DIGITAL FOR SUSTAINABILITY

EUROCHAM POSITION PAPER 2022–2023

EY Building a better working world

EuroCham SINGAPORE

European Chamber of Commerce (Singapore)

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EXECUTIVE SUMMARY

Digital technologies and business models, when thoughtfully applied, are anticipated to accelerate the transition to a more sustainable and circular economy.

Digital technologies can support more sustainable decisions, as well as rapid execution of initiatives, through a bigger volume of higher quality, real-time data and analytics leading to better information and insights across three pillars: how we make things through Industry 4.0; how we fund things through capital markets; and how we live through our behaviors as consumers.

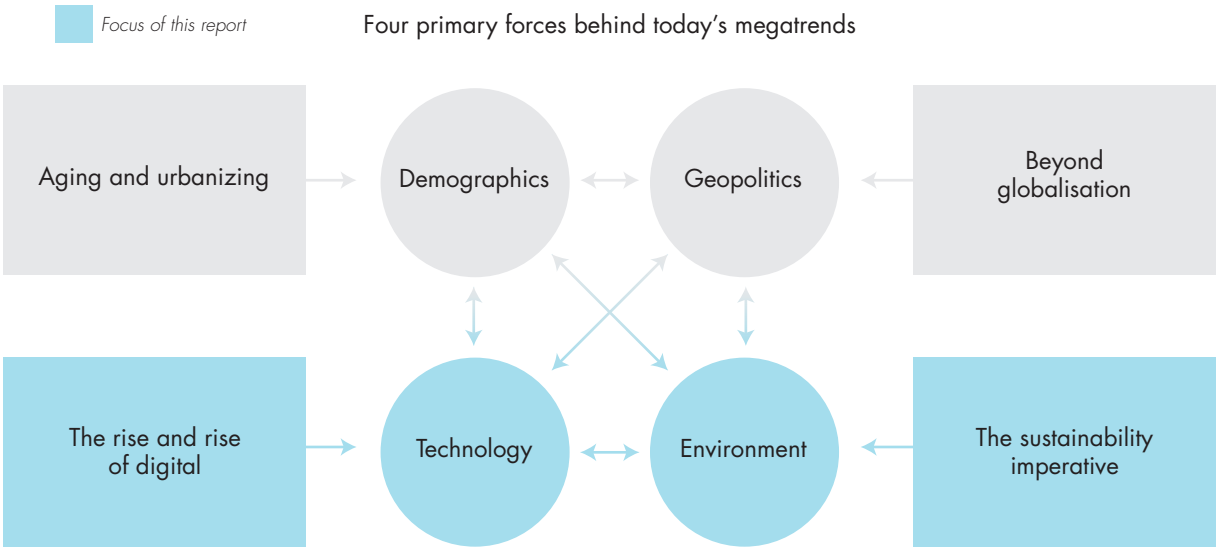
Despite early adoption across all these three pillars, many challenges still exist in the ability to accelerate the sustainability trend. These include unclear business cases, technical complexity and e-waste proliferation. Policymakers have a clear role to play in helping to address these barriers and mitigate their effects, primarily by internalizing environmental costs through initiatives such as the carbon markets, a mechanism that the European Union is pushing for globally.

Ultimately, sustainable development and the further application of digital technologies are intertwined. Business leaders and policymakers that ignore this relationship risk missing out on a large environmental and commercial opportunity.

INTRODUCTION

Both digital and sustainability are fundamental megatrends, i.e., secular long-term patterns of change affecting our economies and societies on a fundamental level, of our era. Despite short-term fluctuations or volatility in markets, megatrends are, over the long-run, resilient in time.

Figure 1.: Four primary forces behind today's megatrends



Source: Megatrends 2020 and beyond (3rd edition), EY-Parthenon Research and Analysis

Due to their nature as all-encompassing and extensive long-term global shifts across the economy and society, megatrends intertwine and interact with each other. That is also the case with digital and sustainability.

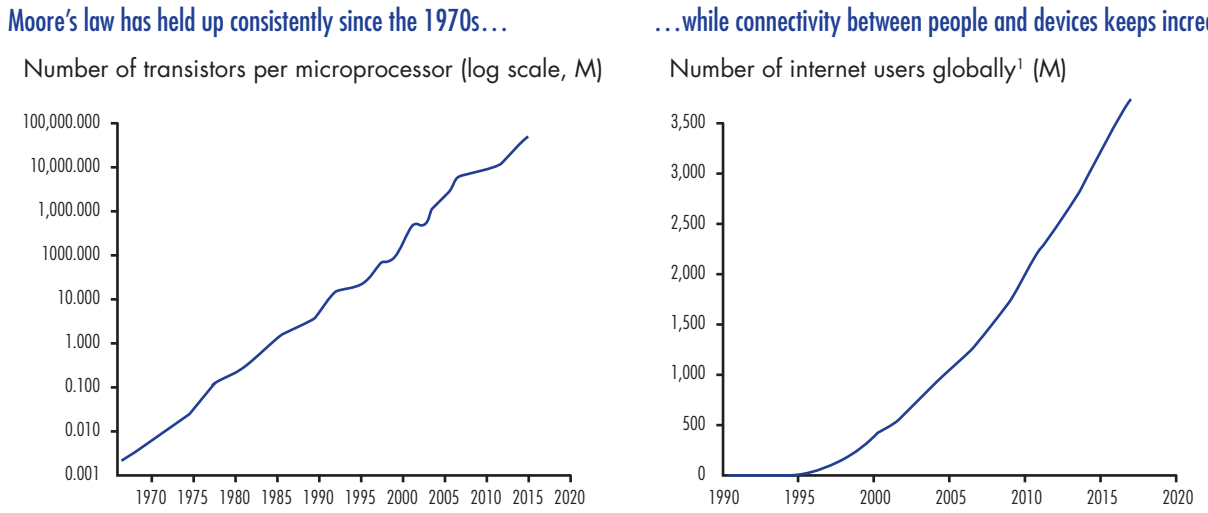
Digital technologies and business models, when thoughtfully applied, are anticipated to help accelerate the transition to a more sustainable and circular economy. Digital can support more sustainable decisions through a bigger volume of higher quality, real-time data and analytics. Further, once these decisions have been taken, digital technologies can help in executing the initiatives that help to drive sustainability outcomes. Corporates and governments around the world are demonstrating this by deploying and scaling up innovative digital solutions that help organizations and leaders make data driven decisions across three pillars of sustainability: how we make things in industry; how we enable new markets; and how we consume products and services in our daily lives.

THE DIGITAL REVOLUTION MEGATREND

Since the 1970s, the global economy and our societies have been undergoing a profound wave of change through information technology. Rapid, consecutive waves of innovation – such as the personal computer revolution of the 1980s, the internet revolution of the 1990s and the mobile internet in the 2000s – have led us to what today we call the digital economy, where the application of the culture, practices, economic models, and technology of the Internet era to meet the growing expectations of users[1].

