

Sustainable and circular business models for the chemical industry

CIRCULAR ECONOMY PLAYBOOK
FOR CHEMICAL COMPANIES

May 2020



Sustainable and circular business models for the chemical industry

Executive summary

- The Chemical Industry Federation of Finland (CIFF) and its 400 member companies have started to work on a carbon neutrality roadmap, that strives to pave the way for a carbon neutral Finnish chemical industry by 2045
- The transition towards sustainability and circular economy is driven by an increased focus on sustainable actions demanded by end consumers, brand owners, investors and regulators alike, and accelerated by the rapid pace of technology development
- Sustainable and circular business models are the foundation of a sustainable transition for the chemical industry, and a crucial element in achieving the ambitious 2045 target
- These models turn inefficiencies and waste streams in traditional linear value chains into business opportunities. This means maximizing the time materials and products are kept in use by continuously feeding them back through the value chain for reuse, and utilizing other inefficiencies like waste energy in the value chain
- The chemical industry plays a key part in enabling more wide-scale sustainability and across industries, as it is heavily interlinked with other industries
- Chemical companies are well equipped to develop materials and methods that enable and speed the adoption of sustainable and circular business models, allowing them to be powerful partners to manufacturers, suppliers and retailers, besides developing their own operations towards sustainability and circularity
- A successful transition to circularity requires a significant shift in operations, culture and organization, product and service development and ecosystem collaboration, supported by relentless focus on customer-centricity and smart application of emerging technologies
- Finnish chemical companies are strongly committed to sustainability and circular economy, and recognize it as a key source of competitive advantage
- A race for “sweet spots” in emerging circular value chains has already begun – we invite chemical companies to use this playbook to embrace this disruption and build a solid foundation for a carbon neutral future

Playbook content

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While reading the playbook, use the business model canvas to start developing your sustainable and circular business opportunities

Business model canvas

What is a business model canvas?

The business model canvas is a tool that helps you to crystallize your circular business idea by reflecting on its key building blocks, including your value proposition, infrastructure, customers and financing.

How to use it?

Each chapter of this playbook supports you with filling in the canvas, with activation questions at their end. We also recommend using the tool and questions with your team to support discussion and ideation.



Vision statement			
Market Customers: Customer relationships: Customer Channels: Competitors:	Offering Products/services: Value proposition: Outlook/pipeline:	Operating model Key partners: Key capabilities: Key resources: Digital:	
Financial aspects Revenue streams:	Cost structure:	Risks (facing /mitigating):	Intangibles:
Enabling companies			

01

Why sustainability and circularity?

Rationale for Finnish chemical companies to engage in sustainability and circularity

Chapter summary

- Sustainable and circular business models enable companies to deliver value to their stakeholders while minimizing environmental costs
- Six forces accelerate the shift towards sustainability and circular economy in the chemical industry
 - 1 End consumers are demanding more sustainable products
 - 2 Brand owners are making voluntary commitments to sustainability
 - 3 Responsible investments are becoming the new norm
 - 4 Greenhouse gas reduction is crucial for slowing down global warming
 - 5 Regulation around sustainability is strongly increasing
 - 6 New technologies enabling circularity are constantly emerging and advancing
- The value case for sustainable and circular business models in the chemical industry is significant, and expected to increase going forward
- Chemical companies are well equipped to develop materials and methods that enable and speed the adoption of sustainable and circular business models in downstream industries, making them powerful partners to manufacturers, suppliers and retailers

Sustainable and circular business models enable companies to deliver value while minimizing environmental costs

Definition of sustainable and circular business models

Sustainable and circular business models enable companies to deliver value to their broader group of stakeholders while minimizing environmental costs.

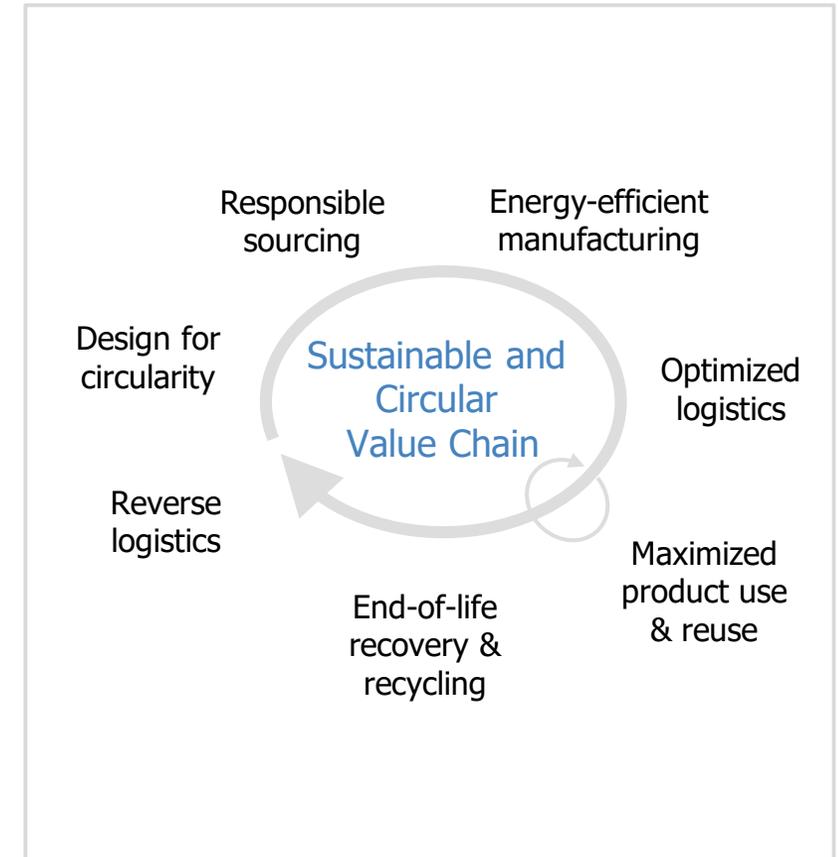
They help companies to shift from traditionally linear “take, make, waste” approaches of production and consumption into sustainable and circular approaches that source materials responsibly and maximize the time materials and products are kept in use by constantly feeding them back through the value chain for reuse, resulting in less energy and resource consumption.

- These new approaches include for example
- the use of renewable, recycled, bio-based, or other non-fossil raw material inputs
 - extension of product lifecycles through repairs and upgrades
 - recovery of materials from end-of-life products for reuse

From linear...



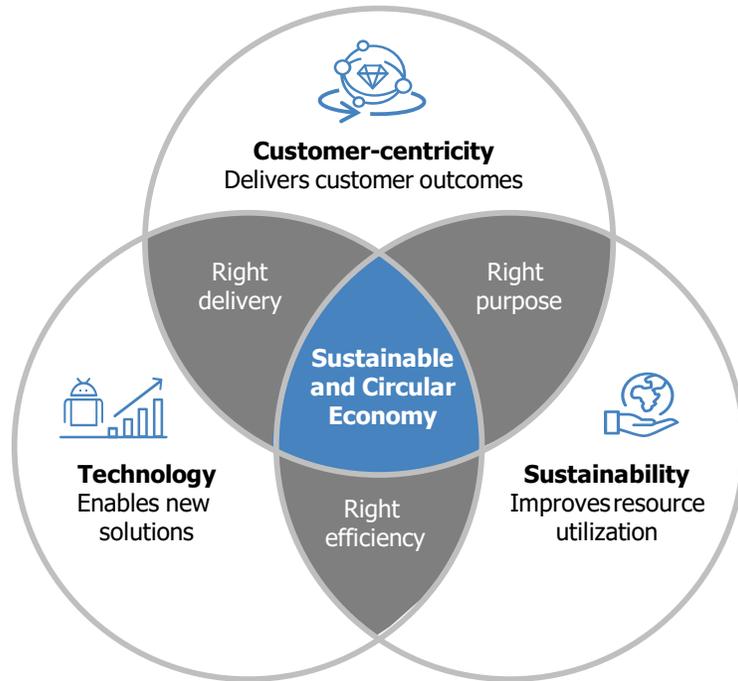
...to sustainable and circular



Complementary drivers accelerate the shift towards enhanced sustainability and circular economy in the chemical industry

Sustainability and circular economy drivers

Complementary drivers



Force	Description	Evidence	
Customer-centricity	End consumer awareness	<ul style="list-style-type: none"> A growing segment of consumers are seeking sustainable/eco-friendly products and appreciate brands that share and cultivate their sustainability beliefs 	<ul style="list-style-type: none"> 81% of consumers plan to buy more environmentally friendly products in the next five years¹ 96% of consumers in the EU consider it important that products are designed in a way that facilitates reuse and recycling¹
	Brand voluntary commitments	<ul style="list-style-type: none"> In reaction to evolving consumer preferences and increasing number of regulations, brand owners have announced ambitious sustainability targets 	<ul style="list-style-type: none"> More than 400 companies have signed a plastics commitment in which consumer goods companies and retailers commit to increasing recycled content in their packaging to an average of 25% by 2025, compared to 2% in 2018²
Sustainability	Responsible investments	<ul style="list-style-type: none"> Investors are increasingly measuring a company's impact on the society and the environment to determine its worth 	<ul style="list-style-type: none"> Impact investments, focusing on measurable social and environmental change alongside investment returns, have increased in Finland by 10% between 2017 and 2019³
	Greenhouse gas (GHG) reduction	<ul style="list-style-type: none"> Reduction of GHG emissions is crucial for slowing down global warming, and the chemical industry plays a key role in it as an enabler 	<ul style="list-style-type: none"> The EU has committed to achieve a 45% GHG emission reduction by 2030, compared to 1990 levels, and plans to increase it to 50-55%⁴
	Increasing regulatory pressure	<ul style="list-style-type: none"> Regulation around product/material reuse and recycling has strongly increased over the past years, and is expected to continue 	<ul style="list-style-type: none"> Various bans, quotas, taxation and extended producer responsibilities (EPR) targeting specific value chain steps have been put in place, and more will come through the EU Green Deal In Finland the national recycling rate of plastic packaging must be 50% by 2025⁵
Tech	Technology development	<ul style="list-style-type: none"> New technologies enabling sustainable and circular business models are constantly emerging and evolving 	<ul style="list-style-type: none"> At least 18% of total funding for Finnish startups and growth companies have been invested in recycling start-ups in 2019⁶

Source: (1) Accenture Chemicals Global Consumer Sustainability Survey 2019 for 6 000 consumers in 11 countries; (2) Ellen MacArthur Foundation; (3) Finland's Sustainable Investment Forum; (4) European Commission; (5) Suomen Uusiomuovi; (6) FVCA - Pääomasijoittajat & Recycling Startups

Consumers prefer eco-friendly products and consider the chemical industry least concerned about the environment

Consumer sentiment

- End consumer awareness
- Brand voluntary commitments
- Responsible investments
- GHG reduction
- Increasing regulatory pressure
- Technology development

81% of consumers plan to buy more eco-friendly products over the next 5 years

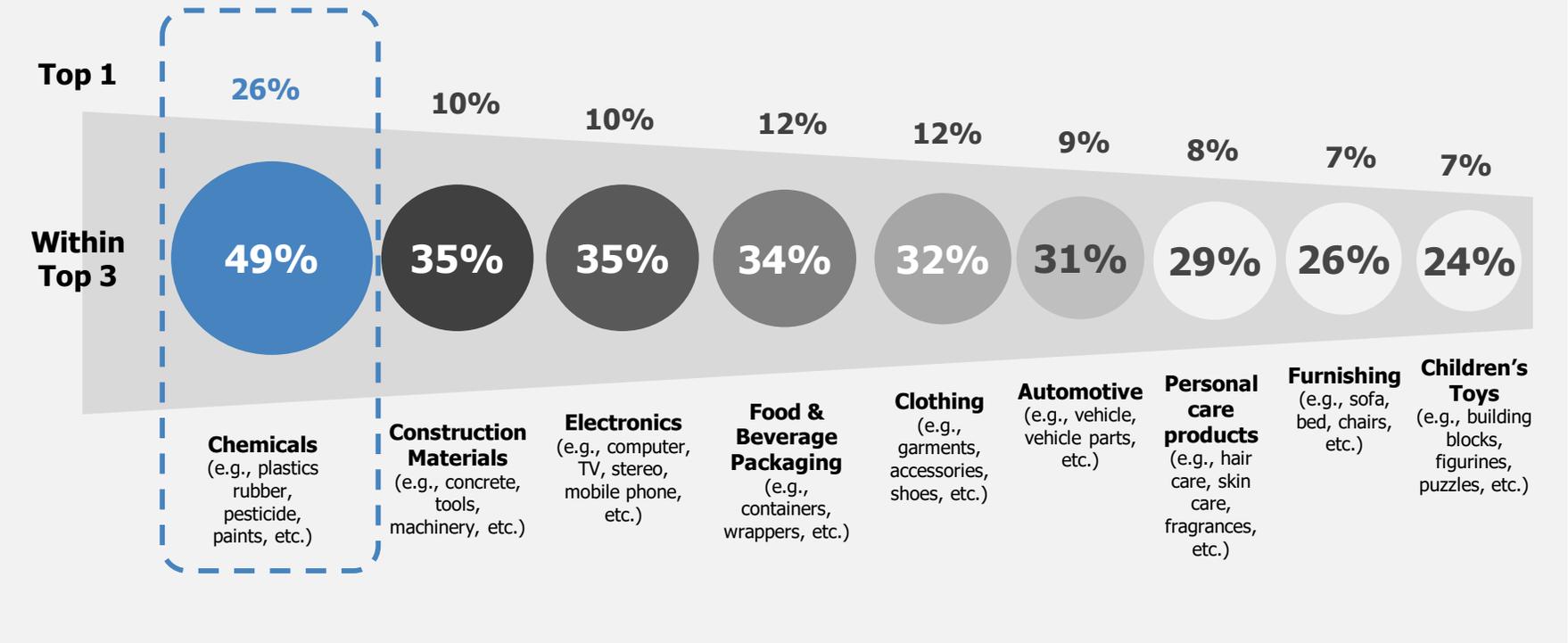
54% of consumers are willing to pay a premium for more sustainable products

62% of consumers want companies to take a public and passionate stance on social, cultural, environmental and political issues

72% have low confidence in chemical manufacturers' communications concerning the environmental impact of their products and/or services — the lowest of all organizations included in the survey

Consumer confidence

Share of respondents considering an industry being among the least concerned about their environmental impact



Source: Accenture Chemicals Global Consumer Sustainability Survey 2019 for 6,000 consumers in 11 countries

Brand owners are committing to sustainability in their operations, products and value chains

Finnish brand owner reactions

End consumer awareness

Brand voluntary commitments

Responsible investments

GHG reduction

Increasing regulatory pressure

Technology development



Valio intends to cut milk's carbon footprint to zero by 2035



Fazer has set four sustainability goals: 50% less emissions, 50% less food waste, 100% sustainably sourced and more plant-based



Kesko has set a target to be carbon neutral by 2025



KONE has a strategic target to be a leader in sustainability, particularly by providing the most sustainable offering



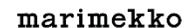
HKScan aims to reduce GHG emissions from its own facilities by 90% by 2030 compared to 2014



OP is committed to making its own operations carbon neutral by 2025



S-Group aims to recycle 80% of its waste (e.g. cardboard and plastics), to be used as materials or turned into new products by the end of 2025



Marimekko aims to reduce CO2 emissions by 50% and waste resulting from operations by 20% compared to 2010 level



Metso aims to reduce emissions from production by 25% and from product use by 10% by 2025 compared to 2018 baseline



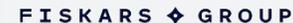
Amer Sports defined circular economy principles focusing on product lifecycle, resource efficiency, durability & repair, business models and end of use



Nokia is targeting a 75% GHG emission reduction from the use of its products by 2030 compared to 2014 baseline



UPM is committed to eliminating process waste going into landfills or to incineration and reducing its CO2 emissions by 65% by 2030



Fiskars aims to have 100% renewable packaging and all waste from own operations recovered or recycled by 2030



Finnair has set a goal to be carbon neutral by 2045, starting by cutting emissions by 50% by 2025 from 2019 level



Huhtamäki continuously innovates for products enabling sustainability and circular economy and aims to use a high degree of renewable materials

Ability to offer sustainable and circular solutions to brand owners is becoming a competitive advantage to chemical companies

Source: Accenture analysis; Company websites

Investors demand increasingly responsible business practices and base portfolio decisions on extra-financial performance

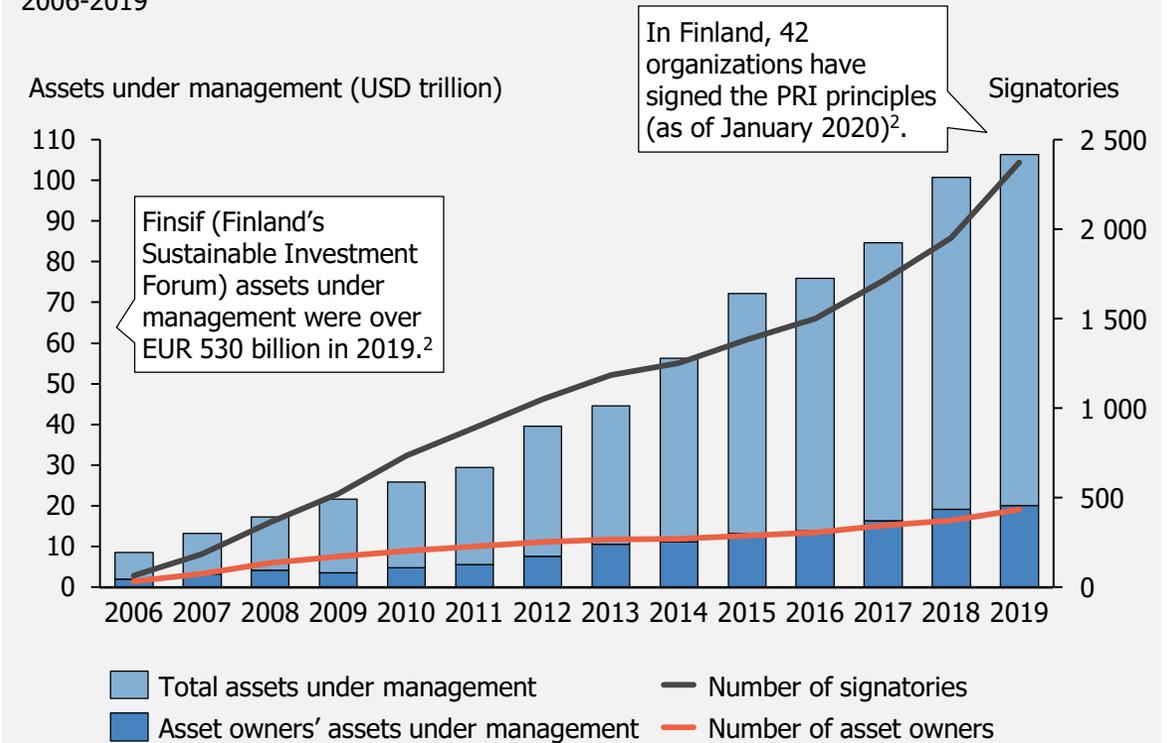
Responsible investments



Responsible investment trends

- In the last decade, interest towards responsible investment has grown significantly worldwide
 - Number of PRI signatories (UN Principles for Responsible Investment) has more than tripled since 2010¹
 - Finsif (Finland’s Sustainable Investment Forum) member base has grown from 18 founding members in 2010 to over 70 members in 2019²
- Investors are putting more and more focus on extra-financial KPIs, with 90% confirming to use them as a basis for decisions³
 - To be attractive for investors, companies need to properly disclose their extra-financial performance across the value chain
 - Proper reporting also helps companies to meet increasing regulatory requirements (see following page for more information)
- Responsible investment policies are also being introduced with an increasing pace, with over 300 policy instruments supporting investors to consider ESG factors, of which over half were created since 2013⁴
- Companies are also seeing the benefits of investing in sustainable business
 - 90% of 2 200 studies analyzed by Deutsche Asset & Wealth Management display a positive (or at least neutral) correlation between extra-financial and financial performance⁵

PRI signatory growth¹
2006-2019



Source: (1) PRI, 2019; (2) Finsif *Responsible investing in Finland – Market study 2019*; (3) State Street, 2017; (4) UNFCCC, 2017; (5) Deutsche Asset & Wealth Management, 2015

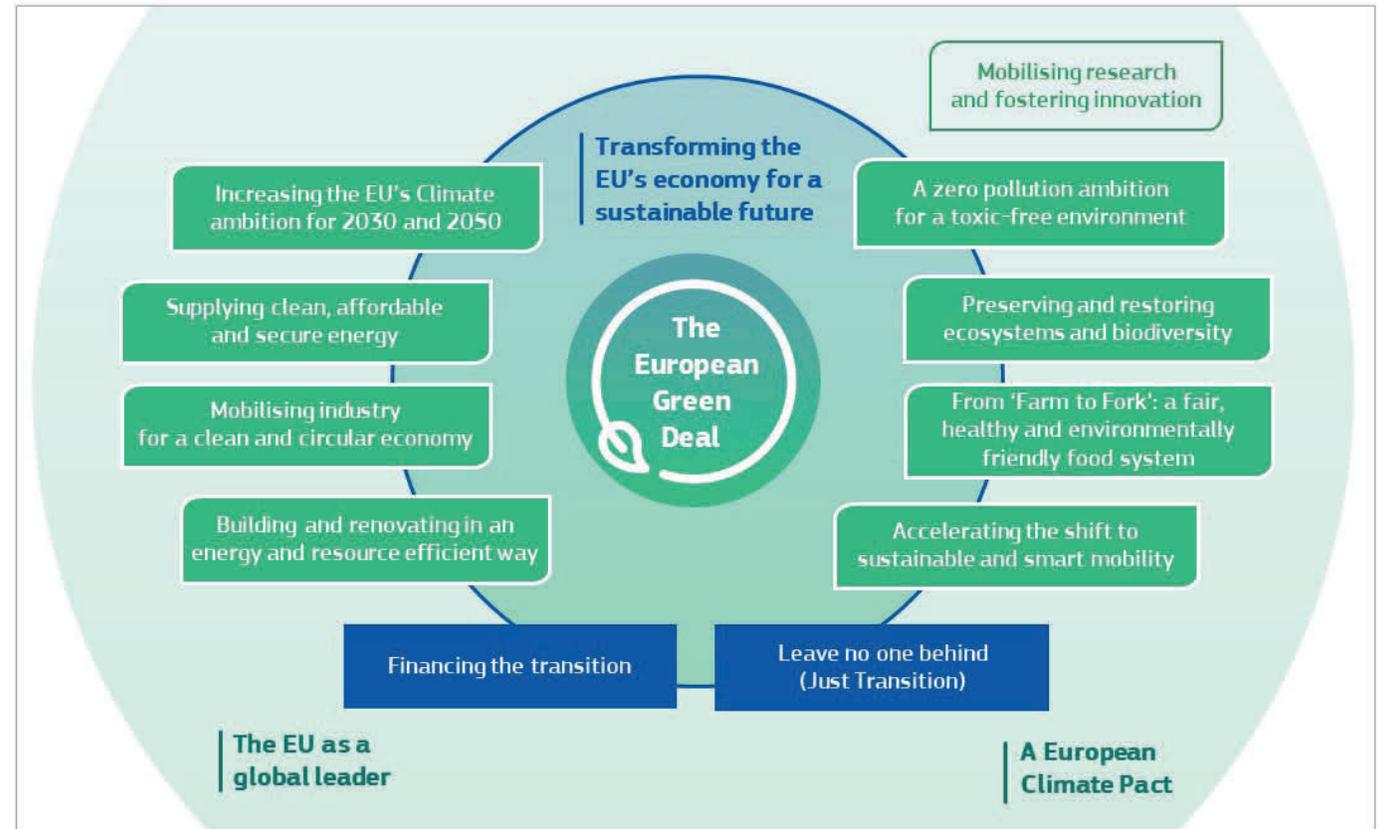
Regulation is being put into place to drive the transition – The European Green Deal playing a key role locally

