

Newsweek

VANTAGE

GOING CIRCULAR:

HOW GLOBAL BUSINESS IS EMBRACING
THE CIRCULAR ECONOMY

Sponsored by:



C&A Foundation



In association with:



Going Circular was researched and written by Newsweek Vantage and sponsored by Autodesk, BASF, C&A Foundation and UL. Circle Economy and World Business Council on Sustainable Development (WBCSD) were knowledge partners.

We are grateful to all who provided their valuable time and insights. In particular we would like to thank the following: Sam Devenport (57st. design), Jason Stamm (AB Inbev), Sander van Wijk (ABN Amro), Pete Desmond (Africa Circular Economy Network), Christoph Scharff (ARA), Lynelle Cameron (Autodesk), Andreas Kircher (BASF), Stefan Blachfellner (BCSSS), Juan Jose Freijo (Brambles), Douwe Jan Joustra (C&A Foundation), Marc de Wit (Circle Economy), Gina Lee (Circular CoLab), Julika Dittrich (Circular Futures), Miquel Ballester (Fairphone), Kim Tjoa, Laury Zwart (FLOOW2.com), Siva Balakrishnan (GE Healthcare), Amanda Weeks (Industrial/Organic), Janez Potocnik (International Resource Panel), Jeroen Cox (KPN), Suzanne Smulders (Lena Fashion Library), Nabil Nasr (REMADE Institute), Markus Mannstrom (Stora Enso), Martin R. Stuchtey (SYSTEMIQ), Tom Szaky (TerraCycle), William F. Hoffman III, Catherine Sheehy, Adrian Wain (UL), Brendan Edgerton (WBCSD) and John Warner (Warner Babcock Institute).

Author: Katy Shields

Editor: Poh-Khim Cheah

Design: Links Design Ltd

Publication date: January 2019

Disclaimer

The contents of this report do not necessarily reflect the opinions of our sponsors or partners. While every effort has been taken to verify the accuracy of this information, neither Newsweek nor Think Big Partners WLL nor any of their affiliates can accept any responsibility or liability for reliance by any person on this information.

© 2019 Newsweek and Think Big Partners WLL. All rights reserved.

CONTENTS

Executive summary.....	2
Eight things companies can do to accelerate their circular transition...2	
1. Why business is going circular.....	3
An approach that resonates across businesses.....	3
Key survey findings.....	4
Circular drivers.....	5
2. The business of circular.....	6
REduce.....	7
REuse.....	8
REmake.....	9
REcover.....	10
REnew.....	11
3. Circular success factors.....	13
1. Adopt a long-term, company-wide strategy.....	13
2. Collaborate across the value chain.....	14
3. Take advantage of scale.....	15
4. Accelerating the change.....	16
1. Bring innovations to market.....	16
2. Invite finance to the table.....	17
3. Support interdisciplinary learning.....	17
4. Promote circular governance.....	18
5. Encourage activism.....	19
Conclusions.....	20
Appendix.....	21
Endnotes.....	22



Circularity's rapid rise

The circular economy's central aim is to extend the life of all the goods and materials being bought, sold, used and discarded daily, throughout our societies, in order to curb extraction, pollution and waste. As such, it has come to be seen as a vital tool in the fight against environmental crises such as climate change, biodiversity loss, resource scarcity and pollution.

Research by Newsweek Vantage confirms that the concept of a circular economy has gone from relative obscurity to the corporate boardroom in just a few years. In an October 2018 survey of 317 senior executives from large corporations around the world, fully 98% were familiar with the concept. Thirty percent said their company had a circular strategy, and over three-quarters plan on adopting targets to make their products, processes or business models more circular in the coming five years.

Our research—which was also based on over 25 in-depth interviews with major companies, circular start-ups and other experts—indicates that companies are prioritizing the following strategies and business models:

REduce. Using design and manufacturing technology to lower material, energy and waste footprints.

REuse. Offering subscription, leasing or sharing models, rather than basing business on one-off sales.

REmake. Designing products that can be more easily repaired or “remanufactured” into new products.

REcover. Turning by-products into new products or adding recycled content to products and packaging.

REnew. Substituting renewable for finite materials and focusing more on sustainable sourcing.

Beyond sustainability

Practitioners describe circularity as a tangible approach to resource efficiency that companies can “wrap their arms around”—one with benefits which go beyond meeting sustainability goals. Indeed, an overwhelming majority of executives we surveyed (95%) saw the transition to a circular economy as a positive for their organization, citing access to new markets, improved competitiveness, enhanced image and higher revenues among the leading perks.

Yet our research also finds that circularity is more than just an add-on to corporate social responsibility or sustainability strategies. It requires a complete product and business model rethink, starting at the choice of material through to how products are designed, made, used—and disposed of.

Lack of know-how, technology and partners were the main challenges cited by survey respondents. To get it right, companies need to collaborate in-house—especially with procurement, design and commercial teams—and throughout the supply chain. This opens the door for new “circular enablers” who can facilitate exchanges, build coalitions, and fill gaps in technology, services and know-how.

No (time to) waste

Despite a growing interest in circularity, just 9% of the global economy is circular today. In a system where polluting is often free, cheap virgin materials mean the economics of going circular don't always work. However, even though a global agreement on resource use remains a distant prospect, businesses are positive about the role of national governments in setting targets and procurement programs which can help build a business case.

There is still much room for innovation, and for investment to scale nascent technologies, too. Finance is beginning to step up, and established companies can complement this by partnering with a growing number of circular innovators, from start-ups giving waste a second life to leasing and sharing services aiming to disrupt the classic “linear” sales model.

As one such innovator points out, there is a new generation of companies that are circular by design. Add to that emerging risks like climate change and resource scarcity, and perhaps the choice for large companies will increasingly be to go circular...or just go.

Eight things companies can do to accelerate their circular transition

Here are some of the key lessons from companies which are making a success of circularity:

- 1 Be holistic.** Going circular is not just about doing good; it is an opportunity to create value—and mitigate risks. Get buy-in from the top, and work across functions to develop commercially viable opportunities.
- 2 Learn.** Circularity requires a new way of thinking and a new skill set. Engage and educate your employees, and go outside of your organization if necessary to fill knowledge gaps.
- 3 Expand your horizons.** Whether it's moving from a product to a service model, or finding new purposes for by-products, many opportunities lie beyond your existing products or industry—seek them out.
- 4 Experiment.** Some aspects of circularity need more testing, and markets are at different maturity levels. Conduct pilots, or help small disruptors with proven models to achieve scale.
- 5 Harness the value of data.** To help make better production and design decisions, and also generate value for your business and customers, such as with insights on product performance.
- 6 Partner.** Tracking, moving and recovering materials and products requires new and deeper forms of collaboration. Build trust with like-minded partners, use third-party facilitators, or join or initiate coalitions.
- 7 Be transparent.** Don't play down the challenges, but use them as part of your business proposition to help accelerate the necessary shift in mindsets, policies and business practices.
- 8 Stick to the plan.** The future of business may be circular, but redesigning products and business models does not happen overnight. Create a plan and adopt interim targets to stay on track.

1. WHY BUSINESS IS GOING CIRCULAR

When, in 2010, Dame Ellen MacArthur—round-the-world, solo-sailing champion—set up a foundation aimed at improving how the world manages its resources, the term circular economy “was still relatively unknown,” according to Martin Stuchtey, Co-Founder of SYSTEMIQ, a company created to accelerate low-carbon, sustainable solutions in land use, materials and energy. Stuchtey is also former head of McKinsey’s sustainability practice, which conducted the research behind the Ellen MacArthur Foundation’s first circular economy reports.

Less than a decade on and the circular economy is now firmly part of the corporate lexicon (see What is the circular economy? for definition). Only 2% of respondents in our survey had never heard of the term, while 30% said their companies had a goal to “adopt circular economy practices,” and 77% said their firms had, or expected to develop, “circularity targets” within the next five years. Overall, 95% saw circularity as a positive development for their business, and 42% “strongly agreed” about its advantages.

An approach that resonates across businesses

The benefits of circularity vary by industry and individual company, but the overarching advantage cited by practitioners is that it turns the nebulous concept of sustainability into something that can be implemented. It offers the possibility of creating real value—whether through extracting efficiencies from lower resource and energy use, creating new revenue streams from production by-products, improving customer retention and brand profile, or gaining a competitive edge with product- or business-model innovations.

“It’s an opportunity to talk about business in a different way than sustainability,” says Catherine Sheehy, Head of Advisory Solutions at UL, a global independent safety science company. “Circularity focuses on things that should resonate clearly with people across functional areas, regardless of their perspective on sustainability. It’s very tangible.”

What is the circular economy?

Though definitions can vary, most proponents agree that the circular economy’s central aim is to extend the life of all the goods and materials in our societies, in order to curb extraction, pollution and waste, and to preserve and enhance ecosystems for future generations.¹ If there is one thing that unites practitioners, it’s that circularity goes far beyond recycling.

“Recycling is not the only solution,” says Andreas Kicherer of chemical company BASF. “The target is to decouple growth from resource consumption. The circular economy opens up tremendous possibilities for companies to tackle today’s and tomorrow’s societal challenges.”

The concept has been around for several decades but has only gained traction in the last few years.² The Ellen MacArthur Foundation’s “butterfly” diagram, developed in 2012, is broadly seen as the most comprehensive depiction to date.³

The main elements are:

Regenerative by design. Based on renewable materials and energy, the circular economy seeks to maintain and enhance natural resources.

Retention of value. The value of goods and materials is kept as high as possible for as long as possible, prioritizing the most efficient means of lengthening lifespans (like sharing, re-use and repair).

Closed-loop. At the end of their useful life, all materials are fed back into the system as fertilizer, material feedstock or as energy for new production cycles, minimizing emissions, pollution and waste.

“The circular economy gives us something that we can actually wrap our arms around, versus the broader goals of sustainability. It is a very good way for industry to start to make progress.”

—Nabil Nasr, CEO, REMADE Institute

Table 1: Circular economy networks and initiatives featuring large corporations

Organization	Initiative name	Launched	About
Ellen MacArthur Foundation	CE100	2015	A membership-based initiative bringing together leaders of major corporations, emerging innovators, pioneering universities, and governments to facilitate learning, capacity-building and cooperation. There are some 150 members, including over 50 large corporations. Campaigns include creating a new economy for plastics and a circular economy for fashion.
World Economic Forum (WEF)	Platform for Accelerating the Circular Economy (PACE)	2017	The 40-plus members include CEOs, government ministers and heads of development organizations. Focus areas are financing, policy and public-private cooperation.
World Business Council for Sustainable Development (WBCSD)	Factor 10	2018	Comprising 35 multinational companies from 15 different sectors, Factor 10 aims to be the “epicentre” of the circular economy for business. It is working initially with a team of “early adopters” to foster and scale up learning for the wider WBCSD network and beyond. Work streams include policy, circularity metrics and deep dives into sectors such as automotive, construction, bioeconomy and electronic waste.

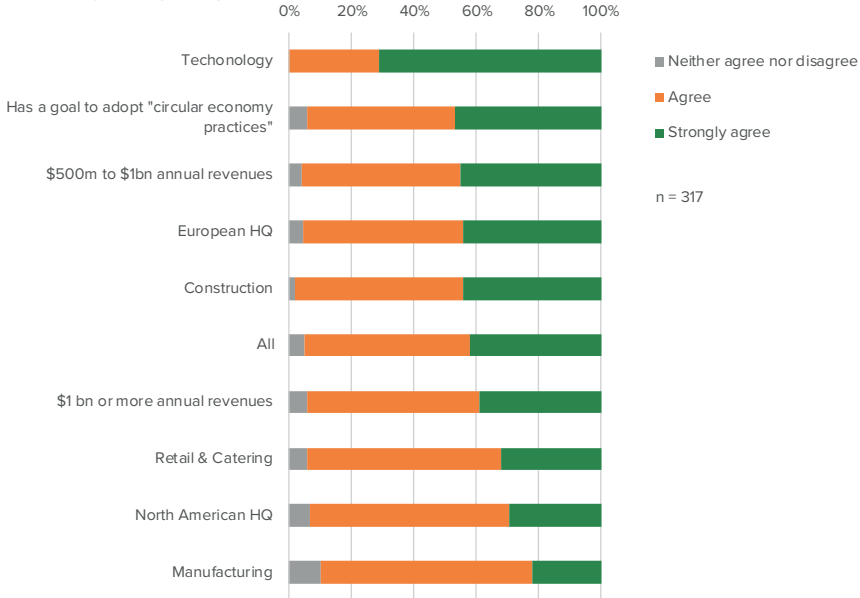
Sources: “CE 100”, Ellen MacArthur Foundation, accessed December 18 2018, <https://www.ellenmacarthurfoundation.org/ce100>; “Platform for Accelerating the Circular Economy”, World Economic Forum, accessed December 18, 2018, <https://www.weforum.org/projects/circular-economy>; “Circular Economy”, World Business Council on Sustainable Development, accessed December 18, 2018, <https://www.wbcscd.org/Programs/Circular-Economy>; Brendan Edgerton (Director, Circular Economy, World Business Council on Sustainable Development), in discussion with Newsweek Vantage, November 14, 2018.