1 *Greenway Andrew, Terett Ben, Bracken Mike, Loosemore Tom, Digital Transformation at Scale: Why the Strategy Is Delivery, 2018*

Figure 2.: The digital revolution continues unabated



Note: (1) Individuals who have used the Internet (from any location) in the last 3 months via a computer, mobile phone, personal digital assistant, games machine, digital TV, etc.
Source: Karl Rupp. 40 Years of Microprocessor Trend Data; Moore's Law: The number of transistors per microprocessor (ourworldindata.org); OWID based on World Bank & UN World Population Prospects (2017)

As entrepreneur, investor and software engineer Marc Andreessen wrote in an article in 2011 titled Why software is eating the world, the digital economy has completely transformed the ways in which we work and live[2].

On the work side, since the 1980s, organizations have become more geographically distributed and global travel and trade have become much more paperless, fast, and efficient, from offices to manufacturing floors. Almost all business processes and workflows today, to some or great extent, depend on affordable, networked computers and software.

The impact of digital is equally pronounced outside work, in how we live. Innovations from e-commerce to streaming have transformed consumption across all product and service categories. The impact of digital in the way society operates has been foundational, even down to the drivers of household formation: by 2017, the most frequent place where most couples in the US had met was online[3].

THE SUSTAINABILITY IMPERATIVE MEGATREND

Concurrently to the digital revolution, the shared imperative for a more sustainable global economic development model has been accelerating.

The 1987 United Nations (UN) Brundtland Commission defined sustainability as meeting the needs of the present without compromising the ability of future generations to meet their own needs[4]. The late 1980s was also concurrent with the publication of the first emerging scientific evidence of global warming.

Accelerating research scientific consensus on anthropogenic global warming since then has led to the realization that our current global economic model for growth, underpinned primarily by fossil fuel technologies, and linear supply chains where humans take, make and waste, is unsustainable[5]. As of 2022, the global carbon budget for achieving a limit to global warming at 1.5°C, in line with the Paris Agreement, at 50% probability is estimated at 500 Gigatons of Carbon (GtCO2). For comparison, global net anthropogenic greenhouse gas (GHG) emissions were approximately 59 GtCO2 just in 2019[6].

2 *Andreessen Marc, "Why Software is Eating The World", The Wall Street Journal, 20 August 2011 (accessed via, https://www.wsj.com/articles/SB10001424053111903480904576512250915629460, 29 September 2022)*
3 *Rosenfeld, Michael J., Thomas, Reuben J., and Hausen Sonia, "How Couples Meet and Stay Together 2017", Stanford, CA: Stanford University Libraries (accessed via, https://data.stanford.edu/hcmst2017, 29 September 2022)*
4 *United Nations, "Report of the World Commission on Environment and Development: Our Common Future (§27)", United Nations, 4 August 1987 (accessed via, https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf, 29 September 2022)*
5 *EY, "Megatrends 2020 and beyond – EYQ 3rd edition" (accessed via, https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/megatrends/ey-megatrends-2020.pdf, 29 September 2022)*
6 *Intergovernmental Panel of Climate Change (IPCC), "Climate Change 2022: Mitigation of Climate Change", Working Group III Contribution to the IPCC Sixth Assessment Report, 4 April 2022 (accessed via, https://www.ipcc.ch/report/ar6/wg3/, 29 September 2022)*

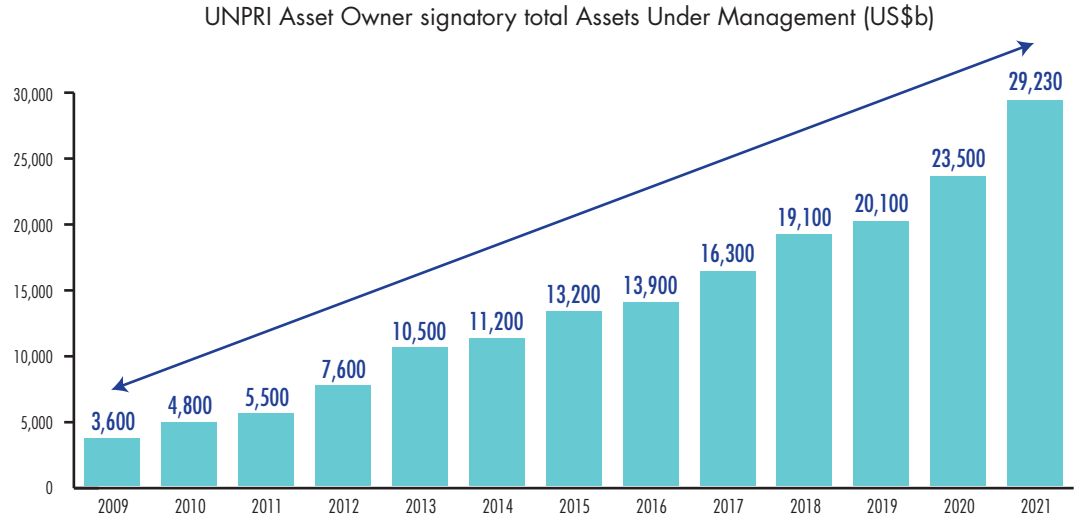
In response to these environmental and other sustainability issues, the UN established 17 Sustainable Development Goals (Figure 3) in 2015. These goals are associated with targets on a total of 231 unique indicators[7].

Figure 3.: The UN Sustainable Development Goals

The UN goals acknowledge the urgent need for change in our manufacturing, trade and consumption patterns as global warming increases the frequency and magnitude of climate-related natural disasters, intensifying social inequalities, global migration and unrest.

In the world of business, this has manifested itself as the environmental, social and governance (ESG) movement, with nearly US$29t of asset owner funds under management committed to the UN's Principles of Responsible Investment, incorporating hard ESG screening criteria into their investment processes.

