customers' resource efficiency resulting in reduced costs and related sustainability benefits ('Green Premium').

Climate change poses a range of challenges for the real estate industry. On the one hand, there are physical risks such as rising sea levels and more frequent extreme weather events. On the other hand, the transition to a low-carbon economy comes with risks due to stricter regulatory requirements and an increased demand for sustainable buildings.

BuildingMinds supports its customers in reducing climate risks and getting prepared for the requirements of the global green economy.

BuildingMinds' innovative platform enables strategic real estate portfolio management and significant carbon reductions



Reaping the potential of technology, BuildingMinds developed a platform that integrates advanced building analytics, KPI tracking and predictive building management.

The platform is based on an industry-specific common data model (CDM), Machine Learning and Artificial Intelligence. The CDM is being developed together with Microsoft as a key partner. This enables the development of a Digital Building Twin, which provides data-driven insights and full transparency around building performance, from a strategic portfolio level down to a granular building focus.

The platform enables real estate asset optimization across the entire building ecosystem based on unprecedented insights, transparency and real-time information.

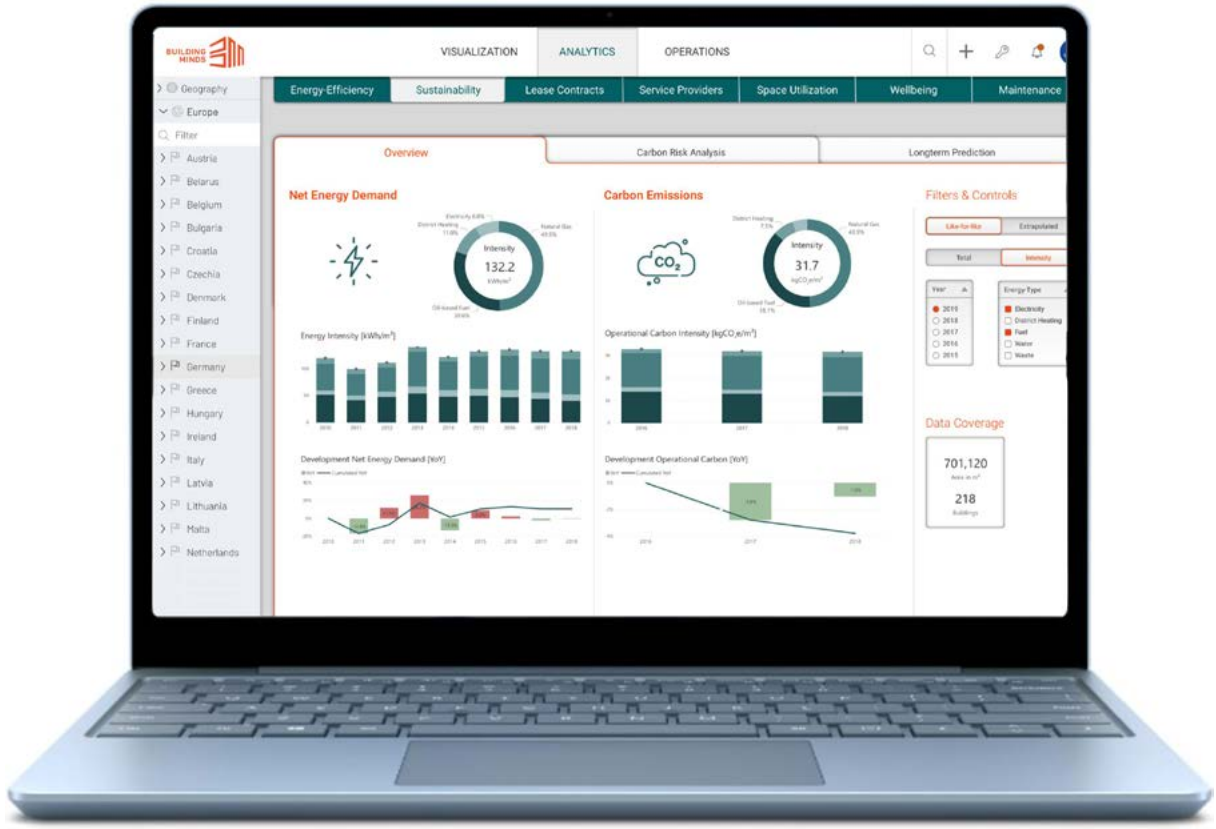
- Energy Consumption
- Carbon Footprint
- Carbon Risk Monitoring
- Portfolio Analysis

BUILDINGMINDS' SOLUTION

- Flexible Data Onboarding
- Data Coverage / Extrapolation
- Transparency & Reliability
- Compatibility / Reporting

Energy Consumption & Carbon Footprint

Sustainability cockpit



Overview of Resource Consumption

- Aggregated consumption data from portfolio down to building level for all types of energy, water and waste

Overview of Operational Carbon Footprint

- Total carbon emissions from portfolio down to building level for electricity, district heating, fuels, water and waste

Energy Consumption and Carbon Emission Details

- Breakdown into different energy sources
- Intensity figures (per sqm) for portfolio, sub-portfolios, business units, regions or individual buildings
- Separation and reporting of scope 1, 2 & 3 emissions (from owner- or tenant-perspective according to Greenhouse Gas Protocol)
- Development of energy consumption and emissions over time

Embodied Carbon Footprint

- Estimation of embodied carbon from portfolio down to building level based on RICS Database
- Option for detailed calculation of embodied carbon footprint based on Digital Building Twin

Carbon Risk Monitoring

Sustainability cockpit

Stranded Asset Monitor

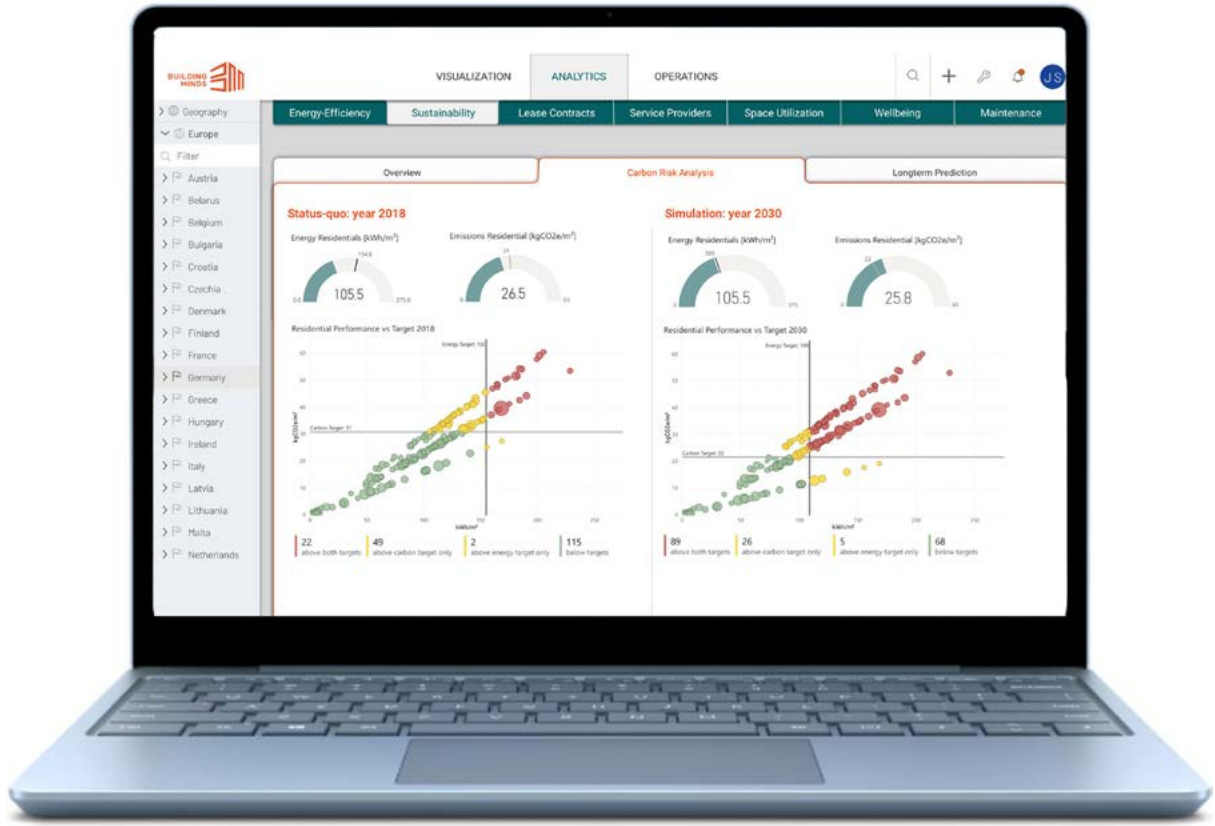
- Overview of energy-intensity and carbon-intensity in comparison to CRREM targets based on Paris climate targets (max. +2°C, better +1.5°C)
- Building performance development over time based on energy mix and predicted consumption
- Overview for entire portfolio, regions, business units or individual buildings

Simulation of Decarbonization Endeavors

- Calculation of operational carbon savings from transition to more sustainable energy sources or modernization efforts
- Estimation of carbon invest of modernization efforts (construction and materials) and break-even / "carbon ROI"

Simulation of Carbon Pricing

- Setting individual carbon prices in €/tCO_2e to predict the impact on portfolio value and compare savings from modernization efforts
- Option to include carbon offset initiatives to carbon footprint calculation and carbon risk prediction



LOOKING BEYOND

BuildingMinds and Microsoft share the belief that with the **democratization of data and the integration of AI**, we can forge a path towards a more sustainable future.

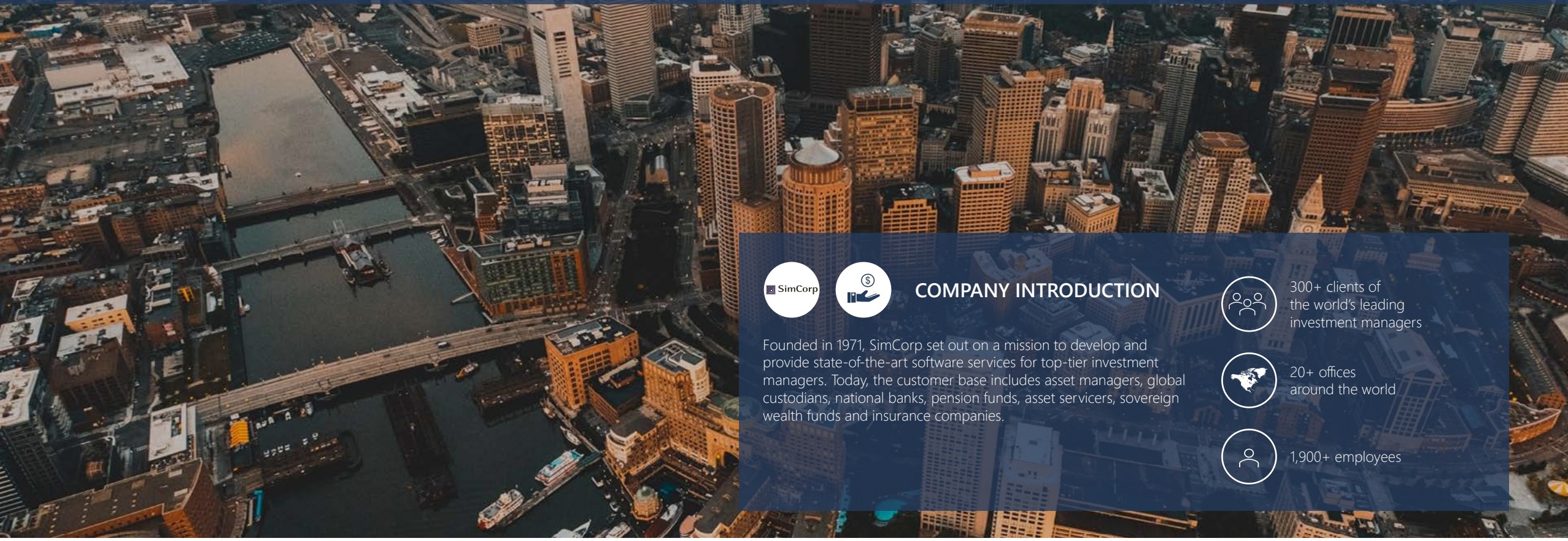
This is merely the first step towards automated green real estate management. In the near future, BuildingMinds envisions to **expand the integration of Microsoft's AI tools** in their products, in order to identify solutions and CO_2e savings that were formerly hidden from sight.

BuildingMinds will furthermore include the **embodied carbon footprint** of buildings in the platform based on the **EC3 database**, which has been co-created by Microsoft (see buildingtransparency.org). This will enable real estate portfolio managers to make decisions on building maintenance and renovation based on the quantified carbon footprint of building materials and design solutions.

> "The width and wealth of Microsoft's services allows us to address truly complex industry problems. Building on the Azure Platform helps us to deliver our promise of a first-class cloud platform to our customers and empowers them to drive the sustainability and profitability of their real estate portfolios."
>
> **Duncan Binger, CTO, BuildingMinds**

Companies increasingly look towards tech-enabled solutions to reduce the environmental footprint from their own operations and client services.

SimCorp's journey to the cloud has substantial carbon benefits acting as a lever in its pursuit to decarbonize business operations and client services



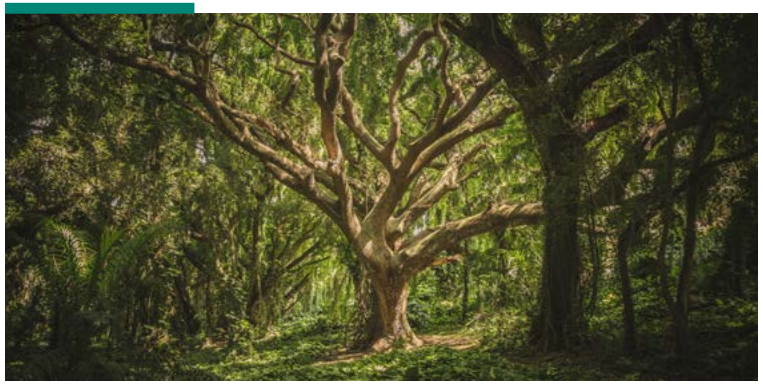
COMPANY INTRODUCTION

Founded in 1971, SimCorp set out on a mission to develop and provide state-of-the-art software services for top-tier investment managers. Today, the customer base includes asset managers, global custodians, national banks, pension funds, asset servicers, sovereign wealth funds and insurance companies.

- 300+ clients of the world's leading investment managers
- 20+ offices around the world
- 1,900+ employees

SimCorp's sustainability journey is tech-driven and includes solutions from decarbonization of business operations through cloud infrastructure to curbing business travel through virtual collaboration

Sustainability as one of the defining megatrends



At SimCorp, sustainability is seen as one of the defining megatrends of our time and it is placed high on the corporate strategic agenda. As part of this agenda, SimCorp will seek to innovate and deliver offerings in a way that will help clients reduce their carbon footprint. In addition, SimCorp analyzes its own operations to reduce CO_2 emissions internally to the company.

One of SimCorp's defining sustainability characteristics is its techdriven approach.

SimCorp's main areas of sustainability focus

SimCorp's sustainability effort spans across multiple levers and are enabled by different tech solutions such as virtual collaboration and cloud infrastructure.