Key survey findings

95%

of executives agreed that the circular economy poses an opportunity for their organization (none disagreed). Technology company executives were most positive while those at North American-based companies and the manufacturing sector were more cautious.

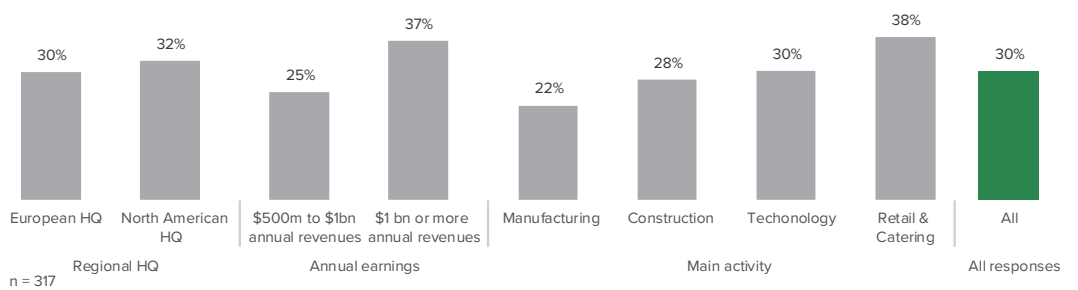
Figure 1. To what extent do you agree that the transition to a circular economy poses an opportunity for your organization? All responses and selected major demographic groups, ranked



30%

of executives said their companies are adopting circular practices. Larger companies and those that lease or sell products were most likely to have circular goals. North American companies appear slightly ahead on ambition, compared with European-based companies.

Figure 2. My organization has a goal to "adopt circular economy practices" All responses and selected demographic groups



77%

of respondents said they expect to implement or align incentives around circularity targets within the next five years. Alignment with management incentives was the most popular response (41%).

Figure 3. Which (if any) of the following steps do you expect your organization to take in the next five years? All sectors



n = 317 except for:
 * manufacturing and construction companies only (n = 156)
 ** manufacturing companies only (n = 78)

Circular drivers

Climate change. The Intergovernmental Panel on Climate Change recently warned that greenhouse gas emissions must halve by 2030.⁴ But news of faster growth in emissions in 2018 is a clear sign that climate action thus far has been neither fast nor effective enough.⁵ One-fifth of Fortune 500 companies have now committed to adopt science-based emissions targets (the number of signatories rose 40% in 2018), which can target not only energy used in production, but also in the value chain.⁶ This means that companies need to think not only about their source of energy, but how their products are made and used.

Sustainable Development Goals. Ever since the adoption of the UN's 2030 Agenda for Sustainable Development in 2015, companies have been increasingly bringing their sustainability targets in line with the Agenda's Sustainable Development Goals (SDGs). Research by PwC found that 72% of listed companies mention the SDGs in their reporting.⁷ SDG 12 on sustainable consumption and production, and SDG 13 on climate change, are two of the top-three priorities.

National regulations and policy. Several countries and regions are championing the circular economy in order to meet emissions targets, secure the supply of raw materials, reduce waste, and support innovation, local industry and jobs. A European Commission Circular Economy package is regarded as the most comprehensive, and has wide-ranging implications for EU businesses.⁸ While policies in the US may be lagging, slightly more executives from North American-based companies reported having circular targets compared with those elsewhere—supporting anecdotal evidence that lack of political commitment may be fuelling more voluntary action.

Consumer awareness and activism. The BBC's *Blue Planet II* series which aired in November 2017, followed by a ban on waste imports by China soon after, brought the world's plastics crisis into sharp relief.^{9,10} The public outcry prompted various states to toughen legislation, but major brands have also begun making voluntary commitments.¹¹ Catalyzed by a growing number of networks and initiatives featuring major companies (see Table 1, page 3), these trends suggest that businesses are starting to take more preemptive approaches to sustainability, increasingly as part of circular strategies.

Business continuity. Though circular strategies are often initiated by sustainability or corporate social responsibility (CSR) teams (see page 13), our research provides further evidence that for many companies, going circular is also about creating a return on investment (over 70% of survey respondents had titles other than sustainability or CSR). "Many companies are mobilising towards circularity because it makes business sense," says Brendan Edgerton, Director of the World Business Council on Sustainable Development's Factor 10 program, which aims to foster learning and create scalable solutions for businesses to enable a circular transition.

Linking resources and climate change

Humanity has a seemingly insatiable appetite for stuff. The world's population has doubled since 1970 but global resource use has trebled.¹² To extract, process, transport, use and then dispose of all those materials requires energy. Although developed nations have become more energy efficient, materials consumption has only recently begun to slow. Meanwhile, demand in developing countries, where many are still striving to meet basic needs, has soared. This helps explain why, despite exponential growth, the share of renewables in the energy mix has barely budged in 45 years.¹³

Not only are emissions from fossil fuels still rising, but so-called "sinks"—the land, oceans and forests that absorb emissions—are being eroded too, thanks to growing demand for materials. Since the 1970s, the ecological capacity (land and oceans) available to each person has fallen from around 2.7 hectares (ha) to 1.7 ha. Yet the footprint in most Western societies is wildly above this (each US resident uses the equivalent of 8.6 ha).¹⁴ In societies where usage is below the available capacity, it is mainly due to lack of basic services. According to one study, no country is managing to meet the societal needs set by the SDGs within the "safe operating space" of the planet.¹⁵

"To achieve climate goals, we need to reimagine not just the *energy*, but the type and amount of *materials* going into our products," says Lynelle Cameron, VP Sustainability at Autodesk, a leader in software solutions for designers, engineers and architects. "Companies need to understand the energy-materials nexus."

Circular economy as transformation

On current trends, the International Resource Panel forecasts that global resource use could double by 2050.¹⁶ The implied demand on energy, and pressures on land and oceans, mean that a shift to renewable energy alone is not enough to derail climate change. In a recent report, the United Nations Environment Programme listed a transition to a circular economy among the six transformations needed to meet climate goals.¹⁷

"We are dreaming if we think we can meet all the SDG targets without firstly changing the way we produce and consume—dealing with SDG 1"

—Janez Potocnik, Co-Chair, International Resource Panel

2. THE BUSINESS OF CIRCULAR

If your business is selling products, why bother to make them last when you can let them become obsolete and then sell more? This was the basic premise behind the Phoebus Cartel, a group of US and European lighting manufacturers which colluded in the 1920s to limit the lifetime of bulbs to ensure a steady flow of new sales.¹⁸

According to Circle Economy, a social enterprise which aims to accelerate the circular transition, one of the first principles of the circular economy should be to “preserve and extend what’s already there”.¹⁹ Yet for companies that depend on (and whose shareholders demand) constant high sales volumes, making products live longer could end up killing the overall business.

It is oddly fitting, then, that the same industry which gave us the linear model has developed one of the most effective business models for the circular economy. “Power by the hour”, “Pay per lux” and other Product-as-a-Service (PaaS) models turn traditional volume-driven businesses on their head, by keeping the ownership of the good with the producer, and renting or leasing only as much as customers need. As Janez Potocnik, Co-Chair of the UN’s International Resource Panel (IRP), points out, “We don’t need light bulbs, we need light.” He argues that such models completely change the way that producers come to view materials, forcing them to seek ways to use as few materials and resources as possible—both in production and use. “Because they derive the profit not from as many sales, but from how long it lasts,” he adds, “it’s a totally different incentive to producers.”

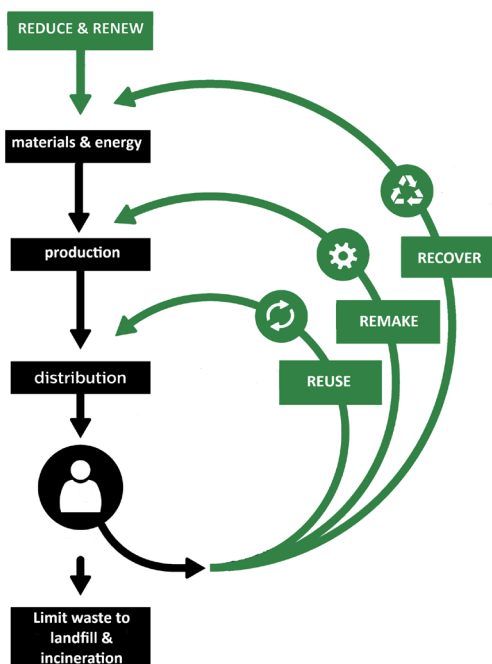
Business models for every loop

Of course, not all products can be made to last (bread or toilet paper, for example). PaaS is one of five circular business models identified by Accenture that can be applied across different industries.²⁰ They map broadly onto the “loops” that commonly depict the circular economy value chain (see Figure 4), starting with reuse (PaaS, sharing), remake (product-life extension, including repair and remanufacturing), recycle (resource recovery) and renew (circular supplies: renewable and recycled materials and energy).

Although experts agree that new models are needed, redesigning a business doesn’t happen overnight. WBCSD observes companies that are setting out on their circular journey typically start with making their processes more circular first, focusing on resource efficiency. “A company’s first circular initiatives are recycling and waste reduction projects, often creating cost reductions or financial gains,” explains Brendan Edgerton, Director, Circular Economy at WBCSD.

In the following pages we detail five steps to going circular, organized by the typical circular value chain. Drawing on survey responses and interviews, it highlights good practices in different industries, and the main benefits and challenges of each step.

Figure 4: The circular value chain



Source: Inspired by Philips’ Circular Economy diagram. See for example: Raquel Rebelo de Mira, “Philips Journey Towards a Circular Economy,” Philips, February 2 2016, http://pontoverdeopeninnovation.com/wp-content/uploads/2016/02/SPV_Rebelo-de-Mira_Philips.pdf. Accessed January 7 2019.

“The circular economy is not just about redesigning your products, but also your business model.”

—Douwe Jan Joustra, Head of Circular, C&A Foundation

REduce

In the zero-waste hierarchy, the best way to be resource efficient is to use less to begin with. New technologies increasingly enable production processes that eliminate excess energy, water and materials. Some examples are additive manufacturing (using only what is needed), “precision farming” and creating virtual prototypes (see also *Case study: generative design*).

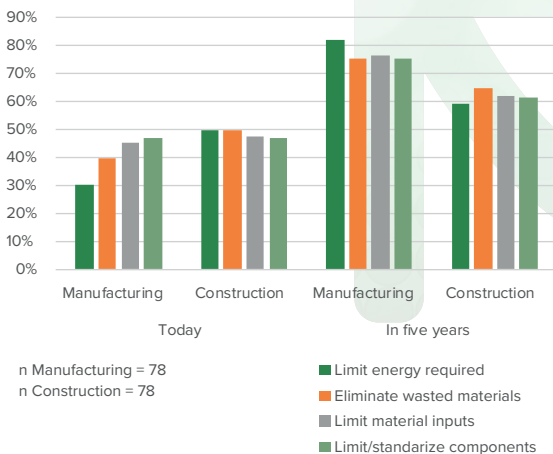
According to Lynelle Cameron, VP of Sustainability at **Autodesk**, some 30% of materials are wasted in construction projects. She is seeing a growing trend toward industrialized construction—the idea of producing houses in factories rather than onsite (modular housing). This will enable construction teams to save much of those materials (and associated energy costs). And it could make a big difference to global resource use, as construction consumes almost half of the total.²¹ “We’re seeing a convergence between design and make, and between manufacturing and construction,” says Cameron.

