



ELLEN MACARTHUR  
FOUNDATION

# Financing the circular economy

Capturing the opportunity



# In support of this paper

**Sir Robert Fairbairn**  
Vice Chairman,  
**BlackRock**

“This timely report highlights the opportunities presented by the circular economy for investors seeking to create long-term value and the growth we are already seeing in this market. The report is being published as we at BlackRock have witnessed strong growth in our circular economy fund since its launch under a year ago, demonstrating investor appetite in the market.”

**Carlo Messina**  
Chief Executive Officer,  
**Intesa Sanpaolo**

“The circular economy redefines the approach to value creation. The financial sector, particularly from a de-risking perspective, can be a catalyst in unlocking opportunities while supporting clients in reorienting their business strategies. Companies that shift towards a circular model can increase their medium- to long-term competitiveness, becoming more appealing to financial institutions in terms of funding and financial support, while creating a positive impact within local communities. We are proud to be a partner of the Ellen MacArthur Foundation, for this paper and more broadly, driving the conversation to scale finance globally for the advancement of the circular economy.”

**Barry O’Byrne**  
Chief Executive, Global  
Commercial Banking,  
**HSBC**

“Finance has a critical role to play in building a more sustainable, healthy and resilient future. Scaling the circular economy helps to achieve this, while unlocking new and better growth opportunities for businesses of all sizes as they transition.”

**Jes Staley**  
Group Chief Executive Officer,  
**Barclays**

“As a British universal bank our role is to help clients by putting capital and investment to productive use, and this report provides new insight into how to ensure that the capital markets can support sustainable economic growth. We have seen strong interest in the circular economy from our corporate clients. Advising these companies on their corporate strategy and capital raising helps us to meet their needs and achieve our ambition to be a net zero bank by 2050.”

**Audrey Choi**  
Chief Sustainability Officer  
and Chief Marketing Officer,  
**Morgan Stanley**

“The circular economy offers a crucial combination of economic opportunity and enhanced environmental outcomes. At Morgan Stanley, we are already working to realize this potential through our industry-first Plastic Waste Resolution, which will facilitate the prevention, reduction and removal of 50 million metric tons of plastic waste from entering rivers, oceans, landscapes and landfills by 2030. This report continues to inspire our commitment to partner with clients and stakeholders across the whole value chain to explore the opportunities in the circular economy.”

**Marisa Drew**  
Chief Sustainability Officer  
and Global Head of Sustainable  
Strategy, Advisory & Finance,  
**Credit Suisse**

“Today’s growth at all costs, consumption-oriented culture has led to a linear system of ‘production, use once and dispose’ which has become the norm in many – if not virtually all – industries, with single use plastic packaging and fast fashion just two highly visible examples. This timely paper brings to light how the principles of the circular economy are creating industrial systems change through redesign, reuse, and business model innovation, and how this disruption brings new attractive investment opportunities for individual and institutional investors as well as for the banks and asset managers that serve them. At Credit Suisse we fully support the circular economy principles and are actively engaged in creating investment opportunities that help our clients capture the economic and environmental benefits of this new way of thinking.”

**Keith Tuffley**  
Managing Director & Vice Chairman,  
and Global Co-Head of Sustainability  
& Corporate Transitions,  
**Citi**

“As laid out in this paper, a circular economy is key to building an economic system that is viable in the long run, in which value is created and maintained, rather than extracted and wasted. At Citi, we see this not only as an important topic to engage clients and other stakeholders, but as a driver of long-term value and a crucial step in the preservation of resources and regeneration of natural capital.”

**Emma Navarro**  
Vice-President,  
**European Investment Bank**

“The shift to a circular economy model will require massive investments in support of innovative promoters who drive the transition. Yet, financing circular initiatives can be challenging and requires that financial institutions develop new ways of identifying and appraising projects. This position paper by the Ellen MacArthur Foundation provides valuable insight on circular investment opportunities for private and public financiers and shares the best practices in the financial sector. The European Investment Bank gladly contributed to this paper and stands ready to work with other financial partners to mobilise more financing and advisory support for circular economy to realise the objectives of the EU Green Deal.”

**Matt Arnold**  
Global Head of  
Sustainable Finance,  
**JPMorgan Chase**

“Increasingly, tackling climate change includes supporting solutions that are part of the circular economy. This paper, led by the Ellen MacArthur Foundation, illustrates the rapidly growing opportunities for companies and governments to participate in those solutions. At JPMorgan Chase, we leverage our core expertise to deliver sustainable solutions that protect the environment and grow the economy. As the market for circular solutions continues to grow, the combined economic and sustainable opportunity has the potential to make circular economy activities more attractive to investors.”

**Katie Koch**  
Co-Head of Fundamental Equity and  
Co-Chair of Sustainability Council,  
**Goldman Sachs Asset Management**

“The circular economy is critical to ensuring that the world can continue to develop within its means while preserving its resources. As demonstrated in the Ellen MacArthur Foundation report, companies that enable the circular economy require funding to grow and succeed. At Goldman Sachs we are determined to play our part by giving these solutions providers access to financing and offering our clients the opportunity to do good and do well by participating in the value being created.”

**Iqbal Khan**  
Co-President,  
Global Wealth Management,  
**UBS**

“The circular economy is a blueprint for a more resilient economic system that could drive significant economic, social and environmental benefits for all stakeholders. Private investment will play a key role in financing this transition, offering the potential for competitive returns while reducing waste, preserving natural resources and addressing climate change. Our private clients at UBS Global Wealth Management increasingly seek opportunities like these that combine financial performance and positive impact on the issues they care about.”

**Michelle Scrimgeour**  
Chief Executive Officer,  
**Legal & General  
Investment Management**

“We will continue to lead in pushing for decisive action on era-defining issues, such as the climate emergency and biodiversity loss. As investors, we believe that continuous engagement with corporate management, regulators and industry partners will accelerate the much-needed transition.”

**Isabel Fernandez**  
Head of Wholesale Banking,  
**ING**

“The circular economy plays a crucial role in helping companies and governments build back better from the Covid-19 pandemic. Financial institutions can support businesses to capture new growth opportunities and build resilience to future shocks. This is why at ING we are actively helping clients to transition to new circular economy models, financing circular deals and investments and strengthening the knowledge base in this area. While there are costs involved in this transition, the increased resilience gained should result in long-term material gains for everyone involved.”

**Bas Rüter**  
Global Head of Sustainability,  
**Rabobank**

“A circular economy, built on renewable energy and materials, is key to achieving the targets set by the Paris Agreement and the SDGs. This insightful paper highlights the transformative potential of the circular economy across sectors. As a key financing partner to the food & agriculture sector, we see the circular economy as a source of innovation for how we produce food, tackle food waste and feed a growing world population whilst regenerating the environment. Rabobank is actively supporting the transition to a circular economy, helping clients and stakeholders future proof their business models by providing financing solutions, leveraging our network and sharing knowledge and expertise.”

**Fiona Cannon**  
Group Director of Responsible  
Business & Inclusion,  
**Lloyd's Banking Group**

“The circular economy is an integral part of a green recovery, improving resilience and transitioning to a net zero carbon economy. Lloyds Banking Group is keen to support businesses that want to invest in shifting from the traditional ‘take-make-waste’ model of production, to a closed-loop system that promotes the continuous use of resources and eliminates waste, including through our £2bn Clean Growth Finance Initiative.”

**Bill Winters**

Group Chief Executive,  
**Standard Chartered**

“Moving to a circular economy not only requires a fundamental rethink of products, but also of business models. The Ellen MacArthur Foundation’s report identifies how this shift can help cut emissions, safeguard ecosystems and create jobs while generating a multi-trillion-dollar economic opportunity for businesses.”

**Mark Barnaba**

Board member of the  
**Reserve Bank of Australia**  
and co-chair of **Sea The Future**

“The circular economy not only represents a trillion-dollar economic opportunity globally, but is a key part of the global solution to tackle plastic waste, address climate change, and restore the health of ecosystems. The coronavirus pandemic has highlighted many of the risks of today’s extractive industrial model, reinforcing the relevance of the circular economy. This timely paper sets a clear direction of travel for the financial sector to capitalise on the opportunity and build an economy that works in the long-term.”

**Saker Nusseibeh**

Chief Executive Officer,  
**the international business  
of Federated Hermes**

“Circular economy principles are crucial in moving the world we share beyond a problematic ‘take-make-waste’ approach to scarce natural resources. Investors need to recognise the financial opportunity in resilient, circular models of resource use, and shift financing to enterprises focusing capital allocation on circular products, processes and value chains. This paper points to early indications of a positive financial case, alongside a proven sustainability case, for doing exactly that.”

**Marshall Bailey**

Non-Executive Chairman,  
**Financial Services  
Compensation Scheme**

“The Ellen MacArthur Foundation has been leading the pack on the circular economy transition over the past decade, engaging a wide variety of leading businesses on the topic. With this paper they are once again breaking new ground, laying out tremendous opportunities for deploying a circular economy lens in finance and banking. At a time when there are many doubts about how to have ESG in a portfolio, this paper sets the record straight and shows what can be done.”

**Gema Sacristan**

Chief Investment Officer,  
**IDB Invest**

“Building a circular economy requires decisive action from all players in society. That is especially true of the financial sector, which can be instrumental in achieving real change, by offering the right instruments, promoting business transformation, while generating financial returns and long-term value.”

**Jean-Philippe Hermine**

VP Strategic  
Environmental Planning,  
**Groupe Renault**

“The circular economy offers significant opportunities for businesses to generate long-term value. Collaboration between businesses and the finance sector will be essential to achieve the required business models shifts and innovation in financial instruments. Considering the full cost of goods and services, and the value of assets over multiple life cycles enables a more representative valuation of circular businesses. This will help the financial sector better understand and capture the circular economy opportunity.”

**Joan Larrea**

Chief Executive Officer,  
**Convergence Blended Finance**

“The circular economy offers an important pathway to combat climate change, waste, pollution and biodiversity loss, with this paper highlighting blended finance as one of the key ‘actions needed to scale.’ Blended finance has already demonstrated itself as a powerful force for addressing climate change, hitting a median transaction size of over USD 87 million for climate solutions in developing economies. We encourage those investing in the circular economy to draw on blended structures where they may be needed to reach comparable scale.”

**Naïm Abou-Jaoudé**

Chief Executive Officer,  
**Candriam**

“The financial industry is awakening to the risks of the ‘take-make-waste’ linear economy and massive opportunities of the circular economy. Finance is key to unlock this opportunity, accelerate the transition to circular business models, and ultimately create a more sustainable ecosystem. Candriam is strongly committed to the circular economy, through investment innovation and the embedding of circularity into its ESG frameworks.”

**Victor Verberk**

Chief Investment Officer  
a.i. and member of the  
Executive Committee,  
**Robeco**

“This paper from the Ellen McArthur Foundation creates a much needed connection between the finance sector and the circular economy, especially against the backdrop of today’s environmental and economic challenges. The transition to a circular economy has the potential to decisively impact future wealth creation without doing harm to human well-being, and understanding this transition creates clear investment opportunities. With our RobecoSAM Circular Economy Equities strategy we aim to seize this economic opportunity while positively contributing to the Sustainable Development Goals.”

**Brian Cahill,**  
Global Managing Director ESG,  
**Moody's Investors Service**

“Circular economy themes are increasingly relevant for our credit analysis, as regulation impacts costs and redefines markets, and strategies to capitalise on new opportunities seek debt financing.”

**Sean Kidney**  
Chief Executive Officer,  
**Climate Bonds Initiative**

“The IPCC tells us we have a short window to act to avoid catastrophic climate change. To do so we must move from our linear, polluting and wasteful economy to a circular economy, and fast. We need a re-tooling of our industrial and economic systems, and we're already seeing directional momentum towards this in the green bonds market. This paper shows how investors are shifting their capital to finance circular economy assets and projects - and the next steps required to accelerate this transition. Essential reading.”

**Ron Gonen**  
Founder and Chief  
Executive Officer,  
**Closed Loop Partners**

“This report captures the enormous economic opportunity tied to the circular economy, and how finance is a critical lever for actualizing this potential. The investment community is waking up to the business risks presented by climate change, laying bare the need for a new economic model. Flexible capital structures, systemic incentives and a more collaborative approach will be critical to scaling the circular economy for a better, more sustainable future.”

**Dr Rhian-Mari Thomas**  
Chief Executive,  
**Green Finance Institute**

“The Ellen MacArthur Foundation continues its trailblazing work with this timely report, clearly setting out the growing commercial benefits of circular economy business models. The finance sector has an opportunity to support the sectoral trends identified by both scaling up the products and solutions outlined in this paper and developing new, innovative financial solutions that generate both attractive risk-adjusted returns and positive social and environmental outcomes.”

**Erika Karp**  
Founder and Chief Executive Officer,  
**Cornerstone Capital Group**

“One day in the future, in a circular economy we won't even have the concept of waste! This is how we can truly steward the resources of our planet, our economy, and humanity.”

**Bertrand Camus**  
Chief Executive Officer,  
**SUEZ**

“This publication offers a wealth of information on the circular economy as a source of value creation. As it lays out drivers, potential actions and examples of circular economy opportunities across industries and asset classes, it is a real inspiration and the basis of tangible evidence for attracting private funding on this essential transition.”

**Eva Hinkers**  
Europe Region Chair,  
**Arup**

“Finance is a major enabler of a circular economy in the built environment. Currently, the added value of a circular economy approach is not taken into account when built environment investment decisions are made. Both public and private sector financial services organisations can enable the adoption of circular practices in the built environment sector, and in doing so overcome barriers and change incumbent processes that often favour conventional linear solutions.”

**Jyrki Katainen**  
President,  
**the Finnish Innovation  
Fund Sitra**

“It is really encouraging that the flow of private money to the circular economy is increasing rapidly, as this report clearly shows. The value proposition for businesses, investors and whole society is clear. However, we know how hard it can be for a company to transform to circularity if upstream or downstream players in the value chain are linear. Therefore, rapid and wide ranging systemic changes throughout the value chains need to be supported by long-term policy frameworks, and continued public investments.”

**Jamie Butterworth**  
Founder and Chief  
Executive Officer,  
**Circularity Capital**

“The circular economy is a powerful framework for driving new sources of value, enhancing resource productivity, and delivering a triple bottom line impact of financial, environmental and social returns. Our current £60 million fund, which closed at its hard-cap with commitments from leading US, European and Australian institutional investors, targets growth equity investments in businesses accelerating the transition towards a circular economy.”

**Mariana Mazzucato**  
Director of the Institute for  
Innovation and Public Purpose,  
**University College London**

“Public finance is not about just fixing market failure—it is about actively co-creating and shaping markets. This paper highlights how governments are crucial to scale the circular economy by setting direction, providing incentives, financing infrastructure and innovation, and using blended finance mechanisms to de-risk investments and attract private sector capital.”

**Rodolfo De Benedetti**

Partner, Head of Fund Managers  
and Product Strategy,  
**DECALIA Asset Management**

“The circular economy encourages innovation, decouples economic growth from resource inputs, and is a powerful contribution to achieving global climate targets, which is imperative. It offers many benefits in terms of environmental impact, resource-saving, cost-cutting and economic growth. This major change in our economic model will foster the emergence of new business models and create substantial opportunities for the companies able to respond to this trend. Timing is of the essence and this paper confirms the importance of the circular economy. Publicly-listed and privately-held companies should act now. At DECALIA Asset Management, we are already driving action on this topic since 2018, with our public equity fund dedicated to the circular economy.”

**Rob Kaplan**

Founder and Chief  
Executive Officer,  
**Circulate Capital**

“Waste has become an international crisis, with the equivalent of a garbage truck of plastics entering the oceans every minute. This paper provides a helpful resource for investors to understand how a circular economy can address global challenges at source, and where investment opportunities already exist to scale circular innovation, build circular supply chains and develop systems to collect, sort, process, and recycle waste. I hope investors will use this information to inform their own investment strategies because we need many more participating in this sector. Through our Circulate Capital Ocean Fund, we identify, incubate, and invest in opportunities designed to prevent the flow of plastic into the ocean, and aim to catalyze capital by proving that this sector is scalable and can generate competitive returns.”

**Robin Millington**

Executive Director,  
**Planet Tracker**

“An extractive economic model damages ecological systems, which in turn creates risks for the financial sector. This paper demonstrates how capital markets are waking up to the potential of the circular economy to address such environmental risks while creating long-term economic value within planetary boundaries.”

**Adam Wolfensohn**

Managing Partner,  
**Encourage Capital**

“Systemic problems require systemic solutions, such as those offered by the circular economy. At Encourage Capital, we believe that investing in these solutions can generate both compelling returns and environmental impacts. This paper shows how incorporating the circular economy in investment practices is already attractive, and how investors can further capitalise on the transition.”

**Hanna Roberts**

Director, Engagement Services,  
**Sustainalytics**

“Highlighting the crucial role the circular economy plays in addressing climate change and other key ESG issues, this paper helps the investment community to understand the opportunities for growth and define strategies to accelerate the transition to a circular economy. At Sustainalytics, we have integrated this topic into our research output and engagement programming, recognising that the finance sector has a key role to play in building a viable alternative to the current linear economic model.”

**Hendrik-Jan Boer**

Head of Sustainable Investments,  
**NN Investment Partners**

“In this new paper, the Ellen MacArthur Foundation raises awareness amongst capital allocators of the clear relevance of the circular economy, showing how environmental and economic considerations can go hand in hand. At NN Investment Partners, the circular economy is a key component of our Impact Equity strategies as it helps to combat environmental issues such as climate change and waste production, while providing attractive investment opportunities.”

**Olivier Raybaud**

Co-Founder and  
Managing Partner,  
**Blue Oceans Partners**

“A circular economy is crucial to solve ocean plastic pollution at scale. Regulations and consumption trends are creating fast-growing market opportunities for circular economy start-ups. This, in turn, creates a unique opportunity for investments which generate both systemic impact and financial returns.”

**Jeremy Oppenheim**

Chair, Blended  
Finance Taskforce and  
Founding Partner,  
**SYSTEMIQ**

“We are undergoing a period of unprecedented change: climate, health and economic emergencies are all emphasising that we need to shift from our current linear and extractive model, to a more circular, inclusive and nature-positive economic system. This paper emphasises that blended finance solutions can be a powerful way to enable this shift by using public money to mitigate investor risk and mobilise private capital for net-zero tech solutions, circular business models and sustainable infrastructure.”

**Leonardo Letelier**

Chief Executive Officer,  
**SITAWI Finance for Good**

“Scaling a circular economy will require the implementation of existing financing solutions - green and sustainable bonds have already been used as tools to finance circular economy solutions - and the development of new ones. This paper lays out how different players in the financial services sector can capture the economic opportunity, whilst generating positive social and environmental impact.”

# Foreword by HRH The Prince of Wales



CLARENCE HOUSE

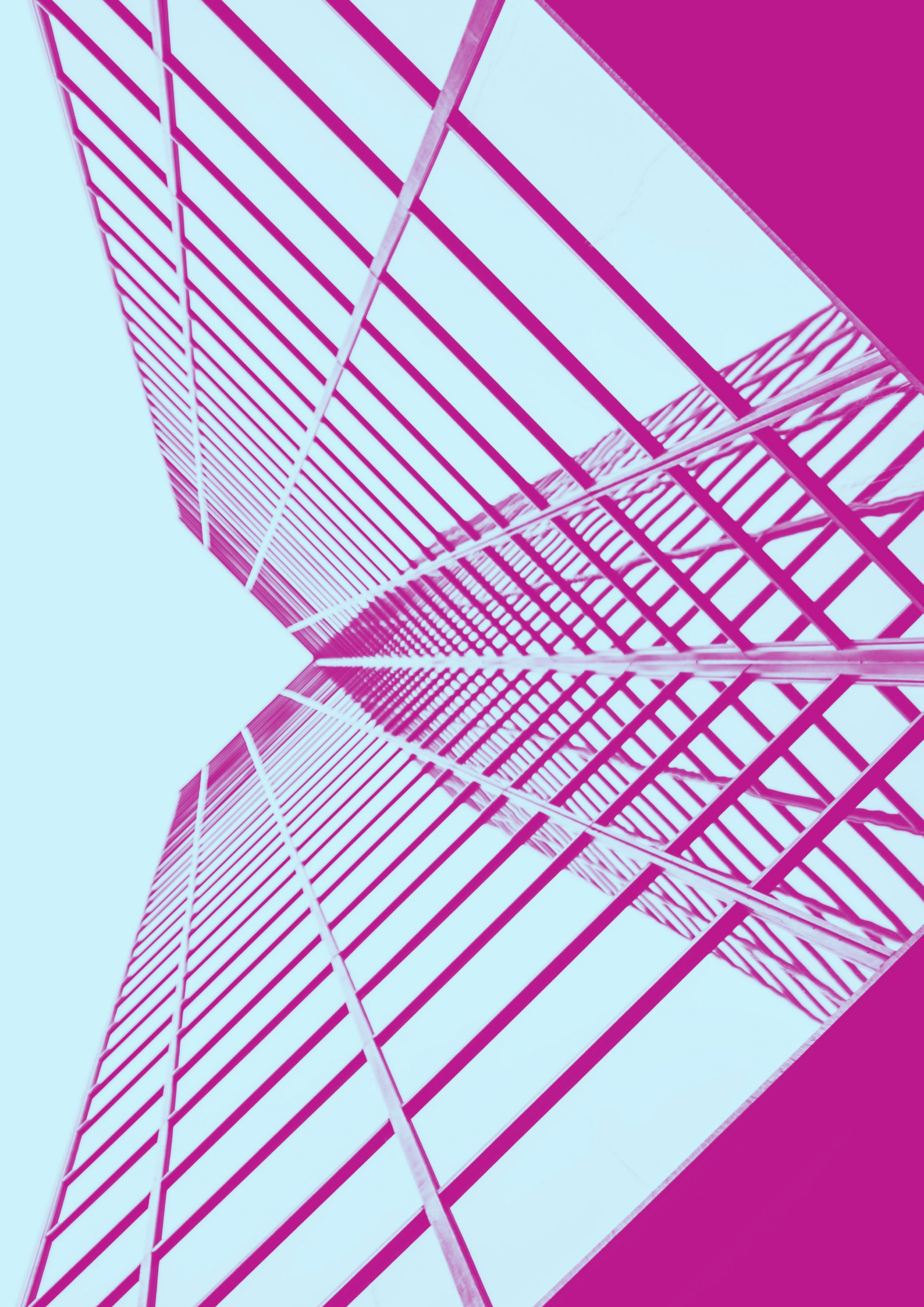
In January 2020, I launched the Sustainable Markets Initiative which aims to build markets designed with the intent to ensure the economy operates in favour of people and planet while contributing to growth and prosperity for all, now and in the future.

The circular economy, along with the circular ‘bioeconomy’ that further emphasizes that Nature must be at the heart of this approach, is an important part of the solution to help realise the ambitions of the Sustainable Markets Initiative:

- The circular economy is a systems approach that combines economic opportunity with better environmental and societal outcomes
- It helps tackle the root cause of many issues, including climate change, loss of biodiversity, and plastic pollution, by fundamentally rethinking business models and redesigning entire value chains of products and used materials, via important system changes.
- Over the past ten years the opportunity and inspiration of a circular economy has gained enormous traction with businesses and governments alike. It is an idea that is clearly mobilised and can have a very positive economic impact as well.

Now it is time to bring the circular economy to scale, and finance will play a crucial role in doing so – and, if done right, will result in new forms of value creation and real ecological, societal and economic benefits from accelerating this transition.

This is why I welcome this timely report, and the opportunities it lays out for the financial services sector in embracing and accelerating the circular economy transition.





# Preface

The circular economy is fast emerging globally, as companies and governments increasingly recognise its potential to tackle the root causes of climate change and other global challenges, while generating new and better growth opportunities. As a solution that can scale fast, its relevance has only become more apparent in recent discussions about economic renewal.

All aspects of finance will be vital to scale the transition to the circular economy. Private sector investors, banks, and corporate finance departments, as well as governments and other public sector bodies that control trillions of dollars of public investment and set the regulatory frameworks, all have crucial roles to play.

This paper focuses primarily on private sector finance and explores the circular economy's value creation potential for investors, banks, and other financial services firms.

First, this paper shows how the circular economy can help achieve climate and other ESG goals while creating opportunities for new forms of better economic growth, effectively moving beyond the initial progress and focus that ESG investment has achieved over recent years.

Second, it highlights how investors, banks, and insurers are already capturing these opportunities, showing that the market for financing the circular economy is rapidly taking off across asset classes and sectors.

Third, it provides a direction of travel for finance to fully capitalise on the opportunity by helping to rapidly scale the circular economy.

This paper is intended as an initial exploration rather than a detailed analysis of any individual aspect of finance. Its purpose is to stimulate discussion about how the financial services sector can help scale the circular economy to drive new and better growth that is more distributed, diverse and inclusive, and help build an economy that is restorative and regenerative by design.