Figure 4.: Nearly US$29 trillion of limited partner Assets Under Management (AUM) has committed to the UN Principles for Responsible Investment



Source: United Nations Principles for Responsible Investment (UNPRI); EY-Parthenon Research and Analysis

7 *UN Department of Economics and Social Affairs, Statistics Division, "Global indicator framework for the Sustainable Development Goals and targets of the 2030 Agenda for Sustainable Development" (accessed via, https://unstats.un.org/sdgs/indicators/indicators-list/, 18 July 2022)*

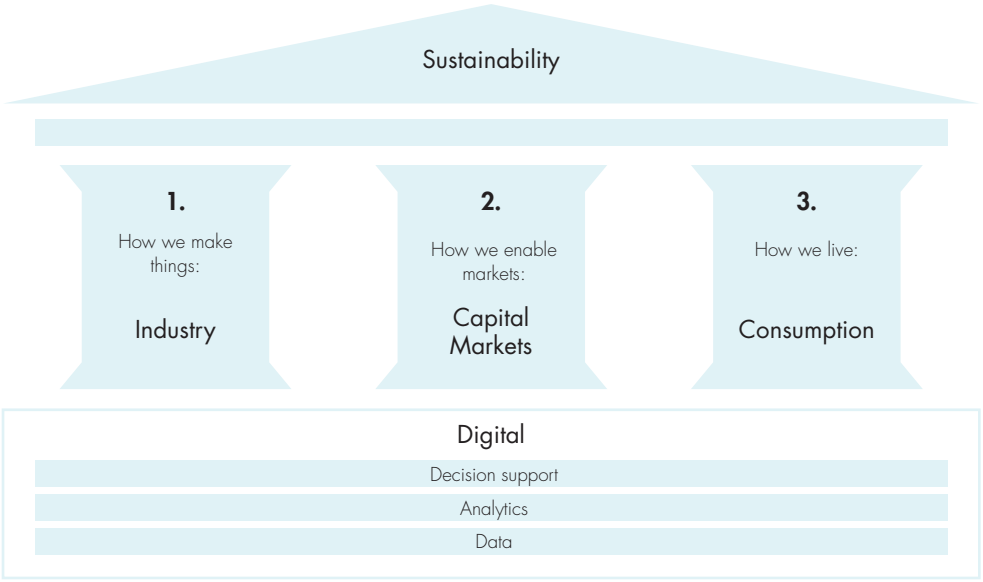
The result of the incorporation of the sustainability imperative into investment processes has resulted in the rise of ESG reporting. As ESG performance becomes a growing consideration in capital markets, capital allocators – be it a firm's leadership choosing key projects to invest in for the next five years, or investment portfolio managers deciding which companies to invest in – will increasingly rely on reliable ESG data to augment their decision-making.

DIGITAL AS AN ACCELERATOR TO SUSTAINABILITY: THE THREE PILLARS

At the intersection of digital and sustainability megatrends, multiple stakeholders are turning to technology to accelerate their sustainability journeys.

In this paper, we conduct a review of current trends in uses of digital solutions and concepts to solve sustainability issues, which we have organized in three pillars that span the full economy: industry, capital markets and consumption (Figure 5).

Figure 5.: The impact of digital toward sustainability – the three pillars



Source: EY-Parthenon Research and Analysis

Across each of these three pillars, the impact of digital is broadly based on the same mechanisms: increased use of internet-connected hardware, including sensors, gathering ever-growing volume of data across the economy; interconnected analytics and artificial intelligence or AI-powered software processing this vast volume of data to produce human-centered reports and visualizations; and humans using the reports to extract useful insights that lead to better – i.e., more profitable under the constraints of sustainability – decisions.

Across all three pillars, the impact of the digital revolution on sustainability is still in its early stages, potentially promising huge potential for productivity gains and value creation for leading, early adopters. In the following sections, the EY-Parthenon team presents the current trends for each pillar, along with case studies on some of the trailblazers among EuroCham's membership.

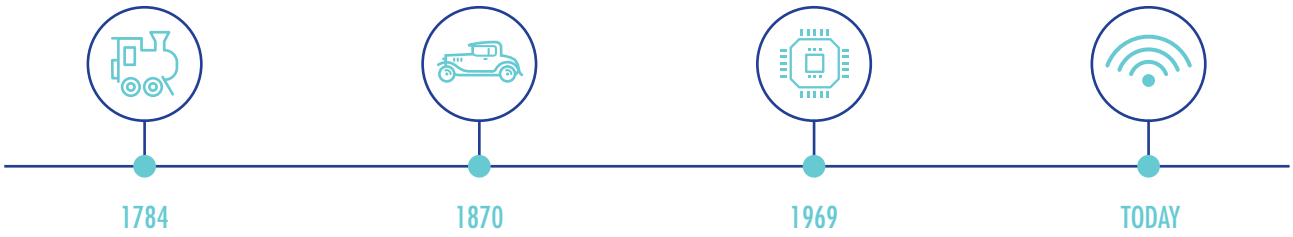
PILLAR 1 - HOW WE MAKE THINGS: INDUSTRY 4.0 AND THE CIRCULAR ECONOMY

THE IDEA

The term Industry 4.0 encapsulates the view that the dual trends of decreasing cost and increasing interconnectivity of hardware and software are precipitating a new, fourth, industrial revolution[8].

8 *Kagermann Henning, Wolf-Dieter Lukas, Wahlster Wolfgang, "Industrie 4.0: Mit dem Internet der Dinge auf dem Weg zur 4. industriellen Revolution", Ingenieur.De (accessed via, https://www.ingenieur.de/technik/fachbereiche/produktion/industrie-40-mit-internet-dinge-weg-4-industriellen-revolution/, 29 September 2022)*

Figure 6.: The four industrial revolutions



Industry 1.0

- Mechanisation
- Steam engines
- Water and steam power
- Iron production
- Textile industry
- Mining and metallurgy
- Machine tools
- Steam factories

Industry 2.0

- Electrification
- Production line
- Mass production
- Globalization
- Engines and turbines
- Broad adoption of telegraph, gas, water supply

Industry 3.0

- Computers
- Digital manufacturing
- Robotics
- IT and OT digitization
- Automation
- Analogue and digital electronics
- Networks and the internet
- Digital machines

Industry 4.0

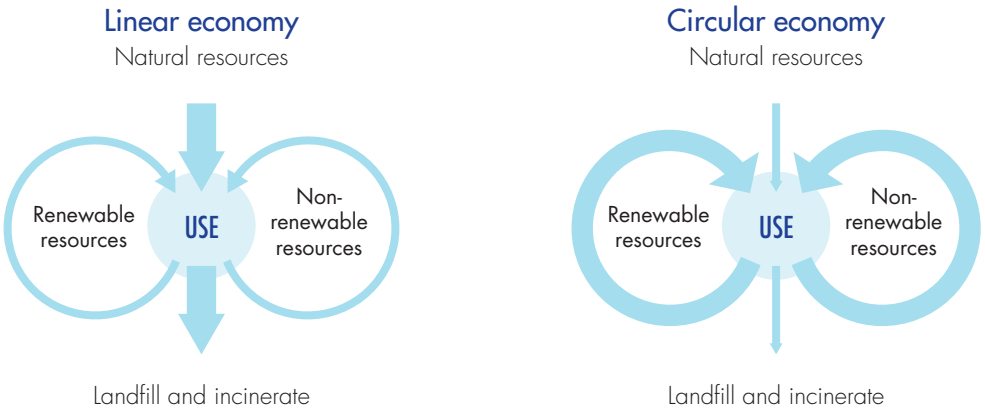
- Convergence IT
- Autonomous machines
- Advanced robotics
- Big data and analytics
- Internet of Things (IoT)
- Digital ubiquity and cloud
- Smart factory
- Machine learning and AI
- Cyber physical

Source: Circular Economy; Measuring Innovation in the Product Chain (2017); EY-Parthenon Research and Analysis

In Industry 4.0, physical production assets, products and manufacturing processes, enabled by sensors and the Internet of Things (IoT), generate a significant volume of data that are shared over networks and used in analytics and digital twins at the product, machine, line, plant and supply chain levels. This is used to optimize production, inform predictive maintenance analysis and improve product and production process design. The concept is broad, encompassing numerous innovations, including, but not limited to, smart factories, distributed power generation and smart buildings.