As with so much of the circular economy, it comes back to design. Industries such as aerospace and automotive have been designing their vehicles to be lighter and more energy efficient for some time. This is now spreading into other sectors as companies look at the material impact of their supply chains. As part of its circular strategy, Dutch telecoms provider **KPN** is working with partners to source devices, like set-top boxes, which are smaller—requiring fewer resources—and cloud-based.²²

Our research suggests that companies are increasingly designing products and choosing production techniques not just with energy efficiency, but also resource efficiency, in mind (see Figure 5). Construction is more ‘circular’ right now, which partly reflects higher recycling rates for certain raw materials. However, manufacturing has the greater ambition – this could reflect greater brand visibility. (See Figure 6: improved brand/profile is among the lead drivers).

Across sectors, the leading challenges cited by companies were lack of knowledge or skills, followed by lack of technology. Understanding materials is key, as less or lighter does not necessarily mean better. Tom Szaky, CEO of global recycling company **TerraCycle**, says that he is seeing a drop in the quality of plastics, partly as a result of “light-weighting”, meaning that the composition of the plastic is more complex and less material can be recovered. Lynelle Cameron says that Autodesk aims to put data at the center of their customers’ design and make processes in order to give design and manufacture teams the information they need to not only produce the most resource-efficient designs, but also to choose better (i.e. more circular) materials.

Figure 5. REduce strategies: Share of manufacturing and construction companies that will do the following for all or most products/projects in the next five years:



Case study: generative design

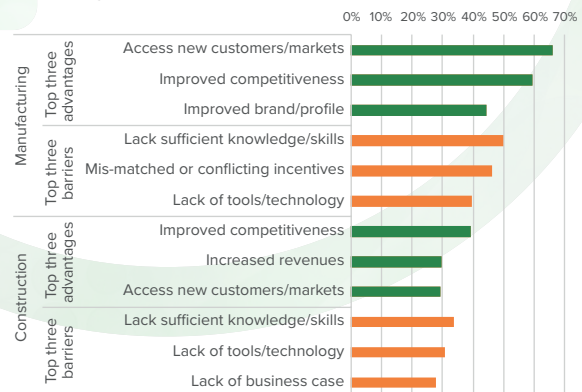
The circular economy is often described as a design challenge. Autodesk has developed a design software that it terms “generative design” which can explore theoretically millions of options for a given brief. Designers or engineers input design goals along with parameters such as material and cost constraints. The software then explores all the possible permutations, simulating and identifying the option(s) that best meet the goals.

Increasingly, designers are using such techniques to improve the resource and energy efficiency of products and production processes. As part of their efforts to make vehicles lighter in order to reduce lifecycle emissions, General Motors used the software to redesign a seat bracket, consolidating eight components into just one, creating a part that is 40% lighter and 20% stronger. In another example, Claudius Peter, a German industrial machinery producer, used the same tool to redesign and reduce the weight of a heavy piece of industrial equipment for cement production, which will help cement producers to lower emissions and meet government mandates.

“We need to change the way we design and make everything, so we are using not only less energy and less materials but also cleaner energy and cleaner materials”

—Lynelle Cameron, VP Sustainability, Autodesk

Figure 6. Opportunities and challenges to REduce strategies Manufacturing and construction companies



Respondents offered the choice of up to eight advantages: lower costs, increased revenues, improved competitiveness, risk mitigation, access new markets, enhanced innovation, improved brand/profile, meet regulatory requirements; and up to eight barriers: cost, lack of business case, lack of knowledge/skills, lack of tools/technology, mis-matched incentives, lack of coordination, not a business priority, restrictive regulations

REuse

Current consumption and use patterns can be incredibly wasteful: just one of every five items in the average American wardrobe is worn each year; cars spend more than 23 hours a day parked; and some 40% of desk space sits unused—during office hours.²³

Internet-aided resale platforms are now making it easier to exchange and sell goods and services (the US market for second-hand clothing is growing at nine times the rate of that for new garb).²⁴ The sharing economy is already a fixture in some consumer segments like property and mobility. But what about convincing businesses to advertise their idle assets—potentially with competitors watching?

“It’s radical, so we have to push it to the market,” says Kim Tjoo, Co-Founder of **Floow2.com**. The Luxembourg based company was set up by Dutch entrepreneurs in 2012, with a vision to create a global one-stop shop for organizations to share excess capacity of any description: materials, machinery, office space, and even personnel. Now in 13 countries and reaching break-even, the company has found success in helping local networks of companies, like those based on industrial parks, to share idle assets. Aside from creating a more trusting environment, it is both cheaper and more convenient to keep the distances short. “At the end of the day, sharing is a local activity,” Tjoo explains.

An alternative to sharing platforms is a PaaS model in which companies retain the ownership of their wares. Executives in our survey—especially those in retail and technology—expect a strong shift toward leasing, subscription and pay-per-use models.

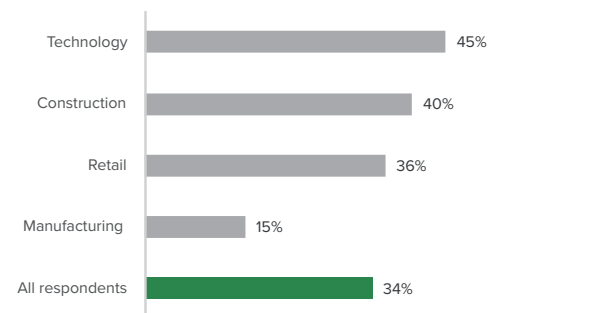
Brambles, a supply chain logistics company, distributes, delivers and recovers some 610 million reusable pallets, crates and containers at over 500,000 collection points worldwide. But the company requires scale to compete on price: according to Juan Jose Freijo, Head of Sustainability, its main competition worldwide is one-way, single-use packaging.

PaaS companies also need to ensure that their items can withstand robust use if they are to recoup their investments. **Lena Fashion Library** is a clothing rental business in Amsterdam which grew out of a vintage store. It aims to disrupt the “fast fashion” model by encouraging people to rent, rather than own, clothing. “Vintage is really suitable, because you can wash it and wear it 100 times and it still looks good,” says Co-Founder Suzanne Smulders. However, Smulders notes that the quality of newer labels, even from sustainable brands, is often much lower. The company is using the data it collates from customers to work with local labels to help them understand which materials and designs wear best.

“What’s important is the standardization, the scale of the network.”

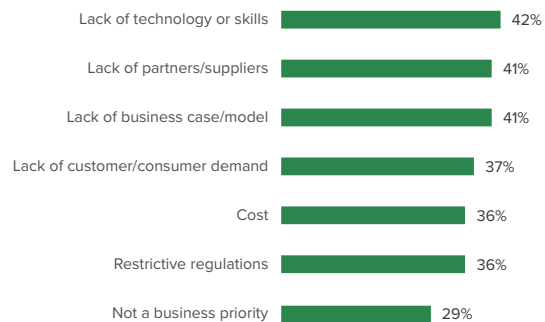
—Juan Jose Freijo, Head of Sustainability, Brambles

Figure 7. Share of companies expecting to change from product- to a performance/service-based model in next five years



n = 317

Figure 8. Challenges to setting up leasing, PaaS or subscription services (manufacturing companies only)



Respondents asked to select all that apply
n = 78

REmake

Glue is the enemy of circular manufacturing. In today's fast-moving, throw-away economy, products are often discarded before the end of their useful life: welded parts, brittle casings and non-standardized components are just some of the reasons so few are given a second chance.

But this is changing. Our survey indicates that manufacturing companies plan on making their products easier to fix and upgrade. Over half of executives in the sector (56%) said that their firms plan to produce better repair guides for customers.

Autodesk is seeing a trend toward designers reducing and standardizing the number of components, which not only reduces the inputs, energy and transport costs, but helps simplify the supply chain.²⁵

Dutch ethical smartphone producer **Fairphone** has developed a robust, modular device and sells all major spare parts as well as some upgrades, like cameras, separately. For its first Fairphone, the company partnered with a manufacturer which owned most of the supply chain, but when the relationship ended, so did the supply of components. Now, Fairphone owns its designs, giving it greater control over the supply of parts. It can also tweak its modules to accommodate new parts, extending the life of its phones.

“If you put a lot of energy and know-how into building a product then it has to stay in the market as long as possible. That’s the best way to be resource efficient.”

—Miquel Ballester, Co-Founder, Fairphone

Alternatively, producers can do repairs, refurbishments and upgrades in-house, then re-sell the spruced-up products. Remanufacturing can save 80% to 99% of materials—and a similar share of emissions—compared to making products from scratch.²⁶

GE Healthcare refurbishes previously owned diagnostic-imaging equipment to a standard that is similar to the top range, for a lower price. The company is seeing strong demand in smaller clinics and in developing markets where customers value reliability, but not necessarily the very latest technology. It benefits from having global operations (much of the refurbishment takes place alongside new production), established relationships with customers (for product trade-in), and attractive warranties. Service parts remain in stock long enough to support both new and refurbished equipment. Siva Balakrishnan, General Manager of GoldSeal, GE Healthcare's refurbishing line, says the main challenge is being able to pair products to customers, which are often in different locations: "That's what we work on every day."

Getting the product back is essential to making remanufacturing work. Most take-back schemes offer a financial incentive. Chicago-based **57st. design** offers store credit to customers who return their used furniture pieces—which are modular in design—no matter the wear and tear, according to Co-Founder Sam Devenport. He says that half of the three-year-old company's revenues come from its "design circulation" program.

Size of items matters too. Fairphone ran a survey and discovered that 40% of their customers kept old devices at home. "It's easy to just keep it in a drawer, not like a washing machine," says Co-Founder Miquel Ballester, adding that the company is now working on a service (i.e. leasing) model.

Despite its obvious sustainability—and economic—credentials, remanufacturing still struggles with image problems. It accounts for just 2% of production in US and European markets, with lack of demand cited as a key barrier in our survey. Promoting advances in remanufacturing is a main focus of the **REMADE Institute**, set up in 2017 with US Department of Energy funding.²⁷ Similarly, the EU's **Reman Council**, a partnership between business and academic institutions, aims to treble remanufacturing activity by 2030.²⁸ Such efforts may help give "remake" a much-needed makeover.

Figure 9. REmake intentions of manufacturing companies

56%

Of manufacturing companies will produce more detailed repair/instruction manuals over the next five years, to allow customers to more easily fix faulty products

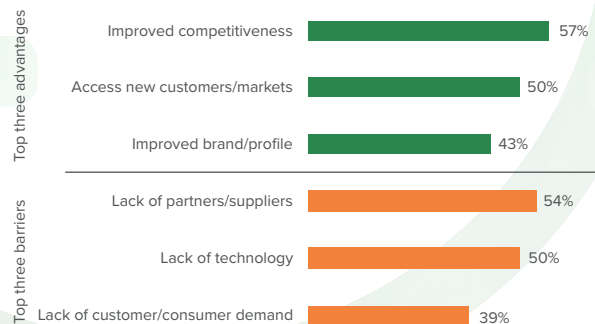
50%

Of manufacturing companies plan on recovering products from customers for refurbishment/remanufacturing, wherever possible

46%

Plan on sourcing used components from other companies/suppliers

Figure 10. Manufacturing companies: advantages and challenges to REmake strategies



n = 78

Respondents offered the choice of up to seven advantages: Lower costs, increased revenues, improved competitiveness, risk mitigation, access new markets, improved brand/profile, meet regulatory requirement; and eight barriers: cost, lack of business case, lack of sufficient knowledge/skills, mis-matched or conflicting incentives, lack of coordination, not a business priority, restrictive regulations

REcover

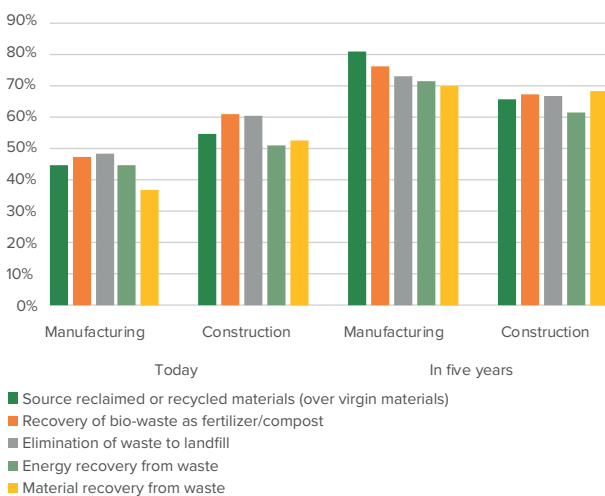
All stages of production and use involve material losses of some kind. In circular parlance, "closing the loop" means recovering and reusing as much of that waste as possible. As a rule of thumb, the purer the waste stream, the higher the recovery value and the lower the processing costs. Increased trading or re-use of production-related waste was most one of the popular plans among the companies we surveyed.