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**Andrew Morlet**

Chief Executive Officer,  
**Ellen MacArthur Foundation**



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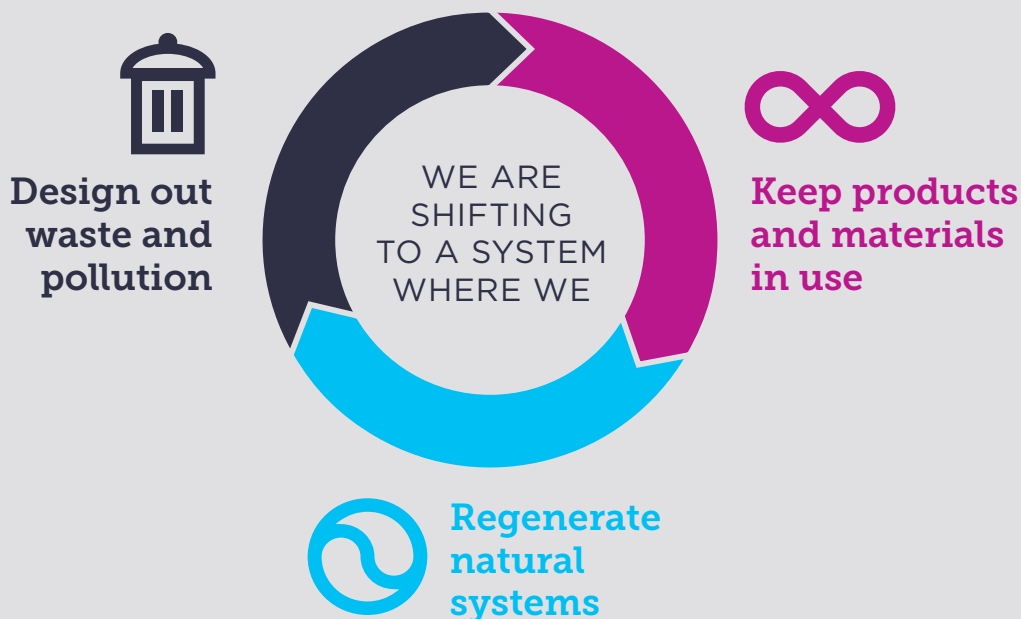
# Executive Summary

**The circular economy financing market is taking off, with a steep increase in activity over the last 18 months. Increasingly recognised as a crucial part of the solution to climate change and other ESG issues, the circular economy also offers significant opportunities for new and better growth. Now is the time for finance to capitalise on this industrial transformation, and help scale the circular economy.**

Over the past two years, climate change and other environmental, social, and governance (ESG) issues have become key boardroom topics for asset managers, banks, and other financial services firms. Clients expect solutions and regulatory pressure is rising. The question is no longer *whether* climate change and other ESG issues matter to the financial services sector, but *how* it will address them. The circular economy is a crucial part of the answer to this question.

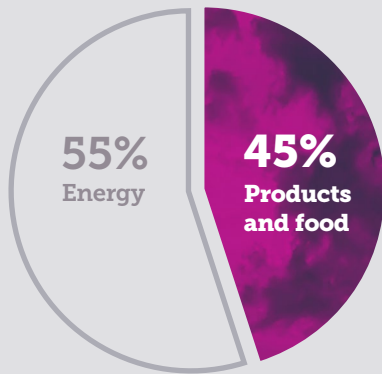
Moving past today's extractive 'take-make-waste' linear model, the circular economy offers a positive vision of an economy in which products are designed to be reused, repaired or repurposed, and natural systems are regenerated.

The circular economy can help meet global climate targets by transforming the way we produce and use goods. Relying solely on energy efficiency and switching to renewable energy will only address 55% of global greenhouse gas (GHG) emissions.<sup>1</sup> By adopting circular practices, we can reduce a significant proportion of the remaining 45%. For example, circulating products and materials – instead of producing new ones – can help cut energy demand, by maintaining the energy that went into making them. In agriculture, adopting circular principles is an effective way to sequester carbon in the soil.



## Completing the picture: tackling the overlooked emissions

TOTAL CURRENT GLOBAL GREENHOUSE GAS EMISSIONS



HOW THE CIRCULAR ECONOMY HELPS TACKLE CLIMATE CHANGE



Design out waste and pollution  
**to reduce GHG emissions**  
across the value chain



Keep products and materials in use  
**to retain the energy embodied**  
within them



Regenerate natural systems  
**to sequester carbon**  
in soil and products

Source: Ellen MacArthur Foundation, Material Economics, *Completing the Picture: how the circular economy tackles climate change* (2019)

Research suggests that if a circular approach were adopted in just five sectors (steel, aluminium, cement, plastic, and food), annual GHG emissions would fall by 9.3 billion tonnes of CO<sub>2</sub>e in 2050, equivalent to the reduction that could be achieved by eliminating all transport emissions globally.<sup>2</sup> In this way, the circular economy can play an important role in managing climate-related risks.

Implementing a circular economy can also help address other ESG issues. For example, a circular economy enhances biodiversity by reducing the need for resource extraction and by regenerating farmland. Moreover, it is estimated that a circular economy could create over half a million jobs by 2030 in Britain alone, in activities such as resale, remanufacturing, and recycling.<sup>3</sup>

### The circular economy presents a multi-trillion-dollar economic opportunity

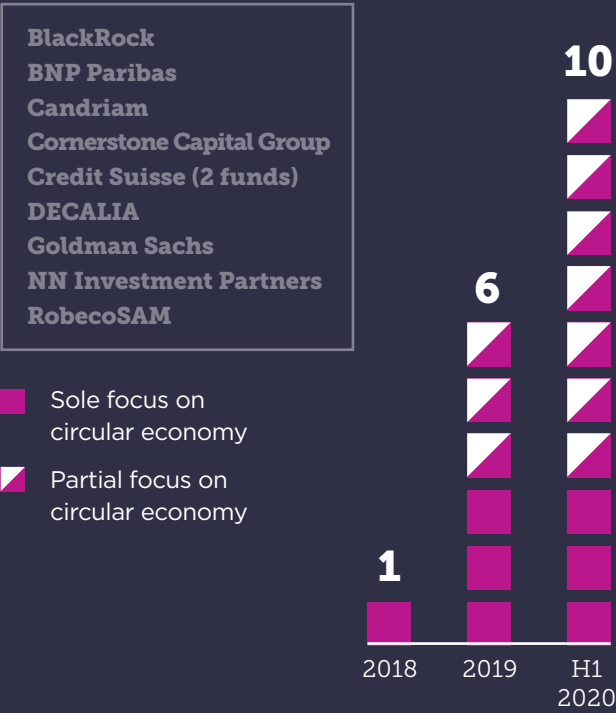
Shifting towards a circular economy model will not only deliver climate and other ESG benefits, but also provide significant new and better growth opportunities. For example, adopting circular economy principles in Europe in mobility, built environment, and food could offer annual benefits of EUR 1.8 trillion (USD 2.1 trillion) in 2030.<sup>4</sup> In China, applying circular

economy practices at scale in five key sectors could save businesses and households CNY 70 trillion (USD 10 trillion or 16% of China's projected GDP) in 2040.<sup>5</sup>

More and more companies across industries are adopting circular principles to reduce costs, increase revenues, and manage risks. Circular solutions accounted for 13% of Philips' revenues in 2019,<sup>6</sup> while Caterpillar offers more than 7,600 remanufactured products.<sup>7</sup> The circular economy has started transforming entire industries: in fashion, clothing resale is expected to be bigger than fast fashion by 2029; and in plastics and consumer packaged goods, profit pools along the value chain are being transformed by increasing regulation, public pressure, and innovation.<sup>8</sup> Governments are accelerating this shift, with the circular economy being a key pillar of the European Green Deal and circular economy roadmaps and legislation in place in countries including China, Chile, and France.

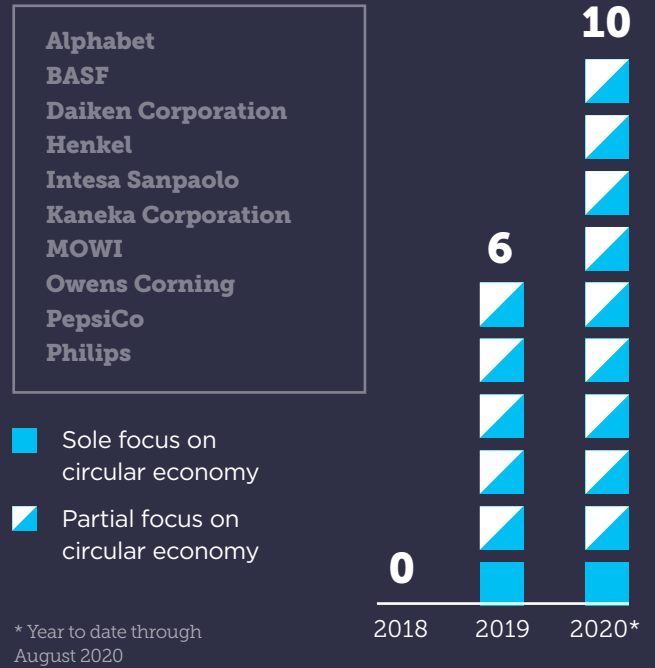
Megatrends such as shifting demographics, digitalisation, and resource scarcity are reinforcing the transition to a circular economy. The coronavirus pandemic has highlighted many of the risks inherent to the linear economy and, in June 2020, more than 50 chief executives and global leaders endorsed the circular economy as a solution to build back better in the wake of the pandemic.<sup>9</sup>

### Number of public equity funds with a circular economy focus



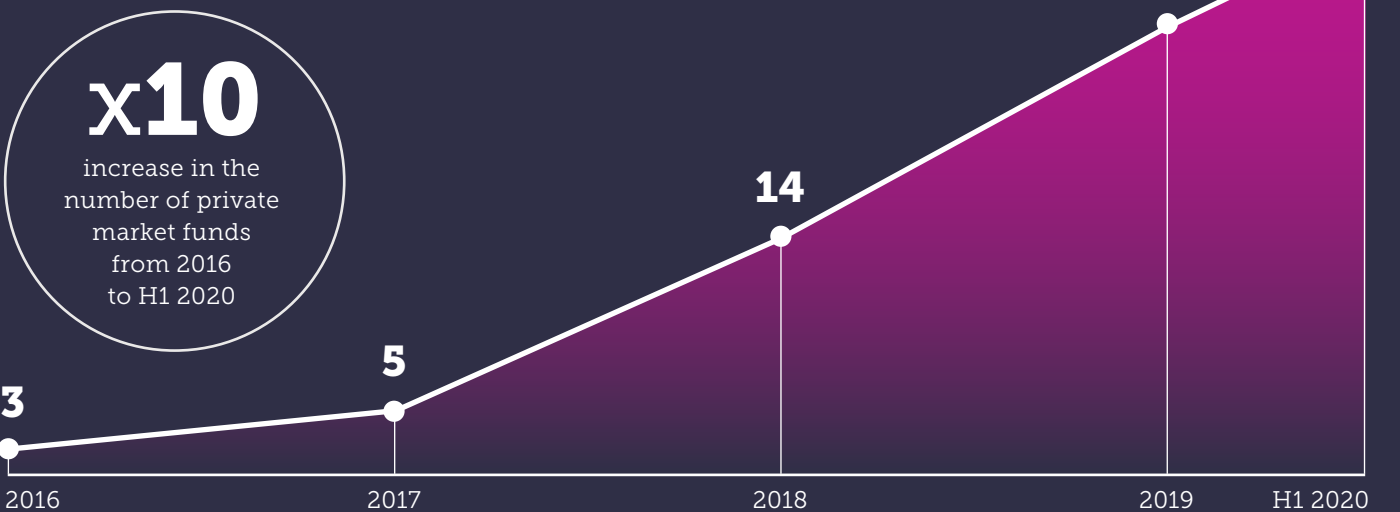
### Number of outstanding corporate bonds with a circular economy focus

Conservative estimate



### Number of private market funds with a circular economy focus

Conservative estimate. Includes venture capital, private equity, and private debt funds



Source: Ellen MacArthur Foundation

**“Since the beginning of 2020, assets managed through public equity funds with the circular economy as the sole or partial investment focus have increased sixfold, from USD 0.3 billion to over USD 2 billion”**

**The financial sector is starting to capture the circular economy opportunity**

The last 18 months have seen a steep increase in the creation of debt and equity instruments related to the circular economy. While no such fund existed in 2017, by mid-2020 ten public equity funds focusing partially or entirely on the circular economy have been launched by leading providers including BlackRock, Credit Suisse, and Goldman Sachs.

In the last 18 months at least ten corporate bonds to finance circular economy activity have been issued with help from Barclays, BNP Paribas, HSBC, ING, Morgan Stanley, and others.

Since 2016, there has been a tenfold increase in the number of private market funds, including venture capital, private equity and private debt, investing in circular economy activities.

A similar trend is visible in bank lending, project finance, and insurance. Intesa Sanpaolo launched a EUR 5 billion (USD 6 billion) credit facility, Morgan Stanley launched a firm-wide Plastic Waste Resolution, and the European Investment Bank (EIB) partnered with five of Europe’s largest national promotional banks and institutions to launch a EUR 10 billion (USD 11.8 billion) loan and investment

initiative dedicated to the circular economy. Insurance firms including AXA are developing new solutions for circular business models such as peer-to-peer sharing.

Existing examples provide early indications as to how the circular economy can create value for asset managers, banks, and other financial services firms. They demonstrate its potential to attract inflows: since the beginning of 2020, assets managed through public equity funds with the circular economy as the sole or partial investment focus have increased sixfold, from USD 0.3 billion to over USD 2 billion.<sup>10</sup> In the first half of 2020, on average these funds performed 5.0 percentage points better than their Morningstar category benchmarks, indicating how the circular economy can deliver excess returns. Future research will be required to see whether outperformance persists over time.

The circular economy can help meet demands from regulators and other stakeholders, such as those expressed by Bank of England Deputy Governor Sam Woods in his July 2020 letter on climate change to finance CEOs.<sup>11</sup> In addition, building circular economy expertise and know-how can help financial institutions to engage with corporate clients, for who the circular economy has increasingly become a boardroom topic.

## The way forward

Now is the time for finance to capitalise on this momentum and help accelerate the circular economy transition. While the recent growth in financing is promising, far more capital and activity will be needed to scale the circular economy and fully seize its opportunity.

All aspects of finance will play an important role in bringing forward the transition to a circular economy. Investors, banks, and other financial services firms have the scale, reach, and expertise to stimulate and support businesses to make the shift. This is not just about investing in perfectly circular companies or divesting from extractive ones, but about engaging with and encouraging companies in every industry to make the transition.

Governments, central banks, and financial regulators can complement and enable the shift in the private sector. Governments can directly invest in circular economy activities and innovation, set direction and level the playing field through, for example, pricing externalities. They can enhance transparency by mandating disclosure and standardising definitions and metrics for circular activities, such as in the EU Taxonomy.<sup>12</sup> Central banks and financial regulators can integrate circular concepts in risk assessments and modelling, and could explore integrating them in less conventional methods such as green quantitative easing. Blended finance solutions, combining public, private and philanthropic capital, can fund harder-to-finance circular economy infrastructure and long-term innovation.

Better data will be required to underpin the shift. If capital is to be reoriented at scale, more transparent and consistent data on circularity performance (both historical and forward-looking) will be crucial. In addition to scaling dedicated circularity measurement tools such as the Ellen MacArthur Foundation's Circulytics,<sup>13</sup> integration of circularity metrics in leading existing frameworks, including the Task Force on Climate-related Financial Disclosures (TCFD)<sup>14</sup> and the Sustainable Accounting Standards Board (SASB)<sup>15</sup> will be needed. Finally, the adaptation of accounting rules would enable a more representative valuation of circular business models and linear risks.

**Public equity funds with the circular economy as a sole or partial investment focus on average performed**

# 5.0

**percentage points**

**better than their benchmarks in H1 2020**

Source: Ellen MacArthur Foundation





# The circular economy delivers on climate and other ESG goals, while offering new and better growth opportunities

Climate change and environmental, social, and governance (ESG) topics have become key boardroom topics for financial services firms, their clients, and regulators. The circular economy is an essential part of the solution to deliver on related targets and manage associated risks. Moreover, as an industrial transformation agenda, it is a source of new and better growth and value creation that goes beyond ESG.



# 1.1

## Climate change and ESG have become key boardroom topics within the financial sector

**Climate change and other societal challenges pose significant investment risks that are increasingly recognised by the financial sector.**

In particular, it is becoming widely acknowledged that climate-related risks are a source of financial risk and a potential threat to financial stability.

**As a response, major banks, asset managers, and insurers are spending more time assessing climate risks and opportunities in their portfolios, and developing their ESG strategies and capabilities.**

ESG investment skyrocketed to over USD 40 trillion in 2020, up from USD 23 trillion in 2016, according to research firm Opimas and the Global Sustainable Investment Alliance.<sup>16,17</sup> Deutsche Bank estimates that 95% of assets under management (AUM), or USD 130 trillion, will be governed by an ESG mandate by 2030.<sup>18</sup> The number of signatories of the UN Principles for Responsible Investment (PRI) grew from 100 in 2006 to over 3,000 in 2020, with over USD 100 trillion AUM.<sup>19</sup> More than 50 financial institutions have publicly committed to set emissions reduction targets through the Science Based Targets (SBT) initiative, and institutional investors representing nearly USD 5 trillion AUM in 2020 have committed to transition their investment

portfolios to net-zero GHG emissions by 2050 as part of the Net-Zero Asset Owner Alliance.<sup>20</sup> In 2020, two notable examples of the scale of this shift in the financial sector have emerged: BlackRock, the world's largest asset manager joined Climate Action 100+, an investor group aiming to improve climate disclosure and align business strategy with the goals of the Paris Agreement; and global investment bank Barclays set a net-zero carbon target for 2050.<sup>21,22</sup>

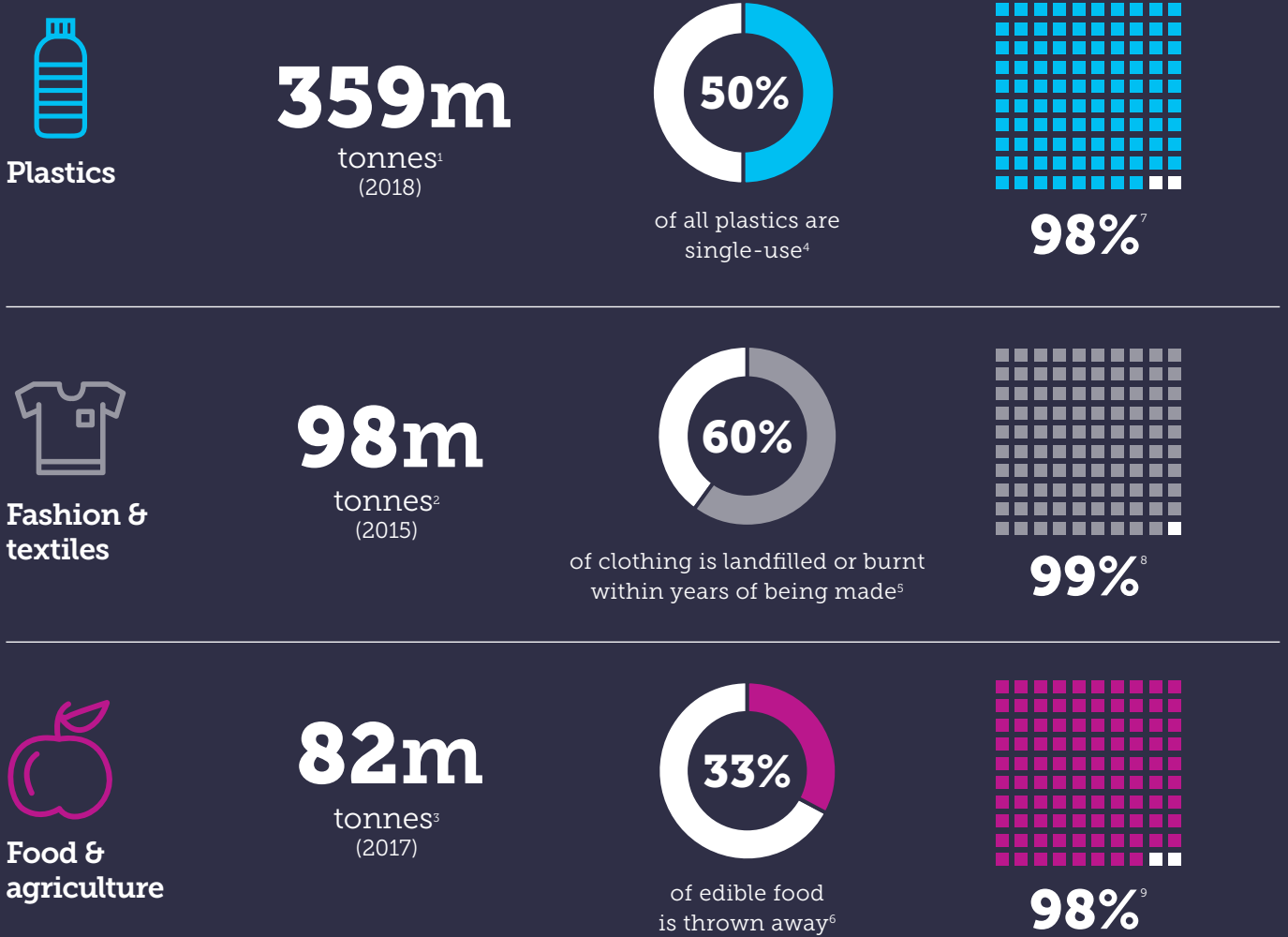
**Governments, financial regulators, and central banks are also taking action to turn climate-related risks into opportunities.**

Policymakers are putting in place enabling standards and regulations, such as the EU's classification system for sustainable activities (EU Taxonomy), green bond standard, and climate benchmarks. Central banks are also exploring the role they can play in the transition to a climate-neutral economy. For example, the European Central Bank (ECB) announced that it has been examining how it can make use of its trillion-euro asset purchase scheme to pursue green objectives. Meanwhile, the People's Bank of China, along with six other government agencies, issued the *Guidelines for Establishing the Green Financial System*.<sup>23</sup> Central banks and supervisors have also established platforms such as the Network for Greening the Financial System (NGFS) and the Task Force on Climate-related Financial Disclosures (TCFD).<sup>24</sup>

FIGURE 1

# Our current economic model is take-make-waste

Highly **extractive, wasteful** economic models...