SimCorp

- Decarbonization of operations and services
- Ensuring an eco-friendly workplace
- Enabling IMS support of ESG investments
- Fostering a truly diverse and inclusive workplace
- Sustainable corporate citizenship

Shortlist of tech-enabled sustainability solutions that are or will be applied by SimCorp

- From air travel to virtual meetings
- From on-premise to cloud
- Shift to high performance computing

Source: SimCorp CSR and ESG report 2019

As energy consumption has increased to fuel the ever-increasing demand for data storage and computing, SimCorp has had to rethink its data infrastructure to reduce its carbon footprint

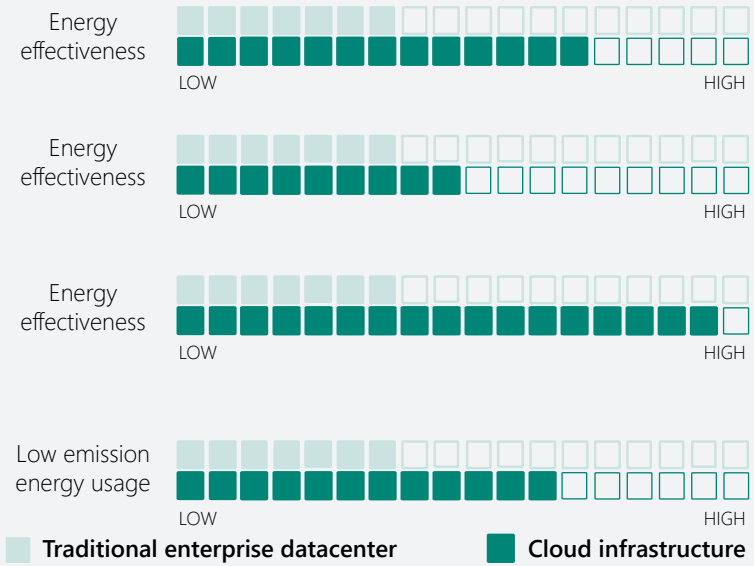
For SimCorp, its digital infrastructure is an important area for carbon reductions as it is one of the main electricity consuming entities.

To curb energy consumption related to digital infrastructure, SimCorp has started a transition from traditional enterprise datacenters to a cloud-based infrastructure with potential significant carbon benefits related to four energy-reducing features, as portrayed to the right.

Four energy- and carbon-reducing features enable SimCorp to tackle its energy consumption challenge related to data storage and computing

Feature	Enabling properties
IT operational efficiency	The large economies of scale seen in cloud computing means that cloud services in general can operate with much greater IT operational efficiency than smaller, on-premises deployments
IT equipment efficiency	The leaner equipment setup often seen in cloud comes with a higher ratio of input energy going towards providing useful output than seen in traditional enterprise deployment
Datacenter infrastructure efficiency	Advanced infrastructure technologies in hyperscale datacenters that power cloud reduce electricity requirements for overhead tasks such as lighting, cooling, and power conditioning compared to typical enterprise datacenters
Electricity	Consolidating distributed electricity demand from on-premises datacenters into the cloud unlocks the potential for large-scale purchases of green power that bring substantial renewable energy projects onto the grid that were not otherwise viable

Enterprise datacenter relative to cloud infrastructure

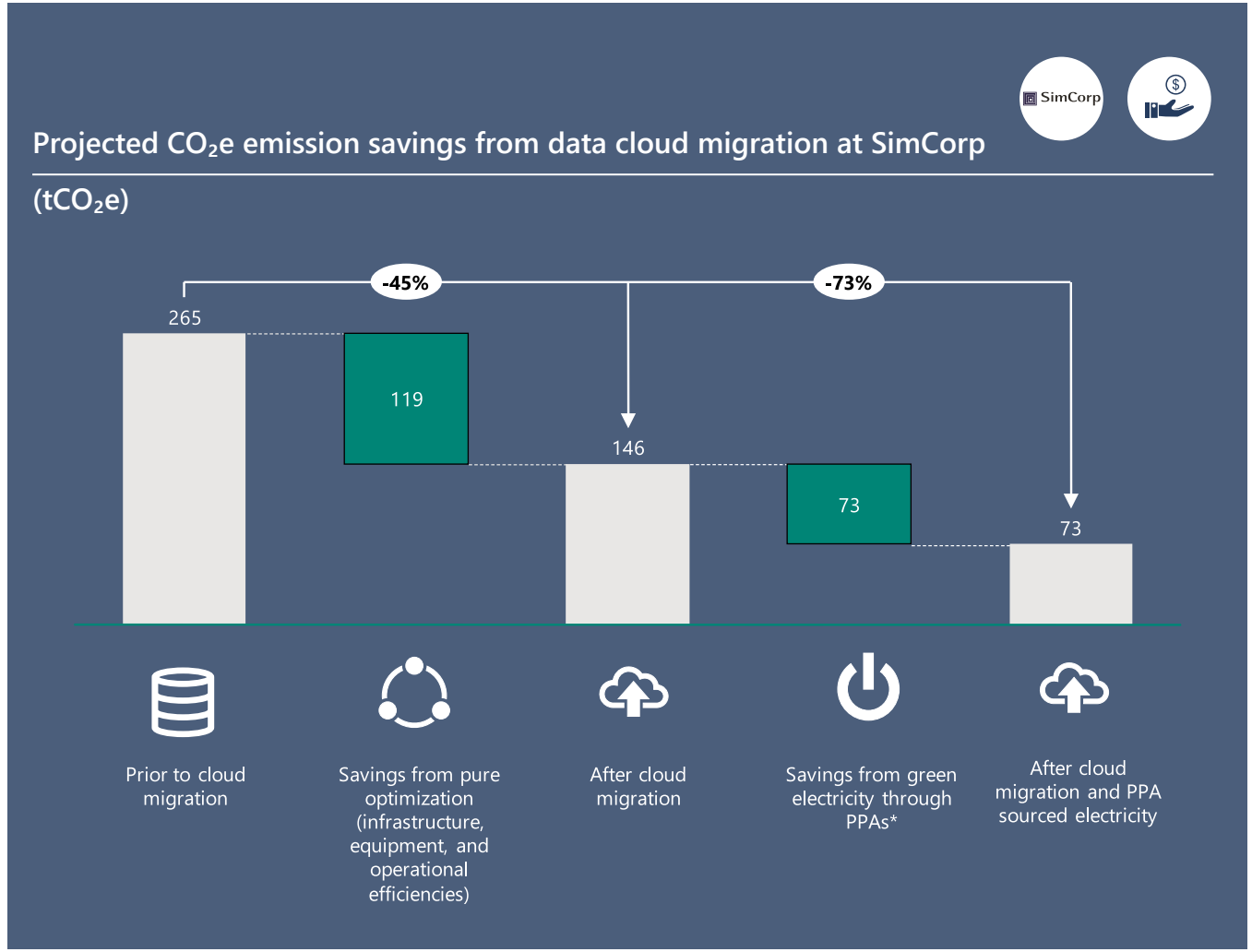


In addition, software improvements has the potential to further accelerate the energy effectiveness and CO_2 savings on the infrastructure

Source: The benefits of cloud computing (2020), Microsoft.

For SimCorp, the planned transition to cloud will enable significant carbon benefits and potential to reduce the CO_2e footprint by 45-73% from its data infrastructure

SimCorp's strategy to decommission its own datacenters and move to the cloud comes with great carbon benefits. In fact, the cloud migration has potential to reduce SimCorp's carbon emissions from its data infrastructure with 45% and up to 73%. The carbon benefits will be realized through two overall components; 1) Energy optimization at the datacenter through infrastructure -, equipment- , and operational-efficiencies. 2) The energy mix used at the datacenter (higher weight of green electricity through guaranteed through Power Purchasing Agreements (PPAs).



Source: Calculations performed by The Footprint Firm on behalf of SimCorp
*In this case, emissions savings from the transition to green energy through power purchasing agreements are factored in.

Reduced server energy consumption, improved power usage effectiveness, and more green electricity are the main drivers behind the projected carbon savings from the cloud migration

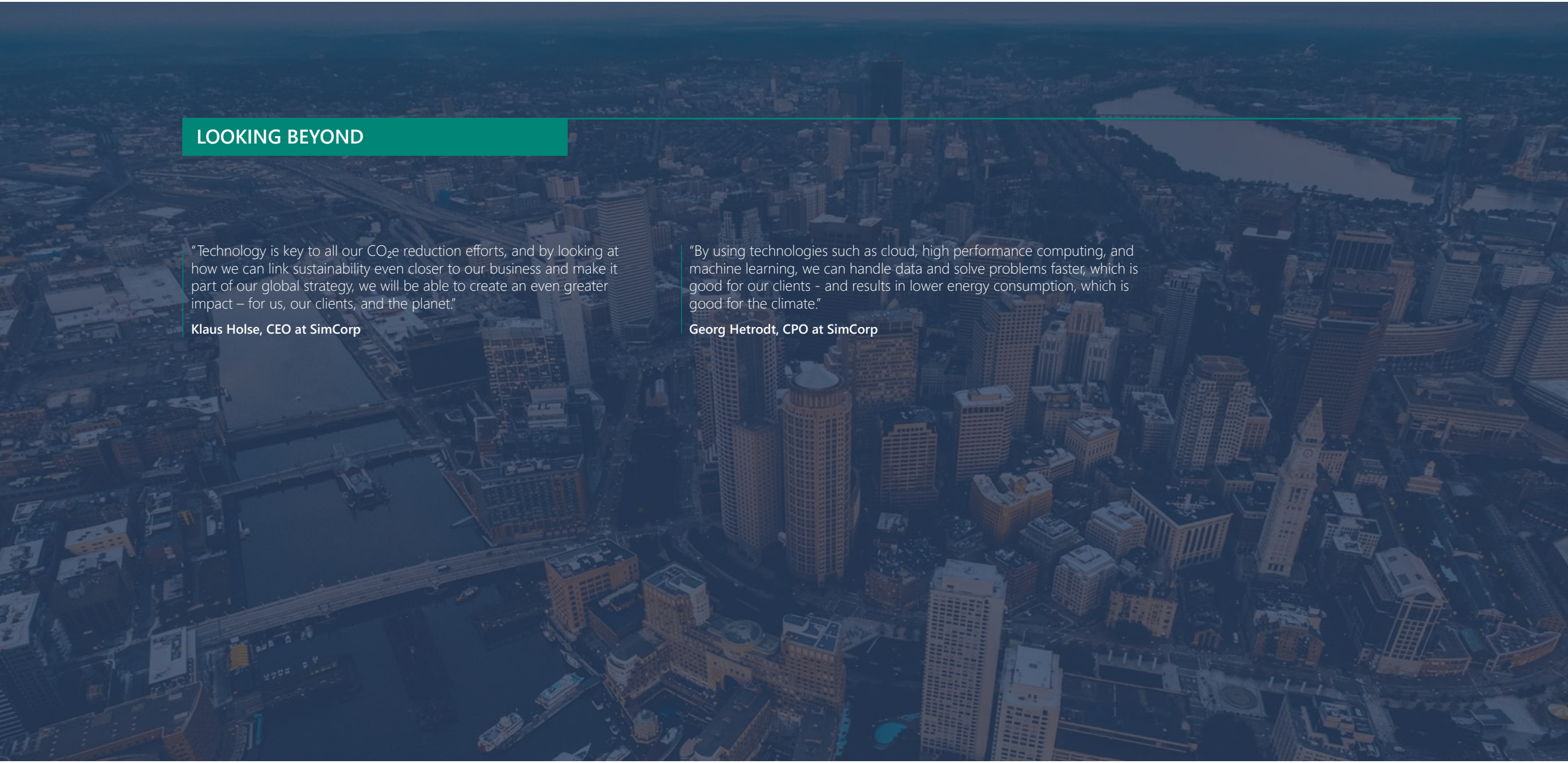
Carbon reduction projections

To estimate the carbon reductions realized through the migration from on-premise servers to cloud four components are needed:

Number of servers Energy used per server	Number of servers and energy used per server is used to calculate the energy consumption from server
Power usage effectiveness	To account for the variation in datacenter efficiency (how much energy is used for computing equipment in contrast to cooling and other overheads), the energy consumption is multiplied by PUE factor
Emission factor	Finally the total energy consumption adjusted for power usage effectiveness is multiplied by the emission factor to translate energy into CO_2e emissions

	Number of servers	x	Energy used per server	x	Power usage effectiveness	x	Emission factor	=	CO_2e
Prior to cloud migration	SimCorp had +320 servers across different locations		SimCorp's energy consumption per server varies greatly but averages between 2,000-3,000 kWh/year		The power usage effectiveness factor (PUE) applied is estimated to 1.6 (average PUE for 2019)*		SimCorp's emission factor is a weighted average of the different emission factors that the servers are in. Here set to ~298 gCO_2/kWh**		**265 t CO_2e/year** (weighted average of the different country site emissions)**
After cloud migration	The total amount of energy related to server use is reduced through cloud. Key reduction enablers include dynamic provisioning and multitenancy where multiple user types occupy the same server to maximize utilization				A more efficient use of electricity in SimCorp's cloud solution results in a PUE equal to 1.1		The greener energy mix related to the cloud datacenter location translates into a lower emission factor		**73-146 t CO_2e/ year** (Emission range from pure optimization to inclusions of green electricity from PPA's)
Component change	**Reduced server energy usage**				**Improved PUE**		**Greener electricity**		**45-73%** (saving range from pure optimization to inclusions of green electricity from PPA's)

*The applied PUE factor is set to 1.6, which is the average 2019 PUE factor according to UI's Annual Data Center Survey Results.
** A weighted average based on share of workload across the following countries; Denmark, Canada, USA, Singapore and Hong Kong.



LOOKING BEYOND

"Technology is key to all our CO_2e reduction efforts, and by looking at how we can link sustainability even closer to our business and make it part of our global strategy, we will be able to create an even greater impact – for us, our clients, and the planet."

Klaus Holse, CEO at SimCorp

"By using technologies such as cloud, high performance computing, and machine learning, we can handle data and solve problems faster, which is good for our clients - and results in lower energy consumption, which is good for the climate."

Georg Hetrodt, CPO at SimCorp

Food retailers increasingly demand new solutions to reduce food waste, energy, and CO_2 emissions.

Cloud based IoT solutions from Danfoss enables positive climate impact and efficiency improvements

COMPANY INTRODUCTION

Since 1933, Danfoss has delivered solutions within cooling, air conditioning, heating, controlling electric motors and mobile equipment.

From a sustainability perspective, Danfoss' opportunities to make a positive impact are many; from feeding a growing population, to saving energy, to letting everyone enjoy a more comfortable, better quality of life.

Danfoss targets CO_2 neutrality by 2030.

28,000 employees

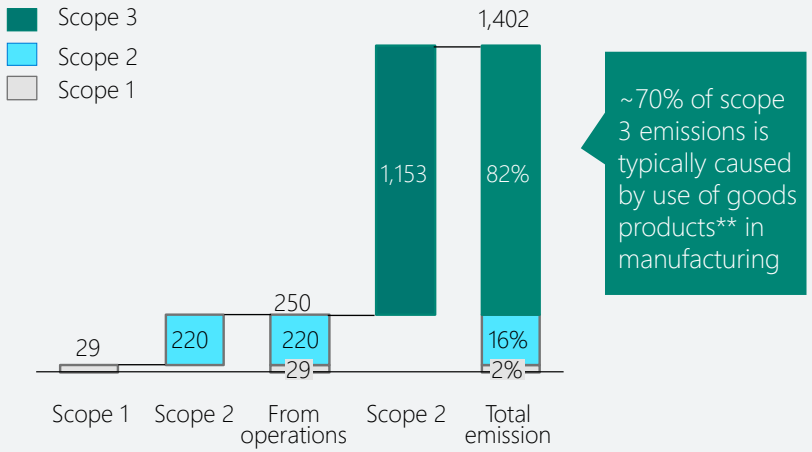
Sales in +100 countries

40,000 products within cooling alone

Danfoss targets CO_2 neutrality by 2030 in global operations while also working with suppliers and customers to bring down scope 3 emissions

Scope 3 is the primary source of CO_2 emissions for Danfoss – typically due to use of goods sold

Danfoss' scope 1, 2 (location-based), and 3 emission
Metric kg tons CO_2e*



Find out more about scope 1, 2 and 3
Page 18

Danfoss joined, as the first global technology company, all three business action initiatives under The Climate Group

Initiative	Actions
EP100	*Energy efficiency first:* Developing energy-efficient solutions for sustainable buildings, heating and cooling, district energy systems and electric transport.
EV100	*Electric company cars:* Working with partners and governments on the infrastructure needed for sector integration to drive uptake of electric mobility, meanwhile transforming own car fleet to all electric.
RE100	*Renewables:* Supporting of future-proofing district energy and ensure that buildings become smart, e.g. utilization of surplus heat from supermarkets to heat homes. Further, ensuring electrification initiatives are powered by renewables.