In the food and agricultural sector, waste is often turned into compost or fertilizer. Yet there can be more valuable alternatives. According to Jason Stamm, Exploration Manager at brewer **AB Inbev**, the protein content of its grain by-products is enough to satisfy the needs of 25 million people each year. Until recently, the company had been selling that waste as animal feed; now it is developing products for people, including a nutritional drink for the South African consumer market.

Where companies don't have the in-house know-how, they can look to a growing number of waste alchemists. Start-up **Industrial/Organic (I/O)** is providing a solution for New York City businesses, from tech company cafeterias to restaurants to food wholesalers, to recycle their food waste. As CEO Amanda Weeks explains, most of the city's garbage grub is sent to landfills, often far away. This represents a major logistics cost and results in emissions from trucking and landfilling. The company's localized approach breaks this cycle through urban biorefineries that safely give this unwanted material new life. "We thought, if we can stabilize this resource and break down the building blocks of food, we can use those raw ingredients to make new things," says Weeks. I/O's first product launch will be a multi-purpose household cleaning product.

Of course, much waste does leak out of the system, especially post-consumption. Research by Greenpeace found that around 80% of marine and land litter could be traced to 10 global brands.²⁹ Major companies, especially in the B2C sector, have bold targets to add recycled content to products or packaging. Our survey also suggests a strong interest in doing so, but cost and quality were top concerns.

Figure 11. REcover strategies: Share of companies that will do the following for all or most products/projects in the next five years:



n Manufacturing = 78
n Construction = 78

"We like to call them co-products, so we don't diminish the value of what we're producing,"

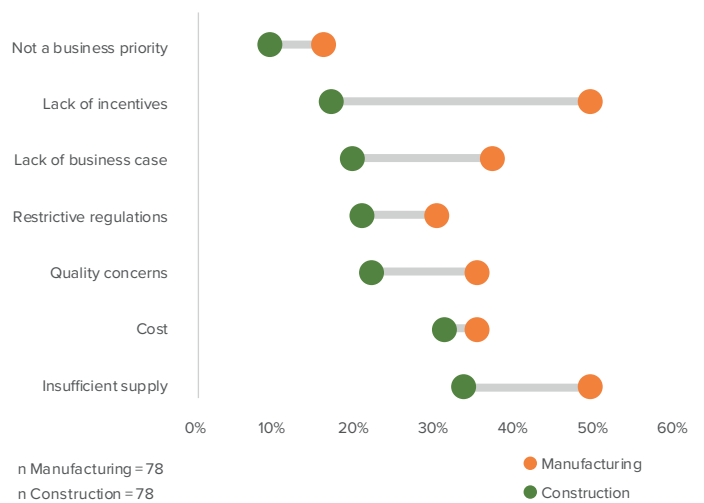
—Jason Stamm, Exploration Manager, AB Inbev

New Jersey-based **TerraCycle** runs the world's largest supply chain of ocean plastic. Its founder and CEO Tom Szaky says that they are seeing a "gigantic" uptake in demand for exotic materials, but their deteriorated and complex nature means they are significantly more expensive to collect and process than traditional recyclates.

As with many aspects of the circular economy, collaboration across the value chain is key to finding cost-effective solutions (see also page 14). "Changing the way they are sourcing materials, changing inputs, redesigning products to make them more recoverable, reusable, recyclable... all require functions like procurement, R&D, engineering, supply chain and finance, to work together in ways they may not have done as well or readily before," says Dr. William (Bill) Hoffman III, Senior Scientist and Corporate Fellow at **UL**. "In this way, what looks like additional cost to divert complex materials from landfill may become an opportunity to tap a new revenue stream or evolve business models to offer products as services, for instance."

UL is part of a consortium that aims to create a circular supply chain on plastics from e-waste (see *Case study; creating a circular supply chain for plastics*). TerraCycle, meanwhile, will be launching a reusable packaging initiative with leading consumer goods companies and retailers, to reduce the amount of plastic being dumped in the first place. "We need to solve for the convenience disposability brings," says Tom Szaky.

Figure 12. Leading challenges to sourcing reclaimed or recycled materials (% of respondents)



Case study: creating a circular supply chain for plastics

Recycled plastics are often associated with single-use products or packaging, but much of the plastic in our societies is bound up in durable products. Adrian Wain, Senior Sustainability Consultant at UL, says there is untapped potential in sourcing post-consumer recycled (or PCR) plastics from e-waste, which is one of the fastest growing waste streams, generating close to 45 million metric tonnes globally in 2016.³⁰

But setting up a supply chain on PCR waste is challenging, requiring collaboration not just in the collection and recovery of products, but in testing properties of reused materials, setting new standards, and redesigning products.

UL is participating in the EU-funded Polymers for a Circular Economy (PolyCE) project, which consists of 20 experts, businesses and designers, and is led by German-based Fraunhofer Institute.³¹

Industry members include Dutch technology company Philips, American appliance manufacturer Whirlpool, Finnish start-up Circular Devices and Spanish EDM developer ONA.³²

Launched in 2017 with a four-year timeline, the PolyCE consortium is seeking to demonstrate the feasibility of using PCR plastics in eight electronic applications. This involves developing a grading system based on their material properties and potential applications, as well as guidelines for designing new products.

The consortium envisages that the upcoming results will promote incentives for consumers, produce policy recommendations for lawmakers, and generate technical guidelines for plastics recyclers. All of this will support the development of a circular economy for e-waste plastics, significantly enhancing the use of recycled plastics in new electronics applications.

REnew

Many interviewees made the point that we cannot recycle our way out of our environmental challenges. Recycling materials many times may not solve emissions problems, and can lead to a lower quality output. Thus, if the circular economy is to achieve its goal of being regenerative by design, it must be increasingly based on renewable materials.

But simply substituting fossil materials is not enough—the so-called bioeconomy can be linear, too. Much of the textile industry's circularity efforts involve moving away not only from synthetics but from (unsustainable) cotton, owing to high water, insecticide and pesticide use.

Ensuring materials are sustainably sourced—managed in a way that protects ecosystems and workers—is usually the first step. Our survey suggests that companies plan to double efforts to source sustainable materials in the next five years (with limited difference between those with and without circular strategies—see Figure 15). However, supply, quality and reliability are top concerns. **Ikea's** circular strategy to recycle used furniture, for example, was driven partly by an inability to meet its target of securing 100% certified sustainable wood.³³

Palm oil hit the headlines in 2018 when UK supermarket chain **Iceland** ran an advertisement (banned on TV for its political links, only to go viral online) that highlighted the industry's slash-and-burn practices, after it found that even certified palm oil is often in breach of sustainable practices. As a result, the company dropped palm oil from its entire product line.³⁴

But others argue that sidestepping unsustainable products does little to address the problem. "You have to help those suppliers with poor performance to improve," says **BASF's** Andreas Kicherer. **Fairphone** is working on a number of projects to help mining communities achieve certification standard. "That's very different than saying, let's source from a safe country where there are no issues involved," says Fairphone's Miquel Ballester.

Markus Mannstrom, Executive Vice President of **Stora Enso**, which creates sustainable wood-based products, sees untapped demand for products such as cellulose. It only makes up around 7% of current textile production, but could replace cotton or synthetics. "There is an endless number of opportunities," says Mannstrom. Other innovations include products based on lignin, which can substitute for bitumen in asphalt; micro-fibrillated cellulose, which can replace rubber in tires; and wood-based building materials, which can replace steel in construction.

With a "mass balance" approach (substituting for fossil materials without changing the formulation or quality of the end product), **BASF** can also create a range of chemicals with bio-based feedstocks, such as organic waste. But with fossil resources often cheaper than renewable alternatives, costs—and lack of other incentives—remain a barrier to greater take-up, something which was confirmed in our survey (see Figure 14). "The growth rate is good, but the share is still very small," says Andreas Kicherer.

The hope is that, as companies strive to meet sustainability goals, scale effects and maturing technology can reduce the entry barrier (discussed further in Chapter 4). "Fifteen years ago the cost barrier was much bigger than today and I think in five to ten years we are going to see many more sustainable applications that also are going to be financially solid and viable," says Markus Mannstrom.

"The more focus and emphasis we put on sustainable materials, the more we're going to learn, and the better we will become."

—Markus Mannstrom, Executive Vice President, Stora Enso

Case study: scaling up circular textiles

Clothing company **C&A** is widely viewed as a leader in sustainability and circularity. It has the largest supply chain on sustainable cotton and was the first fashion retailer to produce a certified Cradle to Cradle™ product range.³⁵

More recently C&A has been using its clout to spur the rest of the industry into action. “Fashion for Good” is a global initiative launched in 2017 with **C&A Foundation** as a founding partner and C&A as a corporate partner. Via an open invitation to the entire industry, it aims to convene brands, producers, retailers, suppliers, non-profit organisations, innovators and funders with the common goal of making fashion circular. Other corporate partners include adidas, BESTSELLER, Galeries Lafayette Group, Kering, Otto Group, PVH Corp., Stella McCartney, Target and Zalando.

At the core of the initiative is an innovation platform intended to spark and scale technologies and business models that have the greatest potential to transform the industry. It provides support to innovators through an accelerator, a ‘scaling’ program and its Good Fashion Fund. According to communications manager Anne-Ro Klevant Groen, Fashion for Good has helped over 60 innovators, organized more than 500 business development sessions between innovators and corporate partners, and catalyzed over €20 million in investments.

The initiative also acts as a convener for change, with a co-working space for like-minded organizations and a visitors’ museum, and through open sharing of best practices on circular apparel via its Good Fashion Guide.