1 359 million tonnes of plastic were put on the market in 2018, predominantly derived from fossil-based virgin feedstock. Plastics Europe, *Plastics - the facts* (2019)

2 The textiles industry used 98 million tonnes of non-renewable resources in 2015, including oil to produce synthetic fibres, fertilisers to grow cotton, and chemicals to produce, dye, and finish fibres and textiles. Ellen MacArthur Foundation, *A New Textiles Economy: redesigning fashion's future* (2017)

3 The agriculture industry extracts large quantities of phosphorus, potassium, and other finite resources per year, with 82 million tonnes of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O synthetic fertilisers used in 2017, including a significant proportion for food production. Ellen MacArthur Foundation, *Cities and Circular Economy for Food* (2019), FAOSTAT, *Fertilizers by nutrient* (2017)

4 UN Environment, *#BeatPlasticPollution*

5 McKinsey, *Style That's Sustainable: a new fast-fashion formula* (2016)

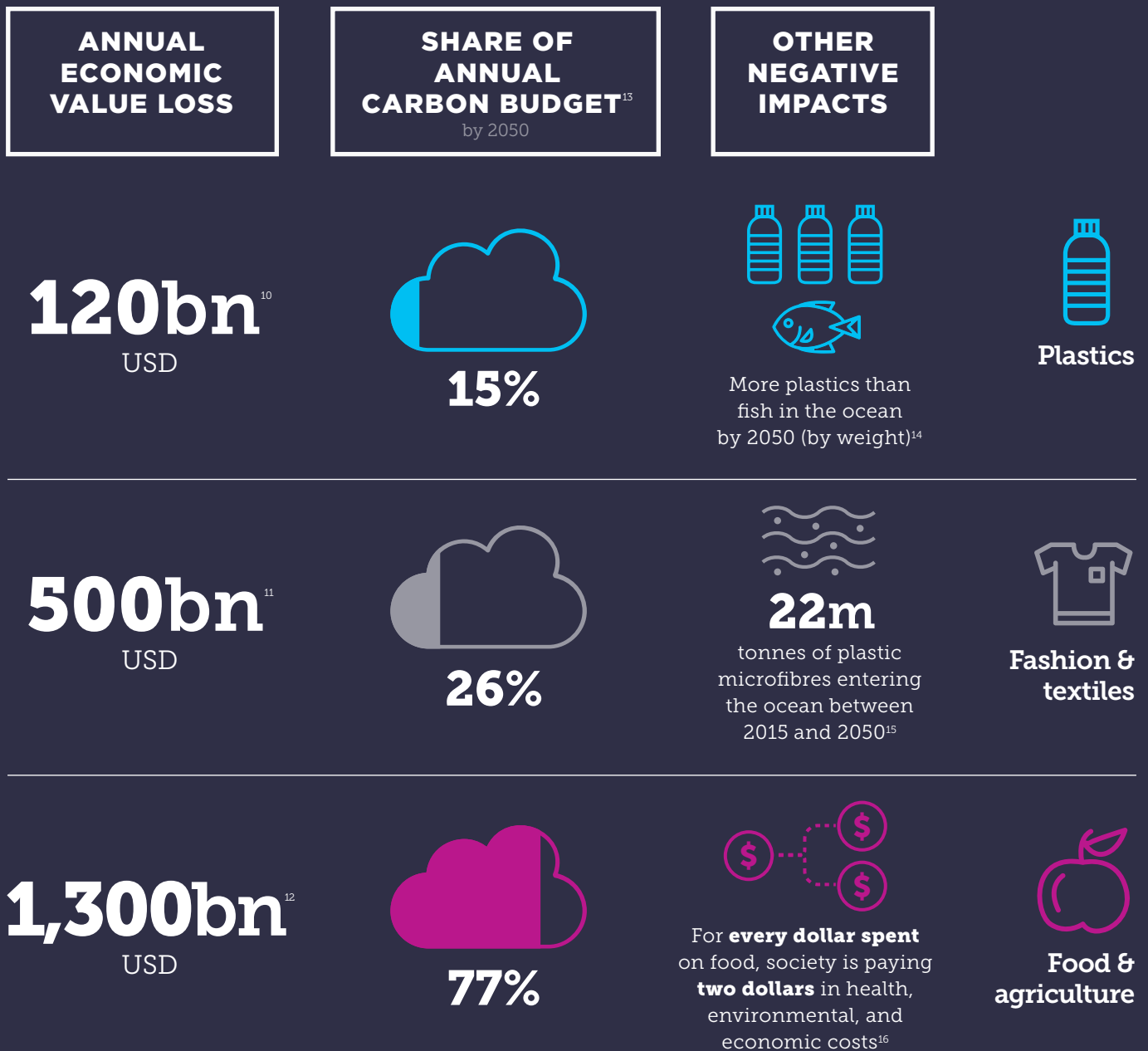
6 FAO, *Global Food Losses and Food Waste* (2011)

7 Figure for plastic packaging. Ellen MacArthur Foundation, World Economic Forum and McKinsey & Company, *The New Plastics Economy: rethinking the future of plastics* (2016)

8 Ellen MacArthur Foundation, *A New Textiles Economy: redesigning fashion's future* (2017)

9 Less than 2% of the valuable biological nutrients in food by-products and organic waste (excluding manure) generated in cities is composted or otherwise valorised. Ellen MacArthur Foundation, *Cities and Circular Economy for Food* (2019)

... result in **massive economic value loss** and many **negative impacts**.



<sup>10</sup> Value of plastic packaging material lost. Ellen MacArthur Foundation, World Economic Forum and McKinsey & Company, *The New Plastics Economy: rethinking the future of plastics* (2016)

<sup>11</sup> Value lost every year due to clothing underutilisation and the lack of recycling. Ellen MacArthur Foundation, *A New Textiles Economy: redesigning fashion's future* (2017)

<sup>12</sup> Direct economic value loss resulting from edible food waste, as well as Nitrogen and Phosphorus (N & P) loss from inedible food waste, other organic waste, sewage, and from N & P runoff from mismanaged fertiliser and manure. Ellen MacArthur Foundation, *Cities & Circular Economy for Food* (2019)

<sup>13</sup> Share of global annual carbon budget by 2050 under business-as-usual, based on the IEA 2°C pathway by 2050 and taking analyses from: World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, *The New Plastics Economy: rethinking the future of plastics* (2016); Ellen MacArthur Foundation, *New Textiles Economy: redesigning fashion's future* (2017); Ellen MacArthur Foundation, *Cities & Circular Economy for Food* (2019). On their current track these three sectors alone would overshoot the 2050 annual carbon budget.

<sup>14</sup> Ellen MacArthur Foundation, World Economic Forum and McKinsey & Company, *The New Plastics Economy: rethinking the future of plastics* (2016)

<sup>15</sup> Ellen MacArthur Foundation, *A New Textiles Economy: redesigning fashion's future* (2017)

<sup>16</sup> Ellen MacArthur Foundation, *Cities and Circular Economy for Food* (2019)

# 1.2 The circular economy is crucial to deliver on climate and many other ESG goals

**Today’s take-make-waste economy is hugely wasteful, and its shortcomings are becoming more apparent by the day.**

We take finite resources from the ground to make products, which we use for often a short time, and then throw away. In a business-as-usual scenario, this linear model will lead to a doubling of global material

extraction between 2015 and 2060.<sup>25</sup> Such an extractive economy amounts to billions of dollars of value being wasted in raw materials and energy, underutilised assets, and disposal costs. Alongside resulting in significant economic value loss, this system aggravates many global challenges, such as climate change and pollution. Figure 1 shows how the current take-make-waste economy plays out in three key sectors.

## Box 1: The concept of a circular economy

Moving past the current take-make-waste extractive linear model, a circular economy aims to redefine growth, focusing on positive society-wide benefits. It entails gradually decoupling economic activity from the consumption of finite resources. Underpinned by a transition to renewable energy sources, it is based on three principles: design out waste and pollution; keep products and materials in use; and regenerate natural systems.

Transitioning to a circular economy not only addresses the negative impacts of the linear economy, but more importantly it represents a systemic shift that builds long-term resilience, generates business and economic opportunities, and provides environmental and societal benefits.

The concept recognises the importance of the economy

working effectively at all scales, and creating an economy that is distributed, diverse, and inclusive.

The circular economy spurs innovation and creates value through a range of strategies and levers, including product redesign for longevity and repairability, digital-enabled resale and sharing platforms, remanufacturing,

material innovation, and regenerative farming.

The Appendix provides an overview of large corporates and innovators that are already using the circular economy to create value. Table 1 provides an example of how the circular economy can create value in the plastic packaging value chain.

FIGURE 1

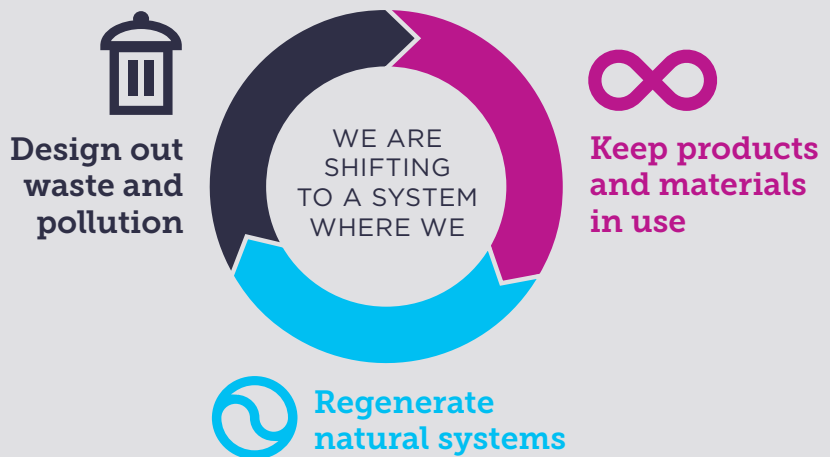


FIGURE 2

## The circular economy plays a vital part in reducing the 45% of global GHG emissions associated with making products and growing food



Source: Ellen MacArthur Foundation, Material Economics, *Completing the Picture: how the circular economy tackles climate change* (2019)

### The circular economy is key to achieving climate targets, as it reduces GHG emissions associated with making products and growing food.

Energy efficiency and moving to renewable energy can address 55% of global GHG emissions.<sup>26</sup> To address the remaining 45% of emissions (22.1 billion tonnes of CO<sub>2</sub>e per year),<sup>27,28</sup> we also need to transform how we design, make, and use products and food (Figure 1). Adopting circular economy principles in just five key areas (steel, cement, aluminium, plastics, food) could achieve a reduction totalling 9.3 billion tonnes of CO<sub>2</sub>e in 2050, which is the equivalent to eliminating current emissions from all forms of transport globally.<sup>29</sup> Concrete circular activities include designing for durability and remanufacturing, reusing products and components, recycling materials, and implementing regenerative cropland approaches. As signalled at COP25 and already demonstrated by revised Nationally Determined Contributions (NDCs), the integration of circular economy strategies can play an important role in finding more comprehensive solutions to reducing

emissions and achieving climate targets.<sup>30</sup> Suggested strategies in ten key sectors can be found in the Appendix.

### By redesigning production and consumption systems, the circular economy also contributes to tackling pollution, enhancing biodiversity, and achieving other UN Sustainable Development Goals (SDGs).

It has been shown that applying circular economy principles can improve air quality, reduce water contamination, and enhance biodiversity.<sup>31</sup> For example, in a circular economy, materials, products, and systems in the plastics and packaged goods sector are designed to eliminate ocean pollution at source. In the fashion sector, circular business approaches, such as resale and subscription models, increase clothing utilisation rates and thereby reduce the amount of water needed for production and decrease industrial water pollution from the dyeing and treatment of new textiles.<sup>32</sup> In agriculture, regenerative practices<sup>33</sup> can reverse soil depletion, enhance food security, and improve the nutrient content of food.<sup>34</sup>

# 1.3

## The circular economy presents a multi-trillion-dollar economic opportunity

**The circular economy offers significant new and better growth opportunities, over and above providing a viable and positive way to address ESG concerns.**

In China, circular economy opportunities in the built environment, mobility, nutrition, textiles, and electronics sectors could save businesses and households around CNY 70 trillion (USD 10 trillion or 16% of China's projected GDP) by 2040.<sup>35</sup> In Europe, moving towards a circular economy could yield annual benefits of up to EUR 1.8 trillion (USD 2.1 trillion) by 2030 by reducing annual primary resource costs, other household and government expenditures, and negative externalities in the mobility, food, and built environment sectors.<sup>36</sup>

**The circular economy offers tangible new revenue and cost saving opportunities for business.**

For example, by refurbishing used parts and remanufacturing engines, Renault offers remanufactured components and spare parts with as-good-as-new warranties to customers for prices that are 30–50% lower than for new replacement parts.<sup>37</sup> Veolia generated EUR 4.8 billion (USD 5.6 billion) in 2018, the equivalent of 50% of its waste revenues, from circular economy activities including recycling, biogas, and wastewater recycling.<sup>38</sup> Danone has enhanced its supply resilience by investing in regenerative agriculture,<sup>39</sup> which has also helped it to meet demand from younger generations who are increasingly interested in where and how their food is grown.<sup>40</sup>

**The circular economy can help create value and manage risks for entire value chains and industries.**




Plastics and packaged goods provide a good example, as shown in Table 1. In fashion, the resale market grew 25 times faster than the broader retail sector in 2019.<sup>41</sup> Meanwhile electronics and technology companies, such as Philips,<sup>42</sup> have already seen strong results through their circular economy initiatives. Moreover, predictions indicate that circular economy approaches could stimulate employment, for example it is estimated that the circular economy in Britain could create over half a million jobs by 2030 through activities such as resale, remanufacturing, and recycling.<sup>43,44</sup>

**As an industrial transformation, the circular economy is a source of new and better growth and value creation.**

The circular economy presents a vision for reshaping entire industries towards long-term value creation. For example, Balbo Group, the leading organic sugarcane producer in Brazil, has demonstrated how shifting to regenerative agricultural practices, – including restoring nutrients to the soil, eliminating chemical inputs, increasing biodiversity, and up-skilling workers – leads to ESG best practice while improving yields by 20% compared to conventional sugarcane production.<sup>45</sup> Driving such an industrial transformation, the circular economy boosts innovation, creates business opportunities, and enhances resilience, providing a strong economic rationale that goes beyond ESG.

TABLE 1

## Overview of risks linked to the current linear system, and circular economy value creation opportunities in the plastic packaging value chain

	Risks linked to the current linear system	Circular economy value creation opportunities
 <p><b>Raw material producers, packaging producers, and suppliers to the plastics industry</b></p>	<p><b>Stricter regulation</b> including taxes (e.g. as of 2021 the EU will introduce a tax on non-recycled plastic packaging waste),<sup>46</sup> mandatory design measures, and recycled content requirements (e.g. 25% for PET bottles by 2025 in EU).<sup>47</sup></p> <p><b>Investor pressure</b> e.g. the shareholder advocacy group As You Sow filed plastics-related resolutions at the 2019 annual shareholder meetings for DowDuPont, Chevron, ExxonMobil and others.<sup>49</sup></p> <p><b>Downside earning risk</b> due to the lack of adaptation to the changing demand and needs of Fast-Moving Consumer Goods companies (FMCGs) and retailers, e.g. Unilever pledged to halve its virgin plastics use by 2025.</p> <p><b>Stranded assets risk</b> as supply chain dynamics are changing (see Box 2).</p>	<p><b>Innovation and growth opportunity</b> for suppliers who can provide the solutions needed by FMCGs and retailers, e.g. demanded by companies representing 20% of all plastic packaging produced globally (including Ahold-Delhaize, Coca-Cola, Colgate, Mars, Mondelez, PepsiCo, Walmart) that have signed up to the vision of a circular economy for plastic, and 2025 targets, through the New Plastics Economy Global Commitment.<sup>48</sup></p> <p><b>Future-proofing the supply chain</b> by investing in long-term growth, e.g. global plastics producer Borealis acquired several plastics recyclers.</p> <p><b>Anticipation of stricter regulation</b> e.g. on mandatory recycled content targets.</p> <p><b>Delivering on climate change</b> objectives, e.g. GHG emissions reduction through recycling (in a business-as-usual scenario the plastics sector will account for 15% of the global annual carbon budget by 2050).<sup>50</sup></p>
 <p><b>Packaged goods companies, retailers, and hospitality and food service companies</b></p>	<p><b>Risk to brand and social license to operate</b> due to increased customer awareness about plastic pollution, with clean-ups and brand audits exposing the world's largest brands.</p> <p><b>Stricter regulation</b> including plastic bans, extended producer responsibility (EPR) (e.g. 63 countries had EPR measures in place in 2018,<sup>51</sup> such as product take-back schemes, deposit-refund, and waste collection; the new EU EPR schemes for certain single-use plastic products cover costs of collection, awareness raising, clean-up, reporting), mandatory design measures, and recycled content requirements.<sup>52</sup></p> <p><b>Investor pressure</b> Nearly a third of both Starbucks' and McDonald's shareholders supported resolutions by As You Sow to phase out the use of plastic straws and polystyrene cups, and to develop plans to meet packaging reuse and recycling goals.<sup>54</sup></p>	<p><b>Innovation and growth opportunity</b> by responding to customer demand, e.g. new delivery models, reusable packaging, alternative materials.</p> <p><b>Brand differentiation</b> by being perceived as leader in eliminating plastic pollution.</p> <p><b>Anticipation of stricter regulation</b> e.g. on mandatory recycled content targets.</p> <p><b>Delivering on climate change</b> objectives and net-zero strategies, e.g. Unilever, Danone, and other major corporations teamed up to share ways of cutting emissions, to which reusable packaging and recycled plastics can contribute greatly by retaining embodied energy.<sup>53</sup></p>
 <p><b>Collection, sorting, and recycling industry</b></p>	<p><b>Stricter regulation</b> landfill bans/taxes, incineration taxes, waste import restrictions (e.g. China's 2017 National Sword Policy effectively banning a wide variety of waste imports, including plastics such as PET, PE, PVC, and PS).<sup>55</sup></p>	<p><b>Innovation and growth opportunity</b> by responding to the demand and needs of FMCGs and retailers, in particular on supplying high-quality recycled material, e.g. Nestlé is committing up to CHF 2 billion (USD 2.1 billion) by 2025 to source food-grade recycled plastic.</p> <p><b>Enhancing resilience of supply chains</b> e.g. by anticipating stricter regulation such as increased compliance costs or import bans.</p>



# 2

## The circular economy transition is happening

More and more companies across industries are adopting circular principles to reduce costs, increase revenues, and manage risks. Governments are accelerating this shift, while megatrends such as shifting demographics, digitalisation, and resource scarcity are reinforcing the transition to a circular economy.



# 2.1

## More and more companies are already innovating towards the circular economy to reduce costs, increase revenues, and manage risks.

### Large corporates are making bold commitments and taking action in line with circular economy principles.

Unilever has pledged to halve its virgin plastics use by 2025 and Solvay has set a goal to more than double the sales of products based on renewable or recycled resources to 15% of its turnover.<sup>56</sup> According to a Gartner study, 70% of supply chain leaders are planning to invest in the circular economy in 2020-2021.<sup>57</sup> A number of companies are also taking concrete action and implementing circular business models. For example, Cisco operates a Takeback and Reuse Program which, through encouraging cycles of use, has created subscription revenue for the company in different markets.<sup>58</sup> Caterpillar, through its Cat Reman programme, reduces owning and operating costs by providing same-as-new quality components at a fraction of the cost of a new part.<sup>59</sup> Other innovative examples of circular economy principles being put into practice across a range of sectors can be found in the Appendix.

### As these efforts are scaling up, the circular economy has started transforming entire industries.

In fashion, for example, clothing resale is expected to be bigger than fast fashion by 2029.<sup>60</sup> Early insights also suggest that resale models have been more resilient during the Covid-19 crisis, with the online second-hand market set to grow 69% between 2019 and 2021, while the broader retail sector is projected to

shrink by 15%.<sup>61</sup> In plastics, the New Plastics Economy Global Commitment unites companies representing 20% of all plastic packaging produced globally – as well as governments, industry associations, investors, and other organisations – behind a common vision and a set of agreed actions and targets for 2025 to address plastic pollution at its source and targets for 2025 (See ‘The circular economy has started transforming entire industries’ infographic on the following page).<sup>62</sup>

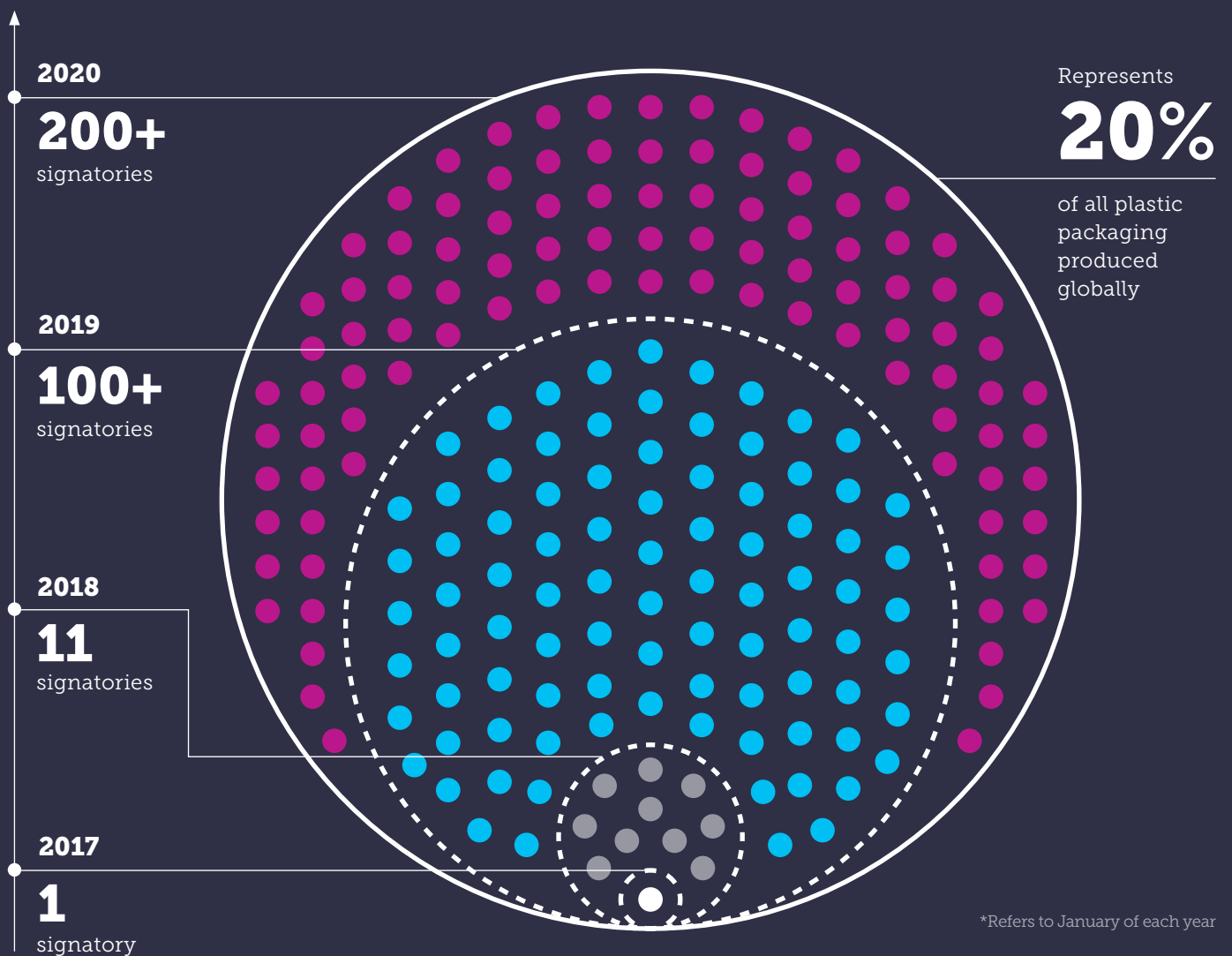
### Governments are increasingly recognising the potential of the circular economy framework to encourage competitiveness, develop more resilient supply chains, and deliver on societal and environmental objectives.

