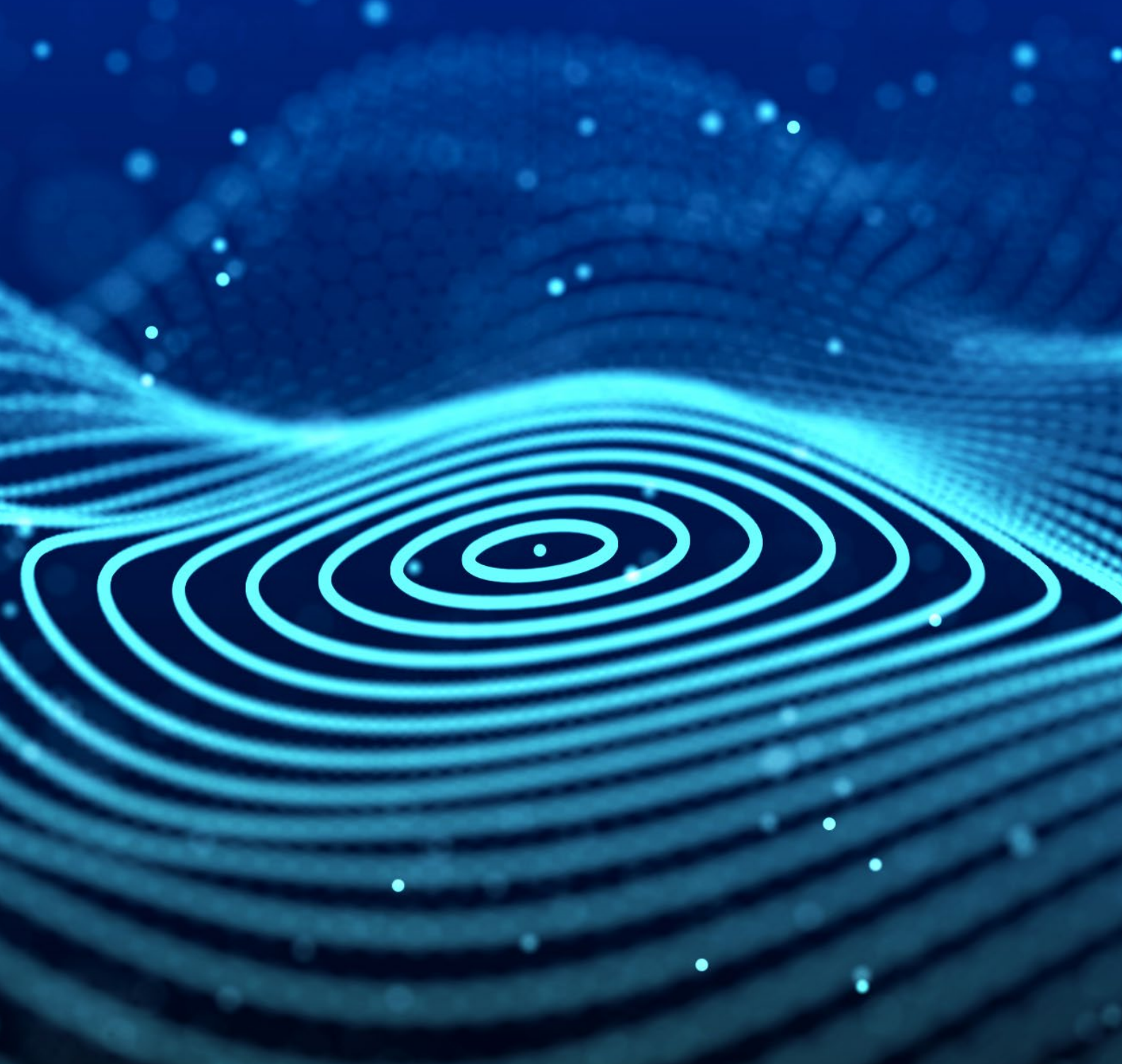


In collaboration with Bain & Company,  
University of Cambridge and INSEAD



# Circular Transformation of Industries: Unlocking New Value in a Resource- Constrained World

WHITE PAPER  
JANUARY 2023



# Contents

Foreword	3
Executive summary	4
1 Why circular transformation?	5
2 The current state and limitations of existing approaches to circular transformation	7
2.1 Operations and business models	7
2.2 Systems-wide partnerships	8
2.3 Policy and regulation	8
3 A systems-wide approach to circularity to unlock its full potential	10
4 Innovator case studies	12
5 Mission	14
Contributors	15
Endnotes	16

## Disclaimer

This document is published by the World Economic Forum as a contribution to a project, insight area or interaction. The findings, interpretations and conclusions expressed herein are a result of a collaborative process facilitated and endorsed by the World Economic Forum but whose results do not necessarily represent the views of the World Economic Forum, nor the entirety of its Members, Partners or other stakeholders.

© 2023 World Economic Forum. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, including photocopying and recording, or by any information storage and retrieval system.

# Foreword



**Francisco Betti**

Head of Advanced Manufacturing and Value Chains, World Economic Forum



**Kristin Hughes**

Director of Resource Circularity and Member of the Executive Committee, World Economic Forum



**Hernan Saenz**

Senior Partner, Global Head of Performance Improvement, Bain & Company



**Jenny Davis-Peccoud**

Senior Partner, Head of Sustainability & Responsibility, Bain & Company



**Jagjit Singh Srail**

Director of Research in the Department of Engineering, University of Cambridge



**Spencer Harrison**

Associate Professor of Organisational Behaviour, INSEAD

Industries and governments have set ambitious targets for the next 10–20 years. A growing number of businesses are committed to achieving net-zero emissions, dramatically reducing waste and alleviating raw materials scarcity. In parallel with the shift to a more sustainable global economy, senior executives are pledging to create more resilient and flexible supply chains and to meet rapidly changing consumer expectations. That's already an unprecedented amount of change, and these visionary efforts are moving forward in a challenging and uncertain geopolitical landscape.