Figure 13. Share of inputs that are renewable or bio-based

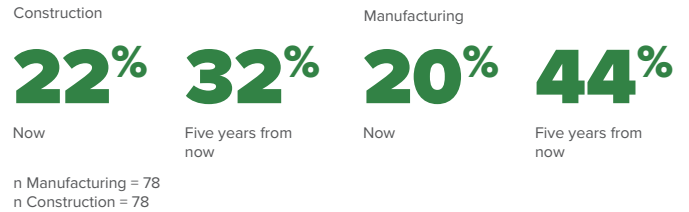


Figure 14. Challenges of sourcing renewable or bio-based materials, in manufacturing and construction industries

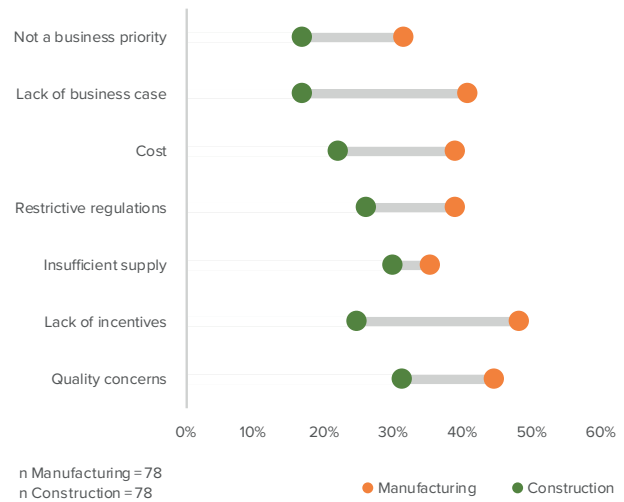


Figure 15. Which approaches does/will your organization take in sourcing materials? All industries except basic industries



Difference in sustainable sourcing intentions between those with circular strategies, and without

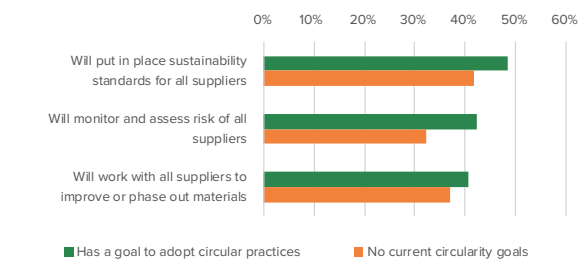
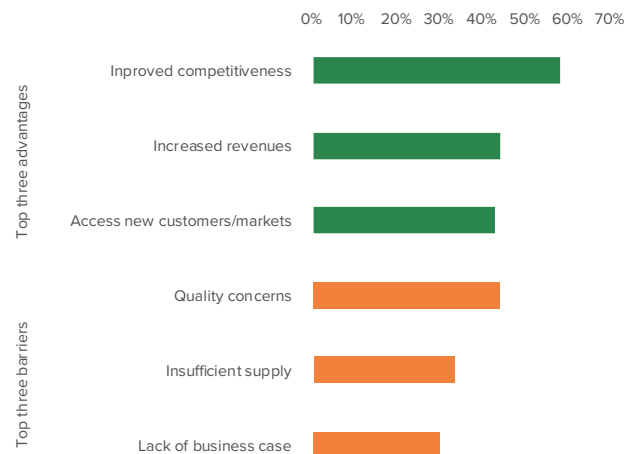


Figure 16. Opportunities and challenges in sustainable sourcing Average for all industries except basic industries (manufacturing, construction, retail and catering and technologies)



Respondents offered the choice of up to eight advantages: lower costs, increased revenues, improved competitiveness, risk mitigation, access new customers/markets, enhance innovation, improved brand/profile, meet regulatory requirements; and up to seven barriers: cost, lack of business case, insufficient supply, quality concerns, restrictive regulations, lack of incentives, not a business priority.

n = 307

3. CIRCULAR SUCCESS FACTORS

There is no one-size-fits-all model for getting circularity right: the best approach will naturally vary by industry, market maturity, organizational size and structure—among other factors. Nonetheless, our research suggests there are at least three recurring traits that unite companies with successful circular models.

1. Adopt a long-term, company-wide strategy

Circular strategies are often led by sustainability or CSR teams (cited by around half of the executives we surveyed). But the changes in procurement, product design and business models that are required often mean that companies need to collaborate with many business units in order to develop a strategy that can deliver.

In our survey, almost three-quarters of executives who said their firms had circular strategies indicated that these strategies involved product design/R&D or general management, and around half said that procurement teams are also involved.

“CSR can be a bit flash in the pan, if there aren’t any realistic economics behind it,” says Jason Stamm of **AB Inbev**. “We wanted to have a business model that can be sustained over the long term.” The company’s co-products initiative (see page 10) sits within procurement and sustainability, but the nutritional drink it has developed was requested by its South African business zone, which will take it to market. “We’re developing the IP,” says Jason Stamm, “so that takes investment and time.”

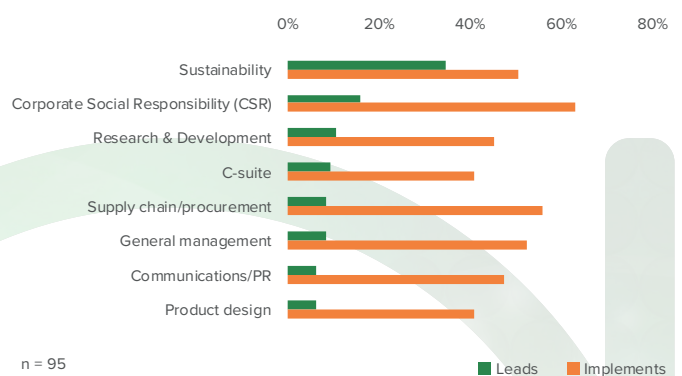
Others also highlighted the need for a longer-term horizon. “If you want to do circularity well you need to have a systemic approach, from the beginning to the end, and over time,” says Juan Jose Freijo of **Brambles**. “You can’t just wake up in the morning and say, ‘I’m going to be circular.’”

“Keep focused on your roadmap—stick to the plan,” advises **KPN**’s Jeroen Cox, Senior Manager Energie & Milieu, who leads the Dutch telecom company’s circular strategy.

“Circular economy is often connected to sustainability, but sustainability officers often don’t have the power to change the business models. We need the design department, the marketing department, we need the buyers, the strategists, even the CEO.”

—Douwe Jan Joustra, C&A Foundation

Figure 17. Who leads your circular strategy, and who is involved in implementing it?



Measuring circularity

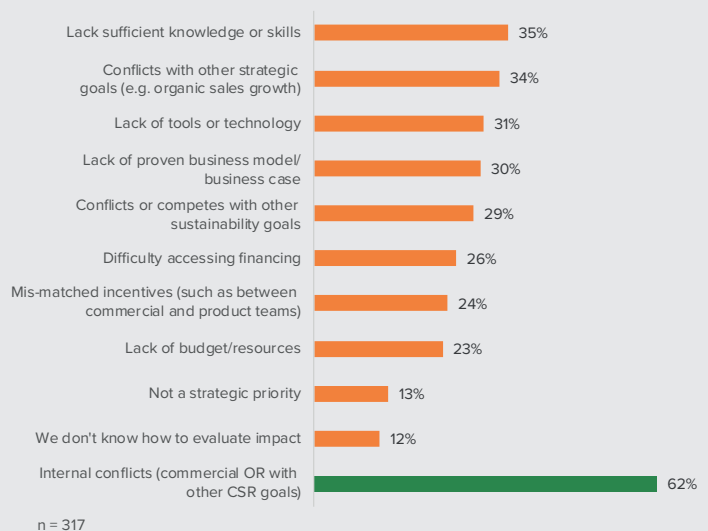
Almost two-thirds (62%) of executives said that conflicts with other business goals—whether commercial or related to other sustainability or CSR initiatives—hinder their organizations from becoming more circular. To move forward, executives favour measures that align the company around circularity. A top-three action that companies expect to take in their circular transition is to “restructure management (or commercial) targets in-line with circularity goals.”

However, measuring circularity is not as straight-forward as, say, targets on greenhouse gas emissions. “The challenge is: what does a circular company look like?” says Martin Stuchtey of **SYSTEMIQ**.

Our data (see Figure 20) indicate that the largest share of companies will focus on targeting recycled and recyclable content, with low-carbon and renewable materials also being priorities. Both our survey and interviews revealed limited appetite for an industry-wide standard. This partly reflects the evolving nature of what it means to be circular, as well as ongoing challenges in verifying the sustainability of circularity suppliers.

“While circularity concepts are not new, our understanding about how to optimize circular systems and measure performance is continuing to evolve,” says Bill Hoffman of **UL**, adding that their certification program is designed both to help companies with measuring as well as identifying data gaps across the value chain, helping to pinpoint areas for improvement.³⁶

Figure 18. What do you think are the main challenges, within your organization, to making your organization more “circular”?



2. Collaborate across the value chain

Making a success of circularity calls for new and deeper kinds of collaboration, not just within companies, but across the supply chain—and sometimes, beyond.

KPN, for example, drew up a "circular manifesto" and asked suppliers to sign up to it. As of next year, most of its requests for proposal will include circular demands. "This new way of working allows us to engage with suppliers and deliver on our ambitions," says Jereon Cox.

Fairphone is another company committed to making an impact through its suppliers, such as with its ethical mining projects (see page 11). "We need to move from the idea of trying to control our supply chain to using our network in the supply chain for having a positive impact," says Fairphone's Miquel Ballester.

But sometimes companies need to look beyond their own suppliers, requiring a broader coalition (see also *Case study: creating a circular supply chain for plastics*, page 11). Over a third (37%) of surveyed companies overall (and almost half of manufacturing and retail companies) expect to cooperate more with peers to co-source, share or trade materials or by-products in the coming five years (see Figure 19).

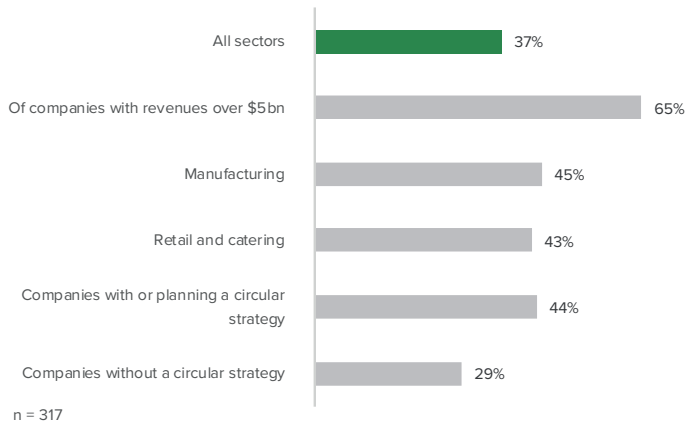
"Many times you have to be the third-party actor; some of these companies simply can't do it on their own," says Tom Szaky of **TerraCycle**. The company's reusable packaging initiative (see page 10), brings retailers and manufacturers together to develop solutions.

SYSTEMIQ's Martin Stuchtey explains that in Germany, a manufacturing "heartland" that is still very export-led, the concept of the circular economy has been slower to take off. His organization has supported a coalition in the automotive and other industries involving leading MNCs and as well as several smaller companies, to help move the industry towards a "mobility transition." "It always takes a while to push these things, but now there is some momentum and people are quite excited."

"If a company makes a lot of effort to make sure that their products are recyclable, if there's no infrastructure for collecting this material, or no company interested in recycling it—if all of this does not exist then we haven't really made a lot of progress. It's important to look at it as a system and ensure there is a broad collaboration so that what we do actually gets implemented."

—Nabil Nasr, CEO the REMADE Institute

Figure 19. Share of companies expecting to cooperate more with peers in co-sourcing, trading or sharing products, by selected demographic groups



Trust: the currency of circular

Whether you need to know the materials in a product, set up a recycled content supply chain, or want to start sharing assets with peers, building trust is at the heart of many circular strategies.

"We see companies wanting to go deeper in their supply chain, making sure they have the right information to understand where their materials are coming from: 'Is this really recycled content?', etc.," says Bill Hoffman of **UL**, which, among other things, provides certification to help companies verify the circularity of their materials, products, production sites and overall organization.

"There needs to be a level of trust," says **KPN**'s Jeroen Cox, who says he aims to spend as much time as possible working with key suppliers. "For example, if you implement a materials passport, your supplier might worry you could also calculate the unit costs of the product."

Flow2.com also facilitates sharing between (potentially competing) organisations. "To start sharing assets is a bit scary, as then everyone sees what you're not using," says Laury Zwart, Head of Marketing. "That's why we decided to start the internal sharing marketplaces—so that organizations could start sharing within their own trusted community." (See also page 8).

Juan Jose Freijo of **Brambles** says in the last five years, he has observed a shift in companies being more willing to collaborate. Brambles is working with a number of companies to organize sharing of fleets in order to limit "empty miles". "At the beginning it wasn't the technology or capability, it was the trust that was the biggest blocker," Freijo observes.

3. Take advantage of scale

Successful circular businesses or business models often start off small. But to realise the economics requires scale—and there is where larger companies come in. There is “a new marriage of large and small” according to Martin Stuchtey of **SYSTEMIQ**.

Many of the start-ups we spoke with are looking not only for investors, but for large, strategic partners whose networks they can share. **GE Healthcare**’s Goldseal remanufacturing unit (see also page 9) works in large part because it leverages an existing network of factories, distributors and customers. **Brambles**’ 500,000+ customer network has been critical to the success of its pallet-sharing model (see page 8).