The Climate Group | Danfoss commitments

Through The Climate Group, Danfoss has committed – in own operations – to follow through on the three business actions; EP100, EV100, and RE100.

* 2019; scope 3 estimation by Trucost; ** Industry average CDP; SBT, Value Chain Report (2019); Danfoss

Danfoss addresses 3 issues for cooling solutions: food waste in stores, energy consumption for coolers, and operational efficiency

Management of resources – especially within food – has become a pivotal topic in retail.

From a company perspective, reducing food waste means less CO_2 emitted from wasteful food production. This also impact cost drivers from wasteful purchasing, but also has the added benefit of impacting consumer reputation, as customers increasingly value sustainable and responsible retailers.

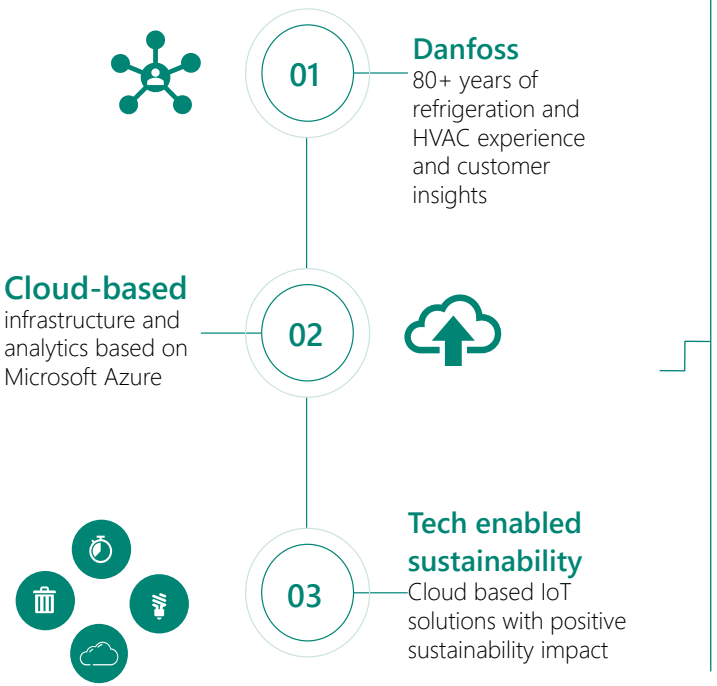
Ensuring cooling, refrigeration, lighting, HVAC etc. run efficiently can be a time-consuming task and often requires specialist knowledge.

Yet, the benefits of doing it right are substantial, as both energy consumption, the associated cost herein, and the associated CO_2 emissions can be reduced considerably.

In food retail stores today, operations are getting increasingly complex; more assets, stricter standards and specialized equipment are introduced.

If not addressed intelligently, operational inefficiency rise, as more time is devoted to issues with store equipment instead of core business operations. Likewise, coolers rely on refrigerants which will have a negative environmental impact in the case of leaks.

A new cloud-based IoT solution from Danfoss enables carbon reductions of ~30% as well as efficiency improvements



Reaping the sustainability advantages of technology, Danfoss' new cloud-based platform Alsense™ is using a combination of sensors and data algorithms to realize above 30% and up to 40% net savings in energy consumption.

In collaboration with Microsoft, Danfoss has combined deep industry experience with the latest advancement in cloud technology and analytics to extend its market offerings to include intelligent, cloud based IoT solutions.

The new solutions enable retailers to reduce food loss, energy consumption and optimize overall store performance. It does so by automatically gathering, processing, and analyzing data from refrigeration assets, HVAC, lighting, and other key assets ensuring actionable insights and immediate action in case of time critical system alarms. Other managed assets of the solution may include renewables and energy storage systems.

* From electricity use

IMPACT

2015 until 2020

Up to 40%
Less energy consumption

Realize up to 40% total net savings in energy consumption by reducing energy consumption from lights, refrigeration, HVAC, etc.

418,000 ton CO_2
reduced

Since rolling out the solution, Danfoss has managed to save an accumulated 418,000 tons of CO_2 from the IoT cooling solution, all over the world*. That is the equivalent of removing 91,000 cars from the roads.

Up to 40%
Reduced food loss

Reduce food loss with up to 40% as temperature is automatically monitored and alarms are sent to the store if temperature thresholds are above limit.

Up to 80%
Less time used

Eliminate up to 80% of the time used to manage issues with store equipment as the connected assets are monitored and analysed ensuring immediate action in case of compressor failure, refrigerant leaks etc.

LOOKING BEYOND

Net-zero energy supermarkets are possible today – and utilizing waste heat, Alsense™ can eventually make supermarkets net-plus energy buildings. This is merely the first step for increasingly connected cooling and heating in our buildings. There are great sustainability gains from smart buildings, where solutions like Alsense™ can ensure that energy consumption is significantly reduced. Achieving such transparency on store and building level also allows us to leverage flexibility and become an active contributor to the electricity grid. For instance demand-side management will intelligently match supply and demand of different assets.

> "The collaboration with Microsoft will deliver tangible results to both existing and new customers of Danfoss and Microsoft. We will build on this collaboration and continue to invest in new cloud services to the industries we have served successfully for more than 80 years with the ambition to reduce food waste and energy consumption".
>
> **Jürgen Fischer, President Danfoss Cooling**

The oil and gas industry has by default a vital responsibility in lowering our climate change impact, which is why energy companies need to advance to a more sustainable future, directing their strategies and investments towards decarbonization."

Repsol is leading their energy transition in line with the objectives of the Paris Agreement and UN SDGs and has committed – as the first energy company – to achieve net zero emissions by 2050

COMPANY INTRODUCTION

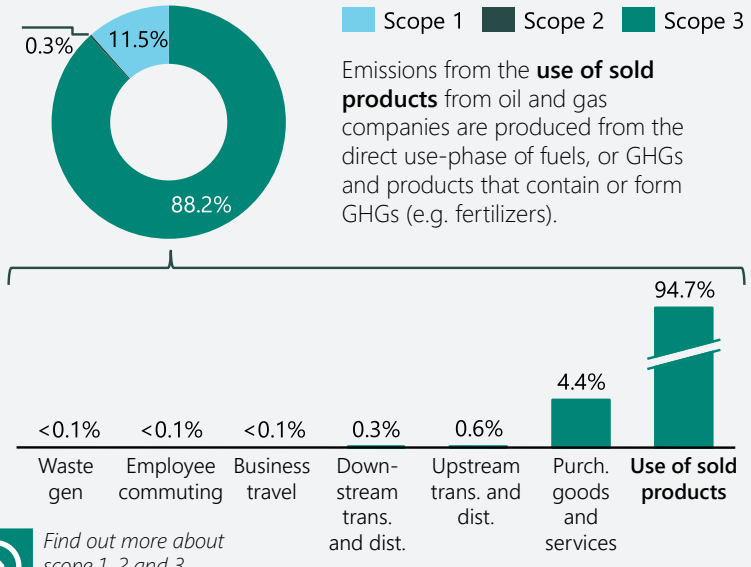
Repsol is a global multi-energy company, working to facilitate the evolution towards a low-emission energy model. Repsol will be a zero net emissions company by 2050, being the first in the sector to set this ambitious goal, and thus showing its commitment to the fight against climate change. This target includes emissions both from production and products, and Repsol has established intermediate goals in 2025, 2030, and 2040. Repsol has oriented its strategy, activities and investments to advance in the decarbonization with the impulse of projects associated to the energy transition and the fulfillment of the objectives of the Paris Agreement. It works with a vision of the future based on innovation, efficiency, respect and value creation for the sustainable progress of society. Repsol is transforming the energy sector with the support of technology and digitalization, to provide accessible, efficient and safe energy, providing new energy solutions and developing circular economy projects to respond to society's demands and offer products and services that make people's daily lives easier.

- A team of ~25,000 employees
- Spanish origin, present across 34 countries
- Average net production of ~710k barrels of oil equivalent per day
- Low-carbon electricity generation capacity of 2,952 MW
- 200 digital initiatives w. 60 of these focusing on sustainability

As part of the energy transition, Repsol will orient its strategy, investments and business plans towards ensuring the sustainability and value creation of its businesses, both in the long and short term

As an O&G player, Repsol's largest contribution in GHG emissions comes from the use of its products (scope 3)...

Repsol's CO_2 emission profile 2019



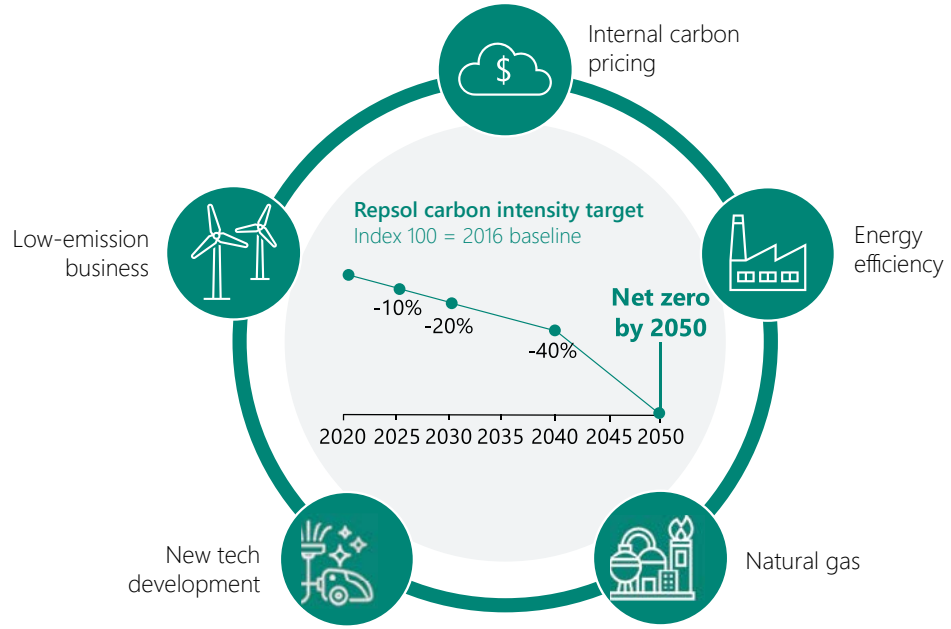
Find out more about scope 1, 2 and 3 Page 18

* Carbon capture, use and storage; ** Natural Climate Solutions
Source: CDP; Repsol Climate Roadmap

... why Repsol is transitioning its business to reduce the carbon intensity to net zero emissions, basing its strategy on five pillars

Repsol's five pillars for reducing the company's carbon intensity

Hover over each pillar for more information

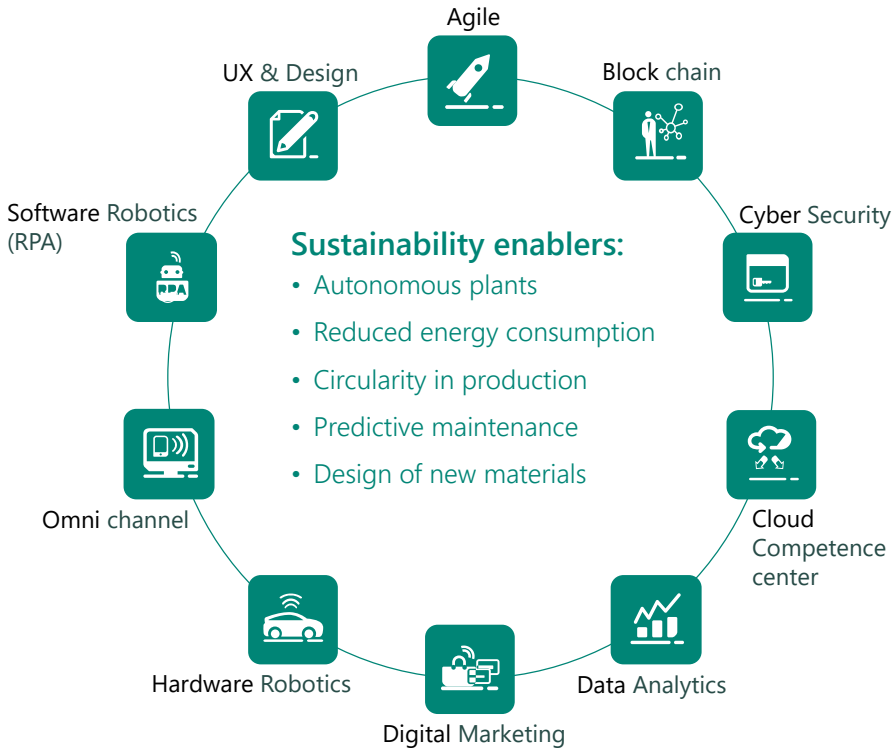


Repsol's Digitalization Program is fundamental to its transition, focusing on building a data driven culture, establishing new ways of working and improving sustainability

Key commitments of Repsol's Digitalization Program

- Drive innovation and creation of new business
- Increase efficiency and maximize value creation
- Enhance focus on client
- Reduce carbon footprint and improve sustainability

Capabilities for tech enabled sustainability



Digitalization is a strategic growth lever at Repsol. Repsol's digital capabilities are deployed and embedded in all areas of Repsol, and as such transversal to the entire value chain and all business units.

60% of all new initiatives have an analytical or application component of artificial intelligence - and 200 initiatives are underway, 60 of which have a direct impact on sustainability.

Link to case examples

A critical move has been Repsol's cloud strategy, changing the foundations on which they build their digital products, and to transform the way they do things. The cloud is a key in achieving the flexibility and agility that digitalization processes require. Further, ARiA, Repsol's data platform facilitates the use of big data and artificial intelligence

Link to description of ARiA

A prerequisite to the program's success is Repsol's partners and technical alliance, working together with more than 40 partners, including Microsoft

60 digital and technology initiatives are already being deployed, with a focus on contributing to adding value and a reduction in Repsol's footprint across its value chains and the energy journey

Examples of Repsol's technology enabled sustainability initiatives across the energy journey

Exploration and Development Project: READS

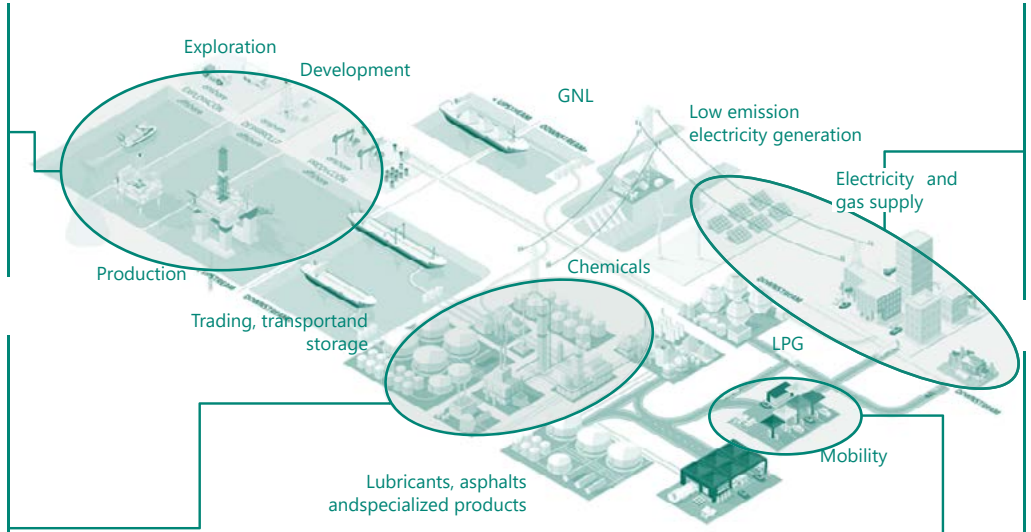
Link to case

By managing natural capital as another company asset, it is possible to obtain simulations that minimize the environmental impact of operations. This is a portfolio optimizer that allows prioritizing the projects that have the best economic and environmental return where GHG emissions are included.