Achieving such commitments will require bold moves. Transforming business models and supply chains is no easy task. It requires systems-wide adaptation – in terms of how we make products, how we sell them, how we use them and how the global economy operates overall. We have a plan to help with this – welcome to the Circular Transformation of Industries initiative.

Circularity is not a new concept. Over the past 20 years, businesses, industries and governments have experimented with circularity initiatives, mainly focused on recycling and waste management. But very few have succeeded at large-scale implementation, according to the [Circularity Gap Report 2022](#).<sup>1</sup> The report states that only 8.6% of the materials that enter the global economy in 2022 will be recycled, down from 9.1% in 2018. And recycling alone will not help improve the numbers outlined and committed to by so many businesses. We must take a much deeper and systems-wide approach.

Why has circularity failed to take off? To date, companies have invested in narrow circular solutions within their own four walls. Additionally, the perceived benefits of circularity have been limited to environmental sustainability, with little consideration of the systemic benefits in terms of resilience, resource efficiency and incremental economic growth. Focusing primarily on recycled inputs and redirecting waste flows is an easier and more controlled option, but it limits the potential to scale circularity initiatives. Without a holistic approach across multiple supply chains, the circularity movement has hit a fundamental barrier: the added cost and complexity of becoming circular outweighs the added benefits. The current value proposition hasn't convinced businesses and consumers to make circularity a reality.

Circularity initiatives to date have shown that isolated efforts are not enough. Slow, incremental change is ineffective because real innovation struggles to prosper and has reached certain limits in a linear economy.

The World Economic Forum is working in collaboration with Bain & Company, the University of Cambridge and INSEAD to accelerate the shift to circular operations and business models, leveraging circularity to unlock productivity, innovation and sustainability. Our aim is to help companies and governments fuel robust and sustainable growth in a resource-constrained world. The circular transformation of industries is critical to our future.

# Executive summary

Success requires systemic change. Without commitments from all stakeholders and global collaborative efforts, circular transformation will continue to stagnate, delivering only slow and incremental change.

With an ever-changing landscape in the global economy, industrial companies are forced to rethink their use of resources and their contribution to economic growth. Circular transformation can help achieve robust and sustainable expansion in a resource-constrained world. However, over the past 20 years, companies have often failed to scale their circular initiatives due to a narrowly defined scope and focus on incremental changes to the operational status quo. The circular transformation of industries at large can help companies unlock productivity, innovation and sustainability, but will require systemic change within and beyond the four walls of organizations, and the involvement of all stakeholders, including government, academia and civil society.

To help stakeholders navigate and accelerate this paradigm shift, the World Economic Forum, in collaboration with Bain & Company, the University of Cambridge and INSEAD, has launched the Circular Transformation of Industries initiative. The initiative takes a broad approach to shaping the dialogue between leaders, setting out to consolidate information from previous circularity initiatives and other ongoing and sector-specific efforts to understand how to bridge the gap and create peak maximization of circularity in industries and economies today. The purpose of this paper is to engage leaders across all industry sectors, government, academia and civil society to share insights, best practices and lessons learned, and

forge new partnerships to accelerate the circular transformation of industries.

Bold ambitions have been set by both companies and governments to drive productivity, innovation and growth, achieve supply-chain resilience, reach net zero and dramatically reduce waste. Success requires systemic change. Without commitments from all stakeholders and global collaborative efforts, circular transformation will continue to stagnate, delivering only slow and incremental shifts.

To inform the global discussion on the circular transformation of industries at the World Economic Forum Annual Meeting 2023 and beyond, the following pages outline key areas for stakeholders to focus on to accelerate the shift and achieve robust and sustainable growth:

- Circular transformation requiring both operating and business-model changes
- The current state and limitations of existing approaches to circular transformation
- A system-wide approach to circularity, to unlock its full potential

The authors of this paper look forward to an engaging discussion and invite all stakeholders to join forces and embark on the Circular Transformation of Industries initiative.

# Why circular transformation?

Organizations that embark on circular transformations and create more adaptable operating and business models will be better positioned to prosper, even in times of disruption, while contributing to sustainable growth.

The linear economy imperils global prosperity. Resource consumption levels are not sustainable and will lead to shortages and potential conflicts.

Humanity faces a triple threat: soaring population growth, diminishing resources and environmental damage. Today, humans consume 1.75 times the natural resources that the earth is capable of regenerating.<sup>2</sup> Moreover, as highlighted in the *Circularity Gap Report*, the majority (70%) of greenhouse-gas (GHG) emissions come from materials handling and use.<sup>3</sup>

How can the world meet the growing demands for goods with fewer resources and in a more sustainable and efficient way? Circular transformation is a critical part of the solution.