The European Green Deal



European Green Deal

- The *European Green Deal* is a roadmap for making **EU the first climate-neutral continent by 2050** through actions that
 - boost the efficient use of resources by moving to a clean, circular economy
 - restore biodiversity and cut pollution
- The *European Green Deal* leverages all policy levers, including regulation and standardization, investment and innovation, national reforms, dialogue with social partners and international cooperation to boost the transition to a more sustainable future



The EU Green Deal brings many new business opportunities for Finnish chemical companies

Implications for chemical companies

End consumer awareness

Brand voluntary commitments

Responsible investments

GHG reduction

Increasing regulatory pressure

Technology development

The European Green Deal creates opportunities for Finnish chemical companies mainly through four policies:

Policy name	Description	Implications
Mobilizing industry for a clean and circular economy	<ul style="list-style-type: none"> To drive the transition to a carbon neutral and circular economy, the Commission has created <ul style="list-style-type: none"> an EU industrial strategy to address the challenge of green and digital transformation a Circular Economy Action Plan to accelerate the transition towards a regenerative growth model that decouples economic growth from resource use 	<ul style="list-style-type: none"> Policies and measures supporting and guiding towards <ul style="list-style-type: none"> circular design of products use of reusable and recyclable packaging materials provision of accurate and reliable information on products and services reduction of waste innovation with breakthrough technologies <p><i>See next page for additional details.</i></p>
Building and renovating in an energy and resource efficient way	<ul style="list-style-type: none"> The Commission will enforce the legislation related to the energy performance of buildings, and in parallel to work with stakeholders on a new initiative on resource-efficient renovation in 2020 	<ul style="list-style-type: none"> Increased demand for sustainable building materials and solutions enabling energy efficiency
Accelerating the shift to sustainable and smart mobility	<ul style="list-style-type: none"> The Commission will adopt a strategy for sustainable and smart mobility in 2020 that will address high volume of transport-related GHG emissions In parallel, the plan is to ramp-up the production and deployment of sustainable alternative transport fuels, boosted by legislation 	<ul style="list-style-type: none"> Increased demand for sustainable (e.g. bio-based and synthetic) transport fuels and other solutions enabling GHG reduction of different vehicles
From 'Farm to Fork': designing a fair, healthy and environmentally-friendly food system	<ul style="list-style-type: none"> In Spring 2020, the Commission will present the 'Farm to Fork' strategy to pave the way to creating a more sustainable and circular food chain An objective of the strategy reduce significantly the use and risk of chemical pesticides, as well as the use of fertilizers and antibiotics 	<ul style="list-style-type: none"> Increased demand for alternative agricultural chemicals, i.e. opportunities to innovate and develop new products Additional opportunities to strengthen customer relationships through co-creation

Other policies of the *European Green Deal* also have implications for chemical companies, e.g. in ensuring use of clean energy in production and replacing hazardous chemicals with more sustainable alternatives to minimize pollution.

Source: Accenture analysis; European Commission

The new Circular Economy Action Plan supports companies to tap into new sustainable business opportunities

The Circular Economy Action Plan

End consumer awareness

Brand voluntary commitments

Responsible investments

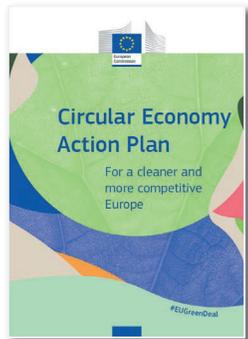
GHG reduction

Increasing regulatory pressure

Technology development

Circular Economy Action Plan

- The *Circular Economy Action Plan* will introduce a set of initiatives to establish a coherent **product policy framework** that will make sustainable products, services and business models the norm in the EU, and transform consumption patterns so that no waste is produced in the first place
- In addition, measures to **reduce waste** and ensure that there is a functioning **market for high quality secondary raw materials** will be put in place



Sustainable product policy framework

The sustainable product policy framework consists of three key elements.

Designing sustainable products

- A common set of design principles for all products placed on the EU market regulating the following aspects
 - extending product lifecycles, addressing hazardous chemicals and increasing energy and resource efficiency of products
 - increasing recycled content in products
 - enabling remanufacturing and high-quality recycling;
 - reducing carbon and other environmental footprints, e.g. microplastics emissions;
 - restricting single-use and countering premature obsolescence;
 - introducing a ban on the destruction of unsold durable goods;
 - incentivizing product-as-a-service models
 - mobilizing the potential of digitalization of product information,
 - rewarding products based on their sustainability performance

Empowering consumers and public buyers

- Revision of the EU consumer law to ensure that consumers receive trustworthy and relevant information on products at the point of sale, including information on their lifespan and on the availability of repair services, spare parts and repair manuals
- Further strengthening consumer protection against green washing and premature obsolescence, setting minimum requirements for sustainability labels/logos and information tools

Circularity in production processes

- Facilitating industrial symbiosis by developing an industry-led reporting and certification system and enabling the implementation of industrial symbiosis
- Promoting the use of digital technologies for tracking, tracing and mapping of resources
- Implementing a new SME Strategy to foster circular industrial collaboration among SMEs building on training, advice, and knowledge transfer

Key product value chains

The sustainable product policy will be progressively rolled out starting in 2021, with the following key product value chains identified by the EU Commission being addressed as a matter of priority.

Electronics and ICT



Batteries and vehicles



Packaging



Plastics



Textiles



Construction and buildings



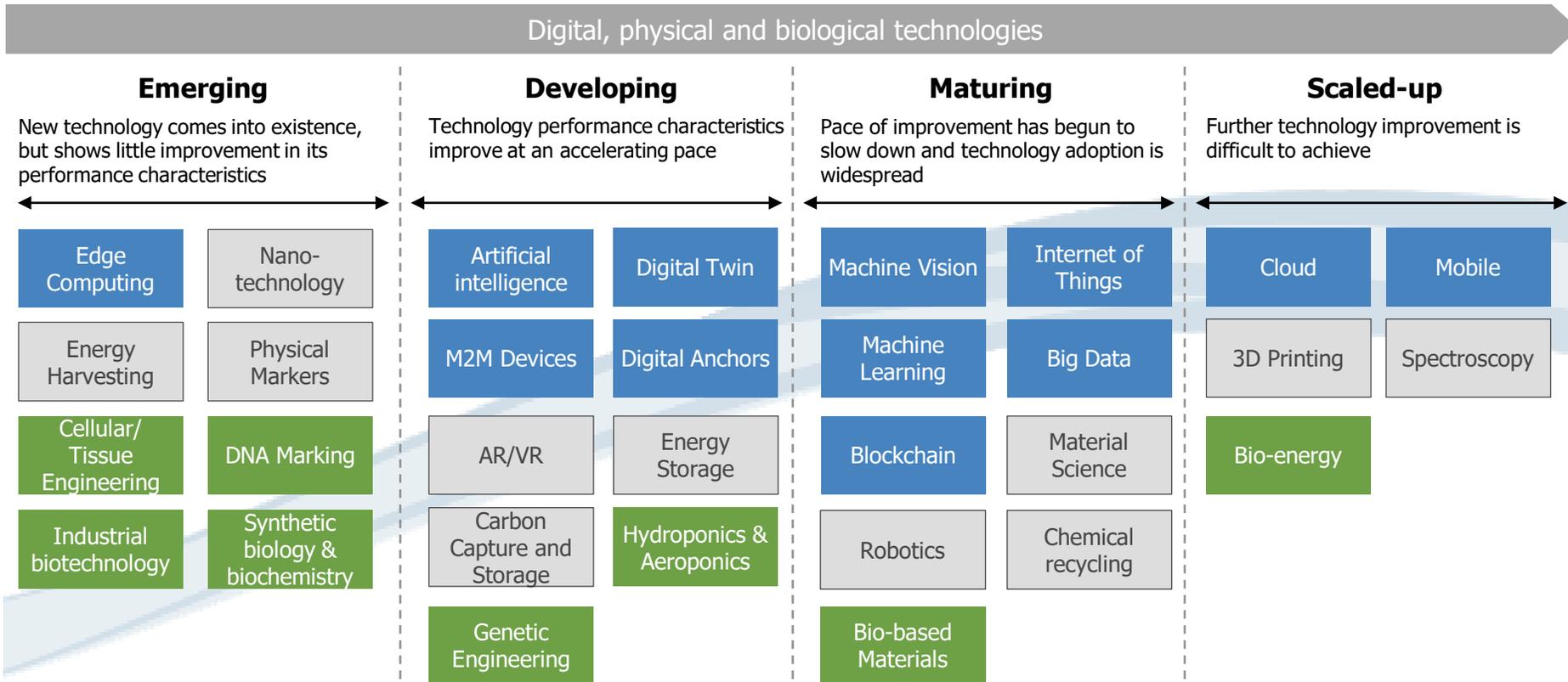
Food, water and nutrients



Source: Accenture analysis; European Commission

Technologies are developing rapidly, enabling sustainability and circularity

Technology development



Technology types

- Digital**
Technologies based on computer, electronics and communication sciences, which make use of the increasing volume of information and connectedness of physical resources
- Physical**
Technologies based on basic properties of materials, energy, forces of nature and their interactions
- Biological**
Technologies based on biological aspects, including, but not limited to, biological systems and living organisms (or derivatives thereof), to make products and processes for specific uses

Type of technology: ■ Digital ■ Physical ■ Biological

Source: Adapted from Accenture research

Want to learn more?
Check out technologies enabling carbon neutral chemistry in the *Roadmap to Reach Carbon Neutral Chemistry in Finland 2045* report [here](#).

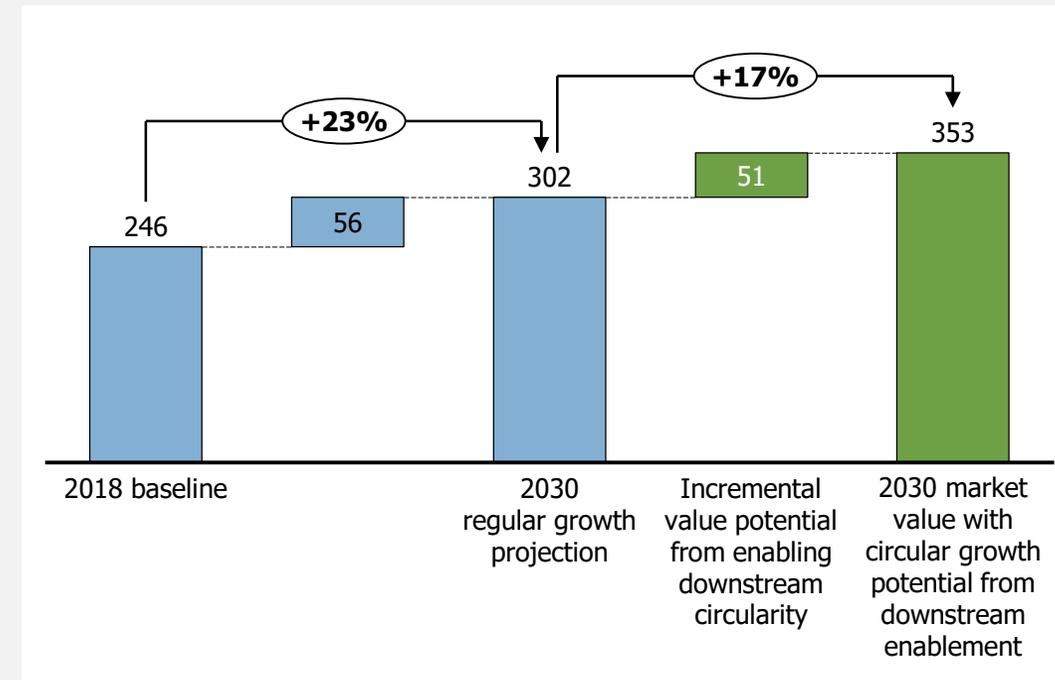
The value case for sustainable and circular business models in the chemical industry is significant, and expected to increase

Value case

USD 4 500 billion
expected additional economic value from circular economy by 2030¹

26% growth potential
in terms of volume for the demand of chemical products through rising need of downstream industries to reduce energy consumption³

EU28 projection of market size evolution for chemical products⁶
2018-2030, EUR billion



Key observations

- Both the consumption (volume) and average unit value of chemical products is expected to grow, increasing the market size for chemical products by 23% by 2030
- Circular economy models can unlock an estimated additional EUR 50 billion upside for chemical products, driven e.g. by a price premium that can be expected for more sustainable alternatives
- The circular growth potential however varies greatly by product and application (see more on next page)

0.5% GDP growth
in the EU by 2030 by applying circular economy principles²

USD 100 billion
value of global market for green chemistry by 2020⁴

700 000 jobs
created across the EU by 2030 through circular economy adoption²

USD 64.1 billion
value of plastics recycling industry in 2024⁵

Helping brand owners meet their commitments and enabling circularity in the downstream value chain offers considerable growth potential for chemical companies

Source: (1) Accenture research; (2) European Commission Circular Economy Action Plan; (3) Accenture estimate; (4) Trucost estimate for the American Sustainable Business Council (ASBC) and the Green Chemistry & Commerce Council (GC3); (5) P&S Intelligence; (6) Accenture analysis. Note: Chemical products sold to customers – not counting basic chemicals and intermediates that are further processed within the chemical industry. Also, short-term effects of disruptions (e.g. COVID-19) have not been reflected in the projection.

The circularity-induced growth potential strongly differs by chemical product and application

EU28 chemical consumption across products: projected overall CAGR 2018-2030¹

Chemicals / chemical group

Segments	Acrylic paints & coatings ABS; SAN	Alkyd paints & coatings	Carbon black	Catalysts	Crop protection chemicals	Dyes	Epoxy paints & coatings	Ester solvent	EPS	Fertilizers	Glycolic acid	HDPE	Ketone solvent	LPDE & LLDPE	Lubricants	Other plastics	Other solvents	Other thermoplastics & Other paints & coatings	Pigments	PA 6 & 66	PC	Polyesters paints & coatings	PEI	PMMA	PP	PS	PTFE	PU	PVC	Silicone	Specialty silica	SBR	Surfactants	Titanium dioxide	Wax	
Agricultural appliances											0.7	0.8		0.8		0.8							0.8	0.8	0.8			0.8								
Agricultural consumables					2.1					0.2																							1.7			
Automotive	0.6	0.2	-0.3	0.1	< 0.1		1.1				-0.1	-0.1		-0.1		-0.1				0.1	0.6	0.4		0.2	0.1	-0.1	0.9	0.9	-0.1	0.4		-1.4				
Building & construction	7.5	7.1	6.6				7.8	7.2			6.9	7.0		7.0		7.0				7.0	7.0	8.2	7.0		8.4	7.6	6.5		8.3	7.3	7.6		7.4			
Consumer products											5.6																			1.3	1.6		5.1	1.2	1.7	
Electrical & electronics		1.2									1.2	1.0		1.0		1.0				1.1	1.9		1.0	2.3	1.4	0.1	1.7	1.5	0.8	1.7						
Household, leisure & sport	1.1	2.2	0.3				2.8	2.8	3.3		3.4	3.4		2.4		2.4				2.5	3.4	2.1	2.4	2.4	2.9	1.8		2.9	1.8	1.5		1.6	2.1		3.1	
Others	4.3	1.2	1.9	1.6		2.3	5.2	2.0			2.5	1.1	0.9	1.1		1.0	1.0	1.0	5.4	0.7	1.0	1.0	3.1	1.9	2.5	1.6	0.8	1.6	2.1	1.5	0.9	2.5	-2.8	1.7	0.6	1.1
Packaging		-1.0		1.1					-0.9			-0.2	-0.2		-0.4		-0.4			-0.4	0.8		< 0.1		0.4	3.5		0.4	-1.2						0.7	
Process chemicals					3.9			1.2			2.5	2.5		0.8		0.9			3.5								1.8				3.5		11.8	5.0	3.1	
Technical applications	2.0		1.2	1.9	2.5		2.3															1.6								1.2						

Key observations

- Some downstream demand for fossil raw material volumes will be replaced by alternative volumes, like bio-based, recycled or synthetic
- For example, the demand for recycled plastics is increasing as the recyclate is achieving a better environmental record and improving in quality
- Also, alternative raw materials are partially substituting fossil raw material volumes in everyday single-use items such as cups, cans, bottles and cutlery



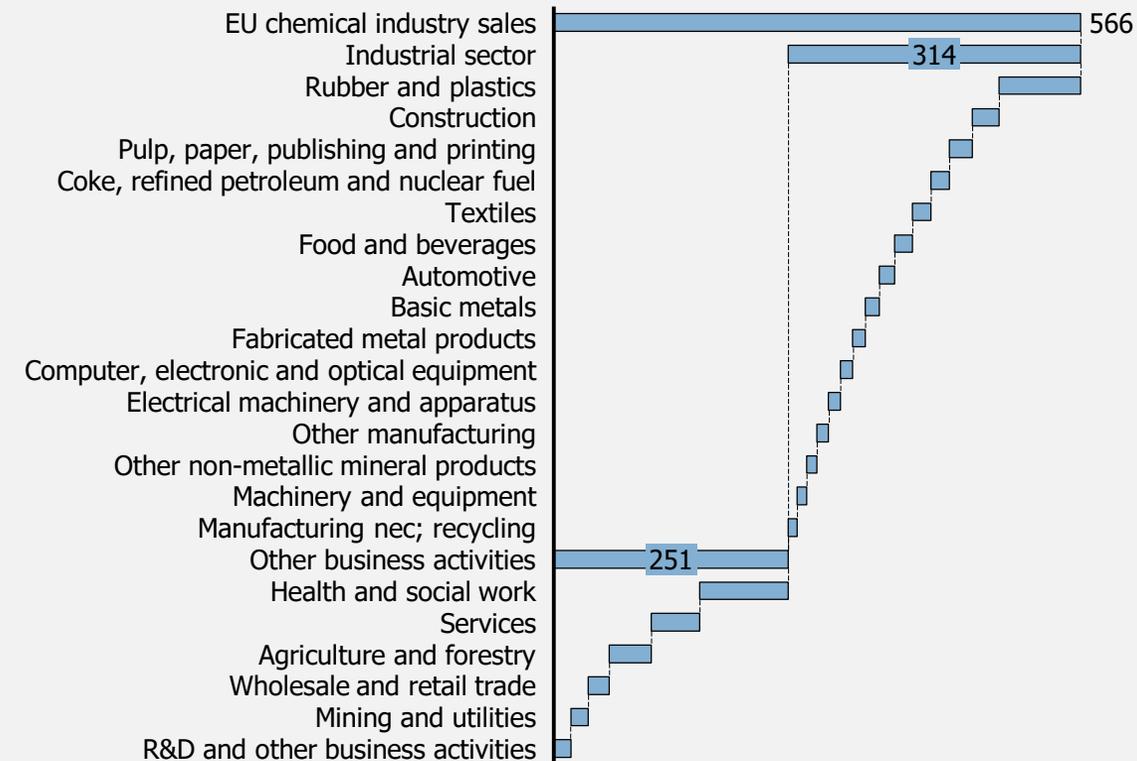
Note: (1) Sum of base growth and circular economy incremental growth
 Source: Accenture research for Winning in a Circular Economy: Practical steps for the chemical industry report, 2020

Chemical companies are well equipped to develop materials and methods that enable and speed the circular transition

Chemical industry as the enabler for sustainability and circularity

Downstream chemical industry customers by sales¹

EUR million, 2018



Source: (1) Cefic Facts and Figures 2020

Observations

- As a supplier of products to a variety of other industries, the chemical industry plays a key role in accelerating the broader transition to sustainable and circular economy
- With increasing pressure from consumers, downstream industries want to find ways to provide more sustainable products and services to their customers, and look for chemical industry for solutions
- Chemical companies are well equipped to develop materials and methods that enable and speed the adoption of sustainable and circular business models, allowing them to be powerful partners to manufacturers, suppliers and retailers that help with fast responses as consumer preferences change
- As technical experts, chemical companies can partner with downstream companies to advise on ingredients and provide information on green and circular chemical alternatives
- At the same time, chemical companies can strengthen their own competitiveness, reduce costs and accelerate growth by adopting sustainable and circular approaches to production and consumption

01

Why sustainability and circularity?

Activation questions

1. How are the key trends affecting your company?
 - What changes are occurring in end consumer behavior?
 - What kind of sustainability commitments are your customers making?
 - What kind of extra-financial information are your investors or potential investors demanding?
 - Which regulations have an impact on your operations?
 - Which new technologies are relevant for your business?
2. To what extent does your business strategy address all of the six trends and their implications? How could the strategy be updated to make it comprehensive?
3. How are the new trends affecting your customers? In which of your customer industries do you expect to see most demand for sustainable and circular solutions? What opportunities does this increase bring to your company?