The number of regulations and policy initiatives geared towards the circular economy is rising quickly. Examples include national roadmaps and circular economy legislation in Chile, China, Finland, France, and the Netherlands. In 2019, the European Commission presented the European Green Deal, of which the circular economy is a key pillar, and in early 2020 it published the *Circular Economy Action Plan*, which includes a detailed set of measures to be implemented over the next five years.<sup>63</sup> In 2018, China and the European Commission signed a memorandum of understanding on circular economy collaboration. In 2019, the UN 4th Environmental Assembly saw the adoption of a resolution on sustainable consumption and production which explicitly references the circular economy as a key delivery mechanism.<sup>64</sup>

FIGURE 3

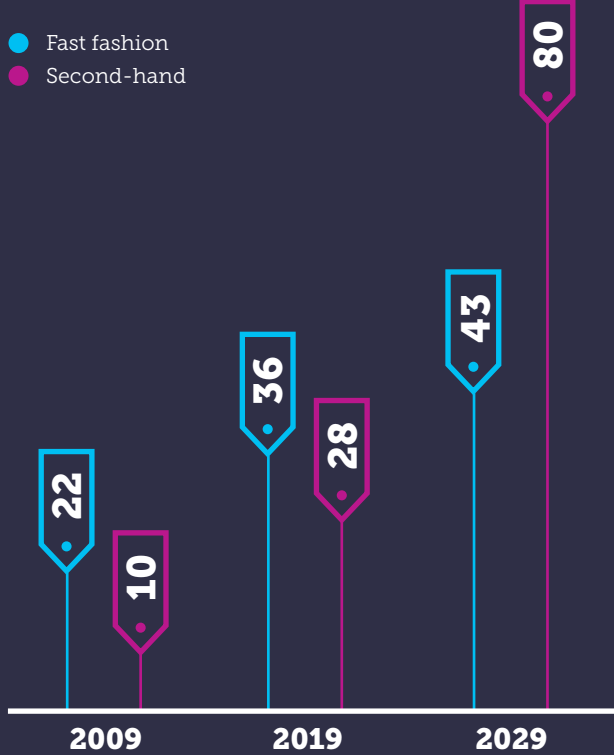
# The circular economy has started transforming entire industries

Number of companies globally with transformative 2025 plastics circularity commitments grew from 1 to over 200 in just 3 years\*



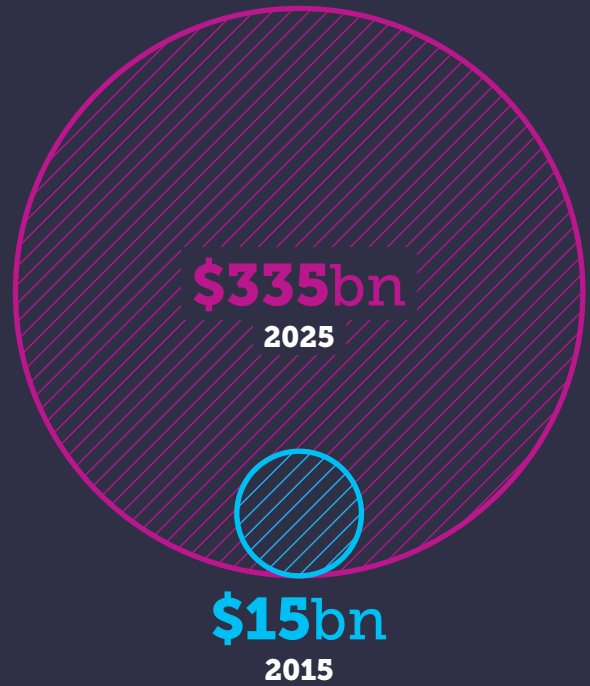
Source: Ellen MacArthur Foundation, New Plastics Economy initiative, *Global Commitment: 2019 progress report* (2019)

**Resale expected to be bigger than fast fashion by 2029**  
(USD billion)



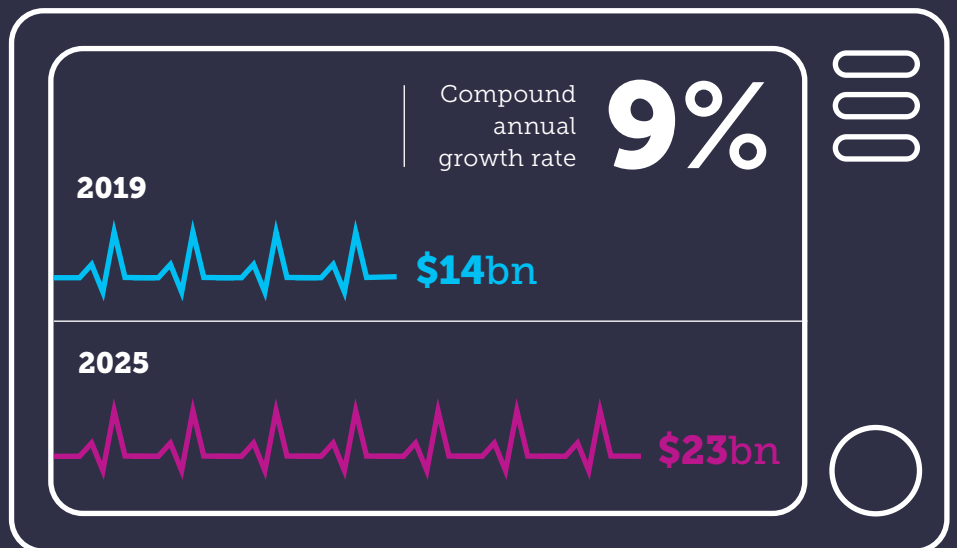
Source: thredUP (GlobalData Market Sizing), thredUP 2020 Resale Report (2020)

**The sharing economy market is expected to grow twentyfold by 2025** (USD billion)



Source: PwC, *The Sharing Economy* (2015)

**The refurbished medical equipment market is expected to nearly double by 2025**  
(USD billion)



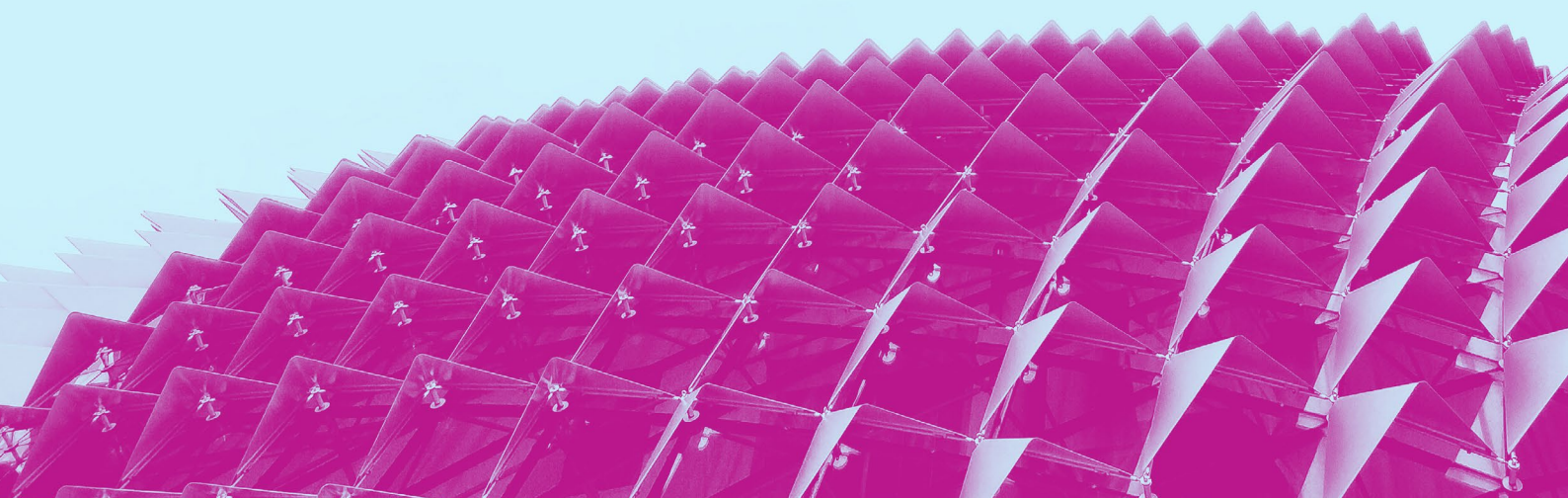
Source: Research&Markets, *Refurbished Medical Devices Market Research Report by Product - Global Forecast to 2025 - Cumulative Impact of COVID-19* (2020)

TABLE 2

## Overview of initiatives aiming to define, measure or disclose circular economy activities

- 1** The circular economy is one of the six key environmental objectives of the upcoming **EU Taxonomy** on sustainable finance, which aims to create the first widely accepted 'green list' for investors of sustainable economic activities. A circular economy **Categorisation System** has been proposed by an expert group to contribute to this work.<sup>65</sup> The importance of the taxonomy was reinforced by the adoption of Taxonomy Regulation by the European Parliament in June 2020.<sup>66,67</sup>
- 2** The Ellen MacArthur Foundation's **Circulytics** is the most comprehensive company-level circularity measurement tool to date, revealing the extent to which a company has achieved circularity across its entire operations.<sup>68</sup>
- 3** The **New Plastics Economy Global Commitment Annual Progress Report** provides an unprecedented level of transparency on how 200+ industry signatories are progressing towards a circular economy for plastics.<sup>69</sup>
- 4** Circular economy is one of the seven system transformations which the **World Benchmarking Alliance** will use to benchmark 2,000 keystone companies on the SDGs.<sup>70</sup>
- 5** The **Global Reporting Initiative** updated their Waste Reporting Standard 306 in May 2020 to include circular economy principles.<sup>71</sup>
- 6** The **Materials Circularity Indicator**, developed by The Ellen MacArthur Foundation and Granta Design, is an assessment tool which allows companies to improve product design and material procurement by identifying additional circular value.<sup>72</sup>
- 7** The **Circular Transition Indicators** by the World Business Council on Sustainable Development is a self-assessment framework for companies to help them understand the circularity performance of their material flows and energy consumption.<sup>73</sup>

Definitions and metrics like the ones above can inform and reinforce other key initiatives (e.g. SASB,<sup>74</sup> TCFD,<sup>75</sup> and CDP<sup>76</sup>), help harmonise non-financial metrics and reporting, and aid investors in assessing the opportunities and risks of transitioning from today's linear system to a circular economy.



# “Millennials increasingly prefer access over ownership for items including cars, music, and luxury goods, and their growing awareness of environmental and social issues is changing purchasing patterns and brand loyalty dynamics”

**Several megatrends are accelerating this inevitable shift away from today’s linear model to the circular economy.**

The impacts of climate change, biodiversity loss, resource scarcity, waste, and pollution point to the urgent need for a system change. Moreover, shifting demographics and customer demands are creating strong pull factors for the circular economy transition. For example, urbanisation leads to higher population density, enabling more effective circulation of goods and materials. Studies also show that millennials increasingly prefer access over ownership for items including cars, music, and luxury goods, and that their growing awareness of environmental and social issues is changing purchasing patterns and brand loyalty dynamics.<sup>77</sup> Digitalisation, automation, artificial intelligence, and other innovations open up new circular economy opportunities, such as digital-enabled sharing and resale platforms, and decentralised production using 3D printing.

**The Covid-19 crisis has shown how vital the transition to the circular economy is.**

The early stages of the crisis highlighted the fragility of many global supply chains, this was not limited to but illustrated by medical equipment availability issues. In this specific case, circular principles provide credible solutions: design and product policy factors such as repairability, reusability, and potential for local remanufacturing offer considerable opportunities in resilience (stock availability) and competitiveness.

The circular economy offers the potential to rebuild at lower cost, reduce the likelihood of future shocks, and create greater resilience within industry and society, which is valuable beyond the current situation.<sup>78</sup> In June 2020, more than 50 CEOs and other influential individuals signed a joint statement published in the *Financial Times* endorsing the circular economy as a solution to better growth.<sup>79</sup>

# 3



## The circular economy financing market is taking off

The last 18 months have seen a steep increase in the creation of debt and equity instruments related to the circular economy across private and public markets. These initial products and services indicate how the circular economy can become a key driver of value creation for investors, banks, and other financial services firms.

# 3.1

## Financial services activity in the circular economy has risen steeply recently

**The past three years have seen significant growth in capital market circular economy activity, particularly in the last 18 months.**

The number of public equity funds investing in the circular economy grew from one in 2018 to ten by the middle of 2020, including funds managed by some of the world's largest asset managers, including BlackRock, Credit Suisse, and Goldman Sachs (Figure 4). The investable universe is expanding as existing publicly listed companies adopt circular economy principles and new entrants emerge, such as the online luxury fashion resale platform

The RealReal, which raised USD 300 million in an initial public offering (IPO) in 2019.

**Similar growth patterns can be seen on the fixed-income side.**

In the last 18 months, at least ten corporate bonds were issued with part of the proceeds available to be used for circular activities, totalling over USD 10 billion, and involving leading investment banks including Barclays, BNP Paribas, Deutsche Bank, Goldman Sachs, HSBC, Intesa Sanpaolo's Banca IMI, Mizuho Financial Group, Morgan Stanley, Rabobank, and Société Générale, among others (Figure 5).

**“The investable universe is expanding as existing publicly listed companies adopt circular economy principles and new entrants emerge”**

**Early-stage and growth-stage investing, including venture capital, private equity and private debt, have also seen a rapid acceleration of circular economy activity.**

The number of private market funds with a circular economy focus has grown tenfold since 2016, and start-ups developing plastic alternatives have raised more than USD 850 million in funding in the last three years (Figure 6).<sup>80</sup> Significant financing has also been raised in the last three years for circular economy projects on the US private activity bond market, including over USD 500 million for projects turning agricultural by-products into commercial products.<sup>81,82</sup>

**Bank lending, project finance, and insurance also show evidence of increasing circular economy activity.**

Although the level of activity is harder to assess based on publicly available data, there seems to be a shift occurring. A range of banks have become active in financing circular companies, including a EUR 5 billion (USD 5.9 billion) credit facility by Intesa Sanpaolo; a 2020 financing target of EUR 1 billion (USD 1.2 billion) by ABN Amro; and dedicated lending programmes by ING and Rabobank. In addition, there has been a rise in private and blended instruments to fund infrastructure for the circular economy, as well as new insurance solutions for sharing models offered by

both large institutions, such as AXA, and innovative start-ups.

**Governments, multilateral development banks (MDBs), and development finance institutions (DFIs) around the world are financing circular economy opportunities.**

The China Development Bank has helped finance the Qaidam Circular Economy Pilot Zone, which includes CNY 400 billion (USD 56 billion) for the construction of six industrial bases.<sup>83</sup> The circular economy is a key pillar of the EU Commission's EUR 1 trillion (USD 1.2 trillion) EU Green Deal Investment Plan.<sup>84</sup> The European Investment Bank (EIB) has provided almost EUR 2.5 billion (USD 2.9 billion) in lending for circular projects over the last five years, as well as a EUR 100 million (USD 118 million) commitment in the European Circular Bioeconomy Fund, and it has launched, together with five European national promotional banks and institutions, a EUR 10 billion (USD 11.8 billion) loan and investment initiative dedicated to the circular economy.<sup>85</sup> The Australian government, through public body CEFC, has implemented a AUD 100 million (USD 71 million) Australian Recycling Investment Fund to invest in projects aligned with the principles of a circular economy.<sup>86</sup>

See Chapter 4, for a more comprehensive overview of existing circular economy instruments and services across investing, banking, and insurance.

**“In the last 18 months, at least ten corporate bonds were issued with part of the proceeds available to be used for circular activities, totalling over USD 10 billion”**



FIGURE 4

### Number of public equity funds with a circular economy focus

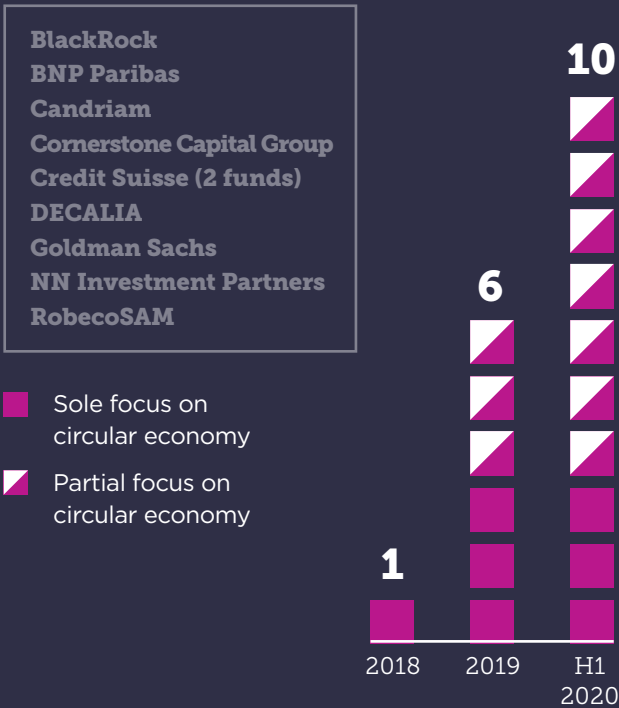


FIGURE 5

### Number of outstanding corporate bonds with a circular economy focus

Conservative estimate

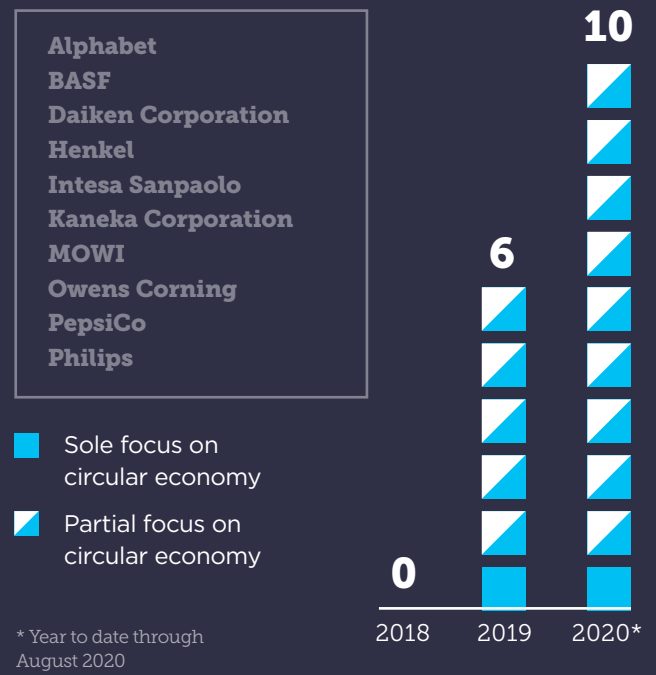
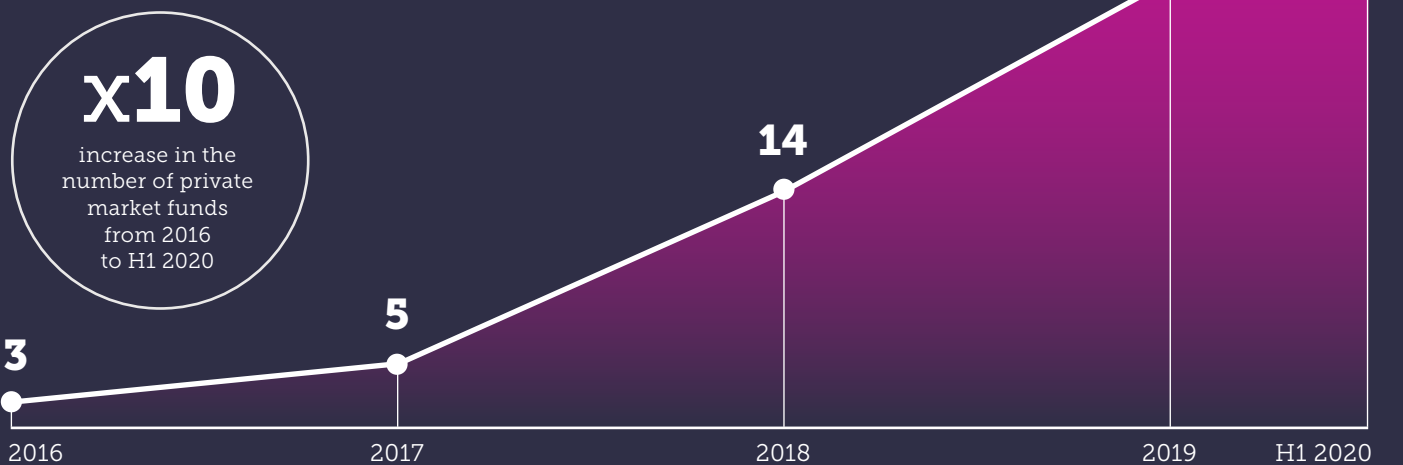


FIGURE 6

### Number of private market funds with a circular economy focus

Conservative estimate. Includes venture capital, private equity, and private debt funds



Source: Ellen MacArthur Foundation

## 3.2 Early examples indicate how the circular economy transition is already creating value for financial services

Evidence on performance is only beginning to emerge and the track record is still limited, yet initial products and services give a good indication of how the circular economy can become a value driver for the financial sector.

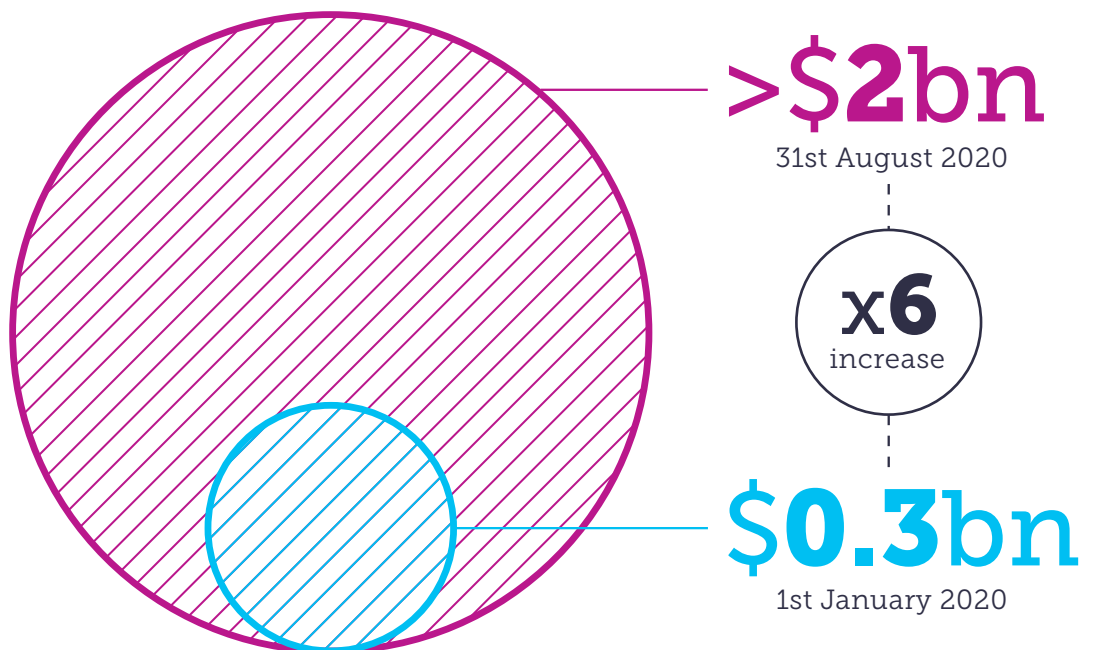
### 3.2.1 Attract inflows

**Early evidence suggests that circular economy funds can meet client demand for investment strategies that seek competitive returns while benefiting society and the environment.**

Albeit starting from a low base, the total amount of assets managed through public equity funds with the circular economy as a sole or partial investment focus increased sixfold since the beginning of 2020, from USD 0.3 billion to over USD 2 billion (see Figure 7).<sup>87</sup>

FIGURE 7

**Assets managed through public equity funds with a circular economy focus increased sixfold in the first eight months of 2020**



Source: Ellen MacArthur Foundation

## 3.2.2

### Generate financing and advisory business

**Circular economy expertise and products are becoming key draws for CEOs and boards, and will help engage corporate and institutional clients.**

Hundreds of companies – including large global corporates such as Alibaba, Coca-Cola and Philips – are adopting circular economy principles, often with direct implications for their operations, supply chains, and financing needs. Transforming production lines, business models, and material use can require significant investment. For example, Nestlé have committed up to CHF 2 billion (USD 2.2 billion) by 2025 to shift from using virgin plastic to sourcing food-grade recycled plastic.<sup>88</sup> Circular business models, such as product-as-a-service or sharing models, affect cash flow profiles and balance sheets in a different way from ownership-based models. Renault have taken advantage of this by offering battery leasing arrangements for electric vehicles and launching ZITY, an all-electric car-sharing service.<sup>89</sup> Keeping assets in use through reselling, from building materials to fashion items, requires assessments of residual value and the existence of functioning marketplaces. For example, in Brazil HP partners with Sintronics to recover and create value out of HP end-of-use electronic equipment, which enables their clients to reduce costs by up to 30%, and results in 97% of the collected materials and components being returned into the supply chain.<sup>90</sup> Innovative cross-value chain partnerships can also present questions on liabilities and value distribution, requiring particular expertise.

Many leading global banks have already published thought leadership pieces on the circular economy, and have started supporting clients in their transition through expert advisory services, capital raising, and direct financing and investment dedicated to this topic. Examples include tailored products and technical and financial advisory support by ABN Amro, BNP Paribas, EIB Advisory, ING, Intesa Sanpaolo (e.g. through its Circular Economy Lab), and Rabobank, among others. Goldman Sachs has made the circular economy one of the key pillars in its USD 750 billion sustainable finance target, while Morgan Stanley has made a Plastic Waste Resolution to prevent, reduce, and remove 50 million tonnes of plastic waste from entering the environment by 2030, through providing structured products, financing, and advisory for plastics innovation, among other initiatives.

**“Hundreds of companies are adopting circular economy principles, often with direct implications for their operations, supply chains, and financing needs”**

### 3.2.3

#### Offer competitive risk-adjusted returns

**By adopting circular principles companies can generate new sources of revenue, reduce costs, spur innovation, and mitigate certain risks.**

Circular business models create value in a number of key ways, including:

- Resource productivity and cost savings: e.g. Rolls Royce's 'Power-by-the-Hour' engine maintenance management approach enables up to 95% of used engine parts to be recovered or recycled<sup>91</sup>
- Valorisation of by-products: e.g. AB Inbev turns brewing by-products into protein-rich food products<sup>92</sup>
- Innovation and new markets: e.g. by offering an IoT-enabled 'printing-as-a-service' subscription model, HP taps into a new market, while facilitating closed-loop recycling of cartridges<sup>93</sup>

Adapting business models in line with circular principles can also help reduce linear risks, such as supply chain disruptions or volatility of resource prices.<sup>94</sup>

**Early adopters of circular principles can gain competitive advantage in the circular economy transition.**

For example, as plastic pollution is driving stricter regulation and changing customer demand, FMCGs and retailers are responding. Their public commitments and targets on, for example, the elimination of problematic packaging, reduction of virgin plastics demand or increased use of recycled content, directly affect both upstream material and packaging suppliers, and the downstream collection, sorting, and recycling industry. Companies capable of offering circular solutions, such as reusable packaging or food-grade recycled plastics, are better adapted to these changing supply chain dynamics, whereas those operating in a linear way can be exposed to greater risks, such as bans on single-use plastics or stranded assets (see Table 1 and Box 2).

**Early indications suggest that circular economy research and analysis could help generate excess returns.**

While it is early days and care should be taken not to draw definite conclusions from returns in a short time period, the first half of 2020 gives an indication of the potential for circular economy investments to outperform their benchmarks. From the start of January to the end of June 2020, public equity funds with the circular economy as a sole or partial investment focus on average performed 5.0 percentage points better than their Morningstar category benchmarks.<sup>95</sup> Future research should look into whether this outperformance persists over time, and seek to better understanding the underlying drivers.