Industrial Project: Smart Energy

Link to case

Leveraging on both simulations and machine learning models, these digital solutions offer recommendations to reduce the energy consumption of industrial assets and consequently GHG emissions. Each one of the digital cases tackle different GHG emitters (distillation units, utilities management and heat exchangers) and could potentially be scaled-up to other industrial units.



ARiA Repsol's data platform

ARiA is Repsol's data platform which will facilitate the use of Big Data and Artificial Intelligence in the fight against climate change.

Link to case

New businessProject: Solmatch

Link to case

Solution that promotes distributed electricity generation in Spain, bringing power generation to the point of consumption through the design of solar communities in urban centers, promoting local economy, providing benefits in terms of sustainability and without the interested parties having to make any investment.

Commercial Project: Eliot

Link to case

ELIoT is a two headed project: commercial and technical, that makes all elements of the service stations more efficient and intelligent by means of sensorization which not just optimize asset management, but also improves customer experience with special focus on energy efficiency.

ARiA is Repsol's data platform that will facilitate the use of Big Data and Artificial Intelligence in the fight against climate change

ARiA represents the state of the art in analytical platforms as it is built in the public cloud which gives it scalability, its operations are completely automated which gives it efficiency, and its component architecture allows it to evolve and adapt to always guarantee users a complete data accessibility and fast AI scalability

DATA ACCESSIBILITY: ARiA allows Repsol users to have access to the data they need when they need it and with the quality they need

1. DATA EXTRACTORS: Allow the user to massively extract all kind of operational data directly from source systems in batch or real time. Sensor data extractors collect millions of data points with IoT technologies and disposed in time series ready to be analyzed.
2. DATA LAKES: Break down data silos and consolidate all data into a single cloud-based storage and access location. This includes all kind of data from events, transactional records, text, image or video.
3. DATA GOVERNANCE: The user has a wide and easy to consult data catalog, with processes for continuous quality improvement and where access security is guaranteed.

AI SCALABILITY: ARiA will allow to bring models and artificial intelligence to all Repsol processes in an easy and fast way

1. ML LAB: Its advanced analytics laboratory guarantees advanced users and expert data scientists **building, training, testing, deploying, and managing all kind of machine learning models.**
2. ML OPS: Its automated machine learning pipeline guarantees a fast deployment of the models and monitor models performance without human intervention.
3. INTEROPERABILITY: Its API system allows it to access all types of external data sources, use analytical models from other specialized platforms or make Repsol's analytical models available to be exploited as a service by third parties.

READS is Repsol's tool to improve business decision making – quantifying and ultimately pricing environmental impact

Reads logic and application sequence

Identify aspects and impact

Impact scenarios, GIS* supported

Quantify biophysical impact units

Tons, hectares, m^3, and decibels

Monetize environmental economic to obtain EEVs and IUs**

US$ 40/tCO_2 from 2025 onwards

Management decision on application of mitigating actions

Avoid

Minimize and restore

Cost-benefit of mitigation measures

READS is a calculation and simulation tool:

READS helps Repsol evaluate, monitor and forecast carbon management scenarios of its actions. Enabling improved environmental management – considering a range of KPIs across GHG, biodiversity, water and well-being – as part of economic analysis of projects and assets. The tool is applied as support e.g. investment scenarios and selection of the optimal mitigating actions to reach its targets.

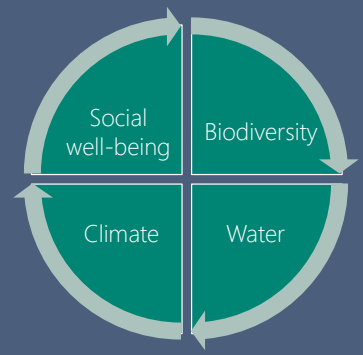
Example use cases:

- Select best-in-class project alternatives in comparative assessments (e.g. cost-benefit analysis) and prioritization of expenditure in projects and operating assets.
- Anticipate business risks due to dependencies on natural capital.
- Calculate offsets and compensation measures of commitments to society and stakeholders.

TECH. ENABLEMENT

READS is a SaaS application, completely built on Azure and developed operating on a DevOps (CI/CD) manner. Azure App Service stands as the front-end, and Azure Functions as the serverless back-end. Further, reporting and simulation is done via Power BI

The natural capital valuation and accounting is based on four aspects



* Geographical information system;** Impact units: Dimensionless metric that refines EEVs by adjusting prices with local factors (e.g. presence of endangered species)
Source: Repsol

Smart Energy provides a range digital solutions to operations – focusing on energy efficiency and CO_2 reduction – in refineries

Smart energy initiatives

Smart Energy consists of various digital solutions with the objective to optimize the operation of the refineries with regards to energy efficiency and CO_2 reduction. Main initiatives in the range of applications are:

- Advanced technical solution that combines refinery systems with Azure services to assist operations personnel in getting the optimum energetic point of unit operation while achieving all the requirements of production planning.
- Advanced software for accurate monitoring and prediction of pre-heat trains' performance in crude distillation units and provide technical evidence to anticipate any key decision in operating these such as assess impact of fouling on economics and optimal blending among others.
- Predictive optimizer whose objective is to reduce CO_2 emissions through the optimization of utilities systems. It will allow making common decisions regarding use of H_2, fuel gas and steam networks at the same time through a digital simulator and optimizer.

POTENTIAL

Annual reduction / refinery, tCO_2e

Sources driving potential, examples:

- 53,000 Gcal / year saved energy from pre-heat trains
- 4% less fuel gas consumed
- H_2, fuel gas and steam network optimization

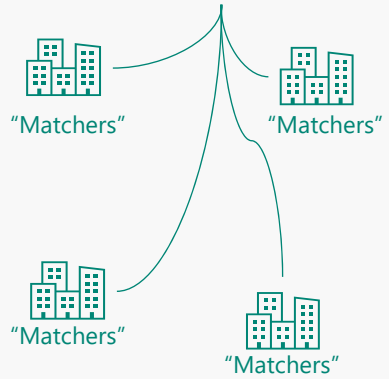
Source: Repsol

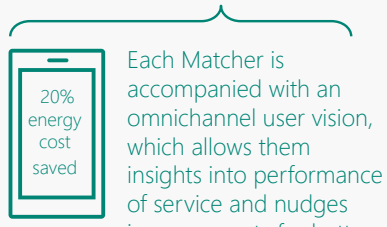
Solmatch is the establishment of a solar community in Spain, promoting distributed renewable electricity generation

Solmatch allows access to a green energy source for those households which cannot install their own solar panels.

Solmatch is an energy solution allowing 100% renewable energy model to be distributed between generation at small urban solar farms, like schools, service stations, industrial sites and other properties where solar panels are conveniently installed, and the local households in the vicinity.

- The generators are referred to as Roofers and neighboring households who can access and acquire the electricity are referred to as Matchers. Matchers are all properties within a 500m range of a Roofer.
- Solmatch is based on a multicloud integration taking advantage of the different infrastructure and service capabilities offered by the different providers. Everything the users see or browse through is built on Azure, that is connected to geo-localization systems, CRM, and ERP system. This allows Matchers to be more aware of their consumption via the omnichannel user vision experience accompanying the solutions.
- The launch of Repsol Solmatch has been successful, achieving a good position in the market with a transformative product in the field of distributed generation in Spain. To ratify and maintain its position from pioneering this business area, Repsol's ambition is to grow the number of solar communities manyfold to enable an even larger impact by its customers and as such on the environment.





Each Matcher is accompanied with an omnichannel user vision, which allows them insights into performance of service and nudges improvements for better utilization as well as promoting responsible behaviour as part of the energy transition training.

IMPACT

51 Solar communities established across Spain

Established by Roofers who often are local schools, service stations, industrial sites, and corporate headquarters – with more being added day by day, and up to 70 confirmed for 2020 – and more 1,350 potential Roofers

2,500 MWh annual energy produced

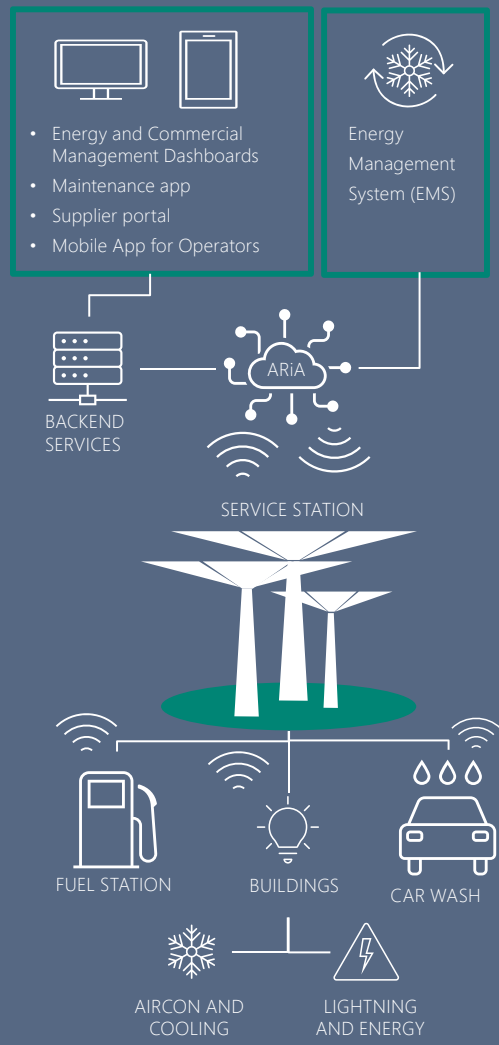
4,100 Households within reach of current communities

Each community with the potential of saving 20,000 $kgCO_2e$ every year or 50,000 kWh

1,030 tCO_2e saved annually from existing scale

Assuming 0.41 $kgCO_2$ / kWh. Savings expected to grow to an annual saving of ~1,400 tCO_2e by end of 2020 with the continued expansion of the solar community to 70

Source: Repsol; Comisión Nacional de los Mercados y la Competencia – 2018
Note: Impact estimate as per mid-October 2020 and solar community keeps growing every day



ELIoT TARGET

12,000 kWh / month

Standard consumption per gas station

10% Reduction

In energy consumption is targeted with Ellot, which is equivalent to ...

288kg CO_2 / year

Per gas station, and ...

230 tCO_2 / year

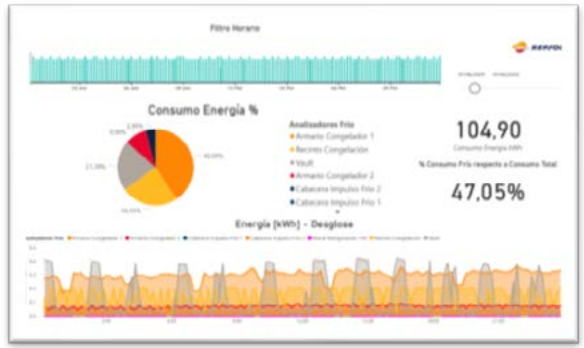
Across entire Repsol gas station grid of ~800 buildings

* Repsol digital platform
Source: Repsol

ElIoT makes service stations intelligent by means of IoT – for better operations and smaller footprint

ElIoT couples data and sensors from machines and customer behaviour, today optimizing the operations of Repsol's petrol stations, especially focusing on energy optimization. **The system is based on integration of IoT equipment for different appliances, e.g. washing (tunnel, vacuum cleaners, centers, etc.), building (lighting, air conditioning, cold and network analyzers) and fuel stations (tanks and pumps). The data available from machines and their environment improves better asset management with intelligent maintenance models through machine learning and automated tasks, e.g. temperature adjustments of coolers.** All data is made available in the ARiA Datalake, built on Azure, to be consumed by other projects, for example Suggested Order or EMS (applying the EMS concept to boost the data provided by Eliot in ARiA, there could be additional energy savings of 10-15 % in the service station by optimizing the consumption of electric devices), and Power BI dashboards are used for both technical and commercial monitoring. As such, ElIoT is proving its value at Repsol's service stations, however, its potential extends beyond.

Example: Energy consumption, snapshot of real time data



Monitoring of energy consumption data that allows system to learn and master, e.g.:

1. Detection of the equipment with the highest consumption
2. Detection of any anomalies in the consumption over time
3. Prioritization of energy efficiency levers

LOOKING BEYOND

A digitalized value chain to support Repsol's sustainability objectives

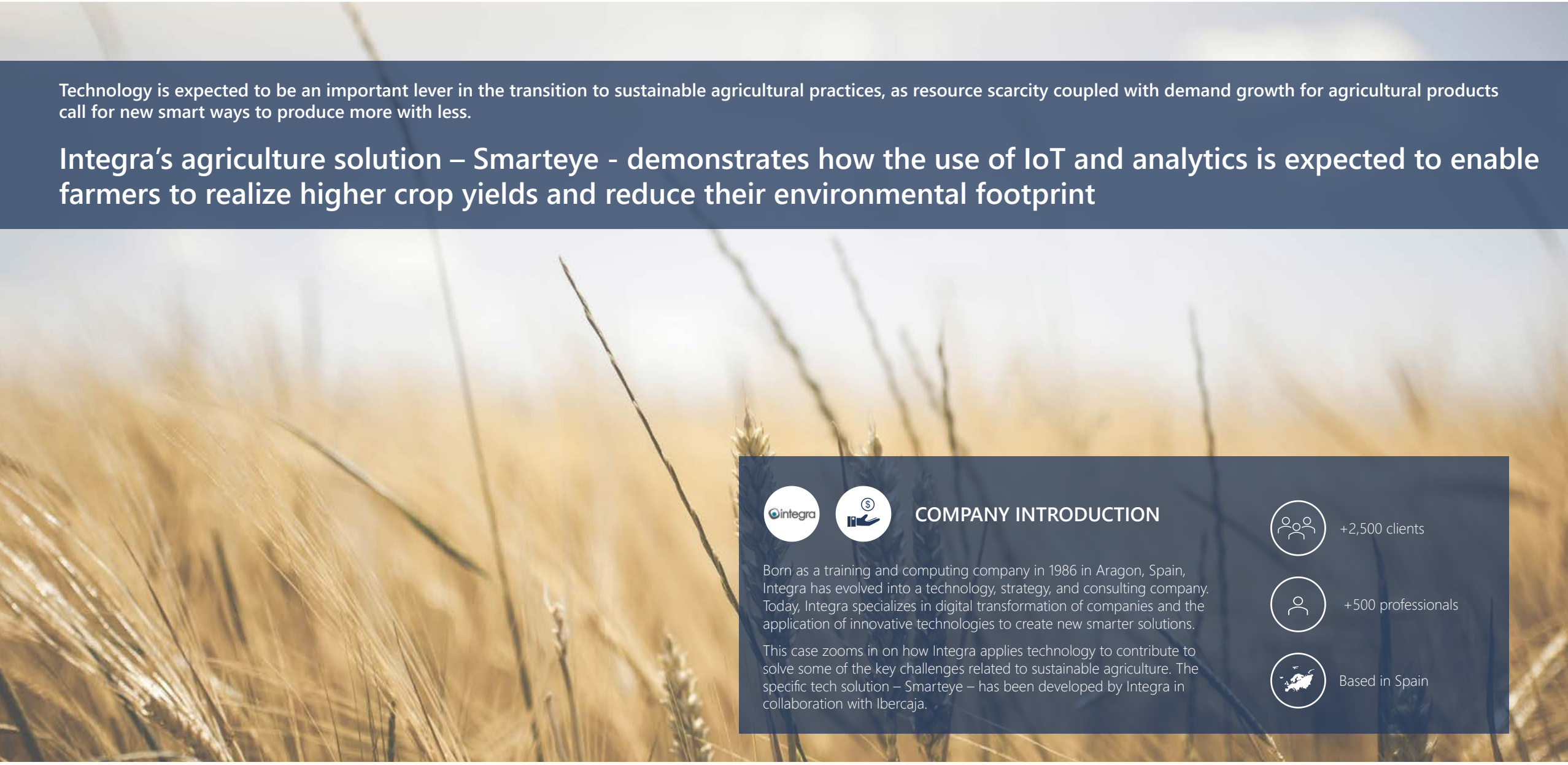
- ***Data analytics and artificial intelligence,*** *to improve Data-driven decision making*
- ***Automated operations,*** *based on digital twin, Robotics or IoT, to address operational efficiency and process automation*
- ***Multi-cloud strategy*** *in a cloud first approach to simplify and accelerate digital product development*
- ***Customer-centricity*** *– omnichannel experience, to foster customer centric strategy and support our low carbon multi-energy services offering*

"Repsol is fully committed to becoming a net zero company by 2050 and the use of digital technologies deployed through our digital program will be key levers in this transformation."