Circular operations and business models address each element of this triple threat, while also offering a path to a prosperous future. Circular practices, such as recovering resources and regenerating materials, build more productive, resilient, resource-efficient, closed-loop supply chains, while bolstering sustainability and driving economic growth:

- **Resilient supply chains:** Circularity increases control of supplies and improves supply chains' responsiveness to global disruptions – from pandemics to geopolitical conflicts – and helps address shortages.
- **Resource efficiency:** Circularity enables new operating and business models, so that

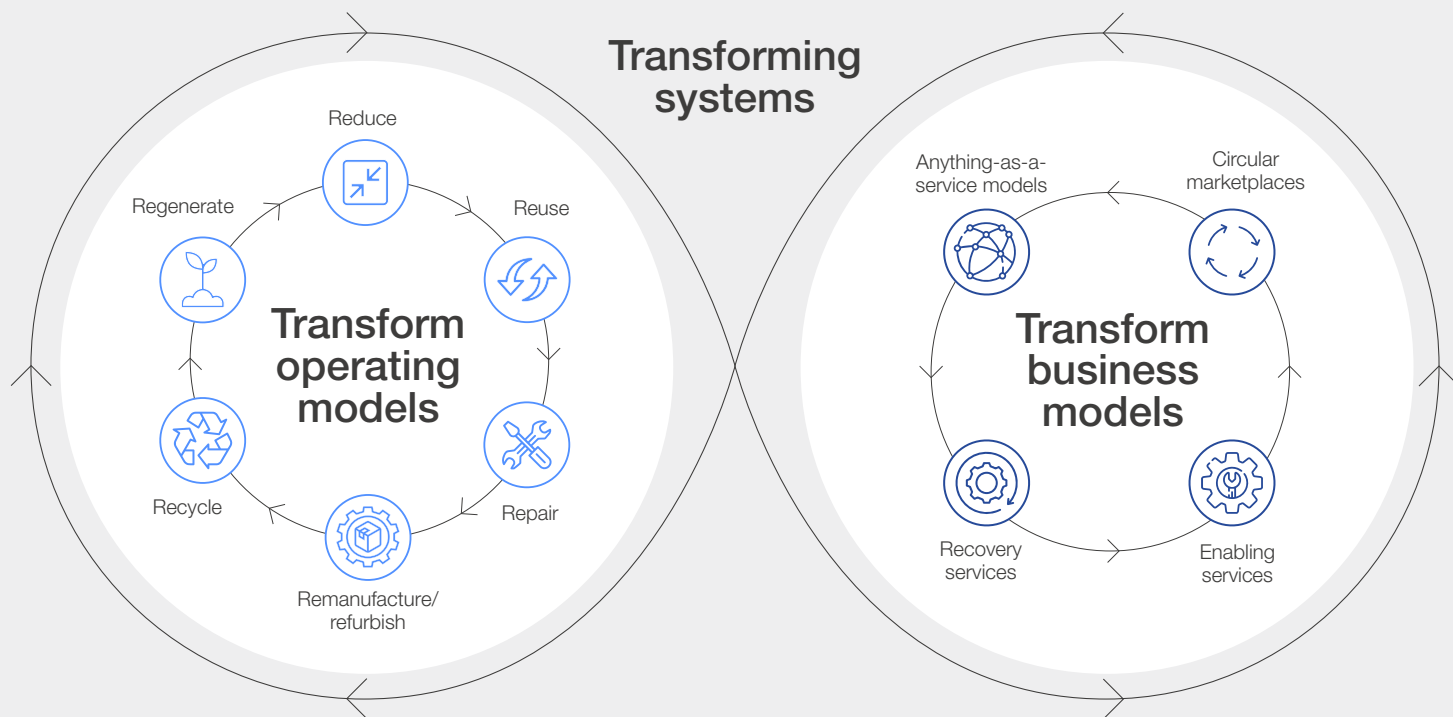
all materials can be easily reused, repaired, remanufactured, recovered and recycled.

- **Environmental sustainability:** By limiting wasteful consumption and production practices, circularity reduces the climate footprint of economic activity and enables the delivery of net-zero emission goals.
- **Economic growth:** Circular operating and business models encourage market products that are looped through the value chain multiple times, which can generate new sources of revenues and profits as well as better meeting consumer needs.

Consumers are increasingly searching for sustainable goods, creating a large market opportunity for companies that embrace circularity. For example, surveys suggest strong acceptance of circular consumer practices in fashion: 30–40% of consumers regularly repair clothes, and 20–30% of consumers purchase pre-owned clothes regularly.<sup>4</sup> Governments that provide incentives to businesses and consumers to become circular can create systems-wide benefits, including supply security, economic growth and new jobs. The EU, for example, estimates that its circular transformation legislation will deliver cost savings of €600 billion, other economic benefits of €1.2 trillion (about 10% of 2022 EU GDP) and an estimated 2 million additional jobs.<sup>5</sup>

“Today, humans consume 1.75 times the natural resources that the earth is capable of regenerating. Moreover, as highlighted in the *Circularity Gap Report*, the majority (70%) of greenhouse-gas (GHG) emissions come from materials handling and use.”

FIGURE 1 | Circular transformation requires both operations and business-model changes



Source: Bain & Company



# The current state and limitations of existing approaches to circular transformation

Circular initiatives to date have been too narrow to deliver substantial benefits, with their focus mainly on recycling and waste management and considering circularity as an end goal on its own.

Companies and governments need to undergo a complete paradigm shift so they view circular operating and business models as the enablers of impact across a broader set of goals – efficiency, resilience, sustainability and economic growth.