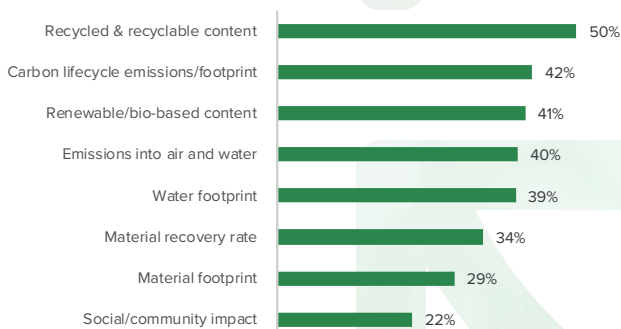
Large companies are starting to notice the value of partnering with a successful initiative, rather than building from scratch: 28% of companies in our survey said they would invest in circular start-ups in next five years (rising to 42% among retailers with distribution networks).

Interested companies and investors can look to several European cities and regions that are developing their own circular hubs.³⁷ In the US, meanwhile, there are more than 200 homegrown circular companies, mostly start-ups or small businesses.³⁸ Globally, there are some 3,000 projects or companies, according to the **Circular Economy Club**, which aims to foster learning across the circular community.³⁹

Even for in-house ventures, having a start-up mindset helps. **AB InBev** has set up an internal unit that functions almost autonomously, with the goal of testing and developing new ventures before taking them to market. “We act more as co-founders,” says Jason Stamm.

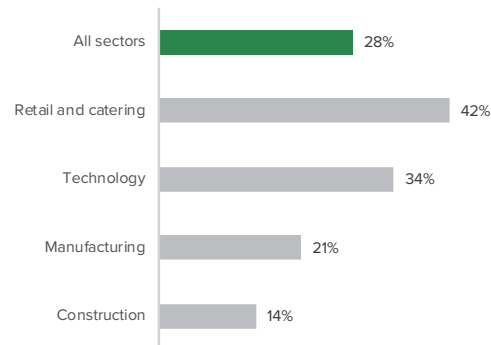
Fairphone is no longer a start-up but is still a small player in an established smartphone market. Though it describes itself as a social enterprise, Co-Founder Miquel Ballester explains that they take the commercial side of the business seriously: “We need to grow to a certain level to be commercially successful so that we can have a bigger influence in our supply chain and inspire the rest of the industry.”

Figure 20. What do you/will you include in “circularity” targets?



Average # of measures = 3.0
n = 246

Figure 21. Share of companies (with earnings over USD 500m) planning to acquire circular companies/start-ups



“As we scale, we’re going to have more and more outputs so we’ll need to find as many monetization opportunities as possible.”

—Amanda Weeks, Founder and CEO, Industrial/Organic

The value of data

It is difficult to overstate the importance of data in making the circular economy work, whether it’s knowing the origins of materials or knowing if a product can be recycled. “That’s why we’re putting data at the center of our software platform,” says Lynelle Cameron of **Autodesk**, whose software tools enable designers to pick materials based on their properties, and allow others in the value stream to know what is in the product.

It’s not just about the data going in, either. Another advantage of tracking, exchanging and reusing products and materials is also learning about where they go and how they perform. Circular companies are starting to realize some of the value in that data, which opens the possibility of adding new services and revenue streams.

Brambles is innovating with tracking devices to improve the visibility of its pallets. It has recently opened a data analytics hub in Palo Alto to look at ways to use its data for customers, too. “Our trials reveal where our pallets are coming from and where they are going to,” explains Juan Jose Freijo. “Suddenly the business is not just about moving things—it’s about the information.”

TerraCycle is piloting a diagnostics scheme to provide customers with health data from waste items like diapers, tissues and toothbrushes. “We’re trying to show that waste can have more value,” says Tom Szaky. **Industrial/Organic**, which turns food waste into new products, also plans to share data with companies about what they’re throwing away, so they can create less waste to begin with, explains CEO Amanda Weeks.

Providing clients with information about their products is a key selling point of PaaS models, too. “Small brands like it because we also collect a lot of data on what the users like about [the item],” says Suzanne Smulders of **Lena Fashion Library**. “So the data is really important.”

4. ACCELERATING THE CHANGE

Despite growing commitments, the world economy is still far from being circular today. Research by Circle Economy found that only 9% of extracted materials make their way back into the global economy after the end of their first useful life. The rest ends up in landfills or dispersed as pollution, meaning that there is a "circularity gap" (the share of materials that is wasted) of 91%.⁴⁰

Much like climate change, there is a lively debate as to whether the circular transition requires tougher regulations—or market solutions. Whatever the answer, there is broad agreement that certain aspects of the circular transition remain too costly or challenging to implement, because of lack of scale, demand, lack of the right price signals, or some mixture of all these things. Our research reveals five actions that can enable progress.

1. Bring innovations to market

When asked what their companies planned to do more of in the next five years in order to accelerate their circular transition, by far the top approach cited by executives was partnering with technology and innovation institutes (chosen by almost 60% of respondents, across sectors, from a list of 20 possible options). As to who should "lead the transition", executives voted the science/R&D community into the top spot (ahead of national governments, finance and even major companies themselves—see Figure 22).

But there is a difference between investing in more R&D and helping to scale existing but nascent technology. "We often hear, 'The technology is already out there. It's already invented,'" says Brendan Edgerton of WBCSD. "The challenge is that, maybe it's not market ready; or that it wouldn't be price competitive to introduce it yet. There are different barriers depending on the technology. But for the most part, from the companies we speak to, it's about bringing it to market." Among the most commonly cited innovations in our interviews were:

- **Material information systems.** An example is "material passports" that record the materials used in a building or product, including their recovery potential and post-use value.
- **Blockchain solutions.** These solutions assist in everything from tracking materials to setting up contracts to enabling cost-efficient, flexible payments systems, such as for PaaS models.
- **Recycling technology.** This is especially useful for hard-to-recycle materials like certain plastics, mixed textiles and other composite materials (see also *Case study: like new—chemical recycling*).

Case study: like new—chemical recycling

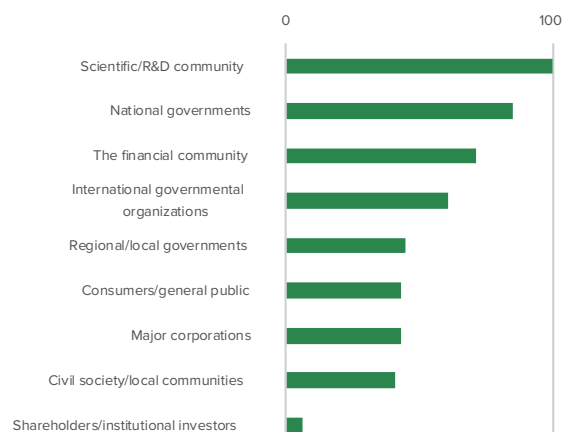
Plastic waste, especially from single-use plastics, is a particularly pernicious barrier to achieving a circular economy. Globally, only 14% of plastics are collected for recycling, and just 2% are recycled to the same quality as virgin plastic. Many types, even if collected, cannot be recycled at all.⁴⁴

"We are seeing increasing regulatory pressure regarding recycling quotas and recyclability on the one hand, and strong commitments of our customers towards increasing the share of recycled material in their offerings on the other," says Andreas Kicherer of BASF.

"Chemical recycling is the first step towards a value economy. Key is to create partnerships along the value chain, replacing fossil resources by feedstock made from plastic waste. It is about taking ownership for the environment, society, and the economy."

—Saori Dubourg, Member of the Board of Executive Directors of BASF SE

Figure 22. Which are the most important groups to lead the transition to a Circular Economy?



Respondents were asked to rank the two most and two least important groups. To create the ranking, two points were awarded for first place, one point for second, one point deducted for second-last place and two points for last place. The scores were then scaled to values between 0 and 100, where 100 = best.

n = 317

In traditional mechanical recycling, residues can build up in each cycle, lowering the quality of the output. A team drawn from across BASF is working on a chemical recycling project that transforms plastic waste into a raw material using thermochemical processes, which creates new chemical products with the same quality as the original fossil material. "We aim to make materials recyclable which could not be recycled so far," explains Kicherer, "such as multi-layer plastics or those with residues."

The project is still at the prototype stage and will require further testing and stakeholder consultations, as well as regulatory approval before, the company hopes, it may form part of the solution to closing the plastics loop.⁴⁵

2. Invite finance to the table

Survey respondents ranked the financial community several places ahead of the business community when asked who should lead the transition to a circular economy. Yet, experts and executives alike agree, finance has paid little attention to the circular transition to date.

“Finance is still largely untapped,” says Janez Potocnik of **IRP**. “There is too much focus on short-term risks. Finance has to start to factor in societal risks— because that’s their role too. Their role should be not only to provide good profits to their shareholders but also to protect them from longer-term risks to their lives and wellbeing.” He notes that the EU’s sustainable finance guidelines are a good initiative.⁴¹

Impact investors such as **SYSTEMIQ**, as well as some venture capitalists, are starting to fund and incubate circular innovators. Several of the companies we interviewed for this report support circular ventures also through their philanthropic foundations with grants, fund-raising and expertise. **Autodesk**, for example, provides free software to start-ups with circular models.

Grants and venture funding are certainly welcome, but Big Finance is also needed to help large companies scale nascent technology, projects and new business models. **ABN Amro** is one of several European banks leading the charge with a goal to fund €1 billion in circular assets by 2020. Much like large companies, it is taking an experimental approach; projects include a “materials bank” (re-organising the ownership structure of materials through the production cycle) and a new credit scheme for PaaS models, says Sander van Wijk, Head of Sector Advisory. He notes that circular business models are complex and uncertain, challenging current risk modelling (in response, the bank has produced a set of guidelines).⁴² But he also sees advantages, such as new service models providing an opportunity to strengthen companies’ relationships with clients. For ABN Amro, it’s ultimately about business continuity. “We believe the circular economy is going to be the economy,” says van Wijk.

Figure 23. Which systems-level interventions are needed to transition to a Circular Economy?



Respondents were asked to tick all that apply
n = 317

3. Support interdisciplinary learning

Lack of know-how trumped lack of technology as the leading barrier cited by executives in our survey, both for circular strategies overall and in relation to most of their elements, from redesigning products to implementing new business models.

“Like sustainability, circularity is inherently complex,” says Lynelle Cameron of **Autodesk**. “That’s why we’re not further along as a global community on this. That said, the technology available today is reducing complexity and making it easier to make better decisions about everything designed and made.”

Companies implementing circular strategies are also coming to realize the need for an interdisciplinary approach in their teams, in order to deal with knowledge gaps. “We need to expand our thinking beyond beer,” says **AB Inbev**’s Jason Stamm. “We are learning as we go through the process of developing different products, but there is a lot of learning that we still have to do.”

Designers, and those with materials and natural science backgrounds, are particularly sought-after. **KPN**’s Jeroen Cox says they are looking to add chemists and engineers to their team.

John Warner is President of the **Warner Babcock Institute for Green Chemistry** in Massachusetts. He notes that when he attends circular economy conferences, he is often one of the only chemists in the room. His aim is to make the chemistry community part of the solution: “Chemists often work alone, in a lab, and can be more focused on inventing a new material than thinking about what impact it might have in the supply chain.”

Nabil Nasr is CEO of the **REMADE Institute** and Founder, Associate Provost and Director of the **Golisano Institute for Sustainability**. He says his decision to set up a school focused on sustainable manufacturing stemmed from a discovery early in his career: “In designing and manufacturing a product, we unintentionally caused many undesirable consequences. We’re not taught how to avoid those circumstances in engineering school.”

Some pioneering countries like Finland are preparing the next generation of leaders by teaching about the circular economy in schools.⁴³ But education systems elsewhere will clearly need time to catch up. For existing employees and their organizations, accelerators such as **Circle Economy**, **WBCSD**, **EMF** and **Circular Economy Club** offer research, training programs and workshops.

“We need to massively improve our understanding of the circular economy. This requires collaboration between social sciences, economics, chemistry, physics, materials sciences, biology – and we don’t see enough of that.”

—Martin Stuchtey, co-Founder, SYSTEMIQ

4. Promote circular governance

From curbing plastic pollution to putting the brakes on fast fashion, cheap raw materials are the elephant in the room when it comes to making circularity work. In our survey, 40% of respondents cited global virgin materials prices as the most important systems-level intervention for accelerating the circular transition (it was also the first or second choice across industries).