Luis Cabra Dueñas, Executive Managing Director of Technology Development, Resources, and Sustainability

Technology is expected to be an important lever in the transition to sustainable agricultural practices, as resource scarcity coupled with demand growth for agricultural products call for new smart ways to produce more with less.

Integra's agriculture solution – Smarteye - demonstrates how the use of IoT and analytics is expected to enable farmers to realize higher crop yields and reduce their environmental footprint



COMPANY INTRODUCTION

Born as a training and computing company in 1986 in Aragon, Spain, Integra has evolved into a technology, strategy, and consulting company. Today, Integra specializes in digital transformation of companies and the application of innovative technologies to create new smarter solutions.

This case zooms in on how Integra applies technology to contribute to solve some of the key challenges related to sustainable agriculture. The specific tech solution – Smarteye – has been developed by Integra in collaboration with Ibercaja.

+2,500 clients

+500 professionals

Based in Spain

With the Smarteye solution, Integra takes aim at some of the key challenges facing global agriculture in relation to sustainable food production

The global agricultural sector is under increasing pressure and new smart ways to produce is needed to transition to sustainable food production systems. Agricultural output must go up, as UN's Food and Agriculture Organization (FAO) estimates that the global food production will need to increase with 50% by 2050 to meet the demand of a world population of nearly 10 billion*. Yet, conventional agricultural systems cannot be leveraged to meet growing demands given its concerning environmental footprint measured in greenhouse gas emissions, biodiversity loss and water consumption. Instead, inefficient and environmentally exhausting practices must be retired and replaced with smart, resource effective agricultural practices.

Three key challenges facing global agriculture now and tomorrow

Challenge	Contributing factors
Scarcity of resources	The global food system has a large environmental footprint; agriculture occupies nearly 40% of the earth's surface, far more than any other human activity, accounts directly for approx. 11% of global greenhouse gas emissions, and crop irrigation comprises 70% of global water use. In addition, expanding agriculture often results in deforestation, biodiversity loss, excessive use of harmful pesticides, and further greenhouse gas emissions.
Demand growth	Agricultural output needs to increase to meet future demand but with a lower environmental footprint per output; global population is expected to increase with 50% reaching a global population size of 10 billion. In addition, global income levels are expected to grow resulting in additional demand for agricultural products. Yet, demand growth cannot be solved by expanding conventional agricultural (land use change already accounts for 24% of greenhouse gas emission from food production**).
Inefficient practices	Inefficient processes- and natural resource use must retire; to produce more with less land and fewer natural resources, efficiency is key. Therefore, new smart agricultural practices need to substitute conventional ways of doing things.

*Source: OECD, 2019
**Source: Our world in data

Combining IoT and analytics, Integra's Smarteye solution enables farmers to monitor and respond to variables affecting crops with the potential benefits of higher yields and lower environmental footprint

Data generation through IoT

Based on intelligent sensors installed in fields, Smarteye monitors and collects data points on a multitude of variables that affect crops such as temperature, humidity, atmospheric pressure, rain, wind, and soil temperature.

Personalized tool and smart analytics

The rich data is processed through an analytics platform and visible in the farmer user application to inform farming practices like seeding, irrigation, and harvesting. The setup is tailored to the farmer's individual needs allowing them to apply their own logic to create the specific data insights they need.

Data driven action and knowledge sharing

The real time insights on the different variables that affect crop yields enable farmers to act with more precision and capture benefits such as higher crop yields and a lower environmental footprint arising from – for example – reduction of pesticide and agricultural machinery use. In addition, the solution enable farmers to share data insights, much like an open platform.

The tech ecosystem collects farmer specific data and insights that enables informed decisions in relation to crop management

Sample of sensors and indicators

Soil temperature · Humidity · Rain · Atmospheric pressure · Leaf moisture · wind · Temperature · Soil moisture

Minimizing the carbon footprint per agricultural output is one of the main tenants of sustainable agriculture, and intelligent solutions like Smarteye can potentially help drive some of the reductions

How to minimize the carbon intensity in crop agriculture?

1

"Produce the same crop output with less input"

On the one hand, smart technology solutions hold the potential to reduce agricultural inputs by site-specific applications, as they better target inputs to spatial and temporal needs of the fields, which can result in lower carbon intensity per crop output.

2

"Produce more crop output with the same input"

On the other hand, smart technology has the potential to affect agriculture productivity; by optimizing agricultural inputs crop yields increase, which can result in lower carbon intensity per crop output.

Observed sustainability impact from Smarteye

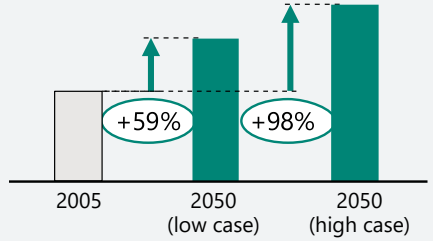
Although no exact sustainability quantifications have been calculated yet for Smarteye (given the novelty of the solution) real impact is seen on a variety of environmental parameters, including reductions in; pesticides usage, water consumption, and fuel consumption related to agricultural machinery.

Sources: *Harvard Business Review (2016), **(1) American Farm Bureau, (2) OnFarm,

As food production rises, new solutions to drive down carbon intensity per kg crop is needed

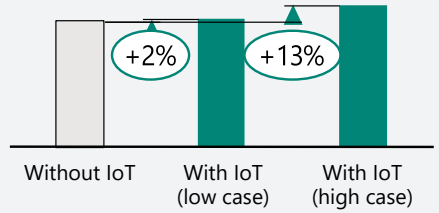
Food demand is expected to increase anywhere between 59% to 98% by 2050
(% increase in food demand*)

As food demand increases, farmers worldwide will need to enhance agricultural productivity and ensure the carbon footprint per agricultural output is reduced as much as possible.



IoT solutions can help farmers increase crop yields and potentially drive down the crop carbon intensity
(% crop yield increase**)

Studies have found that IoT can help drive higher yields (2%-13% improvements) in crop agriculture. Assuming the higher yields are achieved without additional emissions given the features of IoT (better target inputs to spatial and temporal needs of the crop), the crop carbon intensity can potentially be reduced with a close to similar percentage interval.



LOOKING BEYOND

Integra

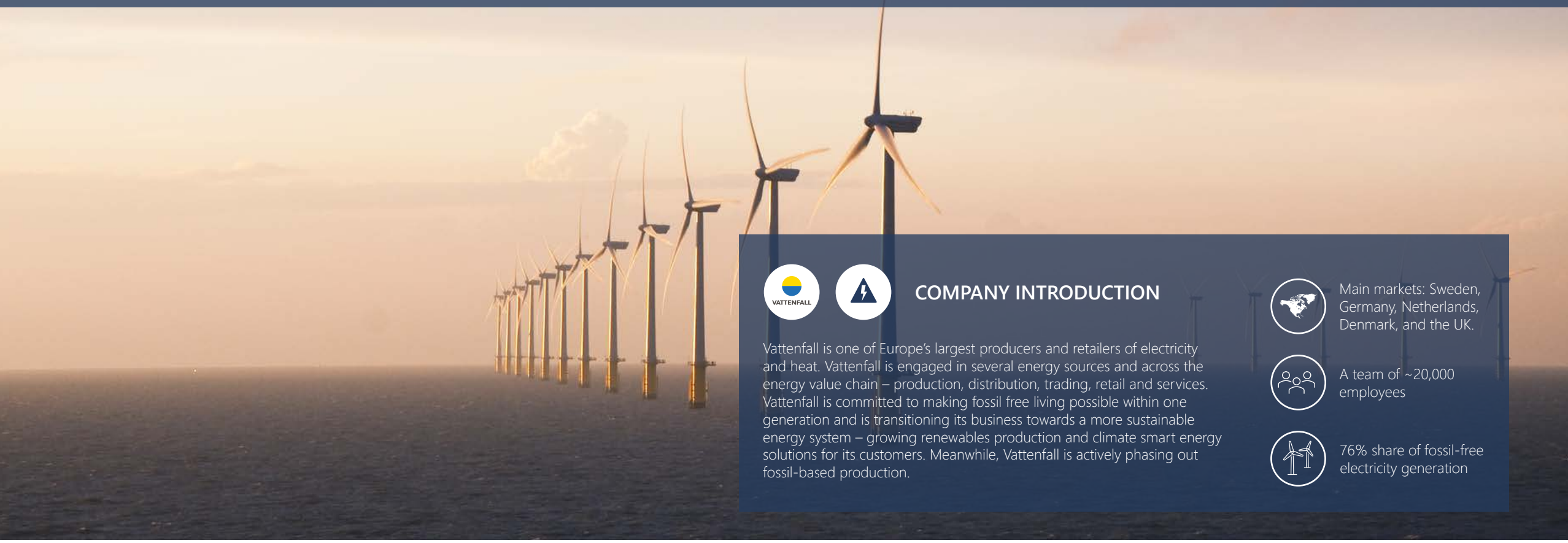
In the eyes of Integra, the sustainability potential of IoT-based solutions, such as Smarteye, is not limited to agriculture. This is merely one example among many. In fact, the properties of IoT can enable solutions to a wide variety of sustainability challenges across industries – now and in the future - such as the built environment, manufacturing, transportation, and even city infrastructure challenges, such as congestion and air pollution. One of the IoT areas Integra views as *high impact* is smart water management. Therefore, Integra is currently working on smart water solutions that apply IoT technology to monitor and measure water quality. The solution holds great potential, as it enables the local city council to evolve its business and incentive model. Now companies that minimize their impact can be rewarded instead of just fining companies that surpass decided thresholds limits.

> "Today it is more necessary than ever to work on solutions that ensure sustainable development. With Smarteye, we do not only have a crop control and monitoring system that empower farmers to take the most appropriate economic decisions but also protect the environment by utilizing natural resources more effectively."
>
> **Gabriel García Rubio, IoT Business Development Manager at Integra**

> "Today we are capable of developing technological solutions that can reduce our negative environmental impact, preserving natural resources for the next generations to come. Leveraging IoT, Big Data, talent, and commitment is key to guarantee new solutions that will enable us to tackle the sustainability challenges we face as a global society."
>
> **Felix Gil, CEO of Integra**

Developing renewable energy sources is one of the main tasks to secure the fossil free energy transition, meanwhile, ensuring an infrastructure to allow for the integration of renewables becomes vital – as such ensuring grid capacity and capabilities to match demand and supply from variable power sources are also challenges that need resolution.

Fossil free living within one generation - Vattenfall is aiming for climate neutrality for its own operations, suppliers and customers, transitioning its production to renewables and climate smart energy solutions



COMPANY INTRODUCTION

Vattenfall is one of Europe's largest producers and retailers of electricity and heat. Vattenfall is engaged in several energy sources and across the energy value chain – production, distribution, trading, retail and services. Vattenfall is committed to making fossil free living possible within one generation and is transitioning its business towards a more sustainable energy system – growing renewables production and climate smart energy solutions for its customers. Meanwhile, Vattenfall is actively phasing out fossil-based production.

Main markets: Sweden, Germany, Netherlands, Denmark, and the UK.

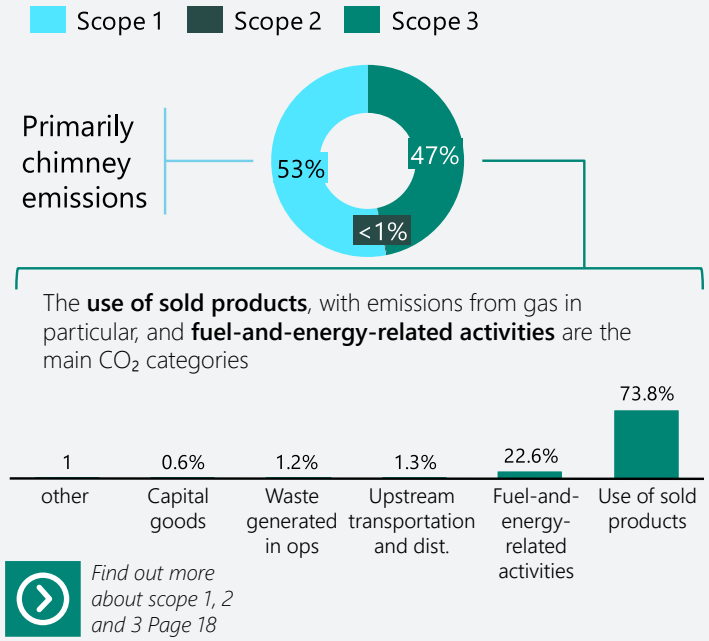
A team of ~20,000 employees

76% share of fossil-free electricity generation

To succeed Vattenfall not only aims to be fossil free themselves, but looks beyond its own industry where its capabilities can make a real difference, climate smart energy solutions are part of the answer

Vattenfall's emissions originate from power production and electricity usage ...

Vattenfall CO_2 emission profile (2018)



Find out more about scope 1, 2 and 3 Page 18

Source: CDP

... The beforementioned is addressed via a transition to renewables, and the latter via climate smart energy solutions, both key elements in Vattenfall's strategy

Read more about climate smart solutions

24 / 7 matching solutions *Flexpower charging stations*

Vattenfall's CO_2 Roadmap

Reducing own business emissions

Vattenfall is reducing the climate footprint through a phase out of fossil fuels through divestments, fuels switch, and power plant closures. In parallel, all growth is focused on transitioning towards the new fossil free energy system. All coal is to be completely phased out by 2030 the latest.