**5.0**  
percentage points

**Public equity funds with the circular economy as a sole or partial investment focus on average performed 5.0 percentage points better than their benchmarks in H1 2020**

Source: Ellen MacArthur Foundation

## Box 2: The risk of stranded assets in a changing plastics industry

Petrochemicals are rapidly becoming the largest driver of global oil consumption, as demand for fossil fuels is flatlining due to the shift towards renewable energy, energy efficiency, and electrification. Current industry forecasts predict that petrochemicals will account for nearly half of the growth in oil demand in the run-up to 2050.<sup>96</sup> Responding to these forecasts, the US chemical and plastics industry has invested extensively in new production capacity, with cumulative investment in this area surpassing USD 200 billion since 2010. The industry is estimated to spend a further USD 400 billion on 80 million

tonnes of new capacity between 2020 and 2024.<sup>97</sup>

At the same time, plastic pollution has captured the attention of the public and governments around the world, resulting in the rapid scaling of corporate action, stricter regulation, and shifts in customer behaviour.

The corporate signatories of the New Plastics Economy Global Commitment, representing over 20% of the global plastic packaging market, have set ambitious targets to redesign their packaging by 2025. Just one of these targets – increasing the use of recycled content – is expected to reduce

virgin plastics demand by 5.5 million tonnes within this timeframe.

Meanwhile, according to McKinsey, demand growth for polymers based on virgin feedstock could evolve closer to 1% a year than the 4% a year that has been used in other demand forecasts.<sup>98</sup>

These two opposing trends, i.e. the continued expansion of virgin plastic production capacity and the ongoing transformation of the plastic packaging sector towards a circular economy creating the potential for much lower demand growth, suggest an increase in the risk of over capacity and virgin plastic production assets becoming stranded.<sup>99</sup>

### 3.2.4

#### Deliver on climate change and ESG objectives

##### **The circular economy can help financial institutions meet their ESG commitments and regulatory requirements.**

As well as tackling both the causes and effects of climate change, the circular economy contributes to addressing many other environmental issues, such as biodiversity loss, social depletion, natural resource scarcity, pollution, water contamination, and waste. Taking a circular economy lens can also help achieve goals related to social and governance topics, including the creation of local jobs, upskilling opportunities, tackling inequality and value distribution in the economy, and supply chain transparency.

### 3.2.5

#### Present an inspiring vision for the future of the economy and the role of finance

##### **The circular economy offers employees, investors, and other stakeholders a positive new narrative and direction for the economy.**

The circular economy provides a vision for long-term value creation and enhanced resilience, as well as tangible positive outcomes such as job creation and upskilling opportunities, liveable cities, and biodiversity. For example, a 2015 study by WRAP and Green Alliance showed that an ambitious plan to move to a circular economy in Britain could create over half a million jobs by 2030, and potentially offset around one-fifth of the expected future losses in skilled employment, helping to address structural unemployment in badly affected regions.<sup>100</sup>

##### **The circular economy vision can also inspire and inform the financial services sector to develop its role as a positive force in society.**

The principles of the circular economy can ultimately inform a reshaping of the financial sector itself, so it is geared towards long-term value creation and the enablement of an economy that is distributed, diverse, and inclusive.

TABLE 3

## The circular economy can help financial services firms deliver on regulators' expectations regarding climate change

Example based on the July 2020 letter on climate change to finance CEOs by Bank of England Deputy Governor Sam Woods<sup>101</sup>

Bank of England's expectations on climate change	How the circular economy can help firms deliver on expectations
<b>Strategic responses</b>	The circular economy can <b>inform strategies and decision-making processes</b> regarding climate change responses, as it combines concrete actions to address 45% of global GHG emissions with a more fundamental rethink of our economic model that goes beyond most current net-zero strategies
<b>Oversight of climate-related financial risks</b>	Driving an industrial transformation, the circular economy provides a lens that can help <b>identify and improve understanding of relevant risks</b> (e.g. stranded assets in plastics production, impact of stricter regulation in various industries)
<b>Metrics and quantification</b>	<b>Measuring circularity</b> , such as through the Circulytics tool, will help capture the full potential of the circular economy lens <sup>102</sup>
<b>Risk management processes</b>	The circular economy can <b>inform part of the dialogue between financial services firms and their clients</b> about the risks they are exposed to
<b>Scenario analysis</b>	The circular economy can <b>inform scenario analyses on more fundamental solutions</b> , such as the redesign of products and services, that complement the current focus on supply-side changes, with demand-side measures (e.g. car electrification versus car-sharing models)
<b>Disclosure</b>	Integrating circular economy concepts into the way firms view risks and how these can be mitigated, can <b>strengthen existing disclosure initiatives</b> , such as TCFD

**“The principles of the circular economy can ultimately inform a reshaping of the financial sector itself, so it is geared towards long-term value creation and the enablement of an economy that is distributed, diverse, and inclusive”**



# 4

## How financial services firms can seize the circular economy opportunity

The financial sector can already capitalise on the circular economy opportunity by leveraging or adapting existing products and services. An early track record of circular economy financing is driven by pioneering institutions, showing how many more opportunities can be seized. This chapter aims to provide inspiration by giving an overview of possible actions and examples across asset classes, product and service types, and sectors in the real economy.



# 4.1 Investing

## 4.1.1 Equity and debt capital markets

Actions to seize the circular economy opportunity, and examples in practice:

### Launch or invest in public equity funds

both active and passive, that invest in companies that adopt, enable or benefit from the circular economy.

- **BlackRock, Candriam, Cornerstone Capital, DECALIA, NN Investment Partners** and **RobecoSAM** offer actively managed circular economy public equity funds<sup>103,104,105,106,107,108</sup>
- **BNP Paribas** offers a circular economy-based ETF (exchange-traded fund), replicating the Circular Economy Leaders Equity Index built by ECPI<sup>109,110</sup>
- **Credit Suisse, Goldman Sachs, and Lombard Odier** offer actively managed public equity funds that invest in the circular economy (or elements of) and related areas (e.g. responsible production and consumption)<sup>111,112,113</sup>
- **MSCI** has introduced a circular economy and renewable energy listed equity index<sup>114</sup>

### Issue or invest in bonds or loans

that finance circular activity directly or enable companies to transition towards the circular economy, e.g. through green, social, sustainability(-linked), and (sustainable) transition bonds.

- **Alphabet's** USD 5.75 billion sustainability bonds to fund ongoing and new projects in eight focus areas, including the circular economy<sup>115</sup>
- **BASF's** EUR 1 billion (USD 1.2 billion) green bond finances projects focused on circular economy-adapted products, production technologies and processes, and renewable energy<sup>116</sup>
- **Daiken Corporation's** JPY 5 billion (USD 46 million) to fund circular measures, including reuse of construction materials and industrial by-products<sup>117</sup>
- **EBRD** issued a EUR 500 million (USD 591 million) Green Transition Bond with proceeds to be invested in projects including the implementation of circular principles in manufacturing (e.g. chemicals, cement, and steel production)<sup>118</sup>
- **EIB's** Sustainability Awareness Bonds can be allocated to lending activities contributing to the circular economy transition, waste prevention, and recycling<sup>119</sup>
- **Henkel's** USD 70 million plastic waste reduction bond to finance projects which contribute to its 100% reusable or recyclable target by 2025<sup>120</sup>
- **Intesa Sanpaolo's** EUR 750 million (USD 884 million) Sustainability Bond has been created to refinance its loans under its circular economy credit facility<sup>121</sup>

- **Kaneka Corporation's** JPY 5 billion (USD 46 million) to manufacture, research, and develop a bio-based polymer which contributes to the circular economy for plastics<sup>122</sup>
- **Mowi's** EUR 200 million (USD 236 million) bond to finance circular economy-adapted products, production technologies and processes, including circular packaging design<sup>123</sup>
- **Owens Corning's** USD 450 million bond to finance circular economy-adapted products, production technologies and processes, as well as renewable energy and energy efficiency projects<sup>124</sup>
- **PepsiCo's** USD 1 billion green bond to fund key initiatives including reducing its use of virgin plastics<sup>125</sup>
- **Philips' EUR 750 million (USD 884 million) green innovation bond** dedicated to, inter alia, the implementation of circular products and solutions<sup>126</sup>

### Require disclosure

of circular economy strategies and metrics, e.g. through the Circulytics measurement tool, the New Plastics Economy Global Commitment, or other relevant tools.

- **BNP Paribas Asset Management, EIB, Federated Hermes, ING, Legal & General Asset Management, Rathbone Greenbank Investments, Robeco, Sarasin & Partners, and Sustainalytics**, among others, endorsed the New Plastics Economy Global Commitment<sup>127</sup>
- **Federated Hermes** published a guide on investor expectations on plastics, linear risks and circular opportunities, including disclosure on plastics footprint and related progress (sourcing, design, recycling)<sup>128</sup>

### Engage companies and governments

governments in their transition as listed equity or debt holders through, e.g. stewardship and active ownership, voting, and resolutions aligned with circular economy principles; divesting or refusing to purchase new equity or debt linked to non-circular practices.

- **As You Sow's** Plastic Solutions Investor Alliance, with more than 40 members with USD 2.5 trillion AUM - including **Actiam, Aviva Investors, Candriam, Federated Hermes, and Robeco** - is actively engaging companies to adopt circular economy solutions to plastic pollution by calling for reduced usage of plastics, and plastic packaging to be recyclable, reusable or compostable.<sup>129</sup> Nearly a third of both Starbucks' and McDonald's shareholders supported resolutions by As You Sow to phase out the use of plastic straws and polystyrene cups, and to develop plans to meet packaging reuse and recycling goals<sup>130,131</sup>
- **EOS at Federated Hermes'** stewardship team has made pollution, waste, and the circular economy a key engagement theme<sup>132</sup>
- **Robeco** has an engagement programme on plastics, joined investor initiatives on this topic, and endorsed the New Plastics Economy Global Commitment<sup>133</sup>
- **Sustainalytics** initiated in 2019 a three-year Stewardship and Risk Engagement on Plastics and the Circular Economy to help investors understand the topic better, and to address the associated risks and opportunities<sup>134</sup>

- **UN PRI's** Plastic Investing Working Group consists of 32 global investors representing USD 6 trillion in assets, and is building an understanding of how plastics fit in with the broader circular economy concept.<sup>135</sup> UN PRI also have engagement tools and case studies for listed equity and fixed income ESG engagement which could be applied in a circular economy context<sup>136</sup>

## 4.1.2

### Private equity

Actions to seize the circular economy opportunity, and examples in practice:

#### Launch or invest in PE

that focuses on circular companies, or invest directly in private companies where circular economy is a core value driver.

- **Ambienta**, with EUR 1.5 billion (USD 1.8 billion) AUM, invests in and scales private growth-stage companies whose products and services improve resource efficiency and pollution control, including through the adoption of circular principles<sup>137</sup>
- **Archipelago Eco Investors** is establishing a PE Impact Fund with a target size of EUR 100 million (USD 118 million) and is aiming to invest in companies creating a circular economy for plastics<sup>138</sup>
- **Closed Loop Partners** has set up a PE Leadership Fund with a target size of USD 300 million, focused on acquiring companies in recycling, packaging, organics, fashion, and electronics to scale circular supply chains<sup>139</sup>
- **Circularity Capital's** GBP 60 million (USD 78 million) PE fund invests in growth-stage circular companies, such as Grover, Winnow and ZigZag Global, with investors including **Sitra, AXA Investment Management, BNP Paribas Fortis, and Philips**, among others<sup>140</sup>
- **European Circular Bioeconomy Fund** provides equity and mezzanine finance to allow circular companies and projects to scale-up from demonstration stage to industrialisation stage<sup>141</sup>
- **Taaleri's** Circular Economy PE Fund accumulated approximately EUR 40 million (USD 47 million) just six weeks after it was opened to investors in 2016, with commitments from over 370 investors<sup>142</sup>

#### Launch or invest in PE

in their transition to the circular economy as a value-creation strategy.

- **Korkia** manages and advises PE funds investing in the circular economy, including consulting on hands-on implementation for new growth<sup>143</sup>
- **Tesi**, which launched a EUR 75 million (USD 89 million) circular economy investment programme, engages with investee companies to remodel their business operations in line with circular principles<sup>144</sup>

## 4.1.3

### Venture capital and early-stage investing

Actions to seize the circular economy opportunity, and examples in practice:

#### Invest in early-stage circular innovators

covering the broad range of opportunities, including 'hard-tech' or CapEx-intensive ventures and innovations that require long-time horizons, such as breakthrough technology and science-based innovation.

- **Alante Capital** invests in innovators and market leaders to connect and scale emerging technologies for apparel production and retail<sup>145</sup>
- **Blue Oceans Partners** expands VC support to circular economy innovators that address the reuse, recycling, and replacement of plastics<sup>146</sup>
- **Closed Loop Partners**, through its second venture fund – Closed Loop Venture Fund II (targeting USD 50 million) – deploys early-stage capital for companies that increase the recycling of products and packaging<sup>147</sup>
- Angel investor networks, such as **Finnish Business Angels Network** and the **Green Angel Syndicate**, have financed circular start-ups, including Alusid and BuyMeOnce<sup>148,149</sup>
- The **Greater London Investment Fund**, a GBP 100 million (USD 131 million) fund of funds, aims to support economic growth and a circular economy ecosystem by providing loan and equity finance for early-stage circular businesses<sup>150</sup>
- **ING** committed EUR 100 million (USD 118 million) for circular economy 'scale-ups', including Black Bear Carbon, Milgro, and Zero Emission Services, or other innovative businesses with proven concepts which generate positive environmental impacts<sup>151</sup>
- **Prelude Ventures**, an evergreen venture capital fund with a longer investment time horizon, has funded circular innovators including AMP Robotics, Trove, and Pivot Bio<sup>152</sup>
- **Sky Ocean Ventures** invests in leading innovators across the plastics and packaging value chain, including those working in renewable materials and recycling technologies, with its GBP 25 million (USD 33 million) venture fund<sup>153</sup>

#### Drive new partnerships

within and beyond the private financial sector, including collaboration with public sector funders, philanthropic investors and large corporates, to develop a strong pipeline of circular investment opportunities across growth stages and value chains.

- **Breakthrough Energy Ventures**, a fund with more than USD 1 billion in committed capital, supports innovations that contribute to net-zero emissions, including circular innovation, by bringing together governments, research institutions, private companies, and investors<sup>154</sup>
- **Circulate Capital's** Ocean Fund is a blended financing mechanism, created in partnership with leading corporations and backed by USAID, which contributes more than USD 100 million capital for innovative companies that prevent plastic pollution and advance the circular economy<sup>155</sup>

- **Closed Loop Partners'** Center for the Circular Economy leads industry partnerships in pre-competitive collaboration for circular supply chain solutions across material types<sup>156</sup>
- **EIB and five European national promotional banks and institutions** launched the 'Joint Initiative on Circular Economy', a EUR 10 billion (USD 12 billion) circular economy initiative providing loans, equity investment or guarantees, and developing innovative financing structures for public and private projects<sup>157</sup>
- **EIB Group's InnovFin Advisory** developed the market case for the European Circular Bioeconomy Fund, a EUR 250 million (USD 295 million) venture capital fund aiming to invest in early stage innovative bioeconomy and circular bioeconomy companies and projects. The fund has risk-sharing features, including partial first loss guarantee to mobilise private investors. In August 2020, EIB made a EUR 100 million (USD 118 million) commitment in the fund<sup>158</sup>
- **MMC Ventures** is deploying a significant proportion of the GBP 52 million (USD 68 million) MMC Greater London Fund, backed by the London Waste & Recycling Board, into circular economy businesses<sup>159</sup>
- **Prime Coalition** partners with philanthropic investors to place catalytic capital into breakthrough climate ventures which address both energy and industrial emissions, including by implementing circular strategies<sup>160</sup>

### Develop expertise on circular innovation

focusing on opportunities and challenges, such as new business models with unconventional collaboration or different risk profiles.

- **BloombergNEF** calculated that circular economy VC funding was up 128% in March 2020 compared to March 2019<sup>161</sup>
- **Intesa Sanpaolo**, together with Fondazione Cariplo, launched the first Italian Circular Economy Lab, dedicated to promoting open innovation and supporting entrepreneurs to help the circular economy transition of the Italian industrial system<sup>162</sup>

### Provide corporate venture capital

to circular innovators and suppliers, or enable innovation to scale through partnerships, guaranteed off-take, offering new payment facilities or working capital solutions and providing expertise and access to supply chains and infrastructure.

- **Alibaba** has invested in circular innovators, including clothing rental platform YCloset<sup>163</sup>
- Global food and beverage brands such as **Coca-Cola** and **Nestlé** have co-funded the NextGen Cup Challenge for reusable cup solutions, managed by **Closed Loop Partners**<sup>164</sup>
- **H&M Co:LAB** has invested in circular start-ups in the fashion industry, including textile-to-textile recycler Worn Again, recycled fibres producer re:newcell, and re-commerce platform Sellpy<sup>165</sup>
- **Ingka Investments, IKEA's** investment arm, has invested in returns management start-up Optoro to help achieve their goal of becoming a circular business by 2030<sup>166</sup>

## 4.1.4 Project finance for long-term infrastructure and public services

Actions to seize the circular economy opportunity, and examples in practice:

### Fund or invest in projects

at all scales that install and scale physical and digital infrastructure for the circular economy, such as: reverse logistics, recycling capacity, digital platforms for product tracing, and 'Infra 3.0' delivery models, including distributed, digitised, pay-per-use or performance-based models for infrastructure or nature-based solutions.<sup>167</sup>

- **EIB** has provided almost EUR 2.5 billion (USD 3 billion) in lending for circular projects over the last five years, including collection and recycling capacity for Waste Electrical and Electronic Equipment (WEEE); and urban infrastructure integrating circular principles<sup>168</sup>
- **Generate Capital**, which secured more than USD 1 billion from global institutional investors in early 2020, builds, owns, operates, and finances infrastructure that is decentralised, modular, and resilient across renewable energy, mobility, water, waste, and agriculture (e.g. anaerobic digesters, precision agriculture, charging depots, microgrids)<sup>169</sup>
- **Indorama Ventures** has committed USD 1.5 billion to invest in plastics recycling infrastructure, including greenfield and brownfield mergers and acquisitions (M&A) investments focusing on bottle-to-bottle recycling<sup>170</sup>
- **Inter-American Development Bank** committed USD 1 billion in financing to support a public-private initiative to promote economic growth in the Caribbean by applying circular principles<sup>171</sup>
- **Spring Lane Capital** has raised over USD 150 million to provide deployment capital for 'distributed assets' in the energy, food, water, and waste industries, including commercial composting and distributed, service-based wastewater recovery solutions<sup>172</sup>
- **Ultra Capital** deployed USD 200 million with its first fund to finance circular economy infrastructure 'waste-to-value' projects (e.g. nutrient, plastic or textile recycling)<sup>173</sup>

### Drive new partnerships

beyond private finance, such as blended finance solutions, to make challenging projects investable.

- **Circulate Capital's** blended finance partnership with USAID will provide up to a USD 35 million, 50% loan-portfolio guarantee to incentivise private capital investment and new business development in the recycling value chain in South and Southeast Asia<sup>174</sup>
- **Closed Loop Partners** finances circular economy infrastructure for collection, sorting, processing, and end-product manufacturing across North America through its Closed Loop Infrastructure Fund, established and funded by the world's largest retail and packaged goods companies, and its Closed Loop Beverage Fund, funded by the members of the American Beverage Association<sup>175</sup>

### **Provide expert structuring and advisory services**

to enable the financing of challenging projects, such as the recurring operational expenditures of collection infrastructure.

- **Asian Development Bank** supports circular economy projects, including USD 150 million to fund, among other things, regenerative farming pilots and community-based circular economy initiatives in Pingjiang County, China; and USD 1.7 million to build infrastructure to reduce plastic pollution in Asia and the Pacific<sup>176,177</sup>
- **InnovFin Advisory**, a joint initiative from EIB and the European Commission, supports and guides companies on how to structure circular economy projects to improve access to finance<sup>178</sup>
- **Minderoo Foundation's** 'Sea The Future' project brings together financial, legal, and industry experts to fund market-led solutions to tackle plastic pollution<sup>179</sup>
- **Rabobank's** Circular Business Desk provides support and advisory services for entrepreneurs on financing circular business models<sup>180</sup>

### **Require the adoption of circular principles**

for the designing, building, and operation of portfolio infrastructure and real estate projects.

- **Delta Development Group**, with **ABN Amro** as a lender, embedded circular principles in the development of Park 20|20<sup>181</sup>

## **4.2 Banking and insurance**

### **4.2.1 Investment banking**

Actions to seize the circular economy opportunity, and examples in practice:

#### **Structure and underwrite IPOs**

of companies contributing to the circular economy.

- **Bank of America, Credit Suisse, and UBS** took part in underwriting the IPO of The RealReal, the online consignment luxury goods seller<sup>182</sup>

#### **Structure and underwrite fixed-income instruments**

that support companies and governments at different stages in their transition.

- **Banca IMI and Crédit Agricole CIB** acted as green structuring advisors and, together with ING and Société Générale, as bookrunners for Intesa Sanpaolo's EUR 750 million (USD 885 million) Sustainability Bond to refinance its loans under the circular economy credit facility<sup>183</sup>
- **Bank of America, Barclays, Citi, and HSBC** acted as joint bookrunners for EBRD's USD 500 million Green Transition Bond<sup>184</sup>

- **Citi** and **Stifel** priced USD 228 million of private activity revenue bonds for CalPlant's rice straw recycling plant<sup>185</sup>
- **HSBC** acted as lead structuring advisor for Henkel's USD 70 million plastic waste reduction bond<sup>186</sup>
- **ING** was Green Structuring Advisor for the issuance of BASF's EUR 1 billion (USD 1.2 billion) green bond, with **Barclays, BNP Paribas, Deutsche Bank, ING, SMBC Nikko Capital Markets Europe,** and **Société Générale** as joint bookrunners<sup>187</sup>
- **Morgan Stanley, Goldman Sachs,** and **Mizuho Financial Group** underwrote PepsiCo's USD 1 billion bond deal, with Morgan Stanley as the structuring advisor and lead underwriter<sup>188</sup>
- **MUFG** worked as bookrunner for Philips' green innovation bond, together with **Rabobank, ABN Amro, BNP Paribas, Deutsche Bank, HSBC, ING, Mizuho Securities,** and **UBS**<sup>189</sup>

### **Build in-house expertise and establish client-facing teams**

that understand the circular economy opportunity and how it can be implemented across sectors.

- **Barclays** established a Sustainable and Impact Banking (SIB) team with the circular economy as one of its four key pillars<sup>190</sup>
- **ING** has developed in-house circular economy expertise across their commercial business, including the Wholesale Banking and Economics departments<sup>191</sup>

### **Conduct research and publish**

on the circular economy as an investment opportunity, e.g. as an industry-disrupting trend, or as a way to anticipate and mitigate linear risks, and to identify and address hurdles that may currently impede investors from capturing the opportunity.

- **Bank of America, Barclays, Citi, Credit Suisse, HSBC,** and **Morgan Stanley,** among others, have all published research and analysis related to the circular economy, including on plastics, fashion, and waste<sup>192</sup>
- Since 2015, **EIB** and **ING** have both published several reports and thought leadership pieces on financing the circular economy<sup>193</sup>





## 4.2.1

### Commercial banking

Actions to seize the circular economy opportunity:

#### Actively seek to finance

circular projects and companies.

- **ABN Amro** has set a target to finance at least EUR 1 billion (USD 1.2 billion) of circular business assets and finance a minimum of 100 initiatives and businesses by end of 2020<sup>194</sup>
- **ING** has committed EUR 100 million (USD 118 million) for scale-ups that make a positive environmental impact in areas including the circular economy<sup>195</sup>
- **Lloyds Bank's** GBP 2 billion (USD 2.6 billion) Clean Growth Finance Initiative offers discounted lending for 'green purposes' to SMEs, including loans to circular businesses, such as Teemill<sup>196</sup>

#### Adapt financing solutions and provide advisory services

to better support corporates in their transition, through lending, working together with circular economy knowledge centres or leveraging bank networks.

- **ING** collaborated with Philips to arrange a EUR 1 billion (USD 1.18 billion) revolving credit facility with an interest rate linked to the company's sustainability performance as assessed by Sustainalytics. Sixteen banks participated in the scheme including **ABN Amro, Bank of America Merrill Lynch, BNP Paribas, Citi, Deutsche Bank, Goldman Sachs, HSBC, ICBC, JP Morgan, Mizuho Bank, Morgan Stanley, MUFG, Rabobank, and Société Générale**<sup>197,198</sup>
- **ING** helped set up the Circular Supply Chain Accelerator as part of the World Economic Forum's Platform for Accelerating the Circular Economy to support the development and funding of circular solutions by large manufacturers and their suppliers<sup>199</sup>
- **Intesa Sanpaolo** launched a EUR 5 billion (USD 5.9 billion) credit facility for companies adopting circular business models<sup>200</sup>
- **Rabobank** offers 'impact loans' to SMEs and mid-caps with positive social or environmental impact at a lower interest rate as a result of funding support from the EIB<sup>201</sup>

#### Build expertise and develop new financing solutions

to make innovative circular business models 'bankable' through, for example, leveraging partnerships beyond private finance, using guarantees or expanding collateral eligibility.