Most research and pilot facility work on Industry 4.0 has been on its potential for efficiency improvements and cost savings[9]. But, from a sustainability perspective, Industry 4.0 is also seen as a key enabler of the circular economy, where manufacturing and supply chains rely, in their overwhelming majority, on the reuse, repurposing and recycling, rather than new extraction, of resources[10] (Figure 7).

Figure 7.: From a linear to a circular economy



Source: Circular Economy; Measuring Innovation in the Product Chain (2017); EY-Parthenon Research and Analysis

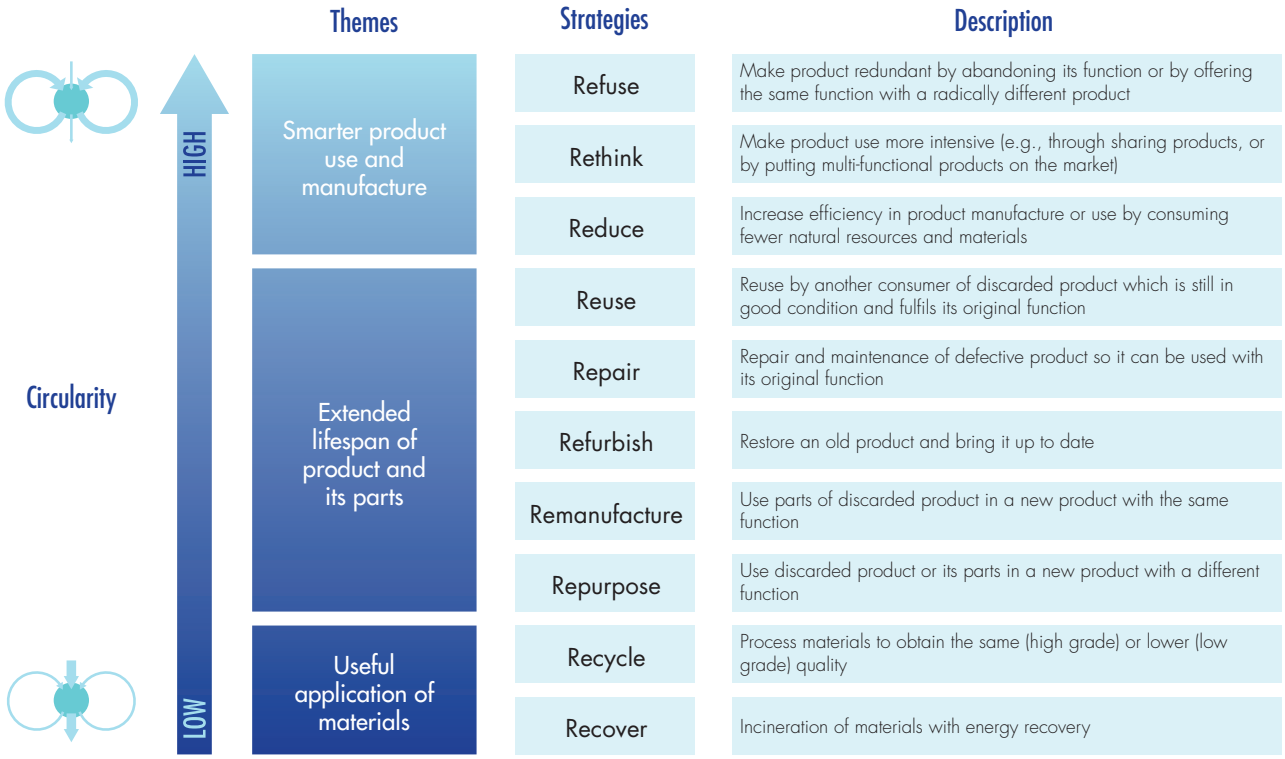
9 *Nayernia Hamed, "A systematic review of the implementation of industry 4.0 from the organisational perspective", International Journal of Production Research (DOI: 10.1080/00207543.2021.2002964), 22 October 2021 (accessed via, https://doi.org/10.1080/00207543.2021.2002964, 29 September 2022)*

10 *Berg Holger, Bendix Phillip, Jansen Maike, Le Blévennec Kévin, Bottermann Patrick, Magnus-Melgar Marianne, Pohjalainen Elina, Wahlström Margareta, "Unlocking the potential of Industry 4.0 to reduce the environmental impact of production", European Environmental Agency, Eionet Report (ETC/WMGE 2021/5), June 2021, (accessed via, https://www.semanticscholar.org/paper/Unlocking-the-potential-of-Industry-4.0-to-reduce-Berg-Jansen/991d1caaa9fa6c98db1f99cf6b68cf489a0ba78d, 29 September 2022)*

In fact, the circular economy is energy- and data-intensive. Just for the purposes of optimal high value recycling of, for instance, metals and plastics, we need not only specific information on parameters of the material composition of individual products and their components, but also market-related information such as availability and supply, which are important to reduce transaction costs[11]. Due to this data-intensity, circularity relies heavily on digital and Industry 4.0 principles.

The effectiveness of digital interventions on improving the circularity of processes can be assessed using the concept of an R-strategy ladder (Figure 8). The principle behind the R-strategy ladder is that certain sustainable strategies are more conducive to circularity than others. For example, extensive recycling, while integral to the circular economy, should be the option of last resort, given its large energy and complex reverse logistics. Instead, ensuring longer product lifespans is a more effective strategy for ensuring that materials, and their embedded emissions, are utilized to the longest extent possible before being recycled.

Figure 8.: the R-strategy ladder



Source: EPA Network; Circular Economy; Measuring Innovation in the Product Chain (2017); EY-Parthenon Research and Analysis

Across the entire ladder, digital solutions can provide the data and analytics that will be needed to enable the manufacturing processes and supply chains of the future to support smarter produce use and manufacturing, extend product and part lifespans, and empower useful application of materials.