Organizations and governments have experimented with circularity initiatives for two decades, with limited results. Up to now, leadership teams have viewed circularity as an improvement on traditional supply-chain processes, with its focus largely on recycling and waste-management practices as a means of meeting sustainability goals. Although there have

been some exciting circularity testbeds – such as the Kalundborg Symbiosis in Denmark,<sup>6</sup> in which 14 companies systemically generate, share and reuse resources within a closed loop, most businesses have struggled to scale pilots and achieve significant financial, operational and sustainability benefits. Consortia have overlooked the real potential of circularity, and the coordination, integration and scalability required for a systems-level change.

Circular transformation has so far stalled across three main areas: operating and business models; systems-wide partnerships; policy and regulation.

## 2.1 Operating and business models

Companies face three main challenges in relation to circular operating and business models.

The first challenge is agreeing on a common definition of circularity and understanding its full potential. Many companies consider themselves to be circular if they introduce recycled materials into a well-honed, fully optimized supply chain. Executives see that shift as costly, and often it is. Adding circular elements to today's linear economic model typically does not improve a company's performance or generate sufficient momentum for change. For that to happen, leadership teams must redesign their operating and business models at large, as well as the customer engagement journeys, product design processes and supply-chain structures, to best support a new way of

doing business. Tweaking an existing operating and business model to be more circular delivers incremental change. New operating and business models that are circular by design, however, can deliver the transformational change required.

The second challenge is learning to design products for longer life or reuse and embracing a business model based on “buy, reuse and redeploy”. Many companies have adapted their products to a circular value chain, but initiatives that focus on materials alone are insufficient. The pace of this material shift is slower than the pace at which global economic consumption is growing. That's why innovations in operating and business models go hand-in-hand and are key to accelerating a step change that decouples value growth from material usage.

The third challenge is scaling new circular operating and business models: research conducted for this paper shows that 58% of new models are stuck in the planning or pilot stages due to the lack of a clear strategy, limitations in getting the right ecosystem support and insufficient technological capabilities.

Instead, companies need to take a “future-back” approach. That means envisioning their place in the circular economy, identifying evolving profit pools, integrating circularity into product design and coming together to usher in a new way of creating and delivering value to customers.

## 2.2 Systems-wide partnerships

Partnerships to date have consisted of a small number of pioneers who band together to advance circular models within the group. Scaling circularity initiatives hasn't been economical until now because consortia generally lack broad participation that spans industry sectors, regions and value-chain stakeholders (competitors, suppliers and clients). Partnerships are ineffective if the most powerful companies in a given supply chain don't participate.

Small circular partnerships restrict collaboration across businesses' adjacent value chains, which reduces the ability of circular products to move through new and different sectors. Research undertaken for this paper indicates that business leaders need broader partnerships to build a vibrant ecosystem that fosters disruptive innovation. This, in turn, will shift profit pools and attract an ever-wider group of participants.