- **BNP Paribas Leasing Solutions** launched Kintessia, the first platform enabling professionals to rent and sell equipment for farming, transport, construction, and public works, and partnered with 3 Step IT to offer product-as-a-service financing solutions for technology equipment<sup>202</sup>
- **China Development Bank Leasing** and **China Construction Bank Financial Leasing** rents e-buses to bus operating companies in Shenzhen, which lowers the upfront capital cost for operating companies and incentivises circular design for reuse and durability, as bus manufacturers retain responsibility for bus maintenance<sup>203</sup>

- **DLL Group**, with **EIB** support, provides second-life financing programmes and leasing services for refurbished or remanufactured assets (e.g. partnership with Desso to offer a carpet leasing service)<sup>204,205</sup>
- The **FinanCE Working Group** published a thought leadership piece on the financial perspective of the transition, and working group members **ABN Amro**, **ING**, and **Rabobank** released the Circular Economy Finance Guidelines, providing a common understanding of circular economy finance<sup>206,207</sup>
- **Glanbia Co-operative Society**, **Ireland Strategic Investment Fund**, **Rabobank**, and **Finance Ireland** set up a EUR 100 million (USD 118 million) MilkFlex loan fund to provide affordable and flexible capital to farmers to enable them to transition to regenerative farming practices<sup>208</sup>

### **Integrate the circular economy concept**

in (credit) risk assessments and lending criteria to level the playing field with linear practices.

- **Intesa Sanpaolo**'s circular economy credit facility is regulated by both ordinary credit procedures and compliance with a set of eligibility criteria based on circularity<sup>209</sup>

### **Engage corporate and institutional clients**

on the circular economy as a value driver for transforming their industry.

- **BNP Paribas Leasing Solutions** engages companies and institutions on the shift from an 'ownership' to an 'access' economy, and its impact on financing, e.g. through solutions for financing electric-charging stations or telecom devices<sup>210</sup>

### **Actively stimulate and scale innovation**

for the circular economy, e.g. by connecting growth-stage entrepreneurs to corporate clients.

- **Barclays** co-founded Unreasonable Impact (in partnership with Unreasonable Group), an accelerator programme supporting growth-stage ventures aiming to tackle pressing global challenges, including through circular businesses<sup>211</sup>
- **ING** is a core partner of Impact Hub's Investment Ready programme, a five-month peer-learning programme for circular start-ups<sup>212</sup>
- **Intesa Sanpaolo**'s Startup Initiative Programme match-makes early-stage circular economy start-ups with potential investors<sup>213</sup>
- **Rabobank**'s Circular Business Challenge brings entrepreneurs together to help them develop and implement their circular ambitions<sup>214</sup>

## 4.2.3 Retail and private banking

Actions to seize the circular economy opportunity, and examples in practice:

### Develop and promote circular economy financing and investment products and services

tailored to retail and private banking clients.

- **UBS, Morgan Stanley, Credit Suisse, JP Morgan, BNP Paribas, HSBC,** and other leading wealth managers offer investment opportunities with exposure to the circular economy theme

## 4.2.4 Insurance services

Actions to seize the circular economy opportunity, and examples in practice:

### Build expertise, adapt existing insurance products, and develop new insurance solutions

to better address the risks of projects or clients in their transition and support circular business models, such as sharing or product-as-a-service models.

- **Allianz** offers insurance for circular business models, such as Getaround, a car-sharing and rental platform<sup>215</sup>
- **AXA XL** has created tailored solutions for sharing economy companies like Fainin, a peer-to-peer rental company, to arrange group insurance covering both lenders and borrowers<sup>216</sup>
- **GUARDHOG**, a peer-to-peer sharing economy insurtech company, created an insurance solution for lending platform Fat Llama by bundling their policy with multiple sharing economy start-ups, enabling **Hiscox** to underwrite the policy<sup>217</sup>
- **MAIF** encourages the use of recycled auto parts for post-accident repairs through their Auto Insurance<sup>218</sup>
- **Munich Re** offers circular economy performance insurance solutions to insure the technology risk of circular economy projects and innovation in order to stabilise revenue streams, improve bankability, and access to capital<sup>219</sup>
- **Omocom** is an early-stage P2P, B2C, B2B, insurtech solution providing on-demand insurance for circular economy platforms<sup>220</sup>

### Integrate the circular economy concept

in risk assessments and insurance criteria to better reflect the risks of the linear economy.

- **Swiss Re** are assessing the durability of reused building materials or construction technologies (in partnership with universities and companies) to provide underwriting services to the built environment industry as they adopt circular economy practices

# 4.3

## Cross-cutting actions

Actions to seize the circular economy opportunity, and examples in practice:

### Develop expertise and publish thought leadership pieces on financing the circular economy.

- **ABN Amro, Circularity Capital, EBRD, EIB, ING, Intesa Sanpaolo, PGGM, Rabobank**, and others have published thought leadership pieces on financing the circular economy through the FinanCE Working Group<sup>221</sup>
- **BlackRock** and **Intesa Sanpaolo** are strategic partners of the Ellen MacArthur Foundation, and are part of the Foundation's circular economy network, whose members produce collaborative thought leadership pieces on a range of circular economy topics, such as the valuation and accounting treatment of used parts<sup>222</sup>
- **Climate Bonds Initiative** produced a sector briefing for circular economy opportunities in the green bond market<sup>223</sup>
- **EIB's InnovFin Advisory** has published several reports, including recommendations to increase access to finance for circular innovation, which have led to the broadening of financing eligibility criteria, the launch of the Circular Economy Finance Support Platform, and subsequently the CE Finance Expert Group<sup>224,225</sup>
- **Oliver Wyman**, in cooperation with **ABN Amro**, has published a report on the role of the financial sector in supporting the circular economy transition in the Netherlands<sup>226</sup>

### Measure and disclose circularity

of financed projects and companies. Table 2 gives an overview of definitions, measurement, and disclosure frameworks for circular economy activities.

- Almost 600 companies (130+ companies with >USD 1 billion revenues) have started to measure their circular economy progress using **Circulytics**, with over 55 assessments completed as of June 2020<sup>227</sup>
- **Closed Loop Partners'** Center for Circular Economy is tracking environmental and economic performance of emerging and advanced recycling technology companies<sup>228</sup>
- **Hermes Federated** tracks outcome-based circular economy metrics for companies in their portfolio<sup>229</sup>
- **ING** discloses progress on its Terra approach – the strategy for steering its EUR 600 billion (USD 709 billion) lending book in line with the Paris Agreement goals<sup>230</sup>
- **Intesa Sanpaolo** tracks relevant targets and KPIs linked to loans from their EUR 5 billion (USD 5.9 billion) circular economy credit facility, e.g. progress towards Greencycle's plastic recycling targets<sup>231</sup>

**Integrate the circular economy concept**

into existing or newly developed strategies, decision-making, targets and action plans, recognising the role the circular economy plays as a solution to climate-related and broader ESG risks.

- Circular economy is part of **AXA's** 'low carbon' investment strategy, which, among other investments, has resulted in an investment in Circularity Capital's European Growth Fund<sup>232</sup>
- **Goldman Sachs** includes the circular economy as part of the action plan for its USD 750 billion commitment<sup>233</sup>

**Build in-house understanding within existing teams**

to apply circular economy principles to internal operations, including buildings and infrastructure.

- **ABN Amro's** multi-purpose pavilion was designed and built based on a circular economy vision<sup>234</sup>
- **Triodos'** HQ building was designed to be fully circular<sup>235</sup>

**Develop fintech solutions**

that promote or use the circular economy as a value driver.

- **Clim8 Invest**, which landed GBP 1.5 million (USD 1.96 million) in a pre-launch crowdfunding campaign, offers a platform where users can invest in clean energy, clean technology, sustainable food, smart mobility, and recycling<sup>236</sup>



## 4.4 Circular economy opportunities across sectors

**Circular economy opportunities can be found in nearly every sector in the global economy. The plastics, fashion, and food sectors stand out as some of the most likely to be significantly impacted or even disrupted by the circular economy in the near term, driven by innovation, regulation, and evolving customer preferences.**

Table 4 shows a heatmap with an overview of the circular economy growth potential in ten key sectors, selected to demonstrate a broad range of circular economy opportunities.

The heatmap is based on a qualitative assessment of three circular economy growth drivers by sector, based on publicly available data and expert interviews. It aims to provide a first indication of sectors with high short-to-medium term circular economy growth potential. More in-depth analysis by sector would be required to inform investment or any other financial decision. The heatmap focuses on growth potential, and does not intend to assess the current maturity of circular economy activity (e.g. a sector may already be highly circular, yet have limited further growth potential).

Details of the drivers of growth potential, opportunities, and examples of large corporates and innovators which are already using circular economy concepts and principles to create value in each sector can be found in the Appendix.

A more public sector investment-oriented view, asking the question how public authorities can invest to build back better post-Covid-19, can be found in *Policy and investment opportunities shaping a resilient and low-carbon economy recovery: 10 circular investment opportunities* by the Ellen MacArthur Foundation.<sup>237</sup>

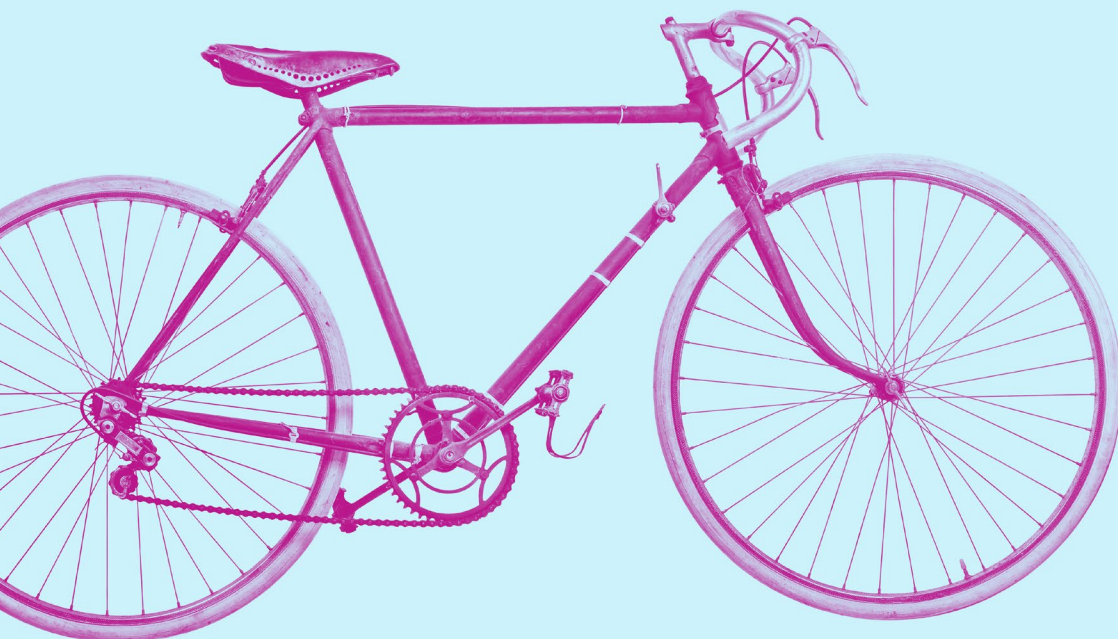


TABLE 4

## Heatmap with qualitative assessment of circular economy growth potential in ten key sectors

- **High** potential for growth in the short-medium term
- **Increasing** potential for growth in the short-medium term
- **Emerging or limited** potential for growth in the short-medium term

Sector	Drivers of circular economy growth potential			Overall circular economy growth potential
	Innovation & corporate action	Policies & regulation	Customer preferences & macro trends	
Plastics & packaged goods	High	High	High	High
Fashion & textiles	High	High	High	High
Food & agriculture	High	High	High	High
Electronics	High	High	Emerging or limited	High
Automotive, transport & logistics	Emerging or limited	High	High	High
Technology, media & telecommunication	High	Emerging or limited	Emerging or limited	Increasing
Engineering & construction	High	Emerging or limited	Emerging or limited	Increasing
Waste management & water	Emerging or limited	High	Emerging or limited	Increasing
Industrial manufacturing	Emerging or limited	Emerging or limited	Emerging or limited	Increasing
Paper, pulp & forestry products	Emerging or limited	Emerging or limited	Emerging or limited	Increasing

# 5



## The way forward

Now is the time for finance to capitalise on the existing momentum and help scale the circular economy. All aspects of finance will play an important role in bringing forward the transition to a circular economy.



# 5.1

## All aspects of finance will play an important role in scaling the circular economy

**The circular economy financing market is taking off. Yet while the recent growth in financing is promising, far more capital and activity will be needed to scale the circular economy and fully seize the opportunity it presents.**

Several barriers remain to unlock the market's full potential, including, for example, limited data availability, unpriced externalities, and outdated accounting rules not fully reflecting the value creation of circular business models or linear risks.

An overview of actions needed to overcome current barriers and scale circular economy financing is given in Figure 8, and detailed below.

**The financial services sector has the reach and expertise to scale the circular economy market, supporting leading companies, and eventually entire industries, in their transition.**

The circular economy transition is not only about financing perfectly circular companies or turning away from extractive ones, to achieve climate targets and build a resilient economy this transformation will require all sectors to shift. An overview of actions already taken by leading asset managers, banks, and other financial services firms is given in Chapter 4, as well as a qualitative assessment of circular economy growth potential across sectors in the Appendix.

**“While the recent growth in financing is promising, far more capital and activity will be needed to scale the circular economy and fully seize the opportunity it presents”**

FIGURE 8

## Overview of actions to scale circular economy financing



### Financial services sector

#### Scale circular economy financial products and services

building on existing proofs-of-concept.

#### Formalise the circular economy

through financial tools and frameworks, such as credit approval processes, circular bond framework, circularity measurement.

#### Integrate the circular economy

within strategies, capabilities, targets, and decision-making across business lines.

#### Innovate

to overcome barriers and close financing gaps through, e.g. transition bonds, circularity-linked loans, bank lending for harder-to-finance circular business models.



### Governments, financial regulators, and central banks

#### Set direction and provide economic incentives

through, for example pricing externalities or favourable fiscal treatment, such as Sweden's tax breaks on product repairs.<sup>1</sup>

#### Invest in circular activities, infrastructure, and innovation,

for example, EUR 3.5 billion (USD 4.1 billion) dedicated to circular economy innovation between 2016 and 2020 in the EU.<sup>2</sup>

#### Improve transparency

through standardisation and reporting requirements, such as EU Taxonomy, Chinese supervisory scheme for green bond verifiers, EU Non-Financial Reporting Directive.

#### Integrate circularity

in financial regulation, risk assessments and modelling, and explore unconventional methods such as integration of circularity in green quantitative easing.



### Blended finance market

#### Use blended finance mechanisms to de-risk investments and attract private sector capital

to the circular economy by structuring and financing the harder-to-finance infrastructure and riskier, long-term innovation.

#### Use philanthropic capital

to nurture and fund nascent circular economy projects and innovation, creating the market and providing proof-of-concept.

#### Provide technical assistance, expert structuring, and advisory services

to enable financing of challenging projects, such as the recurring operational expenditures of collection infrastructure.



### Underpinned by better data

#### Scale dedicated circularity measurement tools

(e.g. Circulytics)

#### Integrate circularity metrics

into leading existing frameworks (e.g. TCFD, SASB, CDP, SBT, EU Non-Financial Reporting Directive)

#### Build evidence base

for circular economy financing and investment, using financial and non-financial metrics.

#### Adapt accounting rules

to enable a more representative valuation of circular business models and linear risks.

<sup>1</sup> World Economic Forum, 'Sweden is Paying People to Fix Their Belongings Instead of Throwing Them Away' (27th October 2016)

<sup>2</sup> European Commission, 'Implementation of the Circular Economy Action Plan (2019)

**Governments, financial regulators, and central banks can complement and enable the shift in the private sector.**

Governments can set direction, provide economic incentives, directly invest in circular economy activities and innovation, and enhance transparency. The unprecedented stimulus packages following the coronavirus pandemic have reinforced the importance of government investment, while a breadth of examples ranging from the invention of the internet to the technologies used in the Apple iPhone demonstrate the crucial importance of public innovation programmes to create new markets.<sup>238</sup>

Financial regulators and central banks can integrate the circular economy concept into risk assessments, modelling, and financial regulation. Building on their actions on climate-related risks, they could integrate the circular economy concept in requirements on identification of financial risks, disclosure, and scenario analysis. They could also explore less conventional methods such as green quantitative easing. For example, the circular economy could be considered as a key delivery mechanism in the ECB's examination of the potential of using its trillion-euro asset purchase scheme to pursue green objectives, or the European Banking Authority's work on a green supporting factor.<sup>239</sup>

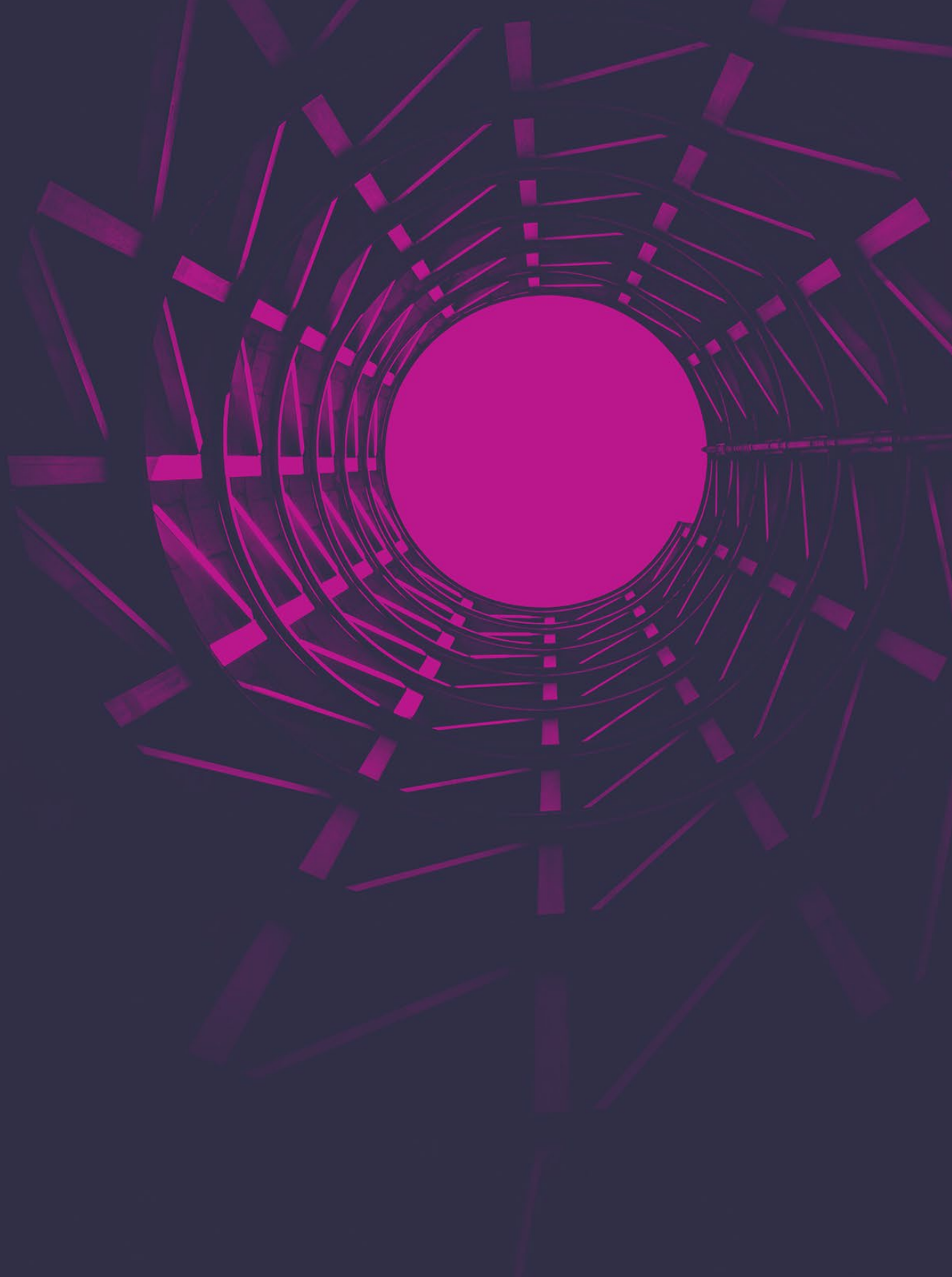
**Better data will be required to underpin the shift.**

If capital is to be reoriented at scale, more transparent and consistent data on circularity performance (both historical and forward-looking) will be required. In addition to scaling dedicated circularity measurement tools (for an overview, see Table 2 in Chapter 2), it is essential to integrate such metrics in key initiatives such as CDP, SBT, SASB, TCFD, and the EU Non-Financial Reporting Directive to help harmonise non-financial metrics and reporting frameworks. Integrating these definitions and metrics in financial market data processes, architecture, and classifications can maximise their uptake and impact.

**The adaptation of accounting rules would enable a more representative valuation of circular business models and linear risks.**

Potential changes include adapting approaches to depreciation and residual value calculation for assets with multiple use-cycles, and ensuring tax treatment reflects the characteristics of circular business models. Mechanisms enabling effective pricing of positive and negative externalities, and a broader focus on non-financial capital in accounting standards and reporting, would further help reflect the true value of circular companies and the risks of extractive practices.