Given the monumental difficulties in reaching a global agreement on climate change, it seems unlikely we will see a similar global pact to curb or put a price on resource use in the near term, though the idea is gaining more traction (see also box: *The International Resource Panel*).

In the meantime, executives are keen for policymakers to support the transition in other ways, ranking national governments second when asked who could lead the transition to a circular economy.

Douwe Jan Joustra of **C&A Foundation** has been involved in research looking at the changes in governance that are needed for the circular economy. The existing system of regulation and control may have worked for the linear economy, but Joustra says, “Now a new perspective is dawning: how can governance empower the circular economy?”

One approach is for governments to define goals rather than hard-

and-fast rules. “It is essential that there is an openness and freedom to choose the appropriate technology to achieve the legislative targets, like recycling quotas. Legislators should not predefine the ‘right’ technology or product,” says Andreas Kicherer of **BASF**. This is a view shared by Christoph Scharff, CEO of **ARA**, a European EPR (Extended Producer Responsibility) scheme, and Chairman of the **CEC4Europe** research network, which aims to create an evidence base for a circular economy. “Give us a target,” he says, “and we will work on effective and efficient solutions—because society ultimately has to pay for it.”

Government’s role goes beyond setting targets, according to Janez Potocnik of IRP: the public procurement potential is “enormous”, at some 18–20% of GDP. Circular purchases by large customers like governments can ripple through supply chains and accelerate progress. Amsterdam, for example, is aiming for 50% of its purchases to be circular by 2025. “It’s a very powerful signal,” says Jeroen Cox of **KPN**.

“There needs to be collaboration between ‘uncommon allies’. It’s about bridging sectors.”

—Marc de Wit, Head of Strategic Partnerships, Circle Economy

The age of responsibility

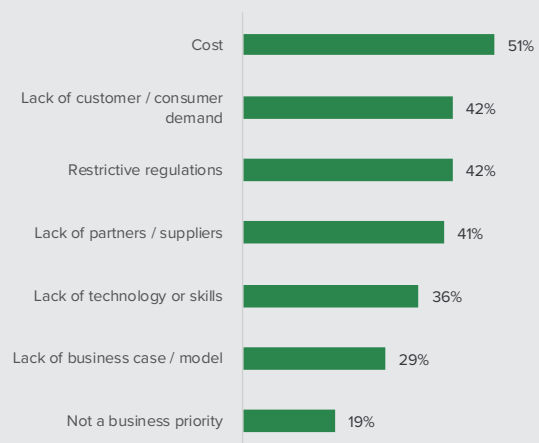
Perhaps one day we will look back and wonder at how we once made products and packaging without a thought for where they would end up.

In Extended Producer Responsibility (EPR) programs, companies take ownership of their product or packaging’s end-of-life, typically footing at least a portion of recovery costs, such as in plastic bottle deposit schemes, coffee capsule collection and separate disposal of hazardous e-waste.⁴⁶

EPR policies ranked second in our survey as a means to accelerate the transition, though it did not garner a majority of votes in any industry (see Figure 23). If companies are able to use old materials in new products, EPR can be a win-win, providing a reliable, homogenous resource stream, in addition to greener credentials. But EPR can be expensive, especially for B2C businesses, where products and packaging are dispersed at the individual level. In our survey, executives cited cost as the key barrier to establishing voluntary schemes.

In the past, companies have often opposed top-down EPR schemes, but this is changing, says Brendan Edgerton of **WBCSD**. “Typically, it was a mainly public-sector led initiative. Increasingly it’s being led by a board that sits outside the public or private sector but is represented by both. Once you allow the private sector to come to the table, and allow them to have a say in best practices or lessons learned, then you get the buy-in.”

Figure 24. Barriers to setting up product take-back or ERP schemes (manufacturing companies only)



Respondents were asked to tick all that apply
n = 78

5. Encourage activism

If there is one point on which almost all agree, it is that we cannot wait for consumers to choose more circular products or services. In many cases, at least for now, they are too expensive, inaccessible or inconvenient.

“I’m not in favour of saying that the consumer has to be more responsible,” says **C&A Foundation’s** Douwe Jan Joustra. “That’s a dead-end strategy—at least for change. We already followed that route for the last 30 years, in environmentalism and sustainability, and now in the circular economy.”

Just 5% of companies said they thought greater public awareness could help accelerate the transition, ranking it last out of 19 potential systems-level initiatives (see Figure 23). Consumers are also not listed among the top-five groups that respondents said should lead the transition.

It’s important to distinguish between two types of people power: activism and buying decisions. Several experts noted that the former can be effective: public outcry following the BBC’s Blue Planet II documentary was instrumental in accelerating policy and voluntary actions (see also page 5). “You need to look at the way you work with customers, with society,” advises Joustra.

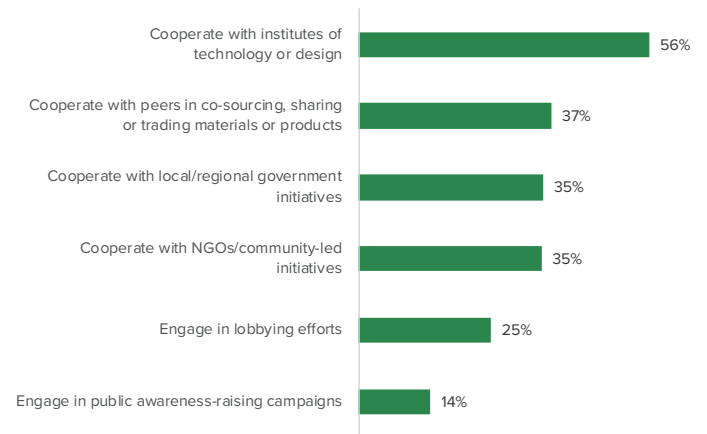
As part of their circular transition, around one in six companies said they would engage in public awareness-raising campaigns—and one in three in local or community-led initiatives—in the coming five years.

The International Resource Panel

Set up in 2007, the IRP has a similar remit to manage resource use as the UN Framework Convention on Climate Change has in managing greenhouse gas emissions.⁴⁷

For circularity practitioners, this is the one to watch. According to Co-Chair Janez Potocnik, the IRP is working on how better resource management could help in combating climate change and environmental degradation, with the aim of influencing climate negotiations. “There might also be a need for a broader agreement, for example, a convention on natural resource management, like we have for climate, to govern better resource use and management on a global level and help educate everyone about the importance of responsible natural resource use.” says Potocnik.

Figure 25. Types of cooperation and engagement planned within the coming five years



Respondents were asked to tick all that apply
n = 317

CONCLUSIONS

The world needs to become vastly more judicious with its resources if it is to meet the challenges of climate change and fulfil the SDGs. The circular economy offers a blueprint for doing just that.

After decades in the dugout, the transition from the linear economy is finally underway, with a vibrant community of innovators, start-ups and accelerators; a growing school of knowledge; and an increasing number of large companies creating strategies and testing new approaches, products and business models.

Practitioners emphasize that going circular needs to be seen as a company-wide, business model shift to ensure it is commercially viable—not just another costly sustainability initiative. This means redesigning products as well as business models. And it means shifting mindsets from viewing waste and old products as inconveniences or sunk costs to seeing them as assets with a value that should be retained for as long as possible.

All together now

Large companies can use their influence and the scale of their networks to accelerate the transition. This starts with being open about what needs to happen. “If companies keep hiding the challenges of doing things more sustainably then they are not leveraging the opportunity of using the process of solving those issues as part of their value proposition,” says Miquel Ballester of Fairphone.

“Denying the problem is the wrong direction,” says IRP’s Janez Potocnik. “The best way is to recognise it. By recognising the problem we also create the conditions for solutions and justify public support.” He also advises that companies be mindful of their lobby groups, who often represent the “lowest common denominator,” which he says is often what policymakers hear.

Yet reaching the scale that is needed to decouple resource use from economic growth will require more than the actions of a handful of (even large) companies, while there are limits to what companies can achieve alone, or even within their supply chains. This calls for more “uncommon” alliances, within and across industries, and across public, private and civil society actors. “We need to see a lot of more pre-competitive industry activity,” says Brendan Edgerton of WBCSD.

Future: proof

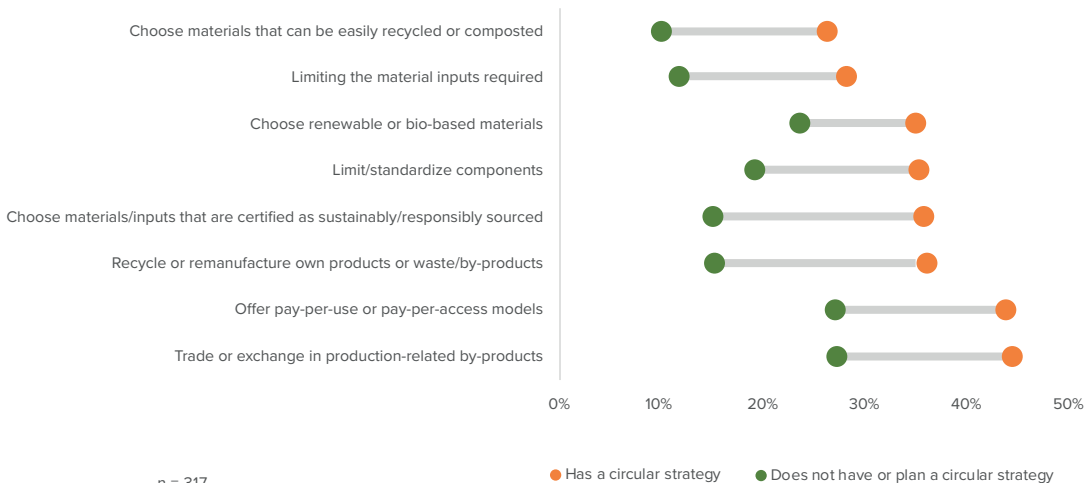
Though companies are becoming increasingly familiar with the circularity concept—and are starting to see its commercial benefits—they have yet to fully join the dots between sustainability and business continuity. In our survey, few executives cited risk mitigation as a benefit of adopting circular practices (although those at companies with circular strategies were more likely to do so than those who weren’t). Yet research suggests that traditional businesses face a growing number of linear risks, including resource scarcity, price volatility, competition from new business models, and new regulations on materials or waste.⁴⁸

The transition to a circular economy is not just transforming the way we view “stuff”, it is also fundamentally changing the way we do business. WBCSD predicts that the “future of business is circular”.⁴⁹ The question is: can today’s large companies move fast enough to be part of it?

“The biggest thing companies can do right now is take voluntary responsibility – not wait for legislation. Sure, legislation will come but I think it’s going to be slow and not as robust as it needs to be relative to the scale of the crisis.”

—Tom Szaky, CEO, TerraCycle

Figure 26. Share of respondents choosing “risk mitigation” as an incentive for selected circular practices



In 2018, Newsweek Vantage set out with the goal of investigating how large, global companies view the transition to a circular economy. In October 2018, 317 senior executives from major companies—with earnings of \$500m and more—across a range of industries, functions and geographies responded to our online survey.

To avoid selection bias, we omitted the term “circular economy” from our mailing campaign and survey introduction. We collected responses only from executives with a level of seniority of at most two levels below the C-suite. To capture a broad range of opinions, we set quotas to ensure that at least three-quarters of respondents came from functions outside of sustainability or corporate social responsibility;

that at least half of companies represented companies from outside of North America; and to have a balance between companies that “make” things (materials, products, buildings), and those that sell or provide technical solutions (retail, catering, technology). Other service categories were excluded.

To complement our survey findings, we also conducted more than 25 in-depth interviews capturing a variety of perspectives, including those of major corporations with circular business models, innovative circular start-ups, “circular enablers”, and policy and business experts and stakeholders.