Business model canvas

Based on the information learnt in this chapter, fill in the following parts of the business model canvas:

- **Vision** – describe your long-term vision and desired position
- **Market** - reflect on customers, the required customer relationships, the channels you could use to reach them and what competition you will see on the market.

Vision statement			
Market	Offering	Operating model	
Customers:	Products/Services:	Key partners:	
Customer relationships:	Value proposition:	Key capabilities:	
Customer Channels:	Outlook/Opport:	Key resources:	
Competitors:		Digital:	
Financial aspects			
Revenue streams:	Cost structure:	Rate (being /impacting):	Intangibles:
Enabling companies			

02

What opportunities exist?

Current state analysis and sustainable and circular opportunities for the chemical industry

Chapter summary

- Conventional models of production and consumption generate waste and inefficiencies across the chemical value chain, limiting growth and increasing exposure to material scarcity
- Five sustainable and circular business models address these waste streams and inefficiencies and turn them into business opportunities
 - Circular Inputs
 - Product as a Service
 - Product Use Extension
 - Sharing Platforms
 - Resource Recovery
- Taking the role of circularity enablers for downstream businesses, e.g. through secondary raw material provision and/or certification, can create significant additional value for chemical companies
- Many inspiring examples on applying sustainable and circular business models exist from leading Finnish and global chemical companies, and serve as concrete evidence of the value potential

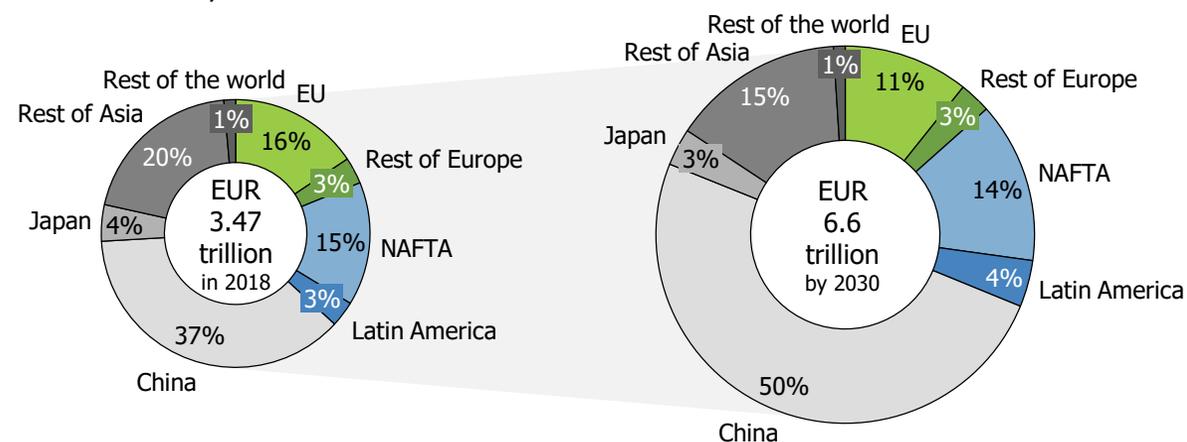
The chemical industry is one of the most important industrial sectors globally and in Finland

Chemical industry overview

Global chemical industry

- With global sales of USD 5.68 trillion in 2017¹, the chemical industry is the second largest manufacturing industry in the world²
- Asia is the largest chemical producing and consuming region, with China only representing 37% of global sales
 - The European Union is the second largest region with a 16% share³
- The global chemical industry sales are expected to almost double from 2017 to 2030³, and the global production value to reach USD 22 trillion in 2060⁴
 - Future industry growth is expected to be mainly driven by emerging markets where the growth of production volume and production capacity is rapidly increasing

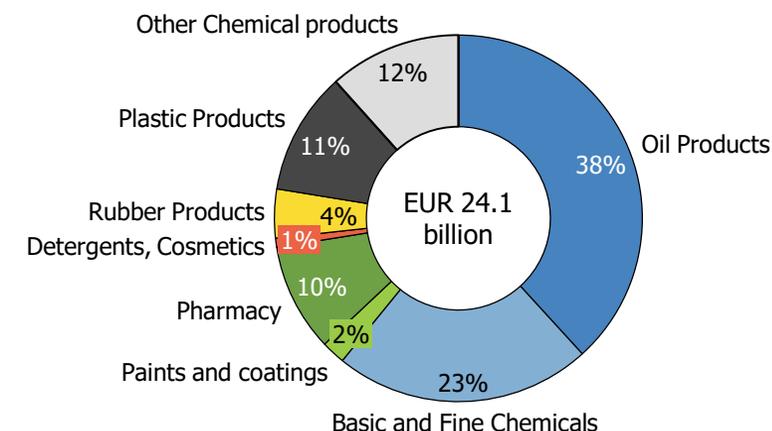
Projected growth in global chemical sales, 2017-2030³



Chemical industry in Finland

- The chemical industry creates almost EUR 10 billion value added in Finland, accounting for 17% of the total value add of the Finnish manufacturing sector (as of 2017)⁵
 - The direct value add is approximately EUR 5 billion
 - EUR 1 billion value add in the chemical industry creates a EUR 0.9 billion value add for other sectors
- The chemical industry accounts for 18% of the Total Industry output and 20% (EUR 12.3 billion) of total exports in Finland⁶
- The chemical industry provides 34 000 direct jobs in Finland and Finnish chemical industry subsidiaries abroad nearly direct 30 000 jobs⁶
- The annual sales of the Finnish chemical industry are about EUR 24 billion⁶

Finnish Chemical industry sales by product group, 2018⁶

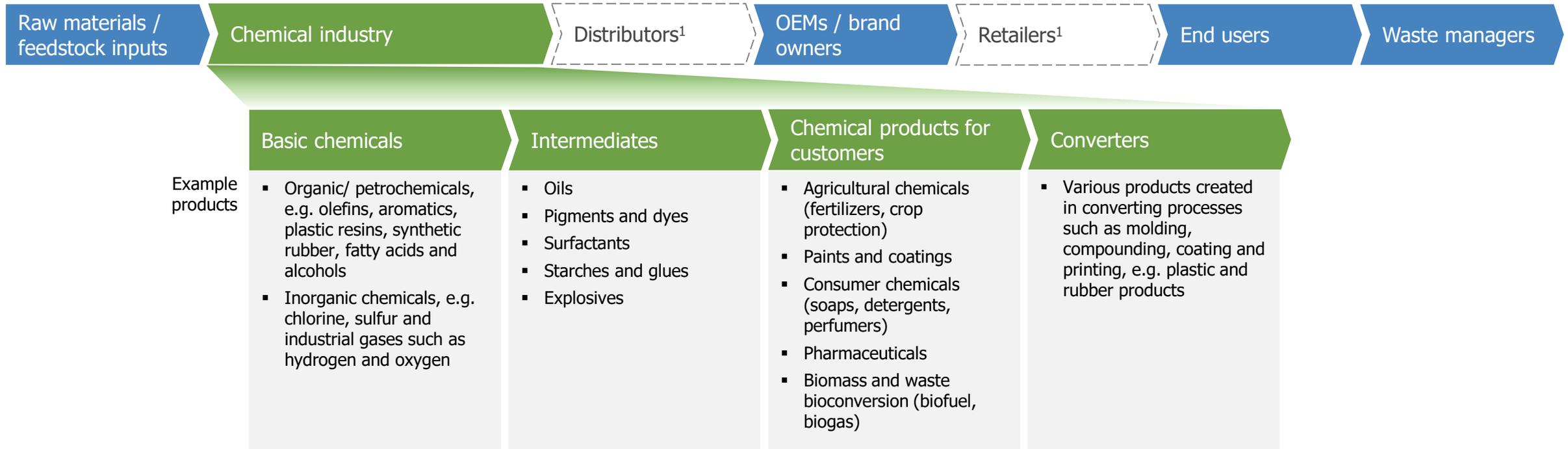


Note: (1) Includes pharmaceutical sales of USD 2.21 trillion

Source: (2) Cefic, American Chemistry Council and International Labor Organization, 2018; (3) Cefic, 2018, excludes pharmaceutical sales of 2.21 trillion; (4) OECD, 2019; (5) KPMG (6) Statistics Finland

The chemical industry produces the building blocks for many products in various downstream industries

Chemical industry value chain



Note: (1) Distributors and/or retailers are part of some chemical value chains, but not all, depending on the product.

Finnish chemical companies can be divided into five clusters, which are vertically integrated

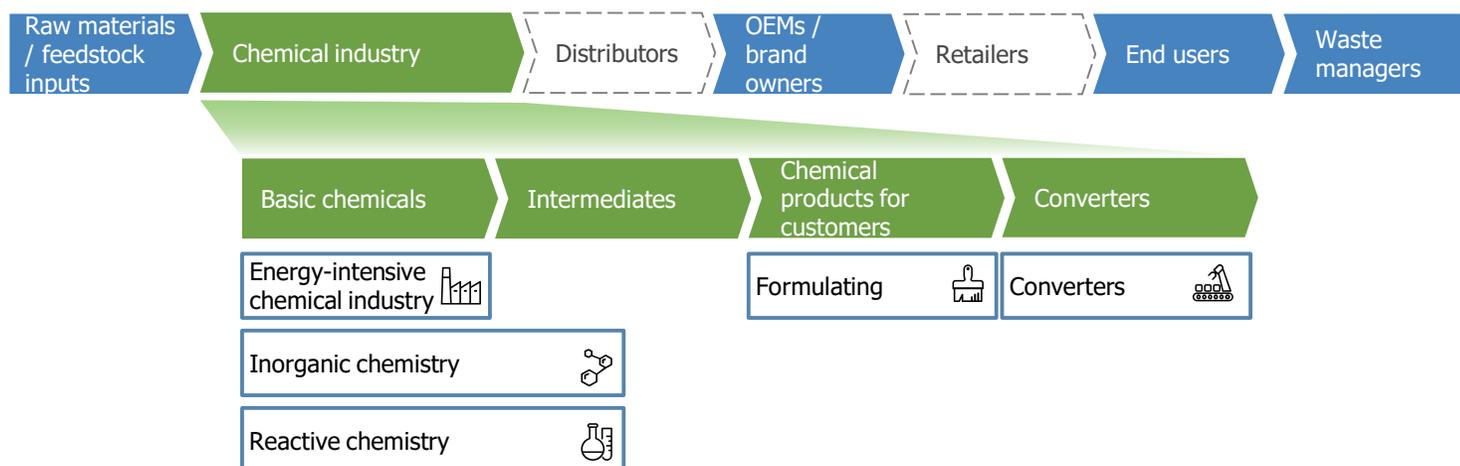
Chemical company clusters

ILLUSTRATIVE

Cluster definitions

<p>Energy-intensive chemical industry</p> 	<p>Capital intensive large scale infrastructures performing complex processes, incl. e.g. distillation, reforming and polymerization.</p>
<p>Inorganic chemistry</p> 	<p>Cluster of plants specialized in inorganic chemical products, such as minerals, metals and salts.</p>
<p>Reactive chemistry</p> 	<p>Middle scale infrastructure performing complex processes, products including specialty chemicals and advanced materials.</p>
<p>Formulating</p> 	<p>Cluster of plants formulating products by mixing a set of raw materials, including e.g. paints and coatings, pharmaceuticals and detergents.</p>
<p>Converters</p> 	<p>Cluster of plants that manufacture consumer products through molding, compounding, coating and printing, e.g. plastic and rubber products</p>

Chemical industry value chain



Note: The classification is inherently flawed to a certain degree, as even a single company may have operations that could be placed in several clusters. Furthermore, the main purpose of the classification is to facilitate generalization.
 Source: Pöyry, *Roadmap to reach carbon neutral chemistry in Finland 2045: Executive summary of intermediate report* (2020)

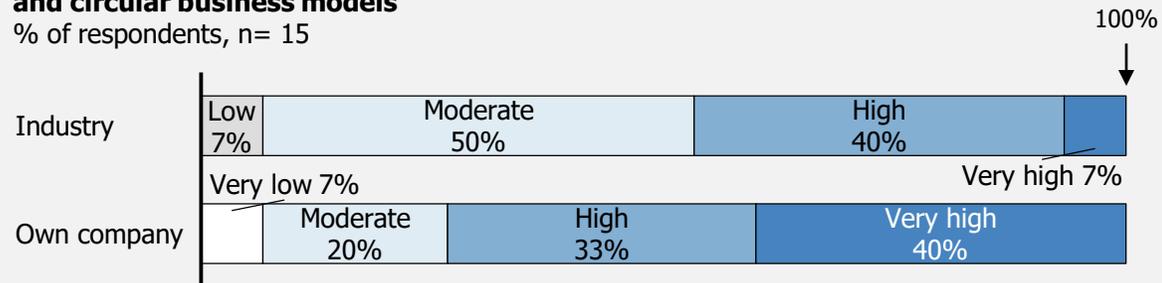
Adoption level of sustainable and circular business models within the Finnish chemical industry appears to be fairly high

Circular maturity assessment

INDICATIVE

Maturity of Finnish chemical industry in adopting sustainable and circular business models

% of respondents, n= 15



"Some companies (big and small) have adopted modern and innovative solutions related to sustainability. On the other hand, there are some companies that are on the other end of the scale."

"Awareness of environmental issues and circular economy opportunities has clearly increased and many Finnish companies have taken it to their agenda."

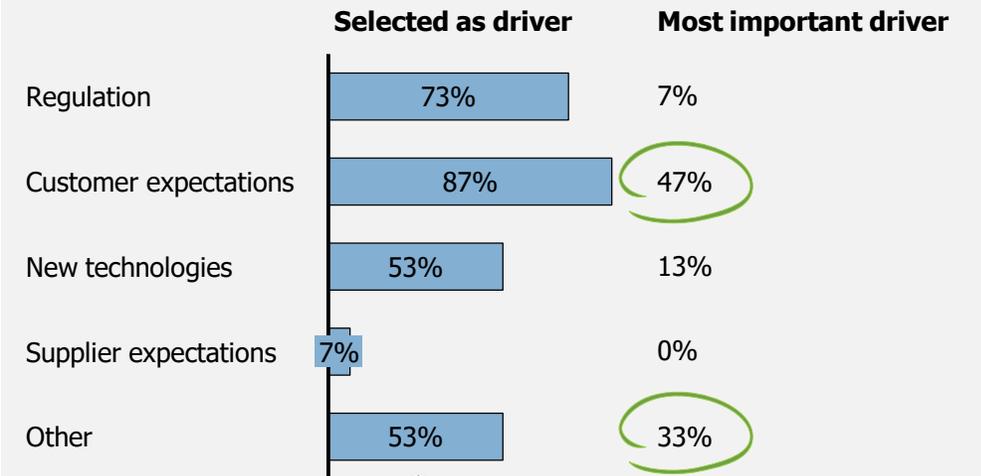
"Some companies are already far with their plans and actions, others are only getting started, yet everyone has a clear desire to make their operations more sustainable."

"There is a large variation between the companies in the chemical sector; some companies are really forerunners whereas others beginners."

"Sustainability and circularity have been well visible in larger companies for some time, but they are still emerging topics in smaller companies. Larger companies usually also dominate discussions in this area. Many companies nowadays see that sustainability and circularity are important topics and talk about them, yet whether or not these topics are placed at the core of the business can be different in reality."

Main drivers for adopting sustainable and circular business models

% of respondents, n= 15



"We want to be a forerunner in our industry" (x3)
 "Cost savings" (x2)
 "New market and customer opportunities"
 "Our strategy and mission"

Industry thresholds

Very high: Many companies (>50%) have sustainability and circularity at the core of their operations
 Moderate: Some companies (20-40%) have sustainability and circularity at the core of their operations
 Very low: Few companies (<5%) have sustainability and circularity at the core of their operations

Company thresholds

Very high: Sustainability and circularity are at the core of operations, incl. e.g. product design, raw material sourcing and manufacturing, and have been recognized by company leadership as strategically important drivers for the company's future
 Moderate: Sustainability and circularity recognized as important topics, and some related initiatives completed/ongoing
 Very low: No sustainability and circularity initiatives planned/ongoing

Note: The survey was conducted for a limited group of 15 Finnish chemical companies, and therefore the results can only be used as an indication of the current state of the industry
 Source: Survey conducted to select companies within the Finnish Chemical industry in April 2020, n=15

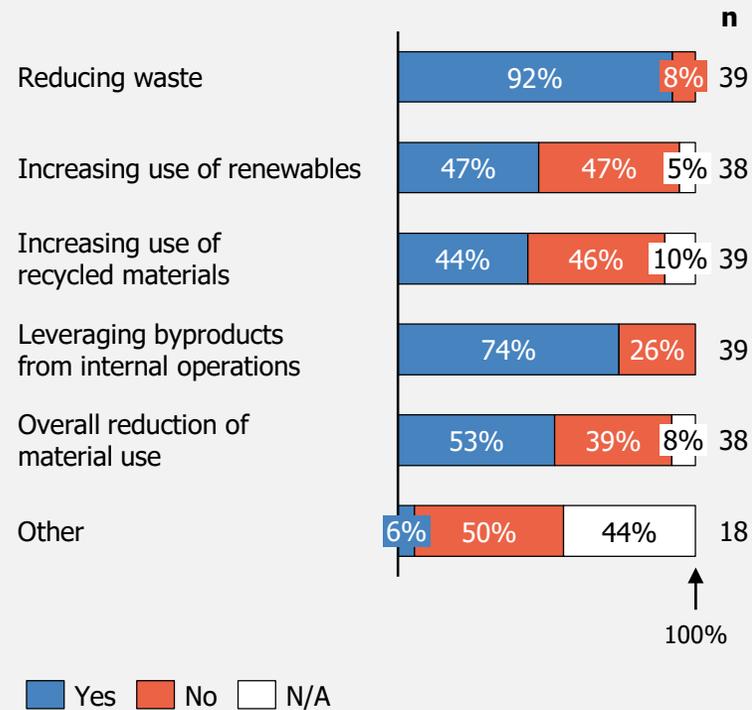
Finnish chemical companies appear to have targets to increase the use of sustainable materials, and have assessed their potential

Material efficiency analysis

INDICATIVE

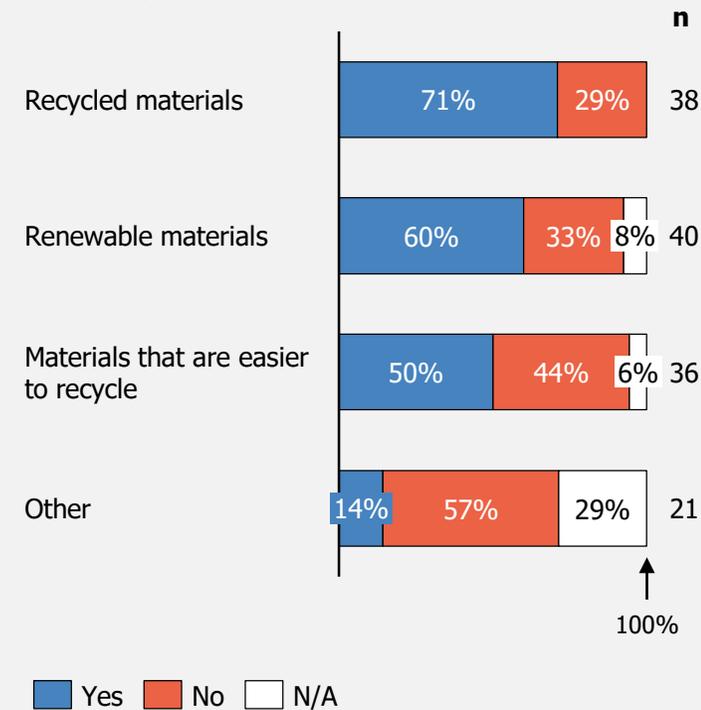
Existing initiatives or targets regarding material flows

% of respondents, n=42



Consideration of replacing existing materials with more sustainable ones

% of companies, n=42



Observations

- The majority of survey participants have set some targets concerning waste reduction and increased use of more sustainable material alternatives in their products
- Many survey respondents have also considered replacing existing materials with recycled or renewable ones, yet only ~25% of them have set percentual targets for material efficiency
- The majority of survey respondents report that origin information is available on over 80% of their materials
- In terms of packaging, most survey respondents report having put attention to recyclability and lightness of packaging materials, and some also to labeling (incl. recycling labels)
- Interestingly, most survey participants report that they have not received customer inquiries regarding packaging reuse, recyclability, weight, material composition or protective capability

Source: Material efficiency survey to member companies of Chemical Industry Federation of Finland (2019), n=42

Chemical companies participating in the voluntary Responsible Care sustainability programme demonstrate good progress

Responsible Care progress facts and figures



- Responsible Care is a global voluntary sustainability programme for chemical companies that has its origins in 1987 in Canada
 - In Finland the work has been running since 1992 and is coordinated by the Chemical Industry Federation of Finland (Kemianteollisuus ry)
 - 98 companies are committed to the programme representing some 80% of all production and 60% of employees in the chemical industry in Finland
- The central themes of the Responsible Care programme include
 - Sustainable use of natural resources
 - Sustainability and safety of production and products
 - Well-being of the work community
 - Open interaction and co-operation
- Achievements in Finland between 1992-2019¹:

-51%

water consumption

-24%

energy consumption

-90%

injuries

-31%

GHG emissions

2019 results (2018)

- 39% (32%) of Responsible Care companies use also renewable virgin raw material
- 51% (49%) of Responsible Care companies use recycled materials or side streams
- 13% (14%) of the used material volume is recycled or renewable

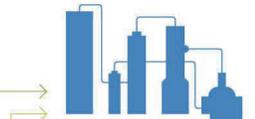
Total material consumption

Virgin raw materials
933 kg

External recycled materials
41 kg

Side streams from another company
42 kg

Water consumption
1 158 kg



Total consumption of circular raw materials

Side streams from internal processes

Products and waste

Products
1 000 kg

Utilization as material elsewhere
6 kg

Energy recovery
4 kg

Waste for disposal
1 kg

Waste water
1 163 kg²

2019 results (2018)