**“Governments can set direction, provide economic incentives, directly invest in circular economy activities and innovation, and enhance transparency”**



# Appendix

**Circular economy  
growth potential by sector**

# 1

## Plastics and packaged goods

**Key circular economy strategies**

- Eliminate problematic and unnecessary plastics and packaging
- Innovate plastics to be reusable, recyclable or compostable
- Ensure plastics are reused, recycled or composted in practice

### Drivers of circular economy growth potential

- **High** potential for growth in the short-medium term
- **Increasing** potential for growth in the short-medium term
- **Emerging or limited** potential for growth in the short-medium term

Innovation and corporate action	
<b>Industry action</b>	<ul style="list-style-type: none"> <li>• Growing number of plastics commitments by large FMCGs and retailers, e.g. 850+ organisations united behind vision for a circular economy for plastics, the New Plastics Economy Global Commitment signatories represent over 20% of the plastics value chain</li> </ul>
<b>Demand for recycled materials</b>	<ul style="list-style-type: none"> <li>• Global demand for recycled plastic grew by 17% between 2012 and 2016<sup>240</sup></li> <li>• Increased interest in recycling from plastic producers, evidenced by major M&amp;A activity (e.g. Borealis)</li> <li>• Reusable plastic containers for fresh produce are projected to be one of the fastest growing produce packaging segments in the US<sup>241</sup> (e.g. Amcor’s sales of reusable and refillable PET containers in markets where refill programmes exist doubled in the two years up to 2019)<sup>242</sup></li> </ul>
<b>Innovation</b>	<ul style="list-style-type: none"> <li>• Ongoing innovation across the value chain including reuse models, packaging design to increase recycled content and reusability, recyclability and compostability, development of renewable feedstocks, and chemical recycling</li> </ul>

<b>Policies and regulation</b>	
<b>Increasing policies and regulation</b>	<ul style="list-style-type: none"> <li>• Single-use plastics bans have been announced around the world including in China, India and South East Asia, 34 African countries, various Central American, Latin American and Caribbean countries and cities, several US states and cities, and across the EU (e.g. Single-Use Plastics Directive banning ten single-use plastic products by 2021)</li> <li>• 63 countries had EPR measures in place in 2018 (e.g. Indonesia, Chile),<sup>243</sup> such as product take-back schemes, deposit return systems (e.g. Australia's 'Return and Earn' scheme), and waste collection; the new EU EPR schemes for certain single-use plastic products cover costs of collection, awareness raising, clean-up, and reporting<sup>244</sup></li> <li>• Increasing landfill taxes, essential requirements for packaging (e.g. recycled content mandates for beverage containers in California)</li> <li>• National recycling targets (e.g. EU target 22.5% for plastic)</li> </ul>
<b>Incentives</b>	<ul style="list-style-type: none"> <li>• Circular economy regulation, including new EU circular economy Action Plan, EU Packaging and Packaging Waste Directive</li> <li>• Subsidies and support for innovation (e.g. Smart Sustainable Plastic Packaging)</li> </ul>

<b>Customer preferences and macrotrends</b>	
<b>Changing preferences and behaviour</b>	<ul style="list-style-type: none"> <li>• Increasing customer pressure regarding plastic pollution (e.g. 'BBC <i>Blue Planet II</i> effect')</li> <li>• Changing behaviour towards reusable instead of single-use (e.g. reusable cups and water bottles)</li> <li>• 92% of EU citizens approve of action to reduce single-use plastics<sup>245</sup></li> <li>• Positive customer response to trials of unpackaged food products by major supermarkets (e.g. Waitrose) demonstrates potential for consumers to adapt to reuse models</li> </ul>
<b>Climate change and global challenges</b>	<ul style="list-style-type: none"> <li>• Eliminating unnecessary plastics, and reusing and recycling plastics, can contribute significantly to objectives on climate change (global CO<sub>2</sub> emissions from plastics production and end-of-life processing could be reduced by 56% in a circular scenario by 2050)<sup>246</sup></li> </ul>

## Types of circular economy opportunity areas



## Current circular economy opportunity areas

### Innovations that eliminate the need for packaging

(e.g. dissolvable/edible packaging, solid shampoo, farm-to-fork)

### Collection of plastics

(e.g. connecting informal waste sector to formal waste collection through digital tech)

### Renewably sourced materials

(e.g. plastics made from agricultural by-products)

### Business models based on reusable packaging

### Identification and sorting technologies

(e.g. digital watermarks)

### Innovative sorting and recycling technologies

(e.g. chemical, solvent-based, robotic sorting)

## Examples: Large corporates

### **Coca-Cola Brazil**

has invested USD 400 million in the expansion of their reuse infrastructure (bottle cleaning and refilling facilities)<sup>247</sup>

### **Nestlé**

has committed to invest up to CHF 2 billion (USD 2.9 billion) to shift to food-grade recycled plastics and to innovate packaging solutions

### **Unilever**

has committed to halve its use of virgin plastics by 2025

### **Borealis**

acquired plastics recyclers Ecoplast Kunststoff-Recycling, mtm plastics, and mtm compact to increase recycled plastic production

### **L'Oréal**

has committed EUR 50 million (USD 58.96 million) to fund circular projects, including new business models to tackle plastic pollution

### **Indorama Ventures**

committed USD 1.5 billion to invest in plastics recycling infrastructure

### **SABIC and BASF**

have developed chemical recycling technologies to produce recycled plastic from mixed after-use plastic streams

### **TC Transcontinental**

acquired Enviroplast to vertically integrate plastics recycling in its flexible plastic packaging production

## Examples: Innovators

### **Algramo**

operates a refill system for detergent and has established multiple corporate partnerships, including with Unilever and Nestlé

### **Bockatech**

has developed technology to produce low cost reusable plastic containers, which are also lightweight and recyclable

### **Loop**

operates an online shopping platform for branded food and cosmetic products in returnable and reusable packaging

### **MIWA**

offers a complete business ecosystem for smart-powered reusable packaging (it has recently partnered with Nestlé)<sup>248</sup>

### **Já Fui Mandioca**

(formerly CBPAK) turns a non-edible starch component of cassava into a compostable packaging material, and has partnered with BASF to produce a protective film to improve durability

### **RePack**

provides a reusable and returnable packaging service for e-commerce

# 2

## Fashion and textiles

**Key circular economy strategies**

- Adopt new business models to increase utilisation (e.g. resale, rental)
- Extend useful life through reuse and repair
- Ensure clothes are made from safe and renewable materials
- Ensure textiles are collected, sorted, and reused or recycled

### Drivers of circular economy growth potential

- **High** potential for growth in the short-medium term
- **Increasing** potential for growth in the short-medium term
- **Emerging or limited** potential for growth in the short-medium term

#### Innovation and corporate action

<b>Industry action</b>	<ul style="list-style-type: none"> <li>• Growing number of fashion brands committing to and acting on reuse or rental models, and design for durability, material health, recyclability, and traceability (e.g. The Jeans Redesign project)<sup>249</sup></li> </ul>
<b>Innovation</b>	<ul style="list-style-type: none"> <li>• Ongoing innovation across the value chain, including reuse models, packaging design to increase recycled content and reusability, recyclability and compostability, development of renewable feedstocks, and chemical recycling<sup>250</sup></li> </ul>

#### Policies and regulation

<b>Increasing policies and regulation</b>	<ul style="list-style-type: none"> <li>• Increasing regulation, e.g. new EU circular economy Action Plan, and French Circular Economy Law banning the destruction of unsold or returned consumer products, affecting luxury goods brands</li> </ul>
<b>Political priorities</b>	<ul style="list-style-type: none"> <li>• Increasing interest from global platforms like the UN (through UNEP, UNFCCC) and the OECD</li> <li>• Policy Hub has proposed the need for green recovery principles boosting circularity in the Textile, Apparel, and Footwear industry for the EU Green Recovery Plan<sup>251</sup></li> </ul>

#### Customer preferences and macro trends







<b>Changing preferences and behaviour</b>	<ul style="list-style-type: none"> <li>• Growing awareness of the current fashion system’s drawbacks, is driving the shift to, e.g. safer chemicals and regenerative sourcing<sup>252</sup></li> <li>• Disappearing stigma around buying second-hand and increased convenience of resale and rental due to enabling digital platforms</li> </ul>
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### Types of circular economy opportunity areas

-  Circular design and innovation
-  Circular business models
-  Reuse, repurpose, and redistribute
-  Repair, remanufacture, and refurbish
-  Collect, sort, and recycle
-  Regenerative and renewable practices and materials
-  Enabling digital technologies

### Current circular economy opportunity areas

 <p><b>Clothing resale business models</b> (e.g. consignment or peer-to-peer)</p>	 <p><b>Digital enabling tech</b> (e.g. tracking and tracing)</p>	 <p><b>Fibre-to-fibre recycling technologies</b></p>
 <p><b>Clothing and textiles collection and sorting infrastructure</b></p>	 <p><b>Clothing rental business models</b></p>	 <p><b>Materials innovation</b> (e.g. fibres from regenerative sources / by-products)</p>

### Examples: Large corporates

<p><b>H&amp;M Group</b> has committed to '100% Circular and Renewable' by 2030, including use of recycled materials in all its products, and reusable, recyclable or compostable packaging by 2025</p>	<p><b>GAP Inc</b> committed to circular design and exploring circular business models (e.g. with thredUP, a leading fashion resale platform)</p>	<p><b>Rent the Runway</b> offers one-off or subscription clothing rental and has been valued at over USD 1 billion</p>
<p><b>Lojas Renner</b> launched a collection of recycled clothing using technology to recycle discarded textiles from their suppliers</p>	<p><b>The RealReal</b> sells authenticated second-hand luxury goods and was valued at over USD 1 billion at IPO</p>	

### Examples: Innovators

<p><b>The Renewal Workshop</b> turns unsellable apparel into renewed products, made from used or recycled materials feedstock</p>	<p><b>AHLMA</b> sources over 80% materials from leftover fabric, open sources designs, and has a repair lab</p>	<p><b>HireStreet</b> offers a clothing rental service for high street apparel</p>
<p><b>Stuffstr</b> partners with retailers to buy back and recirculate used clothing, increasing clothing utilisation</p>	<p><b>Lizee</b> helps brands set up a rental service model using their logistics and managed service solution</p>	
<p><b>YCloset</b> is a fashion rental platform, with more than 15 million customers across China (it has partnered with H&amp;M to test the subscription model)</p>	<p><b>Depop</b> is a peer-to-peer vintage and pre-owned fashion marketplace and online community</p>	

# 3

## Food and Agriculture

**Key circular economy strategies**

- Source food grown regeneratively, and locally, where appropriate
- Apply circular practices to controlled or precision agriculture solutions (e.g. nutrient and water looping for vertical or indoor farming)
- Prevent surplus edible food in production
- Design food products and supply chains to eliminate waste, bring production closer to consumption, and regenerate nature and soils
- Transform food by-products into new products, biomaterials, and agriculture and aquaculture inputs to return nutrients to the soil
- Collect and recover resources from post-consumer organic waste

### Drivers of circular economy growth potential

- **High** potential for growth in the short-medium term
- **Increasing** potential for growth in the short-medium term
- **Emerging or limited** potential for growth in the short-medium term

Innovation and corporate action	
<b>Industry action</b>	<ul style="list-style-type: none"> <li>• Increasing industry action on climate change mitigation and tackling biodiversity loss, e.g. OP2B, an international business coalition on biodiversity including Barry Callebaut, Danone, McCain, Nestlé, Walmart</li> <li>• Growing industry understanding of circular economy benefits beyond packaging and waste management</li> </ul>
<b>Innovation</b>	<ul style="list-style-type: none"> <li>• Emerging business models that redistribute surplus food and reduce food waste</li> <li>• Increasing AgTech innovation (e.g. regenerative agriculture, microbe engineering, robotics, advanced data analytics, and agriculture management software)</li> </ul>

<b>Policies and regulation</b>	
<b>Increasing policies and regulation</b>	<ul style="list-style-type: none"> <li>Increasing regulation (e.g. reducing food waste), with fragmented incentives for regenerative practices, but attention is growing, e.g. the EU's New Circular Economy Action Plan, EU 'Farm to Fork' Strategy, EU Biodiversity Strategy, carbon farming initiatives in California (e.g. Marin Carbon Project)</li> </ul>
<b>Public procurement</b>	<ul style="list-style-type: none"> <li>Public procurement policies (e.g. Brazil National School Feeding policy prioritises local, organic, regenerative food sourcing; Good Food Purchasing Program in cities across the United States)</li> </ul>
<b>Political priorities</b>	<ul style="list-style-type: none"> <li>Attention on food security by shifting to regionalised, resilient food systems, reinforced by the Covid-19 crisis, is creating a rapidly changing landscape (e.g. relocalisation of supply chains)</li> </ul>

<b>Customer preferences and macrotrends</b>	
<b>Health</b>	<ul style="list-style-type: none"> <li>Rising awareness of food-related health issues, including diabetes and obesity</li> <li>Growing preference for diverse ingredients (e.g. proteins, indigenous species) and shifting dietary preferences (e.g. towards plant-based, local and seasonal)</li> </ul>
<b>Climate change and global challenges</b>	<ul style="list-style-type: none"> <li>Emerging awareness of the connection between agriculture and biodiversity loss, soil depletion, and water issues</li> <li>Increasing understanding of agriculture as major contributor to climate change (CO<sub>2</sub> emissions from the global food system could be reduced by 49% in a circular scenario by 2050)<sup>253</sup></li> </ul>

### Types of circular economy opportunity areas

-  Circular design and innovation
-  Circular business models
-  Reuse, repurpose, and redistribute
-  Repair, remanufacture, and refurbish
-  Collect, sort, and recycle
-  Regenerative and renewable practices and materials
-  Enabling digital technologies

### Current circular economy opportunity areas

 <p><b>Technologies to turn organic waste streams, including human waste, into commercially viable agriculture inputs</b></p>	 <p><b>Community Supported Agriculture model, which connects growers and consumers providing mutual support and sharing the risks and benefits of food production</b></p>	 <p><b>Design of food products and menus based on circular economy principles</b> <small>(e.g. innovate new plant-based protein options as alternatives to meat and dairy, develop products and recipes that use food by-products as ingredients, and encourage customers towards them)</small></p>
 <p><b>Regenerative agricultural practices, including shifting from synthetic to organic fertilisers, employing crop rotation, and using greater crop variation</b> <small>(e.g. agroecology, rotational grazing, agroforestry, conservation agriculture, and permaculture)</small></p>	 <p><b>Geospatial mapping solutions that provide visibility into food flows and organic waste streams to effectively capture and transform them</b></p>	 <p><b>Digital customer-facing tools to create transparency on food products and supply chains</b></p>

### Examples: Large corporates

<p><b>Danone</b> has committed EUR 2 billion (USD 2.4 billion) to scaling regenerative agriculture, reducing virgin plastic in packaging, and shifting to renewable energy, and has pledged to source 100% of ingredients produced in France from regenerative agriculture by 2025</p>	<p><b>AB Inbev</b> turns brewing by-products into protein-rich food products</p> <p><b>Balbo Group</b> uses regenerative farming practices to achieve 20% higher productivity than conventional sugarcane production</p>	<p><b>General Mills</b> has committed to advance regenerative agriculture practices on 1 million acres of farmland by 2030, and have invested over USD 5 million to advance soil health on US agricultural lands, including RegenAg pilot projects</p>
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### Examples: Innovators

<p><b>Apeel Sciences</b> has developed an invisible coating made from plant material that extends the shelf-life of loose fruit and vegetables</p> <p><b>Winnow</b> uses AI machine-vision technology to reduce food waste in commercial kitchens</p> <p><b>Sanergy</b> sanitation company treats human waste with black soldier flies to create agriculture products</p>	<p><b>Row 7</b> seed company brings diverse plant varieties to food service players, individuals, and chefs</p> <p><b>Feitosa Foodtech</b> turns surplus bananas, otherwise wasted on farms, into banana ketchup</p> <p><b>Agricycle</b> provides drying technology to farmers in places like Africa to turn surplus fruits into shelf-stable snacks</p> <p><b>Kaffe Bueno</b> valorises spent coffee grounds into cosmetics and food products</p>	<p><b>Greenplat's Plataforma Verde</b> blockchain software provides geospatial mapping of organic material flows</p> <p><b>Ecovative</b> grows mycelium-based biomaterials to create, e.g. alternative meat products and biodegradable packaging materials</p> <p><b>Agriprotein</b> uses insects to convert organic waste into valuable proteins</p>
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# 4 Electronics

**Key circular economy strategies**

- Design products for repairability, disassembly and recyclability, using recycled materials
- Keep electronics in use for as long as possible through circular business models (e.g. rental or product-as-a-service) and by repairing, refurbishing, reusing, reselling, repurposing or remanufacturing components and products
- Maintain value of materials by collecting, sorting, separating, and recycling materials after a product’s useful life

## Drivers of circular economy growth potential

- **High** potential for growth in the short-medium term
- **Increasing** potential for growth in the short-medium term
- **Emerging or limited** potential for growth in the short-medium term

Innovation and corporate action	
Increased demand for finite resources	<ul style="list-style-type: none"> <li>• Increase in urban mining/recycling efforts as the demand for rare earth metals rises in the electronics industry, with only 1% of rare earth elements currently being recycled</li> </ul>
Innovation	<ul style="list-style-type: none"> <li>• Technologies such as IoT, AI, 5G, or blockchain are enabling new business models (e.g. streaming services, subscription models)</li> <li>• Emerging design for repairability and reverse logistics solutions</li> </ul>

<b>Policies and regulation</b>	
<b>Increasing policies and regulation</b>	<ul style="list-style-type: none"> <li>Increasing directives and regulation, such as new EU circular economy Action Plan, national policies and regulations (e.g. in Malawi, South Africa), right-to-repair, restrictions on hazardous substances, EPR on Waste Electrical and Electronic Equipment (WEEE) (e.g. China's Regulation on the Administration of the Recovery and Disposal of WEEE; South Korea's EPR scheme for e-waste covers 27+ products nationally)</li> </ul>
<b>Political priorities</b>	<ul style="list-style-type: none"> <li>Mounting political interest in access to rare earth metals (e.g. EU critical raw materials work), reinforced by Covid-19 crisis and geopolitical tension (e.g. US-China trade)</li> </ul>

<b>Customer preferences and macro trends</b>	
<b>Changing preferences and behaviour</b>	<ul style="list-style-type: none"> <li>More and more customers are opting for cheaper, as-new refurbished electronics or access-over-ownership models to get access to newest products, especially in the fast-moving electronics space</li> </ul>

## Types of circular economy opportunity areas



Circular design and innovation



Circular business models



Reuse, repurpose, and redistribute



Repair, remanufacture, and refurbish



Collect, sort, and recycle



Regenerative and renewable practices and materials



Enabling digital technologies

## Current circular economy opportunity areas



**Electronics resale platforms and refurbished electronics marketplaces**



**Disassembly and recycling technologies**



**Electronics reverse logistics/infrastructure for collection and sorting**



**Repair, maintenance, and upgrade of devices**



**Access-over-ownership business models**

(e.g. rental, peer-to-peer lending or subscription pay-per-use models)

## Examples: Large corporates

### Apple

have committed to use 100% recycled or renewable resources in all products in future and use customer returns programmes and robotic disassembly to increase material recovery from used iPhones

### HP

offers an IoT enabled subscription model ('printing-as-a-service'), closed loop cartridge recycling, and has partnered with Sintronics to recover and create value out of HP end-of-use electronic equipment

### Dell

designs products for reuse, repair, and recyclability, and committed to source 100% recycled or renewable materials for packaging by 2030

### Samsung

offers subscription models that allow an upgrade to the latest device for a monthly fee

### Cisco

has pledged 100% product return using returns programmes to repurpose, repair, refurbish, and remanufacture telecom equipment

### Electrolux

is trialling subscription pay-per-use business models for hardware products in China and Sweden

### Reclite

collect, transport, and recycle waste electronics in South Africa and surrounding countries

## Examples: Innovators

### Grover

offers 'pay-as-you-go' subscriptions to the latest user tech, including e-scooters

### Fairphone

offers a modular mobile phone, allowing customers to replace and upgrade parts easily

### Teleplan

offers lifecycle care of technology products, focusing on screening and testing, repairing and refurbishing, and recovering value from large flows of used electronics

### Refind Technologies

develops systems for automatic classification and sorting of e-waste, such as batteries and phones

### Back Market

is a marketplace for refurbished consumer electronics and recently raised USD 120 million from Goldman Sachs, Aglaé Ventures, and Eurazeo Growth<sup>254</sup>

### ReUrbi

collects discarded IT equipment from businesses, then dismantles/refurbishes it and sells it under the Remakker brand, including warranty and technical assistance, at prices that are up to 50% lower than for new products

### Close the Gap

refurbishes and redistributes used IT equipment for educational, medical, and social projects in developing and emerging countries

# 5

## Automotive, transport, and logistics

**Key circular economy strategies**

- Design vehicles and mobility infrastructure for shared use, adaptability, disassembly and recyclability, accompanied by a shift to electrification
- Keep materials in use by remanufacturing and upgrading of parts, vehicles, and infrastructure
- Diversify modes of transport and operating models (e.g. multimodal public transport-as-a-service)
- Plan cities and regions to optimise mobility (including freight), and enable effective reverse logistics and resource flows

### Drivers of circular economy growth potential

- **High** potential for growth in the short-medium term
- **Increasing** potential for growth in the short-medium term
- **Emerging or limited** potential for growth in the short-medium term

Innovation and corporate action	
<b>Established circular practices</b>	<ul style="list-style-type: none"> <li>• Second-hand car market is already well-established, with car manufacturers often refurbishing and reselling</li> <li>• Car manufacturers have started to launch their own car-sharing programmes with varying uptake</li> </ul>
<b>Innovation</b>	<ul style="list-style-type: none"> <li>• Further shift towards and innovation into electrification of mobility</li> <li>• Ongoing innovation in autonomous driving and connected vehicles, but feasibility of implementation at scale is still uncertain</li> <li>• Development and implementation of digital solutions that optimise logistics and support the consolidation of freight services and reverse logistics, including local 'last mile' solutions</li> </ul>



<b>Policies and regulation</b>	
<b>Increasing policies and regulation</b>	<ul style="list-style-type: none"> <li>• Increasing regulation on emissions restrictions, design with recycled content, end-of-life vehicle reuse and recycling, rechargeable batteries, product-as-a-service mobility solutions (e.g. Reusability, Recyclability, and Recoverability Directive 2005/64/EC, which requires that new vehicles to be sold in the EU be designed so that minimum thresholds of parts and materials may be reused, recycled or recovered at the end of a vehicle's use-cycle,<sup>255</sup> EU circular economy Action Plan)</li> <li>• Increasing regulation on smart mobility (e.g. EU circular economy Action Plan)</li> </ul>
<b>Incentives</b>	<ul style="list-style-type: none"> <li>• Incentives for car-sharing (e.g. Chinese central government and local municipalities have issued multiple policies to encourage car-sharing, which is expected to grow rapidly in China)<sup>256</sup></li> <li>• City planning to ease congestion and air pollution is changing approaches to transport in cities, including walking and cycling action plans (e.g. London's Walking Action Plan and 450km of new Cycleways planned by 2024; Seattle, Brussels, and Milan are all limiting car use and developing dozens of miles of bike lanes following the Covid-19 lockdown)</li> </ul>

<b>Customer preferences and macrotrends</b>	
<b>Changing preferences and behaviour</b>	<ul style="list-style-type: none"> <li>• Increasing demand for electric vehicles (the global EV market is forecasted to grow by 21% annually between 2019 and 2030)<sup>257</sup></li> <li>• Changing customer preferences towards access-over-ownership (e.g. car-sharing market exceeded USD 2.5 billion in 2019 and is estimated to grow at 24% annually between 2020 and 2026)<sup>258</sup></li> <li>• Rapid growth in online shopping, including food and grocery, increasing required logistics and reverse logistics capacity (e.g. online spend in UK grew by 13% year on year (YoY) in July 2019),<sup>259</sup> accelerated by Covid-19 crisis (online YoY revenue growth for US retailers was up 68% as of mid-April 2020)<sup>260</sup></li> </ul>
<b>Changing demographics</b>	<ul style="list-style-type: none"> <li>• Rapid urbanisation, with 68% of world's population expected to live in cities by 2050, shared multimodal public transport becomes increasingly viable<sup>261</sup></li> </ul>

### Types of circular economy opportunity areas



Circular design and innovation



Circular business models



Reuse, repurpose, and redistribute



Repair, remanufacture, and refurbish



Collect, sort, and recycle



Regenerative and renewable practices and materials



Enabling digital technologies

### Current circular economy opportunity areas



**Remanufacturing of spare parts and recycling of materials**



**Circular business models including car-sharing, ride-sharing, logistics and freight load-pooling, mobility/infra-as-a-service, and multimodal integrated public transport, accompanied by a shift to EVs**



**Digital platforms that enable circular businesses such as sharing models**

### Examples: Large corporates

#### Renault

has increased the use of recycled materials in their vehicle design, as well as used vehicle collection, dismantling, reuse, and remanufacturing, the recycling of components, batteries and vehicles, and it launched ZITY, an all-electric car-sharing service

#### DHL

has introduced modular delivery 'Cubicycle' units which can be loaded onto electric cargo bicycles for last mile inner-city deliveries in Frankfurt and Utrecht

#### Daimler and BMW

have formed a joint venture, Share Now, which offers 'mobility-as-a-service' car-sharing in urban areas

#### Toyota

has launched initiatives to establish certified automobile dismantling facilities and has rolled out car-to-car recycling technologies globally

#### LKQ Corporation

recovers, recycles, refurbishes or remanufactures parts from trucks and cars to produce spare parts which can be used to repair and upgrade vehicles

### Examples: Innovators

#### Whim

offers access to (almost) all types of transport through an integrated mobility-as-a-service scheme in Helsinki, the West-Midlands, and Antwerp

#### BlaBlaCar

enables car-pooling, using spare capacity in private vehicles on existing journeys

#### Convoy

is a platform that enables local freight drivers to pick up additional jobs en route and utilise empty load capacity

#### Connected Energy and Powervault

use second-life EV batteries for energy storage systems

#### Mobike

offers a bike-sharing service using IoT technology in dozens of cities across the world

#### Pony

operate a shared micro-mobility rental scheme with decentralised vehicle ownership

#### Black Bear Carbon

turns used tyres into a raw material called 'carbon black' which can be used in a range of products, including pen ink, smartphone covers, and new tyres

# 6

## Technology, Media, and Telecommunications

**Key circular economy strategies**

- Improve knowledge of an asset’s location, condition, and availability using technology solutions to optimise circular economy value drivers (e.g. extend use cycle, increase utilisation, loop an asset, recover and reuse/recycle)
- Design technology and telecom equipment and infrastructure for life extension, upgrade, reuse, and disassembly
- Reuse, redeploy, upgrade, refurbish, and recycle tech and telecoms equipment and infrastructure (e.g. servers, network equipment)
- Operate shared data centre and network infrastructure (Infra-as-a-Service)

### Drivers of circular economy growth potential

- **High** potential for growth in the short-medium term
- **Increasing** potential for growth in the short-medium term
- **Emerging or limited** potential for growth in the short-medium term

Innovation and corporate action	
<p><b>Increased demand for finite resources</b></p>	<ul style="list-style-type: none"> <li>• Increase in urban mining / recycling efforts as the demand for rare earth metals increases in the electronics industry, with only 1% of rare earth elements currently being recycled</li> </ul>
<p><b>Innovation</b></p>	<ul style="list-style-type: none"> <li>• Technological innovation (AI, IoT, blockchain) keeps rapidly broadening the scope for circular business practices</li> <li>• Cloud and edge computing are increasingly enabling intelligent assets</li> <li>• Companies enabling virtualisation and offering (streaming) services have already significantly disrupted the industry (e.g. Spotify, Kindle, Netflix), with the subscription e-commerce market, from streaming media to personal care products, having grown by over 100% annually from 2011 to 2016<sup>262</sup></li> </ul>