SUPPORT SMARTER PRODUCT USE AND MANUFACTURING

Smarter product design lies at the top of the circularity R-strategy ladder. Accordingly, the biggest and more ambitious impact of data on circularity is by helping designers and engineers sift through large volumes of data around the use cases and manufacturing process of products to redesign them in such ways where they are completely abandoned (refuse). However, it is often more achievable to focus on solutions that increase the utilization of existing products (rethink). Furthermore, digital is a key enabler to as-a-service business models, which, if applied across supply chains, can be particularly effective in ensuring that assets – and their embedded emissions – are highly utilized over long periods of time.

11 *Wilts Henning, Berg Holger, "The Digital Circular Economy: Can the Digital Transformation Pave the Way for Resource-Efficient Materials Cycles?", International Journal of Environmental Sciences & Natural Resources (. DOI: 10.19080/IJESNR.2017.07.555725), 21 December 2017 (accessed via, https://juniperpublishers.com/ijesnr/pdf/IJESNR.MS.ID.555725.pdf, 29 September 2022)*

EXTEND PRODUCT AND PART LIFESPANS

When it comes to ensuring that products and manufacturing lines "live" longer, digital twins are a promising area of investment. A digital twin is a virtual model of a product or process, linking the physical and virtual worlds[12]. Such models use data from sensors installed in real-world assets and processes to model their state in a virtual world and run scenarios. Thus, system issues and breakdowns can be predicted and resolved before they happen, avoiding downtime and minimizing failures. Such models also offer the opportunity to explore more efficient modes of system usage and can also be used in the design process of products, reducing the need for physical prototype or tests and waste.

EMPOWER USEFUL APPLICATION OF MATERIALS

Recycling is naturally data intensive. A lot of research is currently going into assessing ways that the concept of digital twins can be used to also capture information on the composition of a product and its components across its full use and lifecycle, so that it can be used in recycling.

The EU Digital Product Passport (DPP) is an example of how policymakers see digital solutions supporting recycling. The DPP, still in its early stages of development, is envisaged as a record of the composition and lifecycle of a product in entirety[13]. This can improve decision making in maintenance, remanufacturing and recycling of all products, an essential key to strengthening the existing circular economy and enabling more sustainable decision-making.

PILLAR 2 - HOW WE ENABLE MARKETS: ESG, GREEN FINANCE AND CARBON MARKETS

THE IDEA

Digital is increasingly being used to support more sustainable investment decisions, whether this involves prioritizing capital deployment opportunities by incorporating ESG criteria, or finding innovative ways to mitigate an organization's carbon footprint. Some of these solutions, such as ESG reporting tools, are incremental improvements of existing applications, while others, such as innovative voluntary carbon exchanges, leverage innovation across the FinTech ecosystem (Figure 9).

Figure 9.: Digital levers toward sustainability in markets

Overall, these solutions can help firms and investors make more sustainable decisions by supporting ESG transparency, helping to price sustainability into new financial products and develop new, better markets.

12 Dr Grösser Stefan, "Digital Twin", Gabler Wirtschaftslexikon (accessed via, https://wirtschaftslexikon.gabler.de/definition/digitaler-zwilling-54371, 16 July 2022)

13 Berg Holger, Bendix Phillip, Jansen Maike, Le Blévennec Kévin, Bottermann Patrick, Magnus-Melgar Marianne, Pohjalainen Elina, Wahlström Margareta, "Unlocking the potential of Industry 4.0 to reduce the environmental impact of production", European Environmental Agency, Eionet Report (ETC/WMGE 2021/5), June 2021, (accessed via, https://www.semanticscholar.org/paper/Unlocking-the-potential-of-Industry-4.0-to-reduce-Berg-Jansen/991d1caaa9fa6c98db1f99cf6b68cf489a0ba78d, 29 September 2022)

SUPPORT MORE ESG TRANSPARENCY

As ESG performance becomes a growing consideration in capital markets, capital allocators – be it a firm's leadership choosing key projects to invest in for the next five years, or investment portfolio managers deciding which assets to allocate capital to – must increasingly rely on a broad set of reliable ESG data to make decisions. ESG disclosures, often requiring assurance, are also increasingly mandated by exchanges and regulators, especially on climate-related topics.

ESG disclosures require organizations to collect and reliably report on new types of data never previously gathered. As the volume and complexity of data that companies need to measure and report on increase, digital transformation is becoming an even more urgent imperative with a stronger business case for most medium to large organizations.

Consequently, new digital tools are springing up to support companies that embark on the journey of setting up these systems and processes. For example, SAP is increasingly integrating sustainability reporting into its suite of tools (see case study below).

HELP PRICE SUSTAINABILITY INTO NEW FINANCIAL PRODUCTS

The use of artificial intelligence (AI) enables financial institutions to price sustainable products, evaluate sustainability risks, implement in risk management solutions and products, and create financing solutions for sustainability projects.

AI can improve the assessment of sustainability linked loans from originating to underwriting to servicing. For example, the Monetary Authority of Singapore and Singapore's National AI Office are funding the development of NovA!, an AI platform that measures the borrowers' sustainability performance at loan origination by comparing their historical environmental performance with their peers[14]. During underwriting, NovA! assists in setting appropriate sustainability performance targets; for loans servicing, the actual sustainability performance indicator is compared against borrower's self-declaration to detect greenwashing[15].

DEVELOP NEW, BETTER MARKETS

Proactive organizations are also actively looking for new ways to reduce their carbon footprint in the nascent voluntary carbon market ecosystem. Digital technologies can play a major role in helping to link demand and supply through the origination of offset projects; illustrate the digital transaction of carbon credits; and provide a visual display of the positive impacts produced from carbon finance.

New digital instruments such as remote sensing and AI and machine learning (ML), along with the insights they generate, are used to increase trackability, accuracy and visibility of climate effects. For example, Kumi Analytics, a Singapore-based startup, uses advanced ML to predict crop volume and estimate carbon sequestration in forests to, among other things, inform offset certification.

Furthermore, some players also see technologies like tokenization and blockchain as having a role to play in carbon markets. Existing and certified carbon assets can be converted to token credits and traded through smart contracts. Based on this, the AirCarbon Exchange, a Singapore-based startup voluntary carbon exchange, claims to utilize blockchain technology to create and offer securitized carbon credits based on underlying carbon projects[16].