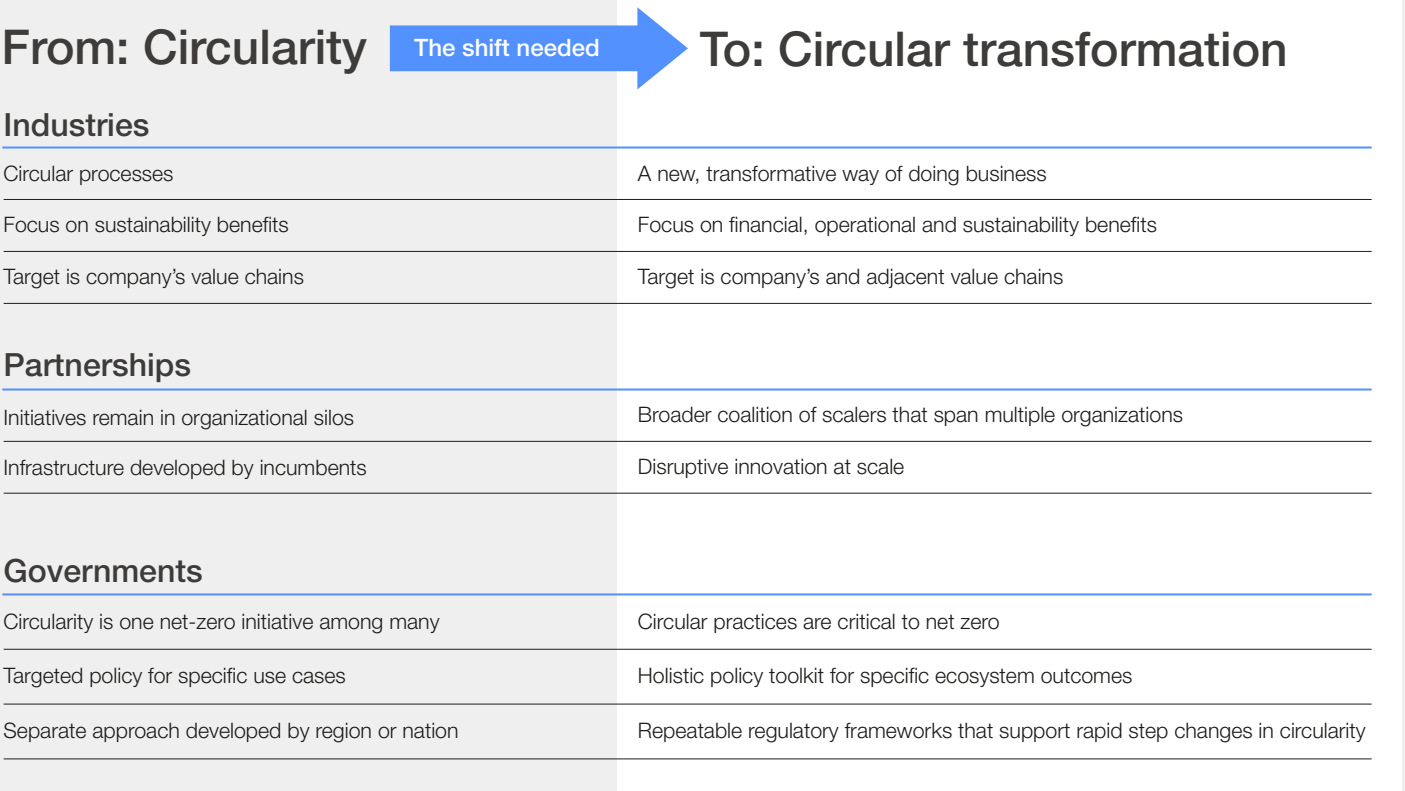
## 2.3 Policy and regulation

“ Policy-makers have an important role to play. Most have not yet begun to install the policies and regulations required to support such large-scale systems change.

Governments can accelerate the process by providing the right infrastructure and standards for circularity. Policy-makers have an important role to play. Most have not yet begun to install the policies and regulations required to support such a large-scale systems change. For example, the rate of recycled concrete that can be used in structural work varies by country, hampering its production, and use, at scale. The EU has been at the forefront of circular policy efforts, creating frameworks such as the Circular Economy Action Plan (CEAP),<sup>7</sup> Extended Producer Responsibility (EPR)<sup>8</sup> or the new battery directive. Other countries

are creating their own programmes, including E-waste Producer Responsibility Organisation Nigeria (EPRON)<sup>9</sup> and Singapore's Resource Sustainability Act (RSA)<sup>10</sup> to manage electrical waste. Although these programmes are building momentum, achieving a systemic shift will require more ambitious and holistic initiatives that are broader in scope, interconnected among industries and aligned across countries and regions in order to create global standards, trade rules and consistent incentive structures. The goal is to generate a series of rapid changes that help decouple growth from resource consumption.

FIGURE 2 | The global community needs a new approach to circularity



Source: Bain & Company



3

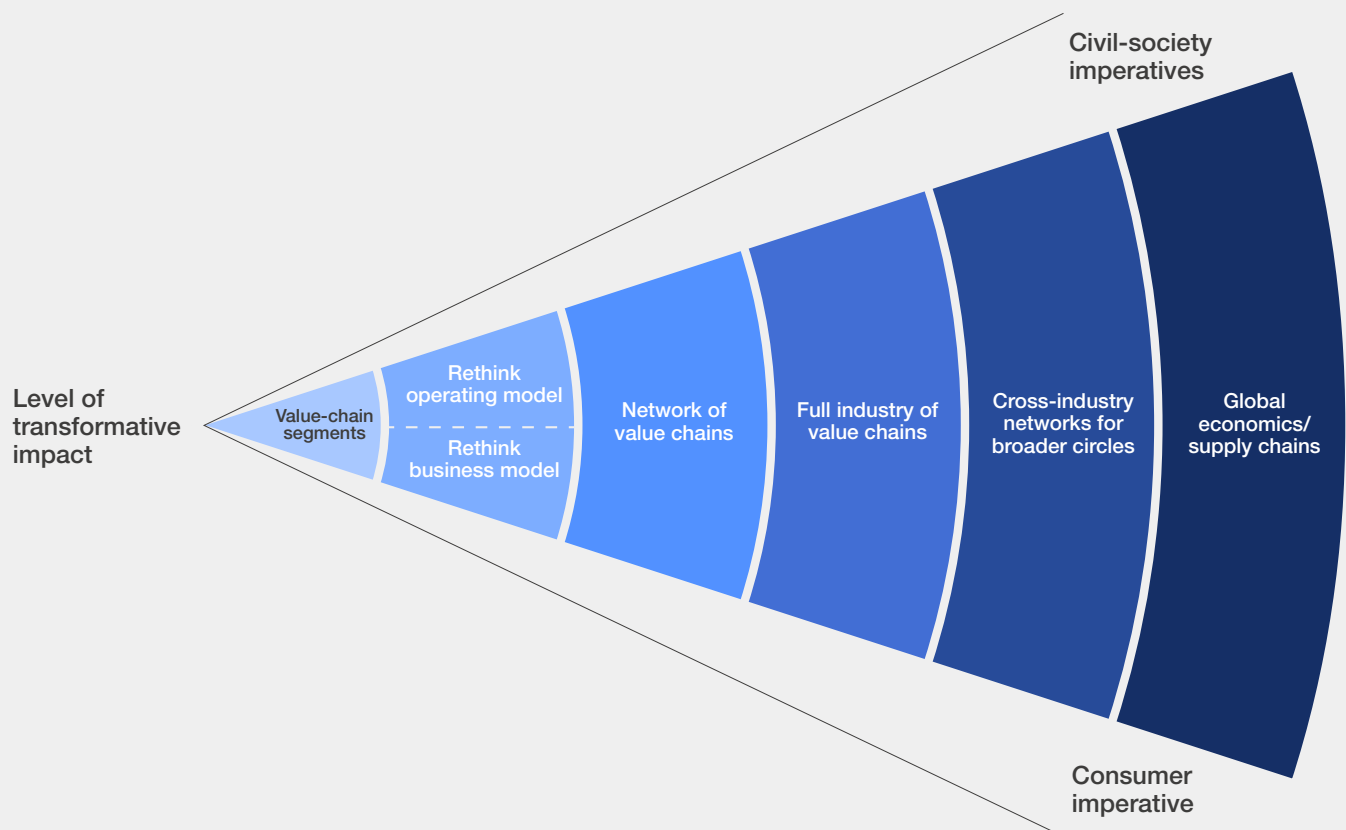
# A systems-wide approach to circularity to unlock its full potential

Transformative results require bold thinking. Leading organizations are starting to reimagine their businesses and build coalitions that support scalable circular models.