Vattenfall's investments are now establishing a low emission portfolio of assets, focusing on renewables, hydro and nuclear.

Reducing supplier emissions

Vattenfall is reducing both existing and future supply chain emissions. With joint initiatives, notably within the steel and cement industry, Vattenfall is targeting the largest sources of emissions. In parallel, Vattenfall is working with strategic suppliers, requiring information on their management of climate aspects while looking for reduction opportunities in connection to new contracts. Vattenfall has been a frontrunner in lifecycle assessments of products and services to identify the key environmental hotspots.

Reducing customer emissions

Vattenfall is striving to enable its customers to reduce their emissions - developing its portfolio of digital and decentralized energy solutions like solar panels, heat pumps, and batteries, and solutions providing transparency to make it easier for customers to make informed, economically beneficial, and climate-smart decisions. Further, Vattenfall is cooperating with energy intensive businesses to reduce CO_2 emissions through the electrification of industrial processes and transportation.

FOSSIL FREE WITHIN ONE GENERATION

Emission reduction aligned with climate science and approved by Science Based Targets

The climate smart energy solutions are addressing a range of related challenges to the environment

Selected challenges addressed by smart energy solutions

The continuous rise in CO_2 emissions drive the demand for supply of renewable energy sources like solar and wind. Meanwhile, there is a growing global demand for stable electricity. In combination this presents the challenge of matching electricity consumption with production as the increasing share of renewable sources in the energy mix cause fluctuations and unpredictability. In addition, the increased electrification causes loads to grow, making significant power peaks.

The above challenges energy systems, which need to become more flexible and ensure the necessary capacity to accommodate and/or transfer the large influx of energy.

Fundamental to driving the energy transition is increasing the demand for "fossil free consumption" – this is primarily driven by more electricity, not less, to power society and production, meanwhile reducing use of or changing over from fossil-based energy.

Demand is expected to grow as electricity prices are falling with the transition to renewables, along with the falling cost of electric equipment and more stringent emission regulation and associated cost of emissions.

However, across industries, smart technical and digital solutions are needed to bringing fossil free electricity to new sectors and contexts like transportation, space heating or into productions

Corporate commitments to 100% renewable energy are growing, typically based on established mechanisms such as Guarantees of Origin (GOs) or Renewable Energy Certificates (RECs). However, as companies are contracting renewable energy, they do not get full transparency on what they are using. GO and REC accounting consider totals over longer time periods, typically a year, not reflecting what happens within that time period. For example, the sun may not shine, and the wind may not blow in the specific hour you need electricity, even though you buy as much renewable electricity as you use on an annual basis.

The lack of transparency reduces consumers ability to manage their impact, and limits the precision of renewable sourcing in driving towards a fossil free energy system

Source: Vattenfall sustainability report and interview

Businesses want to power their operations with renewable energy, hourly matching (24/7) is a necessary enabler to fulfill the pledge

A first-of-its-kind solution for matching of renewable energy

As renewable energy sourcing matures, corporates increasingly seek better transparency on renewable electricity. While Guarantees of Origin (GOs) and other Energy Attribute Certificates are crucial to the integrity of renewable sourcing, notably by avoiding double counting, they do not reflect production and consumption realities on an hourly basis. Even though you buy as much renewable electricity as you use in a given year, that does not mean the same is true every hour of that year, as the wind may not blow, and the sun not shine at the time you need electricity to power your business.

Vattenfall and Microsoft have jointly developed a first-of-its-kind solution, providing a new level of transparency into electricity consumption by making it possible to go from year-based data to hourly based data on source of origin.

The 24/7 matching solution offers several benefits:

- **Transparency:** Businesses can see if their commitment to 100 percent renewable energy cover each hour of consumption.
- **Fossil free consumption:** As hydropower is used to fill the gap when there is not enough wind, businesses can get fully fossil-free consumption, every hour of the year, 100 percent backed up by Guarantees of Origin.
- **Ability to take action:** 24/7 matching allows energy companies as well as consumers data needed to improve matching, driving true market demand for fossil-free energy.

The 24/7 matching solution is built with Microsoft Azure IoT Central platform and connects energy generation such as wind- and hydro power from Vattenfall, with data from smart meters that measure the consumption in real-time and visualizes the matching results (PowerBI dashboard). The 24/7 matching solution was first piloted at Vattenfall and Microsoft Headquarters in Sweden and is now part of Vattenfall product portfolio.

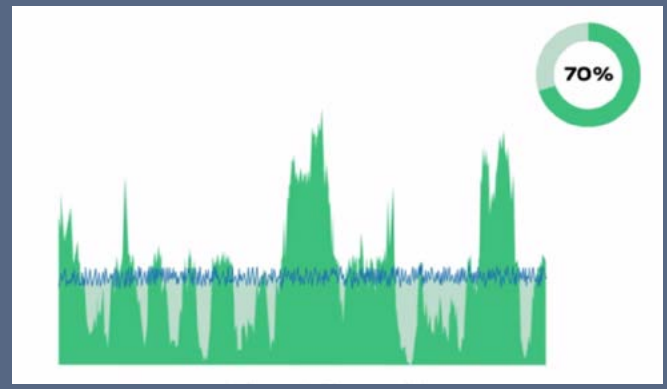
POTENTIAL

For an illustrative production site with a stable consumption using wind power from several wind parks, the standard way of matching on an annual basis would reveal 100% use of wind, as totals add up end of year. However, if measured by the hour, we see it uses only 70 percent wind – a 30 percent gap then comes from other energy sources. With varied consumption patterns and fewer wind parks, the gap increases 50 percent

50-70%
Actual renewable consumption

The difference corporate buyers of wind energy see in standard vs. actual renewable consumption

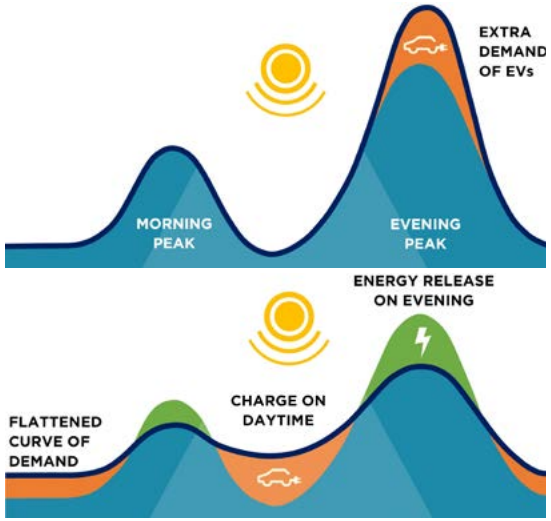
Hourly matching of renewable supply versus consumption



A grid connection solution with more capacity in off peak hours and less in on-peak hours enables integration of renewables in the grid

Flexpower optimizes the use of renewables in Amsterdam

Vattenfall and the City of Amsterdam, together with grid owner Liander, the infrastructure competence center Elaad, and the Amsterdam University of Applied Sciences, has launched Flexpower, the largest public smart charging network for electric vehicles in Amsterdam. Flexpower has been developed to make optimal use of the available grid capacity, as charging speeds are tailored to the grid's electricity consumption and renewable energy production like solar and wind.



The solution Flexpower charging stations allows – via an integrated software run on Microsoft Azure environment – faster charging, maximal use of renewable electricity and more efficient use of the electric grid in Amsterdam.

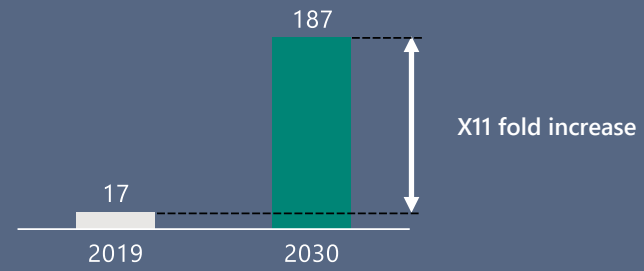
This means the charging stations provide slightly less electricity during the hours that households demand a lot of energy, typically between 18:00 to 21:00 hours, and catch up by charging 40% faster at night when energy consumption is low or during the day when a lot of local solar power is being produced compared to normal charging stations. As most electric cars are charged outside peak hours, electric car drivers will overall benefit from quicker charging – especially advanced battery car models with higher charging speeds are likely to profit from the Flexpower technology.

Applying smart charging profiles such as Flexpower offers cities large scale integration of EVs while reducing concerns on grid impact and minimizing effects on the user.

Source: Vattenfall; Final report Amsterdam Flexpower OP

POTENTIAL

In 2030, energy consumption from electric vehicles in EU is expected to increase 11-fold relative to 2019
*Sustainable Development scenario, Twh**



Smart charging technologies, like Flexpower, allows increased capacity during off peak times, enabling both reductions in peak demand and CO_2 – helping integrating renewables and EVs into the grid

40% capacity increase during off peak times

Increase the charge volume at hours with relatively low CO_2 emission intensity

* Sources: IEA EV Outlook 202: https://www.iea.org/reports/global-ev-outlook-2020

LOOKING BEYOND

Technology and partnerships to pave the way to fossil freedom

The challenges in today's energy landscape are not likely to decrease given the prevailing market conditions. However, Vattenfall's capacity to address problems and drive change where possible is part of its identity as a company. Vattenfall continues the work to enable a fossil free living in one generation and drive the electrification of society with investments in technology and projects that are making a difference in the energy transition. From digital inspection with drones to energy storage and fossil free production- together with customers, partners, authorities and cities, they are making this possible.

Key milestones towards fossil free living within one generation:

2020

- Fossil-free energy solutions available for all customers
- Operations in Netherlands coal-free

2023

- Providing electricity charging for half a million cars
- 10 GW of third-party renewables capacity under management
- 600MW of additional, flexible hydro capacity

2025

- Generating fossil-free electricity to power 30 million homes
- Pilot 100MW of green hydrogen gas production from fossil-free electricity
- The Nordic production fleet is free from fossil fuels

2030

- Coal is phased out from all heat operations
- Emissions reduced by ~40% in line with required level to limit global warming to less than 2 degree Celsius

2035

- More to come ...

Stainless steel's sustainable traits originate from its superior durability, longevity and recyclability – however, the way it is produced holds opportunities to harness additional potential in making steel production more sustainable, addressing manufacturing efficiency and power consumption.

Outokumpu digitalizes manufacturing to increase efficiency and improve sustainability in stainless steel manufacturing

COMPANY INTRODUCTION

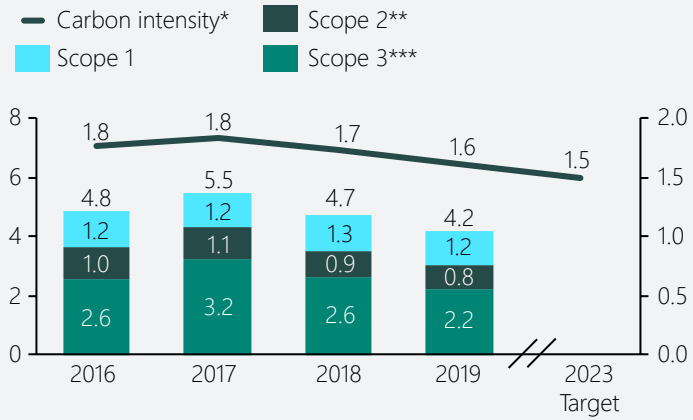
Outokumpu is a global leader in the stainless-steel industry, serving a wide range of industries, from automotive and transportation, energy and heavy industry to appliances and buildings and infrastructure. With a commitment to reaching carbon neutrality by 2050, circularity is at the center of Outokumpu's operations: the proportion of recycled content in Outokumpu's stainless steel is highest on the market with over 85% recycled content. Further, Outokumpu continues to strive towards minimizing its footprint both in its own operations and throughout the value chain.

- 10,500 employees
- Production in six countries – operations in over 30 countries worldwide
- Largest producer of stainless steel in EU and second largest in Americas

Outokumpu is committed to carbon neutrality by 2050 – addressing direct, indirect, and upstream emission drivers, focusing especially on improving circularity in its stainless steel manufacturing

Outokumpu has reduced its footprint and continue to lessen its carbon intensity …

Outokumpu's CO_2 emission profile, 2016-2019 CO_2
(emissions in $mtCO_2e$; carbon intensity in tCO_2e/t steel)



The steel industry is a significant CO_2-emitter, making steel plants strong candidates for decarbonization through a focus on production and electricity emissions (scope 1 and 2 respectively), as well as upstream emissions in terms of mainly use of materials and transportation (scope 3).

* Carbon intensity across all scopes; ** Location based; *** Upstream emissions
Source: Outokumpu

… Which is a result of initiatives to improve across its production (direct), electricity / energy consumption (indirect) and upstream emission drivers (use of materials)

Outokumpu's key climate focus areas, selected examples

STEEL MILLS AS RECYCLING FACILITIES

Outokumpu integrates circularity into the core of its productions with high amounts of recycled materials, currently at ~90%. Stainless steel is highly durable, and quality is not compromised over time, which makes it a valuable input as scrap. Further recovery and recycling of residual metals from the production processes, e.g. from dust is also essential. The focus on recycling products also reduces landfill.

Target 90% recycled content in stainless steel

ENERGY EFFICIENCY AND YIELD OPTIMIZATION

With the high energy-intensity of steel production, Outokumpu seeks to save energy through yield optimization by reorganizing production sites, optimizing internal supply chains, and increasing capacity utilization. Further, Outokumpu is sourcing low carbon electricity and applying alternative energy sources, e.g. Tornio site in Finland has fully transitioned to use LNG instead of propane in production.

Target 20% reduction by 2023 vs. '14-'16 baseline

SUSTAINABILITY IN THE SUPPLY CHAIN

Leveraging its integrated supply chain, Outokumpu keeps control of key raw materials – and keeps its products traceable for customers. Further, Outokumpu has in place stringent requirements on its suppliers and screen direct material suppliers on the ESG risks in countries of origin. Materials are transported by rail and ship where possible to reduce CO_2 emissions.

Target reduction of 23% in scope 3 intensity

REDUCE EMISSIONS INTENSITY TO 0.92 TCO_2 PER TONNE CRUDE STEEL BY 2050 - CLMATE NEUTRAL BY 2050

As a stainless steel producer, Outokumpu is serving the customer demand to decarbonize while setting a new direction for the industry

Selected examples of challenges addressed

1 | Resource depletion

Higher standards of living across the globe combined with an urgent need for new technological solutions have increased demand for stainless steel across the globe. Further, as many industries seek to decarbonize, they increasingly set new sustainability requirements for their upstream steel usage. Stainless steel meets these requirements in terms of both serving a demand for recyclability, limiting resource depletion – basing production on scrap steel as primary raw material – as well as serving the need for durability to extend lifetime of the products and infrastructure produced.

2 | Tightening regulations and consumer trends

Steel manufacturers are faced with increasingly growing economic incentives to decarbonize as a result of tightening regulation. Emission reduction targets set in both national and multinational agreements are being pursued. In addition, there is wide and growing momentum to price carbon in countries around the world.

Further, manufacturers (customers) are increasingly demanding more sustainable products from OEMs and further up the supply chain, as they address their own indirect emissions and react to consumer trends.

3 | Energy consumption

Steel production is highly energy intensive. For the recycled steel to melt in an electric arc furnace, it is heated to over 1,400°C. Energy and electricity use are thus key drivers for emissions – as well as costs. In addition to electricity, fuels are used in the production. Improvements in efficiency and use of alternative fuels and energy sources are to be considered for full decarbonization.

High quality standards are also a key concern, as any wasted end products and obstruction to the production line results both in lower yield and wasted energy and electricity use.