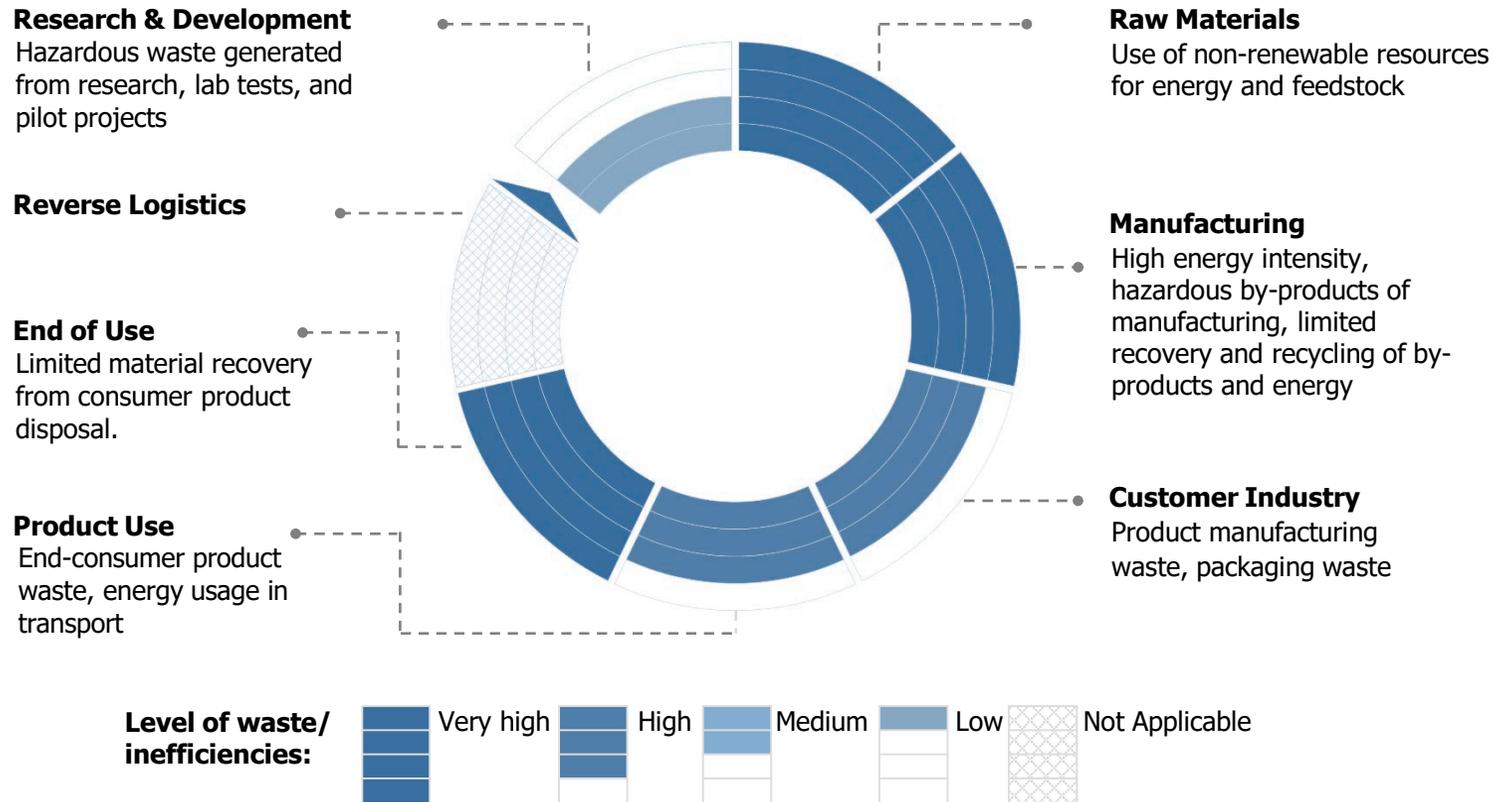
- 78% (77%) of the companies report waste to be utilized as material elsewhere
- Less than 2% of the used materials end up in energy recovery, and less than 1% as waste for disposal

Note: (1) Development since the beginning of reporting described as per total production or per million-hours-worked; (2) Calculated amount of water; Reported amounts of waste water might include also runoff waters.
Source: Chemical Industry Federation of Finland (Kemianteollisuus ry); Responsible Care indicator data; www.responsiblecare.fi

Conventional business models generate waste across the value chain, limiting growth and increasing exposure to material scarcity

Typical sources of waste and inefficiencies in chemical value chains globally

Waste analysis diagram



Observations

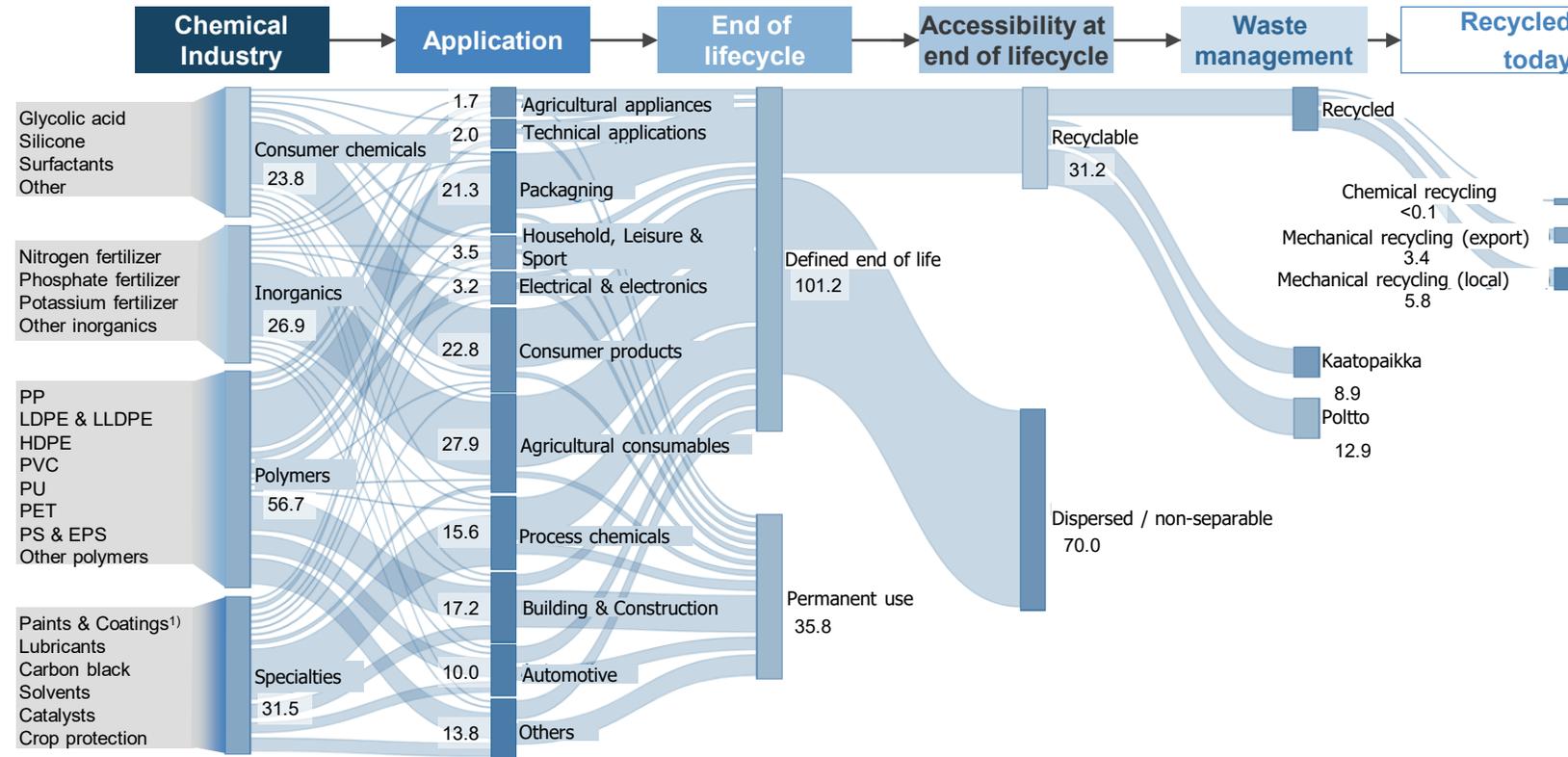
- The chemical industry produces the building blocks for many consumer goods and thus holds immense potential for circularity through innovation, advances in biotechnologies, and digital interventions across the value chain
- Globally, chemical companies must address three major waste streams
 - Use of non-renewable resources as feedstock and sources of energy
 - High energy intensity and hazardous by-products in manufacturing
 - Waste generated from end-consumer products

Source: Accenture research

26

The majority of consumed chemical products reaching their EoL point are not accessible with current methods

Mass balance of consumed chemicals to end-of-life materials in EU28 in 2018 (in million tons)



Observations

- Exploration of end-of-life materials as alternative feedstock sources will be crucial in enabling sustainability and circular economy
- However, currently only a small fraction of chemical product based materials are recyclable, and an even smaller fraction are actually being recycled
- The main reason for this is that the materials are inseparable from the products they are contained in
- As a result, opportunities for tapping into these material streams are significant for chemical companies e.g. through advanced material sorting technologies and circular design (improved separability)

Sustainable and circular business models address these inefficiencies and waste streams and turn them into opportunities

Five sustainable and circular business models

Circular Inputs

Using renewable energy, bio-based and man-made materials, that are recycled or highly recyclable, to enable partial or total elimination of waste.

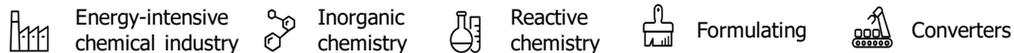


Resource Recovery

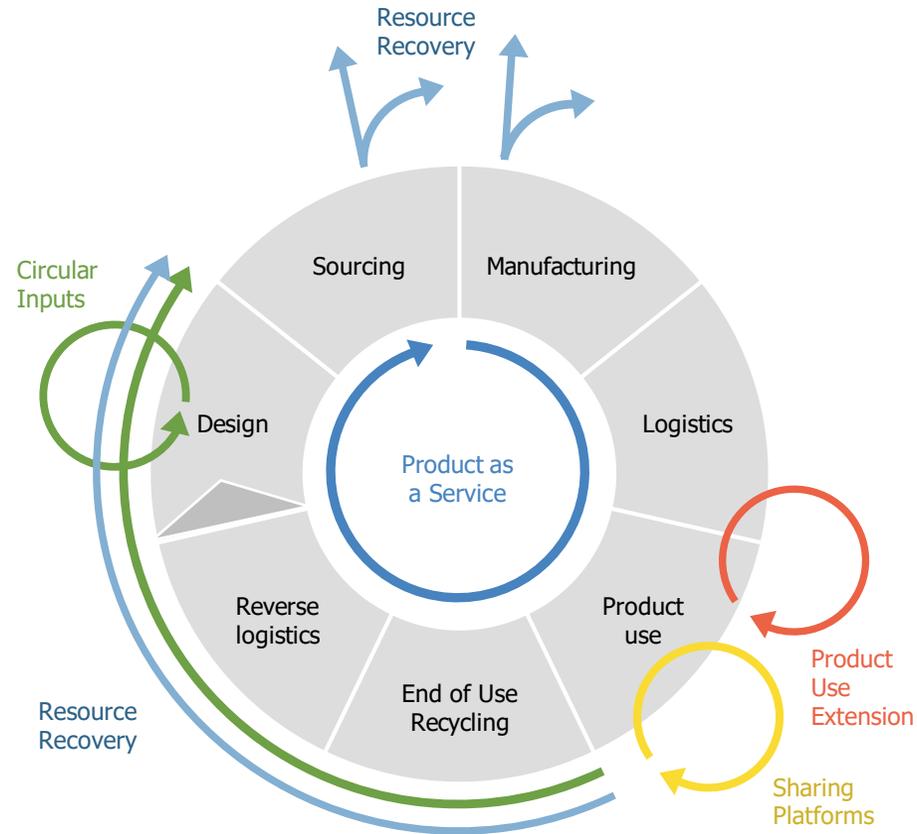
Using the embedded materials or energy from disposed products, byproducts or processes and recovering through collection, aggregation, and processing.



Business model relevance¹



Note: (1) All business models are relevant to all chemical companies at least indirectly through downstream enablement, yet business models concerned with product use, i.e. Product Use Extension and Sharing Platforms are most relevant to Converters, who create concrete consumer products. Source: Accenture research



Product as a Service

Retaining ownership of products and selling benefits like function and quality through a service model, e.g. chemical leasing.



Product Use Extension

Product's use extended through design considerations, repairs, reconditioning, upgrades, and resale for second use



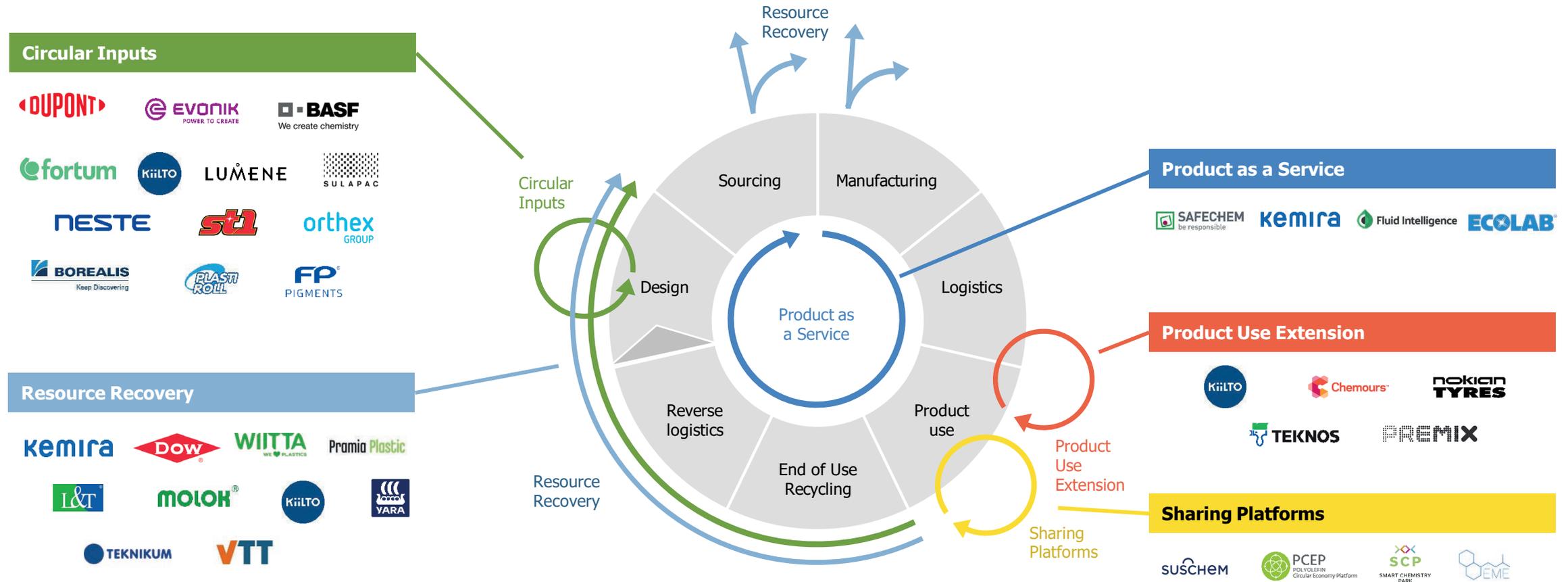
Sharing Platforms

Optimizing utilization rates of products and assets through shared ownership, access, and usage, e.g. online marketplaces for trading excess inventory



Leading chemical companies have already embraced the opportunity in Finland and abroad

Examples of sustainable and circular business models adopted by chemical industry players

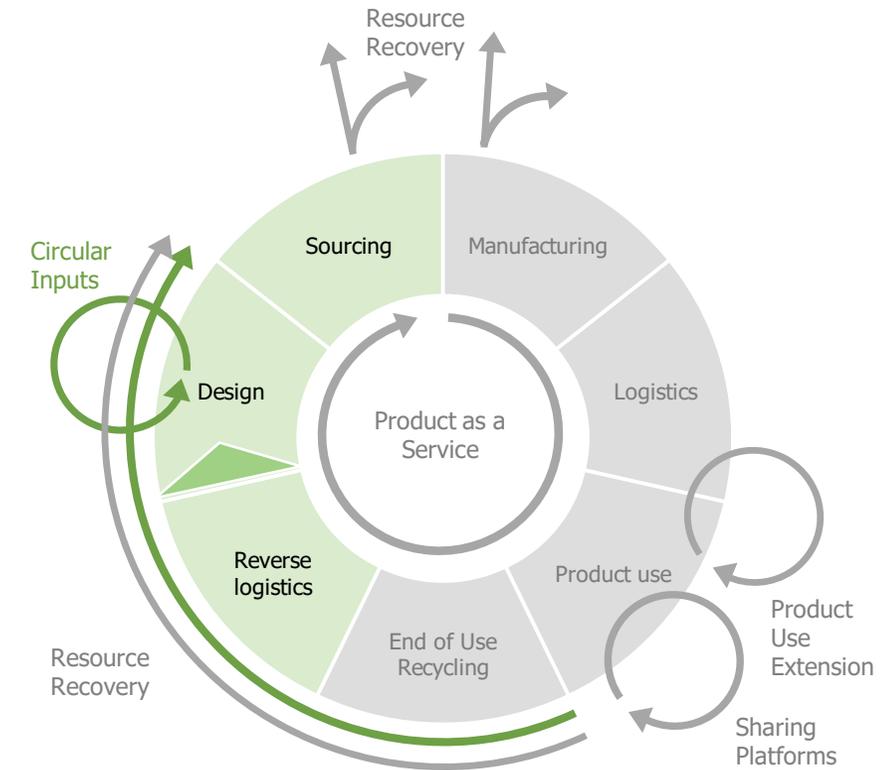


Note: Detailed description of each company example are presented on the following pages.
 Source: Company websites; CIFF Circular Economy and Bioeconomy case studies; Accenture analysis

Many chemical companies are using bio-based or recycled raw materials in their products, and some are even developing them

Case examples – Circular Inputs (1/2)

Company	Description	Cluster
 Fortum	Fortum recycles consumer plastic waste into recycled plastic granulates, which is used to replace virgin materials in plastics production. The Riihimäki plastic refinery recycles ca. 12 000 tons of consumer and industrial plastic waste per year.	
 Neste	Neste is using oil and fat waste and residues to produce its renewable traffic fuels, and is planning to expand the NEXBTL technology to other chemical products such as plastic raw materials.	
 St1	St1 produces bioproducts from waste and residues from food industry, households and saw mills.	
 BASF <small>We create chemistry</small>	BASF developed a biomass balance approach to reduce the use of non-renewable resources. In the approach, renewable resources like bio-naphta ad biomethane derived from agricultural by-products are used together with fossil resources already at the very beginning of chemical production, and then allocated to specific products using a certified method.	
 Evonik <small>POWER TO CREATE</small>	Evonik and Siemens joint research project Rheticus II aims to develop an efficient and powerful test plant that will use carbon dioxide (CO ₂) and water as well as electricity from renewable sources and bacteria to produce specialty chemicals.	
 DuPont	DuPont is producing xylitol from pulp and paper industry side streams. The carbon footprint of the product is approximately 90% lower than that of xylitol produced using corn cobs as raw material.	
 Kiilto	Kiilto produces wallpaper adhesives from starch, and is also developing biodegradable glue from starch, which would e.g. enable fully compostable hygiene products and takeaway goods.	
 Lumene	Lumene uses side streams from cloudbberries used in the food industry as an ingredient in its skin care products.	



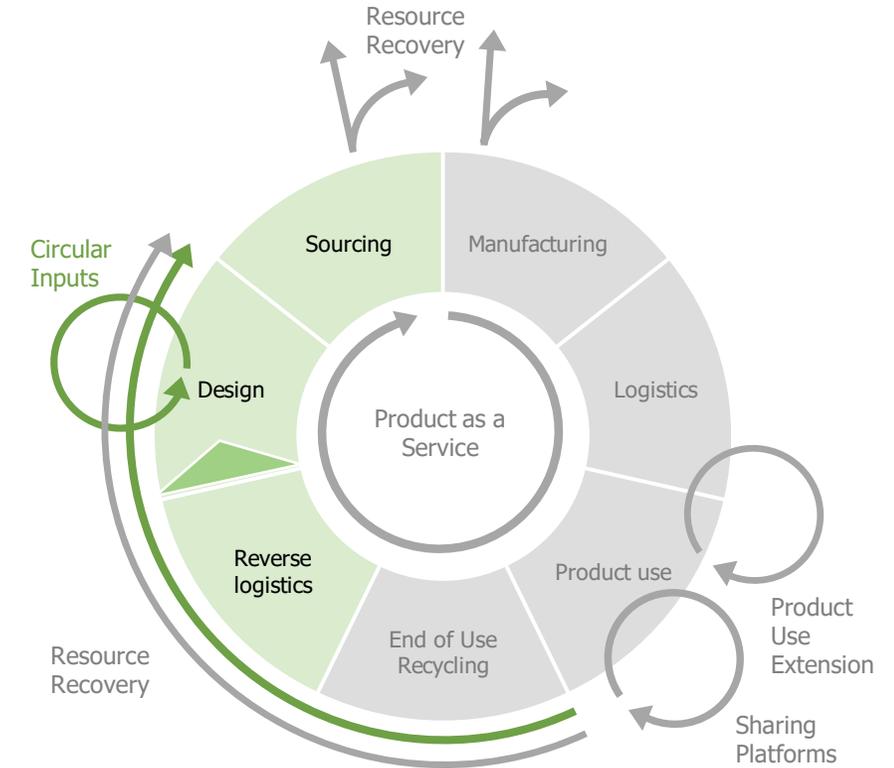
Source: Company websites; CIFF Circular Economy and Bioeconomy case studies; Accenture analysis

Clusters  Energy-intensive chemical industry  Inorganic chemistry  Reactive chemistry  Formulating  Converters 30

Many chemical companies are using bio-based or recycled raw materials in their products, and some are even developing them

Case examples – Circular Inputs (2/2)

Company	Description	Cluster
 Orthex GROUP	Orthex uses industrial and post-consumer plastic waste in its products. Currently, the share of recycled materials is 15-20% of total production, and e.g. all flower pots and balcony boxes are made of 100% recycled plastic.	
 SULAPAC	Sulapac uses industrial side streams and natural binders to produce a wood-based, fully biodegradable alternative for conventional plastics, that leaves no microplastics behind	
 FP PIGMENTS	FP-Pigments opacity pigment products can be used to improve the environmental profile of the end product by lowering its carbon footprint by over 75% compared to TiO ₂ on a ton for ton basis.	
 BOREALIS <small>Keep Discovering</small>	Borealis has developed multiple products that are 100% recyclable, such as Daploy HMS PP recyclable foam and PE laminate stand-up pouch to replace difficult-to-recycle service cups.	
 ELASTIROLL	Plastiroll develops and produces biodegradable packaging film for vegetables from starch, which enables longer shelf life for products and thus reduces food waste.	