Transforming how the global economy operates goes way beyond the first step of companies building circular networks. It entails bold thinking to reshape operating and business models, build new ecosystems and change consumer behaviour.

These broader actions, in turn, will reconfigure industry value chains and set in motion a more sustainable approach to resources worldwide, while unlocking economic growth (see Figure 3).

FIGURE 3 A systems-level approach magnifies the impact of circular transformations



Source: Bain & Company

How does this journey begin? The first step is asking the *right* questions. The circular transformation of industries calls for a mindset shift

in organizations, partnerships and governments. Forward-looking leadership teams are advised to focus on several key questions.

## What are the most effective and profitable circular models to support our growth and sustainability efforts and navigate global disruptions?

Successful leaders start the circular journey by looking inward and designing a profitable circular business model and transforming operations accordingly and at scale. Management teams can pursue step-by-step change towards a full-scale transformation once they have a clear understanding of how new business models can create additional sources of value, reduce total material usage, improve resilience and generate measurable growth.

The most challenging step for companies will be scaling their circular initiatives to meet the growing

economic and sustainability ambitions. To continue to meet demand, organizations will need to retool and invest in procurement, manufacturing and sales, both for circular and traditional products. Volvo, for example, has designed a process in which worn-out products from its trucks are sent to be remanufactured; this business is quickly scaling and is run in parallel with the company's new-truck sales. In addition to being less expensive and more reliable, remanufactured truck parts reduce material use by 85% and energy use by 80%.<sup>11</sup>

## How can my organization build a network of interconnected supply chains to enable new circular models?

To achieve their ambitions, leadership teams can learn from others in the industry and join forces to implement broader, far-reaching change. Each organization is one element in a universe of supply-chain interdependencies. By banding together, companies can create a new fabric of interconnected value chains, allowing circularity leaders to start reimagining their products and how they interact with other value chains. The next step is rethinking innovation and product development, ensuring that circular models are core to every product's DNA. For example, start-up Risacca transforms old fishing nets into fabric, chairs, covers and buttons, creating jobs, designing innovative products and reducing pollution in one of Italy's busiest fishing centres.<sup>12</sup>

Interconnected supply-chain networks are also critical in establishing a pre-competitive agenda for systemic benefits. To build a network of linked value chains and self-sustaining ecosystems, industry coalitions need to understand the economic foundations that support circular models at scale. This requires promoting new standards and certifications, developing circular-focused capabilities within their own companies and among suppliers and consumers, and supporting new policy frameworks. Coalitions of companies can define the "rules of the game", creating an ecosystem with standardized industry metrics – and lean on governments to integrate swift policies that support the need to implement circular practices.

“ To continue to meet demand, organizations will need to retool and invest in procurement, manufacturing and sales, both for circular and traditional products.

## How can we achieve systems-wide change that dramatically increases the number of interconnected circular supply chains?

Public- and private-sector incentives can help increase the number and scale of interconnected circular supply chains. This challenge is most apparent in the plastic value chain, where some companies do not have enough feedstock to meet their recycled PET (the most commonly used plastic material in packaging) targets, and there is a need for supportive government policies and standards on food-grade plastics to scale their efforts. Governments should therefore continue building on existing policy frameworks and strategies to promote a circular ecosystem while exploring bolder opportunities to reward first movers and bring laggards up to the new expectations. They can increase circular initiatives at a regional (CEAP), national (Dutch economic goals)<sup>13</sup> and sector (Intergovernmental Negotiating Committee [INC] on Plastic Pollution) level<sup>14</sup> by encouraging organizations

to make collective commitments. Leaders are starting to create demand for circular products; the Rwandan Government shifted its federal procurement (estimated at 15% of 2017 GDP) to increase the share of circular products procured, thereby stimulating the local circular ecosystem.<sup>15</sup> Governments must encourage companies to account for the negative impact they generate on the environment and take responsibility for their inputs, outputs and practices. The EU has led the way with its EPR programmes,<sup>16</sup> requiring manufacturers to manage their products all the way through the post-consumer stage, shifting the financial and operational responsibility from governments and consumers to businesses. Similar frameworks are being implemented around the world (including in the US, China and Kenya) but need to be expanded and aligned across regions and materials to maximize their impact.

# Innovator case studies

A group of leading World Economic Forum members are forging ahead to scale their circularity initiatives and create systemic change. Here are several success stories.

## CASE STUDY

### Partnership to scale a circular ecosystem

The fashion industry has historically struggled to establish a credible, secondary marketplace that minimizes the risk posed by low-quality, counterfeit products. Ralph Lauren addressed this challenge through a partnership with resale platform Vestiaire Collective (along with the World Economic Forum and Bain & Company) that created a digital architecture for reselling authenticated products.<sup>17</sup> The partnership, which uses digital ID technology developed by Digimarc (formerly EVRYTHNG), has benefited all parties.<sup>18</sup> Ralph Lauren has broadened its brand exposure, enhanced its brand equity and is an early mover in the emerging resale market. Vestiaire Collective has increased its customer volume and reduced the risks and costs associated with inauthentic products. Consumers have benefited, too, as they can confidently purchase authenticated second-hand products. Partnerships provide the opportunity to elevate and scale circular models beyond one product, value chain or company.