Source: Outokumpu

Outokumpu is integrating sustainability in its digital manufacturing – starting with the transformation at its Tornio site in Finland

DIGITAL MANUFACTURING

Outokumpu Digital Platform (ODP) is Outokumpu's tool to collect and analyze data in every step of their production line, from mining and smelting, to melting, hot and cold rolling and finishing, aiming to optimize manufacturing processes. **The Tornio plant was the nesting ground for the platform. Now the solutions, often machine learning solutions based on Azure cloud and AI services, are implemented and have increased output by 10-15 percent, while predictive technology has in some cases helped reduce quality defects by up to 40 percent**. With the ODP, Outokumpu takes digital manufacturing to the next level with added sustainability benefits. The reductions in electricity, energy and processing time all contributes to a lower carbon footprint. Hence, at low costs, the energy intensity of the stainless-steel production process is reduced step by step, which will be highlighted with a few examples below.

Production process flow and selected examples of machine learning solutions

ODP

1 | Raw material processing → 2 | Melt shop operations → 3 | Hot rolling → 4 | Cold rolling

Melting time optimization model

Link to case

End sample prediction model for AOD

Solution predicts end sample results allowing a shorter and more efficient process and less re-work in the argon oxygen decarburization (AOD) process.

AI driven slab heat controller

An AI driven control model for furnace optimization with dynamic reaction on quality defects. System to stabilize discharging temperatures, reduce defects and boost yields.

Computer vision tools applied in quality assurance

Link to case

Source: Outokumpu

IMPACT

Up to 40 percent
Reduced quality defects, limiting re-work and waste and improving yield for certain applications

10–15 percent
Increased output from digital manufacturing

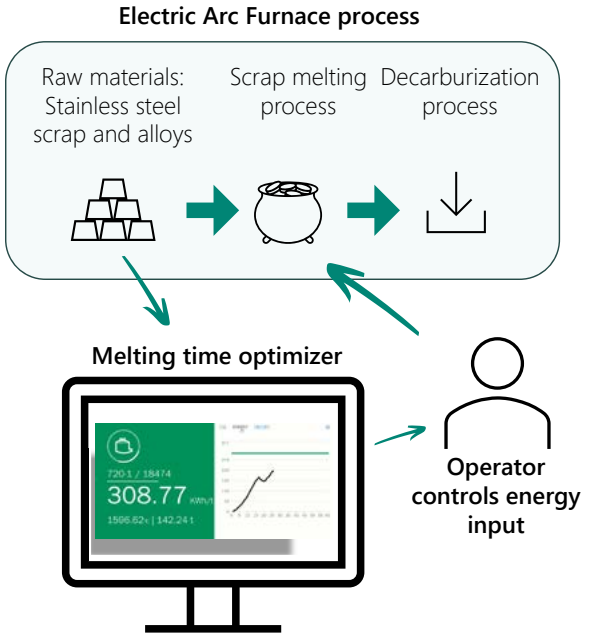
"We have taken the major steps towards reaching end-to-end digital coverage of our manufacturing – we can leverage data mining and turn in depth understanding of our processes into real CO_2 reduction and yield increase"

Juha-Matti Pesonen, Head of Industrial Digitalization

"Our end sample prediction model allows not only a more efficient process but also less rework and thus a higher yield"

Pekka Vainio, Project Manager

Supported by real time operational data Outokumpu's Electric Arc Furnace (EAF) operator estimates the optimum energy input in the steel production process



- Endpoint optimization guidance
- Prediction for temperature and weight
- Controlling for input materials

The EAF melting time optimization solution

The EAF melting time optimization solution is a manufacturing machine-learning solution aimed at optimizing the energy input and melting time that goes into the scrap melting process involved in the making of stainless steel.

The optimization solution allows the operator improved insights and sets the target heat energy, and as such enhanced control for the melting temperature. This helps prevent unmolten material being left in the furnace and avoids overheating. As such, the model saves time and energy in the process, as well as improves quality and yield of the output.

Prior to the solution, the ending point was estimated by the operator based on previous heats, leading to inaccuracies in determining the optimum ending point. Rather than individual estimations, the model relies on real time data integration, e.g. controlling for the composition of input of raw materials.

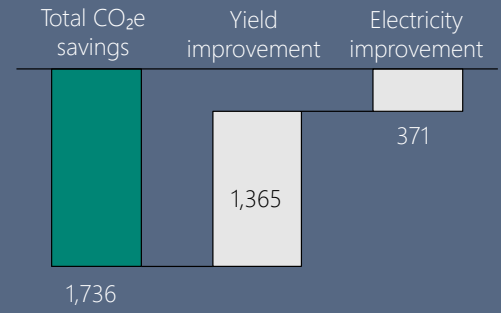
> "The operator is being empowered ... and the results are immediate, the process is optimization as we hit the right temperatures and durations, meanwhile the quality is improved also allowing for use of less virgin material"
>
> **Niko Hyttinen, Research Engineer**

Source: Outokumpu

IMPACT

Emission saving from changes in EAF process, one Tornio furnace plant

(t CO_2e)



The technology-enabled improvements of the Electric Arc Furnace process enables carbon savings by CO_2 emission reductions related to improved yield and reduced electricity usage.

Additional potential reduction via global roll-out across Outokumpu's production sites

LOOKING BEYOND

Outokumpu is exploring the benefits of machine learning and computer vision tools to improve quality and durability of their steel

Outokumpu's Automatic Surface Inspection System (ASIS), enabled by camera technology at Outokumpu's Tornio site in Finland as well as Outokumpu's Digital Platform, harnesses decades of experience among the company's employees, and applies AI, in order to enhance decision making and achieve better results with every yield.

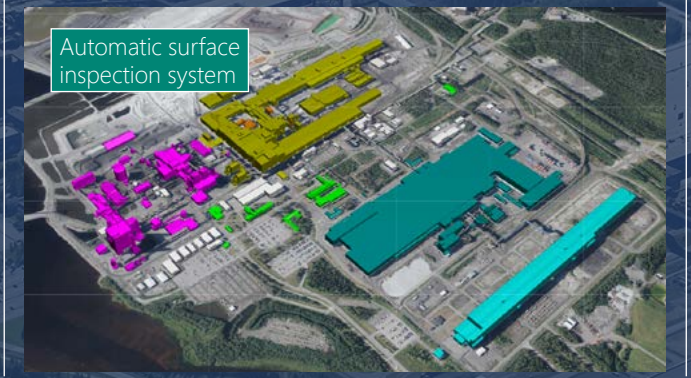
ASIS provides operational and sustainability benefits ...

Greater yield and increased sustainability with reduced emissions through e.g. reduced energy usage and higher recyclability (less virgin raw material)

Enhancing operator and inspector decision making through real time data analytics

Improved quality through automatic identification and classification in the inspection process

... and is currently being implemented in Tonio, FI ...



... and meanwhile being enhanced for the future

2020
- 360 degree view of products
- Inspector assistant
- Operator Pre-warning

2021
- AI-driven defect analytics and reporting
- Production planing assistant

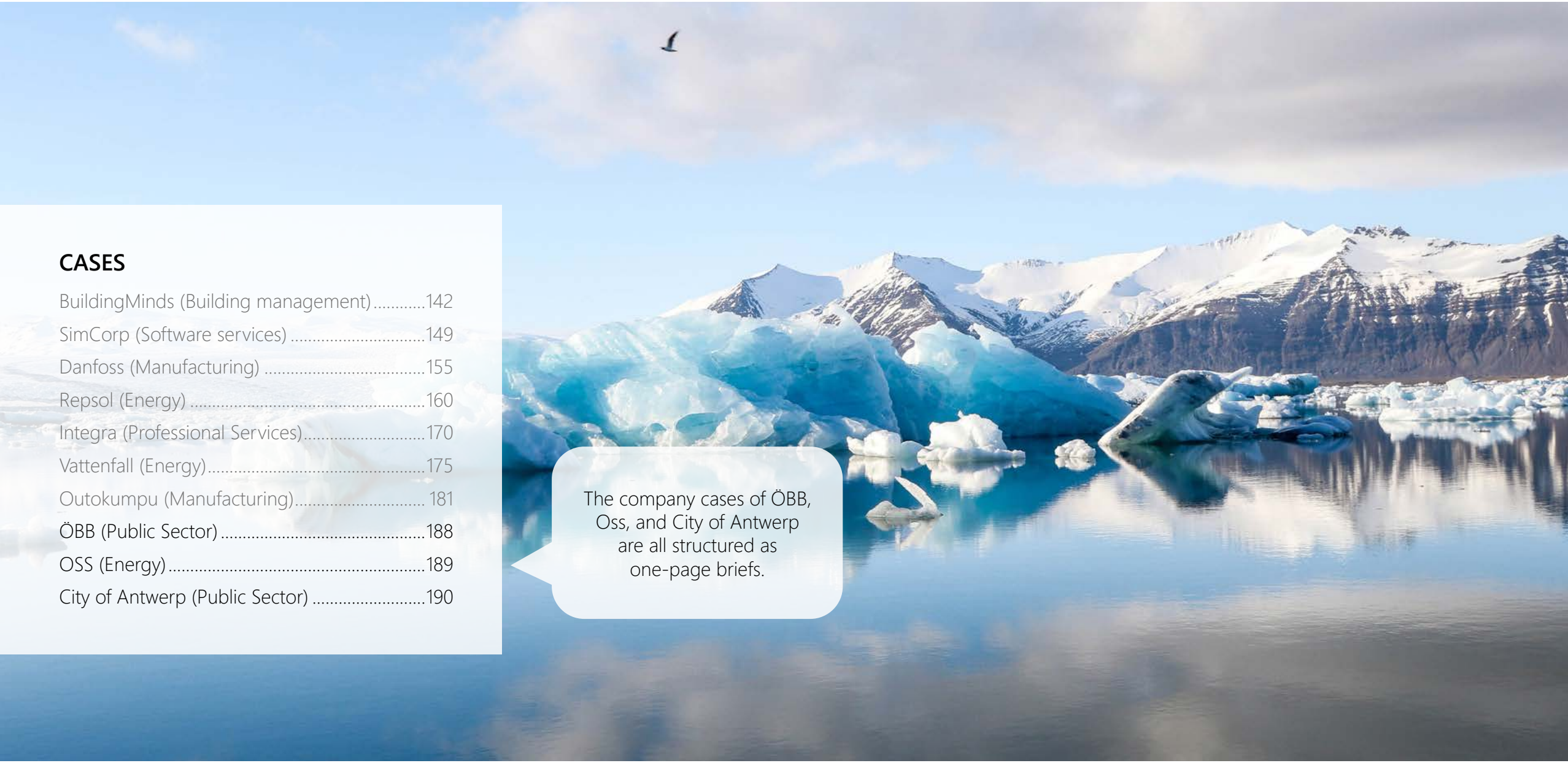
2022
- Continuous improvement of functionalities
- Automated Quality control

"With digital manufacturing we are passing knowledge from experienced people at the front line to the less experienced population. With that, we are enabling a much better and more immediate process support, take better and more data based decisions and increase significantly our efficiency."

Stefan Erdmann, Chief Technology Officer

"Outokumpu Digital Platform is enabling us to bring people together to see production as a chain where everyone has an impact on the end result. ASIS is our spearhead project to enable digital tools and people expertise merge to a one collective virtual mind"

Juha-Matti Pesonen, Head of Industrial Digitalization



CASES

The company cases of ÖBB, Oss, and City of Antwerp are all structured as one-page briefs.

ÖBB is enabling a modal shift towards alternatives for fossil transportation while also working with its own energy efficiency and engaging its supply chain

ÖBB

The Austrian Federal Railways, now commonly known as ÖBB, is the national railway system of Austria, and Austria's largest mobility services provider. ÖBB is targeting CO_2 neutrality by 2030 (scope 1 and 2 – excl. buildings), complete CO_2 neutrality between 2040 to 2050 (scope 1,2, and 3 in full) – and establishing a modal shift by making the transportation system more attractive and adding more capacity leveraging innovation and technology.

The transport sector – excluding international air traffic – currently causes around 29 percent of Austria's total greenhouse gas (GHG) emissions. About 99 percent of this comes from road traffic. The impact of a company like ÖBB is therefore significant. To transition to a low carbon future, ÖBB has developed a comprehensive climate protection strategy with six key levers underpinned by technology*:

Hover over each lever for more information

- **Electrification**
- **Alternative drives for rail**
- **Alternative drives for road**
- **Renewable energy**
- **Energy efficiency**
- **Modal shift**

Tech-enabled impact | ÖBB, selected examples

1. Securing a sustainable supply chain via several cloud solutions

ÖBB's procurement process is applying cloud services to enable its 1) tender platform, 2) supplier management tool and 3) risk management tool for a 360 assessment of suppliers – where a major KPI is the suppliers' sustainability performance. To support the ongoing ratings and supplier dialogues, ÖBB's cloud solution enables real time scraping of supplier data in relation to the KPI. This, in turn, allows ÖBB key insights to proactively and constructively engage with suppliers to improve their sustainability performance.

2. Optimization of energy efficiency of ÖBB's IT infrastructure

ÖBB is constantly scrutinizing its IT infrastructure to improve energy efficiency. Lifecycle assessment of the applied hardware and cloud infrastructure are key tools, which also means ÖBB is setting expectations for indirect vendors' products, services and performance.

IMPACT

Every year, ÖBB saves the climate **1.1 million tonnes of CO_2 through transporting goods by rail and 2.4 million tonnes of CO_2 through transporting passengers by rail.** In total, 3.5mt**.

GHG emission savings
~3.5 mt of CO_2 / year

> "Our suppliers and partners are key in helping us succeed with our six levers for climate protection – an active engagement on how to improve our joint performance through the things we buy is critical to our success as contributor to GHG emissions."
>
> **Phillip Bayer, Process Manager, SCM**

*Source: ÖBB Climate Protection Strategy 2030. **GHG emission savings are calculated by ÖBB and based on a comparison of Co_2e passenger kilometers across modes of transport.

Oss

Oss Norge, headquartered in Drammen, Norway, is on a mission to bring data from smart electricity meters into the hands of the consumer. Founded in 2017, the company is owned partially by Glitre Energi and Agder Energi, as a joint effort in the future of IoT within the Energy sector.

Oss Norge is all about providing users with insight into their energy consumption patterns via the 'Oss' device which makes data from smart meters available, allowing for both real-time monitoring, benchmarking and even prediction

Context

Lack of insights obstructs action

Vast amounts of energy are consumed in residential homes and commercial buildings, accounting for 36% of global energy use.

And while buildings are becoming more efficient due to increasing requirements on building performance with regards to energy, heating and cooling, there is still untapped potential in making buildings increasingly connected.

Recently, electricity meters have been replaced with smart-meters in Norway, yet data is hard to access and harder to act upon.

Tech approach

Enablement of real time insights of consumption patterns

Oss has developed a physical device that plugs into the new smart meters and, via an integrated 4G connection, makes data readily available on the 'Oss' platform. The platform provides users with real-time understanding of power consumption but will in time also provide algorithms that alert users to fluctuations in consumption patterns. This could be related to e.g. charging of electric vehicles, monitoring freezers, and many other applications.

Oss is about providing insight and intelligence to users rather than controlling devices. Oss would rather provide the data and insights for other platforms and integrate with third party smart home solutions.

Sustainability impact

Empowering actions to reduce energy usage

There are many areas where Oss could have a sizeable impact on emissions.

First of all by reducing direct energy consumption in buildings by integrating with existing IoT solutions, e.g. heating, cooling, lighting and more, which will allow for automatic adjustments. But also in e.g. property damage prevention through identifying fluctuations in consumption patterns caused by property damage.