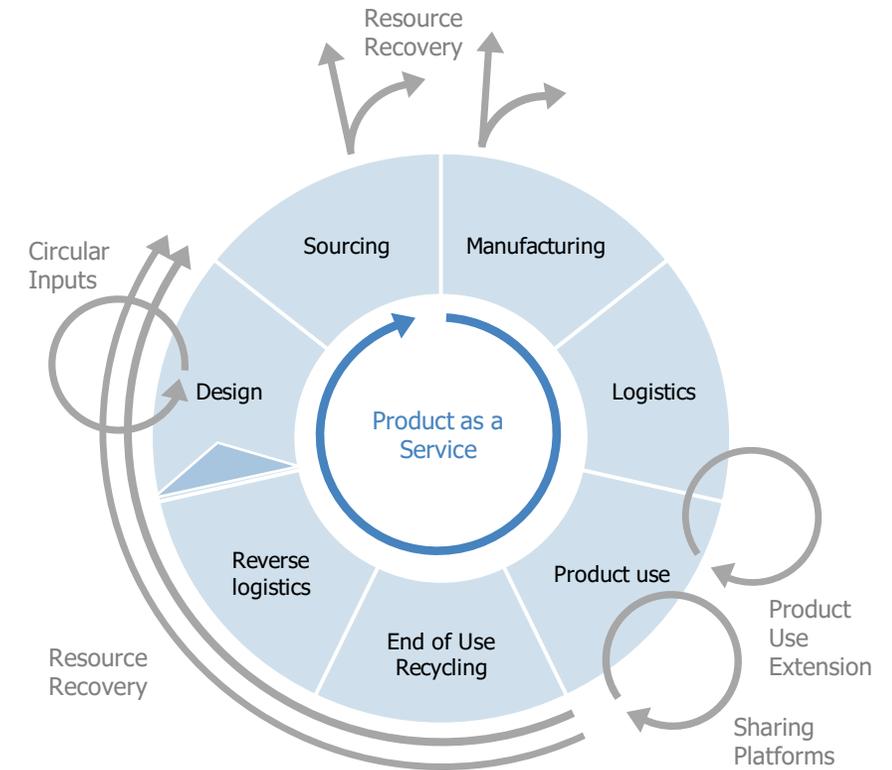
Source: Company websites; CIFF Circular Economy and Bioeconomy case studies; Accenture analysis

Clusters  Energy-intensive chemical industry  Inorganic chemistry  Reactive chemistry  Formulating  Converters 31

Product as a Service models align supplier and customer incentives, creating significant value for both parties

Case examples – Product as a Service

Company	Description	Cluster
 SAFECEM be responsible	SafeChem , a chemical leasing provider initially founded by Dow, helps customers decrease the usage of metal cleaning solvents by up to 93% and reduce energy use by up to 50% through its closed-loop, circular system.	Enabler
 kemira	Kemira offers product-as-a-service models through its Total Chemistry Management and KemConnect solutions, which combine smart technology with payments for performance, aligning incentives with value instead of volume.	
 Fluid Intelligence	Fluid Intelligence provides Oil as a Service. The company leases oils to industrial customers and continuously monitors the condition of the oil in critical machinery through remote monitoring, extending the lifecycle of the oil and thus reducing consumption. The customer pays a monthly fee based on the agreed service level.	Enabler
 ECOLAB	Ecolab provides chemical leasing services, where instead of buying e.g. lubricants for conveyor belts per kilogram, they pay for the working time of the conveyor belt, linking the supplier's profit directly to how little of the lubricant is used. For the customer, the solution allows reduced running costs and improved performance. Ecolab has provided this kind of service e.g. to Coca-Cola.	



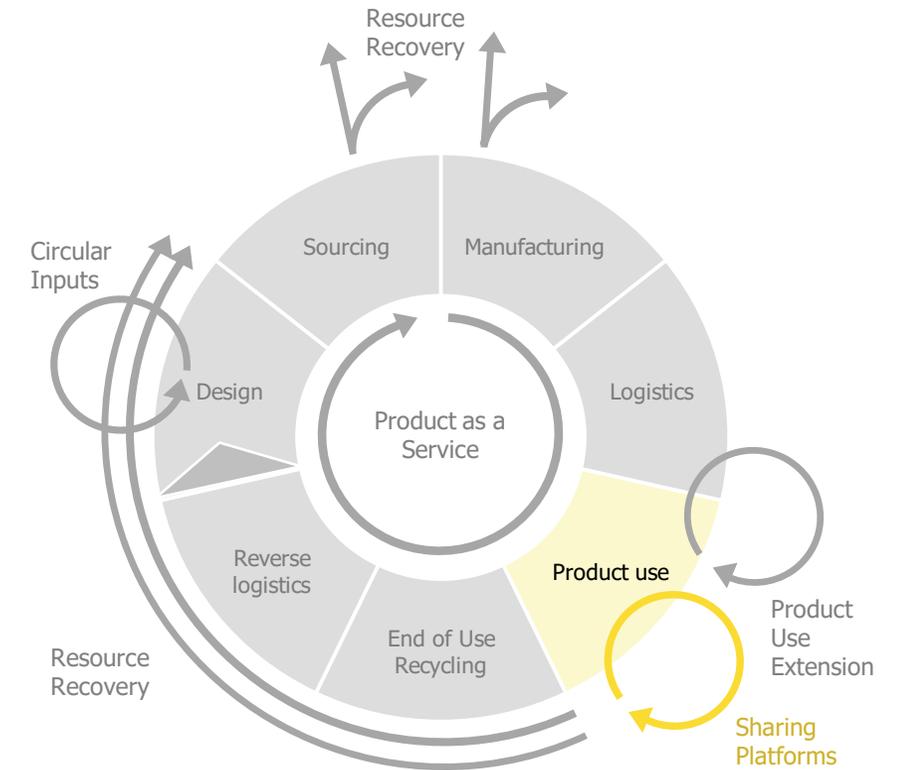
Source: Company websites; CIFF Circular Economy and Bioeconomy case studies; Accenture analysis

Clusters  Energy-intensive chemical industry  Inorganic chemistry  Reactive chemistry  Formulating  Converters 32

Sharing Platforms optimize product and asset utilization and are used by chemical companies e.g. to share production infrastructure

Case examples –Sharing Platforms

Company	Description	Cluster
 suschem	SusChem is the European technology platform for sustainable chemistry, with a vision to help Europe achieve a sustainable low-carbon economy and avert significant climate change. The platform includes enabling technologies across digital, process and advanced materials.	Enabler
 PCEP POLYOLEFIN Circular Economy Platform	Polyolefin Circular Economy Platform (PCEP) is a multi-stakeholder group that seeks to identify effective, science-based solutions for ensuring supply of high-quality recycled plastics.	Enabler
 SCP SMART CHEMISTRY PARK	Smart Chemistry Park (SCP) is an innovation platform and cluster for start-ups and SMEs delivering solutions to bio- and circular economy and cleantech. The 14 companies operating in SCP develop their technologies independently, yet in close symbiosis with each other, sharing the infrastructure, equipment and know-how.	Enabler
 EME	Excess Materials Exchange (EME) is a digital marketplace for excess raw materials, industrial by-products and waste streams. The platform provides for example resource passport, track & trace, valuation and matchmaking services.	Enabler



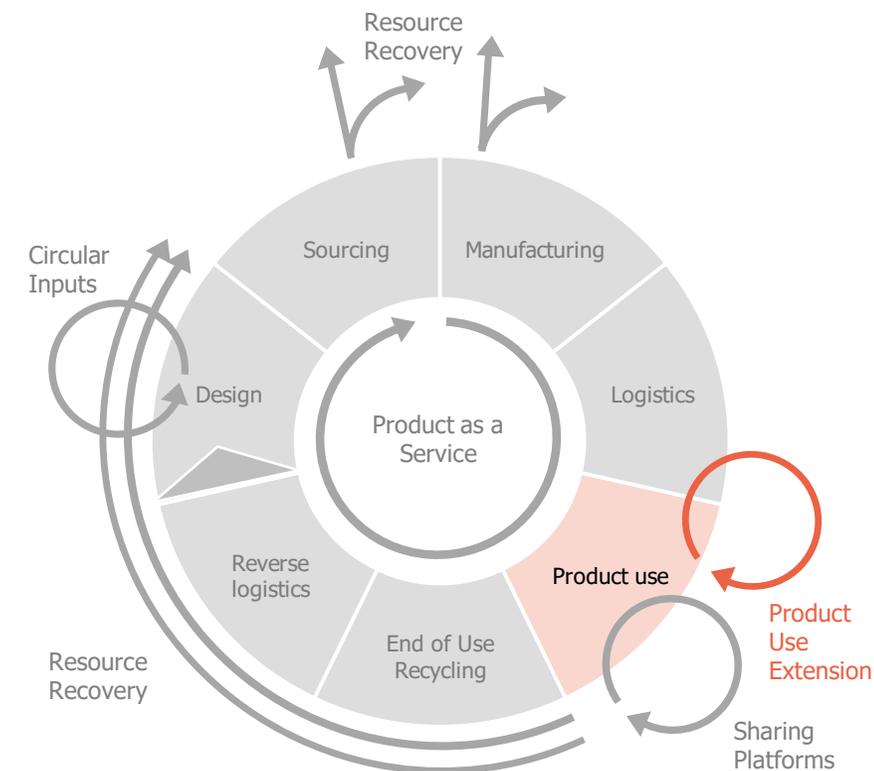
Source: Company websites; CIFF Circular Economy and Bioeconomy case studies; Accenture analysis

Clusters  Energy-intensive chemical industry  Inorganic chemistry  Reactive chemistry  Formulating  Converters 33

Chemicals can help extend the lifecycle of end-consumer products, and the chemicals themselves can also be made more long-lasting

Case examples – Product Use Extension

Company	Description	Cluster
 KiiLTO	KiiLTO Clean Serto products include bio-degradable tensides and bio-based enzymes, and are developed so that a smaller dose of detergent is required to ensure a good washing result, allowing the product to last longer.	
 Nokian TYRES	Nokian Tyres uses bio-based raw materials (e.g. Canola oil) in its rubber compounds to improve the safety and durability of its tyres.	
 Chemours	Chemours Teflon EcoElite™ —a repellent finish made from 60% renewably sourced, plant-based materials that is three times more durable than other non-fluorinated repellents— is used in Colmar skiwear, allowing it to meet the demands of its eco-conscious customer base with high-quality, longer-lasting products, which ultimately became one of its most successful collections.	
 TEKNOS	Teknos WOODOX BIOLEUM is a bio-based furniture wood oil, which extends the lifespan of garden furniture and protects them from weather conditions such as rain or sun. Over 80% of the wood oils raw materials are renewable, and as a result, the product has a higher volume solid than conventional wood oil, meaning that a smaller amount of the product is needed to treat a larger surface, making the product itself also last longer.	
 PREMIX	Premix PREXELENT™ is an antimicrobial technology that prevents the problems caused by unwanted microbes, such as mold and bacteria, improving e.g. the preservability of food, and thus enabling reduction of food waste. The technology is originally based on pine tree resin, but other active natural agents are also suitable for use. PREXELENT™ is compatible with existing production processes, making it a flexible solution to apply.	



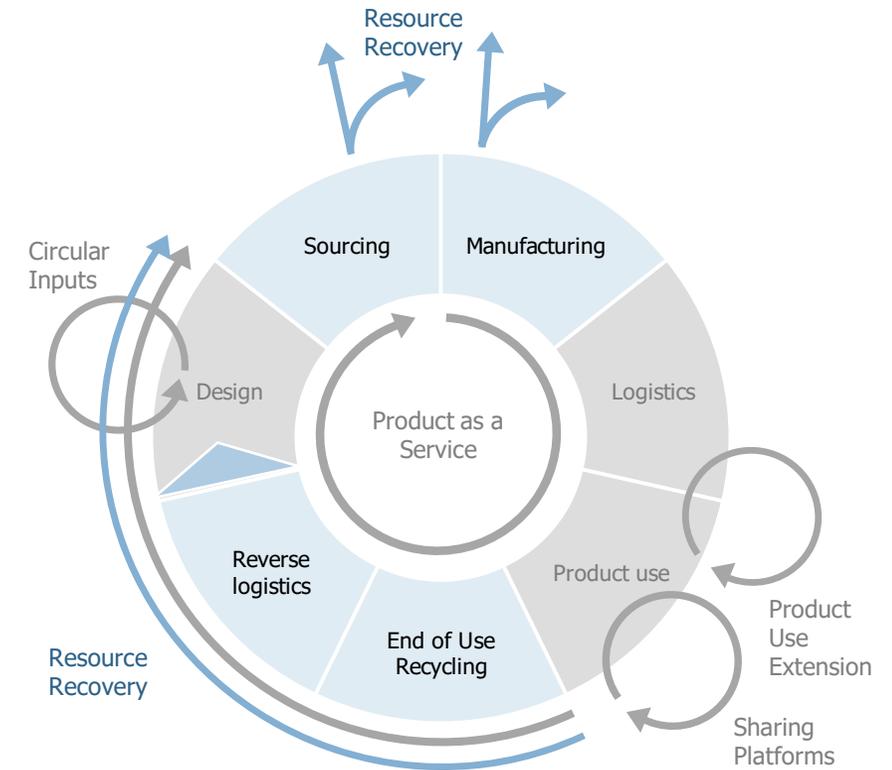
Source: Company websites; CIFF Circular Economy and Bioeconomy case studies; Accenture analysis

Clusters  Energy-intensive chemical industry  Inorganic chemistry  Reactive chemistry  Formulating  Converters 34

Resource recovery is another strong area for chemical companies, with multiple examples of reusing e.g. industrial by-products

Case examples – Resource Recovery (1/2)

Company	Description	Cluster
 Kemira	Kemira performs resource recovery in its operations, with 21% of its raw materials coming from recycled sources or by-products of other industries.	
 Dow	Dow has collaborated with the government and local asphalt plants in India to transform 100 tons of collected plastic waste into 40 kilometers of roads. Not only did this divert plastic from landfills, it gave the plastic a second life that will likely last decades.	
 Yara	Yara implements resource recovery in its production by reutilizing raw materials, side flows and waste heat. Yara also promotes circular economy by researching and developing recycled nutrient solutions.	
 Pramia Plastic	Pramia Plastic leverages plastic waste from used PET bottles to produce 100% recycled rPET, which is comparable to virgin PET material and can be used e.g. as food contact material.	
 Molok	Molok enables doubling of recycling rates by bringing sorting stations with 6-10 waste fractions closer to the consumer. The solution also enables reduction of emissions as transportation can be reduced.	
 Lassila & Tikanoja	Lassila & Tikanoja collects waste oils, oil contaminated water and different emulsions from the industry, harbors, workshops and farms, analyzes them at its recycling plant and directs suitable materials for regeneration or purification to partners. Processed oil and emulsions are then reused in the industry.	Enabler



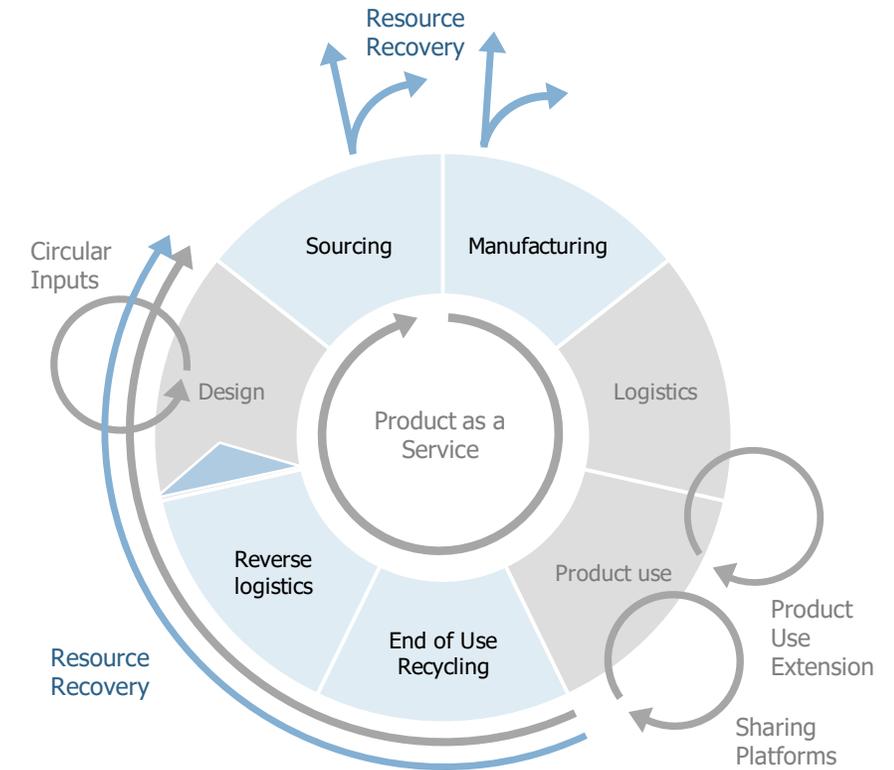
Source: Company websites; CIFF Circular Economy and Bioeconomy case studies; Accenture analysis

Clusters  Energy-intensive chemical industry  Inorganic chemistry  Reactive chemistry  Formulating  Converters 35

Resource recovery is another strong area for chemical companies, with multiple examples of reusing e.g. industrial by-products

Case examples – Resource Recovery (2/2)

Company	Description	Cluster
 TEKNIKUM	Teknikum uses a closed cooling water circuit in its Vammala production facility, which enables significant reduction of water usage. Heat from production is also recovered, allowing for lower energy consumption.	
 WIITTA	Wiitta operations are built around plastics recycling: ~20% of the company's throughput is recycled materials. The company makes continuous efforts to support its customers in increasing their recycling rates, helping e.g. with packaging recycling. For example, Wiitta has produced boxes used in food transport and moving from recycled plastics.	
 VTT	VTT BECCU project aims to perform a proof-of-concept for the integrated production of biopower & heat, transportation fuels and specialty chemicals based on utilization of CO ₂ from biomass operations and hydrogen from water electrolysis or industrial processes. In addition to VTT, the cooperative consists of Business Finland and 11 other stakeholders.	Enabler
 Kiilto	Kiilto factory in Lempäälä runs with solar power, and excess heat from operations is also recovered for reuse. The Lempäälä factory is the largest rooftop solar power plant in Finland.	



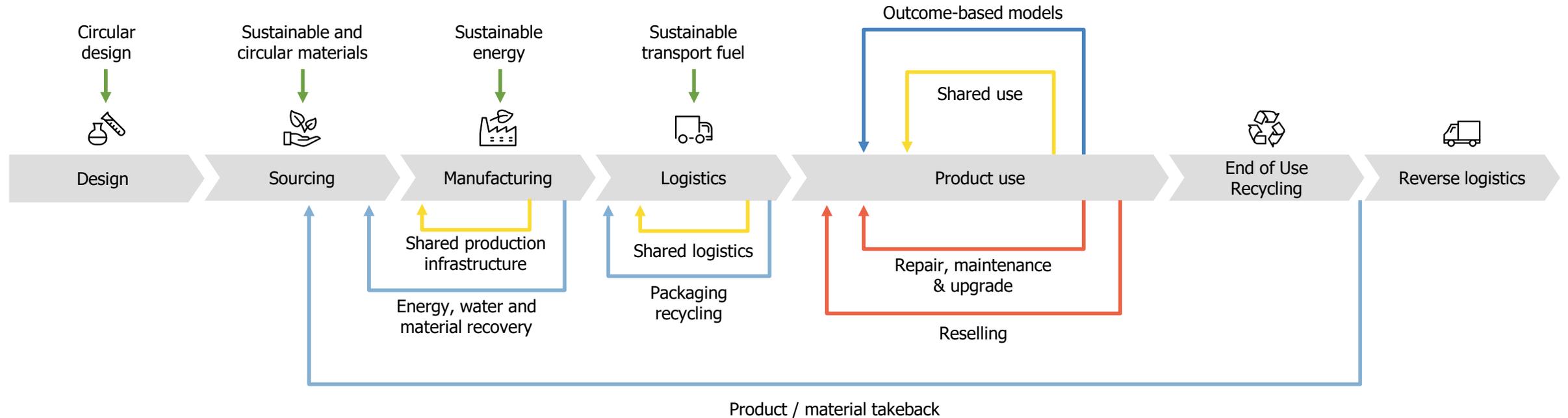
Source: Company websites; CIFF Circular Economy and Bioeconomy case studies; Accenture analysis

Clusters  Energy-intensive chemical industry  Inorganic chemistry  Reactive chemistry  Formulating  Converters 36

Each business model can be further broken down into more specific opportunities across the value chain

Sustainable and circular opportunities across the value chain

ILLUSTRATIVE



- Circular inputs
- Product as a Service
- Product Use Extension
- Sharing Platforms
- Resource Recovery