## CASE STUDY

### Designing a circular business strategy

Schneider Electric incorporates circular design principles into the core of its business to meet sustainability goals, while ensuring growth and greater supply-chain resilience. The leadership team has launched scalable pilot projects that reimagine the entire value chain for a given product, with a focus on producing products with a longer lifespan that are more easily repaired to further extend the product life. Company-

wide circularity training helps all employees understand why circularity is a priority and how initiatives affect their work. In one early pilot, called ECODRIVE, Schneider Electric launched a programme to collect its used Altivar Process drives for refurbishment and resale. Customers submit their products for return on a digital take-back platform, resulting in a smooth and efficient recycling process.

## CASE STUDY

### Industry-wide collaboration across the public and private sectors

Deep, long-standing circular transformation of industries requires a broad group of stakeholders to partner across the public and private sectors. The Consumer Goods Forum,<sup>19</sup> a CEO-led organization that brings together 400 consumer goods retailers and manufacturers globally (including Walmart and Unilever), provides guidance on how EPR schemes can move the responsibility for waste management from governments and consumers to manufacturers

through producer responsibility organizations (PROs). One of the pioneering PROs, ReCarton,<sup>20</sup> is a non-profit that supports and incentivizes companies to recapture and recycle beverage cartons, while providing them with support to identify new markets for the recycled products. This encourages companies to innovate, while also creating a closed, resilient loop of recyclable packaging raw materials for local manufacturers during a period of growing global demand.

## CASE STUDY

### Systems-level circular transformation

To fully realize the benefits of circular transformation requires systems-level initiatives that create value for all stakeholders. While it is early days for systems-level initiatives across industries, battery recycling has emerged as an early example of a fast-growing ecosystem that requires a broader, systemic approach. Vehicle industry leaders, such as Volkswagen, are pioneering a circular business model around batteries for electric cars.

Volkswagen's new battery company, PowerCo, takes a systems-level approach to establishing a green battery cell business with a resilient remanufacturing loop. These green battery cells will be manufactured only with green energy, with a recycling rate of at least 90%.

Partnerships in the public and private sectors are a critical enabler of this business model. PowerCo's partnership with Umicore provides battery recycling technical support and strengthens its operational capabilities. Volkswagen has also joined a research consortium with other industry leaders, academics and the German government to design processes that allow for materials used in electric-vehicle batteries to be recaptured and redeployed.

PowerCo is an example of an established player building a large-scale, collaborative ecosystem that unlocks new revenue streams, limits resource consumption and minimizes the externalities associated with electric-vehicle production. Its smart approach to ecosystem development is a model for scalable, sustainable, systems-level circular transformation.



# Mission

The world needs stakeholders to come together to build the “operating system” for the circular economy and follow in the footsteps of industry innovators.

The time to embrace a circular transformation at scale is now. Many companies, organizations and governments have begun to explore what this systems-level change means for them, but few have made strategic commitments and developed clear strategies.

The world needs stakeholders to come together to build the “operating system” for the circular economy and follow in the footsteps of industry innovators. To achieve this and more, the World Economic Forum has launched the Circular Transformation of Industries initiative, in collaboration with Bain & Company, University of Cambridge and INSEAD.

The initiative brings together cross-functional leaders to share best practices, develop critical enablers across industries and drive action in high-impact areas such as: developing systems-wide partnerships; establishing data-sharing norms; building innovative circular practices and technology; influencing global regulation and policy; equipping companies to build a circularity-oriented organizational culture; developing circular upskilling capabilities; and providing access to financing for catalytic solutions.

This community of leaders aims to achieve four key milestones in the year ahead:

- **Unite:** Bring together global leaders committed to fundamentally changing their organizations and industries, adopting circular operating and business models that break away from the linear status quo
- **Solve:** Crack the toughest obstacles to circular transformation, including economic, policy and technological barriers
- **Commit:** Start forming collective commitments to mobilize the resources and efforts needed to accelerate and scale the circular transformation of industries
- **Act:** Convene circular economy pioneers to stimulate cross-value chain collaboration and set a pre-competitive agenda that aids in scaling circular transformations

The authors of this paper look forward to an engaging discussion and invite all stakeholders to join forces and embark on the Circular Transformation of Industries initiative.

# Contributors

## World Economic Forum

**Maria Basso**

Platform Curator, Advanced Manufacturing and Value Chains

**Francisco Betti**

Head of Advanced Manufacturing and Value Chains

**Mel Hua**

Hoffman Research Fellow; Research Fellow, INSEAD University

**Kristin Hughes**

Director of Resource Circularity

**Christian Kaufholz**

Head of Community Engagement and Impact

**Anis Nassar**

Lead, Resource Circularity

**Lisa Rossi**

Research Fellow; PhD candidate, University of Cambridge

**Alex Viladegut**

Project Fellow; Manager, Bain & Company

**Stacey Weismiller**

Initiatives and Community Lead, Advanced Manufacturing and Value Chains

**Bontu Yousuf**

Industry Transformation Specialist, Resource Circularity

**Xiaoming Zhong**

Initiatives and Community specialist, Advanced Manufacturing and Value Chains

## Bain & Company

**Tessa Byson**

Partner

**Jenny Davis-Peccoud**

Senior Partner, Head of Sustainability & Responsibility

**Arnab Hazra**

Senior Manager

**Josh Hinkel**

Senior Partner

**Hernan Saenz**

Senior Partner, Global Head of Performance Improvement

## Acknowledgements

Arçelik

Celonis

GEA Group

Holcim

Ralph Lauren

Remanufacturing Group

Schneider Electric

Siemens

Volkswagen

We thank the CEOs and executives who have already started the journey of circularity through existing initiatives and communities at the World Economic Forum and outside. We look forward to supporting these communities and to build on their work with them to take circularity to an unprecedented scale.