<b>Policies and regulation</b>	
<b>Political priorities</b>	<ul style="list-style-type: none"> <li>• Growing understanding of how tech can enable solutions for urgent challenges (e.g. EU circular economy Action Plan, European approach to Artificial Intelligence and Robotics)</li> </ul>

<b>Customer preferences and macrotrends</b>	
<b>Changing preferences and behaviour</b>	<ul style="list-style-type: none"> <li>• Customers increasingly switching to subscription streaming models (global video streaming market exceeded USD 42 billion in 2019 and is estimated to grow by 20% annually between 2020 and 2027)<sup>263</sup></li> </ul>
<b>Digitalisation</b>	<ul style="list-style-type: none"> <li>• Increasing global digitalisation and connectivity (3.5 billion people globally had mobile internet connectivity in 2019)<sup>264</sup> gives citizens access to digital platforms and marketplaces, resulting in trends such as growth in online shopping (including groceries)</li> <li>• Adoption of 5G could further enable IoT tech supporting the circular economy (e.g. predictive maintenance of smart home appliances)</li> </ul>

### Types of circular economy opportunity areas

-  Circular design and innovation
-  Circular business models
-  Reuse, repurpose, and redistribute
-  Repair, remanufacture, and refurbish
-  Collect, sort, and recycle
-  Regenerative and renewable practices and materials
-  Enabling digital technologies

### Current circular economy opportunity areas

 <p><b>Technologies that enable circular economy value drivers</b> (e.g. predictive maintenance, automated sorting, reverse logistics planning)</p>	 <p><b>Virtualisation of physical products</b> (e.g. media streaming)</p>	 <p><b>Repair, refurbish, and resale of tech equipment</b></p>
 <p><b>As-a-Service delivery models for network infrastructure</b></p>	 <p><b>Development of enabling telecom technologies</b> (e.g. 5G)</p>	

### Examples: Large corporates

<p><b>Google</b> applied circular economy principles to their data centres and server management, including buying remanufactured servers (18% in 2017), refurbishing existing equipment, and reselling used hardware</p> <p><b>Thyssenkrupp</b> is using elevator data and IoT technology to enable predictive maintenance</p>	<p><b>Crown Hosting</b> provides data centres as a service to the public sector in the UK</p> <p><b>KPN</b> set a target to get close to 100% circular operations and services by 2025 by applying circular design principles, and by the end of 2019, 18 suppliers had signed their KPN Circular Manifesto, representing more than 70% of its spend on materials</p>	<p><b>Cisco</b> provides infrastructure, platform and software-as-a-service delivery models, as well as a Takeback and Reuse Program for network equipment</p>
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### Examples: Innovators

<p><b>Provenance</b> uses blockchain technology to provide information about products and supply chains across multiple use cycles</p> <p><b>ZenRobotics</b> combines AI and robotics to recover recyclables from waste</p>	<p><b>ReGen Villages</b> has developed software and a simulator which uses artificial intelligence and machine learning to address the integration of high yield organic food, clean water, renewable energy and circular waste to aid resource management at the neighbourhood scale</p>	<p><b>Closing the Loop</b> has partnered with <b>T-Mobile</b> and <b>Samsung</b> to collect and recycle a scrap phone for each new phone sold in the Netherlands, offsetting the material footprint on a one-to-one basis</p>
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# 7

## Engineering and Construction

**Key circular economy strategies**

- Offer existing, underutilised building spaces for short-term use on online platforms to maximise the utilisation of existing assets
- Retrofit existing buildings for alternative uses and design new buildings to be adaptable to extend useful life
- Deploy and operate a portfolio of relocatable buildings –which are modular, designed for deconstruction and made of durable, high-quality materials – on unused sites to create short-term, or interim, spaces
- Create futures contracts, in which value is tied to the estimated future value of materials in a building when deconstructed, which can be traded on a centralised exchange to enable recovery and reuse of construction materials.
- Complement the reuse of deconstruction materials by using materials that are renewable, non-toxic, have a high recycled content, and/or are sourced locally
- Pay for performance through product-as-a-service subscriptions for building fixtures and fittings (e.g. heating-, cooling- or lighting-as-a-service)

### Drivers of circular economy growth potential

- **High** potential for growth in the short-medium term
- **Increasing** potential for growth in the short-medium term
- **Emerging or limited** potential for growth in the short-medium term

Innovation and corporate action	
<b>Demand for finite resources</b>	<ul style="list-style-type: none"> <li>• Rapid urbanisation is projected to double demand for steel and nearly double demand for cement by 2050</li> <li>• Unmet housing needs mean 1 billion new homes will be required worldwide by 2025<sup>265</sup></li> </ul>
<b>Industry action</b>	<ul style="list-style-type: none"> <li>• Growing awareness among leading clients and investors of the positive business case for adopting circular models and increasing body of research and knowledge and papers published on the topic</li> <li>• Large demonstration development projects have been designed and constructed using circular principles (e.g. Triodos Bank HQ and Park 20 20 in Amsterdam)</li> </ul>

<b>Innovation and corporate action</b>	
<b>Innovation</b>	<ul style="list-style-type: none"> <li>• Ongoing innovation in business models (e.g. Madaster's platform creates material passports for buildings and tracks the value of materials over time),<sup>266</sup> and building materials and design (e.g. hemp fibre cladding on Flat House by Practice Architecture)<sup>267</sup></li> </ul>
<b>Cost benefit</b>	<ul style="list-style-type: none"> <li>• In 2019 solar, wind, and hydropower projects were being deployed at their fastest rate in four years and renewable power capacity is expected to expand by 50% between 2019 and 2024.<sup>268</sup> According to BNEF analysis, utility-scale solar PV and onshore wind are now the cheapest forms of new-build energy generation across two-thirds of the global population<sup>269</sup></li> </ul>

<b>Policies and regulation</b>	
<b>Increasing policies and regulation</b>	<ul style="list-style-type: none"> <li>• Focus area of the new EU circular economy Action Plan, e.g. material recovery targets for construction and demolition waste and its material-specific fractions</li> <li>• European Waste Framework Directive (2008/98/EC) has set a target for 70% of non-hazardous construction and demolition waste to be reused, recycled or recovered by 2020</li> <li>• Increased policy focus at the city-level, e.g. The New London Plan requires all new developments of a certain size to submit a Circular Economy Statement to help architects embed circular economy principles,<sup>270</sup> and Victoria State government's 'Recycled First' programme for infrastructure requires the prioritisation of recycled and reused materials<sup>271</sup></li> </ul>
<b>Incentives</b>	<ul style="list-style-type: none"> <li>• Decarbonisation of the energy sector is still high on the political agenda (e.g. EU Green Deal), with incentive schemes varying and evolving across geographies (e.g. solar panels vs home batteries)</li> </ul>

<b>Customer preferences and macrotrends</b>	
<b>Changing demographics</b>	<ul style="list-style-type: none"> <li>• Demographic evolution across regions requires different and changing housing needs</li> <li>• Shifting working patterns require flexible spaces, accelerated by Covid-19 crisis</li> </ul>
<b>Climate change and global challenges</b>	<ul style="list-style-type: none"> <li>• Increasing awareness that the construction sector accounts for over one-third of global resource demand and is a major contributor to climate change (a circular scenario could reduce global CO<sub>2</sub> emissions from building materials by 38% or 2 billion tonnes CO<sub>2</sub> in 2050, due to a reduced demand for steel, aluminium, cement, and plastic)<sup>272</sup></li> </ul>
<b>Changing preferences and behaviour</b>	<ul style="list-style-type: none"> <li>• In 2019, over 40% of customers expressed a preference for renewable utility generation (25% in 2018), and 45% said they would be willing to pay more for 100% renewable energy<sup>273</sup></li> <li>• Growing interest in decentralised, off-the-grid energy production and storage, driven by e.g. growth in the global EV market (forecasted CAGR of 21% between 2019 and 2030)<sup>274</sup></li> </ul>



### Types of circular economy opportunity areas

-  Circular design and innovation
-  Circular business models
-  Reuse, repurpose, and redistribute
-  Repair, remanufacture, and refurbish
-  Collect, sort, and recycle
-  Regenerative and renewable practices and materials
-  Enabling digital technologies

### Current circular economy opportunity areas

-  **Digital technologies which enable circular economy business models in engineering and construction, including material passports and predictive maintenance**
-  **Infrastructure- and product-as-a-service business models for infrastructure assets, fixtures, fittings, and furniture**  
(e.g. solar panels offered as a service to individuals and businesses)
-  **Buildings as material banks**

**Note:** Commercial-scale pilots are needed to demonstrate proof-of-concept of emerging real estate and infrastructure circular business models

### Examples: Large corporates

- |   |  |  |
|---|--|--|
| <p><b>Steelcase</b><br/>adopted product-as-a-service systems enabling recovery and redeployment of furniture, and pay-for-use models</p> <p><b>BAM</b><br/>constructed Circl, ABN Amro's circular pavilion in Amsterdam, with architects CIE</p> <p><b>The Crown Estate</b><br/>updated Development Sustainability Principles require design teams to incorporate circular principles into real estate development projects<sup>275</sup></p> | <p><b>Arup</b><br/>apply circular design principles to projects with clients and partners (e.g. The Circular Building, London, with Frener &amp; Reifer, the Built Environment Trust and BAM, HAUT, Amsterdam, Transport Infrastructure Ireland, 1 Triton Square with British Land, and the Quay Quarter Tower in Sydney with AMP Capital and 3XN/GXN)</p> <p><b>Interface and Tarkett</b><br/>design and manufacture modular carpet tiles using recycled materials which can be disassembled and recycled after use</p> | <p><b>Schneider Electric</b><br/>offers an Uninterruptible Power Supply rental service in Spain, with remote asset management and predictive maintenance to extend asset life</p> <p><b>GE</b><br/>offers digital and service solutions to monitor, predict, and optimise wind turbine performance and maintenance, and have a repair and refurbishment centre for spare parts<sup>276</sup></p> <p><b>Enel's</b><br/>Futur-e project is redeveloping the sites of 23 thermal power stations using circular economy principles</p> |
|---|--|--|

### Examples: Innovators

- |   |   |   |
|---|---|---|
| <p><b>GlobeChain</b><br/>is a digitally enabled reuse marketplace for construction material, while collating data</p> <p><b>Kaer</b><br/>offers air-conditioning as a service, taking responsibility for the design, installation, and operation of the AC system</p> | <p><b>Oxara</b><br/>facilitates the reuse of construction waste (excavation material) and produces low cost secondary building materials</p> <p><b>Strukton</b><br/>has developed a mobile concrete recycling plant, Circuton, which recycles demolished concrete on-site into materials that can be reused to produce new concrete</p> | <p><b>Enlighted</b><br/>provides an IoT-based energy service system, claiming it saves their clients 60–70% on lighting and 20–30% on heating/cooling</p> <p><b>Winsun</b><br/>uses 3D printing technology for construction</p> |
|---|---|---|

# 8

## Waste management and water

### Key circular economy strategies

- Design for reusability, repairability, durability, recyclability, and/or compostability, including phasing out hazardous materials and substances of concern
- Collect and sort used products and materials (both non-renewable, e.g. metals, plastics, chemicals, etc.; and renewable, e.g. wood, paper, cotton) for reuse, remanufacturing, and recycling
- Reuse, remanufacture, and recycle materials, components and products, and improve efficiencies of recycling and recovery systems
- Collect, sort, and compost or anaerobically digest food and other organic material, and create valuable products from residual biosolids (e.g. fertiliser)
- Recover, reuse, and recycle water and resources from wastewater

### Drivers of circular economy growth potential

- **High** potential for growth in the short-medium term
- **Increasing** potential for growth in the short-medium term
- **Emerging or limited** potential for growth in the short-medium term

#### Innovation and corporate action

<b>Innovation</b>	<ul style="list-style-type: none"> <li>• Automation increasingly being implemented in the waste management process (e.g. robotic sorting)</li> <li>• Technology and data-driven innovation, such as route optimisation, smart bins and trucks, RFID technology, and fill sensors</li> <li>• Development of new recycling technologies, particularly focussed on plastic (e.g. chemical recycling)</li> <li>• Technological innovation in resource recovery from wastewater (e.g. water innovation projects funded under Horizon 2020)<sup>277</sup></li> </ul>
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<b>Policies and regulation</b>	
<b>Increasing policies and regulation</b>	<ul style="list-style-type: none"> <li>• Stricter waste regulation, e.g. landfill taxes in the EU (EUR 5-100/tonne),<sup>278</sup> Australia (USD 42-105/tonne),<sup>279</sup> and California, US (USD 36-50/tonne),<sup>280</sup> single-use plastic bans, EPR schemes, essential requirements for packaging, and China's National Sword policy banning import of waste in 2018, including plastic, paper and metal, which has increased global waste disposal costs</li> <li>• National recycling targets (e.g. EU targets for plastic, paper, wood, glass, and metals)</li> </ul>
<b>Incentives</b>	<ul style="list-style-type: none"> <li>• Circular economy regulation, including new EU circular economy Action Plan, EU Packaging and Packaging Waste Directive, is helping to develop high-quality secondary raw materials markets</li> <li>• National governments and cities implementing circular economy roadmaps (e.g. Colombia, France, Slovenia, Germany, China; and London, Charlotte, Beijing, São Paulo, Mexico City, Cape Town), including approach to waste management and water</li> </ul>

<b>Customer preferences and macrotrends</b>	
<b>Changing preferences and behaviour</b>	<ul style="list-style-type: none"> <li>• Growing awareness of waste and pollution, particularly single-use plastic and plastic leaking into the ocean, resulting in changing attitudes, spending and behaviour away from linear business models (e.g. fast fashion and single-use plastic)</li> <li>• Recycling rates in Europe have increased by 16% between 2004 and 2017 for municipal waste, and by 13% between 2005 and 2016 for packaging waste<sup>281</sup></li> <li>• However, global waste is expected to grow to 3.4 billion tonnes by 2050, more than double population growth over the same period, with at least a third not managed in an environmentally safe manner<sup>282</sup></li> </ul>

### Types of circular economy opportunity areas

-  Circular design and innovation
-  Circular business models
-  Reuse, repurpose, and redistribute
-  Repair, remanufacture, and refurbish
-  Collect, sort, and recycle
-  Regenerative and renewable practices and materials
-  Enabling digital technologies

### Current circular economy opportunity areas

-  **Collection, sorting, and recycling capacity**
-  **Anaerobic digestion of post-customer organic waste**
-  **Resource recovery from wastewater**
-  **High-quality recycling technologies**
-  **Use of organic waste as feedstock for innovative materials**
-  **Automated sorting technologies**

**Note:**

In general, waste-to-energy is a linear activity which results in the loss of finite materials. It is therefore **not** considered to be part of a circular economy

### Examples: Large corporates

**SUEZ**

generated 36% of their 2018 revenues in Europe from recycling and recovery activities, and becoming 100% circular through reuse and recycling is part of their 2030 value proposition; and opened in 2020 a pioneering industrial unit for the recovery of ultra-fine metal particles from household and industrial waste

**Renewi**

are a waste-to-product business that collect and recycle waste and turn it into secondary raw materials and products

**Veolia**

generated EUR 4.8 billion (USD 5.66 billion) in 2018 (50% of waste revenues) from circular economy activities, including recycling, biogas and wastewater recycling, and partnered with Unilever to jointly improve infrastructure for a circular economy for plastics

**GFL**

has invested in circular processes across material streams, including soil recycling and reuse in construction and development, and converting organic waste into compost and fertilisers

**Cambrian Innovation**

offers distributed wastewater treatment and resource recovery as a service via its water-energy purchase agreement

### Examples: Innovators

**TerraCycle**

has programmes to recycle 'difficult to recycle' products, such as multilayer packaging and chewing gum

**Loop Industries**

produce recycled plastic feedstock of virgin quality using chemical recycling

**TOMRA**

provides reverse vending machines, waste sorting, and recycling solutions and technology

**TriCiclos**

integrates the operation of collection, sorting, and recycling stations with the education of communities and strategic consulting with businesses to help them design out waste

**Recycling Technologies**

have developed mass-producible modular technology which can be installed on existing waste sites to recycle plastic waste into feedstock for new plastic production

**Kudoti**

uses a digital platform to streamline collection, sorting, processing, and recycling of materials streams across Africa to reduce pollution and improve material recovery

**AMP Robotics**

uses AI and robotics to automate the identification, sorting, and processing of complex waste streams

# 9

## Industrial manufacturing

**Key circular economy strategies**

- Use recycled or regeneratively sourced, renewable materials in production
- Design waste out of production processes, and reuse or valorise by-products of production
- Design and manufacture products to be durable, repairable, and easy to disassemble
- Keep products in use through disassembly and demanufacturing, remanufacturing of parts, products and machinery, and production of spare parts to repair and upgrade products, machinery and infrastructure
- Keep materials in use through recycling end-of-life parts, products, and machinery to recover the materials as secondary inputs for manufacturing processes

### Drivers of circular economy growth potential

- **High** potential for growth in the short-medium term
- **Increasing** potential for growth in the short-medium term
- **Emerging or limited** potential for growth in the short-medium term

Innovation and corporate action	
<b>Demand for finite resources</b>	<ul style="list-style-type: none"> <li>• Manufacturing firms in the EU spend on average ~40% on materials</li> </ul>
<b>Innovation</b>	<ul style="list-style-type: none"> <li>• Manufacturers continue to innovate in advanced manufacturing and digital technologies, such as AI, cloud computing, advanced analytics, robotics, additive manufacturing, and 3D printing to the value chain to reduce waste in production</li> <li>• Transition to renewable energy sources to power production</li> </ul>

<b>Policies and regulation</b>	
<b>Increasing policies and regulation</b>	<ul style="list-style-type: none"> <li>• Increasing regulation, (e.g. new EU circular economy Action Plan, EU Industrial Strategy, EPR policies, landfill taxes)</li> <li>• REACH regulation also covers by-products from production, with additional compliance requirements in place for by-products considered to be harmful to human health and the environment</li> </ul>

<b>Customer preferences and macrotrends</b>	
<b>Changing preferences and behaviour</b>	<ul style="list-style-type: none"> <li>• Growing awareness of negative impacts of waste and pollution</li> </ul>
<b>Resilience to global shocks</b>	<ul style="list-style-type: none"> <li>• Covid-19 crisis has created significant disruption to trade flows and manufacturing, supply chains, with some reshoring of manufacturing expected and increased instances of repair and remanufacture (e.g. of ventilators)</li> </ul>

### Types of circular economy opportunity areas

-  Circular design and innovation
-  Circular business models
-  Reuse, repurpose, and redistribute
-  Repair, remanufacture, and refurbish
-  Collect, sort, and recycle
-  Regenerative and renewable practices and materials
-  Enabling digital technologies

### Current circular economy opportunity areas




**Additive manufacturing of components, products, and spare parts**



**Disassembly, demanufacturing, and component and material reuse**



**Circular business models offering products-as-a-service**



**Remanufacturing of components, vehicles, and machinery**

### Examples: Large corporates

<p><b>Caterpillar's</b> Cat Reman programme, produces same-as-new quality components and replacement parts for a fraction of the cost of a new part</p>	<p><b>Siemens Mobility</b> 3D printing of train and rail parts cuts manufacturing times by 95%</p>	<p><b>Neptuno Pumps</b> remanufactures industrial pumps and reuses or recycles end-of-life parts to manufacture new pumps and spare parts</p>
<p><b>Rolls Royce's</b> 'Power-by-the-Hour' engine maintenance management approach (e.g. TotalCare programme) uses predictive analytics for lifecycle engine maintenance, and enables up to 95% of used engine parts to be recovered or recycled</p>	<p><b>IBM</b> has demanufacturing and asset recovery centres to demanufacture used electronics and harvest parts for reuse or resale</p>	<p><b>Jaguar Land Rover</b> recycles aluminium from end-of-life vehicles back into high-quality aluminium for the manufacture of new vehicle bodies</p>

### Examples: Innovators

<p><b>3YOURMIND</b> has developed additive manufacturing software for 3D printing of spare parts, enabling <b>Deutsche Bahn</b> to create a 'digital spare parts warehouse' for maintenance of vehicles and <b>Bosch</b> to produce industrial plastic parts in small quantities, and 3D printing of parts for hospitals and medical centres in response to the Covid-19 crisis</p>	<p><b>Novo Nordisk</b> and eight other private and public companies, have a commercially successful industrial symbiotic partnership in Kalundborg, exchanging 25 different resource streams creating cost savings and socio-economic benefits</p>	<p><b>Warner Babcock Institute</b> has developed an additive to help recycle old asphalt into new</p> <p><b>Urban Mining Company</b> has developed a technology to reprocess rare earth magnets from end-of-use products (e.g. electronics) into new magnets</p>
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# 10 Paper, pulp, and forestry products

**Key circular economy strategies**

- Source renewable materials from regenerative sources
- Keep materials in use by reusing and recycling paper, pulp, and wood through cascades of use, before safely returning them to the biosphere

## Drivers of circular economy growth potential

- **High** potential for growth in the short-medium term
- **Increasing** potential for growth in the short-medium term
- **Emerging or limited** potential for growth in the short-medium term

Innovation and corporate action	
<b>Established circular practices</b>	<ul style="list-style-type: none"> <li>• Recycling rates already fairly high, e.g. ~85% recycling rates of paper and board packaging in Europe in 2018<sup>283</sup></li> </ul>
<b>Demand for alternative materials</b>	<ul style="list-style-type: none"> <li>• Plastic packaging disruption offers opportunities for alternative materials such as paper and cardboard (the shift away from plastic packaging is estimated to create an extra USD 700 million in demand for corrugated cardboard in Europe and the US between 2018 and 2022, equal to 0.4% per annum of incremental growth)<sup>284</sup></li> </ul>

Policies and regulation	
<b>Increased policies and regulation</b>	<ul style="list-style-type: none"> <li>• China’s National Sword policy banning import of waste in 2018, including plastic, paper, and metal, has increased global waste disposal costs and driven down recycled paper input costs (China took ~70% of the world’s waste exports in 2017)</li> <li>• National recycling targets (e.g. EU targets for paper and wood)</li> </ul>




Customer preferences and macro trends	
<b>Changing preferences and behaviour</b>	<ul style="list-style-type: none"> <li>• Increasing customer pressure and changing behaviour for packaging solutions ('BBC's <i>Blue Planet II</i> effect')</li> </ul>



### Types of circular economy opportunity areas

-  Circular design and innovation
-  Circular business models
-  Reuse, repurpose, and redistribute
-  Repair, remanufacture, and refurbish
-  Collect, sort, and recycle
-  Regenerative and renewable practices and materials
-  Enabling digital technologies

### Current circular economy opportunity areas

-  **Use of high-quality recycled content to replace virgin input**
-  **Use of paper or cardboard to replace plastics in packaging**
-  **Automated sorting technologies**

### Examples: Large corporates

- |  |   |  |
|--|---|--|
| <p><b>DS Smith</b><br/>a global packaging company and a net positive recycler, committed to manufacture 100% reusable or recyclable packaging by 2025</p>            | <p><b>Smurfit Kappa</b><br/>has a Better Planet Packaging innovation initiative to design alternatives to problematic packaging formats</p> | <p><b>International Paper</b><br/>is targeting circular solutions throughout their value chain and is one of the largest users of recovered fibre globally</p> |
| <p><b>Stora Enso</b><br/>design for circularity and have a value chain Circular Packaging Programme for driving collection and recycling of paperboard packaging</p> |   |  |

### Examples: Innovators

- |   |  |   |
|---|--|---|
| <p><b>The Loop Factory</b><br/>has developed a manufacturing technology for dry moulded cellulose-based packaging from pulp, named Yangi, which is renewable and recyclable</p> | <p><b>Spinnova</b><br/>turns wood and cellulose waste streams into textile fibre</p>                             | <p><b>Sulapac</b><br/>produces packaging from renewable materials, including by-products from wood processing</p> |
| <p><b>Noble Environmental Technologies</b><br/>have developed ECOR, a composite panel made from recycled waste fibres, using only water and heat</p>                            | <p><b>Paptic</b><br/>has produced a bio-based, recyclable, reusable packaging material made from wood fibres</p> |   |

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## About The Ellen MacArthur Foundation

The Ellen MacArthur Foundation is a UK-based charity, committed to the creation of a circular economy that tackles some of the biggest challenges of our time, such as waste, pollution, and climate change. A circular economy designs out waste and pollution, keeps products and materials in use, and regenerates natural systems, creating benefits for society, the environment, and the economy.

The Foundation collaborates with: its Strategic Partners (BlackRock, Danone, DS Smith, Google, H&M Group, Intesa Sanpaolo, IKEA, Philips, Renault, SC Johnson, Solvay, Unilever, The Eric and Wendy Schmidt Fund for Strategic Innovation, SUN, MAVA, players of People's Postcode Lottery (GB)) and its wider network of businesses; governments, institutions, and cities; designers; universities; and emerging innovators to drive collaboration, explore opportunities, and develop circular business initiatives.

### Further information

[www.ellenmacarthurfoundation.org](http://www.ellenmacarthurfoundation.org)

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