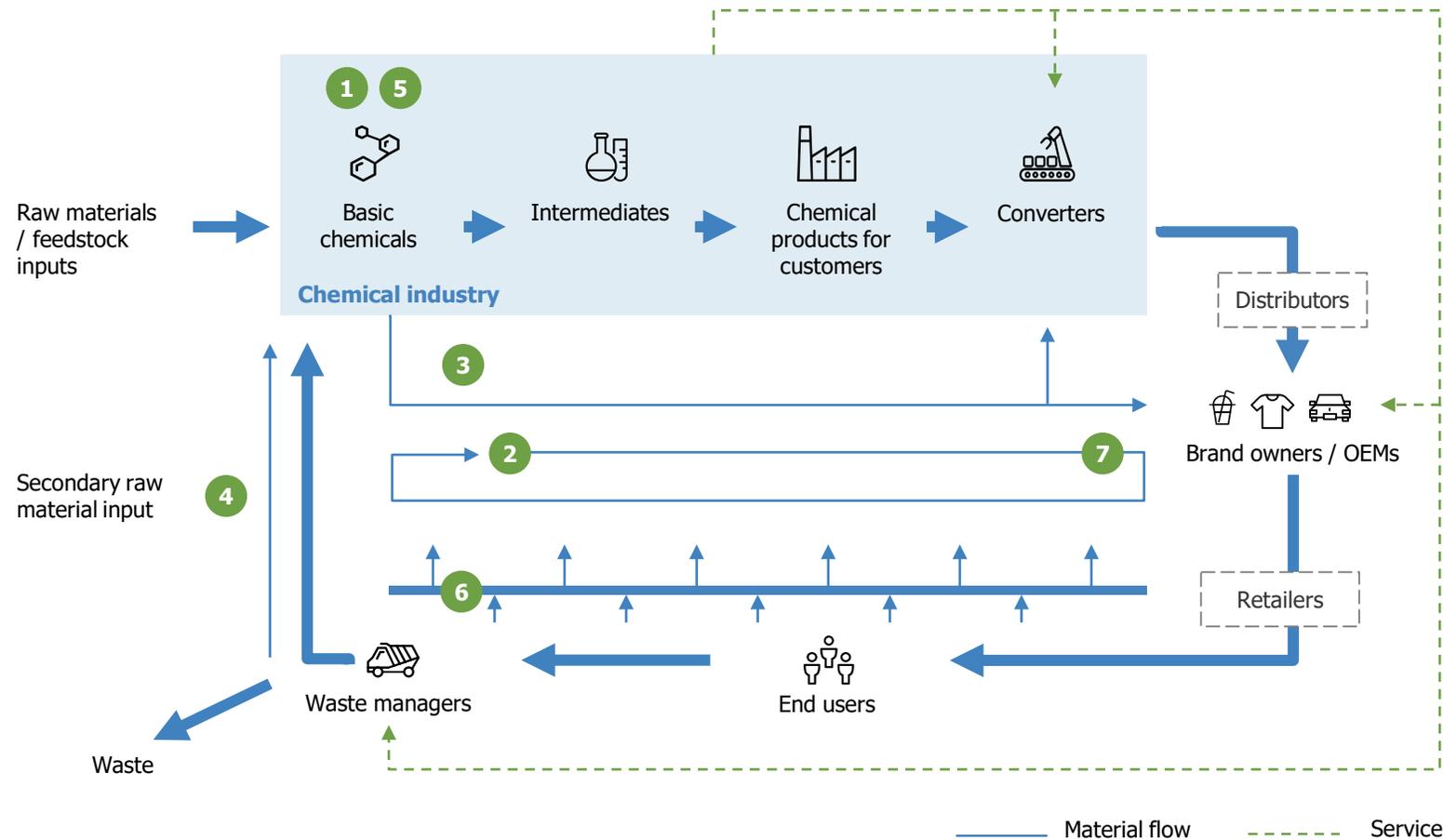
Source: Accenture

37

Chemical companies can act as enablers of circularity for downstream businesses besides reaching circularity within

Role of chemical companies as enablers of circularity

NON-EXHAUSTIVE



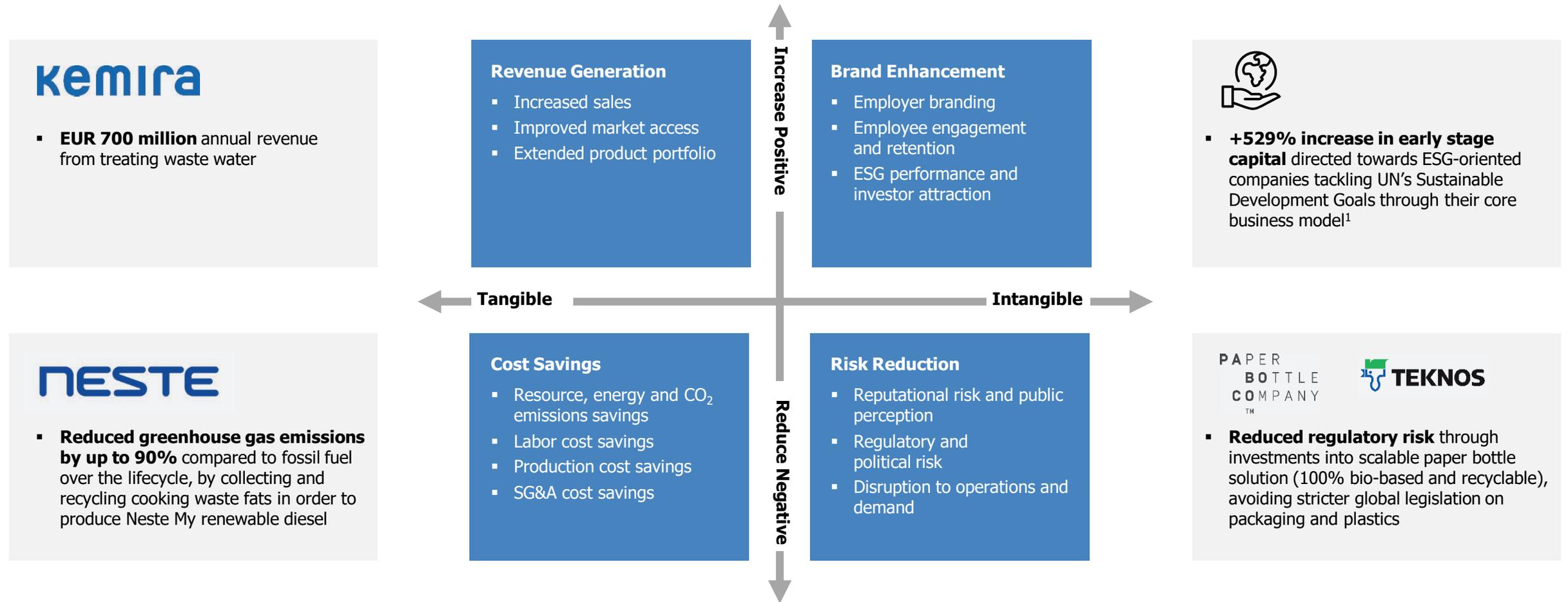
- 1 Sustainability lab as-a-service**
Offering sustainable lab services (e.g. testing), to customers against a volume-based fee.
- 2 Product steward**
Collaborating directly with downstream value chain partners, such as brand owners to develop sustainable/circular solutions.
- 3 Recyclate application specialist**
Leveraging application and technology expertise by providing application development services for companies interested in providing secondary raw materials to the market.
- 4 Secondary raw material provider**
Integrating capabilities such as waste collection, sorting, reverse assembly, and recycling asset operations to get access to high value material streams, that can be cycled back to the value chain.
- 5 Certifier of recycled materials and products**
Engaging in certifying the sustainable/circular provenance of secondary raw materials and products.
- 6 End-of-life stream supply/demand matching platform**
Acting as a platform operator securing stable waste stream feeds at agreed volumes and specifications by bundling market volumes, clearing demand and supply and optimizing transport routes.
- 7 Carbon/molecule manager**
Offering carbon management services (e.g. reporting & analysis tools and advice) to help downstream customers achieve their GHG reduction targets.

Source: Accenture research

38

By adopting sustainable and circular business models, companies can create value in four key dimensions

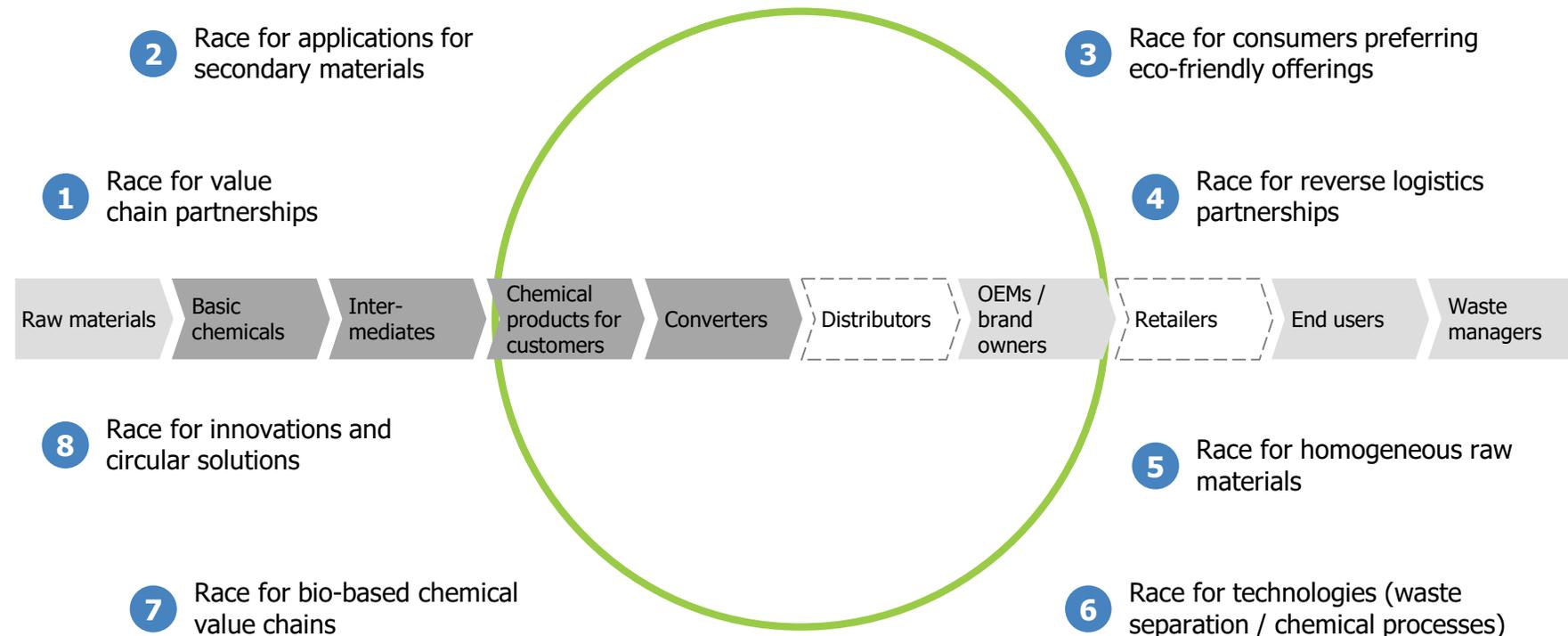
Sustainable value creation framework



Source: Company websites; (1) Atomico 2019 State of European Tech

Emerging sustainable and circular value chains provide significant opportunities, and the right time to start is now

Key "sweet spots" in future value chains



Observations

- Chemical companies need to embrace the disruptive change that is reshaping the industry, and tap into the opportunities emerging throughout the value chain
- Furthermore, new circular value chains are continuously emerging, and the race to occupy the "sweet spots" in these value chains of the future is already on

02

What opportunities exist?

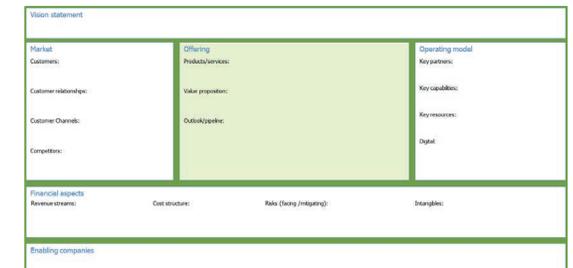
Activation questions

1. What are the key sources of waste/inefficiencies in your company's value chain?
 - Hazardous R&D
 - Unsustainable raw materials
 - Hazardous manufacturing by-products
 - Unsustainable energy sources / high energy consumption in manufacturing
 - Unrecovered materials from end-of-life products
 - Something else?
2. Which sustainable and circular business models would be the most relevant to address those waste streams and inefficiencies? How?
3. What kind of role could your company take in enabling circularity for downstream customers, if any?
4. What kind of benefits do you expect to get from these new business models? How large are they in quantitative terms?
 - Revenue generation
 - Cost savings
 - Brand enhancement
 - Risk mitigation

Business model canvas

Based on the information learnt in this chapter, fill in the following parts of the business model canvas:

- **Offering** - detail what the solution you want to offer could look like, what the concrete value proposition to your customers is and draft an outlook on how it could be developed further or what other solutions could be connected with it



03

How to start the transformation journey?

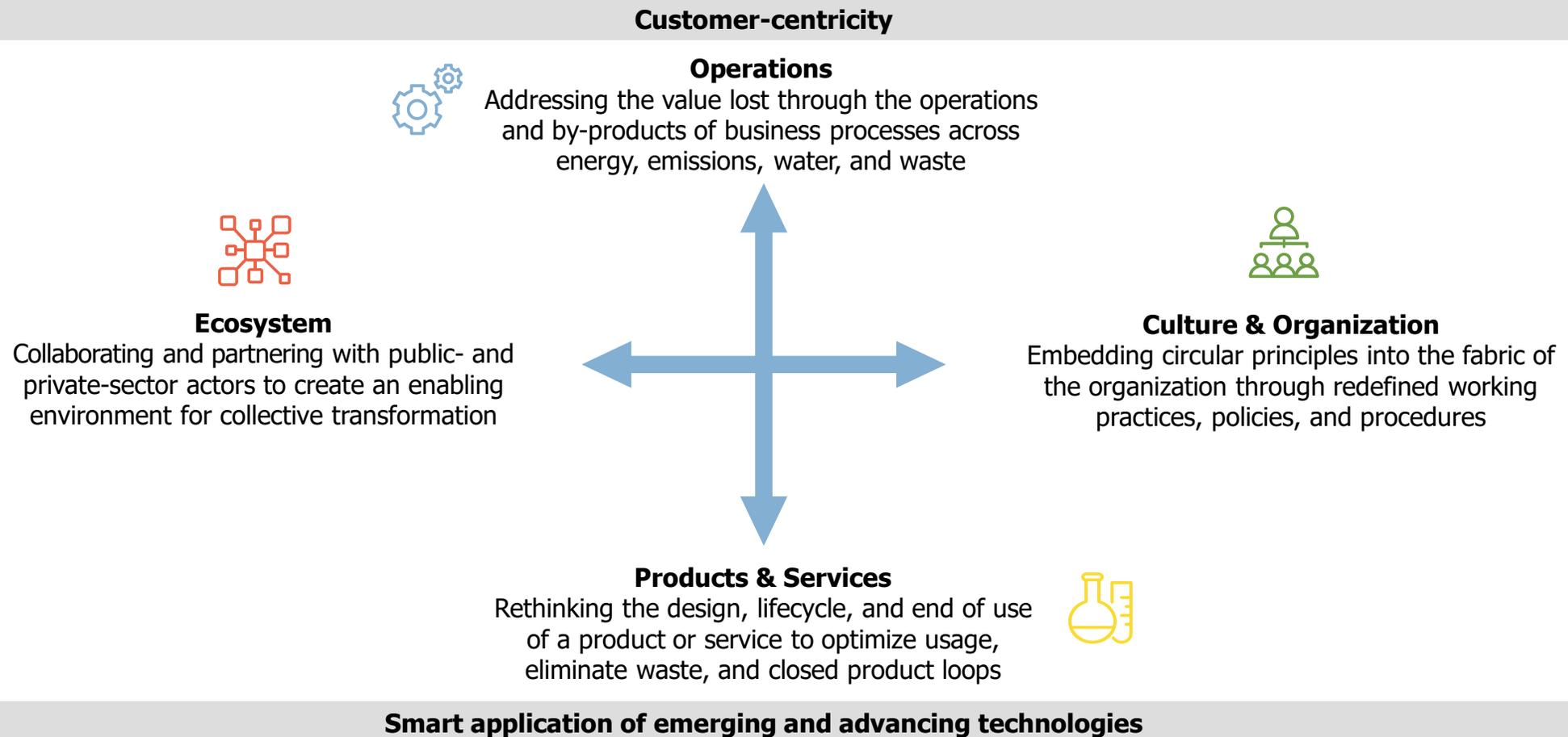
Key steps for chemical companies to take to start their journey and how to overcome typical barriers along the way

Chapter summary

- To succeed in circularity, companies need to mature across four key dimensions
 -  Operations
 -  Culture & Organization
 -  Products & Services
 -  Ecosystem
- Success in each dimension is further enhanced through customer-centricity, and smart application of emerging technologies
- Typically, the transformation journey happens in three stages: first companies become circular within, then they enable the circularity of their customers, and finally extend circularity to benefit the entire surrounding ecosystem
- Organizational & cultural, ecosystem-related and financial barriers are common along the journey
- To overcome these barriers, companies need strong leadership, a network of partners and a solid understanding of funding needs and requirements

To succeed in circularity, companies need to mature across four key dimensions

Key capabilities

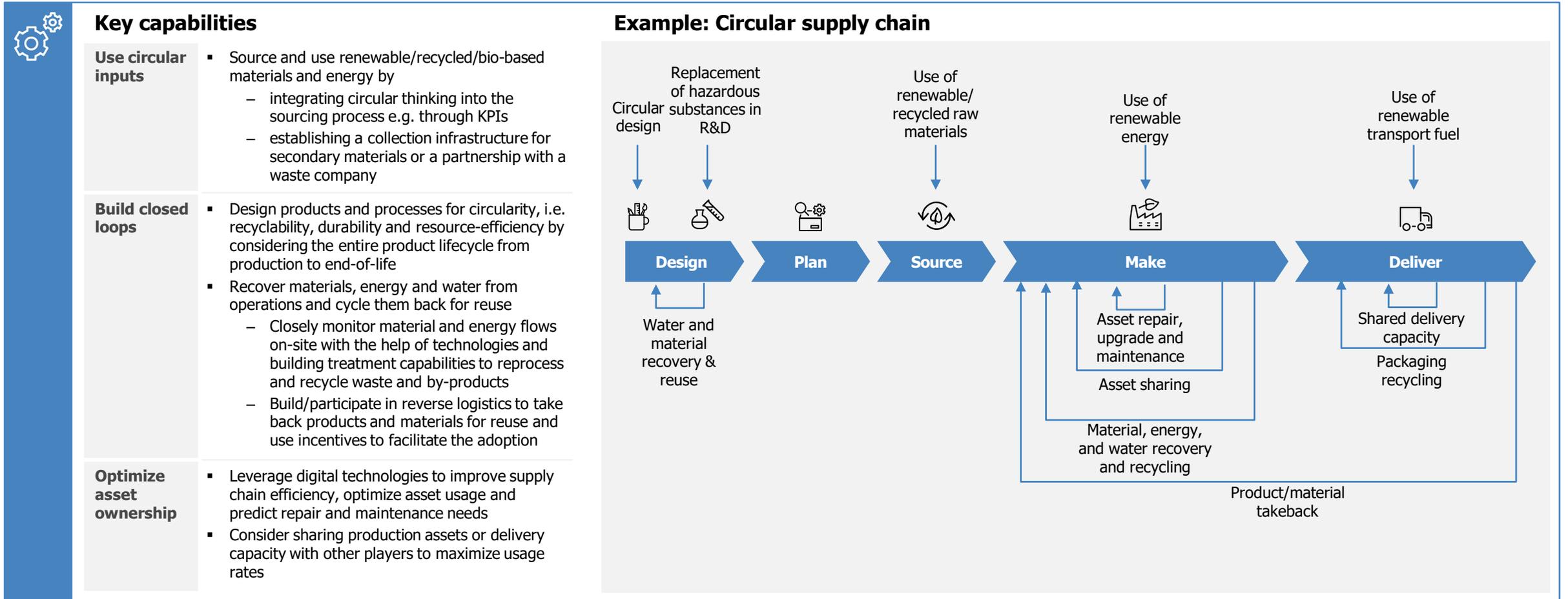


Source: Accenture research

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Supply chain circularity can be a key driver for competitiveness, reducing waste, emissions, water and energy consumption

Key capabilities - Operations



Source: Accenture research

Circularity is rooted deep in Sulapac's operations – from R&D to end-of-life recycling

Case example: Sulapac



- Sulapac® provides biodegradable biocomposite materials
- They can be used for multiple applications such as straws, hangers and packaging for cosmetics and foodstuff.
- The company was founded in 2016 by biochemists Suvi Haimi and Laura Tirkkonen-Rajasalo with the mission of *"Saving the world from plastic waste"*



Circularity in the Sulapac value chain

Sustainable sourcing

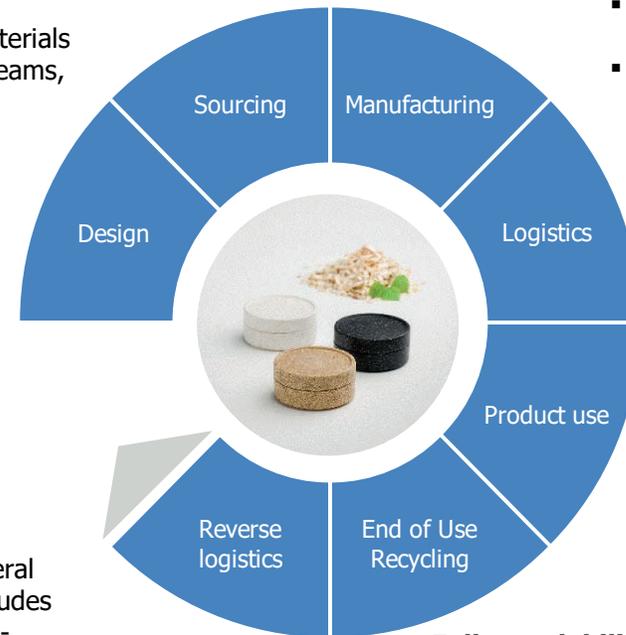
- Primarily plant-based raw materials
- Wood from industrial side streams, originating from sustainably managed forests

Safe & circular design

- Made of wood chips and biodegradable binders
- Unique, luxurious look and feel ideal for sustainability-conscious quality-driven brands

Collaboration with partners

- Sulapac collaborates with several partners and brands. This includes the whole value chain from co-creation of novel recipes to development of take-back systems and new reuse and recycling routes.