Smart power consumption is, as such, a key enabler for a future low-emission society. Adding on to the environmental benefits of the solution, smart power does also come with cost reductions.

City of Antwerp

The city of Antwerp is positioned in the Northern part of Belgium and is the country's second largest city with approximately 530,000 inhabitants and houses Europe's second largest port. Although facing a complex challenge of traffic congestions and major roadwork projects, while implementing low emission zones, the city of Antwerp is an example to follow when it comes to sustainable mobility. Smart Ways to Antwerp – one of the city's mobility solutions - enables citizens to make intelligent transportation choices and has proven to minimize traffic congestion and commuting in cars.

Rethinking mobility by leveraging multiple transport modes and technology is enabling the City of Antwerp to overcome its mobility challenge

Context

A complex mobility challenge comprised of multiple factors

Major roadwork projects in and around the city. Development of low emission zones. Large traffic flows from commuters, citizens, visitors, merchants, suppliers, etc. that follows a lively city with dense urban areas and a strong business sector. Heavy freight and logistic transport from the second largest port in Europe. Combined, these factors comprise the complex mobility challenge that the city of Antwerp is currently facing. And the challenges are growing. The city will have to reduce number of motorized road movements with 10% in the future to hold traffic congestion at todays levels.

Tech approach

Tech enabled multimodality to reduce motorized road transport

To solve the city's mobility challenge, the city has, and still is implementing a wide range of measures, with technology as a critical component. The city is targeting a modal shift to lower congestions. To enable this shift, the Smart Ways to Antwerp mobility platform enables commuters, citizens, and visitors via an app to make smart transportation, optimal route, and modal choices - e.g. a combination of car, public transport, micro-mobility solutions and even use of water ways. The platform utilizes real-time data through Microsoft Azure. In addition, the digital architecture - NXTMobility - links the various digital mobility systems so that mobility data can be shared and integrated with external players too. Other examples of measures implemented are nudging freight via sea or rail and during night.

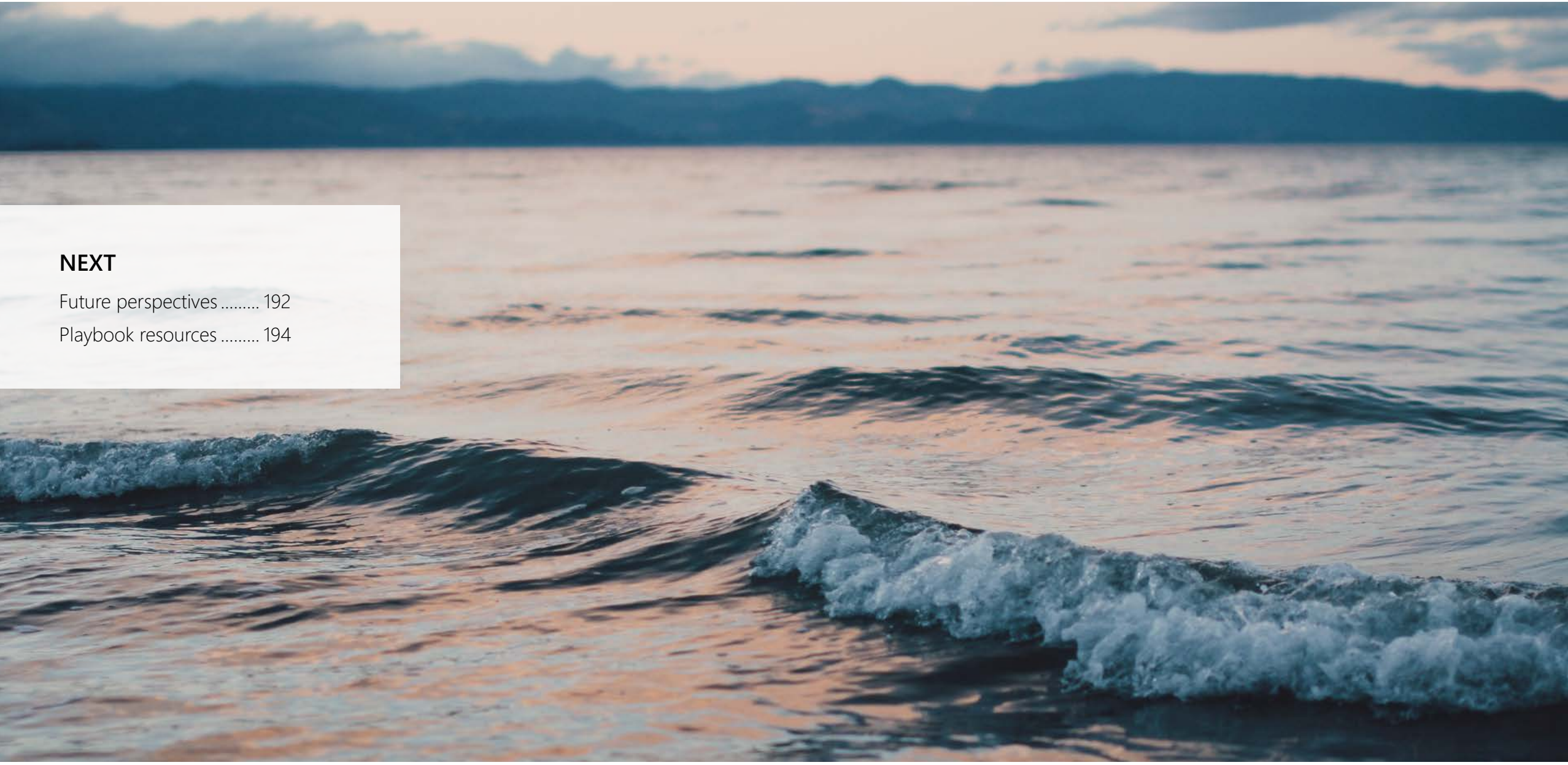
Sustainability impact

Rethinking mobility with sustainability benefits

By empowering citizens to make intelligent transportation choices, the Smart Ways to Antwerp project quickly showcased impressive results i.e. 14,000 fewer cars entering the city centre and 10% reduction in car commuting (2016-2018). Since, the project scope has evolved. Now, instead of being a short-term answer, the city is approaching mobility differently: Today multimodality, technology, and an open ecosystem approach (including both public and private initiatives) are at the centre of sustainable mobility with the city's own residents having shifted away from single-mode car transportation (10% reduction between 2010-2020). In addition, the tech-enabled solutions are developed as open source, enabling other mobility vanguards to benefit from the progress made in the city.

Tech-enabled impact | City of Antwerp

Modal shift in transport | Less traffic congestion | Fewer cars in the city centre



NEXT

EY Sustainability Journey

We are on this journey ourselves.

We are the first Big-4 which commits to be carbon neutral by the end of 2020.

We are the first Big-4 with a suite of industry-leading services – delivered by leading subject matter experts.

We are advising the UNDP, which has developed and is driving the 17 SDGs, which backup most of the discussions.

We have started the Long Term Value (LTV) discussion and hold the most assets and experience in implementing such frameworks.

Read more about EY's sustainability commitment

EY Climate Change and Sustainability Services

EY Climate Change and Sustainability (CCaSS) teams (more than 1,000 experts globally) help organizations assess and respond to environmental, social and governance (ESG) issues. Over the past 15 years, CCaSS has supported EY clients' decarbonization and sustainability journeys by helping them implement a range of solutions crossing sustainability, supply chains and reporting.

EY also offers access to innovative tools that aim to future-proof sustainability strategies and initiatives, and foster collaboration with other organizations who share similar objectives.

Read more about EY climate change and sustainability services

Read more about the Sustainability Impact Hub

> "EY has the potential to become a world leader in sustainable business and becoming carbon neutral is an important step toward making that a reality. By supporting a culture of disruptive innovation, EY can find creative solutions that address global environmental challenges and drive growth that is truly sustainable."'
>
> Steve Varley, EY Global Vice Chair **– Sustainability-elect and EY UK Chairman**

EY contributors

EY Advanced Digital Research Methods (ADRM)

The EY Advanced Digital Research Methods (ADRM) team brings together a skillset that combines core business strategy and data science skills. This allows for novel solutions to classic and new strategic problems, leveraging techniques such as machine learning and advanced analytics on very large datasets. This emerging capability has been catalyzed by the rapidly growing availability of data, significant computational power and cloud services.

Based with EY-Parthenon, the ADRM team has access to 50 data scientists, who help solve client problems at speed.

EYQ

EYQ, EY's global think tank, generates new insights by bringing together business, the public sector and academia to challenge entrenched thinking, shift perceptions and help catalyze change. We want to sense new trends early, and understand and communicate their implications quickly and powerfully. By seeking the answer to "What's after what's next?", we help leaders anticipate the forces shaping our future — empowering them to seize the upside of disruption and build a better working world.

Read more about EYQ's latest thinking

EY Transformation Platform: EY TechWatch & EY Plus

The EY Transformation Platform is a suite of technologies to help our clients transform: EY tracks the evolutions and applications of new technologies with **EY TechWatch**, a proprietary global platform which curates use cases, trends, statistics and solutions across eight major tech categories: Artificial Intelligence & Analytics, Robotics, Blockchain, Internet-of-Things, Additive Manufacturing, Immersive Tech, Security, and Computing. It is powered by EY's proprietary Tech Horizon research and augmented by **EY Plus** which is a suite of leading third-party research platforms. EY TechWatch is an interactive and intuitive platform which can be used by teams to drive and facilitate emerging tech and innovation related topics across the entire organization in a synchronized way.

Companies need to transform so they can deploy technology at the speed at which their customers demand it and their employees need it. Are you putting technology@speed at the core of your transformation? Please contact us eytransformationplatform@ey.com to learn more on how we can support your transformation

EY Future Consumer Index

The EY Future Consumer Index tracks changing consumer sentiment across time horizons and identifies new consumer segments that are emerging. It builds on the future back approach adopted by EY's FutureConsumer.Now program to create a unique perspective on which changes are temporary reactions to the Covid-19 crisis and which point to more fundamental shifts. By taking a 360 degree view of the concerns, hopes and expectations of consumers the Future Consumer Index explores what consumers are prioritizing now and what will shape their behaviors in the coming years.

Read the latest insights from EY Future Consumer Index

Endnotes

INTRODUCTION

Simon Zadek, 2004, 'The Path to Corporate Responsibility'. Retrieved from *https://hbr.org/2004/12/the-path-to-corporate-responsibility*

GeSi & Deloitte, 'Digital with Purpose: Delivering a SMARTer2030'. Retrieved from *https://gesi.org/research/gesi-digital-with-purpose-full-report*

Sitra, 2020, '35 proposals to make the European data strategy work'. Retrieved from *https://media.sitra.fi/2020/05/15104310/35-proposals-to-make-the-european-data-strategy-work.pdf*

University of Cambridge Institute for Sustainability Leadership, 2018, 'Rewiring leadership The future we want, the leadership we need'. Retrieved from *https://www.cisl.cam.ac.uk/resources/publication-pdfs/rewiring-leadership.pdf*

EY, 2020, 'EY Investor Survey: How will ESG performance shape your future?'. Retrieved from *https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/assurance/assurance-pdfs/ey-global-institutional-investor-survey-2020.pdf*

European Commission, 2020, 'Shaping Europe's Digital Future', Retrieved from: *https://ec.europa.eu/info/sites/info/files/communication-shaping-europes-digital-future-feb2020_en_4.pdf*

European Commission, 2020, 'State of the Union: Questions & Answers on the 2030 Climate Target Plan'. Retrieved from: *https://ec.europa.eu/commission/presscorner/detail/en/QANDA_20_1598*

European Commission, 2020, '2030 Climate Target Plan'. Retrieved from: *https://ec.europa.eu/clima/policies/eu-climate-action/2030_ctp_en*

INDUSTRIES

Science Based Targets, 2018, 'Value Change in the Value Chain: Best Practices In Scope 3 Greenhouse Gas Management', Retrieved from: *https://sciencebasedtargets.org/wp-content/uploads/2018/12/SBT_Value_Chain_Report-1.pdf*

New York Stern Center for Sustainable Business, 2019, 'Sustainable Share Index™: Research on IRI Purchasing Data (2013 -2018)'. Retrieved from: *https://www.stern.nyu.edu/sites/default/files/assets/documents/NYU%20Stern%20CSB%20Sustainable%20Share%20Index%E2%84%A2%202019.pdf*

AON, 2020, 'Reinsurance Market Outlook'. Retrieved from: *http://thoughtleadership.aon.com/Documents/20200710-re-analytics-reinsurance-market-outlook-junejuly.pdf*

European Commission, 2018, 'Action Plan: Financing Sustainable Growth'. Retrieved from: *https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0097*

CxO ROLES

EYQ, 2020, 'Megatrends 2020 and beyond: Are you reframing your future or is the future reframing you?'. Retrieved from: *https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/megatrends/ey-megatrends-2020-report.pdf*

EY, 2020, 'EY Investor Survey: How will ESG performance shape your future?'. Retrieved from: *https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/assurance/assurance-pdfs/ey-global-institutional-investor-survey-2020.pdf*

MCSI Europe SRI Index, 2020. Retrieved from: *https://www.msci.com/documents/10199/19bb57cc-7077-4ab1-a4de-b3e51afa4be6*

MSCI North America SRI Index, 2020. Retrieved from: *https://www.msci.com/documents/10199/337c10bd-28e9-48a5-a7ee-cba3606f5829*

MSCI Emerging markets SRI Index, 2020. Retrieved from: *https://www.msci.com/documents/10199/29e94124-55ee-491a-ba9f-38626e0999e4*

European Commission, 2020, 'Taxonomy: Final report of the Technical Expert Group on Sustainable Finance'. Retrieved from: *https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/200309-sustainable-finance-teg-final-report-taxonomy_en.pdf*

EY, 2020, 'How key industries would fare under a carbon tax'. Retrieved from: *https://assets.ey.com/content/dam/ey-sites/ey-com/en_us/topics/tax/ey-how-key-industries-would-fare-under-a-carbon-tax.pdf*

World Bank Group, 2020, 'State and Trends of Carbon Pricing 2020'. Retrieved from: *https://openknowledge.worldbank.org/handle/10986/33809*

CxO ROLES (continued)

EY Supply Chain Pulse Survey, 2020. Retrieved from: *https://www.ey.com/en_gl/consulting/how-a-comprehensively-sustainable-approach-reaches-beyond-compliance*

World Economic Forum, 2020, 'HR4.0: Shaping People Strategies in the Fourth Industrial Revolution'. Retrieved from: *https://www.weforum.org/reports/hr4-0-shaping-people-strategies-in-the-fourth-industrial-revolution*

Harvard Business Review, 2015, 'Proof That Positive Work Cultures Are More Productive'. Retrieved from: *https://hbr.org/2015/12/proof-that-positive-work-cultures-are-more-productive*

EY, 'Recognition and Reward Advisory'. Retrieved from: *https://www.ey.com/en_sg/workforce/recognition-reward-advisory*

UCLA study, 2015. Retrieved from: *https://www.nbs.net/articles/environmental-performance-boosts-employee-productivity*

'The Power of Pride at Facebook w. Wharton professor Adam Grant', 2017. Retrieved from: *https://www.fastcompany.com/3069200/heres-what-facebook-discovered-from-its-internal-research-on-employee-happiness*

World Economic Forum, 2018, 'Internet of Things: Guidelines for Sustainability'. Retrieved from: *https://www.weforum.org/whitepapers/internet-of-things-guidelines-for-sustainability*

Microsoft & PwC, 2019, 'How AI can enable a Sustainable Future'. Retrieved from: *https://www.pwc.co.uk/sustainability-climate-change/assets/pdf/how-ai-can-enable-a-sustainable-future.pdf*