Survey demographics



Endnotes

- 1 Julian Kirchherr, Denise Reike and Marko Hekkert, "Conceptualizing the Circular Economy: An Analysis of 114 Definitions," Resources, Conservation and Recycling 127 (December 2017): 221–232, <https://www.sciencedirect.com/science/article/pii/S0921344917302835>.
- 2 Ibid.
- 3 "Infographic: Circular Economy System Diagram," Ellen MacArthur Foundation, accessed December 18 2018, <https://www.ellenmacarthurfoundation.org/circular-economy/infographic>; Ellen MacArthur Foundation (2015), Towards a Circular Economy. https://www.ellenmacarthurfoundation.org/assets/downloads/TCE_Ellen-MacArthur-Foundation_9-Dec-2015.pdf
- 4 IPCC, 2018: Summary for Policymakers. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P. R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp. According to the report, global net anthropogenic CO₂ emissions should decline by about 45% from 2010 levels by 2030 (40–60% interquartile range), reaching net zero around 2050, to achieve "no or limited overshoot" of warming of 1.5 degrees above pre-industrial temperatures, as set out in the Paris Agreement (Paris Agreement FCCC/CP/2015/10/Add.1 <https://unfccc.int/documents/9097>).
- 5 Latest estimates published by the Carbon Disclosure Project show emissions growing by between 1.8% and 3.7% (average of 2.7%) in 2018, compared to growth of 1.6% in 2017 and a plateau in 2014–16. Source: Zeke Hausfather, "Analysis: Fossil-fuel Emissions in 2018 Increasing at Fastest Rate for Seven Years," Carbon Brief, December 5, 2018), <https://www.carbonbrief.org/analysis-fossil-fuel-emissions-in-2018-increasing-at-fastest-rate-for-seven-years>.
- 6 "Surge in Global Business Embracing Climate Science to Navigate Low-Carbon Transition." Science Based Targets, September 13 2018, <https://sciencebasedtargets.org/2018/09/13/surge-in-global-business-embracing-climate-science-to-navigate-low-carbon-transition/>.
- 7 Louise Scott and Alan McGill, From Promise to Reality: Does Business Really Care About the SDGs? (PWC, 2018). <https://www.pwc.com/gx/en/sustainability/SDG/sdg-reporting-2018.pdf>.
- 8 The Circular Economy Package, launched in 2018, seeks to implement the goals of The Circular Economy Action Plan, adopted in 2016, with new targets on recycling, a strategy on plastics, a monitoring framework, a stakeholder platform, and various forms of innovation funding. For details and information on policies in other countries see: World Business Council for Sustainable Development, Circular Policy Action Brief (Geneva, WBCSD, 2018) https://docs.wbcsd.org/2018/10/Circular_policy_action_brief.pdf.
- 9 Tom Hancock, "China Recyclers Grind to Halt Amid Crackdown on Imported Waste," Financial Times, January 15, 2018, <https://www.ft.com/content/63cf220c-f8ee-11e7-9b32-d7d59aaace167>.
- 10 "BBC Announces Major Initiative 'Plastics Watch' Following the Global Impact of Blue Planet II," BBC Media Centre, June 23, 2018, <https://www.bbc.com/uk/mediacentre/latestnews/2018/plastics-watch>. According to the article, 37.6 million viewers watched Blue Planet II and a survey found that 62% planned to make changes to their lifestyles as a result.
- 11 "Global Efforts to End Plastics Pollution: Single-Use Plastics," Earth Day Network, accessed December 18, 2018, <https://www.earthday.org/plasticban/>. This article summarizes some of the laws around the world, many of which were announced or came into force during 2018. These cover a number of US states, the EU and various other countries, as well as major companies including Ikea, Hilton and McDonald's.
- 12 Global resource consumption (total of biomass, metals, non-metallic minerals and fossil fuels) was an estimated 22bn metric tonnes in 1970 and grew to an estimated 85bn tonnes in 2017. At the same time the population grew from 3.6bn to 7.6bn. Source: UN Environment International Resource Panel Global Material Flows Database. Accessed December 18 2018. <http://www.materialflows.net/>
- 13 Total supply of renewable energy (in kilotonnes of oil equivalent, ktoe), grew 2.65 times between 1971 and 2016, against overall energy supply growth of 2.5 times. The share of renewables in energy consumed grew from 13.3% to 14.0% in the same period. Source: International Energy Agency World Energy Balances Overview (OECD/IEA, 2018). Accessed December 18 2018. <https://www.iea.org/statistics/balances/>
- 14 National Footprint Accounts 2018 edition (Data Year 2014); Global Footprint Network 2018, accessed January 7 2019, <http://data.footprintnetwork.org/#/>
- 15 D.W. O'Neill, A.L. Fanning, W.F. Lamb and J.K. Steinberger, "A Good Life for All Within Planetary Boundaries," Nature Sustainability 1 (2018): 88–95, doi: 10.1038/s41893-018-0021-4.
- 16 IRP (2017). Assessing global resource use: A systems approach to resource efficiency and pollution reduction. Bringezu, S., Ramaswami, A., Schandl, H., O'Brien, M., Pelton, R., Acquatella, J., Ayuk, E., Chiu, A., Flanegin, R., Fry, J., Giljum, S., Hashimoto, S., Hellweg, S., Hosking, K., Hu, Y., Lenzen, M., Lieber, M., Lutter, S., Miatto, A., Singh Nagpure, A., Obersteiner, M., van Oers, L., Pfister, S., Pichler, P., Russell, A., Spini, L., Tanikawa, H., van der Voet, E., Weisz, H., West, J., Wijkman, A., Zhu, B., Zivy, R. A Report of the International Resource Panel. United Nations Environment Programme. Nairobi, Kenya. <http://www.resourcepanel.org/reports/assessing-global-resource-use>.
- 17 United Nations Environment Programme, The Emissions Gap Report 2018 (Nairobi, UNEP, 2018), <https://www.unenvironment.org/resources/emissions-gap-report-2018>.
- 18 Markus Krajewski, "The Great Lightbulb Conspiracy," IEEE Spectrum, September 2014, <https://spectrum.ieee.org/tech-history/dawn-of-electronics/the-great-lightbulb-conspiracy>.
- 19 Marc de Wit, et al., The Circularity Gap Report: How the Linear Economy is Failing People and the Planet and What We Can Do to Close the Global Circularity Gap (Amsterdam: Circle Economy, 2018), <https://www.circularity-gap.world/home>.
- 20 Peter Lacey et al., Circular Advantage (Accenture, 2014) https://www.accenture.com/t20150523T053139_w_us-en/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Strategy_6/Accenture-Circular-Advantage-Innovative-Business-Models-Technologies-Value-Growth.pdf.
- 21 Marc de Wit et al, The Circularity Gap Report (Circle Economy, 2018). According to the authors, an estimated 42.4 gigatons out of a total of 84.4 gigatons of materials extracted in 2015 went towards the housing and infrastructure sector.
- 22 Jerome Cox, Senior Manager Energy & Milieu, KPN, in conversation with Newsweek Vantage on October 22 2018
- 23 US consumers wear only 20% of their wardrobes most of the time. Source: Ray A. Smith, "A Closet Filled With Regrets," The Wall Street Journal, April 17, 2013. <https://www.wsj.com/articles/SB10001424127887324240804578415002232186418>; David Z. Morris, "Today's Cars are Parked 95% of the Day," Fortune, March 3, 2016, <http://fortune.com/2016/03/13/cars-parked-95-percent-of-time/>; "Empty Building Syndrome," Aecom, accessed December 18, 2018, <https://www.aecom.com/without-limits/article/making-empty-buildings-work/>.
- 24 Thred-up (2018), Thred-up Resale Report 2018, (San Francisco, 2018). <https://www.thredup.com/resale>
- 25 Lynelle Cameron, VP Sustainability of Autodesk, in conversation with Newsweek Vantage on November 5 2018.
- 26 Nabil Nasr et al., "Re-defining Value – The Manufacturing Revolution: Remanufacturing, Refurbishment, Repair and Direct Reuse in the Circular Economy," (Nairobi, International Resource Panel, 2018), <http://www.resourcepanel.org/reports/re-defining-value-manufacturing-revolution>.
- 27 "What we do," remadeinstitute.org, accessed December 18 2018, <https://remadeinstitute.org/what-we-do>
- 28 "Conseil Européen de Remanufacture," remancouncil.eu, accessed December 18 2018, <https://www.remancouncil.eu/>
- 29 Greenpeace, Branded: In Search of the World's Top Corporate Plastic Polluters, Volume 1 (Washington DC, Greenpeace, 2018), <https://www.breakfreefromplastic.org/globalbrandauditreport2018/>.
- 30 Baldé, C.P., Forti V., Gray, V., Kuehr, R., Stegmann, P. : The Global E-waste Monitor – 2017, United Nations University (UNU), International Telecommunication Union (ITU) & International Solid Waste Association (ISWA), Bonn/Geneva/Vienna.
- 31 <http://ewastemonitor.info/>
- 32 "Learn More About Who We Are", PolyCE, accessed December 18 2018, <https://www.polyce-project.eu/project-partners/>.
- 33 Matej Hargas, Ikea's Sustainability Manager for Austria, "Circular IKEA – connecting the beginning and the end" (ARA Innovation Space workshop "Circular Business Models," Vienna, June 11, 2018), <https://www.innovation.ara.at/news/circular-business-models-case-study-ikea/>.
- 34 Sarah Butler and Mark Sweney, "Iceland's Christmas TV Advert Rejected for Being Political," The Guardian, November 9, 2018, <https://www.theguardian.com/media/2018/nov/09/iceland-christmas-tv-ad-banned-political-greenpeace-orangutan>.
- 35 Cradle to Cradle Certified TM products are designed according to circular economy principles. For more information, see: <https://www.c2ccertified.org/get-certified/product-certification>
- 36 For more information on Circularity Facts, which is based on the UL 3600 certification document, see: <https://industries.ul.com/environment/certificationvalidation-marks/circularity-facts-program>.
- 37 For example, Glasgow, Scotland and Amsterdam. See Circular Glasgow, accessed December 18, 2018, <https://www.circularglasgow.com/>; "Circular Economy in Amsterdam," lamsterdam, accessed December 18, 2018, <https://www.iamsterdam.com/en/business/news-and-insights/circular-economy>.
- 38 Circular CoLab, The State of the Circular Economy in America (Circular CoLab, 2018), <https://www.circularcolab.org/us-circular-economy-report/>.
- 39 "Circular Economy Mapping Week", Circular Economy Club, accessed December 18 2018, <https://www.circulareconomyclub.com/gd-home/cec-global-database/>.
- 40 Marc de Wit, et al., The Circularity Gap Report: How the Linear Economy is Failing People and the Planet and What We Can Do to Close the Global Circularity Gap (Amsterdam: Circle Economy, 2018), <https://www.circularity-gap.world/home>.
- 41 The guidelines are to be developed by the end of 2019 and aim to fill a €180 billion annual funding gap in climate change initiatives and the SDGs. Source: "Sustainable Finance", European Commission, accessed December 18 2018, https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance_en.
- 42 "Circular Economy Finance Guidelines", ABN Amro, July 2018, https://www.abnamro.com/nl/images/Documents/040_Duurzaamheid/Publications/ABN_AMRO_Circular_Economy_Finance_Guidelines_2018.pdf.
- 43 "Circular economy teaching for all levels of education", sitra.fi, accessed January 7 2019, <https://www.sitra.fi/en/projects/circular-economy-teaching-levels-education/>
- 44 UNEP (2018). SINGLE-USE PLASTICS: A Roadmap for Sustainability, (Nairobi, UNEP, June 2018). Accessed December 18 2018, https://wedocs.unep.org/bitstream/handle/20.500.11822/25496/singleUsePlastic_sustainability.pdf?sequence=1&isAllowed=9
- 45 For more information about the ChemCycling project see: <https://www.basf.com/global/en/who-we-are/sustainability/management-and-instruments/circular-economy/chemcycling.html>
- 46 A useful overview of EPR schemes can be found in "Extended Producer Responsibility," The European Organization for Packaging and the Environment, accessed December 18, 2018, <https://europen-packaging.eu/policy/9-extended-producer-responsibility.html>.
- 47 International Resource Panel, accessed December 18 2018, <http://www.resourcepanel.org/>
- 48 Shyaam Ramkumar et al., Linear Risks (Amsterdam, Circle Economy, May 2018), <https://www.circle-economy.com/wp-content/uploads/2018/06/FINAL-linear-risk-20180613.pdf>.
- 49 "Factor 10", World Business Council for Sustainable Development, accessed December 18 2018, <https://www.wbcsd.org/Programs/Circular-Economy/Factor-10>.