Flexible manufacturing

- Sulapac does not own any production facilities
- Its materials are used on customers' and partners' existing production lines to replace conventional plastics
- Sulapac materials can be processed with existing plastic converting machinery with only minor adjustments needed

Shared logistics

- Sulapac shares the logistics infrastructure with other players, allowing optimized capacity usage

Optimized usability

- Sulapac materials have many of the same benefits as traditional plastic, making them fully functional alternatives, yet Sulapac does not leave microplastic behind
- Many Sulapac products (e.g. jars) can be reused for other functions once consumed, thanks to their appealing design

Full recyclability

- Sulapac biodegrades fully into CO₂, water and biomass
- Sulapac is recyclable via industrial composting, and other recycling methods are under investigation (e.g. mechanical and chemical recycling)

Setting a clear sustainability vision, reorganizing for circularity, and building new competences are key for a successful transition

Key capabilities - Culture & Organization

	Key capabilities	Examples
Define sustainability vision	Define a long-term sustainability strategy with clear targets and milestones, and demonstrate leadership commitment with transparent communication	 <p>In 2019, Neste renewed its strategy and set out an ambition to become a global leader in renewable and circular solutions. The company has set an ambitious target to reaching carbon neutral production by 2035 and to reduce its customers' greenhouse gas emissions by at least 20 million CO₂ tons annually by 2030, and is now developing a detailed action plan.</p> <p>41.5% of new Neste employees say that its sustainability focus is one of the key reasons for joining the company.¹</p>
Foster innovation	Promote a culture of innovation and motivate employees to ideate new ways to deliver value to stakeholders in a sustainable and circular way, leveraging the power of ecosystem partners	 <p>To build sustainability capabilities within the organization, Borealis is engaging senior and mid-level managers in a customized Business Sustainability course, which deepens participants' skills and understanding in key sustainability topics such as circular economy, materiality identification, marine littering, microplastics and design for recycling. The company also hosts interactive webcasts on current and emerging sustainability issues for its employees throughout the year, and has an internal portal for sharing sustainability insights.</p> <p>Since 2016, 72 Borealis managers have been certified, including 16 in 2019.²</p>
Develop competence	Systematically develop sustainable and circular capabilities across the entire organization through trainings and cross-functional knowledge sharing, and attract new talent with inspiring purpose	 <p>The Ellen MacArthur Foundation is developing a new Circulytics tool, that measures a company's circularity in a holistic way, looking not only at products and material flows, but also at strategy, innovation, people & skills, processes & systems and external engagement.</p> <p>30+ companies have participated in piloting the tool, incl. e.g. BASF and Sulapac.³</p>
Reorganize for circularity	Enhance cross-functional collaboration (e.g. R&D and sourcing) and consider setting-up a sustainability/circularity team to drive the change	
Align governance	Embed sustainable ways of working in policies, processes and procedures, and develop metrics and tools for tracking progress over time	

Source: Accenture research; (1) Neste Annual Report 2019; (2) Borealis Annual Report 2019; (3) Ellen MacArthur Foundation

Kiilto desires to be an environmental leader, and is running a comprehensive programme to achieve the ambition

Case example: Kiilto



- Kiilto is a Finnish family-owned company which develops, manufactures and markets chemical industry solutions in four business areas
 - Construction
 - Industrial bonding and hygiene solutions
 - Professional cleanliness and hygiene
 - Consumer business
- In 2018, Kiilto started a group-wide *Promise to the Environment* programme, which consists of four key themes
- Each theme has a dedicated steering committee consisting of representatives from various functions that meet regularly to track progress
- Kiilto has also set concrete group-level targets for each theme, which guide company- and unit-specific operations
- Programme updates are also given in group-wide townhall meetings, and all new employees are given a sustainability-related training as part of their induction



Kiilto Promise to The Environment

Theme	Promise	Targets
Green energy	By 2028, all company operations are carbon neutral	<ul style="list-style-type: none"> ▪ From 2019 onwards, Kiilto will participate in environmental projects aimed at adding carbon sinks (e.g. planting forests in nearby areas) ▪ By 2025, we will reduce our energy consumption per ton produced by 20% from the level in 2010 ▪ By 2028, we will only use energy that is fully renewable ▪ Our logistics and business travel will be carbon neutral by 2028
Green packaging and logistics	A positive environmental impact is the foundation of our packaging solutions	<ul style="list-style-type: none"> ▪ By 2025, 70% of our packaging materials are reusable, renewable or made from recycled materials ▪ Kiilto will start a packaging waste collection program by 2019
Green services	We provide the best circular economy solutions in our industry	<ul style="list-style-type: none"> ▪ By 2020, all Kiilto trainings will have contents on sustainable development and environment. We train 20 000 people per year in Finland ▪ All of our customer meetings in 2020 will include the discussion of environmental issues ▪ All Kiilto personnel will receive environmental training in 2020 ▪ We will reduce our customers' use of materials. From 2023 onwards, our target is 200 000 kg per year
Green material choices	We are the leading circular economy company of our industry	<ul style="list-style-type: none"> ▪ Towards zero waste. We will halve our amount of waste (per produced tons) by 2022 ▪ Circulating materials. We will double the share of renewable and circular raw materials by 2022

Source: Accenture analysis; Interviews with Kiilto representatives; Kiilto website

Customer-centricity and design for circularity enable additional revenues and enhance brand value

Key capabilities - Products & services



Key capabilities

Develop a customer-centric offering

- Re-evaluate product portfolio regularly for expected changes in customer demand patterns, and adjust accordingly
- Build strong understanding of customer values and pain points and develop outcome/performance-based solutions around them
- Engage customers throughout the product lifecycle – from design to takeback and recovery
- Integrate customer-centricity in sales operations

Design for circularity

- Assess methods for using less resources for producing products and for making products last longer
- Replace existing raw materials with renewable and recycled materials, and substitute hazardous substances with more sustainable alternatives
- Enhance circularity in the downstream value chain by developing materials that are resource-efficient (e.g. light-weight), durable, separable, sortable and recyclable

Build trust & transparency

- Communicate openly about sustainability and circularity initiatives, targets and progress within your own organization
- Provide comprehensive information on products and their environmental impact, incl. e.g. material composition, origin, CO₂ footprint, etc
- Educate customers and consumers about the advantages of sustainable and circular approaches to production and consumption to drive their behavioral change

Example



Orthex SmartStore™ Collect is a stylish collect-box for sorting different types of waste, such as plastic packages, glass, metals and cardboard. The product has a modular design which can be tailored to individual needs and wishes, and it is made of 100% recycled materials. What is more, the bamboo-lid of the container enables to use it as a seat, further extending the usability of the solution.



In 2020, the SmartStore™ Collect won the German Design Award and Innovation Interior Award.

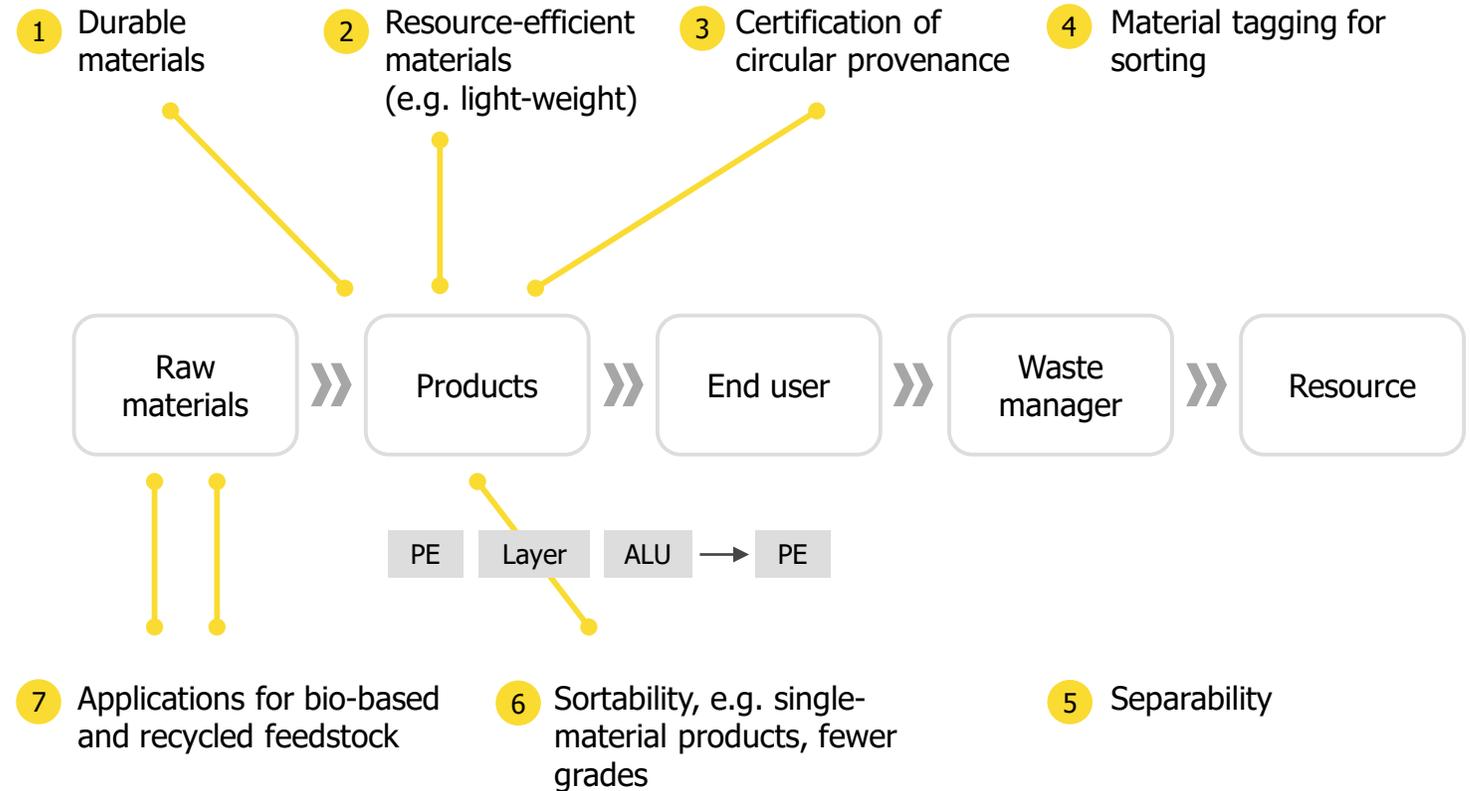
Design for circularity is critical for improving access to and supply of secondary raw materials

Deep-dive: Design for circularity



Design for circularity

- Design for circularity is crucial for improving access to the large amount of chemical product-based materials reaching their end-of-life and not being recycled for reuse
- To address this challenge, chemical companies have an opportunity to supply materials that enhance the circularity in the downstream value chain, such as single-layer materials and adhesives that are easy to split up
- Circular design principles will be further promoted in the EU with the Sustainable Product Policy Framework that supports e.g. product durability, recyclability, reuse, and carbon efficiency
 - The policy will be gradually rolled out across industries starting in 2021



For chemical companies, collaboration across the value chain is vital in order to tap into circular opportunities

Key capabilities - Ecosystem

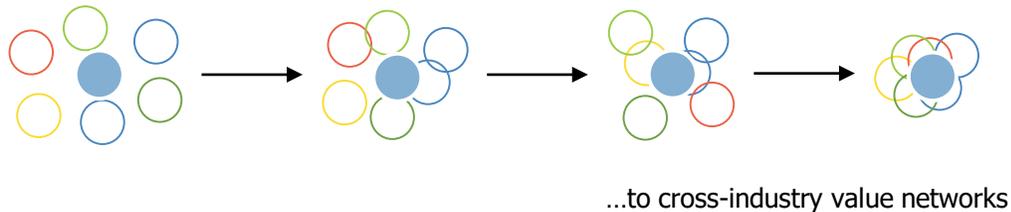


Description

- Circular economy cannot be achieved by one company alone, but collaboration with financial institutions, governmental organizations, technology players, customers, suppliers, public and societal actors is needed to deliver holistic solutions
- What differentiates ecosystems from traditional collaboration models is that activities are centered around a joint value proposition, meaning non-competitive, transparent sharing of knowledge, information, and learning

Ecosystem development over time

From industry-specific value chains....



Key capabilities

Secure funding and investment

Search for funding with an ecosystem mindset and tap into a diverse range of potential investors, e.g. banks, financial institutions, VC-firms, angel investors, and crowdfunding platforms.

Attract talent and future employees

Recruit the best possible talent into the team by leveraging personal and professional networks from across the ecosystem.

Find customers and clients

Promote products and services through ecosystem players and engage ambassadors to amplify marketing efforts.

Connect with peers

Identify and build relationships with other players working on similar challenges, and exchange ideas and learnings to accelerate solutions.

Identify mentors

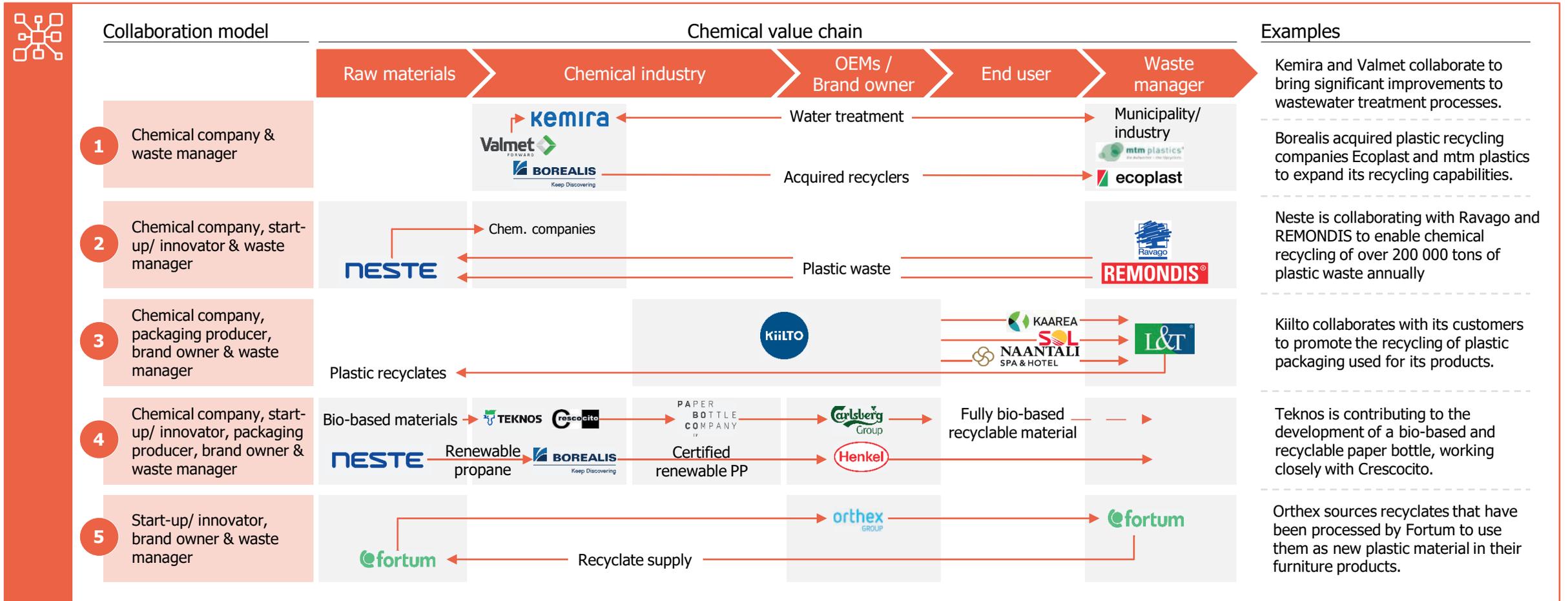
Look for functional and industry experts who can act as mentors and provide valuable guidance and coaching during the innovation journey.

Involve collaborators, partners and suppliers

Collaborate with a diverse ecosystem of brand owners, partners, suppliers, and customers and invite them to test new ideas.

Multiple new collaboration models have already emerged in the Finnish chemical ecosystem

Key capabilities - Ecosystem



Source: Company websites; Accenture analysis

Various players are needed to make an ecosystem flourish

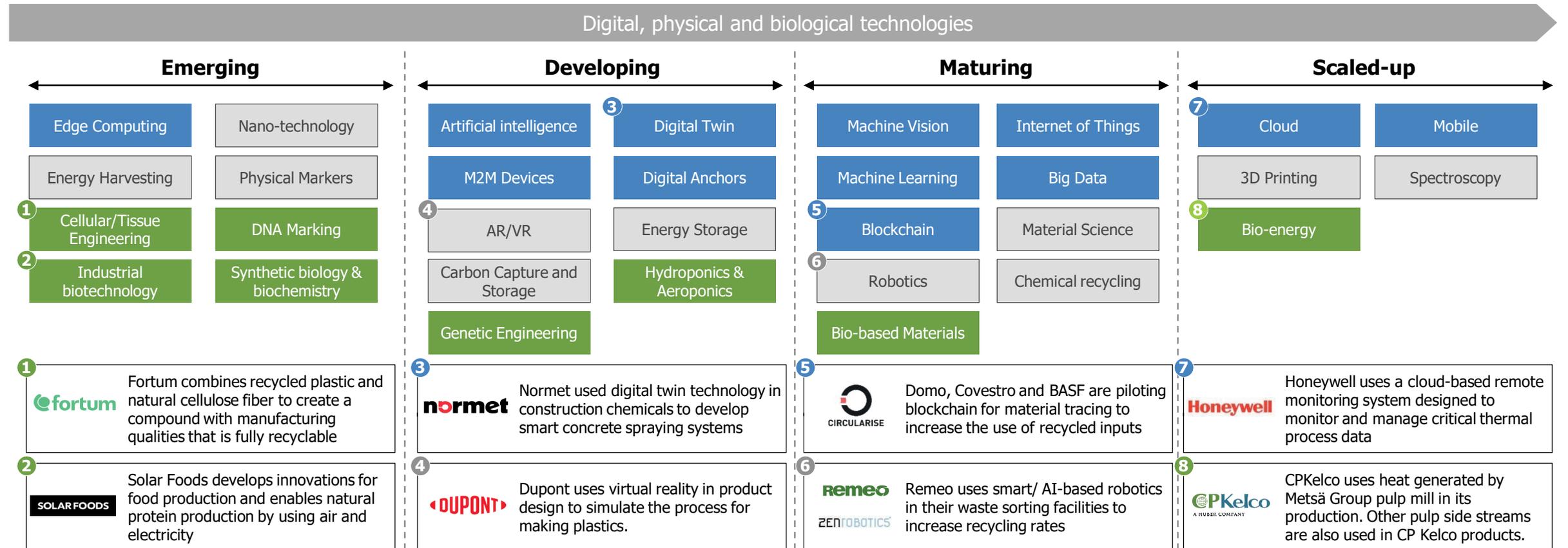
Key capabilities - Ecosystem

	Description	Role	Illustrative examples
Customers and end consumers	Current or potential new customers	Reveal insights on needs and iteratively improve solutions	
Suppliers & delivery partners	Goods and service providers for internal use and collaborative solution delivery (waste/material management, logistics, insurance, payment solutions, circular design ...)	Grant access to circular material, partner for joint provision of circular material or partner for service delivery	
Technology providers	Providers of technologies and software enabling circular solution delivery to customers or internal operational improvements	Engage in solution and process design and supply required technologies	
Thought leaders	Universities, networks and peers with extensive sustainability and circular economy knowhow	Serve as source of inspiration, sounding board and learning platform	
Financiers	Public institutions, banks, investment funds and other funding providers	Give access to funding required for delivering sustainable and circular solutions	
Public and societal actors	Governments, associations and other representative organizations	Influence public perception and opinion, and influence or set framework conditions	

Source: Accenture research

Rapidly evolving technologies enable increased circularity – right application can unlock tremendous value

Smart application of emerging and advancing technologies



Type of technology ■ Digital ■ Physical ■ Biological

Source: Adapted from Accenture research; Company websites

Cross-functional collaboration is key in capability development – some functions take the lead for each capability and others support

Role of functions in capability development

Dimension	Capability	Functions							
		Design / R&D	Sourcing	Manufacturing	Logistics	Sales & Marketing	Aftersales	Strategy & Leadership	Support functions ¹
 Operations	Use circular inputs		✓	(✓)	(✓)				
	Build closed loops	✓	✓	✓	✓		✓		
	Optimize asset ownership			✓	✓				
 Culture & Organization	Define sustainability vision	(✓)	(✓)	(✓)	(✓)	(✓)	(✓)	✓	(✓)
	Foster innovation							✓	
	Develop competence							✓	✓
	Reorganize for circularity							✓	
 Products & services	Align governance							✓	(✓)
	Develop a customer-centric offering	✓				✓	✓		
	Design for circularity	✓	✓						
	Build trust & transparency	(✓)	(✓)			✓		✓	
 Ecosystem	Secure funding and investment	(✓)						✓	(✓)
	Attract talent and future employees							(✓)	✓
	Find customers and clients					✓		(✓)	
	Connect with peers	✓	✓	✓	✓	✓	✓	✓	
	Identify mentors	✓				✓		✓	
	Involve collaborators, partners and suppliers	✓	✓	✓	✓	✓	✓	✓	
Customer-centricity		✓	✓	✓	✓	✓	✓	✓	✓
Technology application		✓	✓	✓	✓	✓	✓	✓	✓

Note: (1) Includes e.g. HR, IT, Finance, Legal

✓ Leading function (✓) Supporting function

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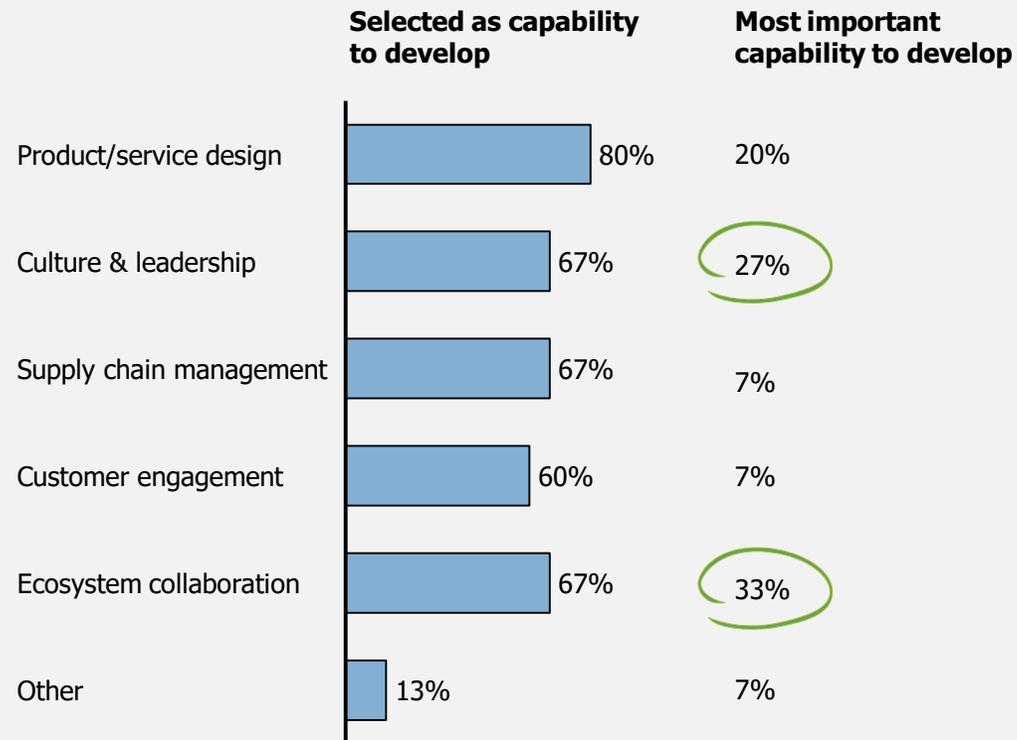
Finnish chemical companies see ecosystem collaboration as the key capability to develop in order to achieve circularity

Key capabilities

INDICATIVE

Perceived key barriers in transitioning to sustainable and circular business models

% of respondents, n=15



"At the moment, many chemical companies are very technology-oriented, and would benefit from a more customer-centric approach."