# Endnotes

1. Circle Economy, “The Circularity Gap Report 2022”, 2022: <https://drive.google.com/file/d/1NMAUtZcoSLwmHtr5TLWwB28QJDghi6Q/view>.
2. Global Footprint Network, “Global Footprint Network Promotes Real-World Solutions that #MoveTheDate, Accelerating the Transition to One-Planet Prosperity”, 23 July 2019: <https://www.footprintnetwork.org/2019/07/23/press-release-july-2019/>.
3. Circle Economy, “The Circularity Gap Report 2022”, 2022: <https://drive.google.com/file/d/1NMAUtZcoSLwmHtr5TLWwB28QJDghi6Q/view>.
4. ING, “Learning from Consumers: How Shifting Demands Are Shaping Companies’ Circular Economy Transition”: <https://www.ingwb.com/binaries/content/assets/insights/themes/circular-economy/ing-circular-economy-survey-2020-learning-from-consumers.pdf>.
5. European Commission, “Circular Economy Action Plan”: [https://environment.ec.europa.eu/strategy/circular-economy-action-plan\\_en](https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en).
6. Kalundborg Symbiosis, “Surplus from Circular Production”: <http://www.symbiosis.dk/en/>.
7. European Commission, “Circular Economy Action Plan”: [https://environment.ec.europa.eu/strategy/circular-economy-action-plan\\_en](https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en).
8. European, “Extended Producer Responsibility”: <https://www.euopen-packaging.eu/policy-area/extended-producer-responsibility/>.
9. EPRON, “Welcome to EPRON”: <https://epron.org.ng/>.
10. National Environment Agency, “Extended Producer Responsibility (EPR) System for E-waste Management System”: [https://www.nea.gov.sg/our-services/waste-management/3r-programmes-and-resources/e-waste-management/extended-producer-responsibility-\(epr\)-system-for-e-waste-management-system](https://www.nea.gov.sg/our-services/waste-management/3r-programmes-and-resources/e-waste-management/extended-producer-responsibility-(epr)-system-for-e-waste-management-system).
11. Volvo, “Sustainability: Circular Economy”: <https://www.volvocars.com/intl/v/sustainability/circular-economy>.
12. Designboom, “Risacca Project, Promoting Innovative Solutions for Recycling Waste from the Fishing Industry”: <https://www.designboom.com/design/project-risacca-recycling-fishing-nets-italy-02-16-2022/>.
13. Government of the Netherlands, “Circular Dutch Economy by 2050”: <https://www.government.nl/topics/circular-economy/circular-dutch-economy-by-2050#:~:text=The%20Netherlands%20aims%20to%20have,and%20raw%20materials%20are%20reused>.
14. United Nations Environmental Assembly of the United Nations Environmental Programme, “Draft Resolution: End Plastic Pollution: Towards an International Legally Binding Instrument”, 2 March 2022: [https://wedocs.unep.org/bitstream/handle/20.500.11822/38522/k2200647\\_-\\_unep-ea-5-l-23-rev-1\\_-\\_advance.pdf?sequence=1&isAllowed=y](https://wedocs.unep.org/bitstream/handle/20.500.11822/38522/k2200647_-_unep-ea-5-l-23-rev-1_-_advance.pdf?sequence=1&isAllowed=y).
15. Republic of Rwanda, “2019 Rwanda: Voluntary National Review (VNR) Report”, 2019: [https://sustainabledevelopment.un.org/content/documents/23432Rwanda\\_VNR\\_Document\\_Final.pdf](https://sustainabledevelopment.un.org/content/documents/23432Rwanda_VNR_Document_Final.pdf).
16. European, “Extended Producer Responsibility”: <https://www.euopen-packaging.eu/policy-area/extended-producer-responsibility/>.
17. World Economic Forum, “Circular Value Chains in Fashion: Strengthening Trust in Second Hand Markets”: <https://www.weforum.org/impact/strengthening-trust-in-second-hand-markets/>.
18. Digimarc, “Ralph Lauren”: <https://www.digimarc.com/resources/ralph-lauren>.
19. The Consumer Goods Forum, “Extended Producer Responsibility”: <https://www.theconsumergoodsforum.com/environmental-sustainability/plastic-waste/key-projects/extended-producer-responsibility/>.
20. ReCarton, “Garant für die Verwertung gebrauchter Getränkekartons” (in German): <https://www.getraenkekarton.de/recarton/>.



---

COMMITTED TO  
IMPROVING THE STATE  
OF THE WORLD

---

The World Economic Forum, committed to improving the state of the world, is the International Organization for Public-Private Cooperation.

The Forum engages the foremost political, business and other leaders of society to shape global, regional and industry agendas.

---

World Economic Forum  
91–93 route de la Capite  
CH-1223 Cologny/Geneva  
Switzerland

Tel.: +41 (0) 22 869 1212  
Fax: +41 (0) 22 786 2744  
[contact@weforum.org](mailto:contact@weforum.org)  
[www.weforum.org](http://www.weforum.org)