14 *Monetary Authority of Singapore, "National programme to deepen AI capabilities in financial services", Monetary Authority of Singapore, 8 November 2021 (accessed via, https://www.mas.gov.sg/news/media-releases/2021/national-programme-to-deepen-ai-capabilities-in-financial-services, 29 September 2022)*
15 *Monetary Authority of Singapore, "AI Utility NovA! to Unlock Opportunities for Green Financing and Combat Greenwashing", Monetary Authority of Singapore, 21 June 2022 (accessed via, https://www.mas.gov.sg/news/media-releases/2022/ai-utility-nova-to-unlock-opportunities-for-green-financing-and-combat-greenwashing, 18 July 2022)*
16 *AirCarbon Exchange (accessed via, https://www.aircarbon.co/exchange, 12 July 2022)*

CASE STUDY: SAP

SAP's purpose is to help the world run better and improve people's lives with sustainability at the core. The company's objective is to create a positive economic, environmental, and social impact worldwide within planetary boundaries. SAP brings this to life by providing products and services that meet the sustainability challenges and opportunities of their customers (enabler) and leading by example in our own sustainable business operations and practices (exemplar). SAP's philosophy is that it wants to help them make sustainability profitable and profitability sustainable. Towards this goal, SAP has released numerous products that help companies towards their ESG disclosures and holistic steering of company activities towards improved sustainability outcomes, including the Sustainability Control Tower, Product Footprint Management, Responsible Design and Production and the SuccessFactors Human Experience Management (HXM) Suite.

SAP Sustainability Impact Labs is as such a key enabler initiative. It brings the Chief Sustainability Officer, Operations Leads (Supply Chain, Financials etc), Sustainability business team, CTO and IT team together in a series of tailored sessions to help business leaders of an organization to create a strategic roadmap towards their sustainable future.

The sessions explore and inspire sustainability objectives, challenges, and outcomes, and help develop a technology roadmap to empower sustainable – and financial – outcomes. Furthermore, digital is a key enabler of these sessions, as these co-creation sessions are often virtual.

At the end of an Impact Lab, business leaders receive a clear, tailored, pragmatic plan mapped directly to digital technologies to take the next steps on their strategic sustainability journey. This helps the business define their baseline, track progress going forward, and report to their stakeholders efficiently and accurately.

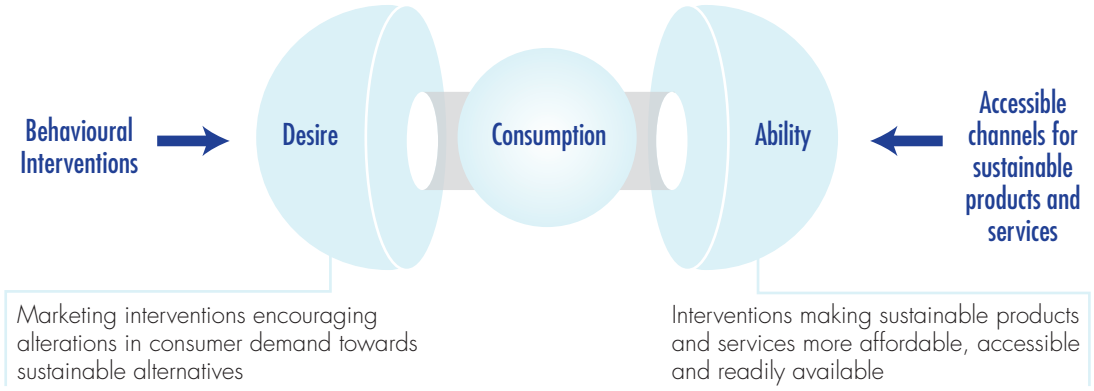
PILLAR 3 - HOW WE LIVE: CHANGING CONSUMPTION PATTERNS

THE IDEA

End consumption by individuals is the ultimate driver for the use of scarce natural resources. Consequently, the transition to a circular economic model is likely to require significant changes in consumer consumption behaviours worldwide.

Individual consumption is the result of the combination of the desire for a good or service and the ability to access and use it. Digital solutions can help to transform consumption patterns through the enabling of interventions toward making sustainable behaviours more desirable and by making sustainable products and services more accessible at the tap of a finger.

Figure 10.: Components of consumption

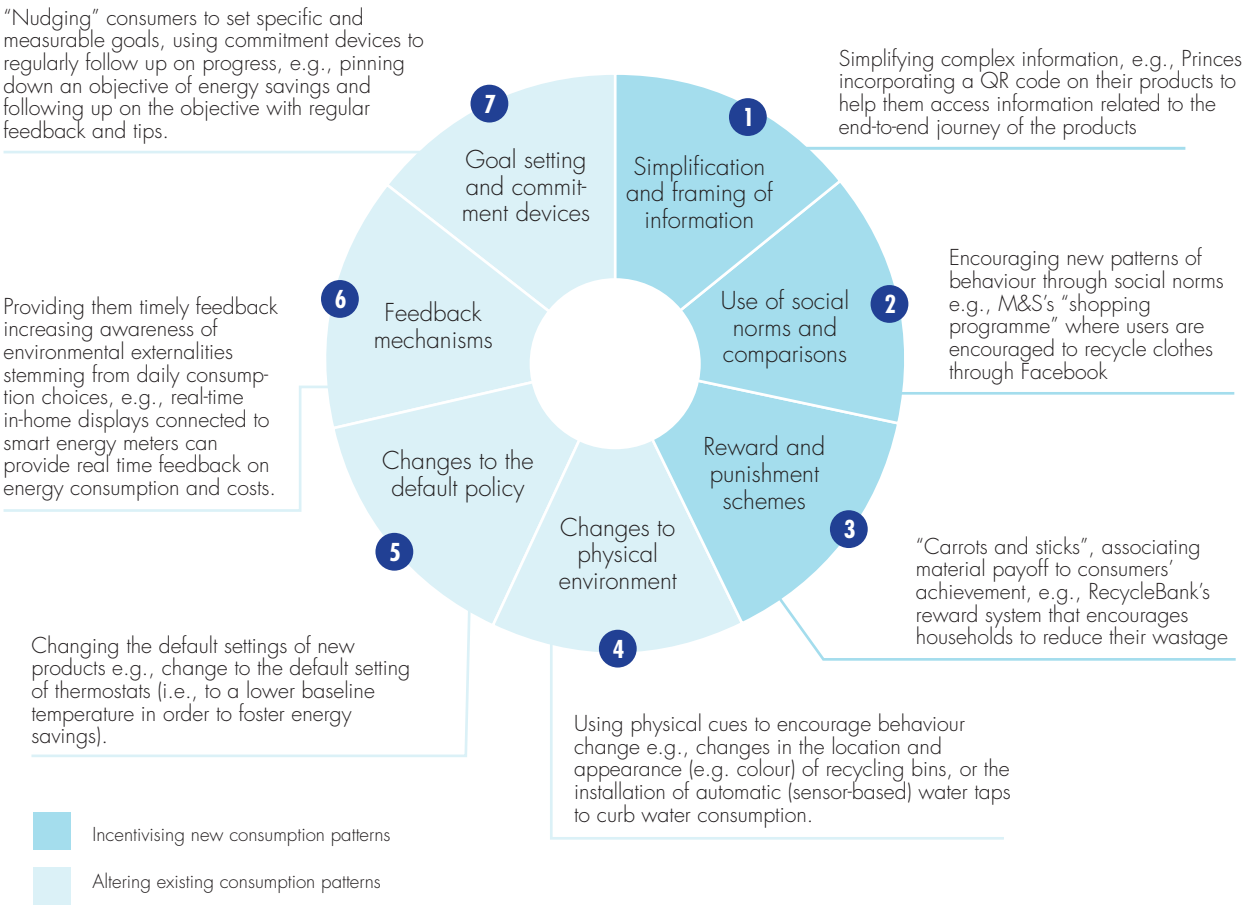


Source: EY-Parthenon Research and Analysis

INCENTIVIZE SUSTAINABLE BEHAVIORS

From e-commerce to payments, the rise of digital has resulted in an explosion in the volume and types of data generated. This treasure trove of data can be used in innovative ways to incentivize consumers to increase sustainable consumption and alter existing consumption patterns to make them more sustainable.