"Without the right culture and leadership, nothing can truly be adopted in the organization. With the right culture and leadership the whole organization will be driven towards the desired goals."

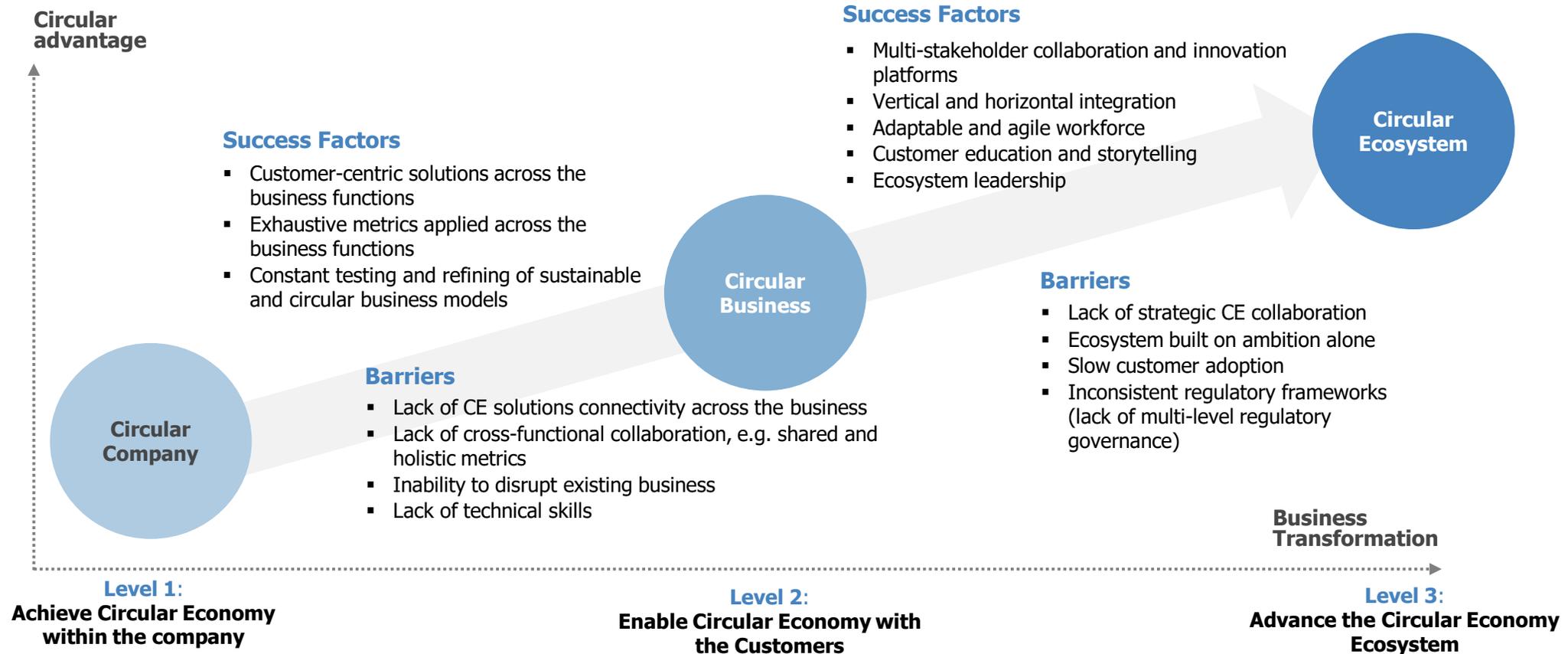
"To take our sustainability commitments forward, we need to engage the entire organization, including R&D, procurement, operations, logistics and back office personnel. We need to communicate about our targets and plans from the very beginning, and be open for additional development ideas."

"To have a circular system, we cannot work alone. We see that it is utterly important to collaborate with partners in our value chain and outside our value chain."

Note: The survey was conducted for a limited group of 15 Finnish chemical companies, and therefore the results can only be used as an indication of the current state of the industry
 Source: (1) Accenture research; (2) Survey conducted to select companies within the Finnish Chemical industry in April 2020, n=15

The transformation to circularity typically happens in three stages

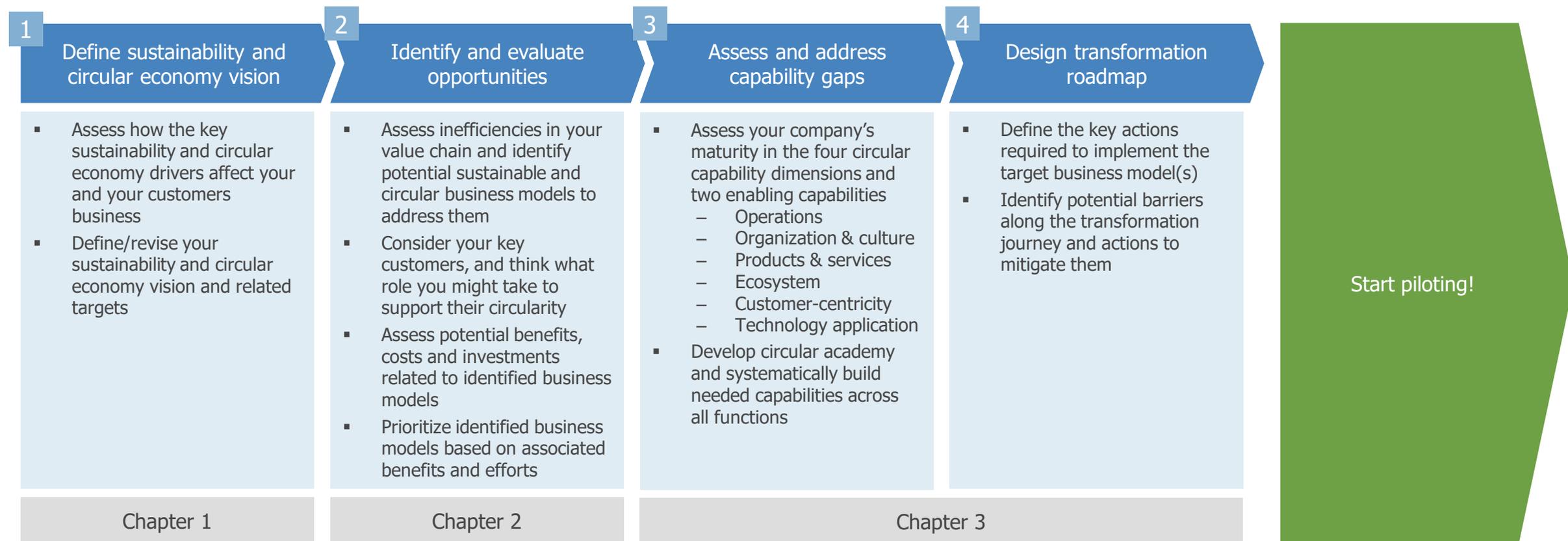
Transformation journey



Source: Accenture research

Four steps can help you get started with the journey

First steps on the circular transformation journey

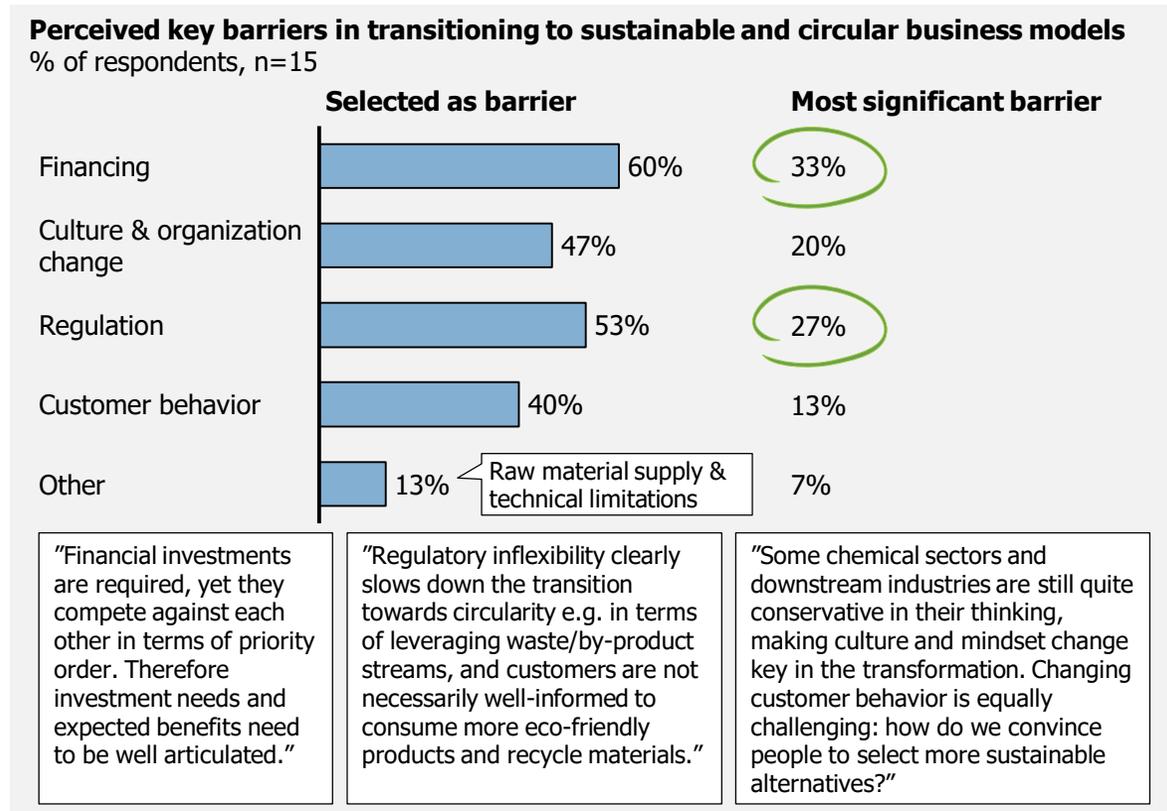
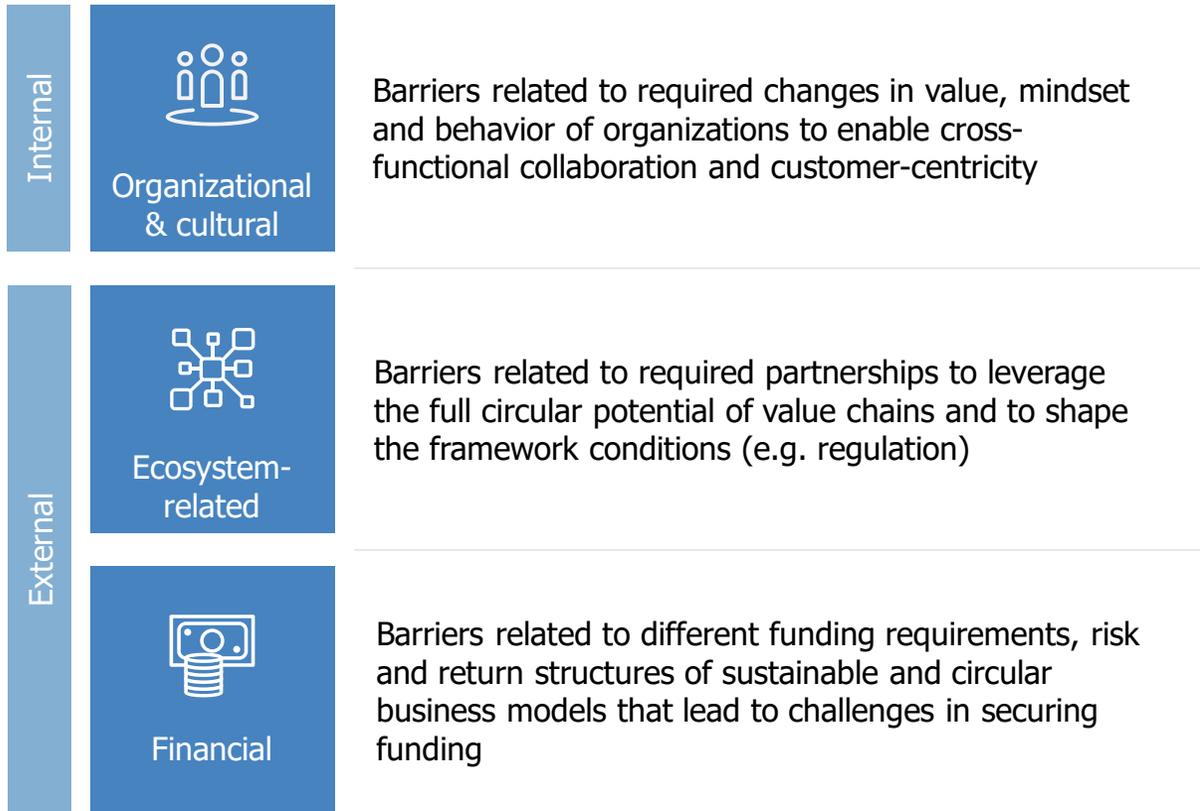


Tip: You can leverage the [circular business model development tools](#) developed for the manufacturing industry to support your work.

Organization & culture, ecosystem and financing are the most typical barriers along the transformation journey

Typical barriers¹

INDICATIVE



Note: The survey was conducted for a limited group of 15 Finnish chemical companies, and therefore the results can only be used as an indication of the current state of the industry
Source: (1) Accenture research; (2) Survey conducted to select companies within the Finnish Chemical industry in April 2020, n=15

To overcome barriers, companies need strong leadership, a network of partners, and a solid understanding of funding needs

Recommendations on how to overcome typical barriers

		Key challenges		Recommendations	
Internal	 Organizational & cultural	<ul style="list-style-type: none"> Resistance from employees to adopt circular behaviors, mindsets and values, incl. e.g. cross-functional collaboration Turning leadership commitments into visible action, i.e. "walking the talk" Integrating circular principles and customer-centricity in sales operations 	➔	<ul style="list-style-type: none"> Establish a dedicated change programme and engage employees in defining what circularity means for the organization as a whole and their function and role in specific Remove barriers and set incentives for cross-functional collaboration Incorporate sustainability and circularity in leadership performance indicators to make leaders accountable for the change Put special focus on enabling circularity and customer-centricity of sales organization through capability development, process and tool updates and performance indicators 	
	External	 Ecosystem-related	<ul style="list-style-type: none"> Low customer and end consumer interest/demand towards more sustainable alternatives Lack of clear ecosystem model that clearly identifies customers, markets, channels and a common revenue model Unfavorable framework conditions, e.g. uncertainty of upcoming regulations or regulations hindering adoption of sustainable and circular models 	➔	<ul style="list-style-type: none"> Educate customers and end consumers on the benefits of more sustainable alternatives and their viability as a substitute for conventional models Determine your own role in the ecosystem first (aggregator / innovator / orchestrator), and only then pick partners. Alternatively, join an existing ecosystem if there is a role that suits your objectives Remember that despite differing views and objectives, the key to ecosystem success is a shared vision and value proposition towards the society and environment Be aware of framework conditions and actively engage to shape them
		 Financial	<ul style="list-style-type: none"> Hesitation towards investing in sustainable and circular business models Understanding funding requirements and risks of sustainable and circular business models Identifying relevant funding sources and instruments 	➔	<ul style="list-style-type: none"> Use the circular value creation framework to holistically assess and demonstrate benefits of circularity and build a detailed business case around it Investigate business model specific funding requirements and related risks, e.g. investments to equipment and process development and balance sheet extension (relevant for Product as a Service) Research different funding sources and instruments and assess their suitability for your business needs (see next page for an overview of potential alternatives)

Source: Accenture research

Various funding sources are available for development of sustainable and circular business models

Potential funding sources

NON-EXHAUSTIVE

Public funding

Finnish		The Finnish Government provides EUR 2.6 million funding for projects promoting carbon neutrality, including circular economy.
		Business Finland offers funding programs for SMEs e.g. to conduct R&D and co-creation projects, perform a material audit, invest in increased energy efficiency and use of renewable energy
		Finnvera gives guarantees against political or commercial risks associated with the financing of exports
		The Finnish State Development Company Vake shall provide capital and accelerate public, commercial and public-private-partnership platforms, and industrial scalability for new technology solutions addressing climate change with an over EUR 100 million annual investment.
		TESI offers funds and direct investments to support growth and has started a programme where it will invest EUR 75 million in CE companies by 2021.
European		The EU ETS Innovation Fund will provide EUR 10 billion funding for innovative low-carbon technologies and solutions that enable emission reductions. The first call will be launched in 2020, followed by regular calls until 2030.
		The Joint Initiative on Circular Economy (JICE) is a partnership between EU's five largest national promotional banks and the European Investment Bank to invest at least EUR 10 billion in 2019-2023 to circular economy projects in the EU. JICE provides loans, equity investment, guarantees, innovative financing structures and technical assistance. Eligible projects can be submitted to respective JICE partners.
		Under Horizon 2020, the European commission funds CE research with EUR 400 million in 2020.

Private funding

Finnish		Taaleri is a financing company that operates the world's first Private Equity Circular Economy Fund
		Grannenfelt Finance is an independent provider of financial solutions for growth companies, drawing on different sorts of funding solutions (equity, debt, EU and government funding), and is particularly focused on funding 'product as a service' models
		Korona Invest is a private equity firm specialized in small and medium-sized growth companies. The firm invests in companies with a turnover of EUR 2-20 million that have a solid growth plan, and currently have 2 circular economy focused companies in their portfolio of 10 companies.
		Voima Ventures invests in promising early-stage technology companies with a strong scientific foundation and global ambition. Its strategic partner is VTT and its portfolio includes many circular economy pioneers such as Solar Foods, Paptic, and Infinited Fiber company.
International		Circularity Capital is a specialized private equity firm investing in European Growth SMEs that operate in the circular economy
		Closed Loop is a fund that invests in sustainable consumer goods companies, advanced recycling technologies and services related to the circular economy

Source: Organization websites; Accenture analysis

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03

How to start the transformation journey?

Activation questions

1. Considering the four key capability dimensions that companies need to mature in to succeed in circularity, what kind of development initiatives your company should start around
 - Operations
 - Culture & organization
 - Products & services
 - Ecosystem
 - Customer-centricity
 - Technology application?
2. What are the key actions required to make these initiatives happen?
3. Who are the key partners you need to collaborate with?
4. What technologies can be used to support the initiatives?
5. What barriers might you encounter when implementing the initiatives? How can you mitigate them?

Business model canvas

Based on the information learnt in this chapter, fill in the following parts of the business model canvas:

- **Financial aspects** – make a high-level estimate on revenues, costs, and required investments
- **Operating model** – reflect on key partners, capabilities, resources and digital technologies needed to operate your circular business idea
- **Enabling companies** – list companies that can support the development of your circular business model, such as financiers and technology providers



Concluding remarks

You should now have a good understanding of...

- The importance of the chemical industry in accelerating the broader transition to sustainable and circular economy across industries
- The competitive advantage that sustainable and circular business models can create for chemical companies through operations optimization, accelerated growth and enablement of downstream circularity
- The key capabilities that your company needs to develop to succeed in circularity
- The potential barriers that you may encounter on your transformation journey and ways to mitigate them

As first steps, we advise you to...

- Gather a cross-functional team and
 - Review your business strategy and see whether it sufficiently addresses the trends driving sustainability and circularity
 - Make a list of potential new sustainable and circular opportunities across your value chain
 - Draft a high-level plan on how you intend to take the identified initiatives forward
- Engage your organization, customers and partners more broadly to validate and complement your ideas, and get started!



Want to learn more?

Additional resources

Publisher	Resource	Description
Kemianteollisuus ry / Chemical Industry Federation of Finland	Carbon Neutral Chemistry 2045	Target set by the Chemical Industry Federation of Finland (Kemianteollisuus ry) in the beginning of 2019 to make the industry carbon neutral in Finland by 2045 by both reducing carbon footprint and increasing handprint.
Kemianteollisuus ry / Chemical Industry Federation of Finland	Responsible Care programme	International voluntary sustainability programme of the chemical industry. Operated in Finland since 1992.
Kemianteollisuus ry / Chemical Industry Federation of Finland	Circular Economy case examples Bioeconomy case examples	Circular economy and bioeconomy case examples from the Chemical Industry in Finland.
Sitra, Technology Industries of Finland & Accenture	Circular Economy Playbook and Tools for the Manufacturing Industry	Comprehensive overview of circular economy opportunities in key manufacturing sectors: <ul style="list-style-type: none">- Machinery & Equipment- Marine- Energy- Transportation Set of tools to start developing company-specific CE opportunities further, e.g. value case tool, business model canvas, and capability assessment tool.
Accenture & Cefic	Winning in a Circular Economy: Practical Steps for the European Chemical Industry	Recent research on Circular Economy in the European Chemical industry.
Accenture	The Circular Economy Handbook	Book featuring insights gained from years of experience and an analysis of 1 500 case studies, offering a practical view on how organizations can take transformative steps towards circularity and create new opportunities for competitiveness and sustainable prosperity.

**Finnish chemical companies contributing to
the development of this playbook**

FP-Pigments Oy

Kiilto Oy

Molok Oy

Orthex Group Oy Ab

Smart Chemistry Park / Turku Science Park Oy

St1 Oy

Sulapac Oy

Teknikum Oy

Teknos Oy

Wiitta Oy

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