Figure 11.: Types of behavioural shifts



Source: Organization for Economic Co-operation and Development (OECD); Nudging - A Promising Tool for Sustainable Consumption Behaviour (2014); EY-Parthenon Research and Analysis

Many brands are trying to highlight the differentiating factors regarding their supply chain and transparency by building narratives of the sourcing and origins of their products using digital technologies, ranging in complexity from the humble QR code to multi-channel, innovative initiatives.

Applications such as QR codes may be key for allowing green or ethical consumers to access sustainability information. For instance, Conrad's Pune branch replaced its plastic bottles with glass bottles that are processed in-house and come with a unique QR code that enables guests to scan and view the amount of plastic and carbon emissions saved[17].

Furthermore, one of the most efficient ways to alter consumer behaviour is by leveraging a carrot-and-stick approach. Linking positive habits with rewards leads to positive reinforcements in the target audience. For instance, P&G partnered with Super Indo, in Indonesia to launch the "Conscious City Bandung" in which consumers were encouraged to sort their household's wastage and deposit it with conservationists or scavengers in exchange for shopping rewards by using digital applications. These conservationists would then recycle the waste thus supporting a more circular economy[18].

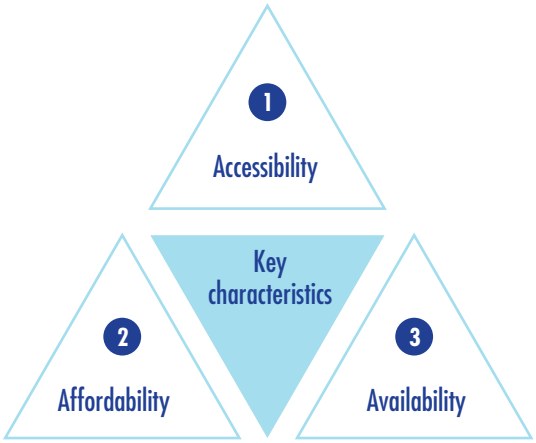
17 *Bond, "Conrad Pune installs in-house water bottling plant; comes up with a new technology to track water quality", Hotelier India, 24 February 2020 (accessed via, https://www.hotelierindia.com/business/10012-conrad-pune-installs-in-house-water-bottling-plant-comes-up-with-a-new-technology-to-track-water-quality, 29 September 2022)*

18 *Suryanto Venny, "Supporting waste reduction up to 30%, Super Indo collaborates with P&G Indonesia", EPR Indonesia, 2 March 2022 (accessed via, https://www.epr-indonesia.id/news/supporting-waste-reduction-up-to-30-super-indo-collaborates-with-p-g-indonesia, 29 September 2022)*

MAKE SUSTAINABLE CONSUMPTION EASIER

Sustainable consumption is also driven by the ability of consumers to obtain sustainable products and services easily. This ability is determined by three main characteristics: access, availability, and affordability.

Figure 12.: Bringing sustainable solutions within consumer reach



Accessibility
- Increasing access to sustainable alternatives leveraging the use of technology
- E.g. – Product Information Apps (Dirty Meter), sustainable alternatives locating apps (Tap)

Affordability
- Making the use of sustainable alternatives more affordable
- E.g. – Online Thrift stores (ThredUp), online used product platforms (ebay)

Availability
- Making Sustainable Alternatives readily available
- E.g. – shared accommodation apps (Airbnb)

Source: EY-Parthenon Research and Analysis

Consumer-facing companies are increasing the affordability, accessibility and availability of sustainable options through market-places for second-hand goods such as eBay, Craigslist or Carousell. Such platforms give new life to pre-owned products by making them available to potential buyers while also providing some guarantees on quality. Similarly, platforms like ThredUp, an online thrift store, enables users to shop for new and used items at lower prices and even opt for donating or selling their own clothes on the platform. Alternatively, the Tap app informs users of nearby water refilling stations thus eliminating the need for single use plastic bottles. Finally, the Think Dirty app helps its users make more eco-friendly cosmetics purchases by rating products on a Dirty Meter taking various health and sustainability factors into consideration[19].

CASE STUDY: BOOKING.COM

Booking.com is one of the world's leading digital travel companies. Part of the US$14.6bn group Booking Holdings Inc. (NAS-DAQ: BKNG), Booking.com's mission is to make it easier for everyone to experience the world.

Given its position as a B2B2C platform that links travellers to a very diverse range of hospitality businesses around the world, Booking.com describes their "North Star" on sustainability as "the responsibility to make sure there is always a world worth expe-riencing".

To achieve this goal, the company's Climate Action Plan is based on three pillars: reducing the carbon footprint of its internal opera-tions, making it easier for consumers to make sustainable choices, and collaborating internationally with academia and competitors to set global standards for sustainable travel.

Booking.com's research showed that travellers want to but don't know how to travel sustainably. At the same time, on the supply side of its platform, it noted that many smaller hospitality businesses did not know where to start their sustainability journey from.

Therefore, in response to this finding and to make it easier for consumers to make sustainable choices, the company launched the "Travel Sustainable" initiative, which uses the simplification and framing of information as a lever to incentivizing new consumer patterns. In collaboration with the Global Sustainable Tourism Council (GSTC), academic and consultancy advisory input, Booking.com identified four material topics – energy, water, community engagement and the environment – for sustainable travel.

19 *Brown Shelby, "8 Apps for a More Eco-Friendly Sustainable Life", CNET, 22 April 2022 (accessed via, https://www.cnet.com/tech/services-and-software/8-apps-for-a-more-eco-friendly-sustainable-life/, 29 September 2022)*

Based on this, Booking.com developed a voluntary, streamlined, high-impact and short (22 question) questionnaire that even smaller hospitality business partners on their platform could respond to and use as a framework at the start of their sustainability journey. The questions cover a broad range of topics, including the use of plastic straws, plastic bottles or water heaters. For participating partners, the results from the submission to the questionnaire are shared with customers on Booking.com's front end via badges and a filter that enables users to search for the most sustainable travel options.

The aim of this approach is not to reward or punish businesses, but to provide sustainability-sensitive customers with more information, while at the same time allowing smaller partners to both differentiate themselves and begin crafting their own journey. At the same time, Booking.com can use the data generated from partner and user behaviour to identify which aspects of sustainability resonate more with consumers. The data can therefore be used to adjust strategy, inform partners, and share with policymakers.

To date, the relatively young Travel Sustainable initiative is demonstrating good traction with partners. Booking.com is prioritizing building supply for the offering, coupled with additional consumer awareness.

CHALLENGES TO ADOPTION AND POTENTIAL SOLUTIONS

While digital is now firmly embedded into all aspects of work and life, the rise of the sustainability imperative in corporate and household decision-making is a more recent phenomenon. Accordingly, many challenges still exist in the ability of digital technologies to accelerate the sustainability trend. These challenges include unclear business cases, technical complexity, and concerns about e-waste proliferation.

Policymakers have a clear role to play in helping address these barriers and mitigate their effects, primarily by internalizing environmental costs through initiatives such as carbon markets, a mechanism in which the European Union is pushing for globally.

UNCLEAR BUSINESS CASES

Digital sustainability solutions, whether on the industry, markets, or consumer side, unless they can be truly scaled up, risk becoming nothing more than, experiments at best, and glorified public relations campaign at worst. For this to happen, the economics need to be compelling in terms of the size of the opportunity and its return on investment.

In manufacturing, the business case for sustainability is often achieved through material and energy savings in processes. There are numerous case-based evidence that cost competitiveness and sustainability can be concurrently achieved[20], at least by larger corporations that enjoy lower cost of capital than small- and medium-sized enterprises (SMEs) and can fund the investment more easily. Broader adoption of such cost-saving-based business cases though can be accelerated by policymakers taking a more aggressive stance on internalizing the cost of carbon across the global economy, thus creating more powerful incentives for increased savings through lower emissions.

COMPLEX TECHNOLOGIES

The IoT, augmented reality, machine learning and blockchain are all technologies that are still evolving rapidly and are at different levels of maturity. The EU's Digital Product Passport (DPP) is an example of the complex implementation of digital sustainability: issues such as the product hierarchy used to store and structure data, the safety of data storage, security and quality of data all need to be resolved and implemented using technologies that are often very early in their adoption curve[21].

Policymakers and governments have a role to play too – by actively adopting such technologies and getting more heavily involved in their development in their own systems and supply chains, whether in public health care or defense. It is important to note that the Transmission Control Protocol/Internet Protocol (TCP/IP), a stack of key computer networking protocols, became a foundation of the Internet because of its early adoption by the US military into ARPANET. Such initiatives can help force adoption and standardization at scale, but require investment and active engagement by governments at the tip of the technological spear.

20 *E. Porter Michael, Claas van der Linde, "Green and Competitive: Ending the Stalemate", Harvard Business Review 73, no. 5, September – October 1995 (accessed via, https://hbr.org/1995/09/green-and-competitive-ending-the-stalemate, 29 September 2022)*

21 *Berg Holger, Bendix Phillip, Jansen Maike, Le Blévennec Kévin, Bottermann Patrick, Magnus-Melgar Marianne, Pohjalainen Elina, Wahlström Margareta, "Unlocking the potential of Industry 4.0 to reduce the environmental impact of production", European Environmental Agency, Eionet Report (ETC/WMGE 2021/5), June 2021, (accessed via, https://www.semanticscholar.org/paper/Unlocking-the-potential-of-Industry-4.0-to-reduce-Berg-Jansen/991d1caaa9fa6c98db1f99cf6b68cf489a0ba78d, 29 September 2022)*

PROLIFERATING E-WASTE

Digitalization requires an increased penetration of information technology hardware across the economy: in each household, on each factory floor and in each product. However, the manufacturing of this hardware – be it semiconductor chips, lithium-ion batteries, or even mundane copper wiring, is energy- and resource-intensive.

Consequently, any increase in the digitalization of the economy to improve sustainability risks causes significant environmental damage if the IT sector is first not decarbonized. Policymakers need to be aware that the environmental impact of the underlying required technologies needs to be considered, and their own circularity prioritized.

Further, it is challenging to trace e-waste management steps, such as segregation, transportation, recycling, disposal, and analysis of waste data, due to the large volume and variety of these processes and data connected with the generated waste. The lack of data transparency and provenance tracking can lead to incorrect information being provided to end-users or organizations that require this to make better recycling decisions.

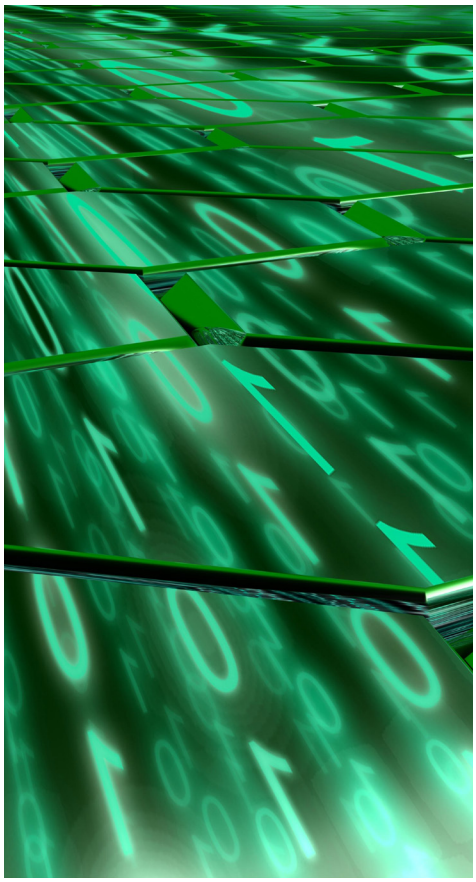
CONCLUSION

Sustainability is an imperative for the 21st century, and digital can be a key accelerator. Digital technologies can support more sustainable decisions through a bigger volume of higher-quality, real-time data and analytics leading to better decisions across three pillars: how we make things, how we fund things and how we live.

Despite multiple emerging applications across industries and markets, the movement is still in its nascent stages and many applications are still at pilot stage as multiple stakeholders need to align on conceptual definitions, technologies, and data standards.

In sustainability, everyone has a role to play across the ecosystem, from individuals, SMEs, large firms to governments. Policy incentives that internalize external costs, especially robust carbon pricing across all major jurisdictions, are required to further mobilize players around the world.

Ultimately, sustainable development and the further application of digital technologies are intertwined. Business leaders and policymakers who ignore this relationship risk missing out on a large environmental and commercial opportunity.



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SAP Asia Pacific